Copeland Borough Council Level 1 Strategic Flood Risk Assessment

Final Report

October 2021

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Revision history

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V1 Draft Report / June 2021		Chris Hoban
V2 Final Report / October 2021	Stakeholder comments	Chris Hoban

Contract

This report describes work commissioned by Chris Hoban, on behalf of Copeland Borough Council, by a letter dated 16 April 2021. Copeland Borough Council's representative for the contract was Chris Hoban. Hannah Bishop and Mike Williamson of JBA Consulting carried out this work.

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Purpose

This document has been prepared as a Draft Report for Copeland Borough Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by Copeland Borough Council for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Copeland Borough Council.

Acknowledgements

JBA would like to thank representatives of Copeland Borough Council, Cumbria County Council, the Environment Agency and United Utilities for information provided to inform this assessment.

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Executive summary

This Level 1 Strategic Flood Risk Assessment (SFRA) is an update to the Draft Level 1 Strategic Flood Risk Assessment, completed 2018, using up-to-date flood risk information together with the most-current flood risk and planning policy available from the National Planning Policy Framework[1] (NPPF) (2021) and Flood Risk and Coastal Change Planning Practice Guidance[2] (FRCC-PPG).

The Level 1 SFRA is focused on collecting readily available flood risk information from a number of stakeholders, the aim being to help identify the number and spatial distribution of flood risk sources present throughout the Copeland Borough Council's Local Plan area to inform the application of the Sequential Test.

Copeland Borough Council (CBC) requires this Level 1 SFRA to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary. This will help to inform and provide the evidence base for the Local Planning Authority's (LPA) review of the Local Plan.

The LPA provided its latest assessed sites data and information. As assessment of flood risk for all assessed sites is provided to assist the LPA in its decision-making process for sites to take forward as part of the review of the Local Plan.

A number of CBC's possible development sites are shown to be at varying risk from fluvial / tidal, surface water and residual risk. Development consideration assessments for all assessed sites are summarised through a number of strategic recommendations within this report and the development sites assessment spreadsheet in Appendix C. The strategic recommendations broadly entail the following:

- Strategic Recommendation A – consider withdrawal based on significant level of fluvial / tidal flood risk (if development cannot be directed away from areas of risk);
- Strategic Recommendation B – Exception Test required;
- Strategic Recommendation C – detailed consideration of site layout and design around flood risk will be required;
- Strategic Recommendation D – development could be allocated subject to the findings of a site-specific Flood Risk Assessment; and
- Strategic Recommendation E – development could be allocated on flood risk grounds subject to suitable consultation with the Local Planning Authority and Lead Local Flood Authority.

Possible development sites

A total of 119 sites were screened against the latest available flood risk information. The majority of the sites were housing at 79 with smaller numbers of other uses: 21 employment, 18 opportunity areas and one wellbeing village.

Following the flood risk screening, three sites are recommended as being potentially unsuitable for development due to their location within the functional floodplain.

There are two sites to which Strategic Recommendation B applies. Overall, there are 20 potential sites to which Strategic Recommendation C applies. Of these sites, 10 have over 97% within Flood Zone 1, meaning surface water is the main source of risk requiring mitigation at these sites. For these sites, the developer should carefully consider site layout and design with a view to removing the development site footprint

[1] https://www.gov.uk/government/publications/national-planning-policy-framework--2
[2] https://www.gov.uk/guidance/flood-risk-and-coastal-change

from the flood zone that is obstructing development i.e. the high and medium risk surface water flood zones. If this is not possible then the alternative would be to investigate the incorporation of on-site storage of water into the site design through appropriate SuDS, following detailed ground investigation.

Strategic Recommendation D applies to 84 sites with 76 of these sites being wholly within Flood Zone 1. Strategic Recommendation E applies to 10 sites.

SFRA Recommendations

The main planning policy and flood risk recommendations to come out of this SFRA are outlined briefly below and are based on the fundamentals of the National Planning Policy Framework and the Flood Risk and Coastal Change Planning Practice Guidance. Section 8.2 of this report provides further detail.

SFRA recommendation:

- No development within the functional floodplain, unless development is water compatible;
- Surface water flood risk should be considered with equal importance as fluvial risk;
- The sequential approach must be followed in terms of site allocation and site layout;
- Ensure site-specific Flood Risk Assessment are carried out to a suitable standard, where required, with full consultation required with the LPA / LLFA, the EA, and United Utilities;
- Appropriate investigation and use of suitably sourced SuDS;
- Natural Flood Management techniques must be considered for mitigation;
- Phasing of development must be carried out to avoid possible cumulative impacts; and
- Planning permission for at risk sites can only be granted by the LPA following a site-specific FRA.

Included within this Level 1 SFRA, along with this main report, are:

- Detailed interactive GeoPDF maps showing all available flood risk information together with the assessed sites – Appendix B;
- Development site assessment spreadsheet detailing the risk to each site with recommendations on development – Appendix C;
- A note on the delineation of the functional floodplain following discussion and agreement between CBC and the EA – Appendix D;
- Figures showing the proposed sites with their strategic recommendation – Appendix F; and
- A User Guide for the SFRA – Appendix G.

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Abbreviations

AAP	Area Action Plan
ABD	Area Benefitting from Defences
ACDP	Area with Critical Drainage Problems
AEP	Annual Exceedance Probability
BGS	British Geological Survey
CaBA	Catchment Based Approach
CBC	Copeland Borough Council
CC	Climate change
CCC	Cumbria County Council
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
DPD	Development Plan Document
DTM	Digital Terrain Model
EA	Environment Agency
FAA	Flood Alert Area
FAS	Flood Alleviation Scheme
FCDPAG	Flood and Coastal Defence Project Appraisal Guidance
FCERM	Flood and Coastal Erosion Risk Management
FCRMS	Flood and Coastal Risk Management Strategy
FDGiA	Flood Defence Grant in Aid
FEH	Flood Estimation Handbook
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FRCC-PPG	Flood Risk and Coastal Change Planning Practice Guidance
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FRMS	Flood Risk Management Strategy
FRR	Flood Risk Regulations
FSA	Flood Storage Area
FWA	Flood Warning Area
FWMA	Flood and Water Management Act
GI	Green Infrastructure
GIS	Geographical Information Systems
HFM	Historic Flood Map
IDB	Internal Drainage Board
LA	Local Authority
LASOO	Local Authority SuDS Officer Organisation
LDF	Local Development Framework
LFRMS	Local Flood Risk Management Strategy
LFRZ	Local Flood Risk Zone
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum

MAFRP	Multi-Agency Flood Response Plan
MHCLG	Ministry of Housing, Communities and Local Government
NFM	Natural Flood Management
NGO	Non-Governmental Organisation
NPPF	National Planning Policy Framework
PCPA	Planning and Compulsory Purchase Act
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RBMP	River Basin Management Plan
RFO	Recorded Flood Outline
RFCC	Regional Flood and Coastal Committee
RoFSW	Risk of Flooding from Surface Water
RMA	Risk Management Authority
RoFRS	Risk of Flooding from Rivers and the Sea
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SoP	Standard of Protection
SPD	Supplementary Planning Document
SuDS	Sustainable Drainage System
SWMP	Surface Water Management Plan
UKCP09	UK Climate Projections 2009
UKCP18	UK Climate Projections 2018
UU	United Utilities
WCS	Water Cycle Study
WFD	Water Framework Directive
WwNP	Working with Natural Processes

1 Introduction

1.1 Commission

Copeland Borough Council (CBC) commissioned JBA Consulting by a letter dated 16 April 2021 for the updating of the Draft Level 1 Strategic Flood Risk Assessment (SFRA) from 2018. CBC requires this update to bring the SFRA fully in line with the Environment Agency's (EA) 'How to prepare a strategic flood risk assessment[3]' guidance, last updated August 2019, at the time of writing.

CBC is preparing a new Local Plan which will replace the 'Copeland Local Plan 2013-2028 Core Strategy and Development Management Policies' (adopted 2013). This plan will set out the vision and planning and development strategy for the borough to 2038 and will comprise of a series of policies, site allocations and land designations. In order to support the preparation of the Plan, it will be informed by an up to date evidence base.

1.2 Strategic Flood Risk Assessment

All local planning authorities should produce a level 1 SFRA. A level 2 SFRA may also be required depending on whether the Local Authority has plans for development in flood risk areas, identified in the Level 1 SFRA. The EA's SFRA guidance for local planning authorities states:

"Your SFRA will help your planning authority make decisions about:

- *your local plan or spatial development strategy*
- *individual planning applications*
- *how to adapt to climate change*
- *future flood management*
- *emergency planning (the resources needed to make development safe)*

You also need it to help you:

- *carry out the sequential test for the local plan or spatial development strategy, and individual planning applications*
- *do the exception test, when you're proposing to allocate land for development in flood risk areas*
- *establish if a development can be made safe without increasing flood risk elsewhere*
- *decide when a flood risk assessment will be needed for individual planning applications*
- *identify if proposed development is in functional floodplain*
- *do the sustainability appraisal of the local plan or spatial development strategy."*

1.3 Copeland Level 1 SFRA

This SFRA has been carried out in accordance with Government's latest development planning guidance including the revised National Planning Policy Framework (NPPF) (2021) and flood risk and planning policy guidance, the Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG) (last updated March 2014, at the time of writing).

[3] https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment

The latest guidance is available online via:

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change

An updated version of the NPPF was published on 20 July 2021 and sets out Government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous NPPF published in March 2012 and is available via:

https://www.gov.uk/government/publications/national-planning-policy-framework--2

The purpose of a SFRA is to highlight areas that may flood, taking into account known sources of flooding and the likely impacts of climate change. This enables the local planning authority to prepare policies for flood risk management of potential areas of flood risk and to make development allocations taking this constraint into account.

It is advised that the SFRA should be used to inform the Sustainability Appraisals of Local Development Documents and it will provide the basis from which to apply the Sequential Test and Exception Test (if applicable) which come into play when it is not possible to locate development in a zone with a lower probability of flooding, most preferably Flood Zone 1.

The objective for the Local Plan process is to allocate land for vulnerable uses in lower flood risk flood zones. The SFRA will provide an aid to decision-making and forms part of the evidence base for the new Local Plan on the issue of flooding.

This SFRA assesses the spatial distribution of flood risk across the local authority area, and provides the discussion and guidance required to put this information into practice when taking account of flood risk in development plans and the level of detail required to carry out site specific Flood Risk Assessments (FRAs).

This SFRA makes use of the most up-to-date flood risk datasets, available at the time of submission, to assess the extent of risk, at a strategic level, to potential development allocation sites identified by CBC which acts as the Local Planning Authority (LPA).

The SFRA appendices contain interactive GeoPDF maps (Appendix B) showing the potential development sites overlaid with the latest, readily available, gathered flood risk information along with a Development Site Assessment spreadsheet (Appendix C) indicating the level of flood risk to each site following a strategic assessment of risk. Each potential site is assigned a strategic recommendation, discussed in Section E.2 of Appendix E. This information will allow the LPA to identify the strategic development options that may be applicable to each site and to inform on the application of the Sequential Test.

1.4 Aims and objectives

The aims and objectives of this Level 1 SFRA, in line with the NPPF (2021), FRCC-PPG (2014), EA SFRA guidance (2020) and as specified by CBC, are to:

- Determine the variations in risk from all sources of flooding including:
    - Fluvial and tidal from main rivers, ordinary watercourses, estuaries and coastlines (Flood Map for Planning and functional floodplain),
    - Surface water (pluvial and sewer),
    - Groundwater,
    - Residual risk from reservoirs and canals,
- Determine the risks to and from neighbouring authorities in the same flood catchments,

- Assess existing and future flood risk management, including defence infrastructure, defence types, Standards of Protection, condition as per T98 specifications, Areas Benefitting from Defences and associated residual risk,
- Assess both existing risk and long-term risk using the EA's latest climate change allowances (where available), and also historic flood events,
- Inform the Sustainability Appraisal of the Council's new Local Plan so that flood risk is fully taken into account when considering allocation options and in the preparation of policies for flood risk management to ensure no increase in flood risk,
- Screen all potential development sites against flood risk data to enable application of the Sequential Test as part of the Level 1 SFRA and, where necessary, the Exception Test, through a Level 2 SFRA, when determining potential land use allocations,
- Identify the requirements for site-specific flood risk assessments in targeted locations, including those at risk from sources other than rivers,
- Determine the acceptability of flood risk in relation to the emergency planning capabilities of the Local Resilience Forum, focusing in particular on identifying safe access and egress routes from new developments, and also EA flood warnings,
- Consider opportunities to reduce flood risk to existing communities, infrastructure and developments through better management of surface water, provision for conveyance, storage of floodwater through appropriate Sustainable Drainage Systems (SuDS). Also, through natural flood management and the use of blue-green infrastructure and open space for flood storage and amenity use through blue/green corridors,
- Review locations where additional development may significantly increase flood risk elsewhere (cumulative impacts) and where development pressures may require the Exception Test to be applied (i.e. where a Level 2 assessment is required),
- Recommend possible flood mitigation solutions that may be integrated into site design (by the developer) to minimise risk to property and life (in accordance with the NPPF Exception Test) where flood risk has been identified as a potential constraint to future development,
- Provide a reference and policy document to advise and inform the general public and private and commercial developers of their obligations under the NPPF,
- Enable the SFRA to be used as a tool to inform the Development Management process about the potential risk of flooding associated with future planning applications and the basis for requiring site-specific FRAs where necessary,

1.5 Consultation

The EA's 2019 SFRA guidance recommends consultation with the following parties, external to the LPA:

- the EA,
- the LLFA,
- emergency planners,
- emergency services,
- water and sewerage companies,
- reservoir owners or undertakers, if relevant,
- internal drainage boards, if relevant,

- highways authorities,
- district councils,
- regional flood and coastal committees.

1.6 SFRA Future Proofing

This SFRA has been developed using the most up-to-date data and information available at the time of submission. The SFRA has been future proofed as far as possible though the reader should always confirm with the source organisation (CBC) that the latest information is being used when decisions concerning development and flood risk are being considered. The FRCC-PPG, alongside the NPPF, is referred to throughout this SFRA, being the current primary development and flood risk guidance information available at the time of the finalisation of this SFRA.

The EA's 2019 SFRA guidance states a review of a SFRA should be carried out when there are changes to:

- the predicted impacts of climate change on flood risk,
- detailed flood modelling - such as from the EA or LLFA,
- the local plan, spatial development strategy or relevant local development documents,
- local flood management schemes,
- flood risk management plans,
- local flood risk management strategies,
- national planning policy or guidance.

The SFRA should also be reviewed after a significant flood event. It is in any authority's interest to keep the SFRA as up to date as possible.

Where possible, the SFRA should be kept as a 'live' entity and continually updated when new information becomes available. The EA requests for reports and maps to be published online and be easily updateable, when required.

This SFRA uses the EA's Flood Map for Planning (FMfP) version issued in May 2021 to assess fluvial to the potential development sites. The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since May 2021, via the following link:

https://flood-map-for-planning.service.gov.uk/

To assess the surface water risk to the potential development sites, this SFRA uses the EA's Risk of Flooding from Surface Water (RoFSW) dataset, last updated March 2020 at the time of writing. This dataset can be updated periodically when applicable local surface water modelling is carried out that adheres to the EA's required methodology. The reader should therefore refer to the online version of the RoFSW map to check whether the surface water flood outlines have been updated, via the following link:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

2 Study area

According to the 2011 census population estimates[4], 70,603 people live in the Borough of Copeland, including the area within the LDNP. Situated in the west of Cumbria and including the western coastline, the Borough covers approximately 73,170 hectares of land. The largest town in the Borough is Whitehaven, with other smaller towns such as Egremont, Millom and Cleator Moor. Historically, the region primarily relied on agriculture, mining and the nuclear industry, however tourism is now also one of the most important sources of income and employment. Sellafield nuclear site, based on the western coastline and adjacent to the River Ehen, is still a major source of employment and income to the Borough.

The presence of built up areas in low lying locations along the coast, such as Whitehaven, Millom, Haverigg, Seascale, St Bees and Parton means that tidal flooding is a significant source of risk to these towns and villages, and to beach properties at Braystones, Nethertown and Coulderton. According to the 2007 SFRA, the greatest risk of flooding to Copeland is from tidal sources. Fluvial flooding, culvert related problems and sewer network failure comprise other sources of flood risk within the borough[5].

The scope of this SFRA relates to the areas of Copeland that lay outside of the Lake District National Park.

2.1 Geology

To the north, the bedrock geology of the mountainous areas is made up of igneous rocks with areas of mudstone, sandstone and siltstone. To the south, the lower lying regions consist of interbedded sedimentary rocks (mudstone, siltstone, sandstone and conglomerate). Areas in the easternmost and southernmost parts of the Borough are characterised by limestone bedrock. Superficial deposits in the valleys are largely composed of glacial till and alluvial sand and gravel.

The upland region is cut by deeply dissected, glaciated valleys radiating from the core of the Lake District. Away from the Lake District core, the topography becomes much flatter especially where the bedrock is masked by glacial deposits such as the Solway lowlands and the coastal plain southwards from St Bees to the Duddon Estuary (Akhurst et al., 1997).

2.2 Topography

Figure 2-1 shows the general topography of the Copeland authority area. The topography of the area is characterised by the high fells of the Lake District to the east from where the rivers drain south and westwards towards the Irish Sea. The valley floors often have large expanses of floodplain and the steep nature of catchments means water is transferred to the channels relatively quickly.

4 http://www.ons.gov.uk/ons/guide-method/census/2011/index.html

5 Copeland Borough Council 2007 Strategic Flood Risk Assessment

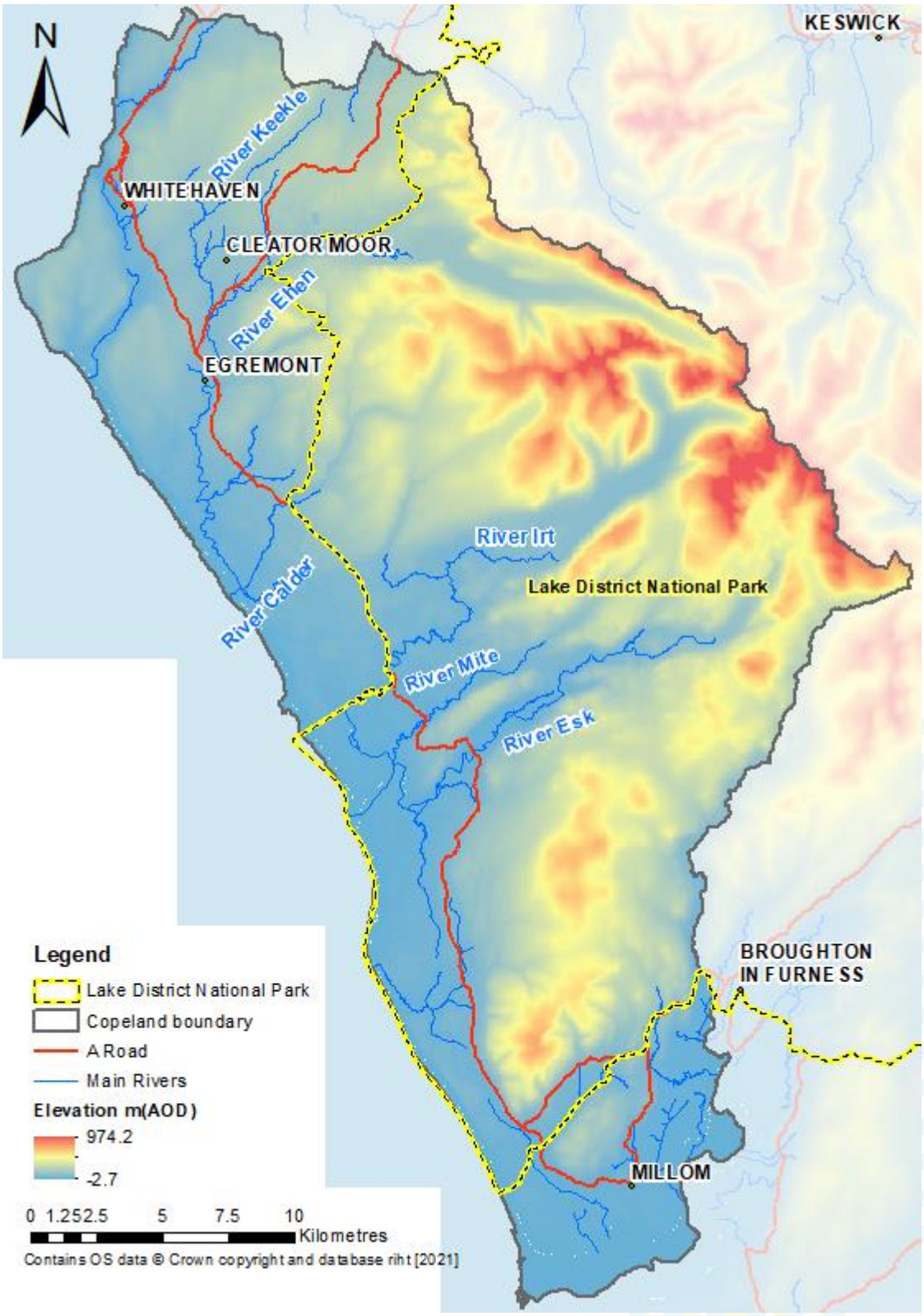

Figure 2-1: DTM Representation of the Topography of Copeland

2.3 Main rivers

Main rivers are usually larger rivers and streams. The EA has permissive powers to carry out maintenance, improvement or construction work on main rivers to manage

flood risk. The EA also regulate development or works on, over, under or within 8 metres of fluvial main river watercourses (16 metres for tidal main river watercourses) under the Environmental Permitting (England and Wales) Regulations 2016. This also includes within the floodplain, if the works do not have planning permission and works involving quarrying or excavation within 16 metres of any main river, flood defence or culvert. The range of activities subject to regulation are listed at:

https://www.gov.uk/guidance/flood-risk-activities-environmental-permits#check-if-the-activity-is-on-a-main-river

While the EA has permissive powers to undertake works, the maintenance of Main Rivers is primarily the responsibility of riparian owners.

