

Westmorland and Furness Council

Level 1 Strategic Flood Risk Assessment

Westmorland and Furness Council

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Quality information

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Abbreviations

Acronym	Definition	Acronym	Definition
AEP	Annual Exceedance Probability	MAFP	Multi-Agency Flood Plan
AIMS	Asset Information Management System	NaFRA	National Flood Risk Assessment
AOD	Above Ordnance Datum	NCERM	National Coastal Erosion Risk Management
AONB	Area of Outstanding Natural Beauty	NFM	Natural Flood Management
AOR	Areas of Risk	NGR	National Grid Reference
BGS	British Geological Survey	NPPF	National Planning Policy Framework
CCC	Cumbria County Council	NWL	Northumbrian Water Limited
CCMA	Coastal Change Management Area	OS	Ordnance Survey
CFMP	Catchment Flood Management Plan	PDG	Project Delivery Group
CSO	Combined Sewer Outfall	PFRA	Preliminary Flood Risk Assessment
DEFRA	Department of Environment, Food and Rural Affairs	PPG	Planning Practice Guidance
DPD	Development Plan Document	PVA	Potentially Vulnerable Area
DTM	Digital Terrain Model	RBD	River Basin District
DWMP	Drainage and Wastewater Management Plan	RBMP	River Basin Management Plan
EU	European Union	RCP	Representative Concentration Pathway
FCERM	Flood and Coastal Erosion Risk Management	RMA	Risk Management Authority
FIR	Flood Investigation Report	RoFFSW	Risk of Flooding from Surface Water
FRA	Flood Risk Assessment	SAB	SuDS Approval Body
FRMP	Flood Risk Management Plan	SAC	Special Area of Conservation
FWMA	Flood and Water Management Act	SFRA	Strategic Flood Risk Assessment
GIS	Geographical Information System	SMPs	Shoreline Management Plans
HMWB	Heavily Modified Water Body	SoP	Standard of Protection
ICM	Integrated Catchment Modelling	SSSI	Sites of Special Scientific Interest
LIDAR	Light Detection and Ranging	SuDS	Sustainable Drainage Systems
LLFA	Lead Local Flood Authority	SWMP	Surface Water Management Plan
LPA	Local Planning Authority	TraC	Transitional and Coastal
LRF	Local Resilience Forum	UU	United Utilities

Executive Summary

As the Local Planning Authority (LPA), Westmorland and Furness Council, hereby referred to as the Council, are responsible for the publication of a Strategic Flood Risk Assessment (SFRA) in accordance with the National Planning Policy Framework (NPPF). The SFRA provides an evidence base to guide sustainable spatial planning and to inform the emerging Local Plan (2028 – 2045). The SFRA identifies the risk of flooding from all sources, including rivers, sea, surface water, groundwater, sewers, canals and reservoirs, across Westmorland and Furness Planning Area, which excludes the Lake District and Yorkshire Dales National Parks.

The Council's Planning Area is at risk of flooding from multiple sources, particularly rivers and the sea. Areas of Flood Zone 2 and 3 are associated with Main Rivers including the River Kent, Station Beck, Peasley Beck, River Eea and Poaka Beck. Key locations at medium to high risk of flooding from these watercourses include Kendal, Milnthorpe, Grange-over-Sands, Ulverston, Appleby-in-Westmorland, Barrow-in-Furness and Walney Island. The south-western part of the Council's Planning Area is tidally influenced and is located within the Kent Leven Catchment. There are three large estuaries within the Planning Area; the River Kent, the River Leven and the Duddon Estuary.

The SFRA identifies the functional floodplain (Flood Zone 3b) for the Planning Area. For the large part of the Planning Area, this has been delineated using the '*Rivers and Sea 3.3% Annual Exceedance Probability (AEP) (1 in 30 year) defended flood risk extents - present day*' dataset. At the time of writing (April 2026), the Environment Agency advised that the additional incorporation of local hydraulic model outputs provides a more accurate representation of functional floodplain for the Poaka Beck and the Bela Catchment in Milnthorpe, Holme and Stainton, and therefore the outputs from the Poaka Beck (2021) model and the Milnthorpe (2021) model have also been used.

Existing flood defences protect key towns such as Kendal and Appleby. At the time of writing (April 2026), the Kendal and Appleby Flood Risk Management Schemes are being delivered to further reduce flood risk for these towns. There are limited tidal flood defences in the area. Areas with tidal defences include Milnthorpe, Arnside, Flookburgh and Grange-over-Sands. There are limited defences at Walney Island and between Barrow-in-Furness and Ulverston. In addition to hard defences, Natural Flood Management has been delivered at Town View Fields in Kendal by South Cumbria Rivers Trust in 2020. This incorporates bunds, leaky dams and de-culverting.

The Planning Area is at risk of surface water flooding. During the 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1,000 year) events surface water flooding is widespread across the Council's planning area, following the natural topography, land drainage systems and road networks. Historical events in Kendal, Appleby, and Ulverston demonstrate vulnerability to flooding during intense rainfall. Detailed surface water modelling studies have also been completed for Kendal (2020) and Kirkby Stephen (2023) which have informed this SFRA.

Areas underlain by permeable geology are at greater risk of flooding from groundwater sources due to the capacity for groundwater storage and conveyance. Reference to broad scale BGS mapping identifies that the majority of the study area has a 'limited potential for groundwater flooding to occur'. However, areas north of Askam-in-Furness, Kendal and to the north of Skelton and Penrith show 'potential for groundwater flooding to occur at the surface'.

Historic records of sewer flooding have been obtained from United Utilities and Northumbrian Water which indicates postcode LA9 6 (Kendal) has the highest number of reported sewer flooding incidents in the last 10 years.

There is residual risk of flooding from artificial sources such as reservoirs, canals and from infrastructure failure. There are 15 No. reservoirs and the Lancaster Canal within the Planning Area. Whilst the residual risk is low due to strict regulation under the Reservoirs Act 1975, emergency planning provisions remain necessary.

In the future, climate change is anticipated to have an impact on all sources of flood risk within the Council's Planning Area. It is important that planning decisions recognise the potential for flood risk to increase into the future and plan for development that will be sustainable.

Chapter 5 and **Chapter 8** of the SFRA provides guidance for undertaking the Sequential Test and for preparing site-specific Flood Risk Assessments (FRA) by, or on behalf of, a developer. **Chapter 6** provides guidance on measures to control and mitigate flood risk and **Chapter 7** provides guidance on managing residual risk. Avoiding flood risk must always be the primary approach; however, where this is not achievable, a range of measures can be applied to control and mitigate flood risk. These include but not limited to safeguarding land for future flood risk management, incorporating SuDS within the drainage strategy, implementing property flood resilience measures,

and raising finished floor levels where appropriate. Even with mitigation in place, a degree of residual risk will always remain. It is therefore essential that the Council ensures robust emergency planning procedures are in place, including implementation of flood warnings and the ability to maintain safe access and egress for all new developments.

Throughout the SFRA, recommendations are provided for the Council to consider as they develop their Local Plan. The recommendations are consolidated in **Appendix C** and include the following.

1. **Infrastructure and Coordination** – Improve communication between neighbouring LPAs to manage cross boundary impacts. Improve communication with other Risk Management Authorities such as Network Rail especially relating to surface water drainage along low-lying estuarine sections of the railway.
2. **Sequential Planning** – Apply the Sequential Test for all site allocations and document justification for decisions made. Identify where the Exception Test may be required.
3. **Land Use and Relocation** – Explore opportunities to relocate vulnerable development from high flood risk zones (e.g. Flood Zone 3) to areas at lowest risk (Flood Zone 1).
4. **Flood Risk Management Infrastructure** – Safeguard land for future flood management works and review drainage systems in rail corridors.
5. **Data Management and Climate Change** – Maintain up-to-date flood models, mapping, and 'reasonably available' site registers. This should include the latest climate change allowances reflected in national guidance.
6. **Sustainable Design** – Include Sustainable Drainage Systems (SuDS) property-level resilience, natural flood management, climate change adaption measures into all development proposals.
7. **Emergency Planning** – Strengthen emergency planning co-ordination with the Cumbria Local Resilience Forum by supporting community-level flood awareness, flood warning response arrangements and ensuring safe access and egress routes are identified for all developments.

The Level 1 SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the study area. The Environment Agency may in the future update the hydraulic modelling across the Planning Area which will improve the current knowledge of flood risk and may marginally alter predicted flood extents within parts of the study area in the future. Specifically modelling for Ulverston is a priority for the Environment Agency to update. New information may influence future development management decisions within these areas. Therefore, it is important that the SFRA is adopted as a 'living' document and is reviewed regularly in light of emerging policy directives, flood risk datasets and an improving understanding of flood risk within the study area.

1. Introduction

1.1 Background

- 1.1.1 The National Planning Policy Framework¹ (NPPF) and associated Planning Practice Guidance² (PPG) for 'Flood Risk and Coastal Change' emphasise the role of Local Planning Authorities (LPA) in managing flood risk, ensuring flood risk is understood and managed sustainably throughout all stages of the planning process.
- 1.1.2 In its role as the LPA, Westmorland and Furness Council (hereafter referred to as the Council) has a responsibility to complete a Strategic Flood Risk Assessment (SFRA) to inform the preparation of the Local Plan, which should consider advice from the Environment Agency and other relevant flood management authorities.
- 1.1.3 The Council faces the challenge of meeting the need for new development within areas already identified to be at risk of both river (fluvial) and tidal flooding associated with a number of different watercourses such as, the River Eamont, River Eden, River Kent, River Leven and Thacka Beck. Furthermore, there is the potential risk arising from localised flooding including surface water generated by heavy rainfall, elevated groundwater, existing drainage systems as well as artificial sources, including several reservoirs, all of which could be exacerbated from the impacts of climate change.
- 1.1.4 Westmorland and Furness is a new unitary authority formed through the merger of Barrow Borough Council, Cumbria County Council, Eden District Council and South Lakeland District Council, including the areas covered by the Lake District and Yorkshire Dales National Park Authorities. The Westmorland and Furness LPA however excludes the Lake District and Yorkshire Dales National Park Authorities. This SFRA therefore supersedes the previous SFRAs prepared by Barrow Borough Council³, Cumbria County Council (as part of the Draft Minerals and Waste Local Plan)⁴, Eden District Council⁵, and South Lakeland District Council⁶. Since the publication of those documents, both flood risk legislation and flood risk datasets have been updated. This SFRA incorporates the latest evidence at the time of writing, including the new National Flood Risk Assessment⁷ (NaFRA2).

1.2 Aims and Objectives

- 1.2.1 The purpose of the Level 1 SFRA is to collate and analyse the most up-to-date flood risk information to inform the Council's Local Plan, including the application of the Sequential and Exception Tests in the allocation of future development sites.
- 1.2.2 Mapping of flood risk from all sources will enable the Council to apply the Sequential Test to potential allocation sites and steer development towards those areas of lowest flood risk from all sources.
- 1.2.3 The aims of the SFRA are to:
- Provide a strategic overview of flood risk within Westmorland and Furness's planning area, to enable effective risk-based strategic planning for the future. This includes but is not limited to the preparation of the Local Plan; and
 - Provide a source of information which can be used by the Council to inform knowledge of flooding and flood risk from all sources.
- 1.2.4 The objectives of the SFRA are to:

¹ National Planning Policy Framework, 2025. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

² Planning Practice Guidance: Flood Risk and Coastal Change, 2025. Available at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

³ Capita, 2015, Barrow Borough Council, Strategic Flood Risk Assessment, May 2015.

⁴ Cumbria County Council, 2018, Cumbria Minerals and Waste Local Plan, Strategic Flood Risk Assessment, June 2018. Available at: <https://www.westmorlandandfurness.gov.uk/sites/default/files/2025-10/SFRA%202018%20-%20Final%20Vsn.pdf>

⁵ JBA, 2020, Eden District Council Level 1 Strategic Flood Risk Assessment, June 2020.

⁶ Jacobs, 2007, South Lakeland District Council Strategic Flood Risk Assessment, October 2007.

⁷ Gov.uk, 2025, New national flood and coastal erosion risk information. Available at: <https://www.gov.uk/guidance/updates-to-national-flood-and-coastal-erosion-risk-information>

- Assess all potential sources of flooding, now and in the future, taking account of the impacts of climate change, based on readily available datasets.
 - Identify the implications of coastal erosion and flood risk for local planning.
 - Define the extent of Flood Zone 3b (functional floodplain).
 - Inform the Sustainability Appraisal process, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies.
 - Identify existing flood risk management measures as well as areas that need to be adapted to climate change, and areas that need to be safeguarded for future flood risk management features and structures.
 - Consider the potential cumulative impact of development and land use change on the risk of flooding in the study area.
 - Inform the application of the Sequential and, if necessary, Exception Tests in the allocation of future development sites, as required by the NPPF¹, and planning application process.
 - Identify the requirements for site-specific Flood Risk Assessments (FRA).
 - Inform the preparation of flood risk policy and guidance and inform policies for land use change.
 - Inform emergency planning practice and determine the acceptability of flood risk in relation to emergency planning capability.
 - Consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and storage for floodwater.
- 1.2.5 The Council should take an integrated approach to flood risk management when preparing plans, as per NPPF¹ paragraph 167(c). This is a collaborative, catchment-based approach delivering coordinated management of water storage, supply, demand, wastewater, flood risk, quality of water and the wider environment.
- 1.2.6 This document forms a Level 1 SFRA which has been undertaken to support the completion of the Sequential Test by the Council, inform the allocation of sites within the Local Plan and identify when a site-specific flood risk assessment for planning permission may be required. If the Council determines that land outside flood risk areas from any source cannot appropriately accommodate all necessary development a further Level 2 SFRA will need to be undertaken. This will need to assess the detailed nature of flood risk within each Flood Zone and provide the evidence required to support the application of the Exception Test.

1.3 Plan Making

- 1.3.1 The Council is currently preparing a Local Plan, expected to be adopted in 2028 which will set the vision for future development across its local planning authority area up to 2045.

1.4 Approach to Flood Risk Management

- 1.4.1 The NPPF¹ and associated PPG: 'Flood Risk and Coastal Change' (2025)² emphasise the active role LPAs should take to ensure that flood risk is assessed, avoided, controlled, mitigated and managed effectively and sustainably throughout all stages of the planning process. The overall approach for the consideration of flood risk set out in paragraphs 003 and 004 of the PPG: 'Flood Risk and Coastal Change' (2025) is summarised in **Figure 1-1**:



Figure 1-1: Approach to Flood Risk Management

- 1.4.2 This has implications for LPAs and developers as described below.

Assess Flood Risk

- 1.4.3 The NPPF¹ outlines that Local Plans should be supported by a SFRA and LPAs should use the findings to inform strategic land use planning. As such, Westmorland and Furness Council, as the LPA, should use the Level 1 SFRA to inform a future local plan.
- 1.4.4 **Figure 1-2** reproduced from the PPG: 'Flood Risk and Coastal Change' (2025)², illustrates how flood risk should be taken into account in the preparation of the Local Plan by the Council.
- 1.4.5 A site-specific FRA should be provided for all development in Flood Zones 2 and 3⁸ (or prior approval for certain types of permitted development⁹, or technical details consent¹⁰). In Flood Zone 1, an assessment should accompany all proposals involving; sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in the future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use. Assessments of flood risk should identify sources of uncertainty and how these are accounted for in a mitigation strategy.

Avoid Flood Risk

- 1.4.6 The Council should apply the sequential approach to site selection so that development is, as far as reasonably possible, located where the risk of flooding from all sources is lowest, taking account of climate change and the vulnerability of future users to flood risk.
- 1.4.7 In plan-making this involves the LPA applying the Sequential Test, and where necessary the Exception Test to Local Plans, as described in **Figure 1-2**.
- 1.4.8 In decision-making this involves applying the Sequential Test and, if necessary, the Exception Test, for specific development proposals.
- 1.4.9 *Within* individual application sites, the most vulnerable aspects of development must be located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location. Measures to avoid flood risk can also be taken, by locating the most vulnerable uses on upper storeys and raising finished floor levels and/or ground levels. Such measures should also account for residual flood risks from flood risk management infrastructure.
- 1.4.10 Where the Sequential and Exception Tests have been applied as necessary and not met, development should not be allowed.

Control Flood Risk

- 1.4.11 The Council and developers can investigate measures to control the risk of flooding affecting the site. Early discussions with relevant flood risk management authorities, and reference to programmes of flood and coastal erosion risk management schemes will help to identify such opportunities.
- 1.4.12 The Council and developers should seek flood risk management opportunities (e.g. safeguarding land), and to reduce the causes and impacts of flooding (e.g. through the rigorous application of the surface water hierarchy and the use of sustainable drainage systems).

Mitigate Flood Risk

- 1.4.13 After applying measures to avoid and control the risk of flooding, the next step is to mitigate flooding. Mitigation itself does not justify development in flood risk areas. In accordance with paragraph 181(b) of the NPPF¹, development should only be allowed in areas at risk of flooding where it can be demonstrated that development is appropriately flood resistant and resilient, such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment. Measures can be passive, such as flood doors which are normally closed, or active, such as air brick covers or removable flood barriers.

⁸ Residential development can be assumed to have a lifetime of at least 100 years, unless there is specific justification for considering a different period. Further guidance on what is considered to be the lifetime of a development is detailed in paragraph 006 of the Planning Practice Guidance: Flood Risk and Coastal Change, 2025.

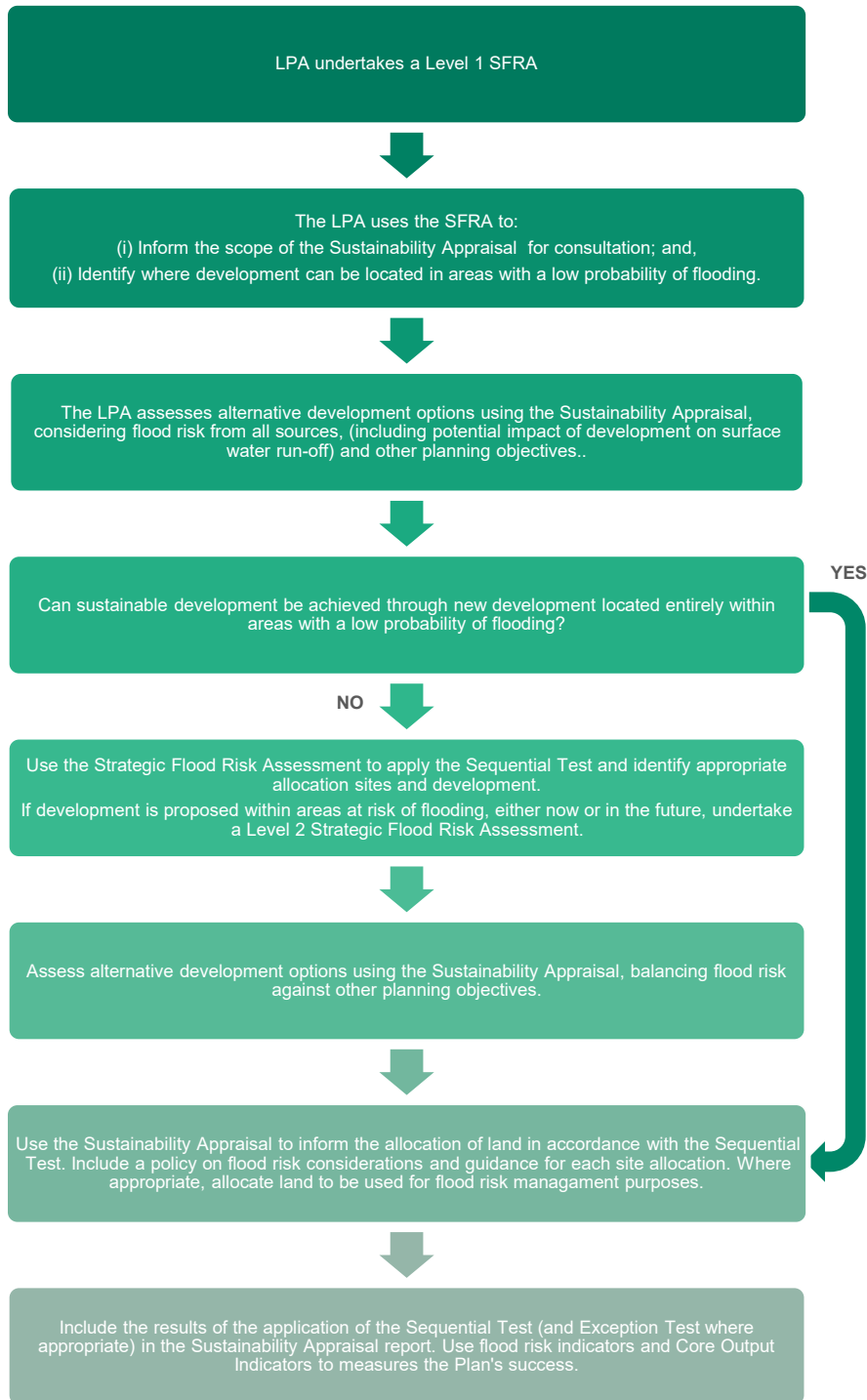
⁹ Planning Practice Guidance: Flood Risk and Coastal Change, 2025 Paragraph 053 'Permitted development rights and flood risk'. Available at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change#para53>

¹⁰ Gov.uk, 2019, Permission in principle guidance, March 2019. Available at: <https://www.gov.uk/guidance/permission-in-principle>

Passive flood resilience and resistance measures should be prioritised over active measures as they are likely to be more effective and more reliable.

Manage Residual Flood Risk

- 1.4.14 The Council and developers should consider further management measures to deal with any residual risk remaining after avoidance, control and mitigation measures have been applied. Residual risks will need to be safely managed to ensure people are not exposed to hazardous flooding. Developers, in consultation with LPAs and Emergency Planning teams, should provide safe access routes and consider whether adequate flood warning would be available to people using the development.
- 1.4.15 In accordance with the PPG: 'Flood Risk and Coastal Change' (2025)², measures to manage residual risk need to be considered early in the design process to ensure that they complement other design requirements such as catering for the needs of the elderly or those with lesser mobility.



Source: PPG²: 'Flood Risk and Coastal Change' (2025), Diagram 1

Figure 1-2: Taking flood risk into account in the preparation of a Local Plan

1.5 User Guide

1.5.1 It is anticipated that the SFRA will have a number of end users, with slightly different requirements. For example, strategic planners (who may be developing policies, undertaking the Sequential Test and allocating sites), development management officers, emergency planners and those preparing site specific FRAs. **Table 1-1** provides a user guide to summarise the content of the SFRA and how to navigate the report and mapping deliverables.

Table 1-1: SFRA Structure

SFRA Section	
Section 1: Introduction	Outlines the background, aims and objectives of the SFRA and the approach to flood risk management. Provides a user guide as well as information on monitoring and updating the SFRA.
Section 2: Policy Context	Outlines and describes key policies and strategies on a national, sub-regional and local level, in relation to Westmorland and Furness and flood risk, which are used as the background against which recommendations are made.
Section 3: Methodology	Identifies the datasets and methodologies applied within the SFRA for assessing flood risk.
Section 4: Assessing flood risk in Westmorland and Furness Council	Provides an overview of the study area, topography and geology. Provides an assessment of the different sources of flooding, residual risk, the cumulative impacts of development on flood risk, and cross boundary considerations.
Section 5: Avoiding flood risk – Applying the Sequential Test	Provides details of how the Sequential Test should be applied at the Local Plan stage, and for individual planning applications. Provides information on the application of the Exception Test.
Section 6: Measures to control and mitigate flood risk	Identifies existing measures in place to control flooding such as existing flood risk management infrastructure, flood storage areas, and flood alleviation schemes. Identifies opportunities that should be considered when developing strategic plans, and as part of site specific FRAs for future development, to control and mitigate the risk of flooding, such as safeguarding of land for future flood risk management, surface water management measures and property resilience measures.
Section 7: Managing residual risk	Identifies measures to manage residual risks such as flood warning, emergency planning, provision of safe access/escape and places of safety.
Section 8: Preparing a site-specific Flood Risk Assessment	Provides details on when FRAs are required, what they should address and where to go for pre application advice.
Section 9: Next steps	Summary of next steps for the Council.
Appendix A Mapping	Mapping for the whole Westmorland and Furness study area has been produced using the datasets identified in Section 3 . For clarity, the mapping has been divided into 'North' and 'South' areas of Westmorland and Furness.
Appendix B Functional Floodplain Delineation	An overview of how the functional floodplain has been delineated using a combination of NaFRA2 and local models.
Appendix C Summary of Recommendations	Recommendations for the Council to take forward in their Local Plan preparation are provided throughout the SFRA. This Appendix provides a consolidated list of the recommendations from the wider report in one location.

1.6 Monitoring and Update

1.6.1 SFRAs are living documents that should be reviewed after a significant flood event or when there are changes to:

- The predicted impacts of climate change on flood risk;
- Detailed flood modelling - such as from the Environment Agency or Lead Local Flood Authority;
- Local Plans, spatial development strategies or relevant local development documents;
- Local flood management schemes;
- Flood Risk Management Plans;
- Shoreline Management Plans;
- Local Flood Risk Management Strategies; and / or,
- National planning policy or guidance.

1.6.2 The mapping presented throughout this SFRA is also available online via PlaceMaker: <https://placemaker.westmorlandandfurness.urbanintelligence.co.uk/documents/32>. This will provide the most up to date mapping and information. For any access issues, contact localplan@westmorlandandfurness.gov.uk.

- 1.6.3 The SFRA includes outputs from NaFRA2 published in March 2025. There was low confidence in the accuracy of the national modelling for Town Beck in Ulverston, so instead the outputs from the 2021 Town Beck Flood Alleviation Scheme model have been incorporated into NaFRA2. The NaFRA2 modelling for Town Beck is under review by the Environment Agency so if updated modelling becomes available, this SFRA should be reviewed accordingly.
- 1.6.4 For Kendal, the NaFRA2 outputs have incorporated the results of an Environment Agency detailed model completed in 2021. The Kendal, Staveley & Ings model has since been updated and these new results will be incorporated into future NaFRA2 updates (timescale unconfirmed). The flood risk modelling for Kendal, Burneside, Staveley and Ings will also be updated after the completion of each Phase (1-3) of the Flood Alleviation Scheme to reflect the improvements and update the risk mapping accordingly. Phase 1 of the Scheme is due for completion in 2028.

2. Legislative and policy context

This Section provides a high-level overview of the national and regional planning context for coastal change and flood risk management in the Westmorland and Furness SFRA study area.

2.1 Legislation

Flood and Water Management Act (2010)

- 2.1.1 The Flood and Water Management Act¹¹ (FWMA) 2010 designates Unitary Authorities and upper tier Local Authorities as LLFAs. As such, the Council is the designated LLFA for its administrative area and is responsible for managing local flood risk, which is defined as flooding from surface water runoff, groundwater and ordinary watercourses. The LLFA is also responsible for maintaining a register of features which provide a local flood risk management function.
- 2.1.2 The FWMA also formalises the flood risk management roles and responsibilities for other organisations including the Environment Agency, Water Companies, Internal Drainage Boards and National Highways. The responsibility to lead and coordinate the management of tidal and Main River fluvial flood risk remains that of the Environment Agency.
- 2.1.3 The role of Sustainable Drainage Systems (SuDS) Approval Body (SAB) was a duty anticipated to be placed on LLFAs by Schedule 3 of the FWMA, allowing them to be responsible for adopting and maintaining SuDS. As the LLFA, the Council would hold the role of the SAB. As of January 2023, the government announced that Schedule 3 will likely be enacted in 2024 however at the time of writing Schedule 3 has still not been implemented. Schedule 3 provides a framework for the approval and adoption of drainage systems, an approving body, and national standards on the design, construction, operation, and maintenance of SuDS. In addition, it makes the right to connect surface water runoff to public sewers conditional upon the drainage system being approved before any construction work can start. The National Standards for sustainable drainage schemes¹² provides additional supporting information relating to SuDS as detailed in [Section 6.6](#).

2.2 National Planning Policy and Guidance

National Planning Policy Framework (2025)

- 2.2.1 The NPPF¹ sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which local individuals and Councils can produce distinctive local plans, which reflect the needs and priorities of their communities. The NPPF¹ has been revised several times to reflect updates to wider Government policy and emerging proposals. The most recent revision is dated February 2025.
- 2.2.2 The overall approach to flood risk is broadly summarised in the NPPF¹ (2025) Paragraph 170:
- “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.”*
- 2.2.3 As described under Paragraphs 171 and 172 of the NPPF¹ (2025), all proposals for development should account for all sources of flood risk and the current and future impacts of climate change:
- “Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.”*

¹¹ Flood and Water Management Act, 2010. Available at: <https://www.legislation.gov.uk/ukpga/2010/29/contents>

¹² DEFRA, 2025, National standards for sustainable drainage systems (SuDS). Available at: <https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds#how-the-national-standards-work>

All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by: a) applying the sequential test and then, if necessary, the exception test as set out below; b) safeguarding land from development that is required, or likely to be required, for current or future flood management; c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.”

- 2.2.4 A draft NPPF¹³ was published for consultation in December 2025. The draft reinforces the role of flood risk as an important issue, separating flood risk and coastal change into a standalone chapter. It introduces clearer wording on when the Sequential Test is required and how it should be applied. The consultation draft also proposes to consolidate flood risk vulnerability and compatibility into a new annex. In addition, the draft places stronger emphasis on the consequences of failing to demonstrate that a development will be safe for its lifetime. It states more clearly that development which cannot be demonstrated to be safe should be refused. The draft consultation sets out clearer national expectations for drainage, including reference to national SuDS standards and a strengthened policy position on watercourse management.

Planning Practice Guidance (2024)

- 2.2.5 The PPG was first published by the UK Government in March 2014 and most recently updated in February 2024. The PPG acts as a catalogue of information, providing further context to the NPPF¹. Its primary purpose is for use in planning and decision-making and it is typically used by Local Authorities. However, it is a publicly available resource that can be used by community groups and other stakeholders. The guidance is separated into categories, the most relevant categories to the SFRA include 'Flood Risk and Coastal Change', updated in September 2025 and 'Climate Change', updated in March 2019. Key information on these is provided below.

Flood Risk and Coastal Change (2025)

- 2.2.6 The PPG: 'Flood Risk and Coastal Change' (2025)² advises how to take account of and address the risks associated with flooding and coastal change in the planning process. This includes but is not limited to the Sequential Test, Exception Test and SuDS guidance. This is described in **Section 5** and **Section 6.6**.

Climate Change (2019)

- 2.2.7 Guidance on climate change is included within the PPG: 'Climate Change' (2019)¹⁴ to enable identification of suitable mitigation and adaptation measures in the planning process to address impacts of climate change. A SFRA forms part of the evidence base for the Local Plan, therefore information on climate change risks included within the SFRA is important to support local planning and decision-making.
- 2.2.8 The guidance considers future climate risks when allocating development sites, in addition to the impact and promotion of design responses to flood risk for the lifetime of the development. The document refers to Section 19 (1A) of the Planning and Compulsory Purchase Act 2004, whereby development plan documents must include policies that are designed to secure the development and use of land which contribute to the mitigation of, and adaptation to, climate change.

Environmental Improvement Plan (2023)

- 2.2.9 The Environmental Improvement Plan¹⁵ was published by the Department for Environment, Food and Rural Affairs (DEFRA) in January 2023. It sets out the delivery of environmental goals, in order to restore habitats and wildlife, promote sustainable use of resources and to improve the mitigation of climate

¹³ Draft NPPF, December 2025. Available at:

https://assets.publishing.service.gov.uk/media/697b71c52ff8d10a830d5d4a/Draft_NPPF_December_2025.pdf

¹⁴ Planning Practice Guidance: Climate Change, 2019. Available at: <https://www.gov.uk/guidance/climate-change>

¹⁵ HM Government, 2023, Environmental Improvement Plan 2023: First Revision of the 25 Year Environment Plan. Available at: <https://www.gov.uk/government/publications/environmental-improvement-plan>

change impacts. The framework for action is underpinned by national policy and spans a period of 25 years, running until 2043.

2.2.10 The Environmental Improvement Plan outlines a series of actions to reduce risk of harm from environmental hazards. A large proportion of these actions seek to address flood risk, as detailed below:

- “Deliver projects funded by the £100 million Frequently Flooded Allowance, as part of the capital programme of investment, to support communities who have suffered repeated flooding;
- Invest a further £22 million per year, on top of baseline funding, for maintaining [...] flood defences between 2022 to 2023 and 2024 to 2025;
- Mitigate surface water flooding by making SuDS mandatory in new developments; and
- Invest in improving [...] flood forecasting capability for surface water flood risk”.

National Flood and Coastal Erosion Risk Management Strategy (2022)

2.2.11 In accordance with the FWMA 2010¹⁶, the Environment Agency has developed a National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England. This strategy provides a framework for the work of all flood and coastal erosion risk management authorities and sets out the other long-term objectives for managing all other sources of flood risk and the measures proposed to achieve them.

2.2.12 The strategy sets the context for, and informs the production of, local flood risk management strategies by LLFAs, which will in turn provide the framework to deliver local improvements needed to help communities manage local flood risk. It has a long-term vision for: a nation ready for, and resilient to, flooding and coastal change – today, tomorrow and to the year 2100 and has 3 long-term ambitions, underpinned by evidence about future risk and investment needs. They are:

- Climate resilient places: working with partners to bolster resilience to flooding and coastal change across the nation, both now and in the face of climate change.
- Today’s growth and infrastructure resilient in tomorrow’s climate: making the right investment and planning decisions to secure sustainable growth and environmental improvements, as well as infrastructure resilient to flooding and coastal change.
- A nation ready to respond and adapt to flooding and coastal change: ensuring local people understand their risk to flooding and coastal change, know their responsibilities and how to take action.

Climate Change Allowances

2.2.13 Climate change trends projected over UK land for the 21st century in UKCP18 are broadly consistent with earlier projections (UKCP09) showing an increased chance of warmer, wetter winters and hotter, drier summers along with an increase in the frequency and intensity of extremes¹⁷.

2.2.14 To ensure sustainable development now and in the future, the NPPF¹ requires that the effects of climate change should be taken into account in an SFRA and the flood outlines delineating climate change should be presented.

2.2.15 The Flood Risk Assessments: climate change allowances¹⁸ guidance was first published by the Environment Agency in February 2016, to define when and how LPA, developers and relevant stakeholders should use climate change allowances in FRAs. It forms part of the wider Environmental Planning guidance and is regularly updated to reflect emerging information and new projections. The most recent update was undertaken in May 2022, which accounts for UKCP19 projections. It is essential that land use planning decisions consider the impact of a changing climate where appropriate.

¹⁶ Flood and Water Management Act, 2010. Available at: <https://www.legislation.gov.uk/ukpga/2010/29/contents>

¹⁷ Met Office, 2022, UK Climate Projections: Headline Findings, August 2022. Available at:

https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18_headline_findings_v4_aug22.pdf

¹⁸ Environment Agency, 2022, Flood Risk Assessments: climate change allowances. Available at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

2.2.16 The climate change allowances are applied during design, and scheme and strategy development. By making allowances, this helps to provide resilience to flooding and coastal change.

2.2.17 The allowances predict anticipated change for:

- Peak river flow;
- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

2.2.18 Where applicable, climate change allowances should be used to demonstrate how flood risk will be managed so that the development remains safe throughout its lifetime without increasing flood risk elsewhere, taking climate change into account. The allowances are applied over a varying period of time and at varying percentiles, to account for the anticipated increase in climate change impacts.

Peak River Flow Allowances by Management Catchments

2.2.19 The peak river flow allowances¹⁹ show the anticipated changes to peak flow by management catchment. The range of climate change allowances are based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it.

- Central allowance is based on the 50th percentile;
- Higher central is based on the 70th percentile; and
- Upper end is based on the 95th percentile.

2.2.20 In addition, three primary epochs are used:

- '2020s' (2015 to 2039);
- '2050s' (2040 to 2069); and
- '2080s' (2070 to 2125).

2.2.21 **Table 2-1** shows how the appropriate climate change allowances for fluvial flooding should be used with regards to the vulnerability of the development and Flood Zone designation.

Table 2-1: Assigning Appropriate Climate Change Allowance Categories (Fluvial)

	Water Compatible	Less Vulnerable	More Vulnerable	Highly Vulnerable	Essential Infrastructure
Flood Zone 2	Central Allowance	Central Allowance	Central Allowance	Central Allowance	Higher Central Allowance
Flood Zone 3a	Central Allowance	Central Allowance	Central Allowance	Development Not Permitted	Higher Central Allowance
Flood Zone 3b	Central Allowance	Development Not Permitted	Development Not Permitted	Development Not Permitted	Higher Central Allowance

2.2.22 Having determined a suitable allowance category, the corresponding percentages for increase in river flow should be assessed. This is dependent on the site location and management catchment. The allowances for the management catchments of relevance to the Council are set out in **Table 2-2**. The guidance states that for SFRA, the central and higher central allowances (shaded in grey) should be considered.

¹⁹ Environment Agency, 2022, Peak River Flow Allowances by management catchment. Available at: <https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow?mgmtcatid=3045> [Accessed: September 2024]

Table 2-2: Peak river flow allowances for management catchments in Westmorland and Furness

Management catchment	Allowance category	Total potential change anticipated for the '2020's (2015 to 2039)	Total potential change anticipated for the '2050's (2040 to 2069)	Total potential change anticipated for the '2080's (2070 to 2125)
Lune	Upper end (95th)	33%	58%	92%
	Higher central (70th)	24%	38%	61%
	Central (50th)	20%	30%	49%
Kent and Leven	Upper end (95th)	32%	56%	91%
	Higher central (70th)	22%	36%	60%
	Central (50th)	18%	28%	47%
Eden and Esk	Upper end (95th)	32%	56%	94%
	Higher central (70th)	22%	35%	61%
	Central (50th)	18%	27%	47%
Tyne	Upper end (95th)	31%	42%	64%
	Higher central (70th)	22%	28%	42%
	Central (50th)	18%	22%	34%
North West TraC	Upper end (95th)	28%	49%	80%
	Higher central (70th)	19%	31%	51%
	Central (50th)	15%	23%	40%
South West Lakes	Upper end (95th)	22%	38%	63%
	Higher central (70th)	14%	23%	39%
	Central (50th)	12%	17%	30%
Swale, Ure, Nidd and Ouse Upper	Upper end (95th)	25%	33%	53%
	Higher central (70th)	15%	20%	34%
	Central (50th)	11%	14%	25%
Tees	Upper end (95th)	32%	41%	61%
	Higher central (70th)	23%	27%	40%
	Central (50th)	19%	21%	32%

Only a small portion of the study area is in the Swale, Ure, Nidd and Ouse Upper catchment. The large majority of the Council's area is within the Eden and Esk and Kent and Leven management catchments.

Peak Rainfall Climate Change Allowances by Management Catchments

- 2.2.23 Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This will lead to an increased volume of water entering land and urban drainage systems, consequently resulting in surface water flooding.
- 2.2.24 LPAs are encouraged to make allowances for climate change in Local Plans to help minimise vulnerability and provide resilience to flooding. The specific allowance to be used depends on the development, as well as its development lifetime. Current guidance on the climate change allowances that should be applied are set out by the Environment Agency²⁰. The Environment Agency advises that the peak rainfall allowances should only be used for surface water flood mapping in small catchments (under 5km²), urbanised drainage catchments, and for site-scale applications. **Table 2-3** indicates the peak rainfall intensity allowances for management catchments in Westmorland and Furness.
- 2.2.25 For peak rainfall intensity allowances, the development lifetime should be used to determine the relevant epoch. This is detailed below:

²⁰ Environment Agency, 2022, Peak Rainfall Allowances by management catchment. Available at: <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall> [Accessed: September 2024]

- Developments with a lifetime beyond 2100 should assess the upper end allowances for both the 3.3% and 1% Annual Exceedance Probability (AEP) event respectively of the 2070s epoch;
- Developments with a lifetime between 2061 and 2100 should assess the central allowance for both the 3.3% and 1% AEP event respectively of the 2070s epoch; and
- Developments with a lifetime up to 2060 should assess the central allowance for both the 3.3% and 1% AEP event of the 2050s epoch. A temporary building (with a lifetime of less than 30 years) should assess the central allowance for the 3.3% and 1% AEP event respectively of the 2050s epoch.

Table 2-3: Peak rainfall intensity allowances for management catchments in Westmorland and Furness

Management catchment	AEP	Epoch 2050s (2022-2060) or 2070s (2061-2125)	Central Allowance	Upper End Allowance
Lune	3.3%	'2050s'	25%	35%
	3.3%	'2070s'	35%	45%
	1%	'2050s'	25%	45%
	1%	'2070s'	35%	50%
Kent and Leven	3.3%	'2050s'	25%	35%
	3.3%	'2070s'	35%	45%
	1%	'2050s'	25%	45%
	1%	'2070s'	35%	50%
Eden and Esk	3.3%	'2050s'	25%	35%
	3.3%	'2070s'	30%	45%
	1%	'2050s'	25%	40%
	1%	'2070s'	35%	50%
Tyne	3.3%	'2050s'	25%	35%
	3.3%	'2070s'	30%	40%
	1%	'2050s'	25%	40%
	1%	'2070s'	35%	45%
North West TraC	3.3%	'2050s'	25%	35%
	3.3%	'2070s'	35%	45%
	1%	'2050s'	25%	45%
	1%	'2070s'	35%	50%
South West Lakes	3.3%	'2050s'	25%	40%
	3.3%	'2070s'	35%	45%
	1%	'2050s'	30%	45%
	1%	'2070s'	35%	50%
Swale, Ure, Nidd and Ouse Upper	3.3%	'2050s'	20%	35%
	3.3%	'2070s'	25%	40%
	1%	'2050s'	25%	40%
	1%	'2070s'	30%	45%
Tees	3.3%	'2050s'	20%	35%
	3.3%	'2070s'	30%	40%
	1%	'2050s'	25%	40%
	1%	'2070s'	30%	45%

Only a small portion of the study area is in the Swale, Ure, Nidd and Ouse Upper management catchment. The large majority of the Council's area is within the Eden and Esk and Kent and Leven management catchments.

Peak Sea Level Allowances by River Basin District

2.2.26 Global sea levels are rising as a result of human-caused global warming through the added water from melting ice sheets and glaciers, and the expansion of seawater as it warms.

2.2.27 There are a range of allowances for each river basin district and epoch for sea level rise which are included in **Table 2-4**. The river basin districts specific to the Council area are the Humber, Northumbria, North West and Solway Tweed. For places in parts of the Solway Tweed river basin district on the west coast of England, the 'North West' allowance should be used.

