

# Eden Level 1 Strategic Flood Risk Assessment

Final Report

June 2020

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Town Hall,  
Corney Square,  
Penrith,  
Cumbria,  
CA11 7QF

## JBA Project Manager

Mike Williamson  
Mersey Bank House  
Barbould Street  
Warrington  
Cheshire  
WA1 1WA

## Revision history

Revision Ref/Date	Amendments	Issued to
Draft V1.0 / August 2019	-	Kevin Hutchinson
Draft V2.0 / February 2020	Stakeholder consultees comments addressed	Kevin Hutchinson
Final V3.0 / June 2020	All final comments addressed	Kevin Hutchinson

## Contract

This report describes work commissioned by Kevin Hutchinson, on behalf of Eden District Council, by email dated 29 March 2018. Eden District Council's representative for the contract was Kevin Hutchinson. Hannah Bishop and Mike Williamson of JBA Consulting carried out this work.

Prepared by Hannah Bishop BSc (Hons)

Technical Assistant

Reviewed by Mike Williamson BSc MSc EADA FRGS CGeog

Principal Flood Risk Analyst

## Purpose

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JBA Consulting has no liability regarding the use of this report except to Eden District Council.

## Acknowledgements

JBA would like to thank representatives of Eden District 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 2015 Level 1 SFRA using all up-to-date flood risk information together with the most current flood risk and planning policy guidance available from the National Planning Policy Framework<sup>1</sup> (NPPF) (2019) and Flood Risk and Coastal Change Planning Practice Guidance<sup>2</sup> (FRCC-PPG).

The Level 1 SFRA is focused on collecting readily available flood risk information from a number of key stakeholders, the aim being to help identify the number and spatial distribution of flood risk sources present throughout Eden District Council's (EDC) authority area to inform the application of the Sequential Test.

EDC 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) Penrith Strategic Masterplan and Local Plan allocations.

A number of EDCs potential development sites are shown to be at varying risk from fluvial and/or surface water flooding. Development consideration assessments for all potential development sites are summarised through a number of strategic recommendations within this report (Section 6.2) and the Development Sites Assessment spreadsheet in Appendix B. The strategic recommendations broadly entail the following:

- Strategic Recommendation A – consider withdrawal based on significant level of fluvial or surface water flood risk (if development cannot be directed away from areas at 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 the Lead Local Flood Authority.

<sup>1</sup> <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

<sup>2</sup> <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

## **Eden Local Plan 2014/2032 allocated sites and Penrith Strategic Masterplan sites**

Eden Local Plan 2014/2032 was adopted 11 October 2018. The Penrith Strategic Masterplan (PSM) was a non-statutory document ultimately intended to inform a review of the Local Plan which went through a public engagement exercise in November 2018 and the results of which were acknowledged and concluded in April 2019. The PSM has no relevance in current decision/plan making.

A total of 93 sites were screened against the latest available flood risk information. 32 of these sites included Penrith Strategic Masterplan (PSM) allocation sites, 30 of which were residential and two allocated as employment. The remaining Local Plan 2014/2032 allocated sites consisted of 50 residential, 10 employment and one mixed use.

Following the flood risk screening, three sites are recommended as being potentially unsuitable for development, one of which is due to its location within the functional floodplain, and two due to significant surface water flood risk.

There are no sites where Strategic Recommendation B applies as there are no sites allocated as more vulnerable (i.e. residential and mixed use) that would require the Exception Test. Overall there are 11 sites, seven of which are PSM sites, allocated as Strategic Recommendation C. Of these sites, 9 have over 90% 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 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 67 sites, 24 of which are PSM sites. 66 of the 67 sites are wholly within Flood Zone 1.

### **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 4 of this report provides further detail.

SFRA recommendation:

- No development within Flood Zone 3b, 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 Local Planning Authority, the Lead Local Flood Authority, the Environment Agency and United Utilities;
- Appropriate investigation and use of suitably sourced SuDS;

- Natural Flood Management techniques must be considered for mitigation, where applicable;
- 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 Local Planning Authority following a site-specific FRA.

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

- Detailed GIS mapping showing all available flood risk information together with the potential development sites are shown on a series of layers within Eden SFRA Appendix A (this is available online on the [Interactive Eden Strategic Flood Risk Assessment map](#) and is explained further on page 132 at the back of this report.
- Development Site Assessment spreadsheet detailing the risk to each site with strategic recommendations on development - Appendix B;
- A note on the delineation of the functional floodplain following discussion and agreement between Eden District Council, the Lead Local Flood Authority and the Environment Agency - Appendix C;
- Figures showing the sites colour-coded as per their strategic recommendation to highlight those that will pass the Sequential Test, those that require more work, or those that should not be allocated – Appendix D; and
- A support document to provide guidance on the use of the SFRA to developers and planners – Appendix E.