The main rivers of note where flood risk and flood management exist are primarily on the:

- River Ehen
- River Keekle
- River Esk
- River Bleng
- River Calder
- River Mite
- River Irt
- Pow Beck

2.4 Ordinary watercourses

Ordinary watercourses are any watercourse that is not designated as a Main River. These watercourses can vary in size considerably and can include rivers, streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 2014) and passages, through which water flows. 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.

Ordinary watercourses come under the regulation of the LLFA, which has permissive powers to carry out works, should this be deemed necessary, and have regulatory control over certain development activities within the watercourse channel. However, the responsibility for the maintenance of Ordinary Watercourses lies with the riparian owner. A riparian owner is anyone who owns a property where there is a watercourse within or adjacent to the boundaries of their property; they are responsible for watercourses or culverted watercourses passing through their land.

3 Understanding flood risk

3.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations, as discussed below. It constitutes a temporary covering of land not normally covered by water and presents a risk when human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways. Major sources of flooding (also see Figure 3-1) include:

- **Fluvial** (main rivers and ordinary watercourses) – inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- **Tidal** – sea; estuary; overtopping of defences; breaching of defences; other flows (e.g. fluvial surface water) that could pond due to tide locking; wave action.
- **Surface water** – surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highways drains, etc.)
- **Groundwater** – water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- **Infrastructure failure** – reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

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

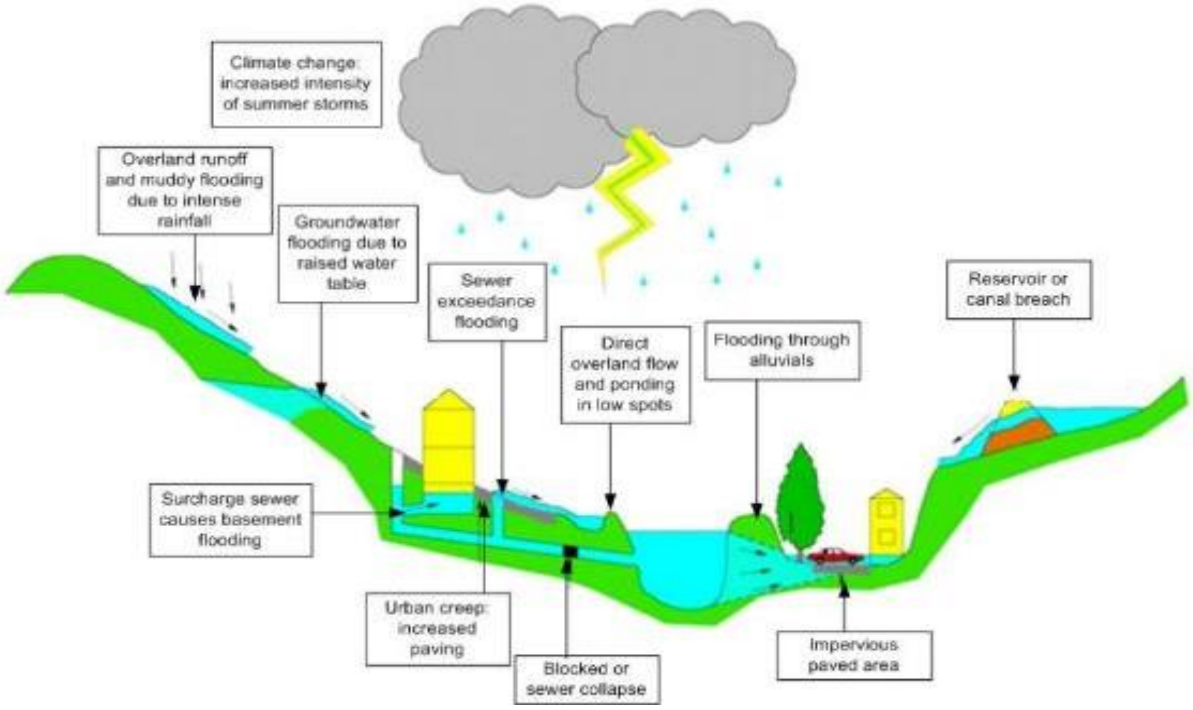

Figure 3-1: Flooding from all sources

3.2 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 3-2 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

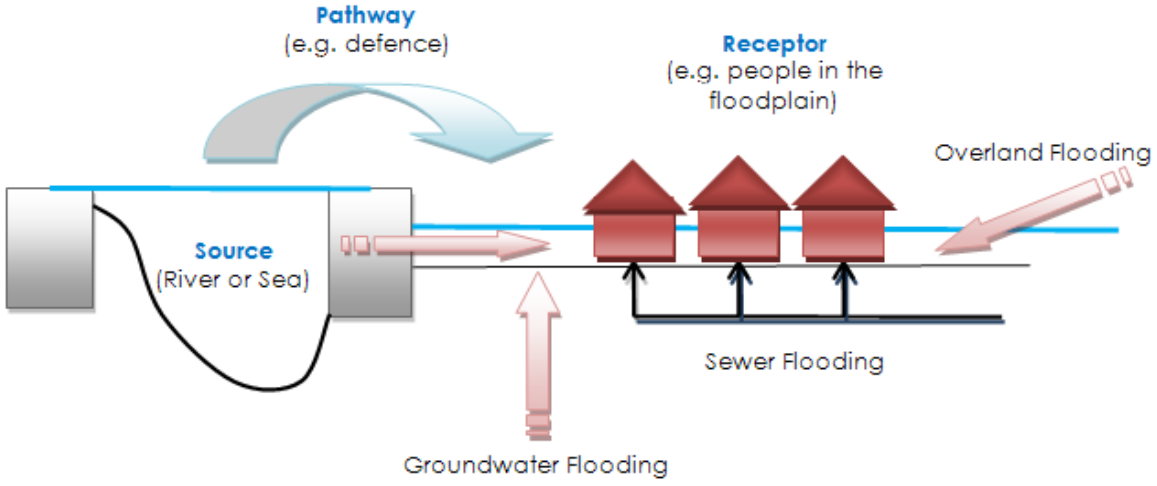

Figure 3-2: Source-Pathway-Receptor Model

The principal sources are rainfall or higher than normal sea levels, the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets and the receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding, but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a consistent manner.

3.2.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

The FRCC-PPG states that in terms of flood risk and coastal change, the lifetime of residential development should be considered as a minimum of 100 years, unless there is specific justification for considering a shorter period. Table 3-1 provides an example of the flood probabilities used to describe the fluvial and tidal flood zones as defined in the FRCC-PPG and as used by the EA in its Flood Map for Planning (Rivers and Sea).

Note that Flood Zone 3b (the functional floodplain) is not included in the FMfP but is used by the LPA to show where new development should not be permitted. Also note that the FMfP does not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	**This zone comprises land where water has to flow or be stored in times of flood.** Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 3-1: NPPF flood zones[6]

[6] Table 1: Flood Zones, Paragraph 065 of the Flood Risk and Coastal Change Planning Practice Guidance

3.2.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure of the population, presence and reliability of mitigation measures etc.). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

3.3 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

3.3.1 Actual risk

This is the risk 'as is' taking into account any flood defences that are in place for extreme flood events (typically these provide a minimum Standard of Protection (SoP)). Hence, if a settlement lies behind a fluvial flood defence that provides a 1 in 100-year SoP then the actual risk of flooding from the river in a 1 in 100-year event is generally low. However, the residual risk may be high in that the impact of flood defence failure would likely have a major impact.

Actual risk describes the primary, or prime, risk from a known and understood source managed to a known SoP. However, it is important to recognise that risk comes from many different sources and that the SoP provided will vary within a river catchment. Hence, the actual risk of flooding from the river may be low to a settlement behind the defence but moderate from surface water, which may pond behind the defence in low spots and is unable to discharge into the river during high water levels.

3.3.2 Residual risk

Defended areas, located behind EA, CCC and private organisation flood defences, remain at residual risk as there is a risk of overtopping or defence breach during significant flood events. Whilst the potential risk of failure may be reduced, consideration of inundation and the impact on development needs to be considered.

Paragraph 041 of the FRCC-PPG defines residual risk as:

"…those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- *The failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;*
- *failure of a reservoir, or;*
- *a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.*

Areas behind flood defences are at particular risk from rapid onset of fast-flowing and deep-water flooding, with little or no warning if defences are overtopped or breached."

Even when flood defences are in place, there is always a likelihood that these could be overtopped in an extreme event or that they could fail or breach. Where there is a

consequence to that occurrence, this risk is known as residual risk. Defence failure can lead to rapid inundation of fast flowing and deep floodwaters, with significant consequences to people, property and the local environment behind the defence. Whilst the actual risk of flooding to a settlement that lies behind a fluvial flood defence that provides a 1 in 100-year SoP may be low, there will always be a residual risk from flooding if these defences overtopped or failed that must be taken into account. Because of this, it is never appropriate to use the term "flood free".

Developers must be able to demonstrate that development will be safe for the lifespan of the development. To that end, Paragraph 042 of the FRCC-PPG states:

"Where residual risk is relatively uniform, such as within a large area protected by embanked flood defences, the Strategic Flood Risk Assessment should indicate the nature and severity of the risk remaining, and provide guidance for residual risk issues to be covered in site-specific flood risk assessments. Where necessary, local planning authorities should use information on identified residual risk to state in Local Plan policies their preferred mitigation strategy in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications".

Table 5-3 (Section 5.7.1) lists the main EA defences in the CBC area and Table 5-4 lists the Areas Benefitting from Defences (ABD). The EA defences and ABD dataset are also shown on the SFRA maps in Appendix B.

Residual flood risk from breach or overtopping of defences must be managed for any new development. This could be achieved by ensuring flood levels are raised a minimum of 600 mm above the critical design event flood level whilst also accounting for freeboard (as advised by the EA). However, compensatory storage must be found where the risk is fluvial. If this cannot be achieved, it is for the applicant to identify alternative mitigation measures. Stilted development is an option whereby floodwaters can still flow naturally though this can prove to be a costly solution. Any site identified to be at residual risk must have suitable site access and egress routes available during times of flood together with a full emergency plan that should accompany the FRA at the application stage. The provisions of suitable flood warning systems should also be investigated.

Detailed mitigation must be agreed through site-specific FRAs or through Level 2 SFRAs where it would be necessary to demonstrate site allocations would be safe for their lifetime.

Chapter 6 discusses various mitigation measures that may be appropriate depending on the site-specific circumstances.

4 The planning framework and flood risk policy

4.1 Introduction

The main purpose of this section and Appendix A of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of the LLFA's and LPA's responsibilities and duties in respect to managing local flood risk including but not exclusive to the delivery of the requirements of the Flood Risk Regulations (FRR) 2009 and the Flood and Water Management Act (FWMA) 2010[7].

Figure 4-1 illustrates the links between legislation, national policy, statutory documents and assessment of flood risk. The figure shows that whilst the key pieces of legislation and policy are separate, they are closely related, and their implementation should aim to provide a comprehensive and planned approach to asset record keeping and improving flood risk management within communities.

It is intended that the non-statutory Surface Water Management Plans (SWMPs) and SFRAs can provide much of the base data required to support the delivery of the LLFA's statutory flood risk management tasks as well supporting local authorities in developing capacity, effective working arrangements and informing Local Flood Risk Management Strategies (LFRMS) and Local Plans, which in turn help deliver flood risk management infrastructure and sustainable new development at a local level. This SFRA should be used to support the LPA's emerging Local Plan and to help inform planning decisions.

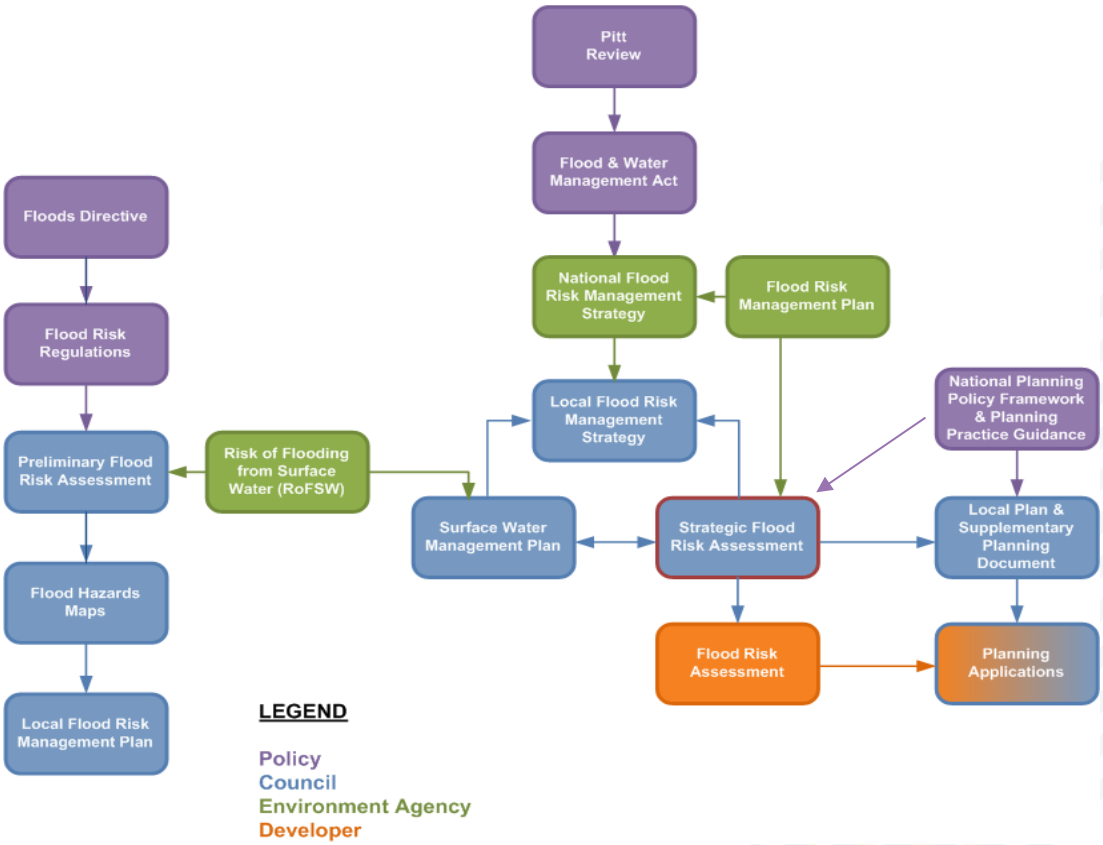

Figure 4-1: Key documents and strategic planning links with flood risk

The remaining flood risk policy information relevant to this study is located in Appendix A.

[7] https://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

5 Flood risk across Copeland Local Plan area

5.1 Flood risk datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within the CBC authority area. The information contained is the best available at the time of publication and is intended to provide CBC with an overview of risk. Table 5-1 provides a summary of the key datasets used in this SFRA according to the source of flooding.

Flood Source	Datasets / Studies
Fluvial / Tidal	EA Flood Map for Planning (Rivers and Sea) (May 2021)
	EA Risk of Flooding from Rivers and Sea map
	Modelled Flood Outlines (MFO) from latest available EA Flood Risk Mapping Studies
	EA Historic Flood Map (HFM) (May 2021)
	EA Recorded Flood Outlines (RFO) (May 2021)
	EA Areas Benefitting from Flood Defences (ABD) (May 2021)
	EA Flood Warning Areas (May 2021)
	EA Shoreline Management Plan (June 2021)
Pluvial (surface water runoff)	EA Risk of Flooding from Surface Water (RoFSW) (March 2020)
	CCC Preliminary Flood Risk Assessment (2011 and 2017)
	Cumbria Surface Water Management Plan (2012)
Sewer	UU Historical Flood Incident Data
Groundwater	BGS Groundwater Potential Flood Map
Reservoir	EA Reservoir Flood Maps (available online)
All sources	North West Flood Risk Management Plan 2015 to 2021
	North West River Basin Management Plan (June 2018)
	Derwent and South West Lakes Catchment Flood Management Plans (2009)
	CCC Local Flood Risk Management Strategy (2015)
	LLFA Historic Flood Records
	CBC Level 1 SFRA Working Draft (2018)
Flood risk management infrastructure	EA Spatial Flood Defence data (May 2021)
	LLFA FRM asset register critical assets

Table 5-1: Flood source and key datasets

5.2 Fluvial flooding

Fluvial flooding is associated with the exceedance of channel capacity during higher flows or as a result of blockage. The process of flooding from watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain; and; infiltration and rate of runoff associated with urban and rural catchments.

The SFRA Maps in Appendix B present the EA's Flood Map for Planning which shows the fluvial coverage of flood zones 2 and 3 across the study area.

5.2.1 EA Flood Map for Planning (Rivers and Sea)

The EA's Flood Map for Planning is the main dataset used by planners for predicting the location and extent of fluvial and tidal flooding. This is supported by the CFMPs and FRMPs along with a number of detailed hydraulic river modelling reports which provide further detail on flooding mechanisms.

The Flood Map for Planning provides flood extents for the 1 in 100 AEP (1%) fluvial event (Flood Zone 3) and the 1 in 1000 AEP (0.1%) fluvial flood events (Flood Zone 2). Flood zones were originally prepared by the EA using a methodology based on the national digital terrain model (NextMap), derived river flows from the Flood Estimation Handbook (FEH) and two-dimensional flood routing. Since their initial release, the EA has regularly updated its flood zones with detailed hydraulic model outputs as part of their national flood risk mapping programme.