Table 2-4: Sea level allowances in the river basin districts relevant to the study area

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Humber	Higher Central	5.5 (193)	8.4 (252)	11.1 (333)	12.4 (372)	1.15
	Upper End	6.7 (235)	11 (330)	15.3 (459)	17.6 (528)	1.55
Northumbria	Higher Central	4.6 (161)	7.5 (225)	10.1 (303)	11.2 (336)	1.03
	Upper End	5.8 (203)	10 (300)	14.3 (429)	16.5 (495)	1.43
North West	Higher Central	4.5 (158)	7.3 (219)	10 (300)	11.2 (336)	1.01
	Upper End	5.7 (200)	9.9 (297)	14.2 (426)	16.3 (489)	1.41

Each epoch in mm for each year (based on 1981 to 2000 baseline). The total sea level rise for each epoch is in brackets.

2.2.28 Current guidance on the application of climate change allowances are set out by the Environment Agency¹⁸. The guidance states that for flood risk assessments and SFRAs, LPAs should assess both the higher central and the upper end allowances.

2.2.29 The guidance states, to calculate sea level rise using **Table 2-4**, the allowances for the appropriate geographical areas should be cumulatively added.

- Up to 2035, the mm for each year rates for the appropriate geographical area must be chosen, starting from the present day extreme sea levels from coastal design sea levels to coastal flood boundary extreme sea levels (2018)²¹.
- From 2036 to 2065, the increase in sea level is determined by adding the number of years on from 2035 (to 2065), multiplied by the respective rate shown in **Table 2-4** for the appropriate geographical area. If the whole time period applies, the cumulative total should be used.
- For time periods 2066 to 2095 and 2096 to 2125, the above steps for 2036 to 2065 should be repeated.

2.2.30 Where it is appropriate to apply a credible maximum scenario, the H++ allowance should be used. There is no H++ value for sea level rise beyond 2100. For the change to relative mean sea level, the H++ scenario of 1.9m for the total sea level rise to 2100 should be used.

²¹ Coastal Design Sea Levels – Coastal Flood Boundary Extreme Sea Levels (2018). Available at: <https://www.data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>

2.3 Sub-regional Planning Policy and Strategies

- 2.3.1 Sub-regional planning policy captures policies which are specific to a geographic area, typically grouped by location and shared characteristics. The policies reflect the wider objectives of a region, such as economic development and large scale planning, in addition to cross boundary issues. Subregional strategies such as river catchment, flood basin management and drainage and wastewater plans are also summarised alongside the regional planning policies relevant to the Council. These are described in **Table 2-5**.
- 2.3.2 Catchment Flood Management Plans (CFMP) and Flood Risk Management Plans (FRMP) have been included in this summary. Where available, FRMPs should be reviewed, however CFMPs have been included to provide additional context.

Table 2-5: Sub-regional Planning Policies and Strategies

Policy Document	Description	Link
Eden CFMP, December 2009	The Eden Catchment is a highly rural area, which provides an opportunity to manage land use to reduce runoff and increase the time between rainfall and peak flows. However, holding water for longer periods of time on agricultural land can lead to increased crop damage and adversely affect rural economies. The Eden CFMP highlights 6 policy options to tackle flood risk within the area, which varies from continuing to monitor and advise within areas with little or no flood risk to taking further action to reduce flood risk and manage run-off in locations that provides overall flood risk reduction or environmental benefits. The CFMP assesses 6 sub-areas within the catchment and assigns the most appropriate policy to tackle flood risk while also protecting the agricultural land.	https://www.gov.uk/government/publications/eden-catchment-flood-management-plan
Derwent CFMP, December 2009	The catchments within the Derwent CFMP receive a vast volume of rainfall. Combined with the impermeable underlying geology and waterlogged upland soils, this produces large amounts of run-off. This CFMP area has a particularly high environmental and landscape value. The Derwent CFMP follows the same 6 policies of the Eden CFMP and assesses 10 sub-areas within the catchment.	https://www.gov.uk/government/publications/derwent-catchment-flood-management-plan
Kent and Leven CFMP, December 2009	This CFMP area is predominately rural, being only 1.5% urban. The River Kent, Leven and Crake drain the southern fells of the Lake District. Combined high rainfall, thin soils and impermeable geology produce large amounts of run-off. Four other main rivers drain lower-lying land, and smaller rivers drain the coastal fringe, with a slower rainfall response. This CFMP area is important for nature conservation and landscape value. Two-thirds of it is within the Lake District National Park Authority, and there are a number of nationally and internationally protected sites. The Kent and Leven CFMP follows the same 6 policies of the Eden CFMP and assesses 8 sub-areas within the catchment.	https://www.gov.uk/government/publications/kent-and-leven-catchment-flood-management-plan
Lune CFMP, December 2009	The Lune is a rural catchment, made up of steep slopes to the north and west and flatter terrain to the east and south, along the River Keer, Conder, Cocker, Pilling Water and the lower reaches of the River Lune. Some urban development has occurred, notably at Carnforth and Galgate. Further south, Pilling Water and the River Cocker catchments include the best agricultural land in the Lune CFMP area. However, in order to realise the soil productivity, it has been necessary to introduce relatively intensive land drainage techniques. The Lune CFMP follows the same 6 policies of the Eden CFMP and assesses 9 sub-areas within the catchment.	https://www.gov.uk/government/publications/lune-catchment-flood-management-plan
South West Lakes CFMP, December 2009	The South West Lakes catchment comprises a number of small, rural, flashy ²² sub-catchments and is amongst the wettest and steepest in England and Wales. Run-off following rainfall is generally rapid due to the relatively impermeable underlying geology and steep sub-catchments. The South West Lakes CFMP follows the same 6 policies of the Eden CFMP and assesses 9 sub-areas within the catchment.	https://www.gov.uk/government/publications/south-west-lakes-catchment-flood-management-plan
River Tees CFMP, December 2009	The Tees catchment has areas with distinctly different characteristics, with steep channel gradients and valley sides in the Upper Tees, mid-catchment gentle slopes and tidal influences in the lower catchment. The River Tees CFMP follows the same 6 policies of the Eden CFMP and assesses 8 sub-areas within the catchment.	https://www.gov.uk/government/publications/river-tees-catchment-flood-management-plan
River Tyne CFMP, December 2009	The River Tyne catchment includes a number of regionally important water supply reservoirs including Kielder and Derwent Reservoirs. These reservoirs can effect flood flows and are also able to maintain river flows in the Tyne, Wear and Tees rivers via water transfer infrastructure. The catchment also contains fertile agricultural plains with a string of towns along the watercourses and land covered by urban development including Newcastle and Gateshead. The Tyne catchment	https://www.gov.uk/government/publications/river-tyne-catchment-flood-management-plan

²² A catchment area that, because of geographic, topographic, and geological factors, shows an almost immediate response to intense rainfall, resulting in a flash flood.

Policy Document	Description	Link
	has a wealth of environmental assets and culturally recognised sites. The River Tyne CFMP follows the same policies of the Eden CFMP and assesses 7 sub-areas within the catchment.	
Humber River Basin District Flood Risk Management Plan 2021 to 2027, December 2022	The Humber River Basin District (RBD) FRMP aims to manage significant flood risk, with particular focus on areas that have been designated as being at risk of flooding from either rivers and sea or surface water. There are 193 measures applicable to managing flood risk in the Humber RBD as well as a series of national measures. Some of which include: <ul style="list-style-type: none"> Investigate local flood events where appropriate and necessary in their area. Support communities to increase their resilience to flooding in their area. Work with other risk management authorities to identify a programme of nature based approaches in their area.' 	https://assets.publishing.service.gov.uk/media/638099ed8fa8f56eb302c6f8/Humber-FRMP-2021-2027.pdf
Northumbria River Basin District Flood Risk Management Plan 2021 to 2027, December 2022	The Northumbria RBD FRMP aims to manage significant flood risk, with particular focus on areas that have been designated as being at risk of flooding from either rivers and sea or surface water. Measures applicable to managing flood risk in the Solway Tweed RBD include: <ul style="list-style-type: none"> 'Identify and map opportunities to deliver nature-based solutions in North East of England. Work together to develop approaches to improve collective learning in North East of England. Work with Risk Management Authorities and wider communities to deliver innovative and natural improvements to flood risk and habitat quality in North East of England.' 	https://www.gov.uk/government/publications/northumbria-river-basin-district-flood-risk-management-plan
Solway Tweed River Basin District Flood Risk Management Plan 2021 to 2027, December 2022	The Solway Tweed RBD aims to manage significant flood risk, with particular focus on areas that have been designated as being at risk of flooding from either rivers and sea or surface water. Measures applicable to managing flood risk in the Solway Tweed RBD include: <ul style="list-style-type: none"> 'Undertake Flood and Coastal Erosion Risk Management Schemes, on a priority basis for identified places in northern England. Deliver existing and updated coastal strategies in northern England. Assess the way flood risk is managed within identified areas in northern England' 	https://assets.publishing.service.gov.uk/media/6380a1c9e90e0723443452f2/Solway-Tweed-FRMP-2021-2027.pdf
North West River Basin District Flood Risk Management Plan 2021 to 2027, December 2022	The North West RBD FRMP aims to manage significant flood risk, with particular focus on areas that have been designated as being at risk of flooding from either rivers and sea or surface water. There are 145 measures applicable to managing flood risk in the North West RBD, some of which include: <ul style="list-style-type: none"> 'Aim to establish a North West Coastal Centre of Excellence, sharing expertise, resources and innovative approaches for coastal schemes in the North West of England. Collaborate with environmental partners and major landowners to significantly increase upland and lowland peat and wetland restoration in the North West of England. Continue to monitor, advise on and work with natural flood processes as far as possible, within identified areas in the North West of England. In-light of climate change predictions, investigate innovative approaches to coastal monitoring and access to data in the North West of England.' 	https://assets.publishing.service.gov.uk/media/63809c7ee90e072345afbd65/North-West-FRMP-2021-2027.pdf
Northumbria River Basin District River Management Plan, December 2022	The Northumbria River Basin District (RBD) River Basin Management Plan (RBMP) describes the challenges that threaten the water environment and how these challenges can be managed. The plan highlights measures for each sector including the water industry, rural land management, government (public sector), industry, services, housing and infrastructure, cross-sector working and climate change mitigation and adaptation measures. Some of the measures include: <ul style="list-style-type: none"> 'Improving sewerage systems and sewage treatment works to reduce the amount of pollution (ammonia, organic material, phosphate, nitrogen, faecal organisms, metals, and other toxic chemicals) discharged to the water environment. Improving soil management to reduce the loss of soil, phosphate and nitrogen. Using sustainable drainage systems to reduce pollution from urban areas, including roads. Work with partners involved in development and development reform to improve local delivery through better alignment and integration of planning programmes to deliver multiple benefits for communities including tackling the climate emergency.' 	https://www.gov.uk/guidance/northumbria-river-basin-district-river-management-plan-updated-2022
Humber River Basin District	The Humber Basin RBD describes the challenges that threaten the water environment and how these challenges can be managed. The plan highlights measures for each sector including the water industry, rural land management,	https://www.gov.uk/guidance/humber-river-basin-district

Policy Document	Description	Link
Management Plan, October 2022	<p>government (public sector), industry, services, housing and infrastructure, cross-sector working and climate change mitigation and adaptation measures. Some of the measures include:</p> <ul style="list-style-type: none"> • <i>'Improving sewerage systems and sewage treatment works to reduce the amount of pollution (ammonia, organic material, phosphate, nitrogen, faecal organisms, metals, and other toxic chemicals) discharged to the water environment.</i> • <i>Improving soil management to reduce the loss of soil, phosphate and nitrogen.</i> • <i>Using sustainable drainage systems to reduce pollution from urban areas, including roads.</i> • <i>Work with partners involved in development and development reform to improve local delivery through better alignment and integration of planning programmes to deliver multiple benefits for communities including tackling the climate emergency.'</i> 	river-management-plan-updated-2022
Solway Tweed River Basin District Management Plan, 2021	<p>The Solway Tweed RBD sets out a framework for protecting and improving the benefits provided by the water environment. It includes information on the current state of the water environment and the actions needed to bring about improvements, where required. It is an update of the RBMP published in 2015. Some of the measures include:</p> <ul style="list-style-type: none"> • <i>'Partnership working with farmers and land managers.</i> • <i>Sustainable management of water resources.</i> • <i>Restoring rivers and removing man-made barriers to fish migration</i> • <i>Controlling invasive non-native species.'</i> 	https://www.sepa.org.uk/media/594087/211221-final-rbmp3-solway-tweed.pdf
United Utilities Drainage and Wastewater Management Plan (DWMP), May 2023	<p>The DWMP assesses the effects of future pressures on wastewater systems over the short, medium and long term, and what can be done to address these issues – in partnership with others where possible. Some of the measures include:</p> <ul style="list-style-type: none"> • <i>'Continuing to work with customers to make sure they know about changes they can make to help prevent blockages.</i> • <i>Use solutions that will mimic natural drainage to prevent surface water from going into the sewers.</i> • <i>Improve the way we operate the whole system, using new technology to improve processes and use existing assets to their maximum potential. This involves monitoring changes from normal conditions to detect issues (such as a blockage) early, so we can take action before they cause a problem (such as flooding).</i> • <i>Solutions to increase the size of sewers, create additional storage or increase the size of wastewater treatment works.'</i> 	https://www.unitedutilities.com/corporate/about-us/our-future-plans/Our-long-term-plans/
Northumbrian Water, Drainage and Wastewater Management Plan, May 2023	<p>The DWMP plan aims to see a reduction from 15,787 properties at risk from a 1 in 20 year storm, to 6,315 by 2050. Northumbrian Water will achieve this by working with partners including the Environment Agency and local authorities, through the Northumbria Integrated Drainage Partnership approach.</p> <p>The plan will also meet the targets of the Storm Overflows Discharge Reduction Plan, improving 1,017 storm overflows and complying with Environment Agency guidance. Improvements will comprise a combination of building storage tanks and green infrastructure; a natural way of returning rainwater to the environment such as directing surface water to ponds and swales.</p> <p>The plan will also make sure all sewage treatment works continue to operate in compliance with permits for the volume of effluent treated, and the quality of discharges. In addition, the plan will help improve water quality through nature based solutions that create additional environmental benefits including restoring a saltmarsh and native oyster grounds.</p>	https://www.nwl.co.uk/dwmp

2.4 Local Planning Policy and Strategies

2.4.1 Local planning policy relates to the planning authority area of Westmorland and Furness, excluding both the Lake District National Park Authority and Yorkshire Dales National Park Authority. The local planning policies relevant to the Council are described in **Table 2-6**. Please note, Westmorland and Furness Council is a new unitary authority, and as such, some of the policy documents described below will be superseded by the Westmorland and Furness Local Plan in due course.

Table 2-6: Local Planning Policies and Strategies

Policy Document	Description	Link
Cumbria Coastal Strategy, 2020	The Cumbria Coastal Strategy sets out how Cumbria County Council will manage the risks related to coastal flooding and erosion along the coastline over the next century. This includes funding support for future flood and coastal risk management schemes and national funds to contribute to the cost of defences. Westmorland and Furness is a new unitary authority which, along with Cumberland Council, replaces the former Cumbria County Council.	https://cumbria.gov.uk/eLibrary/Content/Internet/6640/17802/44272155144.pdf
Cumbria Preliminary Flood Risk Assessment (PFRA), 2011	The PFRA was produced to help manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009). It provides a high level overview of flood risk from local flood sources, including surface water, groundwater, ordinary watercourses and canals. The PFRA also considers future flood risk and highlights where future flood events may pose a significant harmful consequence.	https://www.cumberland.gov.uk/sites/default/files/2024-08/preliminary_flood_risk_assessment_pfra_2011.pdf
Cumbria Minerals and Waste Local Plan 2015 to 2030	The Minerals and Waste Local Plan provides for the sustainable minerals and waste management developments. The policies in the plan help to achieve sustainable consumption and production, living within environmental limits, protecting the quality of life of present and future generations, protecting Cumbria's environmental assets and ensuring the prudent use of natural resources. Policy DC19 highlights flood risk policies that proposed minerals and waste management developments should follow.	https://www.westmorlandandfurness.gov.uk/planning-and-building-control/planning-policy/local-plans-0/minerals-and-waste-local-plan
Cumbria Surface Water Management Plan (SWMP), 2023	The Cumbria SWMP establishes a long-term action plan to manage surface water and influence capital investment, drainage maintenance, public engagement and understanding land-use planning, emergency planning and future developments. The plan identifies potentially vulnerable areas (PVA). They are defined as catchments identified as being at risk of flooding and where the impact of flooding is sufficient to justify further assessment and appraisal. PVAs allow flood risk to be managed in a more holistic and joined up manner with connected impacts and benefits able to be assessed at a catchment scale. The highest risk PVAs with lower levels of historic and scheduled Comprehensive Spending Review investment were taken forward to a second stage of assessment to provide an improved understanding of surface water flooding and to identify localised areas of flood risk. The aim of identifying areas of risk is to support decisions on whether these may require further assessment, and to identify mitigation measures to reduce surface water flooding.	Available from the Council.
Cumbria Flood Action Plan - reducing flood risk from source to sea.	The Cumbria Flood Action Plan, established after Storm Desmond in 2015, sets a long-term vision for catchment management in Cumbria to increasingly work at a catchment scale to integrate land management, development and resilience in areas at risk. The plan sets out a comprehensive and detailed approach to protecting Cumbria, grouped into five themes: <ul style="list-style-type: none"> • Strengthening Defences • Upstream Management • Maintenance • Resilience • Water Level Management Boards 	https://www.gov.uk/government/publications/cumbria-flood-action-plan
Eden District Local Plan 2014-2032	The Eden District Local Plan contains plans and policies that will guide development from 2014 to 2032. Water management and flood risk policies for new development are highlighted in Policy DEV2. The Council is a new unitary authority which has replaced Eden District Council. The Council is currently preparing a local plan to 2045 which, once in place, will supersede the policies in the Eden District Local Plan.	https://www.eden.gov.uk/planning-and-building/planning-policy/adopted-eden-local-plan/eden-local-plan-adoption/
Revitalising Eden: The Eden Catchment Plan, 2020	Within the Eden Catchment Plan, action plans have been developed for each of the 'operational catchments' (Upper Eden, Eamont, Irthing, Caldew, Patteril, Lower Eden) targeting specific areas for interventions to improve ecosystem services.	https://www.edenrivetrust.org.uk/eden-catchment-partnership/

Policy Document	Description	Link
Barrow Borough Local Plan 2016-2031	<p>The Barrow Borough Local Plan contains the plans and policies that will guide development to 2031. Flood risk and erosion policies for coastal flood risk protection are highlighted in Policy C1. Development and the coast policies are highlighted in Policy C2.</p> <p>The Council is a new unitary authority which has replaced Barrow Borough Council. The Council is currently preparing a local plan to 2045 which, once in place, will supersede the policies in the Barrow Borough Local Plan.</p>	https://www.barrowbc.gov.uk/residents/planning/planning-policy/barrow-borough-local-plan
Barrow Port Area Action Plan July 2010	<p>The Barrow Port Area Action Plan aims to expose the issues, needs, natural resources and constraints facing the area and identify approaches to effectively manage the area's transformation.</p> <p>Note: the Barrow Borough Local Plan 2016-2031 supersedes in whole or in part some policies of the Barrow Port Area Action Plan.</p>	https://www.barrowbc.gov.uk/residents/planning/planning-policy/examination-of-local-plan/examination-library/port?entryid1=5886
South Lakeland Local Plan	<p>The South Lakeland Local Plan comprises a portfolio of Development Plan Documents (DPD): Core Strategy (2010); Land Allocations (2013); Development Management Policies (2019); and the Arnsdale and Silverdale Area of Outstanding Natural Beauty DPD (2019).</p> <p>The South Lakeland Local Plan sets out the long term vision, objectives and policies for the development of the district outside the National Parks to 2025. Development and flood risk policies are highlighted in policy CS8.8.</p> <p>The Council is a new unitary authority which has replaced South Lakeland District Council. The Council is currently preparing a local plan to 2045 which, once in place, will supersede the policies in the South Lakeland Local Plan.</p>	https://www.southlakeland.gov.uk/planning-and-building/local-plan/
South Lakeland Core Strategy 2010	<p>The Core Strategy draws together strategies of the Council and other organisations whose activities have implications for the development and use of land for the areas up to 2025. Policy CS8.8 highlights the flood risk and development policies that will be implemented in the area.</p> <p>The Council is a new unitary authority which has replaced South Lakeland District Council.</p>	https://www.southlakeland.gov.uk/media/3521/cs01-core-strategy-october-2010.pdf
South Lakeland Land Allocations 2013	<p>The South Lakeland Land Allocations document highlights the vision and objectives set out in the Council's adopted Core Strategy and identifies the key development requirements. Policy CS8.8 sets out a policy framework for flood risk in the area.</p> <p>The Council is a new unitary authority which has replaced South Lakeland District Council.</p>	https://www.southlakeland.gov.uk/media/6179/01-local-plan_land-allocations-adopted-dec-2013.pdf
South Lakeland Development Management Policies 2019	<p>This document contains a set of development management policies for the LPA area of South Lakeland. Policy DM6 highlights the policies encompassing flood risk management and sustainable drainage systems.</p> <p>The Council is a new unitary authority which has replaced South Lakeland District Council.</p>	https://www.southlakeland.gov.uk/media/6466/final-dm-dpd-adoption-accessible.pdf
Arnsdale and Silverdale Area of Outstanding Natural Beauty (AONB) Development Plan Document (DPD) 2019	<p>The AONB DPD highlights planning policies and decisions across the two District Councils of Lancaster and South Lakeland which both encompass the AONB boundary. Policy AS12 highlights the policies concerning flood risk.</p> <p>Note: as of November 2023, all AONBs in England and Wales are now known as National Landscapes.</p>	https://www.southlakeland.gov.uk/planning-and-building/local-plan/area-of-outstanding-natural-beauty-aonb-development-plan/
North West Marine Plan, 2021	<p>The North West Marine Plan introduces a strategic approach to planning within the English inshore and offshore waters between the Solway Firth border with Scotland and the River Dee border with Wales. It provides a clear, evidence-based approach to inform decision-making by marine users and regulators on where, when or how activities might take place within the north west inshore and north west offshore marine plan areas.</p>	https://www.gov.uk/government/publications/the-north-west-marine-plans-documents
Westmorland and Furness Local Flood Risk Management Strategy, 2025	<p>The Westmorland and Furness Local Flood Risk Management Strategy sets out how local flood risks will be managed in the county, who will deliver schemes and how they might be funded. The main aims are to:</p> <ul style="list-style-type: none"> Coordinate the resources available from people and organisations who have interests in flooding to maximise a reduction in local flood risk. Promote a wider understanding and awareness of flooding in Cumbria. Explain how everyone can play a part in reducing flood risk and "who does what". 	https://www.westmorlandandfurness.gov.uk/sites/default/files/2025-12/28372%20WFC%20Local%20Flood%20Strategy%20%28accessible%20November%202025%29.pdf

3. Methodology

3.1 Overview

- 3.1.1 Under Paragraph 001 of the PPG: 'Flood Risk and Coastal Change' (2025)², the risk of flooding from all sources must be considered as part of a SFRA, including rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources.
- 3.1.2 The methodology for the appraisal of flood risk from these sources is outlined below. **Section 3.2** describes the approach to consultation and identifies the stakeholder organisations that have been involved. **Section 3.3** provides a description of the datasets and models received.

3.2 Consultation

Duty to Cooperate

- 3.2.1 Under the Localism Act 2011²³, there is a legal duty on LPAs to cooperate with one another. Councils and other Prescribed Bodies must work together to maximise the effectiveness within which certain activities are undertaken as far as they relate to a 'strategic matter'.
- 3.2.2 In complying with the duty to cooperate, Government Guidance recommends that LPAs 'scope' the strategic matters of Local Plan documents at the beginning of the preparation process taking account of each matters 'functional geography' and identify those LPAs and Prescribed Bodies that need to be constructively and actively engaged.
- 3.2.3 As part of the SFRA, several organisations were contacted and requested to provide data to inform the SFRA. A summary of the roles of each stakeholder and their involvement through the SFRA project, is provided in **Table 3-1**.
- 3.2.4 A Project Delivery Group (PDG) has been set up as part of the SFRA including representatives from the Environment Agency, the Council's LPA, LLFA and Highways teams, Natural England, United Utilities, Northumbrian Water, Lake District National Park Authority and Yorkshire Dales National Park Authority. The aim of the PDG is to assist with comments on draft outputs, attend an in-person stakeholder meeting, assist with the provision of data and attend meetings.
- 3.2.5 An in-person stakeholder workshop was held on 5th September 2024 with representatives from AECOM, the Environment Agency, the Council's LPA, LLFA and Highways teams, and Natural England. The purpose of this meeting was to introduce the SFRA structure, present an overview of flood risk from all sources and provide an opportunity for stakeholders to discuss the cumulative impacts of development, the Sequential Test and the management of flood risk including safeguarded areas.

3.3 Data collection

- 3.3.1 A large quantity of information, datasets and models have been made available by the stakeholder organisations to inform the SFRA. The datasets are listed in **Table 3-2** and models received are listed in **Table 3-3**.

²³ HMSO, 2011, *Localism Act 2011*. Available at: <http://www.legislation.gov.uk/ukpga/2011/20/contents/enacted>

Table 3-1: SFRA Stakeholder Organisations and Roles

Stakeholder Organisation	Role with respect to the SFRA
Westmorland and Furness Council as LPA	<p>As the LPA, the Council has responsibility to consider flood risk in their strategic land use planning and the development of their Local Plan. The NPPF requires LPAs to undertake a SFRA and to use the findings, and those of other studies, to inform strategic land use planning including the application of the Sequential Test which seeks to steer development towards areas of lowest flood risk prior to consideration of areas of greater flood risk. During the preparation of the SFRA, the Council has provided access to available datasets held by them.</p> <p>In addition, the SFRA will be used by the Council's Emergency Planning team to ensure that the findings are incorporated into their understanding of flood risk and the preparation of their flood plan.</p>
Westmorland and Furness Council as LLFA and Highways Authority	<p>As the LLFA, under the FWMA, the Council has a duty to take the lead in the coordination of local flood risk management, specifically defined as flooding from surface water, groundwater and ordinary watercourses.</p> <p>The Council as LLFA is responsible for regulation and enforcement on ordinary watercourses under the Land Drainage Act 1991. The Council as LLFA is responsible for regulation and enforcement on ordinary watercourses and is a statutory consultee for major development with surface water drainage following changes to the Town and Country Planning (Development Management Procedures) (England) Order 2015. Under Schedule 3 of the FWMA, the LLFA is the SAB, however at the time of writing, this has not been implemented.</p> <p>The Council is the Highways Authority and therefore has responsibilities for the effectual drainage of surface water from adopted roads insofar as ensuring that drains, including kerbs, road gullies and ditches and the pipe network, are maintained.</p>
Environment Agency	<p>The Environment Agency is responsible for managing the risk of flooding from Main Rivers and the sea and has a responsibility to provide a strategic overview for all flooding sources and coastal erosion. Under the FWMA, the Environment Agency has a statutory duty to develop a National Flood and Coastal Risk Management Strategy for England.</p> <p>The Environment Agency is a statutory consultee to the Land Use Planning system. This includes local plan preparation and submission, in addition to development, other than minor development, in areas of Flood Zones 2 or 3, development within notified areas with critical drainage problems or for development within 20m of a main river watercourse. This is set out in Schedule 4 of the Town and Country Planning (Development Management Procedure) (England) Order 2015. Please note, there are no critical drainage areas identified within Westmorland and Furness.</p> <p>The Environment Agency is a prescribed body under the Town and County Planning (Local Planning) (England) Regulations 2012 and has a duty to co-operate with the LPA. The Environment Agency has a role to provide technical advice to LPAs and developers on how best to avoid, manage and reduce the adverse impacts of flooding. Part of this role involves advising on the preparation of spatial plans, sustainability appraisals and evidence base documents, including SFRA as well as providing advice on higher risk planning applications.</p> <p>The Environment Agency undertakes systematic modelling and mapping of fluvial flood risk associated with all Main Rivers in the study area, as well as supporting the LLFA with the management of surface water flooding by mapping surface water flood risk across England.</p> <p>The Environment Agency has supplied available datasets for use within the SFRA including detailed flood risk models of tidal and fluvial flood risk.</p>
United Utilities	<p>United Utilities (UU) manage the water and wastewater network in the North West of England. They are responsible for foul and surface water drainage from development via adopted sewers and for maintaining public sewers into which much of the highway drainage connects. In relation to the SFRA, the main role that UU will play is providing data and advice regarding sewer and reservoir flooding.</p>
Northumbrian Water Limited	<p>Northumbrian Water Limited (NWL) manage the water and wastewater network in Northumberland, Tyne and Wear, Durham and parts of North Yorkshire and areas of Cumbria. They are responsible for surface water drainage from development via adopted sewers and for maintaining public sewers into which much of the highway drainage connects. NWL is responsible for a small area to the north-east of the Council's area including Alston, Leadgate, Garrigill, Nenthail and Nenthead. In relation to the SFRA, the main role that NWL will play is providing data regarding current hydraulic flood risk from sewers.</p>
Natural England	<p>Natural England help conserve, enhance and manage the natural environment for the benefit of present and future generations. In relation to the SFRA, the main role that Natural England will play is providing information regarding Sites of Special Scientific Interest (SSSI) and Nutrient Neutrality.</p>
British Geological Survey (BGS)	<p>BGS hold a number of datasets that have informed the SFRA, including superficial and bedrock geology, susceptibility to groundwater flooding and suitability of infiltration SuDS.</p>
Neighbouring LPAs	<p>As outlined in the Localism Act 2011, there is a legal duty on LPAs to cooperate with one another. Cooperation is critical to successful management of cross-boundary issues. This SFRA considers the flood risk management issues and strategies of neighbouring LPAs which includes Cumberland Council, Durham County Council, Lake District National Park Authority, Lancaster City Council, Lancashire County Council, North Yorkshire Council, Northumberland County Council and the Yorkshire Dales National Park Authority.</p>

Table 3-2: Datasets obtained to inform the SFRA

Name	Description	Type	Source	SFRA Map
The Council's Planning Area	Boundary used for planning purposes of the Council. The boundary excludes the Lake District and Yorkshire Dales National Park Authorities.	GIS Shapefile	Westmorland and Furness Council	Appendix A Map 001
Detailed River Network	Spatial dataset showing main rivers and smaller watercourses.	GIS Shapefile	Environment Agency	Appendix A Map 005a, 005b, 005c and 005d
Ordnance Survey (OS) Watercourses	Spatial dataset showing watercourses.	GIS Shapefile	Westmorland and Furness Council	Appendix A Map 005a, 005b, 005c and 005d
Management Catchment Areas	Spatial dataset showing management catchment areas used for planning, managing and improving water quality and ecological status under the Water Framework Directive.	GIS Shapefile	Catchment Data Explorer	Appendix A Map 005a and 005b
LIDAR Topographic Digital Terrain Model (DTM)	Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. The DTM is produced from the last return LiDAR signal and surface objects are removed (such as buildings, vegetation) to provide a ground surface model. The LIDAR provides accurate elevation data at 1 metre spatial resolution.	ASCII	DEFRA Data Services Platform	Appendix A Map 002a and 002b
Bedrock and Superficial geology	Generalised digital geological map data based on BGS's published poster maps of the UK.	GIS shapefile	British Geological Survey	N/A
Historic Flood Map	Geographical Information System (GIS) layer showing areas of land that have previously been subject to flooding from sea, river or groundwater in line with criteria set by the Environment Agency. This excludes flooding from surface water, except in areas where it is impossible to determine whether the source is fluvial or surface water, but the dominant source is fluvial.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 007a and 007b
Flood hotspots Cumbria	Flood hotspots known to the Council in their role as the LLFA, including the number of residential and commercial properties at risk.	MS Excel Workbook	Westmorland and Furness Council	N/A
Flood Reports	Reported flooding from 2011 to 2023 for Barrow, Eden, South Lakes (east) and South Lakes (west).	MS Excel Workbook	Westmorland and Furness Council	N/A
Flooded Properties	Locations known to the Council in their role as the LLFA that have experienced internal and external flooding. These range from minor drain blockages through to flooding of entire roads.	MS Excel Workbook	Westmorland and Furness Council	N/A
Flood hotspots	Locations known to National Highways that have experienced flooding.	MS Excel Workbook	National Highways	N/A
Section 19 Flood Investigation Reports	Written reports investigating "significant" flood events. The purpose of these reports is to investigate the events leading up to the flooding, number of properties flooded, which Risk Management Authorities (RMA) have flood risk management functions in respect of the flood and whether each of these authorities have exercised or are proposing to exercise those functions in response to the flood event.	PDF	Westmorland and Furness Council	N/A

Name	Description	Type	Source	SFRA Map
Records of hydraulic sewer flooding	Records of internal and external sewer flooding incidents reported by United Utilities for 4 digit post code areas in the Council's area.	MS Excel Workbook	United Utilities	Appendix A Map 012a and 012b
Records of sewer flooding	Data relating to 100m ² grid squares where NWL are aware of flood risk due to hydraulic incapacity.	Text file	Northumbrian Water Limited	Appendix A Map 012a
Postcode Boundary	GIS layer of post code areas. Used to map the United Utilities sewer flooding records which are reported by 4 digit post code area.	GIS Shapefile	Westmorland and Furness Council	Appendix A Map 012a and 012b
Flood Map for Planning (rivers and sea) Flood Zones 2	The Environment Agency's best estimate of the areas of land at risk of flooding, from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year, when the presence of flood defences are ignored.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 003a and 003b
Flood Map for Planning (rivers and sea) Flood Zones 3	The Environment Agency's best estimate of the areas of land at risk of flooding, when the presence of flood defences is ignored and covers land with a 1 in 100 (1%) or greater chance of flooding each year from Rivers; or with a 1 in 200 (0.5%) or greater chance of flooding each year from the Sea.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 003a and 003b
Flood Map for Planning (rivers and sea) Flood Storage Areas	Areas that act as a balancing reservoir, storage basin or balancing pond. Please note, in August 2025, Flood Storage Areas are now referred to as Water Storage Areas.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 005c and 005d
Rivers and Sea 3.3% defended flood risk extents - present day	The extent of land at risk of flooding in the present day in the 3.3% defended AEP scenario.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 006a, 006b, 006c, 006d, 006e and 006f.
Rivers and Sea defended and undefended flood risk extents - present day	The extent of land at risk of flooding in the present day to a defined AEP. The undefended products show flood extents that ignore the presence and condition of flood defences. The defended products take into account the presence of flood defences and assume that they operate in the way they were intended to function. These datasets include the following scenarios: <ul style="list-style-type: none"> • Undefended 0.1% AEP (1 in 1,000) Rivers/Sea and 1% AEP (1 in 100) Rivers/ 0.5% AEP (1 in 200) Sea • Defended: 0.1% AEP (1 in 1,000) Rivers/Sea and 1% AEP (1 in 100) Rivers/ 0.5% AEP (1 in 200) Sea 	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 008a, 008b, 008c, 008d, 008e, 009a, 009b, 009c, 009d and 009e.
Rivers and Sea defended and undefended flood risk extents – climate change	The extent of land at risk of flooding to a defined AEP taking into account the possible effects of climate change. The undefended products show flood extents that ignore the presence and condition of flood defences. The defended products take into account the presence of flood defences and assume that they operate in the way they were intended to function. These datasets include the following scenarios: <ul style="list-style-type: none"> • Undefended 0.1% AEP (1 in 1,000) Rivers/Sea and 1% AEP (1 in 100) Rivers/ 0.5% AEP (1 in 200) Sea • Defended: 0.1% AEP (1 in 1,000) Rivers/Sea and 1% AEP (1 in 100) Rivers/ 0.5% AEP (1 in 200) Sea 	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 008a, 008b, 008c, 008d, 008e, 009a, 009b, 009c, 009d and 009e.

Name	Description	Type	Source	SFRA Map
Risk of flooding from surface water flood extents (3.3% AEP, 1% AEP, 0.1% AEP)	GIS layers showing the extent of flooding from surface water that could result from a flood with a 3.3% (1 in 30 year), 1% (1 in 100 year) and 0.1% (1 in 1,000 year) chance of happening in any given year. This is not suitable for identifying whether an individual property will flood but is useful to identifying areas susceptible to surface water flooding and key flow paths.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 0010a, 010b, 010c and 010d.
Susceptibility to Groundwater Flooding	Dataset which shows where there is the potential for groundwater flooding but does not give any indication of the probability that it will occur. Susceptibility is classified into three categories: (A) Limited potential for groundwater flooding to occur (B) Potential for groundwater flooding of property situated below ground level and (C) Potential for groundwater flooding to occur at surface.	GIS shapefiles	British Geological Survey	Appendix A Map 011a and 011b
Risk of Flooding from Reservoirs mapping	Flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels, and on a "wet day" when local rivers had already overflowed their banks.	GIS Shapefiles	DEFRA Data Services Platform	Appendix A Map 013a and 013b
Infiltration SuDS Suitability dataset (Summary)	Dataset which gives a preliminary indication of the suitability of the ground for infiltration SuDS. These are drainage systems that allow surface water to infiltrate to the ground, such as soakaways, infiltration basins, infiltration trenches and permeable pavements. The mapping allows consideration of subsurface permeability, depth to groundwater, presence of geological floodplain deposits, presence of artificial ground, ground stability, potential for pollutant attenuation, and the Environment Agency's source protection zones.	GIS Shapefile	British Geological Survey	Appendix A Map 015a and 015b
Flood Warning Areas	Geographical areas where flooding is expected to occur and where the Environment Agency provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 016a and 016b
Working with Natural Processes Datasets	A series of spatial datasets identifying best estimate of locations in the country where natural flood management methods can be applied such as floodplain woodland planting potential, riparian woodland planting potential, wider catchment woodland, floodplain reconnection potential, runoff attenuation features.	GIS Shapefiles	DEFRA Data Services Platform	Appendix A Map 017a and 017b
Spatial Flood Defence Layer	Shows flood defences currently owned, managed or inspected by the Environment Agency. Typically, these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 004a and 004b
National Coastal Erosion Risk Mapping	Dataset which shows projected areas at risk from erosion and intended to be a reliable benchmark dataset showing erosion risk extents for two periods: Medium Term (up to 2055) and Long Term (up to 2105) including climate change. Two management scenarios (with Shoreline Management Plans delivered and with no future interventions are provided for three climate scenarios: Present Day climate (2020), Higher Central allowance and Upper End allowance.	GIS Shapefile	DEFRA Data Services Platform	Appendix A Map 014a and 014b
Cumbria Local Resilience Forum Multi Agency Flood Plan Part 1	Written plan which contains the strategic information to coordinate a flooding response in Cumbria. The plan sets out the multi-agency coordination and control arrangements, specifies the manner in which warnings may be communications with the public, communities and partner agencies and provides a framework to facilitate mitigation of the effects of flooding on communities in Cumbria and the management of a flooding incident through to recovery.	PDF	Westmorland and Furness Council	N/A
Sites of Special Scientific Interest	Dataset which shows SSSI Site Units. These are divisions of SSSIs based on habitat, tenure and management, and are the basis for recording all information on SSSI Condition and management. They range in area from 0.004ha up to 18,000ha and only overlap where SSSIs overlap.	GIS Shapefile	Natural England Data Services Platform	N/A

Name	Description	Type	Source	SFRA Map
Planned flood alleviation schemes	Information on current flood alleviation schemes in Kendal and Appleby (Doomgate).	Webpage	Environment Agency	N/A
Cumbria Innovative Flood Resilience Project	Information of the Cumbria Innovative Flood Resilience Project working in the area around Warcop.	Webpage	Natural England	N/A
Nutrient Neutrality North West	Information on Nutrient Neutrality North West which are a partnership project comprising members from Cumberland Council, Environment Agency, Lake District National Park Authority, Natural England, United Utilities and the Council.	Webpage	Natural England	N/A

Table 3-3: Received Hydraulic Models

Model	Details	Modelled Return Periods (% AEP)	Defended 3.33% AEP available	Climate Change Scenarios
Appleby-in-Westmorland and Bolton Hydraulic Model NW133, Capita URS, May 2014*	A 1D-2D ISIS ²⁴ TUFLOW hydrodynamic model was constructed to represent the River Eden at Appleby undertaken as part of the Strategic Flood Risk Management (SFRM2) Framework Agreement for the North West Region of the Environment Agency.	Defended and undefended 20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1% AEP ²⁵ . 1% AEP + 20% CC.	Yes	1% AEP + 20% CC
Barrock Gill Hydraulic Model, Jacobs, 2008*	A 2D hydraulic model using TUFLOW software.	Undefended 1%, 0.5% and 0.1% AEP.	No	None
Bootle and Lazonby Mapping and Modelling, Jacobs, May 2023*	A new 1D-2D linked ESTRY-TUFLOW hydrodynamic model within the Harrow Beck catchment at Lazonby, located in Cumbria.	Undefended 50%, 20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1% AEPs. Future climate change scenarios have been considered for the 2080's epoch adopting Central (+47%), Higher Central (+61%) and Upper End (+94%) estimates.	No	1% AEP + 47% CC, 1% AEP + 61% CC and 1% AEP + 94% CC
Brockleymoor, CH2M, July 2017*	Updated hydrodynamic hybrid 1D-2D Flood Modeller-TUFLOW model for Brockleymoor in Plumpton.	Flood outlines and levels for the defended 50%, 20%, 10%, 4%, 5%, 3.3%, 2%, 1.33%, 1%, 1% + 20% CC, 1% + 30% CC, 1% + 35% CC, 1% + 70% CC, 0.1% and 0.1% + 20% CC AEP. Undefended 1% and 0.1%.	No	1% + 20% CC, 1% + 30% CC, 1% + 35% CC, 1% + 70% CC and 0.1% + 20% CC
Broughton-in-Furness Hydraulic Model, Capita AECOM, June 2019*	A 1D-2D ESTRY-TUFLOW model was constructed for the Foxfield Drain, Tower Tarn Beck and an unnamed ordinary watercourse which all converge to the south of Broughton-in-Furness to form the Broughton Beck.	Undefended 50%, 20%, 10%, 6.67%, 5%, 4%, 3.33%, 2.5%, 2%, 1.33%, 1%, , 0.5% and 0.1% AEP. 1% AEP + 20% CC, 1% AEP + 30% CC, 1% AEP + 35% CC, 1% AEP + 70% CC.	No	1% AEP + 20% CC, 1% AEP + 30% CC, 1% AEP + 35% CC and 1% AEP + 70% CC

²⁴ ISIS refers to the former software now known as Flood Modeller.