## Contents

<b>Eden Level 1 Strategic Flood Risk Assessment Final Report</b>	<b>1</b>
<b>JBA Project Manager</b>	<b>2</b>
<b>Revision history</b>	<b>2</b>
<b>Contract</b>	<b>2</b>
<b>Purpose</b>	<b>2</b>
<b>Acknowledgements</b>	<b>2</b>
<b>Copyright</b>	<b>2</b>
<b>Carbon footprint</b>	<b>3</b>
<b>Executive Summary</b>	<b>3</b>
<b>Eden Local Plan 2014/2032 allocated sites and Penrith Strategic Masterplan sites</b>	<b>4</b>
<b>SFRA Recommendations</b>	<b>4</b>
<b>List of figures</b>	<b>8</b>
<b>List of tables</b>	<b>8</b>
<b>Abbreviations</b>	<b>10</b>
<b>1 Introduction</b>	<b>13</b>
1.1 Commission	13
1.2 Strategic Flood Risk Assessment	13
1.3 Eden Level 1 SFRA	13
1.4 Aims and objectives	14
1.5 SFRA future proofing	16
<b>2 Study area</b>	<b>17</b>
2.1 Main rivers	19
2.2 Ordinary watercourses	20
2.3 Cross boundary issues	20
<b>3 Understanding flood risk</b>	<b>22</b>
3.1 Sources of flooding	22
3.2 Likelihood and consequence	23
3.3 Risk	25
<b>4 The planning framework and flood risk policy</b>	<b>26</b>
4.1 Introduction	26
4.2 Legislation	28
4.3 Flood and water focused policies and plans	41
4.4 Other related plans and policies	45
4.5 Planning legislation	45
4.6 Planning policy	46
4.6. Sustainability Appraisals	48
4.7 Flood risk management policy	49
Surface Water Management Plans (SWMP)	52
Green Infrastructure assessments	54

Flood risk partnerships and partnership plans	55
4.8 Roles and responsibilities	55
<b>5 Flood risk across Eden District</b>	<b>59</b>
5.1 Flood risk datasets	59
5.2 Fluvial flooding	60
Functional floodplain (Flood Zone 3b)	61
EA Risk of Flooding from Rivers and the Sea Map	62
5.3 Surface water flooding	63
5.4 Groundwater flooding	66
5.5 Canal and reservoir flood risk	67
5.6 Historic flooding	69
5.7 Flood risk management	70
<b>6 Development and flood risk</b>	<b>80</b>
6.1 Introduction	80
6.2 The Sequential Approach	80
6.3 Local Plan Sequential and Exception Tests	81
6.4 Site assessments	84
6.5 Screening of assessed sites	84
6.6 Summary of site assessment outcomes and sequential testing progress	95
6.7 Site-specific constraints to development	101
6.8 Sustainability Appraisal and flood risk	102
6.9 Safeguarded land for flood storage	102
6.10 Phasing of development	103
6.11 Cumulative impacts	103
6.12 Guidance for developers	104
6.13 Planning for climate change (NPPF, 2019)	109
6.14 Sustainable drainage systems (SuDS)	112
6.15 Drainage for new developments	115
6.16 Property Flood Resilience (PFR)	116
<b>7 Emergency planning</b>	<b>119</b>
7.1 Civil Contingencies Act	119
7.2 Flood warning and evacuation plans	122
<b>8 Conclusions and recommendations</b>	<b>124</b>
+8.1 Conclusions	124
8.2 Planning policy and 8 flood risk recommendations	125/
<b>Appendices</b>	<b>133</b>
A Strategic Flood Risk Assessment (Appendix A) (this is only available online - <a href="#">Interactive Eden Strategic Flood Risk Assessment map</a> )	133
B Development site assessment spreadsheet	135
C Functional floodplain delineation	135
D Strategic Recommendation sites maps	136
E Eden SFRA user guide	136

## List of figures

Figure 2-1: Study area	19
Figure 2-2: Fluvial hydraulic linkages for catchments in and around Eden	21
Figure 3-1: Flooding from all sources	23
Figure 3-2: Source-Pathway-Receptor model	23
Figure 4-1: Key documents and strategic planning links with flood risk	27
Figure 4-2: EU Floods Directive	28
Figure 4-3: North West, Solway Tweed and Northumbria River Basin Districts	30
Figure 4-4: Main river catchments in Eden district	31
Figure 4-5: North West River Basin District and Lune catchment in relation to the Eden district.	34
Figure 4-6: Northumbria River Basin District and Tyne catchment in relation to the Eden district.	35
Figure 4-7: Main goals and policy areas the 25-year Environment Plan is intended to help work towards	43
Figure 4-8: Defra wheel (taken from SWMP Technical Guidance)	53
Figure 5-1: Cairn Beck and Newbiggin Beck in relation to the Eden authority boundary	79
Figure 6-1: Flood Risk Management hierarchy	81
Figure 6-2: Local Plan sequential approach to site allocation	83
Figure 6-3: Development management Sequential Test process	108
Figure 6-4: SuDS management train principle	115