The Flood Map for Planning is precautionary in that it does not take account of flood defence infrastructure (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represents a worst-case scenario of flooding. The flood zones do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change. As directed by the FRCC-PPG, this SFRA subdivides Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (functional floodplain – see Section 5.2.2).

The EA also provides a 'Risk of Flooding from Rivers and Sea Map'. This map shows the EA's assessment of the likelihood of flooding from rivers and the sea, at any location, and is based on the presence and effect of all flood defences, predicted flood levels and ground levels. **This dataset is not used in the assessment of flood risk for planning applications** but is a useful source of information to show the presence and effects of flood risk management infrastructure. This dataset is further discussed in Section 5.2.3.

This SFRA uses the Flood Map for Planning issued in May 2021 to assess fluvial risk to the potential development sites, as per the NPPF and the accompanying FRCC-PPG. The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since May 2021:

https://flood-map-for-planning.service.gov.uk/

5.2.2 Functional floodplain (Flood Zone 3b)

The functional floodplain forms a very important planning tool in making space for flood waters when flooding occurs. Development should be directed away from these areas.

Table 1, Paragraph 065 of the FRCC-PPG defines Flood Zone 3b as:

"…land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency."

Paragraph 015 of the FRCC-PPG explains that:

"…the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point to help identify the functional floodplain.

The area identified as functional floodplain should take into account the presence and effect of all flood risk management infrastructure including defences. Areas which would naturally flood, but which are prevented from doing so by existing defences and

infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often."

The functional floodplain outline has been delineated as part of this Level 1 SFRA, as required by the EA's SFRA guidance (2019). The final outline was agreed upon by the LPA, the LLFA and the EA, based on their in-depth local knowledge.

It is important to note that the extent of the functional floodplain outline produced from this Level 1 SFRA should always be assessed in greater detail where any more detailed study such as a Level 2 SFRA or site-specific FRA are undertaken.

A technical note is provided in Appendix D which explains the methodology used in creating the functional floodplain outline.

5.2.3 EA Risk of Flooding from Rivers and the Sea map

This Risk of Flooding from Rivers and Sea map (RoFRS) shows the likelihood of flooding from rivers and the sea based on the presence and effect of all flood defences, predicted flood levels and ground levels and is shown on the Appendix B maps. The RoFRS map splits the likelihood of flooding into four risk categories:

- High – greater than or equal to 1 in 30 AEP event (3.3%) chance in any given year
- Medium – less than 1 in 30 AEP event (3.3%) but greater than or equal to 1 in 100 AEP event (1%) chance in any given year
- Low – less than 1 in 100 AEP event (1%) but greater than or equal to 1 in 1000 AEP flood event (0.1%) chance in any given year
- Very Low – less than 1000 AEP event (0.1%) chance in any given year

The RoFRS map is included on the SFRA maps to act as a supplementary piece of information to assist the LPA in the decision-making process for site allocation.

This dataset is not suitable for use with any planning application nor should it be used for the sequential testing of site allocations. The EA's Flood Map for Planning should be used for all planning purposes, as per the FRCC-PPG.

5.3 Surface water flooding

Surface water flood risk should be afforded equal standing in importance and consideration as fluvial flood risk, given the increase in rainfall intensities due to climate change and the increase in impermeable land use due to development.

Surface water flooding, in the context of this SFRA, includes:

- **Surface water runoff (also known as pluvial flooding); and**
- **Sewer flooding**

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

Paragraph 013 of the FRCC-PPG states that SFRAs should address surface water flooding issues by identifying areas of surface water flooding and areas where there may be drainage issues that can cause surface water flooding. The EA's Risk of Flooding from Surface Water (RoFSW) map along with information within the LFRMS (see Section A.6.4 of Appendix A) should assist with this and various mitigative

measures, i.e. SuDS, should be identified. Sections 6.5 and 6.7 provide guidance on mitigation options and SuDS for developers.

It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site-specific and detailed investigations.

5.3.1 Pluvial flooding

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

Pluvial flooding within urban areas across the country will typically be associated with events greater than the 1 in 30 AEP design standard of new sewer systems. Some older sewer and highway drainage networks will have a lower capacity than what is required to mitigate for the 1 in 30 AEP event. There is also residual risk associated with these networks due to possible network failures, blockages or collapses.

Risk of Flooding from Surface Water dataset

The Risk of Flooding from Surface Water (RoFSW), formally referred to as the updated Flood Map for Surface Water (uFMfSW) is the third-generation national surface water flood map, produced by the EA, aimed at helping to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW, used in this SFRA to assess risk from surface water, has proved extremely useful in supplementing the EA Flood Map for Planning by identifying areas in Flood Zone 1, which may have critical drainage problems. However, any sites identified to be at risk from surface water flooding should be assessed in more detail, following this SFRA, as the RoFSW is a national-scale dataset and may therefore overestimate or underestimate risk.

The RoFSW includes surface water flood outlines, depths, velocities and hazards for the following events:

- 1 in 30 AEP event (3.3%) – high risk
- 1 in 100 AEP event (1%) – medium risk
- 1 in 1000 AEP event (0.1%) – low risk

The National Modelling and Mapping Method Statement, May 2013 details the methodology applied in producing the map. The RoFSW is displayed on the SFRA maps.

5.3.2 Sewer flooding

Within the North West, the public sewerage network is made up of around 50% of combined systems, which serve residential homes, and businesses, conveying waste and surface water to waste water treatment works. Combined Sewer Overflows, (CSOs) provide relief of the sewer network during times of heavy rainfall and high flows in the network, through an Environment Agency consented discharge to the environment. If areas are not served by a combined sewer system, they are served by separated foul and surface water sewers which also convey the wastewater to wastewater treatment works and the surface water discharges into the local environment.

There are a number of reasons why flooding from a public sewer network can occur:

1. Hydraulic Incapacity

a. When the flow entering the network exceeds its design capacity.
b. Surface water outfalls or CSO outfalls can become restricted due to high water levels in the receiving watercourse, resulting in the water not being to discharge

2. Flooding Other Causes
   a. Flooding can also occur through other means such as a result of a blockage within the sewer, which is defined as sewer misuse
   b. Collapse of the sewer or burst of a rising main, and also mechanical or electrical faults with pumping stations.

United Utilities is the water company responsible for the management of the drainage networks across the Borough.

5.3.3 Areas with Critical Drainage Problems and Critical Drainage Areas

The EA can designate Areas with Critical Drainage Problems (ACDPs). ACDPs may be designated where the EA is aware that development within a certain catchment / drainage area could have detrimental impacts on fluvial flood risk downstream, and / or where the EA has identified existing fluvial flood risk issues that could be exacerbated by upstream activities. In these instances, the EA would work with the LLFA and LPA to ensure that adequate surface water management measures are incorporated into new development to help mitigate fluvial flood risk.

EA guidance on carrying out Flood Risk Assessments[8] states that a FRA should be carried out for sites in Flood Zone 1 that are…

"…in an area with critical drainage problems as notified by the Environment Agency."

This statement refers to sites within an ACDP, not a CDA.

There are no ACDPs present in Copeland, however there are two CDA boundaries, delineated through the 2012 SWMP, in Whitehaven, one covering the town centre and one covering Moresby Parks.

The SWMP justification for both areas is as follows:

"*the topography and geology of Whitehaven results in an extensive area of flood risk from surface water and sewer system along the Pow Beck Valley. This area would be sensitive to any additional flows as a result of future development. Urban extents and hydraulic boundaries have formed the CDA boundary".*

The SWMP also advises that…

"…any future development in the Kells/Woodhouse/Marchon area should drain west, to the sea or via an attenuated system to Rottington Beck to the south, disposal of surface water to the combined or foul sewer network should be prevented, and upstream storage options on larger watercourses should be investigated by the LLFA".

The LLFA should initially assess the Natural Flood Management (NFM) / Working with Natural Processes (WwNP) datasets, discussed in Volume I, regarding the final point concerning upstream storage options. These datasets are also included on the SFRA Maps in Appendix A.

Neither the LPA nor the LLFA have designated a CDA in Millom, however, due to the level of surface water flood risk in this area, the EA recognises Millom to be significantly vulnerable to surface water flooding. **It is therefore recommended for Millom to be a designated CDA in the short term future.**

At the time of writing, CBC has no immediate plans to introduce specific policy on CDAs. However, it is acknowledged that this requires discussion between CCC as the LLFA

[8] https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas

and the LPA. CBC is open to considering stricter policy requirements for CDAs, particularly whilst in the process of producing the new Local Plan. Current CBC Development Management approach is to accept the judgement of CBC's Flood and Coastal Engineer and the LLFA's consultation responses to individual planning applications.

5.3.4 Locally agreed surface water information

EA guidance on using surface water flood risk information recommends that Cumbria County Council, as the Lead Local Flood Authority, should:

"…review, discuss, agree and record, with the Environment Agency, Water Companies, Internal Drainage Boards and other interested parties, what surface water flood data best represents their local conditions. This will then be known as locally agreed surface water information".

Following on from the LLFA consultation on the Risk of Flooding from Surface Water in 2013 before its release, the EA stated that the Flood Map for Surface Water (2010) and the Areas Susceptible to Surface Water Flooding (2008) maps do not meet the requirements of the Flood Risk Regulations and are not compatible with the 2013 RoFSW mapping. Consequently, these datasets cannot be used as 'locally agreed surface water information'.

Locally agreed surface water information should either consist of:

- The RoFSW map, or
- Compatible local mapping if it exists i.e. from modelling carried out in the Surface Water Management Plan (SWMP), or
- A combination of both these datasets for defined locations in the Lead Local Flood Authority area.

Within the Cumbria SWMP, detailed modelling was undertaken for the area and was considered to be the locally agreed surface water information. However, as this was in 2012, Copeland Borough Council should consider the RoFSW to be its locally agreed surface water flood information as this is the latest, most robust surface water flood map available for the district, at the time of writing

5.4 Groundwater flooding

In simplistic terms, groundwater flooding occurs when the water table rises and water levels in the ground rise above the surface of the land. Flooding tends to occur after long periods of sustained heavy rainfall and can last for weeks or even months. The areas most at risk are often low lying areas where the water table is more likely to be at a shallow depth and flooding can be experienced through water rising up from the underlying aquifer, or from water flowing from springs. Flooding from groundwater is most common in areas where the underlying bedrock is chalk, but it can also happen in locations with sand and gravel.

The EA's 2019 SFRA guidance recommends the use of the British Geological Survey's (BGS) national dataset on the susceptibility of groundwater flooding. Based on geological and hydrogeological information, the digital data can be used to identify areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

The dataset is split into three categories, based on the potential of groundwater flooding occurring:

1. Limited potential for groundwater flooding to occur,
2. Potential for groundwater flooding of property situated below ground level,

3. Potential for groundwater flooding to occur at the surface.

There is currently limited research which specifically considers the impact of climate change on groundwater flooding. The mechanisms of groundwater flooding are unlikely to be affected by climate change, however if winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers.

Further investigation should be carried out as part of the preparation of a site-specific FRA, for any site deemed to be at risk of groundwater flooding i.e. in BGS categories 2 or 3. The FRA should incorporate a site-based assessment of the potential risk of groundwater flooding to the site, confirming from borehole data whether groundwater is a source of flood risk for the site, and setting out any mitigation measures proposed. Onsite infiltration testing should also be carried out; however, it is unlikely that any areas within these categories would be suitable for infiltration-based SuDS.

Categories 2 and 3 are spread across the whole of the Copeland authority area with the main areas being located on the estuary in the south of the council area, and to the north areas such as Sellafield, Egremont, Whitehaven, Cleator Moor, and along the A595.

The BGS dataset is shown on the SFRA Maps in Appendix B.

5.5 Canal and reservoir flood risk

5.5.1 Canals

Non-natural or artificial sources of flooding can include canals where water is retained above natural ground level. The risk of flooding along a canal is considered to be residual and is dependent on a number of factors. As canals are manmade systems that are heavily controlled, it is unlikely they will respond in the same way as a natural watercourse during a storm event. Flooding is more likely to be associated with residual risks, similar to those associated with river defences, such as overtopping of canal banks, breaching of embanked reaches or asset (gate) failure as highlighted in Table 5-2. Canals can also have a significant interaction with other sources, such as watercourses that feed them and minor watercourses or drains that cross underneath.

Potential Mechanism	Significant Factors
Leakage causing erosion and rupture of canal lining leading to breach	Embankments Sidelong ground Culverts Aqueduct approaches
Collapse of structures carrying the canal above natural ground level	Aqueducts Large diameter culverts Structural deterioration or accidental damage
Overtopping of canal banks	Low freeboard Waste weirs
Blockage or collapse of conduits	Culverts

Table 5-2: Possible causes of flooding from canals

The risks associated with these events are also dependent on their potential failure location with the consequence of flooding higher where floodwater could cause the greatest harm due to the presence of local highways and adjacent property.

There are no canals present within the Copeland Borough.

5.5.2 Reservoirs

A reservoir can usually be described as an artificial lake where water is stored for use. Some reservoirs supply water for household and industrial use, others serve other purposes, for example, as fishing lakes or leisure facilities. Like canals, the risk of flooding associated with reservoirs is residual and is associated with failure of reservoir outfalls or breaching. This risk is reduced through regular maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

The EA is the enforcement authority for the Reservoirs Act 1975 in England and Wales, with the Flood and Water Management Act (2010) amending this Act. All large reservoirs must be regularly inspected and supervised by reservoir panel engineers. LAs are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. The LPAs should work with other members of the Cumbria Local Resilience Forum to develop these plans. See Section 7.1.1 for more information on the Cumbria Local Resilience Forum.

Paragraph 014 of the FRCC-PPG states that, in relation to development planning and reservoir dam failure:

"the local planning authority will need to evaluate the potential damage to buildings or loss of life in the event of a dam failure, compared to other risks, when considering development downstream of a reservoir. Local planning authorities will also need to evaluate in Strategic Flood Risk Assessments (and when applying the Sequential Test) how an impounding reservoir will modify 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."

The Canal & River Trust states that, where new development could lead to an increase in flood risk following a dam failure, the reservoir owner will require a contribution to the costs of improvement / remedial works and / or increased reservoir inspections to help maintain the risk exposure pre-development. Developer contributions in such circumstances should be confirmed early on in the site planning process.

Reservoir Flood Map (RFM)

The EA has produced Reservoir Flood Maps (RFM) for all large reservoirs that they regulated under the Reservoirs Act 1975 (reservoirs that hold over 25,000 cubic metres of water). The FWMA updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m^3 to 10,000m^3. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to.

In September 2016, the EA produced a RFM guide 'Explanatory Note on Reservoir Flood Maps for Local Resilience Forums – Version 5[9]' which provides information on how the maps were produced and what they contain.

The RFM can be viewed nationally at:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

The RFM extent shows the worst credible area that is susceptible to dam breach flooding. The map should be used to prioritise areas for evacuation/early warning. It is worth considering that reservoirs within the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

If development is proposed downstream of a reservoir, there will need to be an assessment of whether work is needed to improve the design or maintenance of the reservoir. Together with the reservoir undertakers, the LPA should look to avoid an

[9] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/558441/LIT_6882.pdf

intensification of development within the risk areas and/or ensure that reservoir undertakers can assess the cost implications of any reservoir safety improvements required due to changes in land use downstream of these assets.

The LPA will need to evaluate:

- The potential damage to buildings or loss of life in the event of dam failure, compared to other risks;
- How an impounding reservoir will modify existing flood risk in the event of a flood in the catchment is located within, and/or whether emergency draw-down of the reservoir will add to the extent of flooding;
- Emergency planning requirements with appropriate officers to ensure safe, sustainable development.

There are no 'large reservoirs' directly located within the boundaries of the Copeland LPA area. However, there is Ennerdale Water located within the LDNP, upstream of Cleator Moor and Egremont, which, given dam failure or overtopping, could impact on downstream communities such as Cleator, Egremont and Braystones, according to the RFM. Ponsonby Tarn is located completely within the Copeland borough, and Gatehouse Tarn (Eskdale Green) which is located within the LDNP.

Whilst large reservoirs provide the obvious source of residual risk (breaching/overtopping) from artificial sources, there could potentially be residual risk from a number of smaller waterbodies within Copeland or upstream in the LDNP, Allerdale or South Lakeland. It is considered that smaller reservoirs generally pose less of a risk than larger reservoirs because they hold less water, although there is evidence that a minority of smaller reservoirs could pose a risk in certain circumstances[10]. Smaller waterbodies may have potential ownership issues resulting in a lack of regular inspections and sometimes poor embankment conditions. This may increase the residual risk of breaching or overtopping compared to the large reservoirs which are maintained by UU

5.6 Historic flooding

On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate—

(a)which risk management authorities have relevant flood risk management functions, and

(b)whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

The LLFA provided a copy of its historic floods dataset with incidents ranging between 2012 to the most recent being August 2020 for use in this SFRA but was unable to be mapped graphically. This dataset could not be included on the SFRA Maps in Appendix B due to the confidential nature of the information. There were 21 incidents recorded since 2018 with the majority being recorded for the event on the 10th September 2018 which was noted to be from groundwater sources.

For the draft SFRA produced in 2018, CCC's historic flood incident register and flood hotspots dataset were provided. The historic flood incident register included, at the time, 35 recorded flood incidents and 86 hotspots across Copeland outside of the LDNP between 2005 to December 2017 shown below in Figure 5-1.

[10] Reservoir Safety, Defra, February 2015

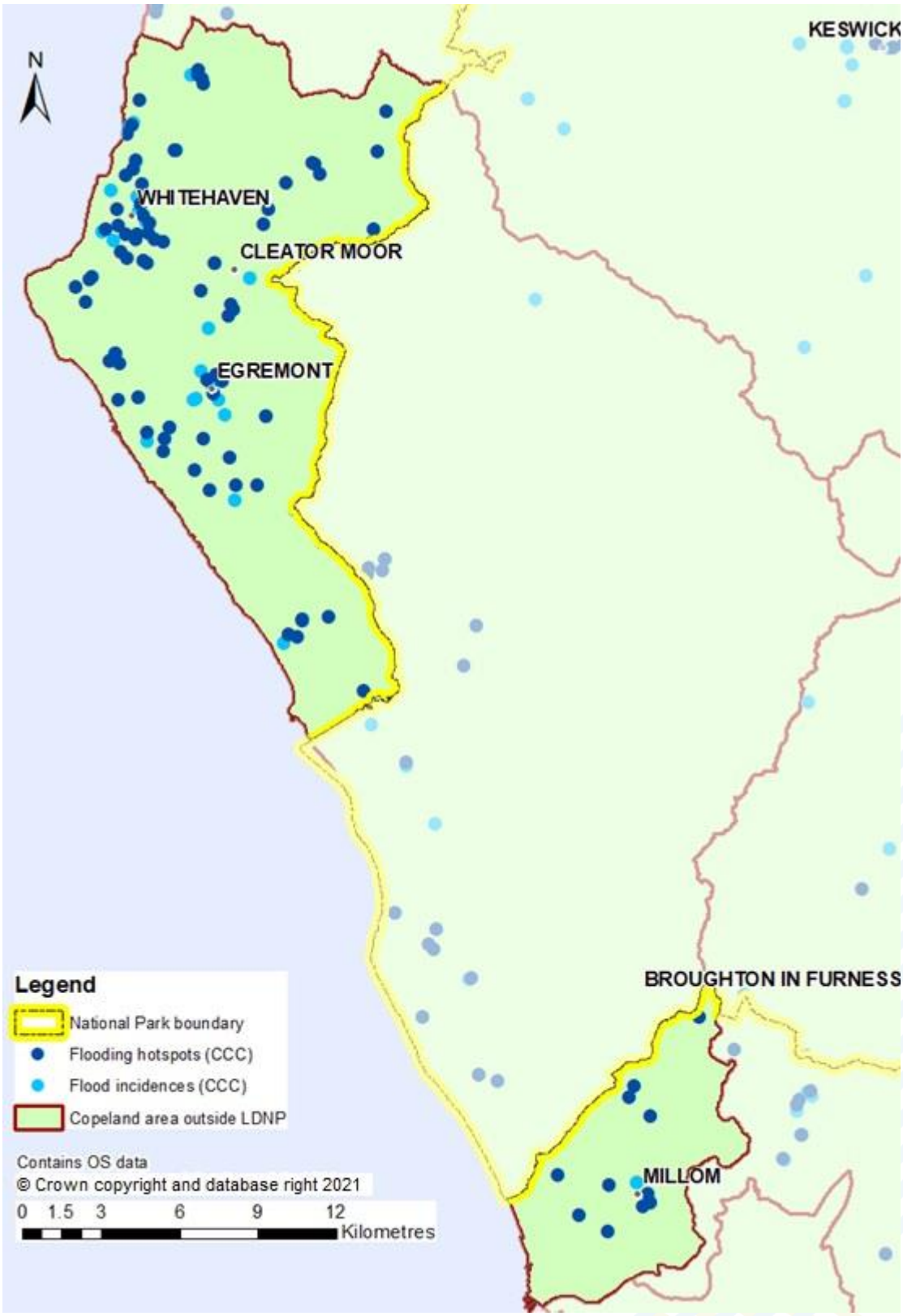

Figure 5-1: CCC historic flooding from 2005 to December 2017

The absence of a flood record in a location does not necessarily mean that there has been no recent or historical flooding at that location, only that an event may not have been recorded.