²⁵ Annual Exceedance Probability (AEP) is the probability, expressed as a percentage, that a flood of a certain magnitude will be exceeded in any given year.

* These hydraulic models have been incorporated into the Rivers and Sea defended and undefended flood risk extents (NAFRA2)

Model	Details	Modelled Return Periods (% AEP)	Defended 3.33% AEP available	Climate Change Scenarios
Carlisle Strategic Flood Risk Mapping Study, CH2M, December 2016*	A linked 1D/2D hydraulic model of watercourses in and around Carlisle using Flood Modeller and TUFLOW software.	Defended and undefended 20%, 10%, 5%, 4%, 2%, 1.33%, 1%, 0.5% and 0.1% AEP. 1% AEP + 20% CC.	No	1% AEP + 20% CC
Coupland Beck 2006	ISIS one dimensional hydrodynamic model of Coupland Beck	Undefended 0.5% and 0.1% AEP		
Cumbrian tidal areas benefitting from defences revisited, JBA, July 2013	The purpose of this study was to improve understanding of the area's exposure to coastal flood risk and to update the areas shown to benefit from the presence of defences. The model outputs were used to create revised tidal Flood Zones 2 and 3 for the Cumbrian Coastline. A series of 2D hydrodynamic models using TUFLOW were created and waves were modelled using the Simulating Waves Nearshore wave model.	Flood outline, maximum depth, velocity, level and hazard maps for the defended 50%, 20%, 5%, 3.33%, 1.33%, 1%, 0.5%, 0.5% + CC and 0.1% AEP. Undefended for the 3.33%, 1.33%, 1%, 0.5%, 0.5% + cc and 0.1% AEP using the 2115 epoch. The water level rise for climate change was based on the latest UKCP09 sea-level change guidance using the medium emission 95th percentile scenario.		
Eden Tributaries Flood Risk Mapping Investigation Brough Hydraulic Model, Atkins, July 2006	ISIS one dimensional hydrodynamic models were constructed for Brough and Skirwith .	Undefended 20%, 10%, 4%, 2%, 1.33% and 1% AEP events	No	None
Eden Tributaries, CH2M, July 2017*	Updated hydrodynamic hybrid 1D-2D Flood Modeller-TUFLOW model for Crosby Ravensworth, Kirkby Stephen, Morland, Soulby and Stockdalewath .	Undefended 50%, 20%, 10%, 5%, 4%, 3.3%, 2%, 1.33%, 1% and 0.1% AEP. 1% AEP + 20% CC, 1% AEP + 30% CC, 1% AEP + 35% CC, 1% AEP + 70% CC 0.1% AEP + 20% CC.	No	1% AEP + 20% CC, 1% AEP + 30% CC, 1% AEP + 35% CC, 1% AEP + 70% CC and 0.1% AEP + 20% CC
Kendal Options Modelling, Capita, September 2018*	A 1D-2D model using Flood Modeller and TUFLOW for the Kent catchment . Additional undefended runs were produced in 2021.	Defended 50%, 20%, 10%, 5%, 4%, 3.33%, 2%, 1.33%, 1%, 1% + 20% CC, 1% + 30% CC, 1% + 35% CC, 1% + 70% CC, 0.5%, 0.1% AEP and 0.1% AEP + 20% CC. Undefended 1%, 1% + 20% CC, 1% + 30% CC, 1% + 37% CC, 1% + 70% CC, 0.1% and 0.1% + 20% CC.	No	1% AEP + 20% CC, 1% AEP + 30% CC, 1% AEP + 35% CC, 1% AEP + 70% CC and 0.1% AEP + 20% CC
Kendal Surface Water Boost Technical Model, Capita, July 2020	Surface Water hydraulic modelling study for Kendal and Staveley using a 1D-2D linked InfoWorks Integrated Catchment Modelling (ICM)	3.33%, 1% and 0.1%.	N/A	None
Kirkby Thore 2006	ISIS one dimensional hydrodynamic model for Kirkby Thore .	Undefended 20%, 10%, 4%, 2%, 1.33% and 1% AEP.	No	None
Kirkby Thore 2008	No report available for Kirkby Thore .	Undefended 0.5% and 0.1% AEP	No	None
Lowther Valley Strategic Flood Risk Mapping Study, ATKINS, September, 2005	1-D hydrodynamic model using ISIS software for the Lowther Valley catchment including the tributaries: Haweswater Beck, Howes Beck and Askham Beck	Undefended 20%, 10%, 4%, 2%, 1.5%, 1%, 1% + 20% CC and 0.1% AEP. Defended 1% AEP.	No	1% + 20% CC AEP

Model	Details	Modelled Return Periods (% AEP)	Defended 3.33% AEP available	Climate Change Scenarios
Lyth Valley model, 2011	A 1D-2D linked ESTRY-TUFLOW model of the Lyth Valley Catchment .	Defended and undefended 50%, 20%, 10% and 1% AEP.	No	None
Melmerby Beck, JBA, January 2009*	A 2D hydraulic model using JFLOW software as part of the Cumbria Villages, Flood Map Improvements project of the Melmerby Beck for the purpose of updating the Flood Zone maps in this area.	Undefended 1.33%, 1%, 0.5% and 0.1% AEP flood outline and flood depth.	No	None
Milburn Beck, 2008	No report available for the Milburn Beck	Undefended 0.5% and 0.1% AEP	No	None
Milnthorpe, JBA, March 2021	A linked 1D-2D model using Flood Modeller and TUFLOW of the River Bela catchment. The main watercourses within the catchment include the Stainton Beck, Peasey Beck, Holme Beck and River Bela .	Undefended 50%, 20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, 1% + 30% CC, 1% + 70% CC, 0.5% and 0.1% Defended 1%, 1% + 30% CC, 1% + 70% CC and 0.1% AEP.	Yes	1% + 30% CC and 1% + 70% CC
Newbiggin Beck, JBA, January 2009*	A 2D hydraulic model using JFLOW software as part of the Cumbria Villages, Flood Map Improvements project of the Newbiggin Beck for the purpose of updating the Flood Zone maps in this area.	Undefended 1.33%, 1%, 0.5% and 0.1% AEP flood outline and flood depth.	No	None
North Petteril Modelling, RENW001543, JacksonHyder, November 2015*	1D-2D ISIS TUFLOW model of North Petteril in Greystoke.	Undefended 50%, 20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1% AEP. 1% AEP plus climate change (allowance unknown).	No	1% AEP + CC CC allowance applied unknown
North West Flood Zone Improvements Great Ormside, JBA, June 2010*	Flood Zone Improvement Studies for nine locations across Cumbria and Lancashire.			
North West Flood Zone Improvements Great Ormside, JBA, June 2010*	Steady State HEC-RAS - Distington (Distington Beck), Great Ormside (Coupland Beck and the River Eden), Ravenstonedale (Stone Gill and Scandal Beck) 1D-2D Linked ISIS-TUFLOW - Warwick Bridge (Cairn Beck and Trout Beck), Sabden (Sabden Brook and Churn Clough), Beardwood (Arley Brook Tributary)	Steady State HEC-RAS and 1D-2D Linked ISIS-TUFLOW – 20%, 10%, 4%, 2%, 1.5%, 1%, 0.5% and 0.1% AEP. 1% AEP + 20% CC.	No	1% AEP + 20% CC
North West Flood Zone Improvements Great Ormside, JBA, June 2010*	1D-2D Linked ESTRY-TUFLOW - Clayton-le-Woods (Bryning Brook), Wade Hall (W/C 2 - Parkgate to Kingsway), Euxton (Chapel Brook)	1D-2D Linked ESTRY-TUFLOW – 1% and 0.1% AEP. 1% AEP plus climate change (allowance unknown).	No	1% AEP + CC CC allowance applied unknown
Poaka Beck Flood Mapping Study, JBA, January 2021	A new and extended 1D-2D hydraulic model of Poaka Beck and its tributary Roose Beck using Flood Modeller and TUFLOW software. The key driver for this study was to produce up to date flood mapping outputs and to produce flood warning deliverables.	Undefended 50%, 20%, 10%, 5%, 4%, 3.33%, 2%, 1.33%, 1%, 1% + 30% CC, 1% + 70% CC and 0.1% AEP	Yes	1% + 30% CC and 1% + 70% CC AEP
River Eamont, JBA, July 2013*	Update of the existing 1D River Eamont model. A1D ISIS river/2D TUFLOW floodplain model of the River Eamont .	Defended and undefended 20%, 10%, 5%, 3.33%, 2%, 1.5%, 1%, 0.5% and 0.1% AEP. 1% AEP + 20% CC.	Yes	1% AEP + 20% CC

Model	Details	Modelled Return Periods (% AEP)	Defended 3.33% AEP available	Climate Change Scenarios
River Eea, RENW001543, Hyder Consulting, September 2015*	A 1D-2D ISIS TUFLOW model of the River Eea at Cark and Cartmel.	Undefended 50%, 20%, 10%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1% AEP. 1% AEP plus climate change (allowance unknown).	No	1% AEP + CC CC allowance applied unknown
River Kent Modelling for the Levens Embankment, Jacobs, April 2018*	Updated 1D-2D model for the River Kent and Gowan in Cumbria.	Defended and undefended 50%, 20%, 10%, 5%, 4%, 3.3%, 2%, 1.3%, 1%, 0.5% and 0.1% AEP.	Yes	None
Skirwith Beck, 2008	No report available for Skirwith Beck	0.1% AEP	No	None
Soutergate Beck, JBA, January 2009*	A 1D hydrodynamic hydraulic model of the channel using HEC-RAS and a 2D hydraulic model using JFLOW software as part of the Cumbria Villages, Flood Map Improvements project of the Soutergate Beck for the purpose of updating the Flood Zone maps in this area.	Undefended 1.33%, 1%, 0.5% and 0.1% AEP flood outline and flood depth.	No	None
South Lakes Flood Risk Mapping Study, Faber Maunsell, July 2006*	A 1D ISIS hydraulic model for four river catchments: the River Eea, Trout Beck, Black Beck, and Deep Meadows Beck .	20%, 10%, 4%, 2%, 1.33%, 1% and 0.5% AEP. 1% AEP + 20% CC.	No	1% AEP + 20% CC
Surface Water Mapping and Modelling for Kirkby Stephen, Tetra Tech, August 2023	A detailed surface water hydraulic modelling study of Kirkby Stephen using a 1D-2D linked InfoWorks ICM	3.33%, 1% and 0.1%.	N/A	None
Swindale Beck, 2008	No report available for Swindale Beck	Undefended 0.5% and 0.1% AEP	No	None
Thacka Beck, JBA, July 2013*	Update of the existing 1D River Eamont model. A 1D ISIS+EXTRY river/2D TUFLOW floodplain model of Thacka Beck .	Defended and undefended 20%, 10%, 5%, 3.33%, 2%, 1.5%, 1%, 0.5% and 0.1% AEP. 1% AEP + 20% CC.	Yes	1% AEP + 20% CC
Ulverston Town Beck Flood Alleviation Scheme Modelling Report, April 2022*	Updated model for the Ulverston Town Beck Flood Alleviation Scheme Project Appraisal Report	Defended Flood outlines of pre- and post-Ulverston Town Beck FAS for the 20%, 10%, 6.66%, 4%, 2%, 1.5%, 1%, 0.5% and 0.1.	No	None
Ulverston, 2024	No report available for Ulverston Please note, the Ulverston 2024 model has not been used to inform the SFRA given the model outputs are awaiting quality assurance from the Environment Agency.	Defended and undefended fluvial flood outlines for the 3.33% and 1%. Defended and undefended tidal flood outlines for the 3.33% and 1%.	Yes	None
Ulverston, JBA, September 2015	Updated Ulverston Flood Alleviation Scheme Project Appraisal Report InfoWorks RS model	Undefended flood outlines for the 20%, 10%, 4%, 2%, 1.33%, 1%, 1% + 20% CC, 0.5% and 0.1%.	No	1% + 20% CC
Warcop, JBA, April 2020*	A new linked 1D-2D Flood Modeller – TUFLOW hydraulic model of the Warcop study area which includes four watercourses: Crooks Beck, Lowgill Beck, Toddygill Beck and Warcop Millstream .	Undefended 50%, 20%, 10%, 5%, 4%, 3.3%, 2%, 1.3%, 1%, 1% + 25% CC, 1% + 30% CC, 0.5% and 0.1%.	No	1% + 25% CC and 1% + 30% CC

4. Assessing flood risk

4.1 Overview

- 4.1.1 Using the datasets and modelling outputs identified in **Section 3**, this Section provides a strategic assessment of the flood risk across the study area from each source.

Study Area

- 4.1.2 The study area is defined by the planning boundary of Westmorland and Furness located in the North-West of England. The planning boundary covers an area of 2,132km² and excludes the Lake District National Park Authority and the Yorkshire Dales National Park Authority, see **Appendix A, Map 001**.
- 4.1.3 The Council is a unitary authority that was established in April 2023 through the merger of Barrow Borough Council, part of Cumbria County Council, Eden District Council and South Lakeland District Council.
- 4.1.4 The study area is England's most sparsely populated local authority which presents challenges in terms of sustaining and delivering services, public transport, and connectivity. The area stretches from Alston in the far north-east, to Walney Island in the far south-west and includes the towns of Barrow-in-Furness, Ulverston, Kendal and Penrith. Along the Council's coastline, most areas are designated for their environmental importance, for example the Duddon Estuary. The total population of Westmorland and Furness in mid-2022 was 227,600²⁶ including the population of the areas of two National Park Authorities which partially fall within the Council's area. Westmorland and Furness have national transport routes within its boundaries with the M6 and West Coast Main Line running north to south and the A66 and A590 running east to west.
- 4.1.5 The study area is bordered by the administrative areas of Cumberland Council, Durham County Council, Lancaster City Council, Lancashire County Council, Lake District National Park Authority, Northumberland County Council, North Yorkshire Council and Yorkshire Dales National Park Authority.
- 4.1.6 This SFRA will be used to inform planning related decisions for areas of Westmorland and Furness *outside of the National Parks*. There are significant targets for new homes and the Council will be looking ahead until at least 2045 to ensure provision for growth for 15 years is sustainable through their new Local Plan²⁷.

Topography

- 4.1.7 1m resolution LiDAR data, sourced from the DEFRA Data Services Platform²⁸ shows that the topography in the north-east is characterised by the North Pennines National Landscape. Ground levels in this region vary significantly, from approximately 600m Above Ordnance Datum (AOD) to 890m AOD. The River Eden (Main River) runs adjacent to the Pennines, flowing in a north westerly direction through Appleby-in-Westmorland. In this area, the terrain is relatively low lying with elevations ranging between 100m AOD and 200m AOD. The topography of the northern section of the Council's administrative boundary is shown in **Appendix A Map 002a**.
- 4.1.8 Towards the south of the study area, the topography is generally more low lying as the land slopes towards the Irish Sea and Morecambe Bay. The central section of the study area lies on the edge of the Yorkshire Dales National Park, where elevations reach approximately 250m AOD to the west of Kirkby Lonsdale. Moving westerly towards Kendal, the elevation falls to approximately 50m AOD, continuing to fall towards Milnthorpe which lies at approximately 4m AOD. Higher topography is located to the north-west of Ulverston, reaching elevations of approximately 280m AOD. From there, the topography

²⁶ Westmorland and Furness (2023) Annual Population Trends. Available at: <https://cumbria.gov.uk/eiibrary/Content/Internet/536/671/4674/17217/17218/45275111816.pdf>

²⁷ Westmorland and Furness (2025) Local Development Scheme. Available at: <https://www.westmorlandandfurness.gov.uk/sites/default/files/2025-03/Westmorland%20and%20Furness%20LDS%20February%202025.pdf>

²⁸ Environment Agency (2025) National LiDAR Programme. Available at: <https://www.data.gov.uk/dataset/f0db0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme>

descends quickly towards the coast where ground levels vary between 0m AOD and 5m AOD. The topography of the southern section of the Council's administrative boundary is shown in [Appendix A Map 002b](#).

Geology and Hydrogeology

- 4.1.9 Datasets have been obtained from the BGS website²⁹ to provide a high-level identification of the superficial deposits and bedrock geology across the Council's administrative area. The underlying geology can influence the presence and nature of groundwater in an area and therefore affect the potential risk of flooding from groundwater.
- 4.1.10 As the geology of the study area is varied and the dataset is highly detailed, the data cannot effectively be represented in a figure. As such, it is recommended that the data is viewed online via the BGS Viewer³⁰.

Bedrock Geology

- 4.1.11 Bedrock is defined as the consolidated rock underlying the ground surface. In the north of the study area, the bedrock geology is predominantly composed of Penrith Sandstone Formation which is characterised by moderate to high permeability and porosity. The surrounding strata is complex and varied, comprising mudstone, sandstone, siltstone and limestone. There is an outcrop of sedimentary and igneous rock including the Kirkland Formation (Tuff and Siltstone).
- 4.1.12 The central portion of the study area is characterised by three main bedrock formations including Kirkby Moor Formation (sandstone) near Kendal, Dalton Formation (limestone) near Milnthorpe and Bannisdale Formation (siltstone and mudstone) to the north of Kendal.
- 4.1.13 The southern portion of the study area presents a complex and varied geological profile. In Ulverston, the bedrock is composed of sandstone, siltstone and mudstone. In Dalton-in-Furness, limestone is the dominant bedrock type. Further south, in Barrow-in-Furness and Walney Island, the bedrock geology is primarily characterised by sandstone and mudstone.

Superficial Deposits

- 4.1.14 Superficial deposits refer to geologically recent deposits that may be present above the bedrock such as floodplain deposits, beach sands and glacial drift. In the northern and central parts of the study area, these deposits are predominately composed of alluvium with occurrences of peat and till. Further south, in areas such as Milnthorpe and Morecambe Bay, marine deposits, primarily sand and gravel, are prominent. These are accompanied by tidal flat and saltmarsh deposits associated with the Leven and Duddon Estuaries and the surrounding coastline.
- 4.1.15 Alluvium is also present within the floodplains of watercourses throughout the study area, including along the Mill Beck and Poaka Beck. It typically comprises a mixture of clays, silts, sands and gravels, with permeability that can vary significantly depending on its exact composition. As the material is commonly deposited in riverbeds, it tends to be relatively impermeable.

Aquifers

- 4.1.16 Aquifers are defined as layers of permeable rock or unconsolidated material (sand, gravel, silt etc.) capable of storing and transporting large quantities of water. The understanding of the behaviour and location of aquifers is important as they can provide an indication of the potential for groundwater flooding. Aquifers are split into two different types: bedrock which are solid permeable foundations such as sandstone or chalk and superficial which are permeable, unconsolidated (loose) deposits such as sands and gravels.
- 4.1.17 The Environment Agency provides free access to information on Aquifer Designation online through 'Magic Map'³¹, however the data is not available to download freely.

²⁹ BGS, Data. Available at: <https://www.bgs.ac.uk/geological-data/>

³⁰ BGS, 2025, BGS Geology Viewer. Available at: <https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/>

³¹ DEFRA, 2024, MagicMap. Available at: <https://magic.defra.gov.uk/MagicMap.aspx> [Accessed: November 2024]

- 4.1.18 The Aquifer Designations³² are defined by the Environment Agency as follows:
- Principal Aquifer: provides significant quantities of drinking water and may also support rivers, lakes, and wetlands;
 - Secondary A Aquifer: comprises permeable layers that can support local water suppliers and may form an important source of base flow to rivers;
 - Secondary B Aquifer: mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures), openings or eroded layers; and
 - Secondary Undifferentiated Aquifers: aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These only have minor value.
- 4.1.19 The typology of the bedrock aquifers varies across the study area. A Principal bedrock aquifer extends from the north to the south, including areas such as Penrith and Appleby-in-Westmorland and also underlies Barrow-in-Furness in the south, which is exploited for public water supply. Surrounding this zone, much of the study area is classified as a Secondary A bedrock aquifer. These aquifers can support local water supply and may form an important source of base flow to rivers. The capacity for groundwater storage and flow conveyance in these areas increases the potential for groundwater flooding. In the central part of the study area, including Kendal and its surroundings, the aquifer is designated as Secondary B. Further south, Walney Island is predominantly underlain by a Secondary B aquifer with some areas classified as unproductive strata. The unproductive strata are generally unable to provide usable water supplies and are unlikely to support surface water systems³².
- 4.1.20 There is also variation with the superficial aquifers across the study area. Most of the study area is designated as Secondary (undifferentiated) with localised areas of Secondary A superficial aquifers identified near Penrith, Grange-over-Sands, Barrow-in-Furness and Kendal. The Leven Estuary is the only area within the Council's administrative area designated as a Secondary B superficial aquifer. Most of the central section is classified as Unproductive.
- 4.1.21 It is important to note that Aquifer Designation mapping is intended to be used at a high-level assessment and further site-level investigation may be required.

4.2 Flooding from Rivers and Sea

Flood Zones

- 4.2.1 The NPPF¹ categorises areas at risk of flooding from rivers and the sea into zones of low, medium and high probability, as defined in **Table 4-1**. Flood Zones 2 and 3 are presented on the Flood Map for Planning (Rivers and Sea)³³ and reproduced in **Appendix A Map 003a and Map 003b**.
- 4.2.2 **Appendix A Map 003a** shows that most of the northern section of the study area is defined as Flood Zone 1, i.e. low probability of flooding ignoring the presence of defences. Flood Zone 2, i.e. medium probability of flooding and Flood Zone 3, i.e. high probability of flooding, are largely confined to the main watercourses including the River Eden, River Petteril and River Eamont. Key locations at medium to high flood risk include Penrith, Appleby-in-Westmorland and areas along the River Eden at Kirkby Thore and Great Orside.
- 4.2.3 **Appendix A Map 003b** shows that most of the fluvial and tidal flood risk in the southern section of the study area is associated with the main estuaries (Kent, Leven and Duddon) which are defined as Flood Zone 3, i.e. high probability of flooding ignoring the presence of defences. Areas of Flood Zone 2 and Flood Zone 3 are linked to the presence of main watercourses including the River Kent, Station Beck, Peasley Beck, River Eea and Poaka Beck. Key locations at medium to high flood risk include Kendal, Milnthorpe, Grange-over-Sands, Ulverston, Barrow-in-Furness and Walney Island.

³² Environment Agency, 2024, Protect Groundwater and Prevent Groundwater Pollution. Available at: <https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution> [Accessed: November 2024]

³³ Flood Map for Planning. Available at: <https://flood-map-for-planning.service.gov.uk/> [Accessed March 2025]

Table 4-1: Flood Zones (PPG: 'Flood Risk and Coastal Change' 2025, Table 1)

Flood Zone	Flood Zone Definition for River Flooding	Probability of Flooding
Flood Zone 1	Land having a less than 0.1% AEP of river or sea flooding each year. Shown as clear on the Flood Map – all land outside Flood Zones 2 and 3.	Low
Flood Zone 2	Land having between a 1% and 0.1% AEP of river flooding each year; or land having between a 0.5% and 0.1% AEP of sea flooding each year.	Medium
Flood Zone 3a	Land having a 1% AEP or greater of river flooding each year or land having a 0.5% AEP or greater of sea flooding each year.	High
Flood Zone 3b	Land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: Land having an annual probability of greater than 3.3% AEP of flooding, with existing flood risk management features and structures operating effectively. Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). LPAs should define Flood Zone 3b within their SFRA in agreement with the Environment Agency. It is not separately distinguished from Flood Zone 3a on the Flood Map for Planning (Rivers and Sea).	Functional Floodplain

Tidal Flooding

- 4.2.4 Tidal flooding can develop through a combination of factors coinciding, including spring (high) tides, strong coastal winds, and low atmospheric pressure.
- 4.2.5 High tide conditions can lead to tide locking, when flap valves at surface water outfalls or public sewer outfalls close to stop sea water entering the system. This prevents drainage channels from discharging and instead surface water or combined sewer overflows accumulates upstream of the outfalls. During heavy rainfall events this can result in flooding from manholes and gullies. As such, a combination of sources of flood risk such as heavy rainfall events and high tides can therefore contribute to significant surface water flooding. This is further discussed in [Section 4.3](#).
- 4.2.6 The south-western corner of the Council's boundary is tidally influenced and is located within the Kent Leven catchment which boasts the largest continuous intertidal area in the UK. There are three large estuaries within the Council's boundary comprising the River Kent, the River Leven and the Duddon Estuary.
- 4.2.7 Two Main Rivers, the River Kent and River Leven feed into the Kent and Leven Estuary respectively. The River Kent is fed from tributaries in the Kentmere area and flows approximately 20 miles through the Lake District National Park and the River Leven flows out of Lake Windermere at its southernmost point, flowing approximately 8 miles through the Lake District National Park Authority area before both discharge into Morecambe Bay.
- 4.2.8 The Duddon Estuary lies to the north of Morecambe Bay, bounded by the Cumbrian coast to the north and Walney Island to the south. It is a macro-tidal³⁴, shallow estuary that features dune systems. The Duddon operational catchment rises in the south-western Lakeland fells before entering the Irish Sea north of Barrow-in-Furness.
- 4.2.9 The orientation of the northern section of Morecambe Bay, combined with its extensive intertidal area, results in a shoreline that is relatively sheltered from wave action. However, the shallow nature of the Bay means storm surges can be significant, especially when combined with strong westerly or south-westerly winds. The Rivers Leven and Kent are the primary controls on the northern Bay system. Their dynamic low water channels and banks strongly influence shoreline evolution within the estuaries and along adjacent shorelines. Where channels run close to the shore, larger, higher energy waves are able to erode the coastline.
- 4.2.10 In the Duddon Estuary, orientation and form expose the south-eastern side directly to waves from the Irish Sea. Under normal conditions, wave energy is reduced by the shallow estuary, but when storms

³⁴ Macro-tidal refers to coastal regions characterised by tidal ranges greater than four metres.

coincide with spring tides, significant wave activity can occur. On the western side of the estuary, wave action is weaker and mostly generated internally, with tidal currents playing a dominant role in sediment transport.

- 4.2.11 Walney Island has experienced erosion along its western coast, with accretion at its northern and southern ends. Large areas of low-lying land are vulnerable to sea-level rise, including the village of Biggar in the south. During storm events, the southern end of the island can become cut-off from the mainland.

Tidal flood defences

- 4.2.12 Flood defences generally fall into two main categories; formal and informal. Formal defences are purpose-built structures, designed specifically to manage and control floodwater. Informal defences include structures not originally intended for flood management but nevertheless help to retain floodwater, such as railway and road embankments, boundary walls and buildings.
- 4.2.13 Information on flood defences has been gathered online from the Environment Agency's Asset Information Management System (AIMS). The AIMS provides key details including asset reference, location, type of defence, and the geographical extent of each asset. All AIMS flood defences in the study area have been mapped as shown in [Appendix A Map 004a and 004b](#). Further detail on the condition and future sustainability of tidal flood defences are described in [Section 6.2](#).
- 4.2.14 There are limited formal tidal flood defences in the study area. Areas with tidal flood defences include Milnthorpe, Arnside and to the south of Flookburgh and Grange-over-Sands. In the lower reaches of the Kent Estuary, a flood defence embankment has been constructed on the left bank of the watercourse to protect Heversham. There are limited defences at Walney island and between Barrow-in-Furness and Ulverston.
- 4.2.15 The coastline between Barrow-in-Furness and Grange-over-Sands has areas of extensive saltmarsh which have a valuable role in reducing flood and coastal erosion risk. The Cumbria Coastal Strategy³⁵ identifies that the saltmarsh protects key areas including Grange Promenade and the Rampside frontage near Barrow-in-Furness.
- 4.2.16 The coastal flood defence at Arnside comprises a disused railway embankment which is managed by the Environment Agency. Similarly, an old railway embankment to the south-east of Ulverston provides significant protection from coastal flooding. This is currently under the ownership of National Highways and is not maintained as a flood defence. One of the actions in the Cumbria Coastal Strategy is to consider amending policy units to manage the flood risk to the A590 and South Ulverston.
- 4.2.17 For sections of the tidal frontage in the Ulverston area, the Shoreline Management Plan policies indicate no future maintenance or improvements to defences as shown in [Table 4-2](#). This includes south of Canal Foot (policy unit 11C11.4), to the north of Ulverston (policy unit 11C11.2) and to the south of Ulverston (policy unit 11C11.6).

Shoreline Management Plans

- 4.2.18 Shoreline Management Plans³⁶ (SMPs) form part of DEFRA's strategy for flood and coastal defences. They provide a large-scale assessment of risks associated with coastal change and present the policy framework to address these risks in a sustainable manner. The SMP policies defined by DEFRA are:
- Hold the line – maintain or upgrade the level of protection provided by defences,
 - Advance the line – build new defences seaward of the existing defence line,
 - Managed realignment – allowing retreat of the shoreline with management to control or limit the movement, and
 - No active intervention – a decision not to invest in providing or maintaining defences.
- 4.2.19 The Council is covered by the Great Ormes Head to Scotland SMP22. More details of this SMP can be found on the DEFRA website³⁷.

³⁵ Cumbria County Council, 2020, Cumbria Coastal Strategy Engagement Summary.

³⁶ Shoreline Management Plan. Available at: <https://environment.data.gov.uk/shoreline-planning> [Accessed October 2025].

³⁷ Great Ormes Head to Scotland Management Plan SMP22. Available at: <https://environment.data.gov.uk/shoreline-planning/shoreline-management-plan/SMP22> [Accessed October 2025].

4.2.20 SMP areas have been further divided into frontages, each of which is has been assigned one of the four policies described above for three time periods; short term (0-20 years), medium term (20-50 years) and long-term (50- 100 years). The short term, medium term, and long-term policies for each coastal frontage section in the study area are presented in [Table 4-2](#).

Table 4-2: SMP management approaches for the Westmorland and Furness Coastline

SMP Unit	Short Term (2005 to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
11C8.1 Heald Brow to Frith Wood	No active intervention	No active intervention	No active intervention
11C8.2 New Barns	No active intervention	No active intervention	No active intervention
11C8.3 Grubbins Wood (New Barns to Ash Meadow)	No active intervention	No active intervention	No active intervention
11C8.4 Ash Meadow to the Kent Viaduct (Arnside)	Hold the line	Hold the line	Hold the line
11C8.5 Kent Viaduct to Holme Island	Hold the line	Hold the line	Hold the line
11C8.6 Holme Island to Humphrey Head (Grange-Over-Sands)	Hold the line	Hold the line	Hold the line
11C9.1 Kent Viaduct to Dick Fell Road (Sandside)	Hold the line	Managed realignment	Managed realignment
11C9.2 Sandside (Dick Fell Road to Hollins Well Road)	Hold the line	Hold the line	Hold the line
11C9.3 Hollins Well Road north to Levens Bridge (east bank) & Levens Bridge to Kent Viaduct (west bank)	Hold the line	Managed realignment	Managed realignment
11C10.1 Humphrey Head	No active intervention	No active intervention	No active intervention
11C10.2 Humphrey Head to Cowpren Point	Hold the line	Managed realignment	Managed realignment
11C10.3 Cowpren Point to Cark	No active intervention	No active intervention	No active intervention
11C11.1 Cark to Leven Viaduct	No active intervention	No active intervention	No active intervention
11C11.2 Leven Viaduct to Canal Foot cottages	No active intervention	No active intervention	No active intervention
11C11.3 Canal Foot	Hold the line	Hold the line	Hold the line
11C11.4 Glaxo Factory Site (south)	No active intervention	No active intervention	No active intervention
11C11.5 Sandhall to Conishead Priory	Hold the line	Managed realignment	Managed realignment
11C11.6 Conishead Priory to Bardsea	No active intervention	No active intervention	No active intervention
11C12.1 Leven Viaduct to Haverthwaite (left bank) and Haverthwaitem to Greenodd (right bank)	Hold the line	Managed realignment	No active intervention
11C12.2 Greenodd to Barrow End Rocks (A590)	Hold the line	Hold the line	Hold the line
11C12.3 Barrow End Rocks (A590) to Leven Viaduct	Hold the line	Managed realignment	No active intervention
11C13.1 Bardsea to Newbiggin	No active intervention	No active intervention	No active intervention
11C13.2 Newbiggin to Rampside	Hold the line	Managed realignment	Hold the line
11C13.3 Rampside	No active intervention	Hold the line	Hold the line
11C13.4 Roa Island	Hold the line	Hold the line	Hold the line
11C13.5 Piel Island	No active intervention	No active intervention	No active intervention

SMP Unit	Short Term (2005 to 2025)	Medium Term (2025 to 2055)	Long Term (2055 to 2105)
11C14.1 South End Hawes to Biggar (east side)	No active intervention	No active intervention	No active intervention
11C14.2 Biggar to Lenny Hill (east side)	Hold the line	Hold the line	Hold the line
11C14.3 South End Hawes to Hare Hill (open coast)	No active intervention	No active intervention	No active intervention
11C14.4 Hare Hill to Hillock Whins	Hold the line	Hold the line	Hold the line
11C14.5 Hillock Whins to Nanny Point Scar	No active intervention	Managed realignment	Managed realignment
11C14.6 Nanny Point Scar to Mill Scar	No active intervention	No active intervention	No active intervention
11C14.7 Mill Scar to north of West Shore Park	Managed realignment	Managed realignment	Managed realignment
11C14.8 North Walney - from north of West Shore Park to Lenny Hill (both coasts)	No active intervention	No active intervention	No active intervention
11C15.1 Rampside to Westfield Point	No active intervention	No active intervention	No active intervention
11C15.2 Westfield Point to Hindpool (Barrow in Furness)	Hold the line	Hold the line	Hold the line
11C15.3 Hindpool to Lowsy Point	No active intervention	No active intervention	No active intervention
11C16.1 Lowsy Point to Askam Pier	No active intervention	No active intervention	No active intervention
11C16.2 Askam-in-Furness (including Askam Pier)	Hold the line	Hold the line	Hold the line
11C16.3 Askam to Dunnerholme	No active intervention	No active intervention	No active intervention
11C16.4 Dunnerholme to Sand Side	Hold the line	Hold the line	Hold the line
11C16.5 Kirkby-in-Furness	Hold the line	Hold the line	Hold the line
11C16.6 Herdhouse Moss	No active intervention	No active intervention	No active intervention
11C16.7 Galloper Pool to Viaduct	Hold the line	Hold the line	Hold the line
11C16.8 Duddon Estuary (Both banks upstream of Viaduct and right bank south to Green Rd Station)	Hold the line	Managed realignment	Managed realignment

4.2.21 The PPG: 'Flood Risk and Coastal Change' (2025)² also sets out the key principles of 'Integrated Coastal Zone Management' and provides guidance on the identification of Coastal Change Management Areas (CCMA). 'Integrated Coastal Zone Management' is defined as a "joined-up and participatory approach towards the planning and management of coastal areas (land and marine)". CCMA's are areas where rates of shoreline change are expected to be significant over the next 100 years taking account of climate change. They should be defined where the identified shoreline management policy during the SMP period is anything other than hold the line across all three epochs (short term, medium term and long term).

4.2.22 Within the PPG: 'Flood Risk and Coastal Change' (2025)² the following is stated in relation to the suitability of different development types within CCMA's:

- Essential Infrastructure may be permitted in CCMA's, if there are clear plans in place to manage the impacts of coastal change, and it will not adversely impact on rates of coastal change elsewhere.
- Ministry of Defence Installations that require a coastal location may be permitted within a CCMA, provided that there are clear plans in place to manage the impacts of coastal change, and to

minimise the adverse impacts on other parts of coast where the installation will have a material effect on coastal processes.

- Within short-term risk areas (losses expected within 20 years) development directly related to the coastal strip is likely to be appropriate such as beach huts, cafes, car parks, and sites used for holiday or short-let caravans and camping.
- Within medium (20-50 years) and long term (up to 100 year) risk areas a wider range of time-limited development such as hotels, shops, office, or leisure activities that require a coastal location and that will provide substantial socioeconomic benefits to local communities, may be appropriate.
- Permanent new residential development (including through change of use) will not be appropriate in a CCMA.

4.2.23 The PPG: 'Flood Risk and Coastal Change' (2025)² advises that applications for development in a CCMA may need to be accompanied by a coastal change vulnerability assessment, which demonstrates whether or not the requirements of NPPF¹ paragraph 185 have been satisfied. The requirements of NPPF¹ paragraph 185 are as follows:

- a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
- b) the character of the coast including designations is not compromised;
- c) the development provides wider sustainability benefits; and
- d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

Recommendation 4-1 *The Council should consider whether to establish Coastal Change Management Areas (CCMA) to ensure prospective developers are made aware of the potential risks and inappropriate development is avoided. In doing so, the council will need to consider a range of factors including flood risk, coastal erosion and SMP management approaches.*

4.2.24 Shoreline Management Plan policies are not accompanied by guaranteed funding and therefore there is no assurance that they will be implemented. The Council may consider Policy Units allocated as Hold the Line to function effectively as CCMA's due to the uncertainty surrounding the availability of funding to deliver the stated policy.

Fluvial flooding

4.2.25 Flooding from rivers occurs when water levels rise higher than bank levels causing floodwater to spill across adjacent land (floodplain). The main reasons for water levels rising in rivers are:

- Intense or prolonged rainfall causing runoff rates and flows to increase in rivers, exceeding the capacity of the channel. This can be exacerbated by wet conditions and where there is significant groundwater base flow;
- Constrictions in the river channel causing floodwater to back up; and,
- Constrictions preventing discharge at the outlet of the river, e.g. locked flood gates, or tide locking.

Main Rivers

4.2.26 The Environment Agency's 'Statutory Main River Map'³⁸ dataset has been used to identify Main Rivers in the study area. This is shown in **Appendix A Map 005a and 005b**. The Environment Agency have duties and powers in relation to Main Rivers³⁹ and the Council, in their role as the LLFA, have duties and powers in relation to Ordinary Watercourses including ditches, dykes, rivers, streams and drains (not public sewers).

4.2.27 There are numerous Main Rivers in the area, all of which form part of larger catchment areas. Rivers highlighted in bold are those located within the study area. There are five catchments in the northern section (refer to **Appendix A Map 005a**) and four catchments in the southern section (refer to **Appendix**

³⁸ Environment Agency, 2025, Statutory Main River Map. Available at: <https://www.data.gov.uk/dataset/4ae8ba46-f9a4-47d0-8d93-0f93eb494540/statutory-main-river-map>. [Accessed September 2024]

³⁹ All watercourses in England and Wales are classified as either 'Main Rivers' or 'Ordinary Watercourses'. The difference between the two classifications is based largely on the perceived 'importance' of the watercourse with particular reference to its potential to cause significant and widespread flooding. However, the watercourses classed as Ordinary Watercourses can still cause significant localised flooding.

A Map 005b) of the Council's boundary. Please note the Lune catchment is shown in both. These are as follows:

Eden and Esk catchment

- 4.2.28 The largest catchment within the Council's boundary is the Eden and Esk which covers an area of 2715 km² between the Lake District fells and the Pennines⁴⁰. The catchment is predominantly agricultural, with the Eden Valley providing some of the most productive agricultural land in Cumbria. The **River Eden** is the principal Main River. It rises on the high limestone fells above Mallerstang Common, near the North Yorkshire border, and flows north-west across eastern Cumbria, with the North Pennines to the east, and the fells of the Lake District to the west, before reaching Carlisle. At Carlisle, the Eden merges with other rivers to form the Solway Firth estuary, ultimately discharging into the Irish sea, approximately 145km from its source. Key tributaries include the **River Petteril** which rises at Motherby near Penrith and flows north through farmland and rural settlements before joining the Eden in Carlisle, and the **River Eamont**, which drains from Helvellyn (including Ullswater and Brothers Water) passes through the tourist village of Pooley Bridge, and meets the **River Lowther**, near Penrith.

Tees catchment

- 4.2.29 Only a small area of the catchment lies within the study area encompassing a section of the **River Tees**. The river rises on Cross Fell, high in the Pennine peat moors and flows east for approximately 85 miles before discharging into the North Sea in North East of England.

Tyne catchment

- 4.2.30 A small area of the Tyne catchment lies within the study area including the **South Tyne** and **River Nent**, both designated as Main Rivers. The South Tyne rises on Alston Moor, with its source located close to those of the Tees and the Wear, before flowing north-east through the towns of Haltwhistle and Haydon Bridge. The South Tyne Valley forms part of the North Pennines National Landscape. The River Nent, a tributary of the South Tyne also originates within this area. Overall the Tyne Catchment covers an area of 2,943km², and flows generally eastward through the urban conurbation of Tyneside before discharging into the North Sea.

Swale Ure Nidd and Ouse Upper catchment

- 4.2.31 The Swale Ure Nidd and Ouse Upper catchment extends from the upland areas of the North Pennine Moors and the Yorkshire Dales southwards into the low-lying Vale of York in the south. No Main Rivers are located within this catchment within the Council's boundary.

Lune catchment

- 4.2.32 The Lune Catchment covers a wide geographical area, encompassing the **River Lune** and all its tributaries. Only a small area of the catchment lies within the study area. The **Birk Beck**, a tributary of the River Lune, rises south of Shap, and joins the river near Tebay. From there, the River Lune flows south through Kirkby Lonsdale before reaching the Irish Sea near Lancaster.

Kent and Leven catchment

- 4.2.33 The Kent and Leven catchment is characterised by short rivers rising in the southern and central fells of the Lake District flowing southwards into Morecambe Bay. The principal Main River is the **River Kent**, which flows through Kendal before discharging into Morecambe Bay near Arnside, via the Kent Estuary. The River Kent catchment also includes several other Main Rivers, including the **Sprint** and **Mint**. The **River Bela** forms at Overthwaite from the confluence of **Peasey Beck** and **Stainton Beck**, flowing west for approximately 4 miles before discharging into Morecambe Bay, south of Milnthorpe. Other tributaries of the River Bela include the **Lupton Beck** and **Holme Beck**. The **Leighton Beck** flows west from the A6 where it discharges into the Kent Estuary near Arnside.

South West Lakes catchment

- 4.2.34 The South West Lakes catchment comprises short rivers rising in the western Lakeland fells that flow quickly to the Irish Sea. Much of the catchment lies within the Lake District National Park Authority. The principal Main Rivers within the catchment include the following:

- the **Poaka Beck** which flows from the Poaka Beck Reservoir through Dalton-in-Furness to Millwood where it discharges into the Mill Beck;
- the Mill Beck flows south through Barrow-in-Furness where it outfalls into Cavendish Dock;

⁴⁰ Catchment Data Explorer. Available at: <https://environment.data.gov.uk/catchment-planning/ManagementCatchment/3036>

- the Blea Beck flows from the northwest of Askam Wood, through Askam-in-Furness before discharging into the Duddon Estuary near Marsh Grange Farm and,
- the Kirkby Pool is another Main River within the South West Lakes catchment which flows southwards towards the village of Kirkby-in-Furness where it discharges into the Duddon Estuary.