## List of tables

Table 3-1: NPPF flood zones	24
Table 4-1: Key LLFA responsibilities under the FWMA	41
Table 5-1: Flood source and key datasets	59
Table 5-2: Groundwater flood hazard classification of JBA groundwater map	67
Table 5-3: EA flood defence condition assessment grades	71
Table 5-4: Major flood defences in Eden district	71
Table 5-5: Future flood risk management schemes in Eden area according to Cumbria County Council	73
Table 5-6: Working with Natural Processes measures and data	76
Table 6-1: Number of allocated sites for the Eden Local Plan 2014/2032 at risk from Flood Map for Planning flood zones	85
Table 6-2: Number of Penrith Strategic Masterplan sites at risk from Flood Map for Planning flood zones	85
Table 6-3: Number of Eden Local Plan 2014/2032 allocated sites at risk from surface water flooding as per the Risk of Flooding from Surface Water map	86
Table 6-4: Number of Penrith Strategic Masterplan sites at risk from surface water flooding as per the Risk of Flooding from Surface Water map	86



Table 6-5: Number of allocated sites for the Eden Local Plan 2014/2032 per strategic recommendation	87
Table 6-6: Number of Penrith Strategic Masterplan sites per strategic recommendation	88
Table 6-7: Sites that are potentially unsuitable for development based on fluvial or significant surface water flood risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)	91
Table 6-8: Sites that Strategic Recommendation C applies to	93
Table 6-9: Development types and application of Sequential and Exception Tests for developers	107
Table 6-10: Recommended peak river flow allowances per RBD	111
Table 6-11: Peak rainfall intensity allowances in small and urban catchments for England	<b>Error!</b>
<b>Bookmark not defined.</b>	
Table 7-1: Flood warning and evacuation plans	123
Table 8-1: Recommended further work for EDC or developers	132

## Abbreviations

ABD	Area Benefitting from Defences
ACDP	Area with Critical Drainage Problems
AEP	Annual Exceedance Probability
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Society
CaBA	Catchment Based Approach
CC	Climate change
CCA	Civil Contingencies Act
CCC	Cumbria County Council
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
CLRF	Cumbria Local Resilience Forum
CRR	Community Risk Register
CSO	Combined Sewer Overflow
DCLG	Department for Communities and Local Government
DPD	Development Plan Documents
DTM	Digital Terrain Model
EA	Environment Agency
EDC	Eden District Council
FAA	Flood Alert Area
FAS	Flood Alleviation Scheme
FCDPAG	Flood and Coastal Defence Project Appraisal Guidance
FCERM	Flood and Coastal Erosion Risk Management Network
FCRMS	Flood and Coastal Risk Management Strategy
FDGiA	Flood Defence Grant in Aid
FEH	Flood Estimation Handbook
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
LA	Local Authority
LASOO	Local Authority SuDS Officer Organisation
LDF	Local Development Framework
LDNP	Lake District National Park
LFRMS	Local Flood Risk Management Strategy
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
PAR	Project Appraisal Report
PCPA	Planning and Compulsory Purchase Act
PFRA	Preliminary Flood Risk Assessment
PSM	Penrith Strategic Masterplan
RBD	River Basin District

RBMP	River Basin Management Plan
RFO	Recorded Flood Outlines
RFCC	Regional Flood and Coastal Committee
RoFSW	Risk of Flooding from Surface Water map
RMA	Risk Management Authority
RoFRS	Risk of Flooding from Rivers and the Sea Map
SA	Sustainability Appraisal
SAC	Special Area of Conservation
SAMP	System Asset Management Plan
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SoP	Standard of Protection
SPD	Supplementary Planning Documents
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKCIP02	UK Climate Projections 2002
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
YDNP	Yorkshire Dales National Park

# 1 Introduction

## 1.1 Commission

Eden District Council (EDC) commissioned JBA Consulting by email dated 29 March 2018 for the undertaking of a Level 1 Strategic Flood Risk Assessment (SFRA) to update the existing Level 1 SFRA carried out in 2015. EDC is the Local Planning Authority (LPA) for the district of Eden and Cumbria County Council (CCC) acts as the Lead Local Flood Authority (LLFA). EDC requires this updated Level 1 SFRA to screen and assess flood risk to potential Penrith Strategic Masterplan (PSM) development site allocations and allocated Local Plan development sites, to provide strategic recommendations and the evidence to inform the Sequential Test and, where necessary, the requirement for the Exception Test.