On 30th September 2017, the town of Millom suffered severe flooding due to both fluvial flooding from ordinary watercourses and the surcharging of the drainage systems causing surface water flooding at the same time.

The 2007 SFRA for Copeland states that the borough has a considerable history of flooding with significant events (resulting in property flooding) occurring at several locations on a number of occasions. In 1999 a prolonged intense storm flooded 150 properties in Whitehaven and 30 properties in Egremont respectively. Distington and Cleator Moor were also badly affected during this same event. Approximately 8 mm of rain an hour fell between 00:00hrs and 10:00hrs in the upper Ehen catchment and in Ennerdale. The Keekle catchment had an average rainfall of 25mm an hour, peaking between 06:30hrs and 08:00hrs where 47 mm fell in 90 minutes. The combination of rainfall in these two areas caused extensive flooding to Egremont. Lambhill Gill caused flooding of property at Parton in 2004 and 2006 due to culvert blockage which may have been caused by material from the upstream quarry. Distington Beck caused flooding of properties at Lowca in 2004.

The flood extents for historical river and tidal flooding events were provided by the EA and the Council. These outlines are limited in their usefulness for SFRA purposes as the magnitude of the mapped event is not known with a great deal of accuracy. They provide a good depiction of known flood risk areas within the Borough however, and have been used to review the delineation of the adopted flood risk zones.

Cellars in Whitehaven Market Place have been flooded from groundwater although this was due to the effect of high levels impounded water in the harbour during periods of heavy rain.

5.6.1 United Utilities (UU) supplied historic drainage events

UU provided shapefiles showing historic drainage incidents, both internal and external. These are shown below in Figure 5-2. The incidents are from 2009 to 2018; the incident data relates to incidents at property level which, due to it being considered sensitive information, cannot be shown in detail on the Appendix B maps and thus are shown in smaller scale below.

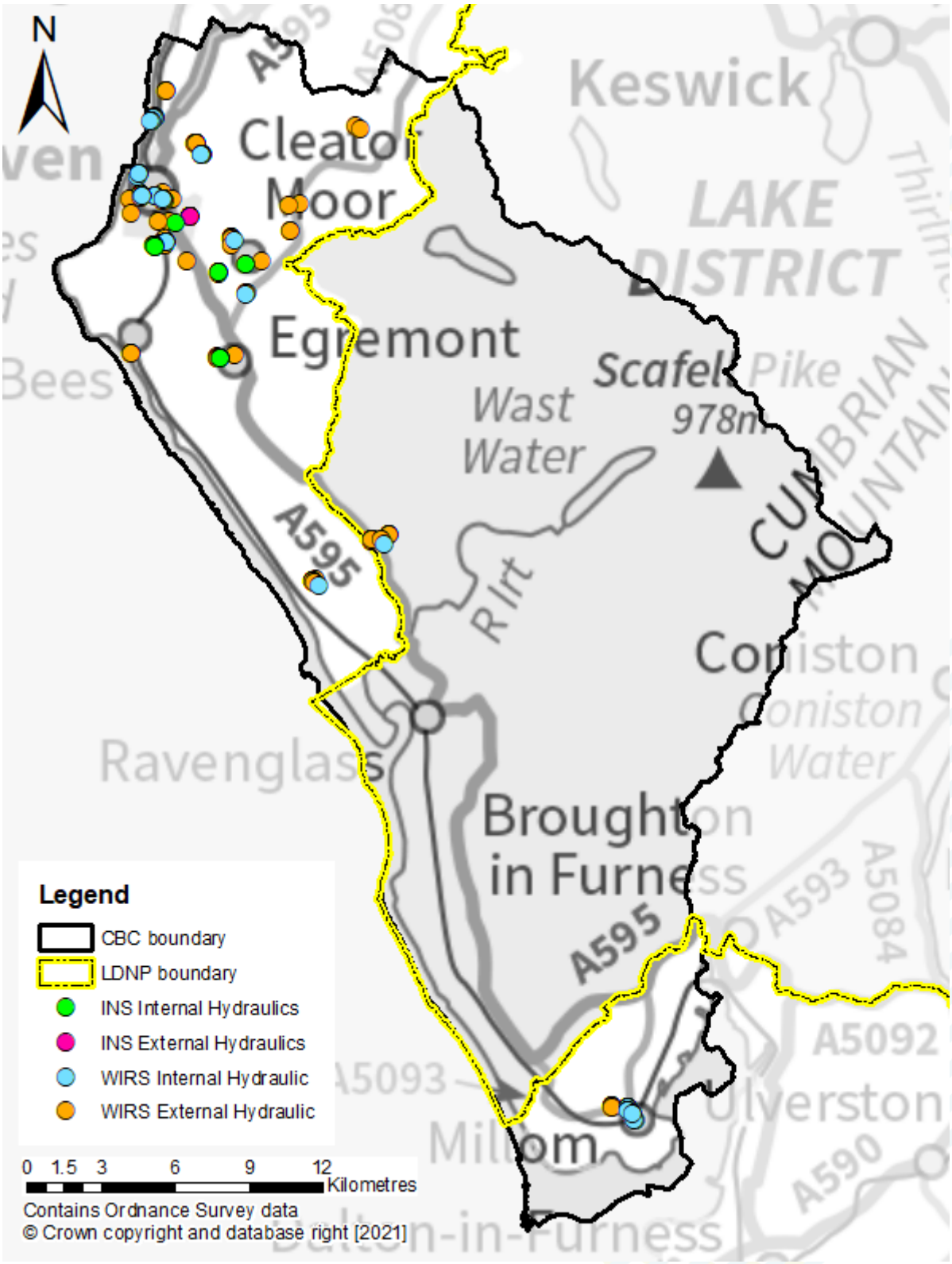

Figure 5-2: UU historical drainage incidents

5.6.2 EA Historic Flood Map

The Historic Flood Map (HFM) is a spatial dataset, available from the EA, showing the maximum extent of all recorded historic flood outlines from river, sea and groundwater, and shows areas of land that have previously been flooded across England. Records began in 1946 when predecessor bodies to the EA started collecting information about flooding incidents. The HFM accounts for the presence of defences, structures, and other infrastructure where such existed at the time of flooding. It includes flood extents that may have been affected by overtopping, breaches or blockages. It is also possible that historic flood extents may have changed and that some areas would not flood at present i.e. if a flood defence has been built.

The HFM does not contain any information regarding the specific flood source, return period or date of flooding, nor does the absence of the HFM in an area mean that the area has never flooded, only that records of historic flooding do not exist. The Recorded Flood Outlines (RFO) dataset however does include details of flood events. The difference between the two datasets is that the HFM only contains flood outlines that are 'considered and accepted' by the EA following adequate verification using certain criteria.

In relation to CBC, the HFM shows areas of historic flooding around Whitehaven, Parton, centred along the River Calder near Braystones, and River Ehen around Egremont, Biggrigg and Cleator Moor Whitehaven.

Five of these outlines detail flood events:

- in Cleator Moor from October 2005, attributable to surface water flooding from sewers;
- November 2009 which lasted for three days and was a result of both surface water flooding from sewers and fluvial flooding from the River Ehen; and
- the August 2017 flood event which was caused by local drainage surcharging and surface water flooding.

Whitehaven has suffered from historic flooding in 1999, 2000, 2006, 2007 and August 2017. The majority of the flood events in the town were attributable to local drainage or surface water issues, according to the RFO. However, Egremont has the greatest number of recorded historic flood events, with seven events recorded since records began in 1946. The vast majority of these events, in 2000, 2005, 2008, 2009 (August and November), are a result of fluvial flooding due to channel capacity exceedance of the River Ehen and Skirting Beck. The August 2012 event however, was attributable to surface water flooding, and the cause of flooding for events in 1999 and 2000 are unknown

The HFM and RFO datasets are shown on the SFRA maps in Appendix B.

5.7 Flood risk management

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

5.7.1 EA inspected assets (Spatial Flood Defences dataset)

The EA maintains a GIS dataset called the Spatial Flood Defences dataset. This national dataset contains such information as:

- Asset type (flood wall, embankment, high ground, demountable defence, bridge abutment);
- Flood source (fluvial, tidal, fluvial and tidal combined);
- Design Standard of Protection (SoP);
- Asset length;
- Asset age;
- Asset location; and
- Asset condition.

See Figure 5-3 for condition assessment grades using the EA's Condition Assessment Manual[11] (CAM).

The design standard of protection (SoP) for a flood defence is a measure of how much protection a flood defence gives. If the SoP is 100, the defence protects against a flood with the probability of occurring once in 100 years.

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no impact on performance
2	Good	Minor defects that will not reduce the overall performance of the asset
3	Fair	Defects that could reduce the performance of the asset
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed.
5	Very Poor	Severe defects resulting in complete performance failure.

Figure 5-3: EA flood defence condition assessment grades

[11] Environment Agency. (2012). Visual Inspection Condition Grades. In: EA Condition Assessment Manual. Bristol: Environment Agency. p9.

Defence Location	Asset Type	Flood Source	Watercourse	Design Standard	Condition
Haverigg	5 Flood Walls 3 Embankments	Tidal	Whicham Beck	Unknown (1) 50 (1) 100 (6)	Unknown (1) 2 (5) 3 (2)
Coastal region in south of borough	12 Embankments	Fluvial / Tidal	Coastal and Black Beck	30 (1) 50 (1) 100 (9) 150 (1)	Unknown (3) 2 (1) 3 (8)
Braystones	2 Embankments	Fluvial	River Ehen	50 (2)	3 (2)
Low Mill Farmhouse by Thornhill	3 Embankments 1 Flood Wall	Fluvial	River Ehen	100 (4)	2 (2) 3 (2)
Egremont	4 Flood Walls 2 Embankments 1 Flood Gate	Fluvial	River Ehen	Unknown (4) 10 (2) 50 (1)	Unknown (3) 2 (2) 3 (2)
Cleator	1 Embankments	Fluvial	River Ehen	100 (1)	Unknown (1)
Whitehaven	2 Embankments 1 Flood Wall	Fluvial	Midgey Gill and Pow Beck	20 (3)	3 (3)
Common End	3 Embankments 1 Flood Wall 1 Flood Gate	Fluvial	Lowca Beck	10 (1) 100 (4)	Unknown (3) 2 (1) 4 (1)
Number in brackets = number of assets					

Table 5-3: Major flood defences

In total, there are 79 flood defence assets within CBC outside of the LDNP, according to the EA's Spatial Flood Defence dataset. Table 5-3 highlights the main locations within the Borough that have significant FRM assets, the majority of which are located along the River Ehen.

Of the 79 constructed fluvial flood defence assets within Copeland borough, 53 are flood embankments, 23 are flood walls, 2 are flood gates and 1 bridge abutment. The floodwalls aim to prevent the flooding of residential and commercial properties and infrastructure. The majority of defences are located in the Millom area. Millom, on the north shore of the estuary of the River Duddon, is prone to flooding due to the natural topography of the area. There are three embankments near Cleator that have been assessed at condition grade 4 meaning the condition is rated as 'Poor' according to the CAM (as discussed in Figure 5-3) meaning that there are defects that would significantly reduce the performance of the asset and further investigation is required.

As well as the ownership and maintenance of a network of formal defence structures, the EA carries out a number of other flood risk management activities that help to reduce the probability of flooding, whilst also addressing the consequences of flooding. These include:

- Maintaining and improving existing flood defences, structures and watercourses.
- Enforcement and maintenance where riparian owners carry out work that may be detrimental to flood risk.
- Identifying and promoting new Flood Risk Management Schemes were appropriate.
- Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is permitted relative to the scale of flood risk.
- Operation of Floodline Warnings Direct and warning services for areas within designated Flood Warning Areas (FWA) or Flood Alert Areas (FAA). EA FWAs are shown on the SFRA Maps in Appendix B.
- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and therefore sufficiently prepared in the event of flooding.
- Promoting resilience and resistance measures for existing properties that are currently at flood risk or may be in the future as a result of climate change.

EA Areas Benefitting from Defences (ABD)

Alongside the Spatial Flood Defences dataset discussed above, the EA also publishes a spatial dataset showing the areas that benefit from major flood defences. ABDs show those areas that would benefit from the presence of defences in a 1% AEP fluvial or 0.5% AEP tidal flood event. The ABDs present within CBC are included on the SFRA maps in Appendix B and are also listed in Table 5-4.

Area Impacted	Unitary ward	Sites impacted	Area (ha)	NGR
Stoup Dub Cut	Black Combe & Scafell Ward	-	19.67	SD1513378490
Haverigg along Main Street	Black Combe & Scafell Ward	-	8.21	SD1593878572
Haverigg along Willowside Park	Black Combe & Scafell Ward	-	0.34	SD1604579048
Poolside, Haverigg	Black Combe & Scafell Ward	-	13.76	SD1644078904
South of Millom	Millom Ward	-	116.31	SD1735778446
Red Hills Cottages	Millom Ward	-	25.90	SD1868479194
Millom Road	Millom Ward	-	3.02	SD1768080337
Salthouse Road	Millom Ward	-	11.20	SD1734480784
Along the A5093	Black Combe & Scafell Ward	-	236.28	SD1836682722
Low Shaw	Black Combe & Scafell Ward	-	53.76	SD1935084754
Lady Hall Lane	Black Combe & Scafell Ward	-	119.95	SD1964586314

Area Impacted	Unitary ward	Sites impacted	Area (ha)	NGR
South of Braystones on River Ehen	Beckermet Ward	-	0.32	NY0121505294
Middlebank Farm, Braystones	Beckermet Ward	-	1.52	NY0113105871
Braystones	Beckermet Ward	-	5.24	NY0076006149
Low Mill Farmhouse	St Bees Ward	-	0.66	NY0062308644
Egremont	Egremont Ward	-	1.03	NY0110010332
Cleator	Cleator Moor Ward	CI005	5.91	NY0201013767
Quay Street, near Arrowthwaite	Whitehaven Central Ward	-	2.68	NX9718218089
B5306 Main Street, Common End	Distington, Lowca & Parton Ward	-	0.08	NY0066122913

Table 5-4: ABDs within CBC boundary

The EA only maps defended areas that offer protection against a 1% AEP fluvial or 0.5% AEP tidal event, as required by the NPPF. This does not mean that only these areas are defended, but that other areas where defences may be present will have a lower standard of protection.

5.7.2 LLFA assets and future flood risk management schemes

The LLFA owns and maintains a number of assets throughout the Borough which include culverts, bridge structures, weirs, gullies, manholes, grids and trash screens. The majority of these assets will lie along ordinary watercourses within smaller urban areas where watercourses may have been culverted or diverted, or within rural areas. All these assets can have flood risk management functions as well as an effect on flood risk if they become blocked or fail. In most cases responsibility lies with the riparian / landowner.

The LLFA, under the provisions of the FWMA, has a duty to maintain a register of structures or features that have a significant effect on flood risk, including details of ownership and condition as a minimum. The Asset Register should include those features relevant to flood risk management function including feature type, description of principal materials, location, measurements (height, length, width, diameter) and condition grade. The Act places no duty on the LLFA to maintain any third-party features, only those for which the authority has responsibility as land/asset owner.

CCC LLFA holds a subset of its asset database which shows spatially where there are critical assets either in need of repair or require regular maintenance to ensure optimum performance and therefore lessen flood risk. The critical assets provided for this SFRA relate to gullies, grids, manholes and trash screens. These assets should be targeted for maintenance expenditure by the LLFA.

5.7.3 Water company assets

The sewerage infrastructure within Copeland is likely to be based on Victorian sewers from which there may be a risk of localised flooding associated with the existing drainage capacity and sewer system. UU is responsible for the management of the adopted sewerage systems in the Borough, including for surface water and foul sewage. There may however be some private foul and surface water sewers in the Borough as only those connected to the public sewer network prior to 1st July 2011 were transferred to the water companies under the Private Sewer Transfer in October 2011

if they met certain criteria. In addition, there are likely to have been sewers and drains constructed since this transfer date which have not been offered for adoption or have not met the requirements of a Section 104 adoption agreement and therefore these remain private too. Many surface water sewers discharging to watercourses were not part of this transfer and would therefore not be under the ownership of the sewerage undertaker, unless they were offered for adoption either at the time of construction under a Section 104 agreement or retrospectively under a Section 104 adoption agreement.

Water company assets include Wastewater Treatment Works, Combined Sewer Overflows, pumping stations, detention tanks, sewer networks and manholes.

5.7.4 Natural Flood Management / Working with Natural Processes

Natural flood management (NFM) or Working with Natural Processes (WwNP) is a type of flood risk management used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood and coastal erosion risk. WwNP has the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible and to increase the lifespan of existing flood defences. NFM and WwNP are used interchangeably in the UK though the term WwNP will be used throughout this report.

A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). WwNP involves taking action to manage flood and coastal erosion risk (although coastal erosion is not applicable to BwDBC) by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts (not applicable).

Both the European Commission and UK Government are actively encouraging the implementation of WwNP measures within catchments and coastal areas in order to assist in the delivery of the requirements of various EC Directives relating to broader environmental protection and national policies. It is fully expected that the sustained interest in WwNP implementation across the UK will continue in the post-Brexit era as a fundamental component of the flood risk management tool kit.

Evidence base for WwNP to reduce flood risk

There has been much research on WwNP, but to date it has never been synthesised into one location. This has meant that it has been hard for flood risk managers to access up-to-date information on WwNP measures and to understand their potential benefits. The EA has produced the WwNP evidence base which includes three interlinked projects:

- Evidence directory
- Mapping the potential for WwNP
- Research gaps

The evidence base can be accessed via:

https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk

The evidence base can be used by those planning projects which include WwNP measures to help understand:

- Their potential FCRM benefits and multiple benefits
- Any gaps in knowledge
- Where it has been done before and any lessons learnt
- Where in a catchment they might not be most effective

The evidence directory presents the evidence base, setting out the scientific evidence underpinning it. Its purpose is to help flood risk management practitioners and other responsible bodies access information which explains what is known and what is not about the effectiveness of the measures from a flood risk perspective. There is also a guidance document which sits alongside the evidence directory and the maps which explains how to use them to help make the case for implementing WwNP when developing business cases.