North West Transitional and Coastal (TraC) catchment

- 4.2.35 The North West TraC catchment extends along the north west coast of Cumbria, from Maryport to Silloth and continues south along the coastline to Warrington. A TraC catchment is a surface water body located near a river mouth that is partially saline in character due to its proximity to coastal waters, but is substantially influenced by freshwater flows. These catchments are also commonly referred to as estuaries.

Ordinary Watercourses

- 4.2.36 The 'OS Watercourses' dataset⁴¹ has been used to identify Ordinary Watercourses in the study area. In addition to Main Rivers, the study area contains several smaller Ordinary Watercourses⁴² which form tributaries to the Main Rivers. These comprise streams, ditches and drainage channels, the majority of which are open channel. Ordinary watercourses do not always contain flowing water all year long; there may be times where the watercourses run dry, particularly over prolonged dry spells. Such watercourses can be described as ephemeral watercourses.
- 4.2.37 The responsibility for the maintenance of these Ordinary Watercourses falls to riparian owners who own the land on either bank. The Council is only responsible for Ordinary Watercourses where land on either bank is in Council ownership or where historical agreements have been made.

Flood Defences

- 4.2.38 Most fluvial flood defences in Westmorland and Furness are maintained either by the Environment Agency or private owners. A small number are owned and maintained by the Local Authority including raised defences in Kendal upstream of Miller Bridge, the flood defence wall at Roosebeck, the flood defence wall at Bardsea and rock armour at Newbiggin. Whilst the Standard of Protection (SoP) wasn't available at the time of writing, the condition of most of the recorded flood defences are classified as Grade 3 (on a scale where Grade 1 represents the best condition and Grade 5 the worst). However, a significant number of privately owned defences have not been condition assessed.

Flood Zone 3b Functional Floodplain

- 4.2.39 As noted in **Table 4-1**, Flood Zone 3b Functional Floodplain is defined as land where water from rivers or the sea has to flow or be stored in times of flood. Areas located within Flood Zone 3b typically have a 1 in 30 (3.3% AEP) chance of flooding in any given year. LPAs should define Flood Zone 3b within their SFRA in agreement with the Environment Agency. It is not separately distinguished from Flood Zone 3a on the Flood Map for Planning (Rivers and Sea).
- 4.2.40 The Environment Agency's SFRA guidance states the following datasets can be used to inform the functional floodplain designation:
- Present day 1 in 30 (3.3%) rivers and sea flood extent with defences on the DEFRA Data Services Platform. This takes into account the presence of flood defences and assume that they operate in the way they were intended (or designed) to function.
 - Water Storage Areas (previously known as Flood Storage Areas) on the Flood Map for Planning
- 4.2.41 The Environment Agency advised that alongside NaFRA2 National Modelling, some of the local models had been incorporated into the Rivers and Sea 3.3% defended flood risk extents - present day. However, a number of local models had also been superseded by the dataset for varying reasoning including age of dataset and return periods modelled. Through conversations with the Environment Agency, LLFA and LPA, it was agreed in addition to the 'Rivers and Sea 3.3% defended flood risk extents - present day' dataset the following local hydraulic models would be incorporated in the functional floodplain delineation. These are as follows:

⁴¹ OS (2025) National Geographic Database Water. Available at: <https://www.ordnancesurvey.co.uk/products/os-ngd>

⁴² This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991.

- Stainton Beck, Holme Beck and Milnithorpe models as part of the River Bela catchment Milnithorpe 2021 model; and
- Poaka Beck 2021 model.

4.2.42 As such, a new functional floodplain outline has been delineated where the 'Rivers and Sea 3.3% defended flood risk extents - present day' dataset has been clipped to the model outputs of the Milnithorpe and Poaka Beck in these locations.

4.2.43 A technical note is provided in **Appendix B** which details the methodology used in delineating the functional floodplain outline. The completeness in this report, the technical note makes the following recommendations related to the functional floodplain.

Recommendation 4-2 *A local policy regarding functional floodplain should be outlined as part of the upcoming Local Plan.*

Recommendation 4-3 *The extent of the functional floodplain produced from this Level 1 SFRA should always be assessed in greater detail where a more detailed study, such as a Level 2 SFRA or site-specific FRA, are undertaken.*

Recommendation 4-4 *The functional floodplain dataset should be reviewed regularly and the delineation should be updated if any data inconsistencies are found in the modelling or if any new or updated hydraulic modelling is undertaken. For example, the functional floodplain delineation should be updated once the Ulverston, 2024 modelling is available for use, as there are some inconsistencies in the 'Rivers and Sea 3.3% defended flood risk extents - present day', for example around the Honeypot estates and area near the Ulverston Canal. However, at the time of writing, the 'Rivers and Sea 3.3% defended flood risk extents - present day' is the best available dataset for representing flood risk in Ulverston.*

4.2.44 The areas defined as Flood Zone 3b in Westmorland and Furness are shown in **Appendix A Map 006a and 006b**. Key areas in the fluvial floodplain include the Kent, Duddon and Leven estuaries, Barrow-in-Furness, Kendal, Penrith, Ulverston and areas along the length of the River Eden.

4.2.45 Four key towns of Penrith, Ulverston, Kendal and Barrow-in-Furness have been selected for a more detailed analysis. **Appendix A Map 006c, 006d, 006e and 006f** show the functional floodplain for Penrith, Ulverston, Kendal and Barrow-in-Furness, respectively.

4.2.46 For Penrith, the functional floodplain is mainly confined to the watercourse channel of the Thacka Beck. However, there is extensive out of bank flooding predicted to the south of the A6 along the River Lowther and some out of bank flooding on the watercourses surrounding the town to the north, east and northwest including the River Eden, Carlsike Beck, Myers Beck and River Petteril.

4.2.47 For Ulverston, the functional floodplain considers both tidal and fluvial flood sources. The low-lying areas along the eastern coastline lie within the functional floodplain. There is extensive flooding out of bank along the Pennington Beck near Three Bridges in the west and significant areas are within the functional floodplain related to the Dragley Beck in the undeveloped urban fringe land to the south-east of Ulverston. Areas around Outcast lie within the functional floodplain as well as the residential and commercial area to the west of the Ulverston Canal near North Lonsdale Terrace. Land to the north of Back Drain and the railway line is located within the functional floodplain and lastly, there is also significant land at risk to the northeast of Ulverston in the Next Ness area

4.2.48 For Kendal, the functional floodplain is mainly confined within the watercourse channel of the River Kent. In the north of Kendal near South Lakeland Retail Park, there are some significant areas of functional floodplain which are not confined to the watercourse. There are also some small areas on either side of the river bank through the centre of Kendal which are located within the functional floodplain extent in comparison to Blind Beck near Brigsteer Road, where this is confined to the channel.

4.2.49 For Barrow-in-Furness, the low-lying areas along the coastline of Walney Island are within the functional floodplain, an area at particular risk is in the south in the Carr Lane area. Other areas in the functional floodplain include the Roose Gate area of Barrow-in-Furness including Salthouse Road, Longway and Flass Lane. Some small areas along the watercourse at Roosecote lie within the functional floodplain as well as Furness Abbey on the Mill Beck.

Historic records

- 4.2.50 The Environment Agency Historic Flood Map⁴³, presented in **Appendix A Map 007a and 007b**, provides historical flooding data from rivers, the sea, and groundwater springs from 1946 to present day that meet a set criteria. The Historic Flood Map takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It includes flood extents that may have been caused by overtopping, breaches, or blockages. It should be emphasised that there could be unreported flooding incidents across the study area. The dataset shows that there have been flood events in Kendal, Milnthorpe, Ulverston, Penrith and along the River Eden in multiple locations including Lazonby, Langwathby and Appleby-in-Westmorland.
- 4.2.51 The study area was greatly affected by Storm Desmond in December 2015 when record levels of rainfall fell over a short period. In Westmorland and Furness, the event resulted in flooding of approximately 2,752 residential properties and 522 business properties⁴⁴.

Flood extents

- 4.2.52 **Appendix A Map 008a and 008b** show the defended Risk of Flooding from Rivers and Seas for the 3.3% AEP, 1% AEP and 1% AEP including an allowance for climate change. **Appendix A Map 009a and 009b** show the undefended Risk of Flooding from Rivers and Seas for the 1% AEP and 1% AEP including an allowance for climate change. For this SFRA three key towns of Penrith, Ulverston and Kendal have been selected for more detailed analysis. These towns were selected due to availability of local hydraulic models and levels of flood risk from all sources. **Appendix A Map 008c, 008d and 008e** show the defended extents for Penrith, Ulverston and Kendal respectively and **Appendix A Map 009c, 009d and 009e** show the undefended extents.
- 4.2.53 For Penrith, the 1% AEP defended flood extent is largely confined to the watercourse channel of the Thacka Beck. However out of bank flows are predicted in the centre of Penrith to the north of Ullswater Community College, along the River Lowther near Hunter Hall School and along the River Eden near Langwathby.
- 4.2.54 For Ulverston, the 1% AEP rivers/ 0.5% AEP sea flood extent shows significant flooding along the coastline of the estuary as well as significant flooding inland to the north of the Ulverston Canal and Back Drain near Next Ness Nature Reserve. Additional flood extents are predicted at the confluence of the Dragley Beck and Lund Beck in the Outcast area. Out of bank flow is also present to the north of the Pennington Beck near Three Bridges and along the watercourse as it flows eastwards towards Ulverston. There is also significant flooding associated with the Town Beck to the south of Dragley Beck and an area associated with the Town Beck to the area bounded by the A590 and the railway line.
- 4.2.55 For Kendal, the 1% AEP defended flood extent is largely confined to the watercourse channel of the River Kent. Localised out of bank flows from the River Kent are predicted to the north near South Lakeland Retail Park and through the centre of Kendal. In addition, the 1% defended flood extent predicts flooding to the south of Kendal to the west of Westmorland General Hospital, associated with the Natland Beck.

Residual Risk

- 4.2.56 Residual risk describes the risks that remain after taking into account flood risk management infrastructure and/or any site-specific mitigation measures that have been applied.
- 4.2.57 The residual risk can be:
- The effects of a flood with a magnitude greater than that for which the defences or management measures have been designed to alleviate (the 'design flood'). This can result in overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming discharges.

⁴³ Data.gov.uk, 2024, Historic Flood Map. Available at: <https://www.data.gov.uk/dataset/76292bec-7d8b-43e8-9c98-02734fd89c81/historic-flood-map> [Accessed: September 2024]

⁴⁴ Westmorland and Furness Council, 2024, Council Plan. Available at: <https://www.westmorlandandfurness.gov.uk/your-council/council-documents/council-plan>. Accessed: [December 2024]

- Failure of the defences or flood risk management measures to perform their intended duty. This could be breach of flood embankments, failure of flood gates to operate in the intended manner or failure of pumping stations.
- 4.2.58 The likelihood of such residual risk is very small; however, the scale of consequences from rapid inundation and deep water in heavily urbanised areas mean that these residual risks must be considered.
- 4.2.59 As detailed in **Section 3.3**, a large number of hydraulic models were provided by the stakeholder organisations to inform the SFRA. A review of these datasets identified that no breach or overtopping results were available within the study area.
- 4.2.60 To assess the residual risk of tidal and fluvial flooding, analysis has been undertaken by comparing the defended and undefended scenarios using the Risk of Flooding from Rivers and Sea dataset.
- 4.2.61 For this SFRA three key towns of Penrith, Ulverston and Kendal have been selected for a more detailed analysis.

Tidal

- 4.2.62 Ulverston and Barrow-in-Furness are at residual risk of tidal flooding, refer to **Appendix A Map 008b** and **Appendix A Map 009b** for Barrow-in-Furness and **Appendix A Map 008d and Map 009d** for Ulverston.
- 4.2.63 For Ulverston, there is a significant difference between the defended and undefended flood extents from tidal sources. In the undefended extent, there is extensive flooding to the southeast of Ulverston around Outcast which, during the defended extent is purely due to fluvial sources. There is also additional flooding in the undefended extent in the residential and commercial area to the west of the Ulverston Canal near North Lonsdale Terrace which is not present in the defended extent.
- 4.2.64 In Barrow-in-Furness, there is not a significant difference between the defended and undefended flood extents. The undefended 1% AEP fluvial / 0.5% AEP tidal flood extent including an allowance for climate change shows a small area of additional flooding in comparison to the defended extent in the town centre.

Fluvial

- 4.2.65 In Penrith, the 1% AEP undefended shows a similar extent to the defended event, with some additional flooding identified along the Thacka Beck to the north of Ullswater Community College.
- 4.2.66 In Ulverston, the 1% AEP fluvial / 0.5% AEP tidal flood extent presents a similar extent in both the defended and undefended scenario. There is a slightly larger flood extent on the Pennington Beck near Pennington and Three Bridges in the undefended extents however the difference is relatively small.
- 4.2.67 In Kendal, the 1% undefended extent shows more extensive flooding associated with the River Kent than the defended extent, particularly through the centre of Kendal and to the north-east near South Lakeland Retail Park.

4.3 Flooding from Surface Water

- 4.3.1 Overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems. It can run quickly off land and result in localised flooding. This source of flooding can be compounded when combined with impermeable sub-soils, significant areas of development with associated hard standing areas or areas of open grassland.
- 4.3.2 As noted in **Section 4.2**, the risk of flooding from land drains and the sewer system is exacerbated during tide locked conditions, when flap valves at outfalls close to stop sea water entering the system. This prevents drainage channels from discharging and instead surface water accumulates upstream of the outfalls. Other outfalls, for example from public sewers can also lock such as combined sewer overflows. During heavy rainfall events this can result in flooding from manholes and gullies. Tide locking therefore has the potential to have a significant knock-on effect on the risk flooding from the contributing drainage systems.

Historic Records

- 4.3.3 In their role as the LLFA, the Council has a duty to record and investigate significant flood incidents relating to local sources of flooding, namely flooding from surface water, groundwater and Ordinary Watercourses under the FWMA 2010.
- 4.3.4 Cumbria County Council (CCC), in their previous role as LLFA published Section 19 Flood Investigation Reports. This includes a Section 19 Report prepared by Westmorland and Furness Council in 2024. A Section 19 Report from September 2023 is also due to be published by the Council, but this was not available at the time of writing. These predominantly relate to surface water flooding events; however flood events often occur due to a combination of sources. These events are listed and a summary provided in **Table 4-3**.
- 4.3.5 Some of these Flood Investigation Reports are on the boundary of the study area, including Old Tebay, Hallgarth, Lyth Valley and Stainton. Cross boundary considerations with neighbouring LPAs should be considered when undertaking Section 19 investigations as discussed further in **Section 4.9**.

Table 4-3: Section 19 Flood Investigation Reports

Location	Date	Affected	Source	Link
Croglin	28th June 2012 and 23rd July 2013	4 properties internally flooded.	Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6734/41761151524.pdf
Gamblesby	28th June 2012 26th November 2012 18th May 2013	3 properties internally flooded. 6 narrowly missed internal flooding.	Fluvial, Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6734/41761162257.pdf
Glassonby	28th June 2012	6 properties flooding internally and reports of 3 properties affected by external flooding.	Fluvial, Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6734/4176116142.pdf
Hallgarth, Kendal	28th June 2012	6 properties suffered internal flooding with 6 experiencing flooding of gardens.	Surface Water, Sewer, Groundwater	https://web.archive.org/web/20240616032304/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6735/4184914231.pdf
Highgate and Kirkland, Kendal	28th June 2012	9 commercial properties and parts of the Highgate and Kirkland sections of the A6 were affected.	Surface Water	https://web.archive.org/web/20240616032304/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6735/41761112737.pdf
Renwick	28th June 2012 and 18th May 2013	9 properties internally flooded during 28th June 2012.	Fluvial	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6734/41761162014.pdf
Greystoke	15th November 2015 and 5th December 2015	At least 15 properties were affected by the flooding on 5th December 2015 across Greystoke. It is understood that at least 5 of the properties experienced internal flooding.	Fluvial, Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6734/426559239.pdf
Kirkby Stephen	5th December 2015	37 properties in 5 different locations in Kirkby Stephen were affected by flooding.	Various sources including Main River, ordinary watercourses, Surface Water,	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/InterNet/544/3887/6729/6734/41761162014.pdf

Location	Date	Affected	Source	Link
			surcharging drainage systems and groundwater.	net/544/3887/6729/6734/42691142218.pdf
Old Tebay	5th December 2015	Flooding to 13 properties	Fluvial, Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/4268410176.pdf
Plumpton	5th December 2015	Internal and external flooding to several Properties.	Fluvial (ordinary watercourse), Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/42695145146.pdf
Shap	5th December 2015	Approximately 25 properties affected by flooding	Various sources including ordinary watercourse, surface water and surcharging of other drainage systems including those of the railway line to the east of Shap.	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/42691142324.pdf
Warcop	5th December 2015	11 residential properties affected by internal flooding	Fluvial, Surface Water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/42695145050.pdf
Appleby-in-Westmorland	5-6th December 2015	166 properties flooded.	Fluvial, Surface water	https://web.archive.org/web/20240616025322/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6734/4255216356.pdf
Beetham and Milnthorpe	5-6th December 2015	8 residential properties experienced internal property flooding in Beetham and 6 in Milnthorpe	Fluvial, Surface Water	https://web.archive.org/web/20220706160805/http://www.cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6735/4292685432.pdf
Burneside	5-6th December 2015	Approximately 80 properties were directly affected by flooding	Fluvial, Surface Water, Drainage systems overwhelmed	https://web.archive.org/web/20240414203242/https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/6729/6735/428078725.pdf
Eamont Bridge	5-6th December 2015	Approximately 101 properties directly affected.	Fluvial, Surface Water	Not available
Kendal	5-6th December 2015	Approximately 2,150 properties were directly affected by flooding, with the majority of these located in the Mintsfeet and Sandylands areas of Kendal.	Fluvial, Overtopping of the Stock Beck Flood Storage Basin, Surface Water, Groundwater	https://web.archive.org/web/20240616032304/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6735/4271394334.pdf
Lyth Valley	5-6th December 2015	Approximately 30 properties were impacted by the widespread flooding in the valley floor and a further 20 were marooned by the floodwater.	Fluvial, Tide locking, Surface Water	https://web.archive.org/web/20240414205801/https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/6729/6735/429891066.pdf

Location	Date	Affected	Source	Link
Stainton	5-6th December 2015	Approximately 12 properties in Stainton were flooded	Fluvial	https://web.archive.org/web/20220706162941/http://www.cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6735/4275993211.pdf
Holme	22nd November 2017	19 properties reported internal flooding.	Groundwater, Surface Water exacerbated by inadequate drainage	https://web.archive.org/web/20240616032304/https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6735/43332104149.pdf
Ulverston Town Centre	27 th – 28 th October 2024	11 properties reported flooding	Fluvial (possibly from Mill Stream) and Surface Water	The Council are currently preparing a S19 Flood Investigation Report

- 4.3.6 The flat estuarine landscape along the coastline in the south of the study area is particularly susceptible to surface water ponding, especially during periods of heavy rainfall coinciding with high tides. These conditions can lead to the accumulation of surface water on farmland and in some areas active pumping measures are required to manage water levels and reduce flood risk. Critical infrastructure is located within several of these high risk locations. In March 2024, a passenger train derailed at Grange-over-Sands. A Rail Accident Report by the Rail Accident Investigation Branch⁴⁵ concluded that the incident was caused by the failure of a partially buried pipe connected to a pump that transferred water from the landward side of the railway, into Morecambe Bay. This pipe was damaged during routine railway maintenance which caused the pump to stop operating. As a result, water discharged into the railway embankment for approximately 2 days, causing material to be washed away and creating a hidden void that ultimately led to the collapse.

Recommendation 4-5 *It is recommended that Network Rail, in conversation with United Utilities, undertake a targeted review of surface water drainage infrastructure along low-lying and estuarine sections of railway and coordinate with local flood risk management authorities. This will ensure there are no operational impact to these assets.*

Areas of Critical Drainage

- 4.3.7 The Cumbria Surface Water Management Plan⁴⁶ (SWMP) identifies 'Potentially Vulnerable Areas' (PVA) which are defined as catchments identified as being at risk of flooding and where the impact of flooding is sufficient to justify further assessment and appraisal. In total 19 No. PVAs were identified in Cumbria and given a risk level ranging from 'Very Low' to 'Very High'. 10 No. PVAs are located within the study area as detailed in **Table 4-4**. Within the highest risk PVAs, localised flood Areas of Risk (AoR) were identified in order to provide an improved understanding of surface water flooding, support decisions on whether these may require further assessment, and to identify mitigation measures to reduce surface water flooding. A high-level summary of conclusions and recommended Action Plans for Barrow-in-Furness, Kendal, Nent, Kirkby Stephen, Ulverston and Burton-in-Kendal is provided in the report. The actions generally encompass reviewing existing model output or producing new fluvial or surface water modelling outputs for each area.

Table 4-4: Summary of Potentially Vulnerable Areas (PVA) within the study area

PVA Risk Category	PVA Name
Very High	Barrow-in-Furness
High	Ulverston, Kendal, Penrith, Nent
Medium	Shap, Sedbergh/Kirkby Lonsdale/Tebay, Kirkby Stephen
Low	Greystoke, Burton-in-Kendal
Very Low	

⁴⁵ Rail Accident Investigation Branch, 2025, Derailment of a passenger train at Grange-over-Sands, Cumbria, 22 March 2024.

⁴⁶ Cumbria County Council, 2023, Cumbria Surface Water Management Plan.

- 4.3.8 It should be noted that the NPPF⁴⁷ also refers to ‘areas with critical drainage problems’ as notified by the Environment Agency. At the time of writing, the Environment Agency has confirmed that since 2020 there are no ‘areas with critical drainage problems for the purposes of the Development Management Procedure Order’ within the study area⁴⁷. It remains important to acknowledge local drainage constraints, utilising the most up to date surface water mapping and latest SuDS guidance.

Risk of Flooding from Surface Water Mapping

- 4.3.9 The Environment Agency has undertaken detailed modelling of surface water flood risk at a national scale and produced mapping identifying those areas at risk of surface water flooding during three probability events:
- 3.3% AEP (1 in 30 year)
 - 1% AEP (1 in 100 year)
 - 0.1% AEP (1 in 1,000 year)
- 4.3.10 The latest version of the mapping was published in January 2025 and is referred to as the ‘Risk of Flooding from Surface Water’ (RoFfSW). The extents are mapped in **Appendix A Map 0010a and Map 010b**. Detailed extents for Penrith and Ulverston are shown in **Appendix A Map 010c and 010d**. Please note, the detailed surface water extents for Kendal and Kirkby Stephen are described in Paragraph 4.3.13 and 4.3.14 as a detailed surface water modelling study has been undertaken.
- 4.3.11 The RoFfSW mapping predicts the risk of surface water flooding to be widespread across the study area. The surface water follows the natural topography of the land and accumulates in the natural depressions. Additionally, surface water flow pathways are present along the road networks.
- 4.3.12 It should be noted that these maps are based on topographic data, without explicit modelling of the interactions between the surface water and sewer network nor the existence of culverts. As a result, the accuracy is not as robust as that of fluvial flood maps. However, in areas with un-modelled watercourses, the RoFfSW mapping provides a useful tool for identifying potential flood risk areas and general flow routes.

Detailed Surface Water Modelling Studies

- 4.3.13 The LLFA have provided surface water modelling outputs for Kendal and Staveley, and Kirkby Stephen. These areas have a history of surface water flooding, and it is believed that the existing Environment Agency RoFfSW mapping does not accurately represent the extent of surface water flooding in Kirkby Stephen when compared to flood events. The surface water modelling for each town has been simulated for the 3.3% AEP, 1% AEP and 0.1% AEP events.
- 4.3.14 For Kendal, the study undertook detailed local surface water modelling and mapping, focusing on the urban areas around Kendal and Staveley, the latter of which is located outside of the study area. The study employed integrated catchment modelling allowing the hydraulic model of the watercourses to be integrated with the UU sewer network model data. The results indicated the mapping aligns with the RoFfSW dataset in most locations, with two main differences. In the Stock Beck catchment this model indicates a greater depth and extent particularly when focusing on the Sandylands area. Two main areas of ponding are indicated to the east of the Lakes Line at Jewsons Yard and Kendal Cricket Club. In the Natland Beck catchment, the results show a reduced flood extent compared to existing mapping. The extents are mapped in **Appendix A Map 010e**.
- 4.3.15 For Kirkby Stephen, the study employed integrated catchment modelling allowing the hydraulic model of the watercourses to be integrated with the UU sewer network model data. The results indicated that the mapping closely aligns with the RoFfSW dataset however the surface water modelling study predicted greater flood depths. The extents are mapped in **Appendix A Map 010f**. In accordance with the report, modelling of the 3.33% AEP event predicted additional flooding in several areas such as

⁴⁷ Environment Agency, 2024, Areas with critical drainage problems. Available at: <https://www.data.gov.uk/dataset/d10fb8e5-f3af-48c1-a489-8c975b0165de/areas-with-critical-drainage-problems> [Accessed: December 2024]

Station Yard, Quarry Close, Croglam Lane, South Road, High Street, Victoria Square, Melbecks, Silver Street, North Road, Croglam Park and Birkbeck Gardens area.

- 4.3.16 For Shap, an Initial Assessment was carried out in 2021 following two major floods in 2015 and February 2020. The flooding issues in Shap are believed to have been primarily a result of surface water, Ordinary Watercourse (principally the Shap Beck) and sewer flooding. The flooding mechanisms within the village are also compounded by a surface water culvert that drains flows from the contributing western catchment into the Shap Beck. The report suggests a number of potential flood risk management measures with the preliminary leading option a combination of natural flood management techniques in conjunction with flood storage areas located upstream of Shap Beck aqueduct and Shap Memorial Park. Based on the Initial Assessment, a recommendation was made to advance the project to Outline Business Case stage.

4.4 Flooding from Groundwater

- 4.4.1 Groundwater flooding occurs when water levels in the ground rise above surface elevations, typically in low lying areas underlain by permeable rock and aquifers following long periods of wet weather. In such locations, the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground. Unlike surface water flooding, groundwater flooding may take weeks or months to dissipate, as groundwater flow is much slower, resulting in a longer time for water levels to recede. In Westmorland and Furness, groundwater flooding appears and dissipates quickly due to fast groundwater flow through fissures in karstic limestone and groundwater levels within riverine gravel alluvium deposits which are closely linked to river levels.
- 4.4.2 Groundwater flooding is usually associated with chalk and limestone catchments that allow groundwater to rise to the surface. Whilst there are no chalk catchments in the study area, limestone is shown near Milnthorpe, Dalton-in-Furness and to the east and south of Kendal. The bedrock and superficial geology and their aquifer designations are described in [Section 4.1](#).
- 4.4.3 In addition, karstic limestone can dissolve along fault lines and fissures which can result in sink holes and may result in a type of spring where the flow is directly to discrete and often unpredictable locations following natural conduits in the bedrock, the groundwater table does not necessarily have to rise to the surface to feed these springs.
- 4.4.4 The BGS dataset 'Susceptibility to Groundwater Flooding'⁴⁸ shows the degree to which areas of England, Scotland and Wales are susceptible to groundwater flooding on the basis of geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring and should be used in conjunction with other data such as site-specific ground investigation works to investigate the groundwater in the area before planning decisions are made.
- 4.4.5 Areas are represented by one of three classifications (A, B and C) of susceptibility to groundwater flooding, as described in [Table 4-5](#). These have been mapped within this SFRA in [Appendix A Map 011a and 011b](#). Outside of these areas, the rock types are not considered to be prone to groundwater flooding.

Table 4-5: BGS Susceptibility to Groundwater Flooding Classes

Classification	Description
A	Limited potential for groundwater flooding to occur based on rock type and estimated groundwater level during periods of extended intense rainfall.
B	Potential for groundwater flooding of property situated below ground level based on rock type and estimated groundwater level during periods of extended intense rainfall. Where this may have an impact, you are advised to check that this has not been a problem in the past at this location and/or that measures are in place to sufficiently reduce the impact of the flooding.
C	Potential for groundwater flooding to occur at surface based on rock type and estimated groundwater level during periods of extended intense rainfall. You are advised to check that this has not been a problem in the past at this location and/or that measures are in place to sufficiently reduce the impact of the flooding.
Elsewhere (onshore)	Not considered to be prone to groundwater flooding: based on rock type.

⁴⁸ BGS, Susceptibility to Groundwater Flooding. Available at: <https://www2.bgs.ac.uk/groundwater/datainfo/GFSD.html>

- 4.4.6 The mapping shows that a significant portion of the Council's local planning authority area boundary falls within classification A which represents a '*limited potential for groundwater flooding to occur*'. This is shown around Dalton-in-Furness, Grange-over-Sands, Milnthorpe and a large area in the northern part of the planning boundary. Within Barrow-in-Furness and Walney Island, there are localised areas classified as B indicating '*potential for groundwater flooding of property situated below ground level*'. Areas north of Askam-in-Furness, Kendal and to the north of Skelton and Penrith, are classified as C representing '*potential for groundwater flooding to occur at the surface*'.
- 4.4.7 It should be noted that the dataset used to produce these maps provides only a high level indication of groundwater flood susceptibility, based on broad scale assumptions. Specifically, areas where non-aquifers are present at the ground surface have been classified as not susceptible to groundwater flooding. However, this may not be appropriate when assessing flood risk to basement areas or impedance to flow from below ground structures where aquifers are known at depth. Additionally, within the delineated areas, local groundwater level fluctuations are strongly influenced by site-specific geological conditions and artificial influences (e.g., structures or conduits).
- 4.4.8 Three former coal mining areas, 'Cumbria', 'Notts' and 'North East' near Penrith and Alston have been identified from the Mining Remediation Authority website⁴⁹. Whilst there are no active coal mines within the Council's planning boundary, former mines may lead to rising groundwater levels as historical de-watering activities ceased. Increased groundwater levels could result in localised flooding or structural issues for development situated nearby. Guidance on mining and groundwater constraints for development⁵⁰ is provided by the Mining Remediation Authority (previously the Coal Authority).
- 4.4.9 Shapfell Quarry (previously known as Hardendale Quarry) is a limestone quarry opened in 1962. Since active drilling ceased in 2009 there have been concerns regarding the rising groundwater levels here which could result in localised flooding or structural issues for nearby development.

Recommendation 4-6 *Groundwater investigations should be carried out as part of site-specific FRAs, particularly for proposed developments that include basements. It is essential to demonstrate that the site is not located on a key groundwater flow path, as the introduction of subsurface barriers could increase the risk of groundwater flooding in surrounding areas.*

Recommendation 4-7 *The design of on-site drainage systems will need to mitigate the risk of groundwater ingress which can contribute to hydraulic issues in the public sewer network.*

4.5 Sewer flooding

- 4.5.1 During heavy rainfall, flooding from the sewer system may occur if:

- 1) The rainfall event exceeds the capacity of the sewer system/drainage system:

Sewer systems are typically designed and constructed to accommodate rainfall events with an annual probability of 3.3% AEP or less. Therefore, rainfall events with an annual probability greater than 3.3% would be expected to result in surcharging of some of the sewer system. Note, not all sewers will be designed to this standard. While NWL and UU, as the sewerage undertakers, recognise the impact that more extreme rainfall events may have, it is not economically viable to construct sewers that could accommodate every extreme rainfall event. Similarly, although sewerage undertakers have an investment programme in response to sewer flood risk, any investment is based on a system of prioritisation. As such, there are areas of land which may be identified for development where there is an existing sewer flood risk, either with wider flood risk incidents or where a sewer passes through the site. In these circumstances, discussions should take place with the wastewater undertaker. See **Section 6.5** for further details.

Furthermore, as urban areas expand to accommodate growth, the original sewer system may not have capacity. This issue is further compounded by climate change which is forecast to result in milder wetter winters and increased rainfall intensity in summer months. Whilst connection points and discharge rates

⁴⁹ Gov.uk, 2025, Mining Remediation Authority. Available at: <https://www.gov.uk/government/organisations/mining-remediation-authority>

⁵⁰ Coal Authority, 2018, Mining and groundwater constraints for development – guidance. Available at: <https://www.gov.uk/guidance/mining-and-groundwater-constraints-for-development>

are identified and agreed with the Water Utility Company in advance, there remains increasing pressure to upgrade the wider sewer network.

2) The system becomes blocked by debris or sediment:

Over time there is potential that road gullies and drains become blocked from fallen leaves, build-up of sediment and debris (e.g. litter). In the study area, outfalls can become blocked from high volumes of sediment movement, especially along the Kent Estuary and at Grange-over-Sands. Morecambe Bay provides the main source of suspended fine sediment to the Kent Estuary which acts as a sediment sink within the larger Morecambe Bay system. Sediment generally moves in a northerly direction and is deposited on banks within the estuary. This has the potential to block outfalls. The Council should prioritise the use of SuDS in development which may help to minimise the implementation of outfalls. This is discussed further in [Section 6.6](#).

3) The system surcharges due to high water levels in receiving waterbodies (i.e. watercourses or the sea):

Within the study area there is potential for outfalls to become submerged due to high water levels in receiving waterbodies (rivers or sea). When this happens, water is unable to discharge. This is a potential issue that can occur in tidal areas such as Grange-over-Sands and Arnside. It may be necessary to assess such combinations of flood risk in a site-specific FRA. Once storage capacity within the sewer system itself is exceeded, the water may overflow into streets and potentially into houses. The sewer network serving Westmorland and Furness by UU has been provided by the water company and shows that the majority of the study area is served by 'combined' sewers i.e. containing both foul and storm water. If rainfall entering the sewer exceeds the capacity of the combined sewer, and storm overflows are blocked by high water levels in receiving watercourses, surcharging and surface flooding may again occur but in this instance, floodwaters will contain untreated sewage.

- 4.5.2 UU have provided an extract from their register of hydraulic flooding incidents for the study area. This shows properties that have been affected by external and internal sewer flooding (as reported to UU) since 2009. Due to data protection requirements, this data has not been mapped at an individual property level; rather the register comprises the number of properties within 4-digit postcode areas that have experienced flooding, either internally or externally, since 2009. It should be noted that it is likely that there have also been unreported sewer flooding incidents in this area over this time period.
- 4.5.3 NWL have provided an extract from their register of 100m² grids where NWL are aware of sewer flood risk due to hydraulic incapacity. The register shows one property in NWL's boundary that overlaps with the study area which is at risk of flooding internally twice in 10 years in the Alston area.
- 4.5.4 Sewer records from UU and NWL are presented in [Appendix A Map 012a and 012b](#) and show a total of 1499 reported sewer flooding incidents across the study area. The data shows that Kendal (LA9 6) has the highest number of reported sewer flooding incidents with between 150 – 250 occurrences. Dalton-in-Furness (LA15 8) and Walney Island (LA14 3) each have reported between 76-100 sewer incidents of flooding. Barrow-in-Furness (LA13 9) and west Kendal (LA9 5) each have reported between 51-75 incidents. The remaining areas of the study, including those within the NWL boundary, generally reported fewer than 25 properties at risk. These typically correspond to more rural areas such as postcode DL12 where the proportion situated within the Council's boundary recorded 0 incidents since 2009.
- 4.5.5 The site selection process should include specific consultation with sewerage undertakers to ascertain if there are any hydraulic flood incidents or sewer modelling data which indicate a risk to the development of a site and whether there is a need to apply the sequential approach. Any sewer flood risk will need careful assessment and consideration in the detailed design, master planning and drainage details for the site. The risk of sewer flooding could affect the developable area of the site and the detail of the design. Applicants must not assume that changes to a sewer such as a diversion or a change in cover/land levels will be acceptable as such changes can affect hydraulic performance/exceedance paths.

4.6 Flooding from Canals and Reservoirs

- 4.6.1 Reservoirs, canals, water retention ponds, docks and other artificial structures may have a potential flood risk associated with them. Generally, under normal circumstances, the flood risk posed is low; however, if a breach occurs, extensive flooding could be experienced which can cause significant threat

to life and major property damage. A number of reservoirs, canals and open water bodies have been identified within the study area, as described below.

Canals

- 4.6.2 The Canal and River Trust provide data⁵¹ showing the canals and waterways by kilometre length across England and Wales
- 4.6.3 The Lancaster Canal, which connects Preston to Kendal, is owned and operated by the Canal and River Trust and is the only canal within the study area. The canal is a coastal canal and historically remained isolated from the national waterway network until 2002 when it was connected to the River Ribble via the Ribble Link, which runs around the outskirts of Preston.
- 4.6.4 Limited information is available on the level of flood risk associated with canals. However, it is widely acknowledged that canals may present potential flood risks. Most canals are considered to be controlled water bodies, so flood risk is deemed to be minimal unless overtopped in storm conditions.
- 4.6.5 Structural failure could lead to a breach which can potentially be hazardous as they may involve the rapid release of large volumes of water at high velocity, however this risk is considered residual. In general, the canal system is hydraulically closed down at relatively high river levels prior to the issuing of a flood alert from the Environment Agency. This is to protect the canal corridors from higher than average river levels which would overtop the banks, and to protect craft from venturing onto rivers at dangerous flows. This risk is managed by the Canal and River Trust.

Reservoirs

- 4.6.6 The failure of a reservoir or artificial source has the potential to cause catastrophic damage due to the sudden release of large volumes of water. The PPG: 'Flood Risk and Coastal Change' 2025² encourages LPAs to identify any reservoirs and evaluate how they might influence existing flood risk in the event of a flood in the catchment it is located within, and/or whether emergency draw-down of the reservoir will add to the extent of flooding. In accordance with Paragraph 046 of the PPG: 'Flood Risk and Coastal Change' 2025², LPAs should also consider the implications of new development located downstream of a reservoir. These may include increased costs for improving the design of the dam, changes to reservoir operation and ongoing maintenance to mitigate flood risk. Developers should be expected to cover any additional costs incurred, as required by the NPPF's¹ 'agent of change' policy (paragraph 187). This could be through Community Infrastructure Levy or Section 106 obligations.
- 4.6.7 The Environment Agency dataset 'Risk of Flooding from Reservoirs'⁵² identifies areas that could be flooded if a large⁵³ reservoir was to fail and release the water it holds. The mapping shows the flood extent when local rivers are at normal levels (a 'dry day') or when local rivers are already in flood (a 'wet day'). This mapping reproduced in **Appendix A Map 013a and 013b** identifies areas that are affected. These areas include Penrith, Great Ormside, Lazonby, Kendal, Ulverston, Dalton-in-Furness and Barrow-in-Furness. **Table 4-6** provides a summary of 24 No. reservoirs which, if breach were to occur, would affect Westmorland and Furness. This includes reservoirs that are located outside of the Westmorland and Furness planning area boundary; however they could pose a potential flood risk to the area. The table provides detail on settlements that would be affected by the 'wet day' scenario.
- 4.6.8 Reservoirs in the UK have an extremely good safety record. The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be inspected and supervised by reservoir panel engineers. It is assumed that these reservoirs are regularly inspected, and essential safety work is carried out. These reservoirs therefore present a minimal risk.
- 4.6.9 The Council is responsible for working with members of the Cumbria Local Resilience Forum (LRF)⁵⁴ to develop emergency plans for reservoir flooding and ensuring communities are well prepared.

⁵¹ Canal and River Trust, 2024, Canals by KM length. Available at: <https://data-canalrivertrust.opendata.arcgis.com/datasets/CanalRiverTrust::canals-by-km-length-21/explore> [Accessed: December 2024]

⁵² Environment Agency, 2024, Reservoir Flood Extents. Available at: <https://environment.data.gov.uk/dataset/d81646cf-37e5-4e71-bbcf-b7d5b9ca3a1c>

⁵³ A large reservoir is one that holds over 25,000 cubic metres of water, equivalent to approximately 10 Olympic sized swimming pools.

⁵⁴ Cumbria Prepared, 2024. Available at: <https://cumbriaprepared.org.uk/>

- 4.6.10 Any proposals for development within the risk of flooding from reservoirs extent will need to confirm with the Environment Agency the source of this reservoir flood risk.
- 4.6.11 UU and NWL are responsible for water supply infrastructure within the Council's boundary which could cause flooding, should any of the infrastructure fail. This infrastructure includes the large water supply reservoir of Haweswater which supplies around 25% of the North West's water supply. UU actively manage the water supply reservoir and ensure that all required safety standards are met. UU's catchment controllers and supervising engineers are responsible for the operation, maintenance, inspection and improvements of our reservoirs. This involves visual checks of the reservoir are regularly carried out for safety reasons, physical operation of the safety equipment at the reservoir is regularly undertaken and maintenance (grass cutting, repairs etc.) is upheld. These reservoirs therefore present a minimal risk.
- 4.6.12 In August 2025, UU agreed to refurbish Haweswater Aqueduct. Construction, due to get underway in 2026, will see six tunnel sections of the original 110km pipeline replaced with most of the work happening below ground using the latest tunnelling techniques.

Table 4-6: Reservoirs affecting Westmorland and Furness

Reservoir	Approximate (Ordnance Survey National Grid Reference) OS NGR	Settlements affected	Within Westmorland and Furness Planning Area Boundary
Blea Water	NY 44800 10700	Penrith	No
Blencarn	NY 64051 31611	Kirkoswald	Yes
Borrans	NY 42965 00980	Kendal, Milnthorpe	No
Cow Green	NY 81272 29103	None	Yes
Dubbs	NY 42200 01700	Kendal, Milnthorpe	No
Fisher Tarn	SD 55000 92800	Milnthorpe	Yes
Gould's Tarn - Warcop Fell	NY 73882 18040	Great Ormside	Yes
Gurnal Dubs	SD 50300 99200	Kendal, Milnthorpe	No
Harlock	SD 24700 79100	Dalton-in-Furness, Barrow-in-Furness	Yes
Haweswater	NY 50000 15500	Penrith, Kirkoswald	No
Kentmere Head	NY 44500 07800	Kendal, Milnthorpe	No
Killington	SD 59000 91000	Milnthorpe	Yes
Knottallow Tarn	SD 27200 80200	Ulverston	Yes
Lilymere	SD 60500 91500	Milnthorpe	Yes
Little Borwick Fold Reservoir	SD 45000 97300	Kendal, Milnthorpe	No
Lower Ormsgill	SD 19479 70691	Barrow-in-Furness	Yes
Pennington	SD 25715 78704	Ulverston	Yes
Poaka Beck	SD 24287 78336	Dalton-in-Furness, Barrow-in-Furness	Yes
Seathwaite Tarn	SD 25267 98707	Askam-in-Furness	No
Thacka Beck	NY 50760 30794	Penrith	Yes
Wet Sleddale	NY 54986 11472	Penrith, Kirkoswald	No
Whinfell Forest	NY 57754 26854	Penrith	Yes
Whins Pond	NY 55300 30600	Penrith	Yes
Wyndhammere	SD 59163 85026	Kirkby Lonsdale, Milnthorpe	Yes

**Data taken from 'Risk of Flooding from Reservoirs - Wet Day'*

4.7 Climate Change

- 4.7.1 Paragraph 008 of the NPPF¹ states that mitigating and adapting to climate change is an important objective that is key to delivering sustainable development that should be delivered through local plans. In relation to flood risk and climate change in the planning system, the NPPF states in Paragraph 164 that:

"New development should be planned for in ways that: a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems".