## 1.2 Strategic Flood Risk Assessment

All local planning authorities must 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 Environment Agency's SFRA guidance for local planning authorities<sup>3</sup> (updated August 2019, at the time of writing) states:

"The SFRA will help various parties consider flood risk when making planning decisions about the design and location of any:

- development
- flood risk management features and structures

In your SFRA, you should assess the:

- risk from all sources of flooding
- cumulative impact that development or changing land use would have on the risk of flooding
- effect of climate change on risk

Your SFRA should identify:

- opportunities to reduce the causes and impacts of flooding
- any land likely to be needed for flood risk management features and structures."

## 1.3 Eden Level 1 SFRA

This SFRA has been carried out in accordance with Government's latest development planning guidance, including the National Planning Policy Framework (NPPF) (2019) 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).

<sup>3</sup> <https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment#level-2-strategic-flood-risk-assessment>

An updated version of the NPPF was published on 19 June 2019 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 latest guidance is available online via:

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

This SFRA assesses the spatial distribution of flood risk across the local authority area, outside of the Lake District National Park (LDNP) and the Yorkshire Dales National Park (YDNP), 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 the potential PSM development site allocations and the already allocated Local Plan development sites. The SFRA appendices contains GIS mapping (Appendix A, which is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#)) showing the PSM sites and the Local Plan allocations, overlaid with the latest, readily available flood risk information along with a Development Site Assessment spreadsheet (Appendix B) indicating the level of flood risk to each site following a strategic assessment of risk. Each site is assigned a strategic recommendation pertaining to development viability, discussed in Section 6. 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, as advised in the National Planning Policy Framework (2019) and Flood Risk and Coastal Change Planning Practice Guidance, are to:

- Update the previous 2015 SFRA using new or updated flood risk information including climate change allowances, where available.
- Produce an independent SFRA Level 1 Report for Eden District Council to include as part of the evidence base for the Local Plan.
- Investigate and identify the extent and severity of flood risk from all sources, both presently and in the future, using available data. This assessment will enable the Local Planning Authority to steer development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To present a thorough and updated understanding of all flood risk, based on up-to-date Environment Agency modelling.
- Inform the Sustainability Appraisal (SA) of the Local Plan, so that flood risk is fully taken into account when considering development options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased.

- Enable the Local Planning Authority to apply the Sequential Test and the sequential approach when determining land use for development; safeguarding land from development that has potential for use in current and future flood risk management.
- Enable the Local Planning Authority to use opportunities offered by new development to reduce the causes and impacts of flooding.
- Identify the requirements for site-specific Flood Risk Assessments for potential development sites, including those at risk from sources other than flooding from watercourses.
- Consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, using Sustainable Drainage Systems (SuDS), provisions for conveyance and storage of floodwater. However, the SFRA does not provide individual sites with detailed methods of surface water disposal. Developers will need to demonstrate adequate provision can be achieved for surface water disposal during the planning process through appropriate site specific flood risk assessment and drainage strategies.
- Reflect current national policy and legislation including the NPPF and FRCC-PPG to enable the Local Planning Authority to meet their statutory obligations in relation to flood risk.
- Identify any cross-boundary flooding issues and to work collaboratively with all relevant Risk Management Authorities (RMA).
- Adopt a catchment-based approach to flood risk assessment and management to help inform potential catchment-wide approaches and solutions to flood risk management.
- Develop strategic recommendations on the suitability of the PSM sites and allocated sites, as an evidence base for local plan making.
- Identify land required for current and future flood management that should be safeguarded as set out in the NPPF.
- Assist the Council in identifying specific areas where further and more detailed flood risk data and assessment work may be required whilst also taking into account other assessments already undertaken.
- Provide guidance for developers and local authority planning officers on planning requirements in relation to flood risk.
- Provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn to for initial advice and guidance.
- Provide GIS flood risk mapping illustrating the interaction between flood risk and the assessed sites.
- Ensure any conclusions and recommendations are fully justified and robust, in accordance with the NPPF and FRCC-PPG requirements and best practice.

## 1.5 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 (Eden District Council) 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 Environment Agency (EA) would usually recommend updating an SFRA following a significant flood event affecting the area, when there is updated EA modelling or a change in policy, such as the revision of the NPPF (2019). Where possible, the SFRA should be kept as a 'live' entity and continually updated when new information becomes available.