Mapping the potential for WwNP

The JBA Trust has worked with Lancaster Environment Centre (LEC) to produce an interactive catalogue of nature-based flood risk management projects in the UK. This map includes a catalogue of projects where WwNP is being applied on the ground or being considered as an option to reduce flood risk. Additionally, the map includes a set of layers that indicates the potential areas where WwNP would be beneficial based on research by the EA, Defra and NRW. The interactive map is available using this link:

https://naturalprocesses.jbahosting.com/

JBA Consulting has also been working with the EA and LEC to update national maps of Potential for Working with Natural Processes. LEC has developed a new spatial model of slowly permeable soils to identify areas where shrub or tree-planting could increase hydrological losses and slow the flow based on British Geological Survey (BGS) 1:50k maps, who have also agreed to an open government license for the maps. The new national maps for England make use of different mapping datasets and highlight potential areas for tree-planting (for three different types of planting), runoff attenuation storage, gully blocking and floodplain reconnection. The maps can be used to signpost areas of potential and do not take into account issues such as land-ownership and drainage infrastructure, but they may well help start the conversation and give indicative estimates of, for example, additional distributed storage in upstream catchments.

These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps, however it is a useful tool to help start dialogue with key partners. The maps are provided as spatial data for use in GIS and also interactive GeoPDF format, supported by a user guide and a detailed technical guide.

The WwNP types are listed in Figure 5-4.

WWNP Type	Open data licence details
Floodplain reconnection	• Risk of Flooding from Rivers and Seas (April 2017) • Data derived from the Detailed River Network, which is not displayed, rescinding the licence requirements for displaying the dataset (to be superseded by OS Water Network but not available for project in time). • Constraints data
Run-off attenuation features	• Data derived from Risk of Flooding from Surface Water (Depth 1 percent annual chance and Depth 3.3 percent annual chance) (October 2013). The original data is not displayed, due to licensing restrictions.[2] • Constraints data • Gully blocking potential (a subset of run-off attenuation features on steeper ground) • Data derived from OS Terrain 50 (2016) to classify each run-off attenuation feature based on median slope.
Tree planting (3 categories)	• Floodplain: Flood Zone 2 from Flood Map for Planning (April 2016) and new constraints layer • Riparian: 50m buffer OS water features from Section 2.2.3 with constraints layer • Wider catchment woodland: - Based on slowly permeable soils. - BGS Geology 50,000 Superficial and Bedrock layers (both V8, 2017). Used with new science to derive new 100m gridded open data. This new layer can be used to signpost areas of SLOWLY PERMEABLE SOILS and can be checked in more detail on the BGS portal. - To the north of the line of Anglian glaciation, the presence of till-diamicton has been shown to be a strong predictor of slowly permeable soils. - To the south of this line, particular bedrock geologies have shown a similarly strong spatial relationship to the presence of slowly permeable soils.

Figure 5-4: WwNP measures and data[12]

The WwNP datasets are included on the SFRA Maps in Appendix B and should be used to highlight any sites or areas where the potential for WwNP should be investigated further as a means of flood mitigation:

- Floodplain Reconnection:
  - Floodplain Reconnection Potential – areas of low or very low probability based on the Risk of Flooding from Rivers and Sea dataset (see Section 5.2.3), which are in close proximity to a watercourse and that do not contain properties, are possible locations for floodplain reconnection. It may be that higher risk areas can be merged, depending on the local circumstances.
- Runoff Attenuation Features (Run-off attenuation features are based on the premise that areas of high flow accumulation in the RoFSW) maps are areas

[12]https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/677592/Working_with_natural_processes_mapping_technical_report.pdf

where the runoff hydrograph may be influenced by temporary storage if designed correctly):

  - Runoff Attenuation Features 1% AEP
  - Runoff Attenuation Features 3.3% AEP

- Tree Planting:
  - Floodplain Woodland Potential and Riparian Woodland Potential – woodland provides enhanced floodplain roughness that can dissipate the energy and momentum of a flood wave if planted to obstruct significant flow pathways. Riparian and floodplain tree planting are likely to be most effective if close to the watercourse in the floodplain, which is taken to be the 0.1% AEP flood extent (Flood Zone 2), and within a buffer of 50 metres of smaller watercourses where there is no flood mapping available. There is a constraints dataset that includes existing woodland.
  - Wider Catchment Woodland Potential – slowly permeable soils have a higher probability of generating 'infiltration-excess overland flow' and 'saturation overland flow'. These are best characterised by gleyed soils, so tree planting can open up the soil and lead to higher infiltration and reduction of overland flow production.

Limitations

The effectiveness of WwNP measures is site-specific and depends on many factors, including the location and scale at which they are used. It may not always be possible to guarantee that these measures alone will deliver a specified standard of defence. Consequently, flood risk management measures should be chosen from a number of options ranging from traditional forms of engineering through to more natural systems. The research gaps that need to be addressed to move WwNP into the mainstream are identified in the evidence directory.

Working with Natural Processes in CBC

There is a shortfall of NFM schemes within Copeland.

5.7.5 EA flood risk management activities and Flood and Coastal Erosion Risk Management research and development

The FCERM Research and Development programme is run by the EA and Defra and aims to serve the needs of all flood and coastal operating authorities in England. The programme provides the key evidence, information, tools and techniques to:

- Inform the development of FCERM policy and strategy.
- Understand and assess coastal and flood risk and the processes by which these risks arise.
- Manage flood and coastal erosion assets in a sustainable way.
- Prepare for and manage flood events effectively.

In March 2020, funding was secured for the next 6 years of investment. At the time of writing, a new investment programme is being developed that will link to the ambitions of the FCERM strategy for England.

The EA regularly reviews the programme to take into account changes such as:

- Serious flooding.
- Local partnership funding contributions.
- New flood risk information.

We develop projects to reduce flooding and coastal erosion by working with:

- Local authorities.
- Internal drainage boards.
- Local communities.

Follow the link below for the latest news:

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

The potential works in the Borough, at the time of writing, associated with the FCERM Development Programme include:

- River flooding defences at Skirting Beck, Egremont. Scheme to protect 221 dwellings.

6 Development and flood risk

6.1 Introduction

This section of the SFRA provides a strategic assessment of the suitability, relative to flood risk, of the potential development sites to be considered through the Local Plan.

The information and guidance provided in this chapter (also supported by the SFRA Maps in Appendix B, the Development Site Assessment spreadsheet in Appendix C, the site assessment commentary in Appendix E and the strategic recommendation figures in Appendix F) can be used by the LPA to inform its Local Plan and provide the basis from which to apply the Sequential Approach in the development allocation and development management process.

There are several consequential development considerations which could come out of the site assessment sequential testing process. The LPA should refer to Appendix E and Appendix C, for details on the site assessments carried out for this SFRA.

The LPA should use Appendix C to record its decisions on how to progress each site or whether to remove a site from allocation, based on the evidence and strategic recommendations provided in this Level 1 SFRA. Recording decisions in the Sites Assessment Spreadsheet demonstrates that a sequential, sustainable approach to development and flood risk has been adopted.

6.2 The Sequential Approach

The FRCC-PPG provides the basis for the Sequential Approach. It is this approach, integrated into all stages of the development planning process, which provides the opportunities to reduce flood risk to people, property, infrastructure and the environment to acceptable levels.

The approach is based around the FRM hierarchy, in which actions to avoid, substitute, control and mitigate flood risk is central. For example, it is important to assess the level of risk to an appropriate scale during the decision-making process, (starting with this Level 1 SFRA). Once this evidence has been provided, positive planning decisions can be made and effective FRM opportunities identified.

Figure 6-1 illustrates the FRM hierarchy with an example of how these may translate into each authorities' management decisions and actions.

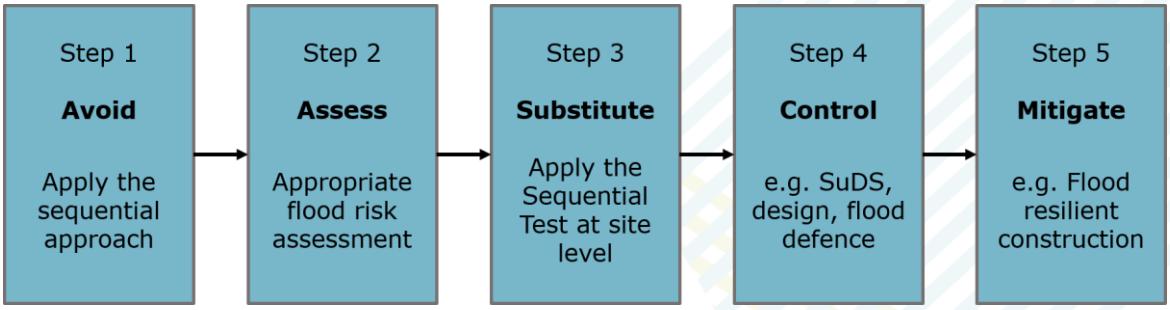

Figure 6-1: Flood risk management hierarchy

Using the EA's Flood Map for Planning, the overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system is being carried out i.e. LPAs allocating land in Local Plans or determining planning applications for development. This SFRA does not remove the need for a site-specific Flood Risk Assessment at a development management stage.

The following sections provide a guided discussion on why and how the Sequential Approach should be applied, including the specific requirements for undertaking Sequential and Exception Testing.

6.3 Local Plan Sequential and Exception tests

The FRCC-PPG, para 019, states the aim of the Sequential Test is:

"…to steer new development to areas with the lowest probability of flooding. The flood zones as refined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required."

The NPPF sets out the Exception Test as below:

"The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) 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.

Both elements of the exception test should be satisfied for development to be allocated or permitted."

The LPA should seek to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk and ensuring that all development does not increase risk and where possible can help reduce risk from flooding to existing communities and development.

At a strategic level, this should be carried out as part of the LPA's Local Plan. This should be done broadly by:

1. Applying the Sequential Test and if the Sequential Test is passed, applying and passing the Exception Test, if required;
2. Safeguarding land from development that is required for current and future flood management (i.e. using potential for WwNP data);
3. Using opportunities offered by new development to reduce the causes and impacts of flooding;
4. Identifying where flood risk is expected to increase with climate change so that existing development may not be sustainable in the long term; and
5. Seeking opportunities to facilitate the relocation of development including housing to more sustainable locations.

Figure 6-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess sites put forward in the Local Plan against the EA's Flood Map for Planning flood zones and development vulnerability classification.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded.

This can be done using the Development Site Assessment spreadsheet in Appendix C. This spreadsheet will help show that the LPA, through the SFRA, has applied the Sequential Test for sites at fluvial risk and also considered surface water flood risk in its decision making.

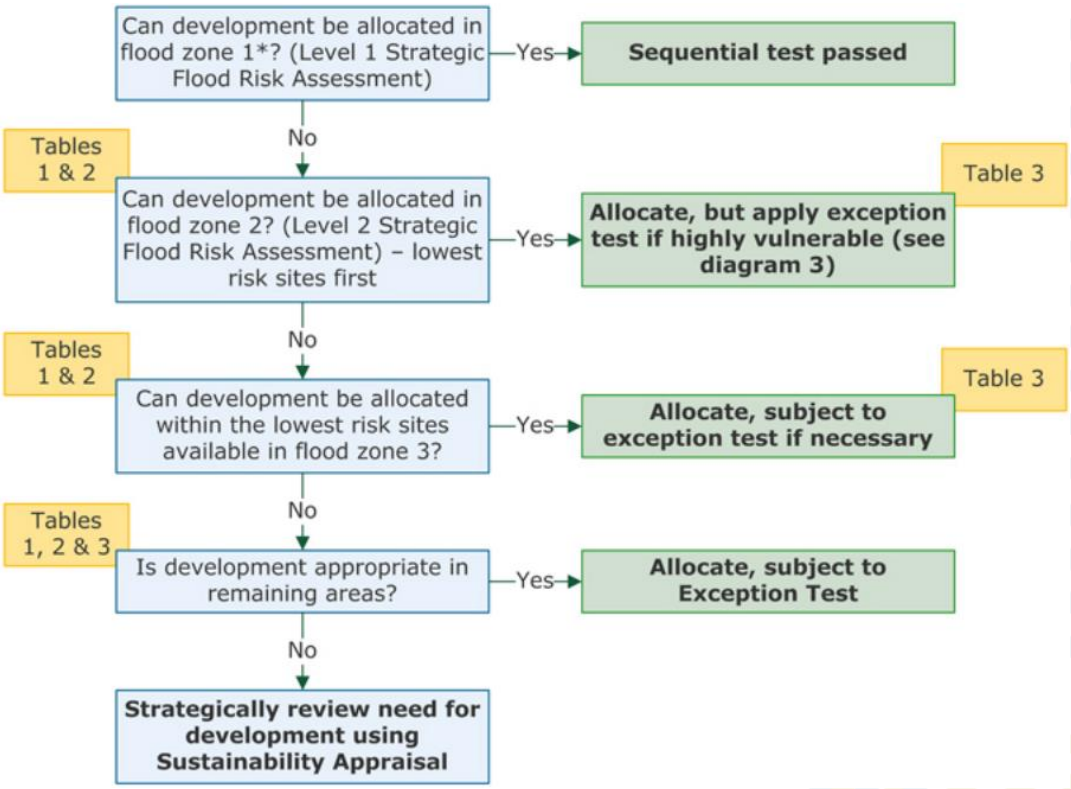

Figure 6-2: Local Plan sequential approach to site allocation[13]

**Other sources of flooding also need to be considered*

(Tables 1, 2, 3 refer to the Flood Zone and flood risk tables of the FRCC-PPG Paragraphs 065-067).

The approach shown in Figure 6-2 provides an open demonstration of the Sequential Test being applied in line with the NPPF and the FRCC-PPG. The LPA should agree a locally specific approach to application of the Sequential Test, based on the available evidence and circumstances. The EA would not approve the locally specific approach taken by the LPA, however the LPA can consult the EA regarding proposed sites and any local information or consultations with the LLFA should also be taken into account.

This Level 1 SFRA provides the evidence base required to carry out this process. The process also enables those sites that have passed the Sequential Test, and may require the Exception Test, to be identified. Following application of the Sequential Test the LPA and developers should refer to 'Table 3: Flood risk vulnerability and flood zone compatibility' of the FRCC-PPG (Paragraph 067) when deciding whether a development may be suitable or not.

Although passing the Exception Test will require the completion of a site-specific FRA, the LPAs should be able to assess the **likelihood** of passing the test at the Local Plan level by using the information contained in this SFRA to answer the following questions:

a. Can development within higher risk areas be avoided or substituted?
b. Is flood risk associated with possible development sites considered too high; and will this mean that the criteria for Exception Testing are unachievable?
c. Can risk be sustainably managed through appropriate development techniques (resilience and resistance) and incorporate Sustainable Drainage Systems without compromising the viability of the development?
d. Can the site, and any residual risks to the site, be safely managed to ensure that its occupiers remain safe during times of flood if developed?

Where it is found to be unlikely that the Exception Test can be passed due to few wider sustainability benefits, the risk of flooding being too great, or the viability of the site being compromised by the level of flood risk management work required, then the LPA should consider avoiding the site altogether.

Once this process has been completed, the LPA should then be able to allocate appropriate development sites through its Local Plan as well as prepare flood risk policy including the requirement to prepare site-specific FRAs for all allocated sites that remain at risk of flooding or that are greater than one hectare in area.

6.4 Sustainability Appraisal (SA) and flood risk

The Sustainability Appraisal (Section A.5.4 of Appendix A) of the Local Plan should help to ensure that flood risk is taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in Figure 6-2. The SA should be informed by this SFRA so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased (para 010 FRCC-PPG).

[13] https://www.gov.uk/guidance/flood-risk-and-coastal-change#Sequential-Test-to-Local-Plan

By avoiding sites identified in this SFRA as being at significant risk, such as those listed in Section E.1.1 of Appendix E or by considering how changes in site layout can avoid those parts of a site at flood risk, such as any site included within Section E.1.3 of Appendix E, the Council would be demonstrating a sustainable approach to development.

In terms of surface water, the same approach should be followed whereby those sites at highest risk should be avoided or site layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques (see Section 6.7).

Surface water flood risk should be considered with the same importance as fluvial flood risk.

Once the LPA has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a Level 2 SFRA, a phased approach to development should be carried out to avoid any cumulative impacts that multiple developments may have on flood risk. For example, for any site where it is required, following the Sequential Test, to develop in Flood Zone 3, detailed modelling would be required to ascertain where displaced water, due to development, may flow and to calculate subsequent increases in downstream flood volumes. The modelling should investigate scenarios based on compensatory storage techniques to ensure that downstream or nearby sites are not adversely affected by development on other sites.

6.4.1 Cumulative impacts

The NPPF (2021) states that strategic policies…

"…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". (para 160)

Previous policies have relied on the assumption that if each individual development does not increase the risk of flooding, the cumulative impact will also be minimal. However, if there is a lot of development occurring within one catchment, particularly where there is flood risk to existing properties or where there are few opportunities for mitigation, the cumulative impact may be to change the flood response of the catchment.

Consideration should be given to the following:

- The importance of phasing of development, as discussed in Section 6.4.4;
- Cross boundary impacts i.e. there should be dialogue between CBC and neighbouring authorities upstream and downstream of Copeland, in terms of decisions taken on upstream development, flood risk management practices and capital works (see Section 6.4.2);
- Leaving space for floodwater, utilising greenspace for flood storage and slowing the flow (see Sections 6.4.3 and 5.7.4;
- Must ensure floodplain connectivity; and
- SuDS and containment of surface water onsite as opposed to directing elsewhere (Section 6.7).

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

All new development plans must comply with the NPPF and demonstrate flood risk will not be increased elsewhere. Therefore, providing all new development complies with the latest guidance and legislation relating to flood risk and sustainable drainage, in theory there should not be any increase in flood risk downstream.

Strategic solutions may include upstream flood storage, integrated major infrastructure/ Flood Risk Management schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for Working with Natural Processes and retrofitting of SuDS to existing development.

Through the Local Plan, the LPA should consider the following strategic solutions:

- Use of sustainable flood storage and mitigation schemes to store water and manage surface water runoff in locations that provide overall flood risk reduction as well as environmental benefits,
- In areas where flood risk is being managed effectively, there will be a need in the future to keep pace with increasing flood risk as a result of climate change,
- Assessment of long-term opportunities to move development away from the floodplain and to create blue/green river corridors throughout the Borough,
- Identification of opportunities to use areas of floodplain to store water during high flows, to reduce long-term dependence on engineered flood defences located both within and outside the Borough,
- Safeguarding the natural floodplain from inappropriate development,
- Where possible, changes in land management should look to reduce runoff rates from development whilst maintaining or enhancing the capacity of the natural floodplain to retain water. Land management and uses that reduce runoff rates in upland areas should be supported,
- Development should maintain conveyance of watercourses through hamlets and villages to help reduce the impact of more frequent flood events and to improve the natural environment and WFD targets,
- Use of this SFRA to inform future development and minimise flood risk from all sources,
- Implementation of upstream catchment management i.e. slow the flow and flood storage schemes could be implemented in upper catchments to reduce risk downstream and across neighbouring authority boundaries, and
- Promotion and consideration of SuDS at the earliest stages of development planning.

According to the NPPF, the LPA should work with neighbouring authorities to consider strategic cross boundary issues and infrastructure requirements. Local authorities also have a duty to cooperate whereby councils work together on strategic matters and produce effective and deliverable policies on strategic cross boundary matters.

6.4.2 Hydrological linkages and cross boundary issues

Figure 6-3 illustrates the fluvial and tidal hydraulic linkages for the catchments in and around the Copeland borough. Many of the main watercourses in the Copeland Borough originate within the authority area and flow into the sea. The River Ehen originates within the Lake District National Park authority area before flowing through Copeland and flowing into the sea. The River Marron in the north of the Copeland Borough originates within the CBC area and flows through Allerdale before reaching the sea.

It is important that the strategic solutions stated above are fully considered in development planning in these catchments, to ensure there are no adverse effects on

flood risk in the downstream authority. In this case, Copeland is the downstream authority from the Lake District National Park.