- 4.7.2 The Level 1 SFRA should be the starting point for any LPA to assess the effects of climate change on flood risk across the local plan area. Along with the NPPF¹, PPG² and Environment Agency guidance¹⁸, the Council should refer to the Royal Town Planning Institute and Town & Country Planning Association's new edition of their joint guidance: 'The Climate Crisis – a guide for local authorities on planning for climate change' when preparing the Local Plan.

Tidal and Fluvial Flooding

- 4.7.3 Climate change is likely to lead to an increase in peak rainfall intensity, river flow and sea level rise which could result in more frequent and severe flood events and higher levels of fluvial flood risk and greater impacts of flooding in coastal areas. As climate change allowances and flood risk definitions are likely to continue to be updated in the future, due to UK Climate Projections, this will cause more sites to become at a greater risk of fluvial flooding due to larger flood extents and greater depths.
- 4.7.4 **Table 3-3** details the local hydraulic models received from the Environment Agency and lists the climate change allowances which have been modelled. The table highlights those models that have been incorporated into the new NaFRA2 dataset. Where local models were not incorporated, the new national model has been used which includes the potential impact of climate change on flood risk, based on UKCP19.
- 4.7.5 The areas at risk of flooding from rivers and sea, including climate change, in Westmorland and Furness are shown in **Appendix A Map 008a, 008b, 009a and 009b** with defended and undefended extents, respectively. More detailed analysis of Penrith, Ulverston and Kendal are presented in **Appendix A Map 008c, 008d, 008e, 009c, 009d and 009e**.
- 4.7.6 For Penrith, the defended and undefended extents for the 1% AEP event, including an allowance for climate change show some additional areas of flood risk when compared with the present day scenarios, particularly along the M6 near Wetheriggs County Park and to the east of Hunter Hall School.
- 4.7.7 For Ulverston, the 'Rivers and Sea' flood risk extents, both defended and undefended, have been reviewed to provide an indication of flood risk including climate change. Both the defended and undefended extents for the 1% AEP event, including an allowance for climate change, are more extensive than the present day scenarios. The two extents are closely aligned with extensive flooding in the east of Ulverston, including the residential areas to the east of Lightburn Park.
- 4.7.8 For Kendal, the 1% AEP defended extent including an allowance for climate change are very similar to the present day extents with a slight increase in extent near South Lakeland Retail Park and in the Westmorland General Hospital Area. The 1% AEP undefended extent plus climate change shows significant additional flooding, particularly on the east river bank through the centre of Kendal.

Recommendation 4-8: *Where required, local hydraulic models should be updated with current Environment Agency Climate Change Allowances, particularly for Ulverston.*

Surface Water

- 4.7.9 As discussed in **Section 2.2**, the predicted increase in the frequency and intensity of storm events could increase the volumes of rainfall. As such, this will likely lead to an increase in the frequency of surface water flooding events and cause more widespread flooding in areas that are currently at risk and areas that are not yet at risk. Furthermore, increased rainfall will likely increase the depth of surface water flooding and velocity of surface water flow paths.

- 4.7.10 Site-specific surface water modelling should be undertaken for developments where surface water flow paths are present to allow for effective management of surface water. This must demonstrate that flooding does not occur on any part of the development for rainfall events up to the 3.3% AEP event and that flooding does not occur during rainfall events up to a 1% AEP event in any part of: a building (including a basement); any utility plant susceptible to water (for example, pumping station or electricity substation) within the development; or any route designed to provide safe access and escape during flooding.
- 4.7.11 The NaFRA2 update in March 2025 also includes information which indicates the possible impacts of climate change on future risk. The Environment Agency have selected the scenarios from their flood risk assessment: climate change allowances guidance¹⁸ which are considered most relevant to the expected uses of the data. The climate change allowances are based on the latest UK Climate Projections (UKCP19) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5. These estimates are based on projections for the middle of the century.
- 4.7.12 The climate change extents are mapped in **Appendix A Map 010a and Map 010b**. The high and medium extents (3.3% AEP and 1% AEP respectively) including an allowance for climate change are similar to the present day extents. When considering low risk extents (0.1% AEP) with climate change, there is a particular increase in surface water flooding in the North Pennines, due to increased rainfall and runoff from the steep slopes. There is a small increase in low surface water flood risk in Penrith when considering climate change. In the southern area, the low surface water extent increased with climate change around Kendal, Ulverston, Barrow-in-Furness and the land to the west of the B5278 near Grange-over-Sands.

Flooding from Groundwater

- 4.7.13 As discussed in **Section 2.2**, the predicted increase in the frequency and intensity of storm events could increase the volume of rainfall. As groundwater is affected by extremes in the weather, increased periods of high rainfall will likely result in more frequent and intense groundwater flooding of basements and the emergence of groundwater at the ground surface, causing damage to property and infrastructure⁵⁵. Whilst there is no specific dataset focused on climate change impacts on groundwater flooding, the Susceptibility to Groundwater Flooding dataset (**Appendix A Map 011a and 011b**) offers an indication of areas that are likely to be at a greater risk of groundwater flooding both now and in the future.

Sewer Flooding

- 4.7.14 As discussed in **Section 2.2**, the predicted increase in the frequency and intensity of storm events could increase the volumes of rainfall. As such, this may lead to increased flow into the combined sewer networks, which serve the study area, leading to the capacity in these networks being reached more frequently and, as a result, causing more frequent combined sewer overflow (CSO) spills.
- 4.7.15 Within the study area there is potential for sewer outfalls to rivers to become submerged during high water levels, whether fluvial or tidal. Such conditions are expected to occur more frequently due to predicted increases in rainfall and sea level rise as a result of climate change. When outfalls are submerged, water is unable to discharge into the river and flows back along the sewer. Once the sewers storage capacity is exceeded, this can lead to overflows into streets, properties and watercourses.

Flooding from Canals and Reservoirs

- 4.7.16 Climate change and more extreme weather events are likely to increase the risks associated with structural integrity, operational management and potential failure of artificial structures such as canals, docks, basins and reservoirs⁵⁶. While the effects of heavy rains storms are dramatic, long, dry spells can also be a serious problem causing earth structures to dry out and increase their vulnerability to erosion, especially when followed by intense rainfall⁵⁷.

⁵⁵ British Geological Survey, 2024, Groundwater extremes, climate change and resilience. Available at: <https://www.bgs.ac.uk/geology-projects/groundwater-research/resilience/> [Accessed: December 2024]

⁵⁶ DEFRA, 2021, Review of the impact of climate change on dams and reservoirs. Available at: <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/review-of-the-impact-of-climate-change-on-dams-and-reservoirs> [Accessed: December 2024]

⁵⁷ Canal & River Trust, 2021, News. Available at: <https://canalrivertrust.org.uk/news-and-views/news/landslip-closes-north-oxford-canal-in-warwickshire> [Accessed: December 2024]

4.8 Assessing the cumulative impact of development

- 4.8.1 The NPPF¹ states that strategic policies should be informed by a SFRA, and should consider cumulative impacts in, or affecting, local areas susceptible to flooding (paragraph 171). The 'How to prepare a Strategic Flood Risk Assessment' guidance⁵⁸ also states that a SFRA should include an assessment of the cumulative impacts of development and land-use change which should include any impact expected from:
- Strategically planned development.
 - Windfall development.
 - Permitted development.
 - Significant changes in land use, such as paving over domestic gardens or reforestation of uplands.
- 4.8.2 Development or the cumulative impacts of development may result in an increase in flood risk elsewhere as a result of impacts such as the loss of floodplain storage, the deflection or constriction of flood flow routes or through inadequate management of surface water. The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure; however an assessment will still need to be made (refer to **Section 6.7**).
- 4.8.3 Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided. Where it is not possible to provide compensatory storage on site, it may be acceptable to provide it off-site if it is hydraulically and hydrologically linked. Whilst the use of stilts and voids below buildings may be an appropriate approach to mitigating flood risk to the buildings themselves, such techniques should not normally be relied upon for compensating for any loss of floodplain storage. This is because voids do not allow water to freely flow through them, trash screens get blocked, voids get silted up, they have limited capacity, and it is difficult to stop them being used for storing belongings or other materials.
- 4.8.4 Using a phased approach to development is also important whereby any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed. Holistic strategies for foul and surface water drainage and flood risk management will be required on sites which are phased. This should be reflected in planning policy. Large strategic multiple development sites should also carry out development phasing within the overall site boundary to avoid cumulative impacts within the site.
- 4.8.5 Identification of those areas where changes in land use could potentially increase surface water runoff rates and volumes can strategically aid spatial planning in avoiding areas where significant mitigation of surface water runoff following development may be required. The provision of multifunctional sustainable drainage systems, natural flood management and green infrastructure can also make a valuable contribution to mitigating the cumulative impacts of development on flood risk.
- 4.8.6 Whilst individual development with appropriate site mitigation measures should not result in measurable local effects with respect to hydrology and flood risk, the cumulative effect of multiple development may be more severe at downstream locations in the catchment. Locations where there are existing flood risk issues will be particularly sensitive to cumulative effects.
- 4.8.7 The cumulative impact should be considered throughout the planning process, from the allocation of sites within the Local Plan, to the planning application and development design stages.

4.9 Assessing cross boundary considerations

- 4.9.1 By its very nature, flooding is an issue that has significant cross boundary impacts. The causes and impacts of flooding do not respect administrative boundaries, and a wide range of organisations have responsibilities for managing flood risk either due to land ownership or statutory duties.

⁵⁸ Environment Agency, March 2022, How to prepare a strategic flood risk assessment. Available at: <https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment>

- 4.9.2 Watercourses, overland flow paths and groundwater flow routes pass from one LPA to a neighbouring one. Therefore, future development in one LPA has the potential to affect flood risk to existing development and surrounding areas in another LPA area.
- 4.9.3 As outlined in **Section 3.2**, under the Localism Act 2011²³, there is a legal duty on LPAs to cooperate with one another. Councils and other bodies must work together to maximise the effectiveness within which certain activities are undertaken as far as they relate to a 'strategic matter'. Therefore, cross boundary considerations will be further supported by these discussions.
- 4.9.4 The Council is adjacent to Cumberland Council, Durham County Council, Lake District National Park Authority, Lancashire County Council, Lancaster City Council, North Yorkshire Council, Northumberland County Council and Yorkshire Dales National Park Authority. The natural catchments within the study area cross borders between LPA administrative areas. Watercourses, overland flowpaths and groundwater flow routes pass from one LPA to a neighbouring one. Therefore, future development in one LPA has the potential to affect flood risk to existing development and surrounding areas in another LPA area. For example, the River Eden flows through Appleby-in-Westmorland and Lazonby and outfalls into the Solway Firth to the north of Carlisle. Any development near the river has the potential to impact flood risk downstream of both the watercourse and the study area.
- 4.9.5 In these locations, LPAs that share river catchments should work together with other RMAs to assess and manage flood risk and consider the wider impacts of any proposed development. This may entail collaboration through flood risk management measures and consulting each other on applications for development on administrative boundaries. Applications for development that would increase the risk of flooding to neighbouring areas should not be permitted. For example, if development is proposed in the Eden Lower catchment, this could have an impact downstream in the Carlisle area. Similarly with development in the Petteril catchment, this could impact flood risk in areas positioned downstream, outside of the study area.
- 4.9.6 Any decision on flood risk management practices should involve discussion with neighbouring authorities to minimise downstream impacts of development on flood risk and where possible provide collective benefits.

Recommendation 4-9 *The Council should ensure communication between LPAs to make sure that action in one does not negatively impact upon another.*

5. Avoiding flood risk – Applying the Sequential Test

5.1 Overview

- 5.1.1 The sequential approach is a decision-making tool designed to select sites so that development is, as far as reasonably possible, located where the risk of flooding from all sources is lowest, taking account of climate change and the vulnerability of future users to flood risk. This will help avoid the development of sites that are inappropriate on flood risk grounds. The subsequent application of the Exception Test where required (as determined by [Table 5-2](#)), will ensure that new developments in flood risk areas will only occur where flood risk is clearly outweighed by other sustainability and safety drivers.
- 5.1.2 The sequential approach can be applied at all levels and scales of the planning process, both between and within Flood Zones, areas predicted at surface water flood risk and areas at flood risk from other sources. All opportunities to locate new developments (except Water Compatible) in reasonably available areas of little or no flood risk should be explored, prior to any decision to locate them in areas of higher risk.

5.2 Applying Sequential Test for the Local Plan

- 5.2.1 When preparing a Local Plan, the LPA should demonstrate that a range of site allocations have been considered, using the SFRA to apply the Sequential and Exception Tests where necessary. The Sequential Test needs to be applied to the whole LPA area to increase the possibilities of delivering development not exposed to flood risk, both now and in the future and should be undertaken by the Council to accurately document each decision and ensure consistency and transparency.
- 5.2.2 The Sequential Test requires an understanding of the risk of flooding in the study area from all sources (as provided within this SFRA) and the vulnerability classification of the proposed developments, as defined in the NPPF¹ and presented in [Table 5-1](#). Note, the Sequential Test will require site specific information including the availability of sewer flooding data such as model outputs and recorded incident data. Detailed information of this nature will likely be provided within a Level 2 SFRA.
- 5.2.3 [Figure 5-1](#) illustrates the approach for applying the Sequential Test that the Council should adopt in the allocation of sites as part of the preparation of the Local Plan. This has been reproduced from Diagram 2 of the PPG 'Flood Risk and Coastal Change' (2025)².
- 5.2.4 All sources of flooding must be considered when planning for new development, including flooding from rivers and the sea; flooding from land or surface water runoff; groundwater; sewers; and artificial sources. If a location is recorded as having experienced repeated flooding from the same source this should be acknowledged within the Sequential Test and should be used to inform the site selection process.
- 5.2.5 Sites should be identified as a low, medium or high risk considering all sources of flooding. It is noted that the definition is not synonymous with the Flood Zones on the Flood Map for Planning, as these are defined by the probability of flooding. However high risk could be considered as Flood Zone 3, a greater 3.3% chance of surface water flooding each year and/or potential for groundwater to occur at the surface. Medium risk could be considered as Flood Zone 2, between 1% and 3.3% year chance of surface water flooding each year and/or potential for groundwater flooding of property situated below ground level. Low risk could be considered as Flood Zone 1, between 0.1% and 1% year chance of surface water flooding each year and/or limited potential for groundwater flooding to occur. Very low risk could be considered as less than 0.1% chance of surface water flooding. If a location is recorded as having experienced repeated flooding from the same source this should be acknowledged within the Sequential Test.
- 5.2.6 Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare sites within medium risk areas and only where there are no sites in low and medium risk areas, should high-risk areas be considered.

- 5.2.7 When considering the risk of flooding to each site, it is important to assess the proportion of the site at risk of flooding and the intended location of development within the site. For example, a large strategic site may have a small area of high risk of flooding, but when considered as a whole, it offers a large area of low risk of flooding. As such, the site may be defined as high risk due to one source of flooding, even though the risk from all other sources of flooding is low. Therefore, it is important that the Council also applies the Sequential Approach *within* the site, which is described in [Section 5.4.5](#).
- 5.2.8 It is also important to assess the risk of flooding along the access / egress routes to the site. There are occasions when development sites at low risk of flooding are located on 'dry islands' surrounded by areas at greater risk of flooding. This should be captured within the site assessments and used to inform the sequential testing of sites by the Council.
- 5.2.9 The PPG 'Flood Risk and Coastal Change' (2025)² recognises the need to balance flood risk considerations with wider sustainability objectives. In cases where sites, such as brownfield regeneration sites within town centres may be considered at higher flood risk compared to alternative sites, potentially out of town sites, the Council must still demonstrate that the Sequential Test has been applied, and alternative low flood risk sites have been considered. However, it may be appropriate to consider a wider planning balance especially where the site is in a more sustainable location and can deliver significant regeneration benefits. While such a site may technically fail the Sequential Test, it is recommended that the Council considers allocating the site providing a robust and justifiable case is made, flood risk can be appropriately managed and the reasoning of its sustainability benefits clearly documented. From a flood risk perspective, it is preferable to allocate such sites through the Local Plan process, rather than allowing them to come forward as windfall. Allocation at this stage provides greater control over the type and scale of development and ensures that flood risk mitigation can be properly embedded in site specific policies.

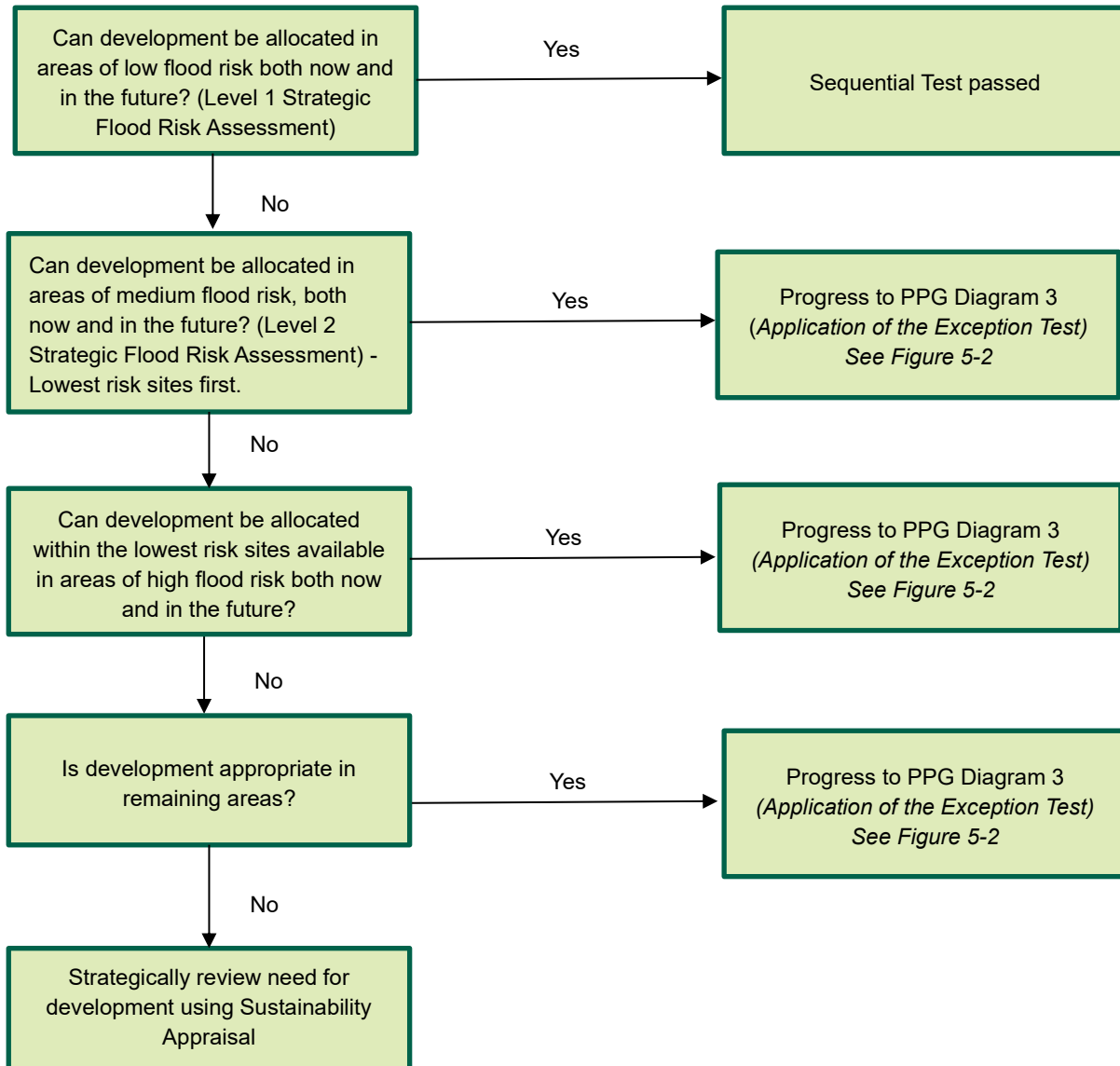


Figure 5-1: Applying the Sequential Test in the Preparation of a Local Plan (PPG: 'Flood Risk and Coastal Change', 2025² Para 025 Diagram 2)

Table 5-1: Flood Risk Vulnerability Classification (NPPF¹ 2025 Annex 3)

Vulnerability Classification	Development Uses
Essential Infrastructure	<p>Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.</p> <p>Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood.</p> <p>Wind turbines.</p> <p>Solar farms.</p>
Highly Vulnerable	<p>Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding.</p> <p>Emergency dispersal points.</p> <p>Basement dwellings.</p> <p>Caravans, mobile homes and park homes intended for permanent residential use.</p> <p>Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "Essential Infrastructure").</p>
More Vulnerable	<p>Hospitals.</p> <p>Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.</p> <p>Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.</p> <p>Non-residential uses for health services, nurseries and educational establishments.</p> <p>Landfill and sites used for waste management facilities for hazardous waste.</p> <p>Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.</p>
Less Vulnerable	<p>Police, ambulance and fire stations which are not required to be operational during flooding.</p> <p>Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure.</p> <p>Land and buildings used for agriculture and forestry.</p> <p>Waste treatment (except landfill and hazardous waste facilities).</p> <p>Minerals working and processing (except for sand and gravel working).</p> <p>Water treatment works which do not need to remain operational during times of flood.</p> <p>Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).</p> <p>Car parks.</p>
Water-Compatible Development	<p>Flood control infrastructure.</p> <p>Water transmission infrastructure and pumping stations.</p> <p>Sewage transmission infrastructure and pumping stations.</p> <p>Sand and gravel working.</p> <p>Docks, marinas and wharves.</p> <p>Navigation facilities.</p> <p>MOD defence installations.</p> <p>Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.</p> <p>Water-based recreation (excluding sleeping accommodation).</p> <p>Lifeguard and coastguard stations.</p> <p>Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.</p> <p>Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.</p>

- 5.2.10 The NPPF¹ indicates suitability of a development based on its vulnerability and location within a fluvial or tidal Flood Zone as set out in **Table 5-2**. However, the vulnerability classification of types of development is still relevant in considering flood risk from other sources. For example, a basement dwelling will still be more vulnerable to surface water flooding than an office development. It is important to note, whilst 'More Vulnerable' development such as residential properties are permitted in Flood Zone 2, the Sequential Test should be applied to ensure development is steered towards Flood Zone 1.

Table 5-2: Flood Risk Vulnerability and Flood Zone ‘Incompatibility’ (PPG: ‘Flood Risk and Coastal Change’, 2025² Table 2)

	Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test Required	✓	✓
	3a †	Exception Test Required †	✓	✗	Exception Test Required	✓
	3b *	Exception Test Required *	✓ *	✗	✗	✗

✓ – Exception Test is not required ✗ – Development should not be permitted

† – In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* – In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood
- result in no net loss of floodplain storage
- not impede water flows and not increase flood risk elsewhere

Recommendation 5-1 *The Council should ensure the Sequential Test is undertaken for all available land allocations and check that the vulnerability classification of the proposed land use is appropriate to the Flood Zone classification.*

Recommendation 5-2 *The Council should pursue opportunities to move existing development from within the floodplain to areas with a lower risk of flooding. This should include consideration of the vulnerability of existing developments and whether there is potential for land swap with lower vulnerability uses.*

Recommendation 5-3 *The Council should ensure that clear justification is documented for any sites that may not pass the Sequential Test but have a sustainable rationale for their geographic location. This would support their allocation in the Local Plan and provide the Council with a mechanism for setting out specific mitigation strategies and/or development requirements that will need to be met for the sites. This would prevent them coming forward as windfall sites, over which the Council have less opportunity to inform development.*

5.3 Recommended Stages for LPA Application of the Sequential Test

5.3.1 The recommended steps in undertaking the Sequential Test are detailed below. The information required to support the following steps are provided in the accompanying maps presented in **Appendix A**. When preparing a Local Plan, a database of the potential allocation sites across Westmorland and Furness should be generated and information for each site populated using the GIS layers presented in the maps. The database can be used by the Council when applying the steps below:

1. Identify all potential development sites across the Local Plan area.
2. Assign a unique reference to each site.
3. Identify the range of potential uses that could be considered on each site and the associated Vulnerability Classifications.
4. Identify the design life⁵⁹ of the development with respect to climate change.

⁵⁹ Planning Practice Guidance: Flood Risk and Coastal Change, 2025 Paragraph 006 ‘What to consider when determining whether a proposed development will be safe for its lifetime?’. Available at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change#para6>

- a. 100 years for residential developments; and
 - b. 75 years for commercial / industrial developments
5. Use the flood risk datasets and information in the Level 1 SFRA to analyse the flood risk to the sites from all sources of flooding, now and in the future. For example, analysis could include but not limited to:
- Site area (ha).
 - % of site within Flood Zones 1, 2, 3a and 3b.
 - % of site within modelled 1% AEP plus climate change flood extents (NaFRA2). *(Please refer to **Table 3-3: Received Hydraulic Models** in **Section 3.3** as not every model has available climate change extents).*
 - o *Note, it is integral that climate change allowances are considered when identifying areas at future flood risk, ensuring they are protected from development. As such, please refer to **Section 8.3** which outlines the need for further assessment and modelling when fluvial flood risk data including climate change is unavailable.*
 - Presence of a watercourse (Main River or Ordinary Watercourse) within the site boundary or within 16m of the site boundary.
 - % of site within 'Risk of Flooding from Surface Water' modelled extents for the 3.3% AEP, 1% AEP and 0.1% AEP scenarios.
 - Recorded flooding incidents or investigations within 20m of the site.
 - Within notable areas of surface water flood risk as identified by the Lead Local Flood Authority and modelled extents greater than the 3.3% AEP outlined within the Kendal and Kirkby Stephen surface water modelling outputs.
 - Susceptibility to Groundwater Flooding of the area local to the site (Class C), based on the BGS Susceptibility to Groundwater Flooding dataset.
 - % of site within 'Risk of Flooding from Reservoirs' flood extent.
 - Details of any sewer flood risk following site specific consultation with the wastewater undertaker.
- 5.3.2 Based on the analysis undertaken in Step 5, the Council should develop a matrix to rank the sites from least to greatest risk of flooding considering all sources of flooding. Further guidance on this can be found in A Good Practice Guide⁶⁰. This will enable the Council to take account of the size of the site, the scale and type of development and the scale of any risks. (For example, a large site with a small area of Flood Zone 3a may be considered preferable to a small site entirely at risk of surface water flooding).
- 5.3.3 The Council should use a sequential approach to allocate those sites with greater vulnerability (e.g., Highly Vulnerable) towards those areas at lowest risk of flooding. If these cannot be delivered in lowest flood risk areas, because the identified sites are unsuitable or there are insufficient sites in low flood risk areas, sites in areas of greater flood risk may need to be identified to accommodate development or opportunities sought to locate the development outside the District.
- 5.3.4 Follow the same approach with More Vulnerable and then Less Vulnerable uses, the Council should steer development towards the lowest flood risk sites first. Should additional sites still be required to meet the identified need, consider those sites at slightly greater risk and so on. This will demonstrate that sites are only selected where there are 'no reasonably available alternative sites at lower risk of flooding'.
- 5.3.5 Water Compatible development has the least constraints with respect to flood risk, and it is considered appropriate to allocate these sites last. The sequential approach should still be followed in the selection

⁶⁰ ADEPT, 2021, Strategic flood risk assessment good practice guide, December 2021. Available at: <https://www.adeptnet.org.uk/strategic-flood-risk-assessment-good-practice-guide>

of sites; however, it is appreciated that Water Compatible development by nature often relies on access and proximity to water bodies. In Flood Zone 3b, Water Compatible infrastructure should be designed and constructed to remain operational and safe for users in times of flood, result in no net loss of floodplain storage and not impede water flows and not increase flood risk elsewhere.

5.3.6 The Council should record this decision making process within a Sequential Test Statement, or similar document, which will form part of the Local Plan evidence base.

5.3.7 Consideration may need to be given to the risks posed to a site within a Flood Zone in more detail in a Level 2 SFRA. This more detailed study should consider the detailed nature of flood hazard to allow a sequential approach to site allocation within a Flood Zone. Consideration of flood hazard within a flood zone would include:

- Flood risk management measures,
- The rate of flooding,
- Floodwater depth, and
- Floodwater velocity.

5.3.8 Where the development is Highly Vulnerable, More Vulnerable, Less Vulnerable or Essential Infrastructure and a site is found to be impacted by a recurrent flood source (other than tidal or fluvial), the site and flood sources should be investigated further regardless of any requirement of the Exception Test.

5.4 Applying Sequential Test for planning applications

5.4.1 The Sequential Test should be applied to 'Major'⁶¹ and 'Non-major development'⁶² proposed in areas at risk of flooding, including windfall sites.

5.4.2 All planning applications within the Council's local planning authority area will be expected to use this SFRA to identify whether their site is at risk of flooding from any source. Please note that applications located within the wider district boundary, specifically areas falling within the two National Parks, refer to **Appendix A Map 001**, are not covered by this SFRA. Instead, applicants should refer to the respective SFRAs for the National Parks.

5.4.3 Demonstrating the flood risk Sequential Test for Planning Applications⁶³ sets out the procedure for applying the sequential test to individual applications as follows:

- Identify the geographical area of search over which the test is to be applied; this could be the planning boundary area, or a specific catchment if this is appropriate and justification is provided (e.g. school catchment area or the need for affordable housing within a specific area). For individual planning applications subject to the Sequential Test, the area to apply the test will be defined by local circumstances relating to the catchment area for the type of development proposed. For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the Council's local planning authority area.
- Identify the source of 'reasonably available' alternative sites; usually drawn from evidence base / background documents produced to inform the Local Plan. The definition of 'reasonably available sites' is defined within the PPG: 'Flood Risk and Coastal Change', 2025² as sites in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged for the development.

⁶¹ 'Major' development defined by the Town and Country Planning Order 2015 as development involving any of the following: the winning and working of materials or the use of land for mineral-working deposits; waste development; provision of dwelling houses where the number of houses to be provided is 10 or more or development is to be carried out on a site having an area of 0.5 hectares or more; the provision of a building or buildings where the floor space is 1000 square metres or development carried out on a site having an area of 1 hectare or more.

⁶² 'Non major development' is any development falling below the 'Major' thresholds but excluding minor development.

⁶³ Environment Agency, 2012, Demonstrating the flood risk Sequential Test for Planning Applications, Version 3.1. Available at: <http://www.gwfoe.org.uk/wp-content/uploads/2014/01/EA-Sequential-Test-Process-v3.1-April-2012.pdf>

- State the method used for comparing flood risk between sites; for example, the Environment Agency Flood Map for Planning, the SFRA mapping, site-specific FRAs if appropriate, other mapping of flood sources.
- Apply the Sequential Test; systematically consider each of the available sites, indicate whether the flood risk is higher or lower than the application site, state whether the alternative option being considered is allocated in the Local Plan, identify the capacity of each alternative site, and detail any constraints to the delivery of the alternative site(s).
- Conclude whether there are any reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.
- Where necessary, apply the Exception Test.

5.4.4 It is for the Council, taking advice from the Environment Agency and other RMAs such as Water Utility Companies and the LLFA as appropriate, to consider the extent to which Sequential Test considerations have been satisfied, taking into account the particular circumstances in any given case. Development that is safe for its lifetime and designed to withstand events above the design flood level may still be unacceptable and fail the Sequential Test if lower flood risk sites are available. The developer should justify with evidence what area of search has been used when making the application.

5.4.5 Ultimately, after applying the Sequential Test, the Council needs to be satisfied in all cases that the proposed development would be safe and not lead to increased flood risk elsewhere. This needs to be demonstrated within an FRA and is necessary regardless of whether the Exception Test is required.

Recommendation 5-4 *The Council should keep an up-to-date register of 'reasonably available' sites (for example as part of their housing and/or economic land availability assessments), clearly ranked in flood risk preference, and prepare guidance on the appropriate area of search for common development types.*

Sequential Test Exemptions

5.4.6 Paragraphs 175, 176 and 180 of NPPF¹ states the sequential test will not be required where:

- The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).
- The site has been allocated for development and subject to the sequential test at the plan making stage (provided the proposed development is consistent with the use for which the site was allocated and provided there have been no significant changes to the known level of flood risk to the site, now or in the future which would have affected the outcome of the test). However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.
- The application is for a development type that is exempt from the test, as specified in footnote 62 of the NPPF¹. This includes:
 - Householder development.
 - Small non-residential extensions (with a footprint of less than 250m²).
 - Changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site.

Applying sequential approach *within* a site

5.4.7 Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. Most large development proposals include a variety of land uses of varying vulnerability to flooding. The sequential approach should be applied within development sites to locate the most vulnerable elements of a development in the lowest risk areas

(considering all sources of flooding) e.g. residential elements should be restricted to areas at lower probability of flooding whereas parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding.

Recommendation 5-5 *Apply a sequential approach to the layout and design of individual development sites.*

5.5 Exception Test

5.5.1 Following the application of the Sequential Test it may be concluded that there are no reasonable available alternative sites in areas of lower risk, and in some cases the Exception Test may be required. **Figure 5-2** shows the decision-making process and **Table 5-2** identifies when the Exception Test is required, based on the flood zone and the vulnerability classification of the proposed development. The Exception Test should only be applied as set out in **Figure 5-2**, i.e. only if the Sequential Test has shown that there are no reasonably available, lower-risk sites, suitable for the proposed development, to which the development could be steered.

5.5.2 For the Exception Test to be passed:

- Part 1 - It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by the SFRA where one has been prepared.
- Part 2 - A site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. If the risk of flooding is not reduced overall, the SFRA must also demonstrate why measures to reduce flood risk overall have not been secured, for example if such measures cannot be identified or are unfeasible.

5.5.3 Both elements of the test have to be satisfied for development to be allocated or permitted.

5.5.4 In order to satisfy the **first part** of the Exception Test, the objectives of the Sustainability Appraisal can be used to assess each potential development site. Examples may include:

- The re-use of suitable brownfield land as part of a local regeneration scheme.
- An overall reduction in flood risk to the wider community through the provision of, or financial contribution to, flood risk management infrastructure.
- The provision of multifunctional SuDS that integrate with green infrastructure, significantly exceeding NPPF1 policy requirements for SuDS.

5.5.5 With respect to the **second part** of the Exception Test, there are a number of ways a new development can be made safe:

- Avoiding flood risk by not developing in areas at risk of flooding.
- Substituting higher vulnerability land uses for lower vulnerability uses in higher flood risk locations and locating higher vulnerability uses in areas of lower risk on a strategic scale, or on a site basis.
- Providing adequate flood risk management infrastructure which will be maintained for the lifetime of the development.
- Mitigating the potential impacts of flooding through design and resilient construction.
- Managing the remaining residual risk through flood warning and emergency planning measures.

5.5.6 Consideration must also be made to ensure that the risk of flooding elsewhere is not increased and where possible is reduced. Further guidance on how development could satisfy the second part of the Exception Test is provided in **Sections 6 and 7**.

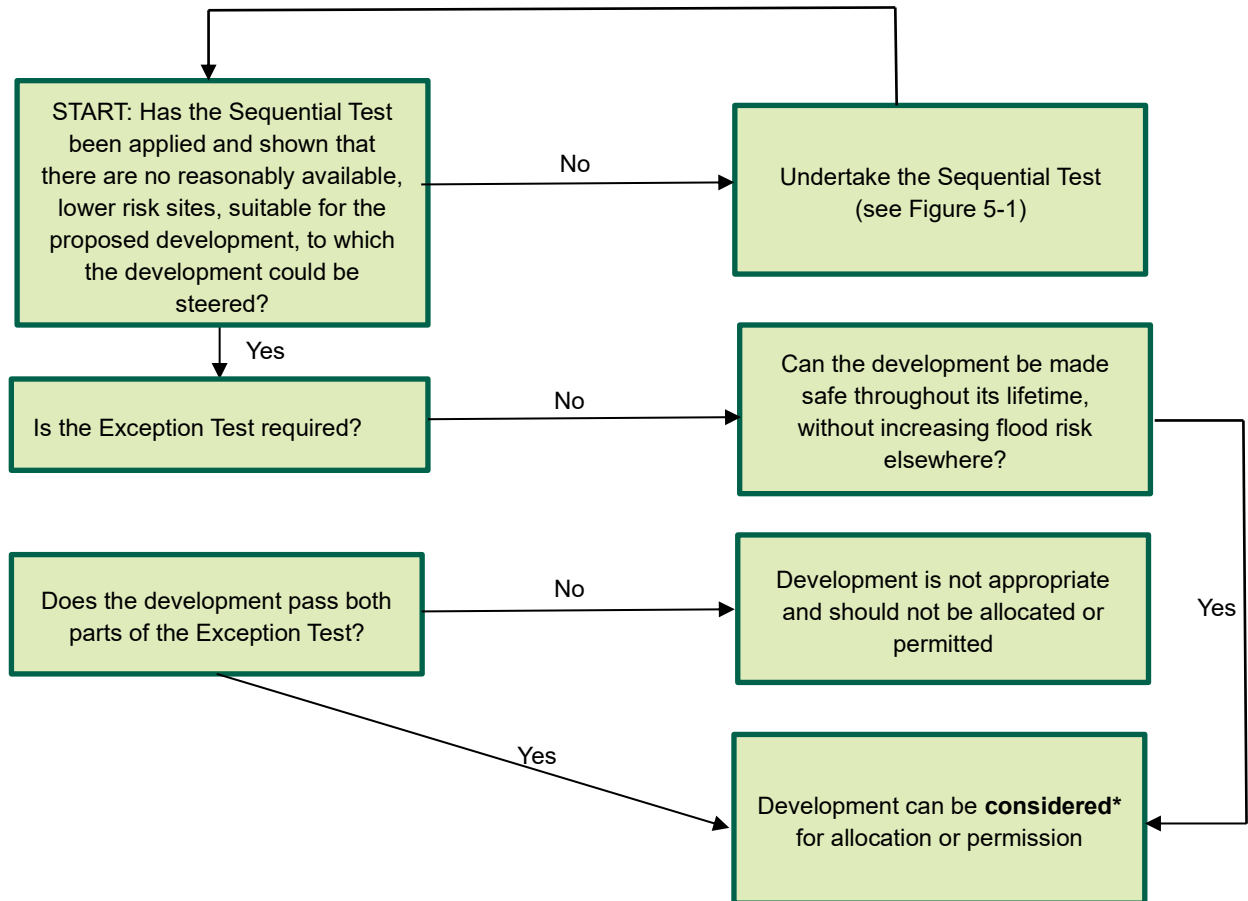


Figure 5-2: Application of the Exception Test in the preparation of a Local Plan (PPG: ‘Flood Risk and Coastal Change’, 2025² Para 032 Diagram 3)

*Westmorland and Furness Council will prioritise development in Flood Zone 1.

6. Measures to control and mitigate flood risk

The NPPF recognises that it is not always possible to **avoid** locating development in areas at risk of flooding, and the next steps are to **control** and **mitigate** the risks. This Section identifies measures already in place, as well as measures that should be considered when developing strategic plans and as part of site specific FRAs for future development to control and mitigate the risk of flooding.

It is also essential that the development management process influencing the design of future development in Westmorland and Furness carefully mitigates the potential impact that climate change may have upon the risk of flooding.

6.1 Existing flood risk management infrastructure

Flood Defences

- 6.1.1 The future sustainability of the Council such as its long term ability to manage growth is also dependent upon the retention and ongoing maintenance of coastal and fluvial flood defence infrastructure.
- 6.1.2 Proactive management to extend the life of defences along Humphrey Head in the short term may be permitted, including raising the crest level of embankments to address increased risk of overtopping caused by sea level rise. However, the long-term changes in intertidal dunes remain highly uncertain as they depend on how Morecambe Bay and its estuaries respond to rising sea levels. This uncertainty will influence future management approaches such as managed realignment.
- 6.1.3 In line with the SMP's, in the short term, areas such as Grange-over-Sands and Rampside Sands near Barrow-in-Furness are anticipated to 'Hold the Line'. This will include maintaining defences to the port and shipyard in Barrow-in-Furness. Areas including Grange promenade are currently protected from direct wave action by a wide expanse of saltmarsh. The Foulney embankment near Roa Island is fundamentally important for maintaining the stability of the marsh in this area. Depending on its future condition, the marsh could accrete in response to sea level rise.
- 6.1.4 **Appendix A Map 014a and 014b** shows the National Coastal Erosion Risk Mapping⁶⁴. The mapping shows the difference between 'No Future Interventions 2105' and 'Hold the Line 2105' is marginal, highlighting the significant protective role of the saltmarsh along this coastline. Nonetheless, while the impacts of sea-level rise in the estuary remains uncertain, maintenance works will still be required for example, to address flooding in Grange-over-Sands caused by culvert blockages from sediment. It is also essential to manage risk to communities and maintain existing defences especially in relation to the Furness rail line. In the long term, upgrading defences may be necessary as current structures reach the end of their residual life, alongside broader adaption to sea level rise.
- 6.1.5 Walney Island is mostly managed by a policy of 'No Active Intervention'. Existing defences in the form of rock revetments have been constructed intermittently along the west coast to reduce erosion and flooding. As there are relatively few assets at this location, defences are likely to be set back to allow the open coast to erode naturally, with the exception of South Walney landfill site which is anticipated to be protected by new defences.
- 6.1.6 Ulverston is mostly managed by a policy of 'No Active Intervention', allowing the shoreline to continue to evolve naturally. It is recommended that continued maintenance of the existing defences to the north-east of Ulverston along the railway line takes place. The approach to the stretch of coastline near Canal Foot is to 'Hold the Line' in the short, medium and long term by maintaining, upgrading and possibly replacing existing defences in the future. To the south-east of Ulverston, the policy of 'Hold the Line' is recommended in the short term, before 'Managed Realignment' in the medium and long term, allowing erosion/recession to a defined alignment.