This SFRA uses the EA's Flood Map for Planning version issued in May 2019 to assess fluvial risk to 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 2019, via the following link:

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



## 2 Study area

The study area for this SFRA is defined by the administrative boundary of Eden District Council located in the North West of England, with part of the Lake District National Park and Yorkshire Dales National Park within its boundaries. Eden is one of six districts in Cumbria and is situated in the eastern part of the County covering an area of 2,156 km<sup>2</sup> making it one of the largest districts in England. The population was estimated in 2018 as 60,000<sup>4</sup>, including people within the National Parks, and is therefore the most sparsely populated district in England and Wales<sup>4</sup>.

Various parts of the district are protected by the designations of the Lake District National Park, Yorkshire Dales National Park and the North Pennines Area of Outstanding Natural Beauty (AONB). The main town and administrative centre is Penrith with other key service centres including Appleby, Alston and Kirkby Stephen.

The Penrith Strategic Masterplan (PSM) project commenced in December 2016 with the Council leader and Political Group leaders of the Council, and the Leader of Penrith Town Council agreeing a vision for the Council to look beyond the current Local Plan to 2050 and produced a discussion paper 'Vision and Opportunities for Eden to 2050'. This was developed, and in September 2018 was the subject of a public engagement exercise. The PSM set out a vision for how Penrith could be expected to grow over the next 30 years with provision for 5,560 homes, 7,000 new jobs and three distinctive settlements, namely the Beacon Villages, to the north of Penrith<sup>5</sup>. The PSM was ultimately intended to inform a review of the Eden Local plan 2014/2032 and went through a public engagement exercise in November 2018 and the results of which were acknowledged and it was concluded in April 2019 and taken no further. The PSM has no relevance in current decision/plan making. The PSM undertook a site optioneering exercise looking at 32 potential development sites around Penrith and these have all been assessed for flood risk within this SFRA, as they in turn may be considered for their development potential with the review of the Eden Local Plan 2014/2032. The Executive Committee agreed to review the Eden Local Plan 2014/2032 in September 2019.

Eden District was developed primarily for agriculture with a number of market towns with wide open spaces where animals and agricultural produce were sold. Penrith was located at the crossroads of several important routes, with Penrith Castle and narrow roads being constructed as defences against raids from the north.

The principal watercourses in the district are the River Eden, River Eamont, River Petteril, River Irthing, and River Caldew, with a total catchment area of approximately 2,400km<sup>2</sup><sup>6</sup>. There is also the River South Tyne and River Nent that flow through Alston in the north-east of the district. The most significant watercourse is the River Eden which flows northwards through the Eden Valley towards Carlisle and reaches the Solway Firth some 145 km from its source. It is one of very few large rivers that flows northwards in the UK. The district of Eden is a unique network of rivers, becks and lakes, which together stretch some 80 miles.

<sup>4</sup> <https://www.eden.gov.uk/business-and-trade/the-economy-of-eden/>

<sup>5</sup> [https://www.cumbriacrack.com/wp-content/uploads/2018/09/Penrith\\_Masterplan\\_A-Vision-to-2050.pdf](https://www.cumbriacrack.com/wp-content/uploads/2018/09/Penrith_Masterplan_A-Vision-to-2050.pdf)

<sup>6</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/289422/Eden\\_Catchment\\_Flood\\_Management\\_Plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289422/Eden_Catchment_Flood_Management_Plan.pdf)

The Upper Solway Flats and Marshes Special Area of Conservation (SAC) lies at the confluence of the Eden and the Solway Firth.

The topography of Eden is that of a valley with the River Eden flowing northwards directly through the centre of the district with the areas of higher ground of the valley edge forming the district boundary. The Eden Catchment is highly significant for landscape, cultural heritage and nature conservation. 30% of the Eden area lies within the North Pennines AONB.

Flood risk across the Eden District is varied but the majority is considered to be fluvial sources from Main Rivers, in particular the Eden and the Eamont. Water levels in the rivers and streams respond rapidly following high rainfall; the small, steep catchments transfer water to the channels very quickly. There is also flood risk from surface water, groundwater, sewers, and residual risk from reservoirs. In some instances, areas may suffer from a combination of more than one source of flooding.

Historically, flooding has significantly affected parts of Eden, with particular effects being felt in Penrith according to the PFRA (2011<sup>7</sup>) with several large scale, damaging flood events having occurred (see Section 5). Due to the increasing effects of climate change, awareness of and preparedness for flooding, both at a local and national scale, is vital in reducing flood risk to local authority areas such as Eden.