Were these strategic solutions not considered in upstream development planning, the following issues may occur:

- Reduction in upstream floodplain storage capacity; and
- Increase in impermeable areas leading to a reduction in rainfall infiltration and subsequent increased runoff.

These issues highlight the importance of the Cumbria Strategic Flood Partnership (CSFP) and the need to work together on flood risk management, particularly where actions could exacerbate flooding in downstream communities. The need for consistent regional development policies controlling runoff or development in floodplains within contributing districts is therefore crucial as this would have wider benefits for Cumbria authorities as a whole as well as Copeland. Appropriate flood risk management policies will be required in the Local Plan.

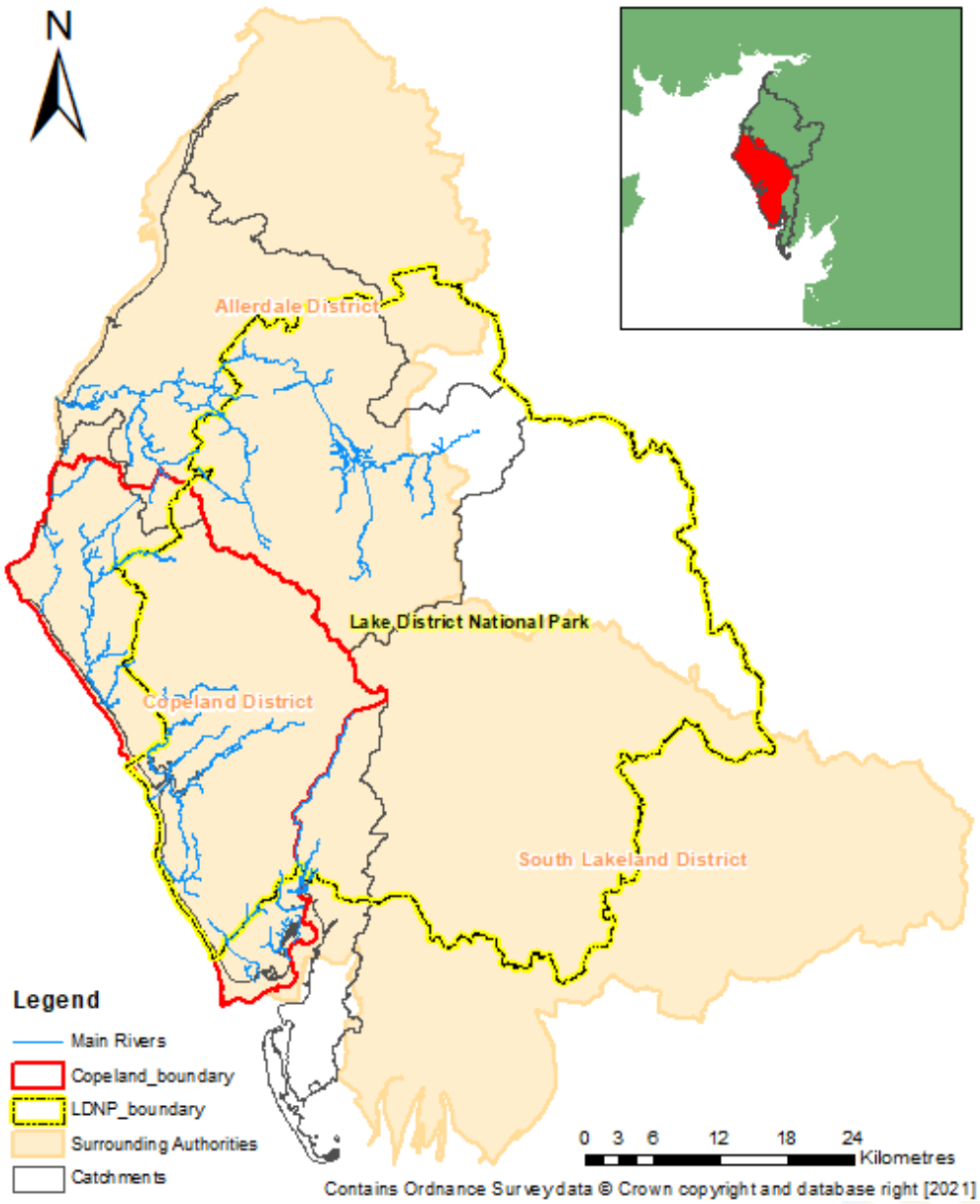

Figure 6-3: Hydraulic linkages for catchments in and around the Borough

6.4.3 Safeguarding land for flood storage

Where possible, the LPA may look to allocate land for flood storage functions. Such land can be explored through the site allocation process whereby an assessment is made, of the flood risk at assessed sites and what benefit could be gained by leaving the site undeveloped.

In some instances, the storage of flood water can help to alleviate flooding elsewhere, such as downstream developments. Where there is a large area of a site at risk that is considered large enough to hinder development, it may be appropriate to safeguard this land for the storage of flood water.

Section 14 Paragraph 161 of the NPPF states that, to avoid where possible, flood risk to people and property they should manage any residual risk by:

'safeguarding land from development that is required, or likely to be required, for current or future flood management'

Applicable sites assessed through this SFRA may include any current greenfield sites:

- That are considered to be large enough (>1 hectare) to store flood water to achieve effective mitigation,
- With large areas of their footprint at high or medium surface water flood risk (based on the RoFSW),
- That are within the functional floodplain (Flood Zone 3b),
- With large areas of their footprint at risk from Flood Zone 3a, and
- That are large enough and within a suitable distance to receive flood water from a nearby development site using appropriate SuDS techniques which may involve pumping, piping or swales / drains.

Brownfield sites could also be considered though this would entail site clearance of existing buildings and hardstanding areas, conversion to greenspace and contaminated land assessments.

By using the sequential approach to site layout, the LPA and developers should be able to avoid the areas at risk and leave clear for potential flood storage. See the SFRA Maps in Appendix B to spatially assess the areas of the sites at risk.

6.4.4 Phasing of development

Flood risk should be taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in Figure 6-2.

Using a phased approach to development, based on modelling results of floodwater storage options, should ensure that 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, thus ensuring a sustainable approach to site development. Also, it may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites. Large strategic multiple development sites should also carry out development phasing within the overall site boundary so as to avoid cumulative impacts within the site, as well as off the site (see Section 5.7.4 for information on Natural Flood Management and Working with Natural Processes).

6.5 Guidance for developers

This SFRA provides the evidence base for developers to assess flood risk at a strategic level and to determine the requirements of an appropriate site-specific FRA. Before carrying out an FRA, developers should check with the LPA whether the Sequential Test has been carried out. If not, the developer must apply the Sequential Test as part of their FRA by comparing their indicative development site with other available sites to

ascertain which site has the lowest flood risk. The EA provides advice on this process via:

https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

Table 6-1 identifies, for developers, when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who should apply the test if required.

Development	Sequential Test Required?	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Allocated Sites	No (assuming the development type is the same as that submitted via the allocations process)	LPA should have already carried out the test during the allocation of development sites	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Yes	Developer provides evidence, to the LPA that the test can be passed. An area of search will be defined by local circumstances relating to the catchment and for the type of development being proposed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration Sites Identified Within Local Plan	No	-	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Redevelopment of Existing Single Properties	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

Development	Sequential Test Required?	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Changes of Use	No (except for any proposal involving changes of use to land involving a caravan, camping or chalet site)	Developer provides evidence to the LPA that the test can be passed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

Table 6-1: Development types and application of Sequential and Exception Tests for developers

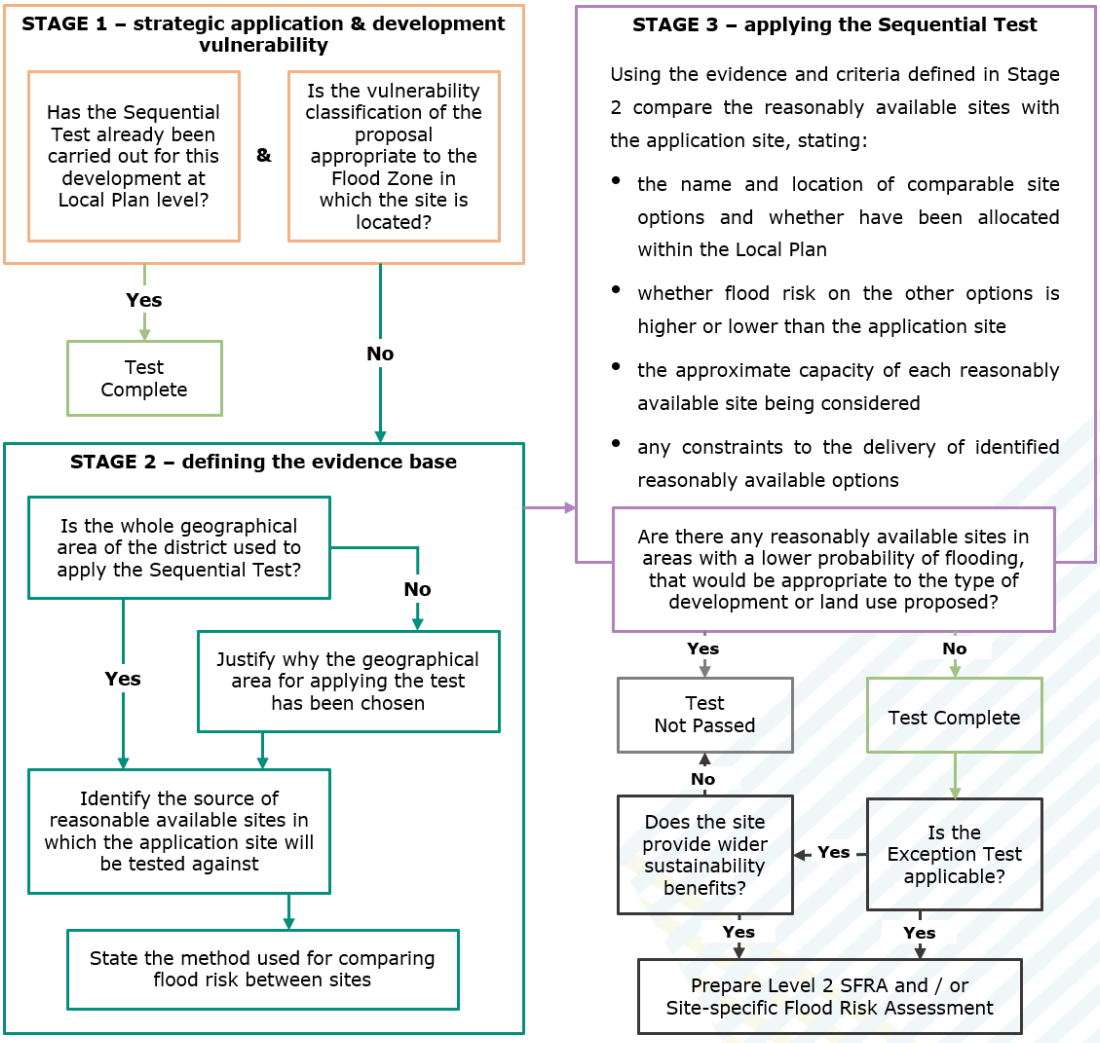

Figure 6-4: Development management Sequential Test process

Figure 6-4 shows what developers should do with regards to applying the Sequential Test if the LPA has not already done so.

The Sequential Test does not apply to change of use applications unless it is for change of land use to a caravan, camping or chalet site, or to a mobile home site or park home site. The Sequential Test can also be considered adequately demonstrated if both of the following criteria are met:

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (Local Plan); and
- The development vulnerability is appropriate to the Flood Zone (see Table 3 of the FRCC-PPG).

If both these criteria are met, reference should be provided for the site allocation of the Local Plan document and the vulnerability of the development should be clearly stated.

When applying the Sequential Test, the following should also be considered:

- **The geographic area in which the Test is to be applied;**
- **The source of reasonable available sites in which the application site will be tested against; and**
- **The evidence and method used to compare flood risk between sites.**

Sites could be compared in relation to flood risk, Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development on the local area, and future environmental conditions that would be experienced by the inhabitants of the development.

The test should conclude if 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 that has been put forward in the Local Plan.

The LPA should now have sufficient information to be able to assess whether or not the indicative site has passed the Sequential Test. If the Test has been passed, then the developer should apply the Exception Test in the circumstances set out by tables 1 and 3 of the FRCC-PPG.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific FRA has not already been carried out, a site-specific should be completed in line with the NPPF and the FRCC-PPG.

In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach to locating development within the site. As part of their application and masterplanning discussions with applicants, LPAs should seek whether or not:

- Flood risk can be avoided by substituting less vulnerable uses or by amending the site layout;
- Less vulnerable uses for the site have been considered; or
- Density can be varied to reduce the number or vulnerability of units located in higher risk parts of the site.

When initially considering the development options for a site, developers should use this SFRA, the NPPF and the FRCC-PPG to:

- ***Identify whether the site is***
    - *A windfall development, allocated development, within a regeneration area, single property or subject to a change of use to identify if the Sequential and Exception Tests are required.*
- ***Check whether the Sequential Test and / or the Exception Test have already been applied***
    - *Request information from the LPA on whether the Sequential Test, or the likelihood of the site passing the Exception Test, have been assessed;*
    - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test.*
- ***Consult with the LPA, the LLFA and the EA and the wider group of flood risk consultees, where appropriate, to scope an appropriate FRA if required***
    - *Guidance on FRAs is provided in Appendix E.3.4 of this SFRA;*
    - *Also, refer to the EA Standing Advice, the NPPF and the FRCC-PPG;*
    - *Consult the LLFA*
- ***Submit FRA to the LPA for approval; the LPA can then consult the EA if required who will then review the FRA within their remit and give recommendations to the LPA***

6.6 Planning for climate change

In relation to flood risk and climate change in the planning system, the NPPF states:

"All plans should apply a sequential, risk-based approach to the location of development – taking into account the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property." (para 161).

Local plans should do this by safeguarding land from development that is required, or likely to be required, for current or future flood management; and to seek opportunities for the relocation of development, including housing, to more sustainable locations from areas where climate change is expected to increase flood risk.

6.6.1 EA climate change allowances

As discussed in Appendix E, the EA has published (July 2021) the updated climate change allowances for peak river flows and peak rainfall intensities following research completed in 2020. This research sought to better understand how different river catchments respond to changes in rainfall due to climate change. It uses the latest rainfall projections from UKCP18 which has superseded UKCP09. It was agreed with

the EA that, in the absence of appropriate modelling, the precautionary approach discussed in Appendix E be used for this Level 1 SFRA.

At the time of writing, the latest allowances are available online via:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

The climate change allowances are predictions of anticipated change for:

- Peak river flow by River Basin District (see Table 6-2 for Derwent North West and South West Lakes management catchment allowances);
- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

Management catchment	Allowance Category	Total Potential Change Anticipated for…		
		2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Derwent North West	Upper end	+28%	+49%	+80%
	Higher central	+19%	+31%	+51%
	Central	+15%	+23%	+40%
South West Lakes	Upper end	+22%	+38%	+63%
	Higher central	+14%	+23%	+39%
	Central	+12%	+17%	+30%

Table 6-2: Recommended peak river flow allowances for the Derwent North West and South West Lakes Management Catchments

To gauge the impacts of climate change on surface water, the EA states the allowances for peak rainfall intensities provided in Table 6-3 should be used. The peak rainfall intensity allowances apply to the whole of England for small catchments (less than 5 km^2) and urban catchments. SFRAs and FRAs should assess both the central and upper end allowances to gauge the range of impacts. Note: surface water climate change modelling has not been carried out for this SFRA.

Allowance Category	Total Potential Change Anticipated for…		
	2015-2039	2040-2069	2070-2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 6-3: Peak rainfall intensity allowances in small and urban catchments for England

Allowances for sea level rise are based on river basin district and were last updated in 2019. The allowances for the North West RBD are shown in Table 6-4. The number in brackets is the cumulative sea level rise for each year within each range. The EA expects SFRAs and FRAs to assess both allowance categories and also the H++ allowance in some cases. The H++ scenario for sea level rise for England is set at a total sea level rise of 1.9 metres, up to the year 2100.

Allowance category	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
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

Table 6-4: Sea level allowance for the North West RBD

As discussed, modelled climate change outputs, using the EA's latest allowances, are not available at the time of writing for this Level 1 SFRA. However, any Level 2 assessment, following on from this Level 1, should fully model appropriate climate change allowances where fully functioning EA hydraulic models are available. Until this is done by Copeland Council, the onus is on the applicant to undertake this to support any planning application where required.

UKCP18

In November 2018 Defra released a new set of UK Climate Projections (UKCP18). These projections replace the UKCP09 projections which have been used for the past ten years. In February 2019, the EA stated that the 2016 guidance is being revised in line with the UK Climate Projections 2018. An update was provided in December 2019 whereby the EA stated the following updates to the guidance:

1. Updated the sea level rise allowances using UKCP18 projections.
2. Added guidance on how to
    a. calculate flood storage compensation,
    b. use peak rainfall allowances to help design drainage systems,
    c. account for the impact of climate change on storm surge,
    d. assess and design access and escape routes for less vulnerable development.
3. Changed the guidance on how to apply peak river flow allowances so the approach is the same for both flood zones 2 and 3.

In July 2021, there was a further update in which the peak river allowances were updated with the UKCP18 projections to be based on management catchments rather than river basin districts. There were also changes to guidance on how to apply peak river flow allowances where:

a) the central allowance is used for all assessments except for essential infrastructure, where you use the higher central allowance
b) the upper end for 'credible maximum scenario' assessments, and
c) the central allowance to calculate flood storage compensation, except for where essential infrastructure is affected, where you use the higher central allowance.

6.7 Sustainable Drainage Systems (SuDS)

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and consequently a potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and

existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding.

The Department for Communities and Local Government (DCLG) (now Ministry of Housing, Communities & Local Government (MHCLG)) announced, in December 2014, that the local planning authority, in consultation with the LLFA, should be responsible for delivering SuDS[14] through the planning system. Changes to planning legislation gave provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the 'non-statutory technical standards for sustainable drainage systems'[15], published in March 2015. A Practice Guidance[16] document has also been developed by the Local Authority SuDS Officer Organisation (LASOO) to assist in the application of the non-statutory technical standards.

In order to manage flood risk, all development, regardless of development type, flood zone and development size, must give priority use to SuDS. Particularly for major developments, there is a requirement to assess and include SuDS for managing surface water at the development unless it is demonstrated during the assessment that it is inappropriate for the site.

In order to satisfy the NPPF and its accompanying PPG, applicants must demonstrate that priority has been given to the use of SuDS in their development proposals. SuDS should be provided by default unless demonstrated to be inappropriate. Where priority use of SuDS cannot be achieved, applicants must justify this by submitting robust and acceptable evidence.

The NPPF, para 169, states:

"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a. take account of advice from the lead local flood authority;

b. have appropriate proposed minimum operational standards;

c. ***have maintenance arrangements, in place to ensure an acceptable standard of operation for the lifetime of the development;*** *and*

d. where possible, provide multifunctional benefits".

Although the NPPF states only 'major' developments should incorporate SuDS, all development proposals, for both major and minor development, should include SuDS, providing multiple benefits that contribute to many other NPPF policies, including climate change. Where site conditions may be more challenging, the types of SuDS may need to be adapted. At a strategic level, this should mean identifying SuDS opportunities and constraints according to geology, soil type, topography, groundwater / minewater conditions and potential impacts on site allocation and yields. Local SuDS guidance should then be developed including instructions on adoption and maintenance.

Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers, and, set out a minimum standard to which the SuDS must be maintained.

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14 http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/

15 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

16 http://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf

Sustainable drainage should form part of an integrated design methodology secured by detailed planning conditions to ensure that the SuDS to be constructed is maintained to a minimum level of effectiveness.