⁶⁴ Environment Agency (2025) National Coastal Erosion Risk Mapping (NCERM) - National (2024). Available at: <https://environment.data.gov.uk/dataset/9fede91f-5acd-4fd2-9bd8-98153fa3c2ff>

- 6.1.7 The implementation of any new flood defences must consider the hydraulic implications for other sources of flooding. For example, the performance of the public sewer must not be adversely affected.

Flood Storage Areas

- 6.1.8 Flood Storage Areas (FSAs), also referred to as Water Storage Areas, are natural or man-made areas that temporarily fill with water during periods of high river level, retaining a volume of water which is released back into the watercourse after the peak river flows have passed. There are two main reasons for providing temporary detention of floodwater:

- To compensate for the effects of catchment urbanisation, and
- To reduce flows passed downriver and mitigate downstream flooding.

- 6.1.9 Providing flood storage within a development area or further upstream of a development can manage and control the risk of flooding. In some cases, it can provide sufficient flood protection on its own, in other cases, it may be chosen in conjunction with other measures. The advantage of flood storage is that the flood alleviation benefit generally extends further downstream, whereas other methods tend to benefit on the local area and may increase the flood risk downstream.

- 6.1.10 Further guidance on Flood Storage is provided within Chapter 10 of the Environment Agency's Fluvial Design Guide⁶⁵.

Recommendation 6-1 *Safeguard land for new flood (water) storage areas, specifically near areas anticipated for development.*

- 6.1.11 Two Flood Storage Areas in Westmorland and Furness are shown in **Appendix A Map 005c and 005d**, one north-west of Penrith and one south-east of Kendal.

- 6.1.12 In 2011, a £5.6m flood alleviation scheme was implemented in Penrith, which included the construction of a flood storage reservoir and the repair and replacement of more than 675m of culverting to protect homes and businesses. The scheme created a 76,000m³ flood storage area upstream of the town at Thaka Beck Nature Reserve which holds back floodwater and reduces the risk of culvert overflow. At the same time, the project supported the development of the site as a valuable wildlife habitat.

- 6.1.13 The Calder Drive FSA in Kendal is located at the confluence of the southern and eastern tributaries of the Stock Beck watercourse system. It functions as an online flood storage basin, with flows discharging immediately downstream of the confluence through a water-retaining embankment and flow control structure. In 2024, the Environment Agency delivered the Stock Beck culvert rehabilitation project as part of the Kendal and Upper Kent Catchment Flood Risk Management Scheme⁶⁶. This project addressed flood risks associated with the Stock Beck and involved replacing and rehabilitating several sections of the Stock Beck culvert network, including works in the Calder Drive area.

Flood Alleviation Schemes

- 6.1.14 Two flood alleviation schemes are currently in progress within the Council's study area, Kendal Flood Risk Management Scheme and Appleby Town Centre Flood Risk Management Scheme, both described below.

- 6.1.15 At the time of writing, there are no coastal alleviation schemes under construction within Westmorland and Furness.

Kendal Flood Risk Management Scheme

- 6.1.16 The Environment Agency is delivering a proposed Flood Risk Management Scheme to better protect homes and business from flooding in the Kent catchment, while also enhancing the local environment and community amenities. Within the study area, Kendal is the first location to benefit, followed by Burneside. Additional measures such as flood storage will be implemented further upstream, outside the study area, in Staveley and Ings. Currently under construction, the Kendal scheme combines raised linear defences with improved river conveyance, providing protection to residential and commercial

⁶⁵ Environment Agency, 2010, Fluvial Design Guidance Chapter 10 . Available at:

https://assets.publishing.service.gov.uk/media/60549b7a8fa8f545cf209a29/FDG_chapter_10_-_Flood_storage_works.pdf

⁶⁶ Environment Agency, 2024, Kendal and Upper Kent Catchment Flood Risk Management Scheme. Available at: <https://thefloodhub.co.uk/wp-content/uploads/2024/07/77.-Stock-Beck-Rehabilitation-project-update-Final-July-24-4.pdf>

properties. More than 6km of flood defences extend from Mintsfeet in the northern end of the town to Helsington Mills in the southern end of the town.

- 6.1.17 The Flood Risk Management Schemes in Burneside, Staveley and Ings are in the early design stages and will focus on targeted engineered solutions, environmental improvements and landscaping enhancements. A key feature of the overall design is upstream flood storage, which will temporarily hold excess water in the upper catchment. This approach regulates the flow of water through Kendal, Burneside, Staveley and Ings during flood events, thereby increasing the resilience of bridges, roads, drainage systems, utilities and communication infrastructure.
- 6.1.18 To further reduce local flood risk, a new catchment drain is proposed to divert flows from Stock Beck East and North into the River Mint, protecting the residential area of Sandylands in Kendal. Alongside engineered measures, Natural Flood Management techniques will complement the scheme by slowing flows and enhancing habitats at strategic locations.
- 6.1.19 Construction of the Kendal Flood Risk Management Scheme (which is being delivered in three phases) commenced in February 2021. Completion of Phase 1, raised defences in Kendal, is due for completion in 2028. This will be followed by Phases 2 and 3 which will involve upstream measures to reduce flood risk to Burneside, Staveley and Ings.

Appleby Town Centre Flood Risk Management Scheme – Doomgate Culvert

- 6.1.20 Appleby Town Centre is at risk of flooding both from overtopping of riverside defences and surcharging of Doomgate culvert. The town has a history of flooding and was severely affected during Storm Desmond in 2015 when approximately 170 properties were flooded. There are several historic records of flooding in Appleby, most recently in 2005, 2009, 2015 and February 2020.
- 6.1.21 When flows in the River Eden are high, water cannot discharge through Doomgate culvert, causing a backup within the pipe network and surcharging through manholes along Holme Street. Prolonged high river levels of the River Eden also lead to flooding of lower lying properties in Holme Street and Chapel Street.
- 6.1.22 To address this risk, the Environment Agency is installing a new pumping station to manage excess flows within Doomgate culvert. The scheme will provide a 1.33% AEP (1 in 75 year) SoP for the town centre and reduce flood risk to 64 properties. A detailed cost benefit analysis has been completed, identifying anticipated benefits of approximately £21 million over the assets lifespan.
- 6.1.23 Construction is scheduled for completion in 2026.

6.2 Programme of FCERM Schemes

- 6.2.1 The Environment Agency manage an investment programme to reduce flood risk and coastal erosion in England. The current 6 year flood and coastal erosion risk management investment programme runs from 1 April 2021 to 31 March 2027. Completed and planned capital schemes are shown on the Environment Agency's interactive map⁶⁷. Schemes in the study area include Shap Beck flood alleviation scheme, pumping station refurbishments and an appraisal package for the Kendal Flood Risk Management Scheme.

6.3 Safeguard land for flood risk management

Riverside Development

- 6.3.1 The Environment Agency is a statutory consultee for planning applications located within 20m of Main Rivers. Permission from the Environment Agency is required for specific regulated flood risk activities⁶⁸ under the Environmental Permitting (England and Wales) Regulations 2016. This includes activities within 8m of the bank of a Main River, (or 16m if it is a tidal Main River), and within 8m of any flood defence structure or culvert on a Main River, (or 16m on a tidal river). These land 'corridors' should be

⁶⁷ Programme of flood and coastal erosion risk management (FCERM) schemes. Available at:

<https://www.gov.uk/government/publications/programme-of-flood-and-coastal-erosion-risk-management-schemes>

⁶⁸ Flood risk activities: environmental permits, September 2022. Available at: <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>

safeguarded for maintenance access, and where possible opportunities should be sought for river restoration and the de culverting of watercourses. The Environment Agency are likely to seek an 8m wide permanent retention of a continuous unobstructed area e.g. a buffer strip alongside Main Rivers for maintenance purposes. Suitable access to utility assets adjacent to waterbodies, for example sewer outfalls, must be allowed for in the design of development and agreed in writing with the relevant utility owner.

- 6.3.2 Any landscape, development, or environmental enhancements around flood defences must accommodate existing flood defence crest levels and allow for them to be raised in the future.
- 6.3.3 Under the Environmental Permitting Regulations 2016, a Flood Risk Activity Permit (FRAP) is required for works on or near a Main River, on or near a flood defence structure, or in a floodplain. Applicants should consult the *Environment Agency flood risk activities: environmental permit guidance*⁶⁹ to determine if a permit is required.
- 6.3.4 Consent will be refused if the proposed works would increase flood risk, prevent operational access to the watercourse and/ or pose an unacceptable risk to nature conservation.
- 6.3.5 For existing development within these areas, a pragmatic approach should be adopted. Opportunities should be pursued for to set back development from river walls, enabling defences to be modified, raised and maintained as needed.
- 6.3.6 Developers are strongly encouraged to engage with the Environment Agency at the pre-application stage before finalising development layout designs close to watercourses and flood defence structures. For further information or advice, applicants and developers should contact the Environment Agency at enquiries@environment-agency.gov.uk. Applicants should also engage with the wastewater undertaker in instances where there are outfalls or pumping stations near to watercourses to ensure that access can be maintained.
- 6.3.7 Responsibility for the consenting of works by third parties on Ordinary Watercourses, lies with the Council (as LLFA), under Section 23 of the Land Drainage Act 1991 (as amended by the FWMA 2010). The Council is responsible for consenting works for Ordinary Watercourses and enforcing against un-consented and non-compliant activities. This includes any works (including temporary) that affect flow within the channel (such as in channel structures or diversion of watercourses). Enquiries and applications for Ordinary Watercourse consent should be directed through the Council's website⁷⁰.

Recommendation 6-2 *Safeguard an 8-metre-wide undeveloped buffer strip alongside Main Rivers (that are not tidally influenced) and prioritise opportunities for riverside restoration. New development within 8m of a Main River will require consent (Flood Risk Activity Permit) from the Environment Agency.*

Recommendation 6-3 *Safeguard an 8-metre-wide buffer strip alongside Ordinary Watercourses. Prioritise opportunities to de-culvert watercourses. If any works, temporary or permanent, are required within 8m of an Ordinary Watercourse, an Ordinary Watercourse Land Drainage Consent from Westmorland and Furness Council (as LLFA) would be required. Proposed structures and obstructions within a watercourse will require consent from Westmorland and Furness Council (as LLFA). As per the Land Drainage Act 1991⁷¹, "no person shall*

(a) erect any mill dam, weir or other like obstruction to the flow of any ordinary watercourse or raise or otherwise alter any such obstruction; or

(b) erect a culvert in an ordinary watercourse, or

(c) alter a culvert in a manner that would be likely to affect the flow of an ordinary watercourse."

Recommendation 6-4 *Safeguard a 16-metre-wide undeveloped buffer strip alongside sea defences and tidal watercourses. Only temporary development will be permitted on this land. Where land safeguarded for future flood defence works falls within a development site, opportunities should be taken*

⁶⁹ Environment Agency, Flood risk activities: environmental permits. Available at <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>

⁷⁰ Westmorland and Furness Council, Apply for consent for works on ordinary watercourses. Available at: <https://www.westmorlandandfurness.gov.uk/planning-and-building-control/environment-and-planning/flooding-management-and-prevention/apply-consent-works-ordinary-watercourses>

⁷¹ Land Drainage Act, 1991. Available at: <https://www.legislation.gov.uk/ukpga/1991/59/section/23>

to integrate future flood defence requirements into the landscaping and open space provision for the site.

- 6.3.8 It is important to note, from an environmental perspective, that a buffer strip wider than 8 metres should be provided to safeguard the natural function and dynamic processes of watercourses.

Green Infrastructure

- 6.3.9 Green Infrastructure (GI) is a strategically planned and managed network of natural and semi-natural green (land) and blue (water) spaces that intersperse and connect urban centres, suburbs and rural fringe, comprising:

- Open spaces e.g. parks, woodland, nature reserves and lakes.
- Linkages e.g. river corridors, canals, pathways, cycle routes and greenways.
- Networks of 'urban green' e.g. private gardens, street trees, verges and green roofs.

- 6.3.10 The identification and integration of GI are critical to both sustainable growth and flood risk management. GI delivers a wide range of ecosystem services, including climate mitigation and adaptation, and plays a central role in supporting climate resilience.

- 6.3.11 By providing additional green spaces to accommodate storm flows, GI can free up water storage capacity in existing infrastructure and reduce the risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. It can also enhance accessibility to waterways, improve water quality, and contribute to regeneration by supporting leisure, economic activity and biodiversity. For sites where the Exception Test is required, the inclusion of GI can help demonstrate that a development delivers wider sustainability benefits, thereby supporting the first part of the Exception Test.

Recommendation 6-5 Safeguard land likely to be needed for green infrastructure.

Natural Flood Management

- 6.3.12 Natural flood management involves techniques that aim to work with natural hydrological and morphological processes, features, and characteristics to manage the sources and pathways of floodwaters. Techniques include the restoration, enhancement and alteration of natural features and characteristics, but exclude traditional flood defence engineering that works against or disrupts these natural processes.

- 6.3.13 The contribution natural flood management (NFM) techniques can make to reducing the causes and impacts of flooding will vary greatly from site to site. In some cases, NFM measures may be sufficient to address flood risk comprehensively. More often, however, they will need to be implemented alongside conventional flood risk management techniques such as engineered defences to provide effective protection. NFM techniques can deliver wider benefits including biodiversity enhancement, environmental net gains and support the implementation of river basin management plans and the public body duty to have regard to them. For sites where the Exception Test is required, the inclusion of NFM techniques may help to demonstrate that a development delivers wider sustainability benefits, thereby contributing to the first part of the Exception Test.

- 6.3.14 There are a number of opportunities available to reduce the causes and impacts of flooding through Working with Natural Processes (WWNP)⁷². This involves implementing measures that help to protect, restore, and emulate the natural functions of catchments, floodplains, rivers, and the coast. WWNP takes many forms and can be applied in urban and rural areas, and on rivers, estuaries, and coasts.

- 6.3.15 As part of a research project undertaken by the Environment Agency and Flood and Coastal Risk Management Research and Development Programme, a series of spatial datasets have been generated

⁷² Environment Agency and Flood and Coastal Risk Management R&D Programme, 2021, Working with Natural Processes to Reduce Flood Risk. Available at: <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/working-with-natural-processes-to-reduce-flood-risk?web=1&wdLOR=c56AD7DAC-BB7B-471B-94B4-B5C5B91DEEE4>

for these natural processes⁷³, identifying their best estimate of locations in the country where the methods can be applied. A description of the WWNP datasets is available in **Table 6-1**.

- 6.3.16 DEFRA have produced a Woodland Constraints dataset which refines potential locations for WWNP, taking into account roads, rail, urban areas, existing woodland, peat, and water bodies.
- 6.3.17 The WWNP data does not provide information on design, which may need to consider issues such as drain-down between flood events. It is important to note that land ownership and change to flood risk have not been considered. Locations identified may have more recent building or land use than available data indicates.

Table 6-1: Description of WWNP datasets

Natural Process	Benefits	Most Effective Conditions	Notes
Floodplain Woodland Planting Potential	Slows floodwaters and increases water depth on the floodplain. Reduces flood peaks, delays flood peak timing and desynchronises flood peaks. Enhances sediment deposition on the floodplain.	Middle and lower river reaches of middle to large catchments.	Based upon Flood Zone 2. Information is largely based on modelled data and open constraints data and is indicative rather than specific.
Riparian Woodland Planting Potential (woodlands on land immediately adjoining a watercourse)	Slows flood flows. Reduces sediment delivery to the watercourse. Reduces bankside erosion. Creates below ground storage.	At the reach scale in middle and upper catchments.	Based upon a 50m buffer of available OS Open Data River networks. Information is largely based on open data and is indicative rather than specific.
Wider Catchment Woodland	Intercepts, slows, stores and filters water. Reduces flood peaks, flood flows and frequency.	Small events on small catchments – extent of reduction decreases as flood magnitude increases.	Based upon the 1:50k BGS geology survey and relies upon identifying drift and bedrock geologies that are characteristic of slowly permeable soils. Information is largely based on the 100m gridded version of BGS data and open constraints data and is indicative rather than specific.
Floodplain Reconnection Potential (reconnecting watercourses and floodplains)	Encourages more regular floodplain inundation and floodwater storage Decreases the magnitude of flood peaks and reduces downstream flood depths.	high frequency, low return period floods.	Designed to support signposting of areas where there is currently poor connectivity such that floodwaters are constrained to the channel and flood waves may therefore propagate downstream rapidly Based upon the Risk of Flooding from Rivers and Seas probability maps and identifies areas of low and very low probability that are close to a watercourse, but do not contain residential property or key services (may contain non-residential property – important to consider).
Runoff Attenuation Features (3.3% and 1% AEP) (includes swales, ponds and sediments traps)	Delays and flattens the hydrograph and reduces peak flow locally for small flood events.	A cluster of features working as a network throughout the landscape.	Based upon the Risk of Flooding from Surface Water datasets and identifies areas of high flow accumulations for the 1% AEP and 3.3% AEP surface water maps. The areas of ponding or accumulation are between 100 and 5000 metres squared and have been tagged where they fall on an area of slope steeper than 6% as gully blocking opportunities

- 6.3.18 **Appendix A Map 017a and 017b** provides information from the Environment Agency's 'Working with Natural Processes – Evidence Directory'⁷³ about where these measures could be applied. This map shows that although there are a lot of existing woodland constraints within the study area, there are also some opportunities to implement natural processes to alleviate flooding. There are potential opportunities for wider catchment woodland across the entire study area, except for areas in the

⁷³ Working with Natural Processes datasets, 2017. Available at: <https://environment.data.gov.uk/searchresults?query=wwnp&searchtype=&orderby=default&pagesize=20&page=1>

northeast in the North Pennines National Landscape. There are also areas with potential opportunities for riparian woodland planting which tend to centre around the watercourse corridors. This mapping should also be used by the Council to support future blue and green infrastructure planning.

- 6.3.19 The Lake District National Park Authority has identified a range of *Farming in Protected Landscapes* projects that include both direct and indirect contributions to Flood Risk Management. These include NFM works on Thackthwaite Beck in Kendal. In addition, several planned works upstream of the study area are expected to provide downstream benefits for Westmorland and Furness. Examples include a programme of NFM works at Hazelrigg Farm, Newby Bridge and the installation of leaky dams, creation of wetland habitat and the de culverting of a watercourse near the River Leven at Haverthwaite. Any areas of wetland, or similar proposal, should not be sited on top of existing utility assets.

Natural Flood Management Pilot Programme

- 6.3.20 Between 2017 and 2021, the Environment Agency invested £15 million of government funding in the NFM pilot programme⁷⁴, aimed at benefiting communities and biodiversity, alongside protecting homes and businesses from floods. The programme was made up of 60 pilots across England:

- 26 were catchment scale pilots led by risk management authorities.
- 34 were community scale pilots led by local groups and charities.

- 6.3.21 Across these projects, the programme created an equivalent of 1.6 million cubic metres of water storage and increased flood resilience to 15,000 homes. In addition, the programme contributed to nature recovery: improving 4,000 hectares of habitat, improving 610 kilometres of river and planting 100 hectares of woodland.

- 6.3.22 In Westmorland and Furness, £2.5 million was invested in the Cumbria Flood Action Plan Small Projects⁷⁵. One such project, delivered by South Cumbria Rivers Trust in 2020 at Town View Fields, in Kendal, aimed to test the effectiveness of NFM techniques in an urban setting. The project involved de-culverting approximately 90 metres of the existing stone walled culvert to create a meandering stream with a reduced slope. The stream flowed into bunded wetland areas designed to provide stormwater attenuation, allowing the controlled, gradual release of water before reconnecting to the culvert downstream. Additional NFM features, including bunds and leaky dams constructed from natural materials were installed to temporarily store and slowly release water during flood events.

- 6.3.23 In addition to this fund, the Environment Agency have delivered a series of NFM projects using the Slow the Flow fund. In September 2023, the Environment Agency and DEFRA announced £25 million funding for improving flood resilience through a new NRM programme⁷⁶, with the aim of enhancing flood and coast resilience and nature recovery as set out in the FCERM Strategy Roadmap to 2026⁷⁷. Three locations have been successful at securing this funding including Brampton (Cumberland Council), Braithwaite (Cumberland Council) and Windermere (Westmorland and Furness Council outside of the planning boundary).

Recommendation 6-6 *Extend and enhance existing Green Infrastructure (GI) in the Council's study area including the implementation of floodplain and riparian woodland planting schemes. Land that is likely to be needed for natural flood management should be safeguarded. Consideration should also be given to any necessary access to that land, and any additional land which may be needed temporarily during construction.*

Recommendation 6-7 *It is recommended that the Council work with land managers and farmers to reduce soil erosion from intensively farmed land and encourage NFM.*

Cumbria Innovative Flood Resilience

- 6.3.24 The Cumbria Innovative Flood Resilience⁷⁸ (CiFR) programme will be working in four areas that represent the diverse landscapes across Cumbria and the different kinds of flood risk that the communities face, including Grasmere (Westmorland and Furness Council outside of the planning

⁷⁴ Environment Agency, 2022, Natural Flood Management Programme: evaluation report. Available at:

<https://www.gov.uk/government/publications/natural-flood-management-programme-evaluation-report/natural-flood-management-programme-evaluation-report>

⁷⁵ South Cumbria Rivers Trust, Kendal Town View Fields – NFM Project. Available at: <https://scrt.co.uk/kendal-nfm-project/>

⁷⁶ Environment Agency, £25 million for projects using nature to increase flood resilience. Available at: <https://www.gov.uk/government/news/25-million-for-projects-using-nature-to-increase-flood-resilience>

⁷⁷ Environment Agency, FCERM Strategy Roadmap to 2026. Available at:

<https://assets.publishing.service.gov.uk/media/629de862e90e07039c27b440/FCERM-Strategy-Roadmap-to-2026-FINAL.pdf>

⁷⁸ Cumbria Innovative Flood Resilience. Available at: <https://engageenvironmentagency.uk.engageenthq.com/cub005-cifr>

boundary), Warcop (Westmorland and Furness), Stockdalewath (Cumberland Council), and Cockermouth (Cumberland Council). These small, rural communities have suffered repeated flooding in the last two decades but are not eligible for funding for traditional flood defences, and so the project will develop new ways to support, prepare and protect them from flooding. The project will work with communities to co-design and deliver an ambitious programme to build environmental and social resilience to flood threats that they face.

- 6.3.25 The CiFR will investigate how they can bring together the good practice that already exists in Cumbria around natural flood management, community resilience and blended finance, and work with those communities to develop and test a “whole place” approach to flood resilience. The projects will focus on natural flood management work in the areas where modelling shows it is likely to make a meaningful difference to the community’s risk of flooding, monitoring the impact that this work has on flood risk and water quality, and gaining a better understanding of the landscapes in which natural flood management makes the most difference to flood risk.
- 6.3.26 The CiFR, along with the Regional Flood and Coastal Community, are in the process of producing an NFM pipeline, which will indicate which of the 250 communities at risk from flooding in Cumbria would benefit the most from a NFM led approach. This is expected to be ready by late 2025 when funding will then be sought.

Our Future Coast

- 6.3.27 Our Future Coast⁷⁹ is a partnership of local councils, parish councils, the Environment Agency, organisations including Lancashire Wildlife Trust and Morecambe Bay Partnership, farmers, landowners, researchers and local people. Our Future Coast is:

- Working with communities at multiple sites to understand issues from their perspective and work with them to shape solutions.
- Learning how to make natural coastal habitats, such as sand dunes and saltmarshes, effective at protecting the coast.
- Testing new and innovative approaches including monitoring and practical resilience actions.
- Sharing lessons learned to inform future coastal management approaches.

- 6.3.28 The project is working across multiple sites along the North West Coast of England to design and test new approaches to coastal flood risk management. Sites within Westmorland and Furness include:

- Saltmarsh at Humphrey Head - seeking to understand the feasibility of creating new saltmarsh habitat on the western margins of Humphrey Head.
- Roa Island - exploring options to help expand saltmarsh habitat around the causeway. This will help to provide a buffer to erosion and protect the causeway into the future.
- Sea Grass in Walney - Trial restoration of seagrass within the Walney Channel.
- West Shore, Walney Island - working with local stakeholders to better understand flooding and erosion risks at the site and identify economically and environmentally feasible solutions that could help to manage coastal change today and into the future.

6.4 Water Environment

- 6.4.1 A key objective of the Water Framework Directive (WFD) is the requirement to prevent deterioration in the current status of water bodies, whilst Heavily Modified Water Bodies⁸⁰ (HMWB) must achieve good ecological potential within a set deadline. If an activity has the potential to impact on the ecology or morphology of a water body, the risk of causing deterioration in the status must be assessed.
- 6.4.2 Westmorland and Furness is covered by four River Basin Management Plans (RBMP). These identify the current quality of water bodies in the study area and set objectives for making further improvements to the ecological and chemical quality. The south of the study area is covered by the North West RBMP

⁷⁹ Our Future Coast. Available at: <https://thefloodhub.co.uk/ourfuturecoast/>

⁸⁰ A surface water body that does not achieve good ecological status because of substantial changes to its physical character resulting from physical alterations caused by human use, and which has been designated, in accordance with criteria specified in the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as ‘heavily modified’.

and the majority of the north of the study area is covered by the Solway Tweed RBMP. The eastern edge of the study area boundary in the north is covered by the Northumbria RBMP and a small area near Kirkby Stephen is covered by the Humber RBMP.

- 6.4.3 **Table 6-2** shows the WFD watercourses in the study area which are designated as HMWBs and their overall ecological status, taken from the Catchment Data Explorer⁸¹.

Table 6-2: WFD watercourses designated as HMWBs in the study area

Water Body	River Basin District	Overall Ecological Status
Mill Beck (Poaka Beck)	North West	Moderate
River Bela	North West	Good
Peasey Beck	North West	Good
River Lowther (Upper)	Northumbria	Good
River Lowther (Lower)	Northumbria	Moderate
Nent (from source to South Tyne)	Northumbria	Moderate
Tees from Trout Beck to Maize Beck	Northumbria	Moderate

- 6.4.4 It is anticipated that growing population numbers and changing climate patterns will place increased pressure on water resources across the study area. New development can assist in alleviating this water scarcity by incorporating water efficiency measures such as grey water recycling, rainwater harvesting, and water use minimisation technologies. This will also have a substantial benefit on the sewer system which will receive less wastewater from properties, potentially freeing up capacity during flood events. The Government is proposing to tighten Water Efficiency Standards in Building Regulations Part G⁸² for new homes, aiming to reduce per-person consumption to combat water scarcity. Proposed changes include lowering the standard from 125 to 105 litres per person per day (l/p/d), and the "optional" higher standard in water-stressed areas from 110 to 100 l/p/d.

Recommendation 6-8 *Through measures to manage and mitigate flood risk, the Council should also seek opportunities to achieve wider environmental benefits.*

Nutrient Neutrality

- 6.4.5 Nutrient pollution is a significant environmental challenge. In freshwater habitats and estuaries, elevated levels of nutrients (especially nitrogen and phosphorus) can accelerate the growth of certain plants, disrupting natural processes and adversely affecting wildlife. The eutrophication⁸³ damages water dependent sites and undermines the survival of plants and wildlife that should naturally occur there. In technical terms it can lead to sites being classified as in an '*unfavourable condition*'. The sources of excess nutrients are highly site specific but typically include sewage treatment works, septic tanks, livestock, arable farming and industrial processes.
- 6.4.6 To reduce the impact on nutrient pollution on protected sites, Natural England has issued guidance to LPAs emphasising the need to assess carefully the nutrient impacts of new plans and projects, and to determine whether mitigation is required to avoid additional pollution. Development proposals can be considered '*nutrient neutral*' where they demonstrate that no overall increase in nutrient loading will result. Nutrient Neutrality was introduced by in March 2022 for four specific areas: River Eden Special Area of Conservation (SAC) (within the Planning Area), River Derwent and Bassenthwaite Lake SAC, River Kent SAC (within the Planning Area) and Esthwaite Water Ramsar.
- 6.4.7 Natural England has advised LPAs in relevant catchments that they should undertake Habitats Regulations Assessments⁸⁴ of all development proposals which may give rise to additional nutrients entering their catchments, in line with the requirements of the Conservation of Habitats and Species

⁸¹ Environment Agency, Catchment Data Explorer. Available at: <https://environment.data.gov.uk/catchment-planning/>

⁸² HM Government, 2010. The Building Regulations 2010 – Part G, Sanitation, hot water safety and water efficiency. Available at: https://assets.publishing.service.gov.uk/media/66f6c6ce3b919067bb4828cc/ADG_with_2024_amendments.pdf

⁸³ Eutrophication is described as a condition of an aquatic network with a high level of nutrient concentrations, that include nitrogen and phosphorus which result in algal blooms, thus degrading the water quality in the aquatic ecosystems.

⁸⁴ Gov.uk, 2023, Habitats regulations assessments: protecting a European site. Available at: <https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site>

Regulations⁸⁵. Where developments would fail the requirements of the assessment, developers may be asked to take action to mitigate impacts through nutrient neutrality such as:

- building additional mitigation into their plans onsite.
- working with the LPA to arrange for mitigation offsite.
- purchasing nutrient credits via a nutrient trading scheme (where other landowners in the catchment have taken action to reduce their nutrient load), or buying credits through the Natural England-led Nutrient Mitigation Scheme.

6.4.8 Nutrient neutrality provides a mechanism by which development that would otherwise be prohibited on the grounds of nutrient pollution may be given consent if mitigation is put in place. Using nutrient neutrality, developers only pay for mitigation required to counteract nutrients generated by their development.

6.4.9 At the time of writing, four sites within the Council's study area have been confirmed for Nutrient Neutrality sites. These are as follows:

- Townhead Farm (between Askham and Tirril, south of Penrith).
- Ladybeck (between Askham and Tirril, south of Penrith).
- Low Heskett Farm (south-west of Dacre, west of Penrith).
- Sceugh Farm (east of Penrith).

6.5 Consultation with Water Companies

6.5.1 Large parts of Westmorland and Furness are at risk of sewer and reservoir flooding. Where a site is located in a reservoir flood zone, early consultation should be undertaken with the owner and operator of the reservoir to establish what approach may be required in accordance with the Planning Practice Guidance. In respect of sewer flooding, it is important to recognise that underground drainage infrastructure is not able to accommodate the flows that arise from all storm events and will be overwhelmed in some circumstances. New development provides an opportunity to reduce the causes and impacts of flooding associated with surface water and sewer surcharge. The hierarchy for surface water management must be rigorously applied and sustainable drainage systems should be embedded in the design of new development to reduce flood risk. It is critical that applicants engage with the wastewater / water undertaker to understand any sewer/reservoir flood risk as soon as possible in the development process. This can inform the need to apply the sequential approach and could affect the developable area. Any sewer / reservoir flood risk will need to be considered in the master planning and detailed design of a site.

6.5.2 It is important to consult with the wastewater undertaker to understand if there are any known on-site flood risk or sewer flood risk in the vicinity of a site when considering a development proposal. This is fundamental when a sewer passes through a site. Detailed design and drainage details are particularly important when managing flood risk. It is recommended that where the ground level of a site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at an increased risk of sewer surcharge. It is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer.

6.5.3 It may be necessary to co-ordinate the delivery of development with the delivery of new or improved infrastructure. Such decisions are, however, dependent on the specifics of development sites, which can influence any investment response. Such specific information is often only available at the detailed planning application stage or when conditions are discharged. Any maintenance and investment needs may be identified within the Infrastructure Delivery Plan, which should be regularly updated, in liaison with the water / wastewater undertakers.

6.5.4 It should be noted that there are over 2000 private water supplies in the former Eden and South Lakeland areas and a small number in the former area of Barrow. The private owners are responsible for

⁸⁵ The Conservation of Habitats and Species Regulations 2017. Available at: <https://www.legislation.gov.uk/uk/si/2017/1012/contents>

maintaining these assets, so limited information is available about the maintenance carried out compared with statutory undertakers.

Recommendation 6-9 *Consult NWL and UU to identify preferred locations for development and any specific flood risk concerns (sewers and reservoirs). Ensure there is policy provision which allows for the coordination of development with infrastructure provision. Include site-specific policy on development constraints, including flood risk concerns, and set out clear sustainable drainage requirements for a site in policy. Reflect any circumstances and investment needs in the wider associated evidence base (SFRA, Infrastructure Delivery Plans and Water Cycle Study).*

6.6 Sustainable Drainage Systems

6.6.1 SuDS are designed to control surface water run off close to where it falls, combining a mixture of built and nature-based techniques to mimic natural drainage as closely as possible, and accounting for the predicted impacts of climate change. Where possible SuDS solutions for a site should seek to provide benefits for:

- Water quantity (reduce flood risk to the site and neighbouring areas).
- Water quality (reduce pollution).
- Biodiversity (wildlife).
- Amenity (landscape).

6.6.2 SuDS are typically softer engineering solutions inspired by natural drainage processes such as ponds and swales which manage water as close to its source as possible. Wherever possible, a SuDS technique should seek to contribute to each of the four goals identified above.

6.6.3 The layout and function of drainage systems needs to be considered at the start of the design process for new development, as integration with road networks and other infrastructure can maximise the availability of developable land. This should ideally be achieved by incorporating SuDS. An important component of embedding SuDS in the urban environment will slow the flow of surface water which can help reduce flood risk and the risk of combined sewers spilling into the region's watercourses.

6.6.4 Generally, the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable in accordance with the National Standards for Sustainable Drainage Systems⁸⁶ and Building Regulations 2010 Drainage and Waste Disposal Approved Document⁸⁷:

- priority 1: collected for non-potable use
- priority 2: infiltrated to ground
- priority 3: discharged to an above ground surface water body
- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer

6.6.5 SuDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e. natural watercourse or public sewer etc.). The SuDS Manual⁸⁸ identified several processes that can be used to manage and control runoff from developed areas. Each option can provide opportunities for storm water control, flood risk management, water conservation and groundwater recharge.

- **Water Harvesting:** the direct capture and use of runoff on site, e.g. for domestic use (flushing toilets), irrigation of urban landscapes or if the development is in an area identified as seriously water stressed. The ability of these systems to perform a flood risk management function will be

⁸⁶ DEFRA, 2025, National standards for sustainable drainage systems (SuDS). Available at: <https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds#how-the-national-standards-work>

⁸⁷ Drainage and waste disposal: Approved document H. Building Regulations in England for foul water drainage and disposal. Available from: <https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h>

⁸⁸ CIRIA C697 SuDS Manual. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C753F

dependent on their scale, and whether there will be a suitable amount of storage always available in the event of a flood.

- **Infiltration:** the soaking of water into the ground. This is the most desirable solution as it mimics the natural hydrological process. The rate of infiltration will vary with soil type and condition, the antecedent conditions and with time. The process can be used to recharge groundwater sources and feed baseflows of local watercourses, but where groundwater sources are vulnerable or there is risk of contamination, infiltration techniques are not suitable.
- **Detention/Attenuation:** the slowing down of surface flows before their transfer downstream, usually achieved by creating a storage volume and a constrained outlet. In general, though the storage will enable a reduction in the peak rate of runoff, the total volume will remain the same, just occurring over a longer duration.
- **Conveyance:** the transfer of surface runoff from one place to another, e.g. through open channels, pipes and trenches.

6.6.6 The SuDS guidance⁸⁶ was updated in July 2025, which emphasise the mandatory requirement to collect surface water runoff for non-potable use before infiltration to the ground is permitted (if feasible). Developers must therefore demonstrate how collected water will be reused before considering any alternative drainage options.

6.6.7 Rainwater harvesting is an effective method of water reuse that improves runoff quality and contribute to wider water sustainability targets. Unless an agreed departure has been approved with the approving body (LLFA), rainwater harvesting must now be considered in all circumstances where the following apply:

- There is a demand for non-potable water and available contributing catchment area that will deliver safe and efficient water savings
- There is a need for landscape irrigation
- The development is in an area identified as seriously water stressed*

* A review of the Water Stressed Areas in the UK as determined in 2021⁸⁹ shows that Westmorland and Furness Council is not considered a Water Stressed Area.

Recommendation 6-10 *It is recommended that whilst a Water Cycle Study is undertaken to support the review of Water Stressed Areas, UU has concluded a supply and demand balance deficit and the Council should work with UU to implement water efficiency measures at a regional level.*

6.6.8 As part of any SuDS scheme, consideration should be given to the long-term maintenance of the SuDS to ensure that it remains functional for the lifetime of the development.

6.6.9 **Table 6-3** has been reproduced from the SuDS Manual, CIRIA C697 and outlines typical SuDS techniques.

6.6.10 Consideration of SuDS early in the design process can lead to improved integration of measures and multi-functional benefits. The LPA must consult the LLFA on the proposed drainage arrangements. In this instance, the LLFA is the Council. Adoption arrangements for SuDS schemes should be considered for the lifetime of the development. The LPA will need to consider whether the proposed standard of construction would facilitate adoption and maintenance by an appropriate body such as the water and sewerage company under the Ofwat-approved Sewerage Sector Guidance.

6.6.11 The role of SABs was initially given to LLFAs allowing them to be responsible for adopting and maintaining SuDS. As of January 2023, the government announced that Schedule 3 will likely be enacted in 2024 however at the time of writing Schedule 3 has still not been enacted. Schedule 3 provides a framework for the approval and adoption of drainage systems, an approving body, and national standards on the design, construction, operation, and maintenance of SuDS. Also, it makes the right to connect surface water runoff to public sewers conditional upon the drainage system being approved before any construction work can start.

⁸⁹ Water stressed areas. Available at: <https://www.gov.uk/government/publications/water-stressed-areas-2021-classification>

- 6.6.12 The application of SuDS is not limited to a single technique per site. Often a successful SuDS solution will be multi-functioning, utilising a combination of techniques in accordance with the four pillars of SuDS, providing flood risk, pollution and landscape/wildlife benefits. In addition, SuDS can be employed on a strategic scale, for example with a number of sites contributing to large scale jointly funded and managed SuDS. It should be noted; each development site must offset its own increase in runoff and attenuation cannot be “traded” between developments.

Recommendation 6-11 *Developers must demonstrate how collected water will be reused before considering any alternative drainage options in accordance with the SuDS Hierarchy.*

Recommendation 6-12 *The runoff from all major developments and other development shall not increase the risk of flooding elsewhere from any source. The rate and volume of surface water run off must be controlled in accordance with the new National Standards for Sustainable Drainage Systems⁸⁶. SuDS should be used to reduce and manage surface water run-off to and from proposed developments as near to source as possible in accordance with the requirements of the new National Standards for Sustainable Drainage Systems⁸⁶ and supporting guidance.*

Suitability for Infiltration SuDS

- 6.6.13 The use of infiltration techniques is highly dependent on the underlying ground conditions. As part of this SFRA, the detailed BGS Infiltration SuDS Map⁹⁰ has been used to provide an indication of the suitability of using infiltration SuDS techniques across the study area using the following categories:
- Highly compatible: The sub-surface is likely to be suitable for free-draining infiltration SuDS.
 - Probably compatible for infiltration SuDS: The sub-surface is probably suitable for infiltration SuDS, although design may be influenced by the ground conditions.
 - Opportunities for bespoke infiltration SuDS: The sub-surface is potentially suitable for infiltration SuDS although the design will be influenced by the ground conditions.
 - Very significant constraints are indicated: There is a very significant potential for one or more geohazards associated with infiltration.
- 6.6.14 **Appendix A Map 015a and 015b** shows that there are significant constraints indicated for infiltration SuDS due to the underlying soils and geology across the study area. The presence of groundwater is also likely to render infiltration SuDS unsuitable. Flow attenuation of surface water released into a waterbody or a sewer could be considered for locations where infiltration is not suitable.
- 6.6.15 There are limited areas throughout the study area which are highly compatible for infiltration SuDS. These include areas in south-west of Kendal, south of Milnthorpe, Levens, south of Arnside, Grange-over-Sands and to the east of Barrow-in-Furness.
- 6.6.16 It is critical that the suitability of a site for infiltration is confirmed through site-specific evidence as soon as possible in the planning and design process. The suitability of a site for infiltration is a key determinant of site design. Applications for full planning permission and reserved matters approval must be supported by site-specific evidence, which confirms whether infiltration is suitable at the site.

Table 6-3: Typical SuDS Components

Technique	Description	Conveyance	Detention	Infiltration	Harvesting
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.		Y	Y	*
Filter Drains	Linear drains/trenches filled with a permeable material, often with perforated pipe in the base of the trench. Surface water from the edge of paved areas flows into the trenches, is filtered and conveyed to other parts of the site.	Y	Y		
Filter Strips	Vegetated strips of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and particulates.	*	*	*	

⁹⁰ BGS, Infiltration SuDS map. Available at: <https://www.bgs.ac.uk/datasets/infiltration-suds-map/>

Technique	Description	Conveyance	Detention	Infiltration	Harvesting
Swales	Shallow vegetated channels that conduct and/or retain water and can permit infiltration when unlined.	Y	Y	*	
Ponds	Depressions used for storing and treating water.		Y	*	Y
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds. Based on geology these measures can also incorporate some degree of infiltration.	*	Y	*	Y
Detention Basin	Dry depressions designed to store water for a specified retention time.		Y		
Soakaways	Sub-surface structures that store and dispose of water via infiltration.			Y	
Infiltration Trenches	As filter drains but allowing infiltration through trench base and sides.	*	Y	Y	
Infiltration Basins	Depressions that store and dispose of water via infiltration.		Y	Y	
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. It is noted that the use of brown/green roofs should be for betterment purposes and not to be counted towards the provision of on-site storage for surface water. This is because the hydraulic performance during extreme events is similar to a standard roof (CIRIA C697).		Y		
Rainwater Harvesting	Storage and use of rainwater for non-potable uses within a building, e.g. toilet flushing. It is noted that storage in these types of systems is not usually considered to count towards the provision of on-site storage for surface water balancing because, given the sporadic nature of the use of harvested water, it cannot be guaranteed that the tanks are available to provide sufficient attenuation for the storm event.	*	*	*	Y

Y: primary process, * some opportunities subject to design

Technical standards and supporting guidance

6.6.17 Developers, designers and consultants looking for information on how to design SuDS within the study area should refer to the Cumbria Development Design Guide⁹¹ for guidance on surface water drainage schemes. This is currently being reviewed and updated as the Westmorland and Furness Development Design Guide.

6.6.18 In addition, Network Rail technical standards should be adhered to where SuDS are proposed within the vicinity of existing railway drainage assets.