<sup>7</sup> <https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/6729/43221161446.pdf>

The study area falls mainly within the Solway Tweed River Basin District (RBD), with eastern areas falling into the Northumbria RBD and southern and western areas falling into the North West RBD.

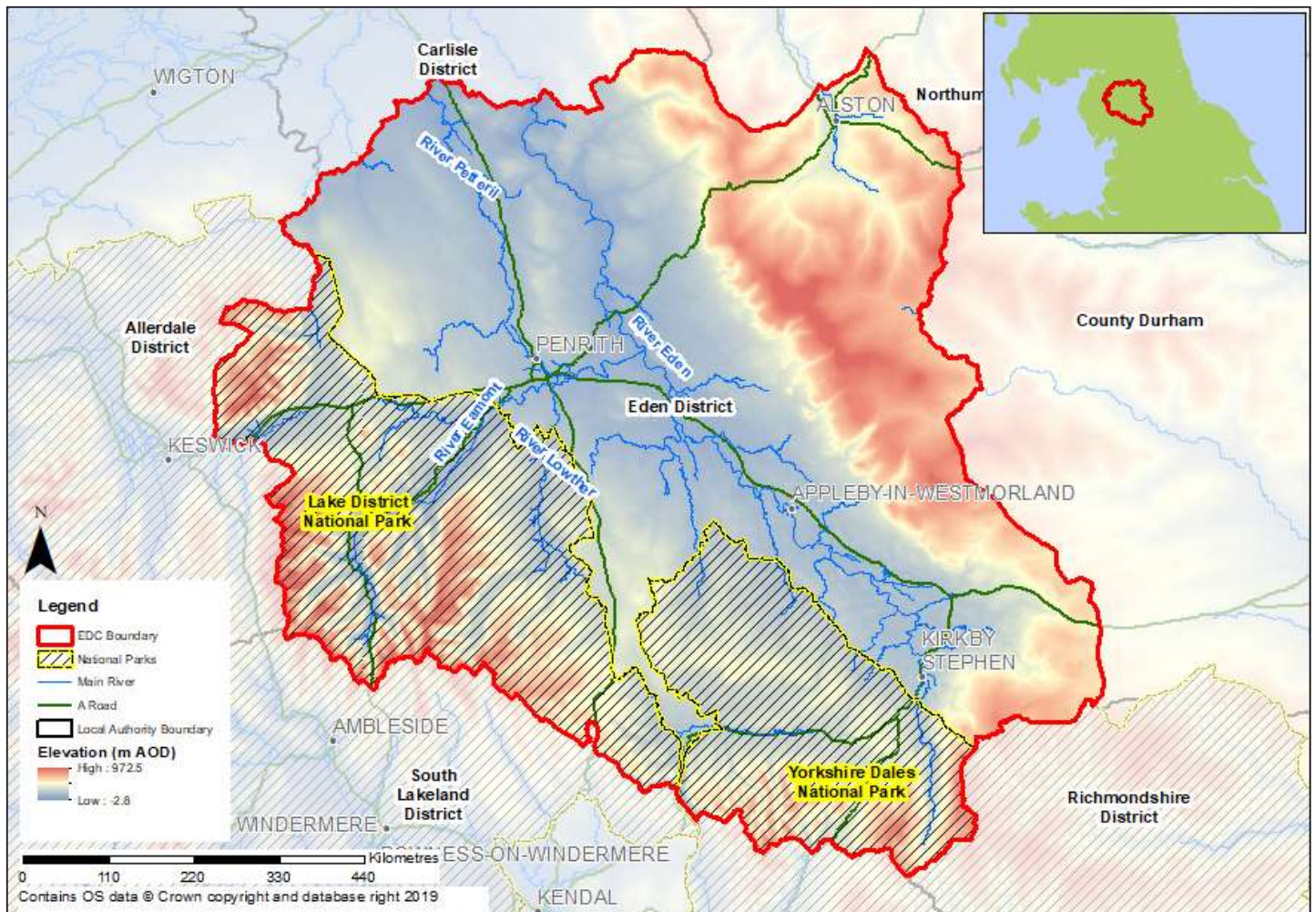


Figure 2-1: Study area

## 2.1 Main rivers

Main rivers are usually larger rivers and streams. The Environment Agency (EA) carries out maintenance, improvement or construction work on main rivers to manage flood risk and therefore they are designated as the EA's responsibility.

### 2.1.1 River Eden

The River Eden is the largest river with the Eden District. The source of the river is on high limestone fells above Mallerstang Common, near the North Yorkshire border, and makes its way across eastern Cumbria, with the North Pennines to the east, and the fells of the Lake District to the west, to Carlisle. Here, in Carlisle, it merges with other rivers to form the Solway Firth estuary, before reaching the sea, 145km from its source.