New rules that came into force on 1 April 2020 now allow English water and sewerage companies to adopt a wider range of sewer types than they have done to date, including some SuDS. In order to meet the criteria for adoption, the SuDS must be constructed to an adoptable standard, taking into consideration the current Non Statutory Technical Standards for SuDS and the CIRIA SuDS Manual (or appropriate replacement guidance or legislation). Developers and their consultants should engage with the LPA, the Lead Local Flood Authority (LLFA) and United Utilities early on to explore mechanisms for adoption.

6.7.1 SuDS hierarchy

The runoff destination should always be the first consideration when considering design criteria for SuDS including the following possible destinations in order of preference:

a) Source control / interception

1. Into the ground (infiltration);
2. To a surface water body;
3. To a surface water sewer, highway drain, or another drainage system;
4. To a combined sewer.

Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination. Developers should also establish that proposed outfalls are hydraulically capable of accepting the runoff from SuDS through consultation with the LLFA and UU as appropriate. The EA may also look at the potential impact of an outfall structure through the planning consultation and Environmental Permitting Regulation process. It should be noted that detailed modelling will not be available for all outfalls therefore developers should carry out their own investigations whilst referring to the non-statutory technical standards for sustainable drainage systems (March 2015, due to be updated in 2021).

The non-statutory technical standards set out appropriate design criteria based on the following:

1. Flood risk outside the development;
2. Peak flow control;
3. Volume control;
4. Flood risk within the development;
5. Structural integrity;
6. Designing for maintenance considerations;
7. Construction.

Many different SuDS techniques can be implemented. As a result, there is no one standard correct drainage solution for a site. In most cases, using the Management Train principle (see Figure 6-5), will be required, where source control is the primary aim.

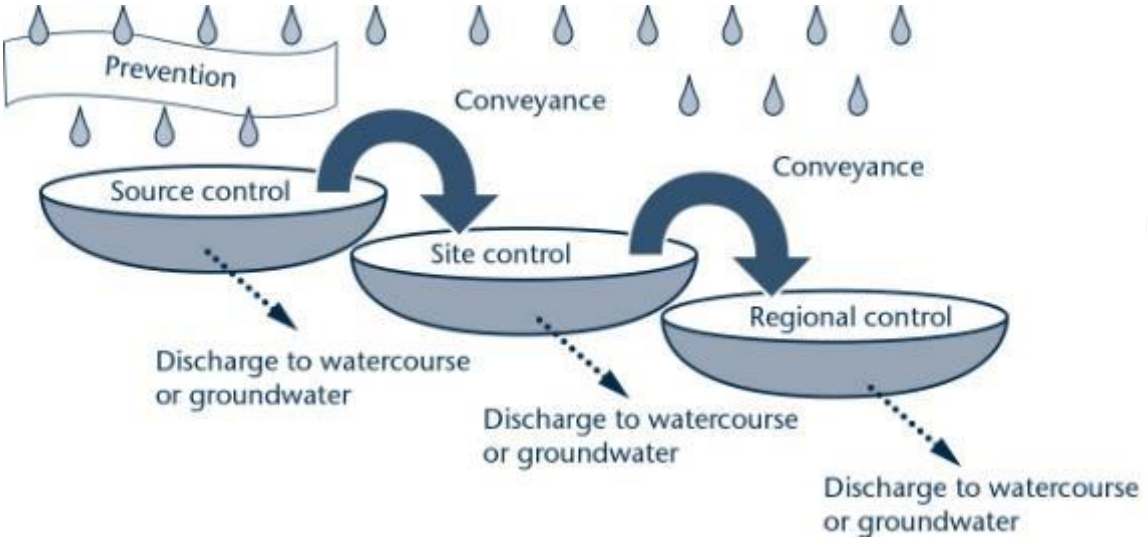

Figure 6-5: SuDS management train principle

The effectiveness of a flow management scheme within a single site is heavily limited by land use and site characteristics including (but not limited to) topography, geology and soil (permeability), and available area. Potential ground contamination associated with urban and former industrial sites should be investigated with concern being placed on the depth of the local water table and potential contamination risks that will affect water quality. The design, construction and ongoing maintenance regime of any SuDS scheme must be carefully defined as part of a site-specific FRA. A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential for successful SuDS implementation.

In addition to the national standards, the LPA may set local requirements for planning permission that include more rigorous obligations than the non-statutory technical standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high-risk or densely populated areas. This could include improvements on Greenfield runoff rates. The LPA and LLFA should always be contacted with regards to any local requirements at the earliest opportunity in development planning.

The CIRIA SuDS Manual[17] 2015 should also be consulted by the LPA and developers. The SuDS manual (C753) is highly regarded and incorporates the latest research, industry practice, technical advice and adaptable processes to assist in the planning, design, construction, management and maintenance of good SuDS. The SuDS Manual complements the non-statutory technical standards and goes further to support the cost-effective delivery of multiple benefits.

6.8 Sustainable drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

Managing surface water discharges from new development is crucial in managing and reducing flood risk to new and existing development.

17 https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in setting standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance by the water companies on their assets. Water companies plan their investment on a five-year rolling cycle, in consultation with key partners, including the EA and local authorities.

The Cumbria LLFA Development Design Guide, approved in November 2017, provides detailed design guidance on such matters / drainage for new developments.

6.8.1 Overland flow paths

Underground drainage systems have a finite capacity and regard should always be given to larger events when the capacity of the network will be exceeded. Hence there is a need to design new developments with exceedance in mind. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

All development proposals including masterplanning should ensure that existing overland flow paths are retained within the development. As a minimum, the developer should investigate, as part of a site-specific FRA, the likely extents, depths and associated hazards of surface water flooding on a development site, as indicated at the strategic level by the RoFSW dataset. This is considered to be an appropriate approach to reduce the risks of flooding to new developments. Blue-green infrastructure (BGI) should be used wherever possible to accommodate such flow paths. **Floor levels should always be set above the design flood based on EA guidance and the conclusions of the site-specific FRA** to reduce the consequences of any localised flooding, unless local guidance states otherwise.

The EA states that ground floor levels should be a minimum (in relation to Ordnance Datum) of whichever is higher of:

- 300 mm above the general ground level of the site, or
- 600 mm above the estimated river level

unless local guidance states otherwise.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography; geology and soil (permeability); development density; existing drainage networks both onsite and in the surrounding area; adoption issues; and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

6.9 Property Flood Resilience (PFR)

PFR measures should only be applied retrospectively to existing development that is at flood risk, as new development should not be constructed in areas at flood risk. Para 167 of the NPPF explains that development must only be allowed in areas at flood risk where, following the Sequential and Exception Tests, and supported by an FRA, the development is appropriately flood resistant and resilient.

Flood resilience and resistance measures are mainly designed to mitigate flood risk and reduce damage and adverse consequences to existing property. Resistance and

resilience measures may aim to help residents and businesses recover more quickly following a flood event.

It should be noted that it is not possible to completely prevent flooding to all communities and businesses.

Research carried out by the then DCLG, now MHCLG, and the EA has recommended that the use of resistance measures should generally be limited to a nominal protection height of 600 mm above ground level, in relation to Ordnance Datum, the lowest point of ground abutting the external property walls. This is because the structural integrity of the property may be compromised above this level.

It should be noted that PFR measures would not be expected to cause an increase in flood risk to other properties or other parts of the local community. They will help mitigate against flood risk but, as with any flood alleviation scheme, flood risk cannot be removed completely. Emergency plans should, therefore, be in place that describe the installation of measures and residual risks.

As the flood risk posed to a property cannot be removed completely, it is recommended that PFR products are deployed in conjunction with pumps of a sufficient capacity. Pumps help manage residual flood risks not addressed by resistance measures alone such as rising groundwater.

6.9.1 Definitions

Flood resilience measures aim to reduce the damage caused by floodwater entering a property. Flood resilience measures are based on an understanding that internal flooding may occur again and when considering this eventuality, homes and businesses are encouraged to plan for flooding with an aim of rapid recovery and the return of the property to a habitable state.

For example, tiled floors are easier to clean than carpets, raised electricity sockets and high-level wall fixings for TVs / computers may mean that that power supply remains unaffected. Raising kitchen or storage units may also prevent damage that may not require replacement after a flood. There is a lot of information available about what items get damaged by floodwater and features that are considered to provide effective resilience measures that can be installed at a property.

Flood resistance measures aim to reduce the amount of floodwater entering the property. Obvious inflow routes, such as through doors and airbricks may be managed, for example, by installing bespoke flood doors, door flood barriers and automatic closing airbricks. However, the property's condition and construction are also key to understanding how floodwater may enter and move between buildings. For example, flood water can also flow between properties through connecting cavity walls, cellars, beneath suspended floors and through internal walls. Flood resistance measure alone may not keep floodwater out. Building condition is a critical component of any flood mitigation study.

6.9.2 Property mitigation surveys

To define the scale and type of resistance or resilience measures required, a survey will need to be undertaken to pick up property threshold levels, air brick levels, doorways, historic flood levels and a number of ground spot levels required to better understand the flood mechanisms for flood water arriving at the property (e.g. along road, pavements, etc.). The depth of flooding at each property will help guide the selection of resistance measures proposed. Surveys will need to include consideration of issues such as:

- Detailed property information
- An assessment of flood risk, including property (cross) threshold levels

- Routes of water ingress (fluvial, ground and surface water flooding)
- An assessment of the impact of flood waters
- A schedule of measures to reduce risk (resistance and resilience)
- Details of recommendations (including indicative costs)
- Advice on future maintenance of measures
- Advice on flood preparedness

All sources of flooding will need to be considered, including a comprehensive survey of openings (doors, windows and air bricks), as well as potential seepage routes through walls and floors, ingress through service cables, pipes, drains and identify possible weaknesses in any deteriorating brickwork or mortar.

7 Emergency Planning

The provisions for emergency planning for local authorities as Category 1 responders are set out by the Civil Contingencies Act, 2004 and the National Flood Emergency Framework for England, December 2014[18]. This framework is a resource for all involved in emergency planning and response to flooding from the sea, rivers, surface water, groundwater and reservoirs. The Framework sets out Government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies;
- Giving all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies;
- Establishing clear thresholds for emergency response arrangements;
- Placing proper emphasis on the multi-agency approach to managing flooding events;
- Providing clarity on the means of improving resilience and minimising the impact of flooding events;
- Providing a basis for individual responders to develop and review their own plans; and
- Being a long-term asset that will provide the basis for continuous improvement in flood emergency management.

Along with the EA flood warning systems, there are a range of flood plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and tactical response framework for key responders. The Environment Agency and the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) have produced guidance on flood risk emergency plans for new development[19] (September 2019). The EA do not however, review and approve flood risk emergency plans as it falls under the LPA's remit alongside their emergency planners.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The SFRA Maps in Appendix B and accompanying GIS layers should be made available for consultation by emergency planners during an event and throughout the planning process.

7.1 Civil Contingencies Act

Under the Civil Contingencies Act (CCA, 2004)[20], the LLFA and LPA are classified as Category 1 responders and thus have duties to assess the risk of emergencies occurring, and use this to:

- Inform contingency planning;
- Put in place emergency plans;
- Put in place business continuity management arrangements;
- Put in place arrangements to make information available to the public about civil protection matters;
- Maintain arrangements to warn, inform and advise the public in the event of an emergency;

[18] https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england
[19] https://www.adeptnet.org.uk/floodriskemergencyplan
[20] https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act

- Share information with other local responders to enhance coordination; and
- Cooperate with other local responders to enhance coordination and efficiency and to provide advice and assistance to businesses and voluntary organisations about business continuity management.

During an emergency, such as a flood event, the local authority must also co-operate with other Category 1 responders (such as the emergency services and the EA) to provide the core response.

7.1.1 Cumbria Local Resilience Forum (CLRF)

The aim of the CLRF is to make sure that the duties stated in the Civil Contingencies Act 2004 are achieved within a multi-agency environment. These are to:

- Co-operate with other local responders
- Share information with other local responders
- Assess the risk of emergencies in the area
- Put in place business continuity management arrangements
- Put in place arrangements to warn, inform and advise the public in the event of an emergency
- Provide advice and assistance to businesses and voluntary organisations about business continuity.

7.1.2 Cumbria Community Risk Register[21]

The CLRF produces the Community Risk Register (CRR) which lists possible risks, the probability of occurring and potential impact. The CRR provides information on the biggest emergencies that happen in Cumbria, together with an assessment of how likely they are to happen and the impacts if they do include impacts to people, houses, the environment and local businesses.

7.1.3 Community Emergency Plan

Communities may need to rely on their own resources to minimise the impact of an emergency, including a flood, before the emergency services arrive. Many communities already help each other in times of need, but experience shows that those who are prepared cope better during an emergency. Communities with local knowledge, enthusiasm and information are a great asset and a Community Emergency Plan can help. Details on how to produce a community emergency plan, including a toolkit and template, are available from the Government's website[22]. CCC have produced guidance and emergency plans on how to prepare and respond to emergencies, these are available from:

https://www.cumbria.gov.uk/emergencyplanning/planning.asp

7.1.4 Local flood plans

This SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. The LPA will be unable to write their own specific flood plans for new developments at flood risk. Developers should write their own. Generally, owners with individual properties at risk should write their own individual flood plans, however larger developments or regeneration areas, such as retail parks,

[21] https://www.cumbria.gov.uk/emergencyplanning/supportingpages/crr.asp
[22] https://www.gov.uk/guidance/resilience-in-society-infrastructure-communities-and-businesses#community-resilience

hotels and leisure complexes, should consider writing one collective plan for the assets within an area.

This SFRA can help to:

- Update these flood plans if appropriate;
- Inform emergency planners in understanding the possibility, likelihood and spatial distribution of all sources of flooding (emergency planners may however have access to more detailed information, such as for Reservoir Inundation Maps, which have not been made available for this SFRA);
- Identify safe evacuation routes and access routes for emergency services;
- Identify key strategic locations to be protected in flooding emergencies, and the locations of refuge areas which are capable of remaining operational during flood events;
- Provide information on risks in relation to key infrastructure, and any risk management activities, plans or business continuity arrangements;
- Raise awareness and engage local communities;
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk; and
- Provide flood risk evidence for further studies.

The following guidance written by the Environment Agency and the Association of Directors of Environment, Economy, Planning and Transport is aimed at Local Planning Authorities to help assist in setting up their own guidelines on what should be included in the flood risk emergency plans:

https://www.adeptnet.org.uk/floodriskemergencyplan

7.2 Flood warning and evacuation plans

Developments that include areas that are designed to flood (e.g. ground floor car parking and amenity areas) or have a residual risk associated with them, will need to provide appropriate flood warning and instructions so users and residents are safe in a flood. This will include both physical warning signs and written flood warning and evacuation plans. Those using the new development should be made aware of any evacuation plans.

In relation to new development it is up to the LPA to determine whether the flood warning and evacuation plans, or equivalent procedures, are sufficient or not. If the LPA is not satisfied, taking into account all relevant considerations, that an indicative development can be considered safe without the provision of safe access and exit, then planning permission should be refused.

Whilst there is no statutory requirement on the EA or the emergency services to approve evacuation plans, LPAs are accountable under their Civil Contingencies duties, via planning condition or agreement, to ensure that plans are suitable. This should be done in consultation with development management officers. Given the cross-cutting nature of flooding, it is recommended that further discussions are held internally to the LPA between emergency planners and policy planners / development management officers, the LLFA, drainage engineers and also to external stakeholders such as the emergency services, the EA, UU, Internal Drainage Boards and Canal & River Trust (if applicable).

It may be useful for both the LLFA and spatial planners to consider whether, as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. Cumbria Local Resilience Forum are essential

to establish the feasibility / effectiveness of such an approach, prior to it being progressed. It may also be useful to consider how key parts of agreed flood evacuation plans could be incorporated within local development documents, including in terms of protecting evacuation routes and assembly areas from inappropriate development.

Once the development goes ahead, it will be the requirement of the plan owner (developer) to make sure the plan is put in place, and to liaise with the LPA and LLFA regarding maintenance and updating of the plan.

7.2.1 What should the Plan include?

Flood warning and evacuation plans should include the information stated in Table 7-1. Advice and guidance on plans are accessible from the EA website and there are templates available for businesses and local communities.

Consideration	Purpose
Availability of existing flood warning system	The EA offers a flood warning service that currently covers designated Flood Warning Areas in England and Wales. In these areas, they are able to provide a full Flood Warning Service.
Rate of onset of flooding	The rate of onset is how quickly the water arrives and the speed at which it rises which, in turn, will govern the opportunity for people to effectively prepare for and respond to a flood. This is an important factor within Emergency Planning in assessing the response time available to the emergency services.
How flood warning is given and occupants awareness of the likely frequency and duration of flood events.	Everyone eligible to receive flood warning should be signed up to the EA flood warning service. Where applicable, the display of flood warning signs should be considered. In particular sites that will be visited by members of the public on a daily basis such as sports complexes, car parks, retail stores. It is envisaged that the responsibility should fall upon the developers and should be a condition of the planning permission. Information should be provided to new occupants of houses concerning the level of risk and subsequent procedures if a flood occurs.
The availability of staff / occupants / users to respond to a flood warning and the time taken to respond to a flood warning	The plan should identify roles and responsibilities of all responders. The use of community flood wardens should also be considered.
Designing and locating safe access routes, preparing evacuation routes and the identification of safe locations for evacuees	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and flood hazard rating, including allowance for climate change, should be considered when identifying these routes.
Vulnerability of occupants	Vulnerability classifications associated with development as outlined in the FRCC-PPG. This is closely linked to its occupiers.
How easily damaged items will be relocated, and the	The impact of flooding can be long lasting well after the event has taken place affecting both the property

Consideration	Purpose
expected time taken to re-establish normal use following an event	which has been flooded and the lives that have been disrupted. The resilience of the community to get back to normal will be important including time taken to repair / replace damages.

Table 7-1: Flood warning and evacuation plans

7.2.2 EA Flood Warning Areas (FWA) and flood awareness

The EA monitors river levels within the Main Rivers across England and, based upon weather predictions provided by The Met Office, make an assessment of the anticipated maximum water level that is likely to be reached within the proceeding hours (and/or days). Where these predicted water levels are expected to result in inundation of a populated area, the EA will issue a series of flood warnings within a defined FWA, encouraging residents to take action to avoid damage to property in the first instance.

More information on flood warnings is provided by the EA via:

https://www.gov.uk/government/publications/flood-warnings-what-they-are-and-what-to-do

There are 14 FWAs in operation across the study area. The FWAs are located along the Cumbrian coast, Whitehaven, the Duddon estuary, the River Ehen and Skirting Beck at Egremont to protect the properties and businesses. The FWAs are shown on the SFRA maps in Appendix B.

Live information on flood warning and flood alerts for any location in England is available via:

https://flood-warning-information.service.gov.uk/

Emergency planners may also use the outputs from this SFRA to raise awareness within local communities. This should include raising awareness of flood risk, roles and responsibilities and measures that people can take to make their homes more resilient to flooding from all sources whilst also encouraging all those at fluvial flood risk to sign up to the EA's Flood Warning service.

https://www.gov.uk/sign-up-for-flood-warnings

It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas, to ensure that adequate pre-planning response and recovery arrangements are in place.

8 Summary and Recommendations

8.1 Summary

This Level 1 SFRA provides a single repository planning tool relating to flood risk and development in Copeland borough. Key flood risk stakeholders namely the EA, LPA / LLFA, UU, local emergency services, emergency planners and local resilience forums were consulted to collate all available and relevant flood risk information on all sources into one comprehensive assessment. Together with this main report, this SFRA also provides a suite of interactive GeoPDF flood risk maps (Appendix B) and a development site assessment spreadsheet (Appendix C) illustrating the level of risk to potential development sites.