- Surface and foul water drainage should be directed away from Network Rail's retained land and structures, ensuring that water does not pond on or adjacent to railway land during or after construction.
- The construction of soakaways for stormwater, surface water drainage, SuDS or flow-control systems is not permitted within 30m of a Network Rail boundary, and soakaways must not be constructed within any Network Rail lease area.
- Where a Network Rail owned underline structure, such as a culvert, pipe or drain, is proposed to convey surface water within or away from a development, all stakeholders must work collaboratively to confirm that the asset is fit for purpose and capable of accommodating the proposed flows without compromising the safety of the railway or surrounding land. Any use of Network Rail culverts must be formally agreed with Network Rail.
- The position of any underline drainage asset shall not be within 5m of drainage assets sensitive operational equipment such as crossing and overhead lines and not within 15m of bridges, culverts, retaining walls and other structures. Any works within 5m of these assets require prior consent. It is recommended that agreement to development drainage is agreed prior to submission to

⁹¹ Westmorland and Furness Council, Cumbria development design guide. Chapter N. Sustainable Drainage Systems. Available at: <https://www.westmorlandandfurness.gov.uk/planning-and-building-control/environment-and-planning/flooding-management-and-prevention/cumbria-development-design-guide>

determine any impacts of the proposals and ensure that the developer includes and funds any mitigation as required by Network Rail.

- 6.6.19 The following documents will also provide advice on how best to design sustainable drainage schemes in the study area:
- National standards for sustainable drainage schemes⁸⁶.
 - The CIRIA SuDS Manual (C753)⁸⁸.
 - BS8582 Code of practice for surface water management for development sites⁹².
- 6.6.20 The national standards⁸⁶ that are of chief concern in relation to the consideration of flood risk to and from development relating to peak flow control and volume control are presented below.

Runoff rates and volumes to surface waters or sewers

- 6.6.21 **Paragraph 3.18** The peak allowable discharge rate from the development to surface waters or sewers for the 50% AEP event shall be limited to the equivalent 50% AEP greenfield runoff rate, or 3 l/s/ha, whichever is the greater.
- 6.6.22 **Paragraph 3.19** Where the volume of runoff discharged from the development to surface waters or sewers for the 1% AEP, 6-hour rainfall event is greater than the volume of greenfield runoff for the same rainfall event, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 50% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater.
- 6.6.23 **Paragraph 3.20** Where the volume of runoff discharged from the development to surface waters or sewers for the 1% AEP, 6-hour rainfall event is less than or equivalent to the volume of greenfield runoff for the same event, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater.
- 6.6.24 **Paragraph 3.21** For previously developed sites a 'relaxation factor' shall be applied to the target 50% and 1% AEP greenfield runoff rates where evidence is provided that demonstrates why greenfield runoff or 3l/s/ha rates cannot be achieved and this is agreed with the approving body. This relaxation factor shall be no greater than 5 times the greenfield runoff rate.

Management of surface water flooding from the drainage system

- 6.6.25 **Paragraph 3.35** The surface water drainage system shall be designed so that, unless an area is designated to hold or convey water as part of the design, flooding does not occur on any part of the development for rainfall events up to the 3.3% AEP event.
- 6.6.26 **Paragraph 3.36** The surface water drainage system shall be designed so that flooding does not occur during rainfall events up to a 1% AEP event in any part of: a building (including a basement); any utility plant susceptible to water (for example, pumping station or electricity substation) within the development; or any route designed to provide safe access and escape during flooding.
- 6.6.27 **Paragraph 3.40** The surface water drainage system shall be assessed for exceedance events in excess of the 1% AEP event with expected exceedance routes identified across the development to confirm there is no adverse flood risk to the development or elsewhere.
- 6.6.28 All applications which could affect drainage on or around the site should include provision for SuDS and, as the LLFA, the Council is a statutory consultee on surface water management drainage issues for all such developments.
- 6.6.29 For smaller schemes located within Flood Zones 2 and 3, SuDS will need to be addressed as part of an FRA and will be assessed by the Council.

⁹² BSI, 2013, BS8582 Code of practice for surface water management for development sites. Available at: <https://knowledge.bsigroup.com/products/code-of-practice-for-surface-water-management-for-development-sites?version=standard>

6.7 Floodplain Compensation Storage

- 6.7.1 Where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain which are hydraulically linked must be provided to ensure that the total volume of the floodplain storage is not reduced.
- 6.7.2 Where flood storage from any source of flooding is to be lost as a result of development, floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary (**Figure 6-1**). Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and hydraulically and hydrologically linked to the site. If a suitable location cannot be identified, planning permission will be refused. Floodplain compensation must be considered in the context of the 1% AEP flood level including an appropriate allowance for climate change. In accordance with the Environment Agency's climate change allowances guidance, the appropriate allowance to assess off-site impacts and calculate floodplain storage compensation depends on land uses in affected areas. The allowances used should be:
- The Central allowance for most cases.
 - The Higher Central allowance when the affected area contains essential infrastructure.
- 6.7.3 When designing a scheme, floodwater must be able to flow in and out and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the life of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624⁹³.

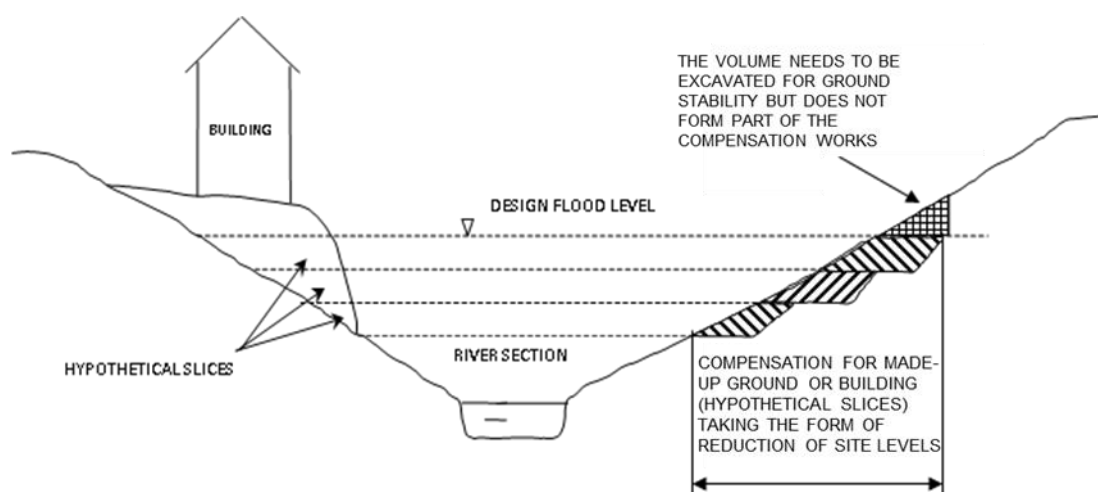


Figure 6-1: Example of Floodplain Compensation Storage (Environment Agency 2009)

- 6.7.4 The requirement for no loss of floodplain storage means that it is not possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, or indirect compensation, by lowering land already within the floodplain, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation or could be used in combination with other measures to limit the impact on floodplain storage.
- 6.7.5 In defended areas, the need for compensation should be based on the results of a sensitivity test. The test can be assessed in three parts:
- What increase in flood levels may result from development in the defended area if the defences were breached or overtopped.
 - What is the effect of this change, how much better or worse will flooding be to properties in particular.

⁹³ CIRIA, 2004, CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry.

- Are the affects acceptable, and in reality, what mitigation measures can the developer implement to offset the impacts.

Compensation will be an appropriate solution if the principle of development in the area is in accordance with the NPPF. Note, floodplain compensatory storage must **not** be used as a reason for developers or planning authorities to advocate floodplain development where lower risk alternatives are available.

- 6.7.6 This evidence will need to be provided by the developer for review and the FRA for the development proposal must identify the resulting change.
- 6.7.7 Rather than stating what the impact on flood levels will be, it must also include what the impacts are as a result of the change (i.e. how many more properties will be at risk of flooding). If the increase in flood level means that water exceeds a building threshold then it is likely the proposals will be unacceptable.
- 6.7.8 If, however, the increase in flood level is very small, such that no additional properties will be at risk, then the proposals may be considered acceptable.
- 6.7.9 In principle, flood risk must be reduced up to the design flood (as defined in NPPF¹ and PPG: 'Flood Risk and Coastal Change' (2025²)) including allowances for climate change and people must remain 'safe' from flooding during an extreme event.

Recommendation 6-13 *Where proposed development results in a change in building footprint, land raising or other structures such as bunds, the developer must ensure that it does not impact upon the ability of the floodplain to store water and should seek opportunities to provide betterment with respect to floodplain storage.*

6.8 Risk of Groundwater Flooding

- 6.8.1 The underlying geology creates pathways for groundwater to flow through the sub-surface and the potential for groundwater flooding to occur, which is exacerbated when water levels in the watercourses are elevated. Additional sub-surface development or additional infiltration has the potential to modify groundwater flows, leading to potential flooding elsewhere and/or impacting on groundwater abstractions downstream.
- 6.8.2 A preliminary Hydrogeological Risk Assessment (HRA) should be undertaken for all proposed developments at the planning application stage. The preliminary HRA should identify:
- the depth and geometry of the penetration of works into the sub-surface from the construction of the proposed development (for example piled foundations, basements, excavation for services). These features can disrupt groundwater flow, alter groundwater levels and therefore increase the risk of groundwater flooding at or around the site.
 - any changes in drainage, for example impermeable surfaces or infiltration/SuDS systems which could alter groundwater flow patterns and the elevation of the water table.
- 6.8.3 If the preliminary HRA identifies works below ground and/or changes in drainage a detailed HRA (sometimes called a Basement Impact Assessment) will be required. The scope and detail required for the HRA will vary depending on the scale of sub-surface construction proposed and the local geological and hydrogeological conditions.
- 6.8.4 The HRA should therefore be used to determine the geological and hydrogeological setting and whether sub-surface development will reach the water table. The water table will move up and down depending on rainfall; the assessment should consider the highest level. If the development does extend down to the water table, it may disrupt groundwater flow in the aquifer by creating a barrier and increase the risk of flooding. The HRA should identify the impact and any required mitigation measures.
- 6.8.5 In some settings there may be an aquifer at depth and, depending on the proposed depth of the development, this may also have to be assessed. A site-specific ground investigation with trial pits and boreholes should be recommended if there is uncertainty over the geological or hydrogeological conditions at any proposed development site.
- 6.8.6 The HRA should also identify changes in drainage as these may create additional inflows to ground which can also exacerbate groundwater flood risk. Groundwater flows must be considered when

designing a proposed surface water system. There is a risk that groundwater or overland flows can overload a drainage system as a result of illegal connections being made as an afterthought by individual residents if their plots are not drained effectively.

Recommendation 6-14 *Future development should assess the potential to impact on the risk of groundwater flooding as a result of sub-surface development or additional infiltration. A preliminary HRA should be undertaken for all proposed developments at the planning application stage. Where required a detailed HRA should be undertaken to determine the potential for impact of groundwater flooding and appropriate mitigation measures.*

6.9 Property Flood Resilience

6.9.1 'Property Flood Resilience' is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice⁹⁴, which provides advice for both new-build and retrofit. It includes specific guidance for local authority planners. In accordance with paragraph 181 of the NPPF¹, development should only be allowed in areas at risk of flooding where it can be demonstrated that development is appropriately flood resistant and resilient, such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.

6.9.2 Therefore, flood resilience measures should now be the norm for designs of development that are proposed to take place in areas at risk of flooding

6.9.3 Resistance and recovery measures are unlikely to be suitable as the only mitigation measure to manage flood risk, but they may be suitable in some circumstances, such as:

- Water Compatible and Less Vulnerable uses where temporary disruption is acceptable, and the development remains safe.
- Where the use of an existing building is to be changed and it can be demonstrated that the avoidance measures are not practicable, and the development remains safe.
- As a measure to manage residual flood risk from flood risk management infrastructure when avoidance measures have been exhausted.

6.9.4 Flood resistance and recovery measures cannot be used to justify development in inappropriate locations.

6.9.5 Where historic buildings are involved, early consultation with Historic England should be undertaken and their guide⁹⁵ on flood resilience for historic properties provides additional information.

Flood Resistance 'Water Exclusion Strategy'

6.9.6 Flood resistant construction can prevent entry of water or minimise the amount that may enter a building where there is short duration flooding with water depth up to approximately 0.6 metres, depending on the building's characteristics. Where measures to exclude water in this way are proposed above this level, advice should be sought from a suitably qualified building surveyor, architect or structural engineer.

6.9.7 There is a range of flood resistance and resilience construction techniques that can be implemented in new developments to mitigate potential flood damage. Flood resistance measures, or dry-proofing, stops water entering a building up to a safe structural limit. Resistance measures can be passive, such as flood doors which are normally closed; or active, such as air brick covers or removable flood barriers. Passive measures are to be prioritized above active measures.

6.9.8 This form of construction needs to be used with caution and accompanied by measures that will speed-up flood recovery, as effective flood resistance can be difficult to achieve. Hydrostatic pressures exerted by floodwater can cause long-term structural damage, undermine the foundations of a building or cause

⁹⁴ Kelly, D, Barker, M, Lamond, J, McKeown, S, Blundell, E and Suttie, E, 2020, Guidance on the code of practice for property flood resilience, C790B, CIRIA, London (ISBN: 978-0-86017-895-8). Available at:

https://www.ciria.org/CIRIA/Resources/Free_publications/CoP_for_PFR_resource.aspx

⁹⁵ Historic England, April 2015, Flooding and Historic Buildings. Available at: <https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/>

leakage through the walls, floor or sub-floor, unless the building is specifically designed to withstand such stresses. In addition, temporary and demountable defences are not appropriate for new-build developments.

- 6.9.9 There are a range of property flood protection devices available on the market, designed specifically to resist the passage of floodwater. These include removable flood barriers and gates designed to fit openings, vent covers and stoppers designed to fit WCs. These measures can be appropriate for preventing water entry associated with fluvial flooding as well as surface water and sewer flooding. The efficacy of such devices relies on their being deployed before a flood event occurs. It should also be borne in mind that devices such as air vent covers, if left in place by occupants as a precautionary measure, may compromise safe ventilation of the building in accordance with Building Regulations.

Flood Recovery ‘Water Entry Strategy’

- 6.9.10 Flood recoverability measures (or wet-proofing), accept that water will enter the building, but through careful design and changes to the construction will minimise damage and allow faster cleaning, drying, repairing and re-occupancy of the building after a flood. Measures are preferably passive, such as the use of resilient building materials, or active such as moving sensitive equipment or belongings to upper floors when flooding is expected.
- 6.9.11 Materials should be used which allow the passage of water whilst retaining their structural integrity and they should also have good drying and cleaning properties. Alternatively sacrificial materials can be included for internal and external finishes; for example, the use of gypsum plasterboard which can be removed and replaced following a flood event. Flood resilient fittings should be used to at least 0.1m above the design flood level. Recovery measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.
- 6.9.12 A variety of flood recovery tools can be implemented, such as:
- Using materials with either, good drying and cleaning properties, or sacrificial materials that can easily be replaced post-flood.
 - Design for water to drain away after flooding.
 - Design access to all spaces to permit drying and cleaning.
 - Raise the level of electrical wiring, appliances and utility metres.
- 6.9.13 Structures such as (bus, bike) shelters, park benches and refuse bins (and associated storage areas) located in areas with a high flood risk should be flood resilient and be firmly attached to the ground and designed in such a way as to prevent entrainment of debris which in turn could increase flood risk and/or breakaway posing a danger to life during high flows.

Recommendation 6-15 Where development or redevelopment is proposed in areas at risk of flooding, flood resilience measures must be implemented to mitigate the risk of flooding.

6.10 Finished Floor Levels

Recommendation 6-16 Where developing in Flood Zone 2 and 3 is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (residential) and Highly Vulnerable land uses, is to ensure internal floor levels are raised a freeboard level above the design flood level i.e. the known or modelled 1% AEP flood level for rivers or the 0.5% AEP flood level for tidal, including an allowance for climate change.

- 6.10.1 In areas at risk of **river flooding**, the climate change allowance required depends on the vulnerability of the development, as set out in the climate change guidance¹⁸. For More Vulnerable development the central allowance should be used.
- 6.10.2 In areas at risk of **tidal flooding**, finished floor levels for More Vulnerable development should be a freeboard above the 0.5% AEP plus upper end climate change allowance. Finished floor levels for Less Vulnerable development should be a freeboard above the 0.5% AEP plus higher central climate change allowance. These requirements are summarised in Table 6-4.

Table 6-4: Requirements for finished floor levels in Westmorland and Furness.

Development Vulnerability	Finished floor level requirements in areas at risk of tidal flooding	Finished floor level requirements in areas at risk of fluvial flooding
Essential Infrastructure	Finished floor levels should be raised a freeboard above the flood level for the 0.1% AEP plus upper end climate change allowance.	Finished floor levels should be raised a freeboard above the flood level for the 1% AEP plus central climate change allowance.
More Vulnerable	Finished floor levels should be raised a freeboard above the flood level for the 0.5% AEP plus upper end climate change allowance.	Finished floor levels should be raised a freeboard above the flood level for the 1% AEP plus central climate change allowance.
Less Vulnerable	Finished floor levels should be set a freeboard above the flood level for the 0.5% plus higher central climate change allowance.	Finished floor levels should be set a freeboard above the flood level for the 1% AEP plus central climate change allowance.

- 6.10.3 For More Vulnerable single-storey uses, ground floor levels should be provided 600mm above the 0.1% AEP flood level, inclusive of climate change.
- 6.10.4 For self-contained ground floor flats with access to refuge at a higher level for more extreme events, ground floor levels can be 600mm above the 1% AEP fluvial level inclusive of climate change, or 600mm above the 0.5% AEP tidal flood level, inclusive of climate change. If access to refuge from within the building is not available, then the floor levels for ground floor self-contained flats should be the same as that for single storey developments.
- 6.10.5 In certain situations (e.g. for proposed extensions to buildings with a lower floor level or conversion of existing historical structures with limited existing ceiling levels), it could prove impractical to raise the internal ground floor levels to sufficiently meet the general requirements. In these cases, the Environment Agency and/or the Council should be approached to discuss options for a reduction in the minimum internal ground floor levels provided flood resistance measures are implemented up to an agreed level.
- 6.10.6 Drainage details, ground levels and finished floor levels are critical to ensure the proposal is resilient to flood risk and climate change. It is good practice to ensure the external levels fall away from the ground floor level of the proposed buildings (following any regrade), to allow for safe overland flow routes within the development and minimise any associated flood risk from overland flows. In addition, where the ground level of the site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at an increased risk of sewer surcharge. It is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer.

6.11 Basements

Recommendation 6-17 *Basement dwellings should not be permitted in Flood Zone 3.*

- 6.11.1 Annex 3 of the NPPF (Flood Risk Vulnerability Classification), classifies basement dwellings as Highly Vulnerable. Table 2 of the PPG: 'Flood Risk and Coastal Change' (2025)² concludes that Highly Vulnerable uses should not be permitted in Flood Zones 3a and 3b. Basement dwellings are therefore incompatible in Flood Zone 3 and should not form part of developments planned in these areas.
- 6.11.2 Where basement dwellings are considered in Flood Zone 2, the Exception Test needs to be applied and a safe means to escape via internal access to higher floors is required (above the 0.1% AEP flood level including an allowance for climate change, in line with the requirements for places of safety, described further in [Section 7.6](#)).
- 6.11.3 For basements containing sanitary appliances, where the risk of surcharge from the public sewer is considered to be higher, measures may be required to mitigate the risk of flooding from the public sewer, for example, a pumped drainage connection.

7. Managing residual risk

7.1 Overview

- 7.1.1 **Section 6.1** identifies that there are a number of flood defences in the study area which are generally shown to be in fair condition, according to the AIMS database. These defences provide a significant level of protection. As described in **Section 4.2**, the defended flood extents and undefended flood extents are similar across the study area, except for in Ulverston where the flood extent is reduced due to the presence of formal defences and the presence of the disused railway embankment. Whilst these defences provide a significant SoP, there remains a residual risk of flooding. This residual risk can arise when flood management infrastructure is exceeded by events beyond its design specification, including tidal and fluvial defences. Residual risk could also come from reservoir breaches, excess surface water overwhelming watercourses and drainage systems, as well as watercourses exceeding capacity. Key areas in Westmorland and Furness that are at residual risk of flooding include Kendal, Ulverston, Penrith, Milnthorpe and Barrow-in-Furness.
- 7.1.2 The modelling of flood flows and flood levels is not an exact science, therefore there are inherent uncertainties in the prediction of flood levels used in the assessment of flood risk. While the Flood Map for Planning Flood Zones provide a relatively robust depiction of flood risk for specific conditions, all modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response. No residual modelling (breach or overtopping of defences or structural blockages) has been undertaken as part of this SFRA. This should be included as part of a site-specific FRA, or a Level 2 SFRA, should development be located in an area where residual flood risk is considered to be an issue.
- 7.1.3 The minimum acceptable SoP for a new property within a flood risk area is 1% AEP for fluvial flooding and 0.5% AEP for a tidal event, with allowance for climate change over the lifetime of the development. The measures chosen will depend on the nature of the flood risk. Some of the more common measures are broadly outlined in this section.

7.2 Development Safety

- 7.2.1 When assessing whether a development can be made safe, the following should be considered:
- Characteristics of a possible flood event including residual risks from flood risk management infrastructure e.g. type and source of flooding, frequency, depth, speed of onset, likelihood of warning.
 - Ability of residents and users to safely access and exit a building during a design flood⁹⁶ and to evacuate before an extreme flood (0.1% AEP including climate change).
 - Structural safety of buildings.
 - Provision of an accessible place of safety in the event that a failure of flood risk management infrastructure would result in speeds of onset flooding that would not make escape from the development feasible.
 - Impact of a flood on the essential services provided to or from a development.
- 7.2.2 In order to inform this assessment, the following sections describe the requirements for flood warning, emergency plans, access and escape and places of safety.
- 7.2.3 The recommendations in this section are not intended to justify development in areas of flood risk. Sites located outside of flood risk areas should continue to be prioritised and in accordance, with the Sequential and Exception Tests followed.

⁹⁶ i.e. 0.5% AEP tidal event including appropriate allowance for climate change, or 1% AEP fluvial flood event or surface water event including an appropriate climate change allowance.

7.3 Flood Warning Areas

- 7.3.1 The Environment Agency operates a free Flood Warning Service⁹⁷ for many areas at risk of flooding from rivers and the sea. Three different codes are issued depending on the type of flooding forecasted:
- Flood Alert – Flooding is possible, be prepared.
 - Flood Warning – Flooding is expected, immediate action is required.
 - Severe Flood Warning – Severe flooding, danger to life.
- 7.3.2 The Environment Agency has provided a GIS layer of Flood Alert⁹⁸ and Flood Warning Areas⁹⁹ within Westmorland and Furness. A Flood Alert is issued to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early/low impact preparations for flooding. Flood Alerts are issued earlier than Flood Warnings to provide advance notice of the possibility of flooding and may be issued when there is less confidence that flooding will occur in a Flood Warning Area. Flood Warnings are issued when flooding is expected to occur. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater. There are 40 Flood Warning Areas within the study area as shown in **Appendix A Map 016a and 016b**, most of which are in the southern area near the settlements of Kendal, Milnthorpe, Ulverston, Barrow-in-Furness and Walney Island. The Environment Agency issues flood warnings to residents and businesses that have registered for the service in these specific areas when flooding is expected.
- 7.3.3 The Environment Agency also publishes 'Water situation: area monthly reports for England'¹⁰⁰ for each of its areas. These reports identify monthly rainfall, soil moisture deficit, river flows, groundwater levels and reservoir levels, offering valuable insight into the likelihood of flood warnings being issued.
- 7.3.4 In some parts of England, the Environment Agency may also be able to indicate when flooding from groundwater is possible. This service is not currently provided in Westmorland and Furness. According to the Environment Agency's 'Hydrometric Monitoring Points' dataset¹⁰¹ there are currently 21 No. monitoring points located within the northern portion of the Council's planning area, following the corridor of the River Eden (Main River) and 5 No. monitoring points in the southern boundary, near Barrow-in-Furness.
- 7.3.5 The Environment Agency also publish 'Groundwater situation'¹⁰² reports which provide the latest update on monitored groundwater levels and whether there are any groundwater alerts or warnings in force. These reports will give an indication as to when groundwater levels may be high and groundwater flooding may be imminent. At the time of writing, the Environment Agency do not provide groundwater situation reports for the study area.

7.4 Emergency Plan

- 7.4.1 **Evacuation** is where flood alerts and warnings provided by the Environment Agency enable timely actions by residents or occupants to allow evacuation to take place unaided, i.e. without the deployment of trained personnel to help people from their homes, businesses and other premises.
- 7.4.2 **Rescue** by the emergency services is likely to be required where flooding has occurred, and prior evacuation has not been possible. An emergency plan will be needed wherever emergency flood response is an important component of making a development safe.
- 7.4.3 In accordance with paragraph 181 of the PPG: 'Flood Risk and Coastal Change' (2025)², an emergency plan will be needed wherever emergency flood response is an important component of making a development safe, including where there is a residual risk of flooding. Emergency plans will be essential for sites at risk of flooding used for holiday or short-let caravans and camping and for any site with transient occupancy (e.g. hostels and hotels). Such occupants may not be aware of the risks, are often

⁹⁷ Environment Agency Flood Warning Service. Available at: <https://check-for-flooding.service.gov.uk/>

⁹⁸ Environment Agency, 2024, Flood Alert Areas. Available at: <https://www.data.gov.uk/dataset/7749e0a6-08fb-4ad8-8232-4e41da74a248/flood-alert-areas2>

⁹⁹ Environment Agency, 2024, Flood Warning Areas. Available at: <https://www.data.gov.uk/dataset/0d901c4a-6e1a-4f9a-9408-73e0c1f49dd3/flood-warning-areas3>

¹⁰⁰ Water Situation: area monthly reports for England. Available at: <https://www.gov.uk/government/publications/water-situation-local-area-reports#full-publication-update-history>

¹⁰¹ Environment Agency, 2025, Hydrometric Monitoring Points. Available at: <https://www.data.gov.uk/dataset/0bac3947-c632-47eb-83d5-fff7f1911537/hydrometric-monitoring-points1>

¹⁰² Groundwater situation report. Available at: <https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk>

not signed up to Flood Alerts and Flood Warnings and do not have the local knowledge to respond safely to a flood event.

7.4.4 For sites in Flood Zone 1 that are located on 'dry islands', it may also be necessary to prepare an Emergency Plan to determine potential egress routes away from the site. These routes could pass through areas at risk of flooding during the 1% AEP flood event including an allowance for climate change, or a 0.5% AEP tidal flood event including an allowance for climate change if tidal is the dominant source. More information on dry islands is provided in **Section 7.5**.

7.4.5 The Environment Agency has a tool on their website to create a Personal Flood Plan¹⁰³. The Plan comprises a checklist of things to do before, during and after a flood and a place to record important contact details. Where proposed development comprises non-residential extension <250m² and householder development (minor development), it is recommended that the use of this tool to create a Personal Flood Plan will be appropriate. Reference should also be made to the ADEPT/Environment Agency guidance¹⁰⁴ on Flood Risk Emergency Plans for New Development.

7.4.6 Emergency Plans should include:

- How flood warning is to be provided, such as:
 - Availability of existing flood warning systems.
 - Where available, rate of onset of flooding and available flood warning time.
 - How a flood warning is given.
- What will be done to protect the development and contents, such as:
 - How easily damaged items (including parked cars) or valuable items (important documents) will be relocated.
 - How services can be switched off (gas, electricity, water supplies).
 - The use of flood protection products (e.g. flood boards, airbrick covers).
 - The availability of staff/occupants/users to respond to a flood warning, including preparing for evacuation, deploying flood barriers across doors etc.
 - The time taken to respond to a flood warning.
- Ensuring safe occupancy and access to and from the development, such as:
 - Occupant awareness of the likely frequency and duration of flood events, and the potential need to evacuate.
 - Safe access route to and from the development.
 - If necessary, the ability to maintain key services during an event.
 - Vulnerability of occupants, and whether rescue by emergency services will be necessary and feasible.
 - Expected time taken to re-establish normal use following a flood event (clean-up times, time to re-establish services etc.).

7.4.7 There is no statutory requirement for the Environment Agency or the emergency services to approve emergency plans. The Council is accountable via planning condition or agreement to ensure that plans are suitable. This should be done in consultation with emergency planning staff.

Recommendation 7-1 *Where development is proposed or expected in Flood Zone 2 or 3, at high surface water risk or at high risk of flooding from other sources (including groundwater, sewer and artificial sources) (particularly those that have potentially vulnerable users or residual flood risks with implications for emergency planning), an Emergency Plan should be prepared as part of a FRA to demonstrate what actions site users will take before, during and after a flood event to ensure their safety,*

¹⁰³ Environment Agency Tool 'Make a Flood Plan'. Available at: <https://www.gov.uk/government/publications/personal-flood-plan>

¹⁰⁴ ADEPT, Environment Agency Flood Risk Emergency Plans for New Development. Available at: <https://adeptnet.org.uk/floodriskemergencyplan>

and to demonstrate their development will not impact on the ability of the local authority and the emergency services to safeguard the current population.

Recommendation 7-2 *Local planning authorities should work with their emergency planning officers to produce local guidelines setting out requirements for flood warning, evacuation and places of safety, against which individual planning applications can then be judged. These should avoid additional burdens on emergency services, explore opportunities for development proposals to address any shortfall in emergency service and infrastructure capacity, and minimise the need for further consultation at planning application stage. It is ultimately the decision of the local planning authority to require an emergency plan.*

7.5 Access and Egress

- 7.5.1 Where development may be proposed in areas at risk of flooding, safe access and egress are required to enable the evacuation of people from the development, provide the emergency services with access to the development during times of flood and enable flood defence authorities to carry out any necessary duties during periods of flood.
- 7.5.2 A safe access/escape route must be provided to allow occupants to safely enter and exit the buildings and be able to reach land outside the flooded area (e.g. within Flood Zone 1, an area of low surface water, low reservoir and low sewer flood risk) using public rights of way without the intervention of emergency services or others during design flood conditions, including climate change allowances (i.e. 1% AEP fluvial flood event and surface water event including an appropriate climate change allowance or a 0.5% AEP tidal flood event including an allowance for climate change if tidal is the dominant source). The failure of flood risk management infrastructure has the potential to cause catastrophic damage with a speed of onset that would not allow sufficient time for safe access and egress. This is explained in detail in **Section 7.6**. The potential need for evacuation prior to a more extreme flood event should also be considered when determining a safe access and escape route.
- 7.5.3 In accordance with paragraph 047 of the PPG: 'Flood Risk and Coastal Change' (2025)², where access and escape are important to the overall safety of development in areas of flood risk, the LPA should consult with emergency planning staff and, where appropriate with the emergency services, unless local standards or guidelines have been put in place in lieu of consultation.
- 7.5.4 For developments located in areas at risk of fluvial, surface water and tidal flooding, safe access / escape must be provided for new development as follows in order of preference:
- Safe dry route for people and vehicles.
 - Safe dry route for people.
 - If a dry route for people is not possible, the FRA should provide an assessment of the flood hazard rating along the route and demonstrate that the route is a low hazard (in terms of depth and velocity of flooding as defined in the Flood Risks to People Methodology FD2321/TR1105) and should not cause risk to people.
 - If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding as defined in the Flood Risks to People Methodology FD2321/TR1105) is low to permit access for emergency vehicles. However, the public should not drive vehicles in floodwater.

'Dry Islands'

- 7.5.5 During times of flood, it is possible that all the land surrounding areas in higher elevation becomes flooded, resulting in this higher area becoming a 'dry island'. Areas in Westmorland and Furness where 'dry islands' occur include Penrith, Kendal, Ulverston and Walney Island. During prolonged periods of flooding, it may prove difficult to provide resources and emergency services to those living in these areas. In order to reduce the flood risk, these 'dry islands' should be treated the same as for the level of flood risk in the area surrounding them, regardless of their size. When contemplating development, it is

¹⁰⁵ DEFRA and Environment Agency, 2005, FD2320/TR2 Flood Risk Assessment Guidance for New Development.

important to study the wider area of the flood map to ensure that there is a dry route to a point outside the floodplain.

- 7.5.6 In exceptional circumstances, safe access above the design flood level including an allowance for climate change may not be achievable. In these circumstances the Environment Agency and the Council should be consulted to determine whether the safety of the site occupants can be satisfactorily managed. This will be informed by the type of development, the number of occupants and their vulnerability and the flood hazard along the proposed egress route. For example, this may entail the designation of a safe place of refuge on an upper floor of a building, from which the occupants can be rescued by emergency services. It should be noted that sole reliance on a safe place of refuge is a last resort, and all other possible means to evacuate the site should be considered first. Provision of a safe place of refuge will not guarantee that planning permission will be granted.

Recommendation 7-3 *New development must have safe access / escape along a dry route to an area outside the floodplain during design flood conditions including an allowance for climate change.*

7.6 Places of Safety

- 7.6.1 Places of safety should be located above the extreme flood level (0.1% AEP event) including an appropriate allowance for climate change.
- 7.6.2 LPAs should consider whether the development can be considered safe given the predicted duration of flooding and the vulnerability of occupants and users. In doing so, LPAs should account for the likely impacts of flooding on essential services such as electricity, gas, telecommunications, water supply and sewerage. Any place of safety needs to be designed to facilitate rescue in case emergency care is needed or if it is unlikely to be safe for occupants and users to wait until floodwaters have receded sufficiently for safe access/escape to be possible.
- 7.6.3 Reference should be made to the ADEPT/Environment Agency guidance section entitled 'How should residual risks be considered?'¹⁰⁴ in addition to Section 7 of its Emergency Plan checklist¹⁰⁶ which provides guidance on how the Emergency Plan for a development should include information on temporary facilities and areas.
- 7.6.4 From a review of the high-level datasets in this report, no locations have been identified where a failure of flood risk management infrastructure would result in flooding with a speed-of-onset that would not allow sufficient time for safe access and escape. This should be reviewed if new modelling is made available. For proposed developments, the speed of onset from a failure of flood risk management infrastructure should be reviewed in a site-specific FRA.

7.7 Emergency Planning

- 7.7.1 Emergency planning can be broadly split into three phases, all of which should be considered in managing flood risk across the study area:
1. Before a flood – raising flood awareness, ensuring no inappropriate use of the floodplain/flow paths, preparing suitable flood emergency plans and communicating them to the wider community.
 2. During a flood – Flood alerts and communication, rescuing occupants, providing safe refuge and alternative accommodation.
 3. After the flood – providing support to help people recover and return to their homes and businesses.
- 7.7.2 Where a new development or change of land use is proposed, flood evacuation plans should be developed through liaison with the emergency planners and the emergency services¹⁰⁴.
- 7.7.3 Consideration of emergency planning is even more critical when it relates to vulnerable sites and essential infrastructure, as further described below.

¹⁰⁶ ADEPT, Environment Agency Flood Risk Emergency Plans for New Development. Appendix 2: Emergency Plan Checklist. Available at: <https://adeptnet.org.uk/floodriskemergencyplan>

- 7.7.4 Westmorland and Furness Council have developed a Multi-Agency Flood Plan (MAFP)¹⁰⁷ to collate information regarding the roles and responsibilities of organisations that respond to flooding within the Cumbria area to improve multi-agency response and coordination to flooding incidents. The plan primarily focuses on fluvial flooding where detailed arrangements can be made and forecasted. Surface water flooding has also been considered, however as it cannot be accurately forecasted, the response is often more reactive.
- 7.7.5 The aim of the Plan is to provide a clear and concise overview of flooding in Cumbria. The objectives of the plan are:
- To provide clear trigger levels for activation of the plan;
 - To set out the multi-agency coordination and control arrangements including the initial actions on activation;
 - To specify the manner in which warnings may be communicated with the public, communities and partner agencies;
 - To provide a framework to facilitate mitigation of the effects of flooding on communities in Cumbria and the management of a flooding incident through to recovery.
- 7.7.6 As the LPA, the Council should use this SFRA to determine the risk of flooding within the study area in relation to emergency planning measures. The Council should also consider emergency planning measures from sewer flooding and reservoirs which is not currently included in the MAFP. It is vital that emergency planning is considered for any new development especially critical infrastructure, ensuring efficient flood warning systems and procedures are in place. Effective emergency planning ensures occupants of the site are able to act quickly upon the warnings and have the knowledge and equipment to remain safe in a flood event. This may include educating the public, such as advising on the use of sandbags to help manage surface water flooding rather than preventing the ingress of water, ensuring floodwaters are not redirected towards neighbouring properties.
- 7.7.7 Paragraph 046 of the PPG: 'Flood Risk and Coastal Change' (2025)² states the LPA should consider any implications for reservoir safety and reservoir owners and operators caused by new development located downstream of a reservoir such as the cost of measures to improve the design of the dam to reduce flood risk, the operation of the reservoir and general maintenance costs by consulting with reservoir owners and operators on plan and development proposals.

Recommendation 7-4 *Emergency planning strategies should be reviewed in the light of this updated SFRA to determine the suitability of refuge centres and evacuation routes based on the updated flood risk mapping produced. This should be reflected in the next planned review of the Multi-Agency Flood Plan.*

- 7.7.8 The Council is developing an Economic Strategy, currently in draft form, to strengthen the resilience of local businesses. The strategy focuses on supporting businesses to put effective contingency plans in place and to maintain remote operation capabilities during periods of adverse weather. It also sets out how the Council will work with businesses to enhance preparedness ahead of a flood event and to provide support afterwards should they be impacted.

Vulnerable Sites

- 7.7.9 Emergency service authorities responsible for hospitals, ambulance, fire and police stations as well as prisons should ensure that emergency plans, in particular for facilities in flood risk areas, are in place and regularly reviewed so that they can cope in the event of a major flood. These plans should put in place cover arrangements through other suitable facilities, if deemed needed.
- 7.7.10 The NPPF¹ classifies police stations, ambulance stations, fire stations and command centres as Highly Vulnerable buildings. It is essential that all establishments related to these services are located in the lowest flood risk zones and low areas of surface water flooding to ensure that in the event of an emergency those services vital to the rescue operation are not impacted by floodwater. Furthermore, development management policies should seek to locate more vulnerable uses such as schools and care homes in areas at the lowest risk of flooding to minimise the impact of a flood on their vulnerable users.

¹⁰⁷ Westmorland and Furness Council, 2023, Cumbria Local Resilience Forum Multi-Agency Flood Plan. Date of publication: 15/05/2023. Version 2.0.0.

7.7.11 Allied to this, nominated rest and reception centres should also be identified within the study area and compared with the outputs of this SFRA to ensure that these centres are not at risk of flooding, so that evacuees will be safe during a flood event. Developments that would be suitable for such uses would include leisure centres, churches, schools and community centres.

7.7.12 On occasions where development of vulnerable sites within flood risk areas is unavoidable, necessary measures as outlined in **Section 6** should be implemented to ensure the site is as safe as possible.

Essential Infrastructure

7.7.13 In the event of a flood incident, it is essential that the evacuation and rescue routes to and from any proposed development remain safe. Floodplain management and emergency response activities must have a focus on key infrastructure and any properties that are below sea level. Essential infrastructure located in Flood Zone 3a or 3b must be operational during a flood event to assist in the emergency evacuation process.

7.7.14 Relevant transport authorities and operators should examine and regularly review their infrastructure including their networks, stations, and depots, for potential flooding locations and to identify the need for any flood risk reduction measures. For large stations and depots, solutions should be sought to store or disperse rainwater from heavy storms in a sustainable manner. In Westmorland and Furness, sections of the rail network are located in Flood Zone 3a or 3b. A Rail Accident Report was completed by the Rail Accident Investigation Branch⁴⁵ after the derailment of a passenger train at Grange-over-Sands. The report makes a recommendation for Network Rail, to undertake a national review to understand if there are any pumping or drainage assets that were originally installed as a temporary measure but that have stayed in operation for a period longer than originally anticipated.

7.7.15 Network Rail are also the statutory consultee for any planning applications within 10 m of the relevant railway land, as set out in Article 16 of the Development Management Procedure Order. As such, any proposed development which is in close proximity to the railway line or could affect Network Rail's specific land interests will need to be carefully considered.

Emergency Planning Teams

7.7.16 The Council's Emergency Planning Team prepares contingency plans for incidents and risks across Westmorland and Furness. There are also several groups which support emergency planning across Cumbria, these are listed below:

1. [Cumbria Prepared](#)
2. [Community Risk Register](#)
3. [ACTion with Communities in Cumbria](#)

8. Preparing a site-specific FRA

8.1 When is a Flood Risk Assessment required?

- 8.1.1 A site-specific FRA is a report that is conducted by, or on behalf of, a developer to assess flood risk from all sources to and from the development and demonstrate how the proposed development will be made safe and resilient over its lifetime and will not increase flood risk elsewhere. Where possible, the development should reduce flood risk overall in accordance the NPPF¹ and PPG: 'Flood Risk and Coastal Change' (2025)². The assessment should take climate change into account and consider the vulnerability of its users. An FRA must be prepared by a suitably qualified and experienced person and must contain all the information needed to allow the Council to satisfy itself that policy requirements have been met.
- 8.1.2 Guidance for preparing site-specific FRAs is available in "Flood Risk Assessments: applying for planning permission"¹⁰⁸, Flood risk assessment: Flood Zones 1, 2, 3 and 3b¹⁰⁹, Preparing a flood risk assessment: standing advice¹¹⁰ and that contained in the Site-specific flood risk assessment checklist within the PPG: 'Flood Risk and Coastal Change' (2025)².
- 8.1.3 The Environment Agency, in collaboration with the Town and Country Planning Association, have produced updated guidance materials¹¹¹ and tools, including a template¹¹², for developers and FRA consultants.
- 8.1.4 The NPPF¹ states that a site-specific FRA is required for proposals for new development (including minor development and change of use) in the following circumstances:
- In Flood Zones 2 and 3 (including Flood Zone 3b).
 - In Flood Zone 1 with a site area of 1 hectare or more.
 - In Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
 - In Flood Zone 1 and within the 'Flood Zones plus Climate Change' dataset.
 - In Flood Zone 1, which was identified in the SFRA as being at increased flood risk in future.
 - In Flood Zone 1 and at risk of flooding from surface water flooding.
 - Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

8.2 What needs to be addressed in a Flood Risk Assessment?

- 8.2.1 The PPG: 'Flood Risk and Coastal Change' (2025)² states that the objectives of a site-specific flood risk assessment are to establish:
- Whether a proposed development is likely to be affected by current or future flooding from any source.
 - Whether a proposed development will increase flood risk elsewhere.
 - Whether the measures proposed to deal with these effects and risks are appropriate.
 - The evidence for the local planning authority to apply (if necessary) the Sequential Test.