### 2.1.2 River Petteril

The River Petteril begins at Motherby near Penrith and flows north through farmland and rural communities until it joins the River Eden in Carlisle.

### **2.1.3 River Eamont**

The River Eamont drains down from Helvellyn and includes Ullswater and Brothers Water. The river then flows through the tourist village of Pooley Bridge and meets the River Lowther near Penrith.

### **2.1.4 River Irthing**

The River Irthing is a major tributary of the River Eden where for the first 15 miles of its course it defines the border between Northumberland and Cumbria. It confluences with the Eden near Warwick Bridge, just north of Wetheral.

### **2.1.5 River Caldew**

The Caldew's source is high up on Skiddaw in the Lake District where it flows through the suburbs of Carlisle north of Cummersdale before emptying into the Eden opposite Stanwix.

### **2.1.6 River South Tyne**

The South Tyne rises on Alston Moor and flows through the towns of Haltwhistle and Haydon Bridge. The source of the South Tyne is very close to those of the Tees and the Wear. The South Tyne Valley falls within the North Pennines Area of Outstanding Natural Beauty. The River Nent is a tributary of the South Tyne.

## **2.2 Ordinary watercourses**

Ordinary watercourses are rivers, streams, drains, ditches and sluices that are not designated as Main River and therefore come under the control of the Lead Local Flood Authority (LLFA), who have Permissive Powers to carry out works when necessary. There are a number of ordinary watercourses within Eden that are mainly tributaries to Main Rivers.

## **2.3 Cross boundary issues**

According to the revised National Planning Policy Framework, the Local Planning Authority (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.

The neighbouring LPA's including Allerdale Borough Council, Barrow Borough Council, Carlisle City Council, Copeland Borough Council, and South Lakeland District Council are all within the Cumbria County Council LLFA area. The Cumbria Strategic Flood Partnership (CSFP) brings the districts together along with Cumbria County Council, the EA and United Utilities (UU) to help develop and manage flood risk within Cumbria.

### **2.3.1 Hydrological linkages**

Eden is unique in that, given the administrative area is roughly based on the catchment of the River Eden, there are no major watercourses running into the district from other districts. Any major land use changes in neighbouring districts cannot therefore influence flood risk in Eden. However, changes in parts of Eden could influence flood risk in neighbouring authorities, particularly Carlisle District which is downstream of Eden and receives the lower

reaches of the River Eden. Figure 2-2 illustrates the fluvial hydraulic linkages for the catchments in and around Eden.

The main potential adverse impacts that future development in Eden may have on downstream areas are twofold resulting in a potential:

- Reduction in upstream floodplain storage capacity; and
- Reduction in rainfall infiltration and subsequent increased runoff.

These issues highlight the importance of the Cumbria Strategic Flood Partnership, of which the EA is a part, on development planning and flood risk management, particularly where actions could exacerbate flooding in downstream communities. Cumbria County Council as Lead Local Flood Authority has a larger role than the EA in advising the Local Planning Authorities on rainfall reduction and the issue of increased runoff in areas of Flood Zone 1.

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 other Cumbrian authorities as a whole as well as Eden. Successful implementation of the Sequential Test is crucial in attaining sustainable development.