The flood risk information, assessment, guidance and recommendations provided in this SFRA will provide the LPA with the evidence base required to apply the Sequential Test, as required under the NPPF, and demonstrate that a risk-based, sequential approach has been applied in the preparation of its new Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas, in some locations where the council is looking for continued growth and/or regeneration, this will not always be possible. This SFRA therefore provides the necessary links between spatial development, wider flood risk management policies, local strategies and plans and on the ground works by combining all available flood risk information together into one single repository. As this is a strategic study based on current available information, detailed, site-specific local information on flood risk is not fully accounted for. For a more detailed assessment of specific areas or sites, a Level 2 SFRA may be carried out following on from the completion of a Level 1 assessment, if required.

The data and information used throughout the SFRA process is the most up-to-date data available at the time of writing (October 2021). Once new, updated or further information becomes available, the LPA should look to update this SFRA. The Level 1 SFRA should be considered to be, and maintained as, a 'live' entity which is updated as and when required (when new modelling or flood risk information becomes available). The LPA and LLFA can decide when to update the SFRA, and the EA as a statutory consultee on local plans can also advise the LPA to update the SFRA.

8.1.1 Summary of risk

The risk across the CBC area is varied:

- The main fluvial risk comes from:
  - the River Ehen and Skirting Beck in Egremont,
  - Pow Beck in Whitehaven, and
  - Kirk Beck and Black Beck in Beckermet.
- The main tidal risk comes from the Copeland coastline, particularly along the low-lying coastal flats and estuaries. The town of Millom, in the south of the district, is at high tidal flood risk, particularly east Millom from the Duddon Estuary.
- Surface water risk is spread across the whole of the Copeland borough. The main areas of risk are primarily centred around the Main Rivers; and
- The areas with the highest levels of groundwater vulnerability are spread across the whole of the Copeland authority area with the main areas being located on the estuary in the south of the council area, and to the north areas such as Sellafield, Egremont, Whitehaven, Cleator Moor, and along the A595.

8.2 Planning and flood risk policy recommendations

The following planning flood risk policy recommendations are designed to enable the LPA to use the information provided in this Level 1 SFRA to inform Local Plan policy direction:

Recommendation 1: No development within the functional floodplain…

…as per the National Planning Policy Framework (2019) and Flood Risk and Coastal Change Planning Practice Guidance, unless in exceptional circumstances such as for essential infrastructure, which must still pass the Exception Test, or where development is water compatible.

Development must not impede the flow of water within the functional floodplain nor should it reduce the volume available for the storage of floodwater. Sites within the functional floodplain may still be developable if the site boundary can be removed from the functional floodplain or the site can accommodate the risk on site and keep the area of functional floodplain free from development or obstruction and allowed to flow freely.

Refer to tables 1 to 3 of the FRCC-PPG.

Recommendation 2a: Consider surface water flood risk…

…with equal importance alongside fluvial risk including possible withdrawal, redesign or relocation for sites at significant surface water risk.

Sustainable Drainage Systems on all new development must adhere to industry standards and to the applicable runoff discharge rate and storage volume allowances stated by the Lead Local Flood Authority.

Site specific Flood Risk Assessments should always consider surface water flood risk management and options for on-site flood storage through appropriate Sustainable Drainage Systems. The Local Planning Authority / Lead Local Flood Authority must always be consulted during this process, as should United Utilities and the EA, if required.

A Sustainable Drainage Strategy should always be submitted which clearly takes account of the findings of the site-specific Flood Risk Assessment and specify the proposed design, constructions, adoption and management and maintenance arrangements of the proposed SuDS components. The LPA and LLFA must always be consulted during this process, as should United Utilities and the EA, if required

Recommendation 2b: Use of appropriately sourced SuDS…

…required for all major developments of 10 or more residential units or equivalent commercial development. This is in accordance with Para 163 of the National Planning Policy Framework (2019).

As per the NPPF (2021), in terms of Sustainable Drainage Systems, development in areas at flood risk should only be permitted where SuDS are incorporated into the design, unless clear evidence demonstrates this would be inappropriate.

SuDS scoping and design, as part of a site-specific Flood Risk Assessment, must be included within the early stages of the site design in order to incorporate appropriate SuDS within the development.

The Local Planning Authority / Lead Local Flood Authority, United Utilities (if appropriate) must be consulted during the site design stage and the Flood Risk Assessment must be submitted to and approved by the Local Planning Authority, considering all consultation with key stakeholders.

All SuDS must be designed to meet industry standards, as specified below, including any replacement standards/documents which update or are in addition to those listed:

- Local SuDS Guidance
- Interim national standards published in March 2015
- Technical Standards for Sustainable Drainage Systems (Defra)
- C753 The SuDS Manual
- The Design and Construction Guidance for Sewers (2020)

Recommendation 3: Sequential approach to site allocation and site layout…

…must be followed by the Local Planning Authority to ensure sustainable development when either allocating land in Local Plans or determining planning applications for development.

The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3a, be considered. This should take into account the flood risk vulnerability of land uses, residual surface water and/or groundwater flood risk and the likelihood of meeting the requirements of the Exception Test, if required.

This SFRA, the National Planning Policy Framework and Flood Risk and Coastal Change Planning Policy Guidance must be consulted throughout this process along with the LPA / LLFA, EA, and United Utilities.

Recommendation 4: Requirement for a site-specific Flood Risk Assessment…

…from a developer when a site is:

- Any site located within Flood Zone 2 or 3
- Any site that has an area greater than 1 ha
- Within Flood Zone 1 where any part of the site is identified by the Risk of Flooding from Surface Water maps as being at risk of surface water flooding.
- Identified by the EA as having critical drainage problems (within an Area with Critical Drainage Problems)
- Situated over or within 8 metres of a culverted watercourse or where development will be required to control or influence the flow of any watercourse
- Within 20 metres of a Main River
- Identified as being at increased flood risk in future
- At risk of flooding from other sources of flooding or at residual risk
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding
- Situated in an area currently benefitting from defences
- Within a council designated Critical Drainage Area

Before deciding on the scope of the Flood Risk Assessment, this SFRA should be consulted along with the LPA / LLFA, and United Utilities. The Flood Risk Assessment should be submitted to and be approved by the LPA including suitable consultation with the LLFA and the EA and any other applicable parties.

Recommendation 5: Natural Flood Management techniques…

…must be considered, where possible, to aid with flood alleviation and implementation of suitable SuDS, depending on the location.

The national Working with Natural Processes mapping (included in this SFRA) should be consulted in the first instance, followed by local investigation into whether such techniques are appropriate and whether the benefits are proportionate to the work required to carry out the identified Working with Natural Processes approaches.

Natural drainage features should be maintained and enhanced and there should be a presumption against culverting of open watercourses. Where possible, culvert removal should be explored.

Recommendation 6: Phasing of development…

…must be carried out by the Local Planning Authority on a site by site basis and also within sites by the developer to avoid any cumulative impacts of flood risk (reinforced by the revised National Planning Policy Framework (2019)).

Using a phased approach to development, should ensure that any sites at risk of causing flooding to other sites are developed first to ensure that flood storage measures are in place and operational before other sites are developed, thus contributing to a sustainable approach to site development during all phases of construction. It may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

Development phasing within large strategic sites of multiple developments should also be considered where parts of such sites are at flood risk.

The EA states that the optimum approach would be to have all development sites that make up a large strategic site to have all developers sign up to a Flood Risk and Drainage Masterplan from the very start of the planning stage. It is often the case that outline planning permission is given for larger strategic sites with individual developers then submitting further separate site-specific FRAs that are not joined up with the rest of the site. These individual FRAs can then fail to include the green SuDS infrastructure indicated within the Outline FRA

Recommendation 7: Planning permission for at risk sites…

…can only be granted by the Local Planning Authority where a site-specific Flood Risk Assessment shows that:

- The National Planning Policy Framework and Flood Risk and Coastal Change Planning Practice Guidance have been referenced together with appropriate consultation with the Lead Local Flood Authority, the EA, and United Utilities, where applicable
- The effects of climate change have been taken into account using the latest allowances developed by the EA
- There is no loss in floodplain storage resulting from the development i.e. where development takes place in a fluvial flood zone or is at risk from surface water flooding, compensatory storage must be found to avoid loss of floodplain and subsequent displacement of water which may cause flooding elsewhere
- The development will not increase flood risk elsewhere
- For previously developed sites, the development should look to meet greenfield runoff rates where practicable (in line with the Non-Statutory Technical Standards for Sustainable Drainage (March 2013)), achieved through providing Sustainable Drainage Systems as appropriate or through the use of appropriate flow and volume control devices.
- There is no adverse effect on the operational functions of any existing flood defence infrastructure
- Proposed resistance / resilience measures designed to deal with current and future risks are appropriate
- Whether the development will be safe for its lifetime and has passed the Exception Test, if applicable
- An appropriate Emergency Plan is included that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood.

8.2.1 Recommendations for further work

The SFRA process has developed into more than just a planning tool. Sitting alongside the SA, LFRMS and FRMP, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are a number of plans and assessments listed in Table 8-1 that may be of benefit to the LPA, in developing their flood risk evidence base to support the delivery of the Local Plan, or to the LLFA to help fill critical gaps in flood risk information that have become apparent through the preparation of this Level 1 SFRA.

Type	Study	Reason	Timeframe
Understanding of local flood risk	Level 1 SFRA update	When there are changes to: • the predicted impacts of climate change on flood risk • detailed flood modelling - such as from the EA or LLFA	As required

Type	Study	Reason	Timeframe
		• the local plan, spatial development strategy 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 Or after a significant flood event.	
	Level 1 SFRA update; Level 2 SFRA; site-specific FRA	Reviewing of EA flood zones in those areas not covered by existing detailed hydraulic models i.e. the Flood Map for Planning does not cover every watercourse such as those <3km^2 in catchment area or Ordinary Watercourses. If a watercourse or drain is present on OS mapping but is not covered by the Flood Map for Planning, this does not mean there is no potential flood risk. A model may therefore be required to ascertain the flood risk, if any, to any nearby sites.	Short term
	Level 2 SFRA	**Further, more detailed assessment of flood risk to high risk sites, large strategic sites, as notified by this Level 1 SFRA. Dependant on the availability EA river model data.**	**Short term**
	Preliminary site-screening FRAs / outline drainage strategy	Further, more detailed assessment of larger strategic sites such as S195.	Short term
	Local Flood Risk Management Strategy review	It is recommended that the LFRMS is updated to ensure it remains consistent with the National Flood and Coastal Erosion Risk Management Strategy that was updated and published July 2020.	
	SWMP / drainage strategy / detailed surface water modelling	CCC developed a SWMP for the borough in 2013 and thus should be updated. At the time of writing, an update is currently underway.	Short to Medium term
	Water Cycle Study	CCC has not developed a WCS for the borough. If the Local Plan highlights large growth and urban expansion, the LLFA should produce a WCS to look at capabilities of water and sewerage providers.	Short to Medium term
	Climate change assessment for Level 1 update or Level 2 SFRA	Modelling of climate change, using the EA's 2016 allowances. February 2016 allowances for updated EA models are currently used. Guidance has been revised in line with UKCP18 where the guidance has changed on how to apply peak river flow allowances so the	Short term

Type	Study	Reason	Timeframe
		approach is the same for both flood zones 2 and 3.	
	Possible CDA delineation	Whether the delineation of CDAs may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the LLFA, UU and any relevant Internal Drainage Board would be required. It may then be beneficial to carry out a local SWMP or drainage strategy for targeted locations with any such critical drainage problems.	Medium term
Flood storage and attenuation	Working with Natural Processes	Promote creation of floodplain and riparian woodland, floodplain reconnection and runoff attenuation features where the research indicates that it would be beneficial in Copeland.	Ongoing
Data collection	Flood Incident data	CCC, as LLFA, has a duty to investigate and record details of significant flood events within their area. General data collected for each incident, should include date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any Risk Management Authority.	Short term
	FRM Asset Register	CCC has a responsibility to update and maintain a register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Capacity	SuDS review / guidance	The LPA should work with the LLFA to clearly identify its requirements of developers for SuDS in new developments. The LLFA would encourage the creation of a SuDS SPD and robust policy in the DPD to secure maximum weighting is applied to surface water management and sustainable design of new drainage systems to prevent flooding from surface water.	Short Term / Long Term
Partnership	United Utilities	The LLFA should continue to collaborate with UU on sewer and surface water projects. The LPA should be kept informed and carry out an assessment of water company assets to ensure they are operational and resilient at all times across the catchment and that capacity for new development is appropriate.	Ongoing
	EA	CBC and CCC should continue to work with the EA on fluvial flood risk management projects. Potential opportunities for joint schemes to tackle flooding from all sources should be identified.	Ongoing

Type	Study	Reason	Timeframe
	Community	Continued involvement with the community through CCC's existing flood risk partnerships.	Ongoing

Table 8-1: Recommended further work for CBC or developers

8.2.2 Level 2 SFRA

The LPA should review the sites where they expect the main housing numbers and employment sites to be delivered, using Section E.1 of Appendix E, the SFRA maps in Appendix B and the development site assessment spreadsheet in Appendix C. A Level 2 SFRA may be required for sites where any of the following applies:

- The Exception Test is required,
- Further evidencing i.e. climate change modelling is required at the strategic level in order to allocate,
- A large site, or group of sites, are within Flood Zone 3 and have strategic planning objectives, which means they cannot be relocated or avoided,
- A cluster of sites are within Flood Zone 2 or are at significant risk of surface water flooding.

A Level 2 SFRA should build on the source information provided in this Level 1 assessment and should show that a site will not increase risk elsewhere and will be safe for its lifetime, once developed.

As discussed in Section 6.5, a Level 2 assessment can be used to model the February 2016 climate change allowances, where current EA models are available. A Level 2 study may also further assess locations and options, in more detail, for the implementation of open space, or Green Infrastructure, to help manage flood risk in key areas, and also to assess residual risk.

Ultimately, the LPA will need to provide evidence in its Local Plan to show that housing numbers, economic needs and other sites can be delivered. Proposals within the Local Plan may be rejected if a large number of sites require the Exception Test to be passed but with no evidence that this will be possible.

As sites within this Level 1 assessment have been reviewed by the LPA in the consideration of planning applications, then further advice or guidance may be required to establish how best to progress future development proposals, possibly by a further review of the SFRA.

All Strategic Recommendation B sites should have a Level 2 SFRA completed assuming the LPA want to allocate. Those sites with Strategic Recommendation A should be withdrawn based on significant levels of fluvial / tidal and/or surface water flooding; if a site is still going to be taken forward then a Level 2 assessment should be carried out to assess depths and hazards of flooding in order for the site to pass the Exception Test (if applicable). Certain Strategic Recommendation C sites may also benefit from a more in-depth assessment through a Level 2 SFRA.

The EA should always be consulted as to whether a Level 2 SFRA is required.

Appendices

A Planning Framework and Flood Risk Policy

Following the introduction to the planning framework and flood risk policy located in Section 4, the remainder of the policy information is located within Appendix A and gives background into the policy documents that are relevant to CBC.

B SFRA maps

Interactive GeoPDF maps

The SFRA Maps consist of all flood risk information used within the SFRA, by way of interactive GeoPDFs. Open the Overview Map in Adobe Acrobat. The Overview Map includes a set of five squares; clicking on one of these squares will open up on of the Index Maps. The Index Maps then contains a set of index squares covering the authority area at a scale of 1:10,000. Clicking on one of these index squares will open up a more detailed map of that area (scale = 1:10,000) by way of a hyperlink.

Within the detailed maps, use the zoom tools and the hand tool to zoom in/out and pan around the open detailed map. In the legend on the right-hand side of the detailed maps, layers can be switched on and off when required by way of a dropdown arrow. The potential development site reference labels can also be switched on and off if, for example, smaller sites are obscured by labels.

The table below lists the datasets that are included in the maps with a short description of what they show.

Dataset	Description
Areas Benefitting from Defences	This dataset shows those areas that benefit from the presence of defences in a 1 in 100 (1% AEP) chance of flooding each year from rivers; or 1 in 200 (0.5% AEP) chance of flooding each year from the sea (not applicable to BwDBC). Note: in mapping these areas, it is assumed that flood defences and other operating structures act perfectly and give the same level of protection as when the assessment of the area was done.
BGS Potential for Groundwater Flooding map	Dataset from the British Geological Survey shows which areas are susceptible to groundwater flooding classified into three categories.
Council Boundary	A shapefile showing CBC's administrative area.
Climate Change Modelled Flood Outlines	Climate change modelled flood outlines from the EA hydraulic models provided by the EA for this SFRA.
Flood Alert Areas	Geographical areas where it is possible for flooding to occur from rivers, sea and, in some locations, groundwater. Flood Alerts are 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 Storage Areas	Geographical areas that act as a balancing reservoir, storage basin or balancing pond with a purpose to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel.
Flood Warning Areas	Geographical areas where we expect flooding to occur and where the Environment Agency provide a Flood Warning Service.
Flood Zone 3b (functional floodplain)	The functional floodplain was delineated as part of this SFRA (see Appendix D for methodology note) as it is not included in the Flood Map for Planning. This zone is for the use of LPAs and developers.
Flood Zones 2 and 3	The flood zones that are included within the Environment Agency's Flood Map for Planning. Note: Flood Zone 3b was delineated so Flood Zone 3 is therefore classed as Flood Zone 3a.
Recorded Flood Outlines	Dataset from the Environment Agency showing all records of historic flooding from rivers, the sea, groundwater and surface water. This dataset contains a consistent list of information about the recorded flood.
Historic Flood Map	Dataset from the Environment Agency showing the maximum extent of all individual Recorded Flood Outlines from river, the sea

Dataset	Description
	and groundwater. It differs from the Recorded Flood Outlines dataset as the HFM only contains outlines that are 'considered and accepted'.
Main Rivers	Dataset from the Environment Agency of the designated Main Rivers that the EA has permissive powers to carry out maintenance, improvement and construction work.
Main River buffer	EA guidance states that a buffer is required along all watercourses, which may be needed for access, maintenance or future flood risk management to make sure development in these areas does not increase flood risk. An 8-metre buffer, either side of each watercourse, has therefore been used in this SFRA, based on typical EA advice. Note: this buffer area is indicative and any plans for development should, through an FRA, further investigate the area required for the buffer zone.
Risk of Flooding from Rivers and Sea (RoFRS)	Dataset from the Environment Agency showing the chance of flooding from rivers and/or the sea, based on cells of 50 metres. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition.
Risk of Flooding from Surface Water (RoFSW)	Previously known as the updated Flood Map for Surface Water (uFMfSW); shows the extent of flooding from surface water that could result from a flood. Note: this data should not be used for property level investigations.
Spatial Flood Defences	Dataset from the Environment Agency showing all flood defences currently owned, managed or inspected by the EA. It has been symbolised to show raised flood walls and embankments within the study area.
Working with Natural Processes	There are 6 shapefiles located on the maps showing working with natural processes interventions that can be used as more natural forms of flood management.
United Utilities boundary	A shapefile of UU's administrative area.

C Development site assessment spreadsheet

Excel spreadsheet containing an assessment of flood risk to the potential development sites based on Flood Zones 1, 2, 3a and 3b; the Risk of Flooding from Surface Water (RoFSW); and bespoke climate change considerations. Each site is allocated a strategic recommendation based on the identified risk.

D Functional floodplain delineation

Technical note explaining the methodology behind the delineation of the functional floodplain (Flood Zone 3b) for this SFRA.

E Strategic recommendations of the potential sites

Following on from the introduction to the strategic recommendations for sites and the site assessment spreadsheet in Appendix C, this Appendix provides a commentary on the strategic recommendations for the potential sites.

F Strategic recommendation figures

Figures mapping the sites across the study area categorised by strategic recommendation to easily illustrate the assessed risk at each site.

G Copeland Level 1 SFRA User Guide

A support document to provide guidance on the use of the SFRA to developers, spatial planners, development management, flood risk management and emergency planners.

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