¹⁰⁸ Environment Agency, August 2024, Flood risk assessments: applying for planning permission. Available at:

<https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

¹⁰⁹ Environment Agency (2024) Flood risk assessment: flood zones 1, 2, 3 and 3b. Available at: <https://www.gov.uk/guidance/flood-risk-assessment-flood-zones-1-2-3-and-3b>

¹¹⁰ Environment Agency, August 2024, Preparing a flood risk assessment: standing advice. Available at: <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>

¹¹¹ Environment Agency, Flood Risk Assessment template – guidance. Available at: <https://ecab.planningportal.co.uk/uploads/ea/Environment-Agency-Flood-Risk-Assessment-Template-Guidance.pdf>

¹¹² Environment Agency, Flood Risk Assessment template. Available at: <https://ecab.planningportal.co.uk/uploads/ea/Environment-Agency-Flood-Risk-Assessment-Template.docx>

- Whether the development will be safe and pass the Exception Test, if applicable.
- 8.2.2 The PPG: 'Flood Risk and Coastal Change' (2025)² states that site-specific FRAs need to be credible, fit for purpose, and proportionate to the anticipated degree of flood risk and the nature and scale of the development. Site-specific FRAs need to make optimum use of information already available, including information on the Environment Agency Flood Map for Planning³³ and risk of surface water flooding dataset, although in some cases additional modelling or detailed calculations will need to be undertaken. FRAs need to include the information set out in the flood risk assessment checklist in the PPG: 'Flood Risk and Coastal Change' (2025)².
- 8.2.3 According to paragraph 181 of the NPPF¹, development should only be allowed in areas at risk of flooding where, in light of the FRA, it can be demonstrated that:
- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location.
 - The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.
 - It incorporates SuDS, unless there is clear evidence that this would be inappropriate.
 - Any residual risk can be safely managed.
 - Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
- 8.2.4 As a result, the scope of each site-specific FRA will vary considerably. **Table 8-1** presents the different levels of site-specific FRA, as defined in the CIRIA publication C624¹¹³, and identifies typical sources of information that can be used. Sufficient information must be included to enable the Council and where appropriate, consultees, to determine that the proposal will be safe for its lifetime, not increase flood risk elsewhere and where possible, reduce flood risk overall. Failure to provide sufficient information will result in applications being refused.

Table 8-1: Levels of Site-Specific FRAs

Description

Level 1 Screening study to identify at a high-level whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information. The screening study will ascertain whether a FRA Level 2 or 3 is required.

Typical **sources of information** include:

- Westmorland and Furness Council SFRA.
- Flood Map for Planning (Rivers and Sea).
- Environment Agency Standing Advice.
- NPPF¹ Tables 1, 2 and 3.
- Consultation with the wastewater undertaker, and
- A review of reservoir exceedance paths and consultation with the water undertaker as appropriate.

Level 2 Scoping study to be undertaken if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding, or the site may increase flood risk due to increased run-off. This study should confirm the sources of flooding which may affect the site.

The study should include:

- An appraisal of the availability and adequacy of existing information.
- A qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere. The estimated flood level for the development, taking into account the impacts of climate change over its lifetime needs to be understood. The estimated flood level is the maximum depth of flooding on a development site in a 1% AEP fluvial event (plus an allowance for climate change) or in a 0.5% AEP tidal event (plus an allowance for climate change), and
- An appraisal of the scope of possible measures to reduce flood risk to acceptable levels. For all developments involving surface water drainage in flood risk areas and major developments involving surface water drainage, SuDS must be provided unless clear evidence detailing their unsuitability is provided to the LPA. The management of surface water, including the provision of SuDS, should be outlined in a FRA, or in a separate surface water drainage strategy.

The scoping study may identify that sufficient quantitative information is already available to complete a FRA appropriate to the scale and nature of the development and be suitable for submitting for planning.

Typical **sources of information** include those listed above, plus:

- Local policy statements or guidance.
- Relevant Catchment Flood Management Plan.
- Data request from the Environment Agency to obtain result of existing hydraulic modelling studies relevant to the site and outputs such as maximum flood level, depth and velocity.
- Consultation with the Environment Agency /Westmorland and Furness Council/sewerage undertakers and other flood risk consultees to gain information and to identify in broad terms, what issues related to flood risk need to be considered including other sources of flooding.
- Historic maps.
- Walkover survey to assess potential sources of flooding, likely routes for floodwaters, the key features on the site including flood defences, their condition, and

¹¹³ CIRIA, 2004, Development and flood risk – guidance for the construction industry C624.

- Site survey to determine general ground levels across the site, levels of any formal or informal flood defences etc.

Level 3 Detailed study to be undertaken if a Level 2 FRA concludes that further quantitative analysis is required to assess flood risk issues related to the development site.

The study should include:

- Quantitative appraisal of the potential flood risk to the development.
- Quantitative appraisal of the potential impact of the development site on flood risk elsewhere, and
- Quantitative demonstration of the effectiveness of any proposed mitigations measures.

Typical **sources of information** include those listed above, plus:

- Detailed topographical survey.
- Detailed hydrographic survey.
- Site-specific hydrological and hydraulic modelling studies, including overtopping and breach modelling where appropriate, which should include the effects of the proposed development.
- Monitoring to assist with model calibration/verification, and
- Continued consultation with the LPA, Environment Agency and other flood risk consultees.

8.3 Modelling of Ordinary Watercourses

8.3.1 It should be noted that the scope of hydraulic modelling studies undertaken by the Environment Agency typically covers flooding associated with Main Rivers. As such, Ordinary Watercourses that form tributaries to the Main Rivers may not always be included in these models. For example, at the time of writing, and as discussed in **Section 4.2**, modelling of the Town Beck in Ulverston has not been finalised which may impact the production of Level 3 FRAs within the vicinity. However, the release of NaFRA2 outputs within Westmorland and Furness local planning authority area has improved coverage by incorporating more flood extents associated from Ordinary Watercourses.

8.3.2 Where a proposed development site is in close proximity to an Ordinary Watercourse, the LLFA and/or local authority should be contacted to see whether any modelling data exists (on the assumption that this has not been considered by the Environment Agency). If either no hydraulic modelling exists, or the available modelling is considered to provide very conservative estimates of flood extents (due to the use of national generalised modelling such as JFLOW), applicants may need to prepare a hydraulic model to enable more accurate assessment of the probability of flooding associated with the watercourse and to inform the site-specific FRA. The requirements of this should first be discussed with the LLFA. If required, modelling should be carried out in line with industry standards and in agreement with the Environment Agency and the Council (as the LLFA).

8.3.3 Where a watercourse exists on, under, or adjacent to a property, the owner of that property is classified as a riparian owner. A 'watercourse' here is defined as any natural or artificial channel above or below ground through which water flows, such as a river, brook, ditch, gill or stream (which may be piped or culverted in sections). The responsibilities of riparian owners include:

- The clearance of silt and debris, including rubbish, from a watercourse.
- The management of vegetation within the channel.
- Ensuring the flow of water within the watercourse is not obstructed.

8.3.4 Riparian owners have the right to protect their property from flooding or their land from erosion. However, riparian owners must not:

- Dispose of waste such as grass cuttings into the watercourse.
- Fill in, obstruct, bridge, or pipe the watercourse without obtaining consent.

Recommendation 8-1 *Developers or those preparing FRAs on their behalf, should liaise with the Environment Agency at the earliest opportunity to obtain available modelling outputs and seek clarity on whether local models or NaFRA2 outputs are considered more accurate, particularly whilst NaFRA2 outputs are still being refined.*

Recommendation 8-2 *Where modelling is not available for an Ordinary Watercourse, developers or those preparing the FRA on their behalf should undertake additional hydraulic modelling.*

8.4 Pre-application advice

8.4.1 The Environment Agency and the Council each offer pre-application advice services which should be used to discuss particular requirements for specific applications.

- Westmorland and Furness Council: <https://www.westmorlandandfurness.gov.uk/planning-and-building-control/planning/get-advice-council-applying-planning-permission>
- Environment Agency: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/297018/LIT_9015_c2822b.pdf
- National Rail: AssetProtectionLNWNorth@networkrail.co.uk

8.4.2 The following government guidance sets out when LPAs should consult with the Environment Agency on planning applications <https://www.gov.uk/flood-risk-assessment-local-planning-authorities>.

Recommendation 8-3 *At all stages, the Council, and where necessary the Environment Agency and/or the Statutory Water Undertaker(s) and/or Statutory Wastewater Undertaker(s) may need to be consulted to ensure the FRA provides the necessary information to fulfil the requirements for planning applications.*

9. Next steps

9.1 Next steps

9.1.1 The Council should use this SFRA, the associated mapping and resulting recommendations to:

- Develop their Local Plan and associated strategic policies.
- Safeguard land for flood risk management and green infrastructure.
- Carry out the Sequential Test for potential allocation sites.
- Carry out the Sequential Test for individual planning applications.
- Make decisions about individual planning applications.
- Decide whether a development can be made safe without increasing flood risk elsewhere.
- Aid discussions with emergency planning teams.
- Identify the need for local design guidance or codes.

9.1.2 Where development must be allocated in areas at risk of flooding further assessment of the risk of flooding may be required, for example through the preparation of a Level 2 SFRA.

9.2 Future monitoring and update

9.2.1 SFRAs are living documents that should be reviewed after a significant flood event or when there are changes to:

- The predicted impacts of climate change on flood risk.
- Flood products, for example surface water mapping, flood map for planning.
- Detailed flood modelling - such as from the Environment Agency or LLFA.
- Local Plans, spatial development strategies or relevant local development documents,
- Local flood management schemes.
- Flood Risk Management Plans.
- Shoreline Management Plans.
- Local Flood Risk Management Strategies.
- National planning policy or guidance.

Appendix A Mapping

Map	Title
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Map 002b	LiDAR Topography – South
Map 003a	Flood Map for Planning Flood Zones – North
Map 003b	Flood Map for Planning Flood Zones – South
Map 004a	AIMS Spatial Flood Defences – North
Map 004b	AIMS Spatial Flood Defences – South
Map 005a	Watercourses and Management Catchments – North
Map 005b	Watercourses and Management Catchments – South
Map 005c	Watercourses and Flood Storage Areas – Penrith
Map 005d	Watercourses and Flood Storage Areas – Kendal
Map 006a	Functional Floodplain – North
Map 006b	Functional Floodplain – South
Map 006c	Functional Floodplain – Penrith
Map 006d	Functional Floodplain – Ulverston
Map 006e	Functional Floodplain – Kendal
Map 006f	Functional Floodplain – Barrow-in-Furness
Map 007a	Environment Agency Historic Flood Map – North
Map 007b	Environment Agency Historic Flood Map – South
Map 008a	NaFRA2 Risk of Flooding from Rivers and Sea Defended – North
Map 008b	NaFRA2 Risk of Flooding from Rivers and Sea Defended – South
Map 008c	NaFRA2 Risk of Flooding from Rivers and Sea Defended – Penrith
Map 008d	NaFRA2 Risk of Flooding from Rivers and Sea Defended – Ulverston
Map 008e	NaFRA2 Risk of Flooding from Rivers and Sea Defended – Kendal
Map 009a	NaFRA2 Risk of Flooding from Rivers and Sea undefended – North
Map 009b	NaFRA2 Risk of Flooding from Rivers and Sea undefended – South
Map 009c	NaFRA2 Risk of Flooding from Rivers and Sea undefended – Penrith
Map 009d	NaFRA2 Risk of Flooding from Rivers and Sea undefended – Ulverston
Map 009e	NaFRA2 Risk of Flooding from Rivers and Sea undefended – Kendal
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Map 016a	Flood Alert and Flood Warning Areas – North
Map 016b	Flood Alert and Flood Warning Areas – South
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Map 017b	Working with Natural Processes – South

Appendix B Functional Floodplain Delineation Methodology

Westmorland and Furness Council

Level 1 Strategic Flood Risk Assessment
Appendix B Functional Floodplain Delineation Methodology

Westmorland and Furness Council

Project number: 60734993

April 2026

Quality information

Prepared by	Checked by	Verified by	Approved by
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1. Introduction

- 1.1.1 As defined in Table 1 of the PPG 'Flood Risk and Coastal Change'¹, Flood Zone 3b functional floodplain "comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on modelling parameters. The functional floodplain will normally comprise:
- Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or
 - Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding)."
- 1.1.2 The functional floodplain is not included within the Flood Map for Planning. Instead, the PPG¹ states that in agreement with the Environment Agency, local planning authorities (LPAs) should identify areas of Flood Zone 3b functional floodplain and define its boundaries within the Strategic Flood Risk Assessment (SFRA).
- 1.1.3 As such, the Level 1 SFRA has used the most up-to-date data available from the Environment Agency to delineate the functional floodplain within Westmorland and Furness Council planning area. The methodology has been jointly agreed between the Council and the Environment Agency and is detailed within this Appendix.
- 1.1.4 The approach is to predominately use the 'Rivers and Sea 3.3% defended flood risk extents - present day' dataset (March 2025) which itself is derived from NaFRA2 New National Models (NNM) and supplemented with local hydraulic models. In agreement with the Environment Agency, outputs from a few specific local models have been used to define Flood Zone 3b where data is considered to provide greater accuracy.

¹ Planning Practice Guidance: Flood Risk and Coastal Change, 2025. Available at <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

2. Functional Floodplain Definition

- 2.1.1 The Environment Agency's 'How to prepare a Strategic Flood Risk Assessment' guidance² states that the Level 1 SFRA should map the functional floodplain alongside a detailed explanation of how the functional floodplain was defined. This is described in **Section 3** and presented in **Maps 6a to 6f** which includes key towns of Penrith, Ulverston, Kendal and Barrow-in-Furness.
- 2.1.2 The SFRA guidance states *"in any modelling used to identify the functional floodplain, include existing defences and other flood risk management features and structures."* Therefore, the functional floodplain may not be required in locations where evidence shows flooding would be prevented by existing:
- Flood defences;
 - Flood risk management features or structures; and
 - Buildings.
- 2.1.3 The SFRA guidance further states the following datasets can be used to inform the functional floodplain designation:
- Present day 1 in 30 (3.3%) rivers and sea flood extent with defences on the DEFRA Data Services Platform.
 - Water storage areas on the Flood Map for Planning.
- 2.1.4 If there is not enough detailed modelled information available to identify the functional floodplain, this should be made clear on the Level 1 SFRA maps to ensure risk is not underestimated. In these areas, site-specific flood risk assessments should determine whether a site is affected by functional floodplain through additional modelling. If sites are proposed for development in such areas in the Local Plan, a Level 2 SFRA will be required to robustly map the functional floodplain extent.

² Environment Agency, August 2025, How to prepare a strategic flood risk assessment. Available at: <https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment>

3. Functional Floodplain Delineation

3.1 Datasets

- 3.1.1 A data request was submitted to the Environment Agency on the 2nd September 2024 and a large number of local hydraulic models were received as detailed in **Table B-1**.
- 3.1.2 The '*Rivers and Sea 3.3% defended – present day*' dataset was downloaded from the DEFRA Data Services platform. This dataset is derived from NaFRA2 New National Model (NNM) and supplemented by outputs from local models, where deemed suitable by the Environment Agency.
- 3.1.3 **Table B-1** details whether the local models have been incorporated into the '*Rivers and Sea 3.3% defended – present day*' dataset, and where they were not included, provides reasoning. (In some instances, the local models are not deemed suitable due to age of dataset or return periods modelled).
- 3.1.4 Through correspondence with the Environment Agency, LLFA and LPA, it also became apparent that in some cases local models were not incorporated into the '*Rivers and Sea 3.3% defended – present day*' dataset but are suitable for defining Flood Zone 3b functional floodplain. These are as follows:
- Stainton Beck, Holme Beck and Milnthorpe models, as part of the River Bela catchment Milnthorpe 2021 model as shown in **Figure B-1**.
 - Poaka Beck 2021 model as shown in **Figure B-2**.
- 3.1.5 As a result, the outputs from these models for the 3.3% AEP event have been used to inform the delineation of Flood Zone 3b functional floodplain.
- 3.1.6 The Environment Agency's Flood Storage Area (FSA) dataset has been reviewed, and it was identified that there are two FSAs within the study area at Thacka Beck Nature Reserve in Penrith and Calder Drive in Kendal. These FSAs have been included within the functional floodplain mapping (**Appendix A Maps 6a to 6f**) as a default approach and should be considered as part of the functional floodplain. In addition, whilst not included within the Environment Agency's FSA dataset, the LLFA have advised of an additional FSA which is located at Myers Beck in Penrith (Grid Reference: NY 50950 29823). This is also included within the functional floodplain extent as shown on **Figure 6c**.
- 3.1.7 The Environment Agency's Statutory Main River Map dataset has been included as a separate layer on the functional floodplain mapping (**Appendix A Maps 6a to 6f**). This is required by the Environment Agency SFRA guidance² to define areas that would normally form the river channel and where water has to flow in times of flooding.
- 3.1.8 The final datasets used to delineate the functional floodplain for the study area are presented in **Table B-2**.

Table B-1 Local hydraulic models received from the Environment Agency

ID	Model	Has the local model been incorporated into 'Rivers and Sea 3.3% defended flood risk extents - present day'?	Local model used to delineate functional floodplain	Reasoning
1	Appleby-in-Westmorland and Bolton Hydraulic Model NW133, Capita URS, May 2014	Yes	N/A*	N/A
2	Barrock Gill Hydraulic Model, Jacobs, 2008	Yes	N/A	N/A
3	Bootle and Lazonby Mapping and Modelling, Jacobs, May 2023	Yes	N/A	N/A
4	Brockleymoor, CH2M, July 2017	Yes	N/A	N/A
5	Broughton-in-Furness Hydraulic Model, Capita AECOM, June 2019	Yes	N/A	N/A
6	Carlisle Strategic Flood Risk Mapping Study, CH2M, December 2016	Yes	N/A	N/A
7	Coupland Beck, 2006	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2. Also, only 0.5% and 0.1% AEP available.
8	Cumbrian tidal areas benefitting from defences revisited, JBA, July 2013	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
9	Eden Tributaries Flood Risk Mapping Investigation Brough Hydraulic Model, Atkins, July 2006	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
10	Eden Tributaries, CH2M, July 2017	Yes	N/A	N/A
11	Kendal Options Modelling, Capita, September 2018	Yes	N/A	N/A
12	Kirkby Thore, 2006	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
13	Kirkby Thore, 2008	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
14	Lowther Valley Strategic Flood Risk Mapping Study, ATKINS, September, 2005	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
15	Lyth Valley, 2011	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2. No 3.3% AEP or proxy event available.
16	Melmerby Beck, JBA, January 2009	Yes	N/A	N/A
17	Milburn Beck, 2008	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
18	Milnthorpe, JBA, March 2021 (includes the Stainton Beck, Holme Beck and River Bela (Milnthorpe) models.	No	Yes	The Environment Agency have advised that the 3.3% undefended scenario from the local models for Stainton Beck, Holme Beck and the River Bela (Milnthorpe) should be incorporated into the functional floodplain.
19	Newbiggin Beck, JBA, January 2009	Yes	N/A	N/A

ID	Model	Has the local model been incorporated into 'Rivers and Sea 3.3% defended flood risk extents - present day'?	Local model used to delineate functional floodplain	Reasoning
20	North Petteril Modelling, RENW001543, JacksonHyder, November 2015	Yes	N/A	N/A
21	North West Flood Zone Improvements Great Ormside, JBA, June 2010*	Yes	N/A	N/A
		Yes	N/A	N/A
		Yes	N/A	N/A
22	Poaka Beck Flood Mapping Study, JBA, January 2021	No	Yes	The Environment Agency have advised that the 3.3% undefended scenario from the Poaka Beck local model should be incorporated into the functional floodplain.
23	River Eamont, JBA, July 2013	Yes	N/A	N/A
24	River Eea, RENW001543, Hyder Consulting, September 2015	Yes	N/A	N/A
25	River Kent Modelling for the Levens Embankment, Jacobs, April 2018	Yes	N/A	N/A
26	Skirwith Beck, 2008	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
27	Soutergate Beck, JBA, January 2009	Yes	N/A	N/A
28	South Lakes Flood Risk Mapping Study, Faber Maunsell, July 2006	Yes	N/A	N/A
29	Swindale Beck, 2008	No	No	The Environment Agency have advised that this model has been superseded by NaFRA2.
30	Thacka Beck, JBA, July 2013	Yes	N/A	N/A
31	Ulverston Town Beck Flood Alleviation Scheme Modelling Report, April 2022	Yes	N/A	N/A
32	Ulverston, 2022	Yes	N/A	N/A
33	Ulverston, 2024	No	No	At the time of writing, it has been advised by the Environment Agency that this model has not undergone the quality assurance process for sign off. Recommendation to update the functional floodplain once the Ulverston 2024 local model is available.
34	Ulverston, JBA, September 2015	No	No	This model is undefended and only contains the flood outlines for the 4% and 2% AEP events. Therefore, the NaFRA2 data supersedes this local model.
35	Warcop, JBA, April 2020	Yes	N/A	N/A

*Local models that have been incorporated into the 'Rivers and Sea 3.3% defended flood risk extents - present day' are already represented in the functional floodplain through the inclusion of this layer.

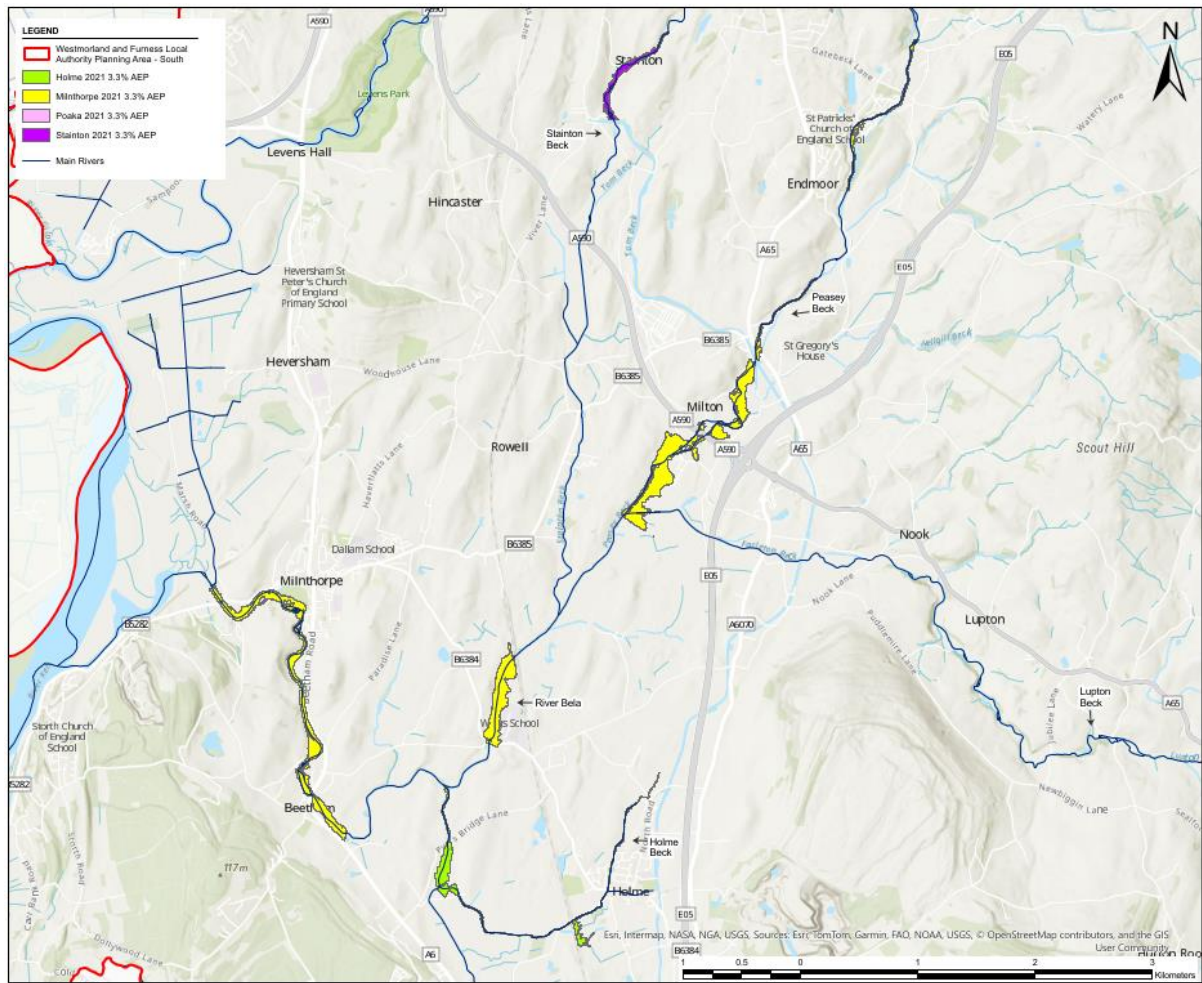


Figure B-1 Modelled 3.3% flood extent for Stainton Beck, Holme Beck and Milnthorpe models, as part of the River Bela catchment Milnthorpe 2021 model

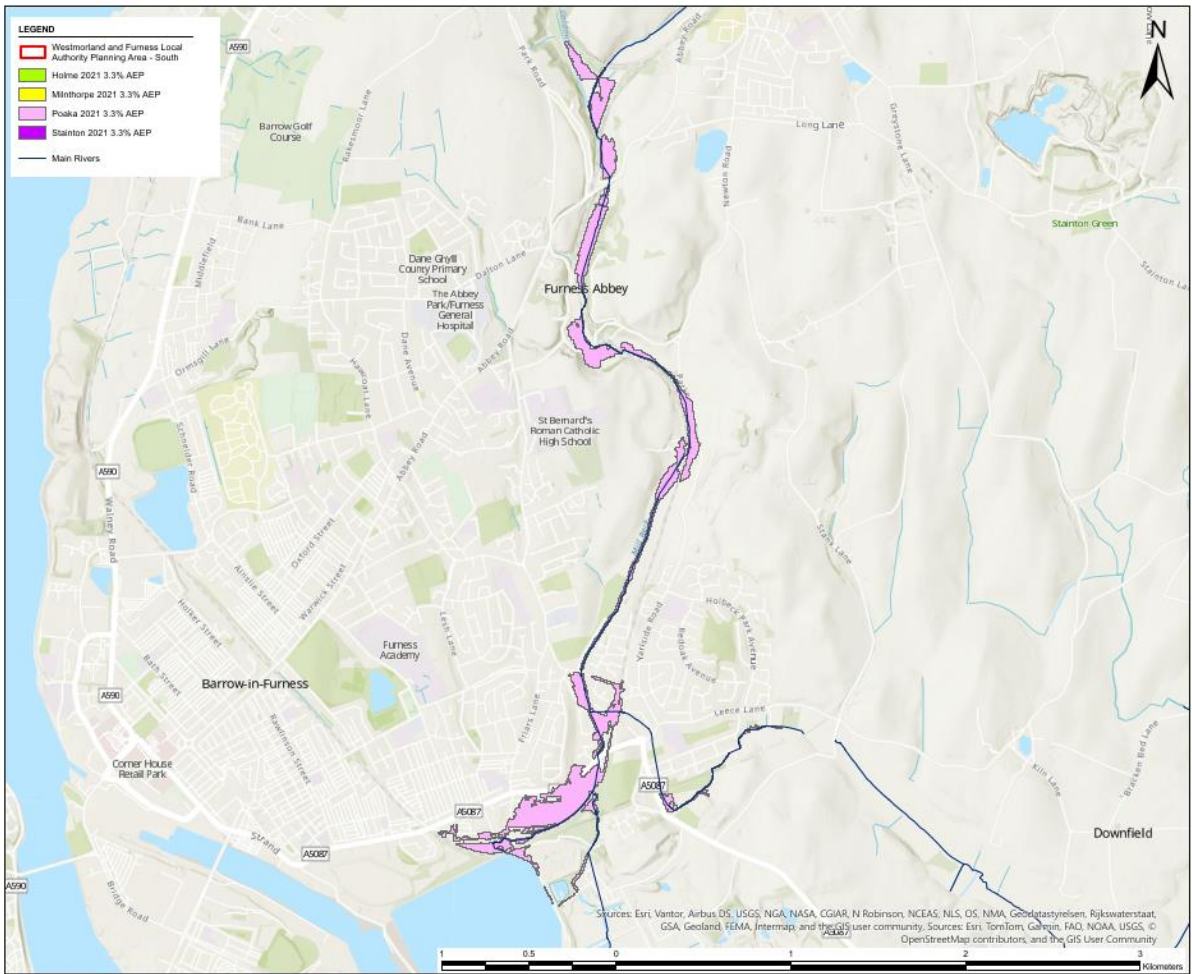


Figure B-2 Modelled 3.3% flood extent for Poaka Beck, 2021 model

Table B-2 Datasets used to delineate the functional floodplain

Name of dataset	Year	Description	Source	Reason for use
Rivers and Sea 3.3% defended flood risk extents - present day	2025	The extent of land at risk of flooding in the present day in the 3.3% defended AEP scenario.	DEFRA Data Services Platform	The Environment Agency's SFRA guidance ² states this dataset can be used to inform the functional floodplain designation. Through consultation with the Environment Agency, it was highlighted there are some inconsistencies with this dataset and therefore, the inclusion of some local hydraulic models was also recommended.
Milnthorpe, JBA, 3.3% AEP undefended return period (includes the Stainton Beck, Holme Beck and River Bela (Milnthorpe) models.	2021	A linked 1D-2D model using Flood Modeller and TUFLOW of the River Bela catchment. The main watercourses within the catchment include the Stainton Beck, Peasey Beck, Holme Beck and River Bela .	Environment Agency	The Stainton Beck, Holme Beck and Milnthorpe sections of the River Bela catchment model have been incorporated into the functional floodplain layer following consultation with the Environment Agency as it is acknowledged that these local models represent flood risk more accurately than the NaFRA2 dataset in these locations.
Poaka Beck Flood Mapping Study, JBA, 3.3% AEP undefended return period	2021	A new and extended 1D-2D hydraulic model of Poaka Beck and its tributary Roose Beck using Flood Modeller and TUFLOW software. The key driver for this study was to produce up to date flood mapping outputs and to produce flood warning deliverables.	Environment Agency	This model has been incorporated into the functional floodplain layer following consultation with the Environment Agency as it is acknowledged that this local model represents flood risk more accurately than the NaFRA2 dataset, in particular the Poaka Beck model is more conservative at Roose Gate in Barrow-in-Furness.
Flood Map for Planning (rivers and sea) Flood Storage Areas*	2024	Areas that act as a balancing reservoir, storage basin or balancing pond.	DEFRA Data Services Platform	Flood Storage Areas are advised to be included within the functional floodplain but should be consulted on for appropriateness with the Environment Agency.

*Please note, in August 2025, Flood Storage Areas are now referred to as Water Storage Areas.

3.2 GIS Methodology

- 3.2.1 The '*Rivers and Sea 3.3% defended - present day*' dataset has been used as a baseline, as advised in the Environment Agency's SFRA guidance². This was refined by incorporating model outputs from the Milnthorpe local hydraulic model (specifically the Stainton Beck, Holme Beck and Milnthorpe sections) and the Poaka Beck local hydraulic model to '*Rivers and Sea 3.3% defended flood risk extents - present day*'. The 3.3% AEP was available for both local models. As such, a new functional floodplain outline has been delineated where the '*Rivers and Sea 3.3% defended flood risk extents - present day*' dataset has been clipped to the model outputs of the Milnthorpe and Poaka Beck in these locations. The data has been supplied in a single shapefile. The attribute table of the functional floodplain shapefile contains information on the data source that has been used to delineate the functional floodplain.
- 3.2.2 It has been assumed that any dry islands falling within the functional floodplain outline should be considered as part of the functional floodplain. Although these areas have not been manually incorporated into the mapped outline, they should nonetheless be regarded as the functional floodplain for planning and assessment purposes.
- 3.2.3 Buildings and infrastructure footprints within the functional floodplain have been retained within the outline, i.e. they have not been removed on the assumption that floodwater ingress may occur. The Environment Agency SFRA guidance² states that functional floodplain does not need to be designated in locations where evidence shows flooding would be prevented by existing buildings, however it may be simpler to include them and use local policies to control the redevelopment or changes of use that may be acceptable.

4. Recommendations

- 4.1.1 A local policy regarding the functional floodplain should be outlined as part of the upcoming Local Plan.
- 4.1.2 The extent of the functional floodplain produced from this Level 1 SFRA should always be assessed in greater detail where a more detailed study, such as a Level 2 SFRA or site-specific FRA, is undertaken.
- 4.1.3 The functional floodplain dataset should be reviewed regularly, and the delineation should be updated if any data inconsistencies are found in the modelling or if any new or updated hydraulic modelling is undertaken. The functional floodplain delineation should be updated once the Ulverston, 2024 modelling is available for use as there are some inconsistencies in the '*Rivers and Sea 3.3% defended flood risk extents - present day*', for example around the Honeypot estates and area near the Ulverston Canal. However, at the time of writing, the '*Rivers and Sea 3.3% defended flood risk extents - present day*' is the best available dataset for representing flood risk in Ulverston.

Appendix C Summary of Recommendations

The following recommendations are made throughout the SFRA report:

- Recommendation 4-1** *The Council should consider whether to establish Coastal Change Management Areas (CCMA) to ensure prospective developers are made aware of the potential risks and inappropriate development is avoided. In doing so, the council will need to consider a range of factors including flood risk, coastal erosion and SMP management approaches.* 36
- Recommendation 4-2** *A local policy regarding functional floodplain should be outlined as part of the upcoming Local Plan.* 39
- Recommendation 4-3** *The extent of the functional floodplain produced from this Level 1 SFRA should always be assessed in greater detail where a more detailed study, such as a Level 2 SFRA or site-specific FRA, are undertaken.* 39
- Recommendation 4-4** *The functional floodplain dataset should be reviewed regularly and the delineation should be updated if any data inconsistencies are found in the modelling or if any new or updated hydraulic modelling is undertaken. For example, the functional floodplain delineation should be updated once the Ulverston, 2024 modelling is available for use, as there are some inconsistencies in the 'Rivers and Sea 3.3% defended flood risk extents - present day', for example around the Honeypot estates and area near the Ulverston Canal. However, at the time of writing, the 'Rivers and Sea 3.3% defended flood risk extents - present day' is the best available dataset for representing flood risk in Ulverston.* 39
- Recommendation 4-5** *It is recommended that Network Rail, in conversation with United Utilities, undertake a targeted review of surface water drainage infrastructure along low-lying and estuarine sections of railway and coordinate with local flood risk management authorities. This will ensure there are no operational impact to these assets.* 44
- Recommendation 4-6** *Groundwater investigations should be carried out as part of site-specific FRAs, particularly for proposed developments that include basements. It is essential to demonstrate that the site is not located on a key groundwater flow path, as the introduction of subsurface barriers could increase the risk of groundwater flooding in surrounding areas.* 47
- Recommendation 4-7** *The design of on-site drainage systems will need to mitigate the risk of groundwater ingress which can contribute to hydraulic issues in the public sewer network.* 47
- Recommendation 4-8:** *Where required, local hydraulic models should be updated with current Environment Agency Climate Change Allowances, particularly for Ulverston.* 51
- Recommendation 4-9** *The Council should ensure communication between LPAs to make sure that action in one does not negatively impact upon another.* 54
- Recommendation 5-1** *The Council should ensure the Sequential Test is undertaken for all available land allocations and check that the vulnerability classification of the proposed land use is appropriate to the Flood Zone classification.* 59
- Recommendation 5-2** *The Council should pursue opportunities to move existing development from within the floodplain to areas with a lower risk of flooding. This should include consideration of the vulnerability of existing developments and whether there is potential for land swap with lower vulnerability uses.* 59
- Recommendation 5-3** *The Council should ensure that clear justification is documented for any sites that may not pass the Sequential Test but have a sustainable rationale for their geographic location. This would support their allocation in the Local Plan and provide the Council with a mechanism for setting out specific mitigation strategies and/or development requirements that will need to be met for the sites. This would prevent them coming forward as windfall sites, over which the Council have less opportunity to inform development.* 59

- Recommendation 5-4** *The Council should keep an up-to-date register of ‘reasonably available’ sites (for example as part of their housing and/or economic land availability assessments), clearly ranked in flood risk preference, and prepare guidance on the appropriate area of search for common development types..... 62*
- Recommendation 5-5** *Apply a sequential approach to the layout and design of individual development sites. ... 63*
- Recommendation 6-1** *Safeguard land for new flood (water) storage areas, specifically near areas anticipated for development..... 66*
- Recommendation 6-2** *Safeguard an 8-metre-wide undeveloped buffer strip alongside Main Rivers (that are not tidally influenced) and prioritise opportunities for riverside restoration. New development within 8m of a Main River will require consent (Flood Risk Activity Permit) from the Environment Agency. 68*
- Recommendation 6-3** *Safeguard an 8-metre-wide buffer strip alongside Ordinary Watercourses. Prioritise opportunities to de-culvert watercourses. If any works, temporary or permanent, are required within 8m of an Ordinary Watercourse, an Ordinary Watercourse Land Drainage Consent from Westmorland and Furness Council (as LLFA) would be required. Proposed structures and obstructions within a watercourse will require consent from Westmorland and Furness Council (as LLFA). As per the Land Drainage Act 1991, “no person shall 68*
- Recommendation 6-4** *Safeguard a 16-metre-wide undeveloped buffer strip alongside sea defences and tidal watercourses. Only temporary development will be permitted on this land. Where land safeguarded for future flood defence works falls within a development site, opportunities should be taken to integrate future flood defence requirements into the landscaping and open space provision for the site. 68*
- Recommendation 6-5** *Safeguard land likely to be needed for green infrastructure. 69*
- Recommendation 6-6** *Extend and enhance existing Green Infrastructure (GI) in the Council’s study area including the implementation of floodplain and riparian woodland planting schemes. Land that is likely to be needed for natural flood management should be safeguarded. Consideration should also be given to any necessary access to that land, and any additional land which may be needed temporarily during construction. 71*
- Recommendation 6-7** *It is recommended that the Council work with land managers and farmers to reduce soil erosion from intensively farmed land and encourage NFM. 71*
- Recommendation 6-8** *Through measures to manage and mitigate flood risk, the Council should also seek opportunities to achieve wider environmental benefits. 73*
- Recommendation 6-9** *Consult NWL and UU to identify preferred locations for development and any specific flood risk concerns (sewers and reservoirs). Ensure there is policy provision which allows for the coordination of development with infrastructure provision. Include site-specific policy on development constraints, including flood risk concerns, and set out clear sustainable drainage requirements for a site in policy. Reflect any circumstances and investment needs in the wider associated evidence base (SFRA, Infrastructure Delivery Plans and Water Cycle Study)..... 75*
- Recommendation 6-10** *It is recommended that whilst a Water Cycle Study is undertaken to support the review of Water Stressed Areas, UU has concluded a supply and demand balance deficit and the Council should work with UU to implement water efficiency measures at a regional level. 76*
- Recommendation 6-11** *Developers must demonstrate how collected water will be reused before considering any alternative drainage options in accordance with the SuDS Hierarchy. 77*
- Recommendation 6-12** *The runoff from all major developments and other development shall not increase the risk of flooding elsewhere from any source. The rate and volume of surface water run off must be controlled in accordance with the new National Standards for Sustainable Drainage Systems. SuDS should be used to reduce and manage surface water run-off to and from proposed developments as near to source as possible in accordance with the requirements of the new National Standards for Sustainable Drainage Systems and supporting guidance. 77*

Recommendation 6-13 *Where proposed development results in a change in building footprint, land raising or other structures such as bunds, the developer must ensure that it does not impact upon the ability of the floodplain to store water and should seek opportunities to provide betterment with respect to floodplain storage. 81*

Recommendation 6-14 *Future development should assess the potential to impact on the risk of groundwater flooding as a result of sub-surface development or additional infiltration. A preliminary HRA should be undertaken for all proposed developments at the planning application stage. Where required a detailed HRA should be undertaken to determine the potential for impact of groundwater flooding and appropriate mitigation measures. 82*

Recommendation 6-15 *Where development or redevelopment is proposed in areas at risk of flooding, flood resilience measures must be implemented to mitigate the risk of flooding. 83*

Recommendation 6-16 *Where developing in Flood Zone 2 and 3 is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (residential) and Highly Vulnerable land uses, is to ensure internal floor levels are raised a freeboard level above the design flood level i.e. the known or modelled 1% AEP flood level for rivers or the 0.5% AEP flood level for tidal, including an allowance for climate change. 83*

Recommendation 6-17 *Basement dwellings should not be permitted in Flood Zone 3. 84*

Recommendation 7-1 *Where development is proposed or expected in Flood Zone 2 or 3, at high surface water risk or at high risk of flooding from other sources (including groundwater, sewer and artificial sources) (particularly those that have potentially vulnerable users or residual flood risks with implications for emergency planning), an Emergency Plan should be prepared as part of a FRA to demonstrate what actions site users will take before, during and after a flood event to ensure their safety, and to demonstrate their development will not impact on the ability of the local authority and the emergency services to safeguard the current population. 87*

Recommendation 7-2 *Local planning authorities should work with their emergency planning officers to produce local guidelines setting out requirements for flood warning, evacuation and places of safety, against which individual planning applications can then be judged. These should avoid additional burdens on emergency services, explore opportunities for development proposals to address any shortfall in emergency service and infrastructure capacity, and minimise the need for further consultation at planning application stage. It is ultimately the decision of the local planning authority to require an emergency plan. 88*

Recommendation 7-3 *New development must have safe access / escape along a dry route to an area outside the floodplain during design flood conditions including an allowance for climate change. 89*

Recommendation 8-1 *Developers or those preparing FRAs on their behalf, should liaise with the Environment Agency at the earliest opportunity to obtain available modelling outputs and seek clarity on whether local models or NaFRA2 outputs are considered more accurate, particularly whilst NaFRA2 outputs are still being refined. ... 94*

Recommendation 8-2 *Where modelling is not available for an Ordinary Watercourse, developers or those preparing the FRA on their behalf should undertake additional hydraulic modelling. 94*

Recommendation 8-3 *At all stages, the Council, and where necessary the Environment Agency and/or the Statutory Water Undertaker(s) and/or Statutory Wastewater Undertaker(s) may need to be consulted to ensure the FRA provides the necessary information to fulfil the requirements for planning applications. 95*