**Figure 2-2: Fluvial hydraulic linkages for catchments in and around Eden**

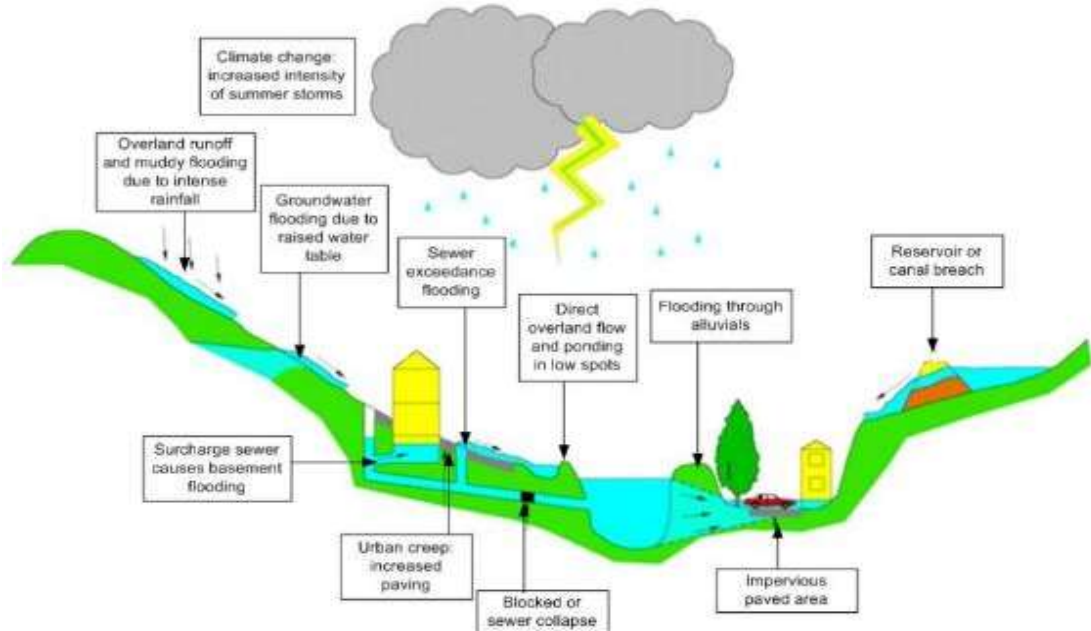
## 3 Understanding flood risk

### 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; residual risk from overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- **Tidal** – sea; estuary; overtopping of defences; breaching of defences; other flows (eg fluvial surface water) that could pond due to tide locking; wave action (not applicable to Eden District).
- **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 (residual)** – reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

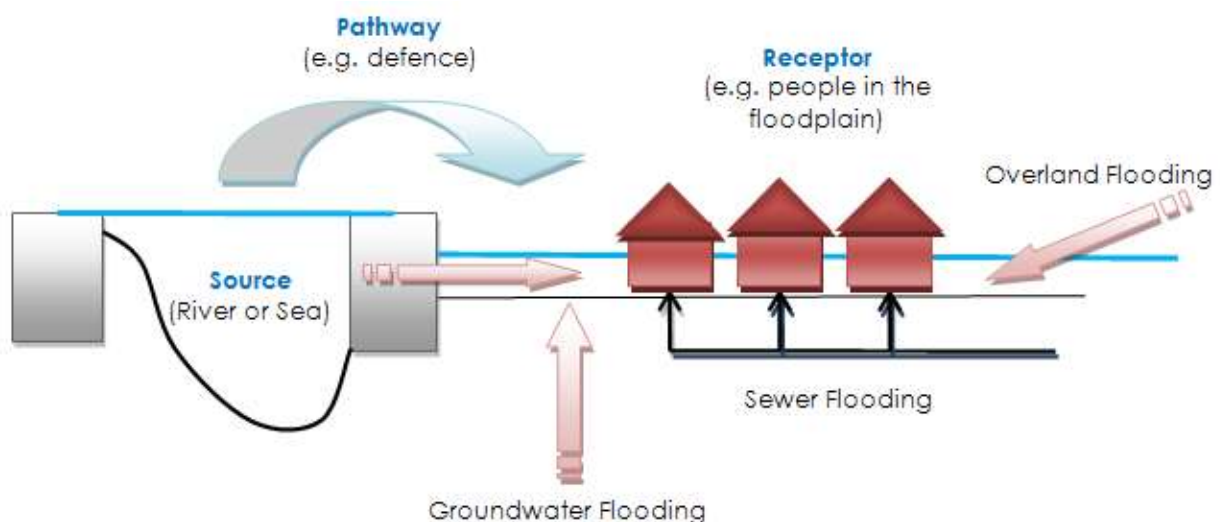
Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.



**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 (which are not an issue within Eden District), 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 (such as housing or industrial development).

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 in 100 AEP (Annual Exceedance Probability) events indicates the flood level that is expected to be reached on average once in a hundred years, ie it has a 1 in 100 AEP event of occurring in any one year, not that it will occur once every one hundred years. **Error! Reference source not found.** Below provides an example of the flood probabilities used to describe the fluvial and tidal flood zones as defined in the Flood Risk and Coastal Change Planning Practice Guidance and as used by the EA in their Flood Map for Planning (Rivers and Sea).

Note that the flood zones shown on the Flood Map for Planning do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. The Flood Map for Planning can be accessed via:

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

Flood Zone	Definition
<b>Zone 1 Low Probability</b>	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)
<b>Zone 2 Medium Probability</b>	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)
<b>Zone 3a High Probability</b>	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)
<b>Zone 3b The Functional Floodplain</b>	<b>This zone comprises land where water has to flow or be stored in times of flood.</b> 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<sup>8</sup>**

<sup>8</sup> 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 (eg 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, eg 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 Environment Agency, Eden District Council 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 Flood Risk and Coastal Change Planning Practice Guidance 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".*

## **4 The planning framework and flood risk policy**

### **4.1 Introduction**

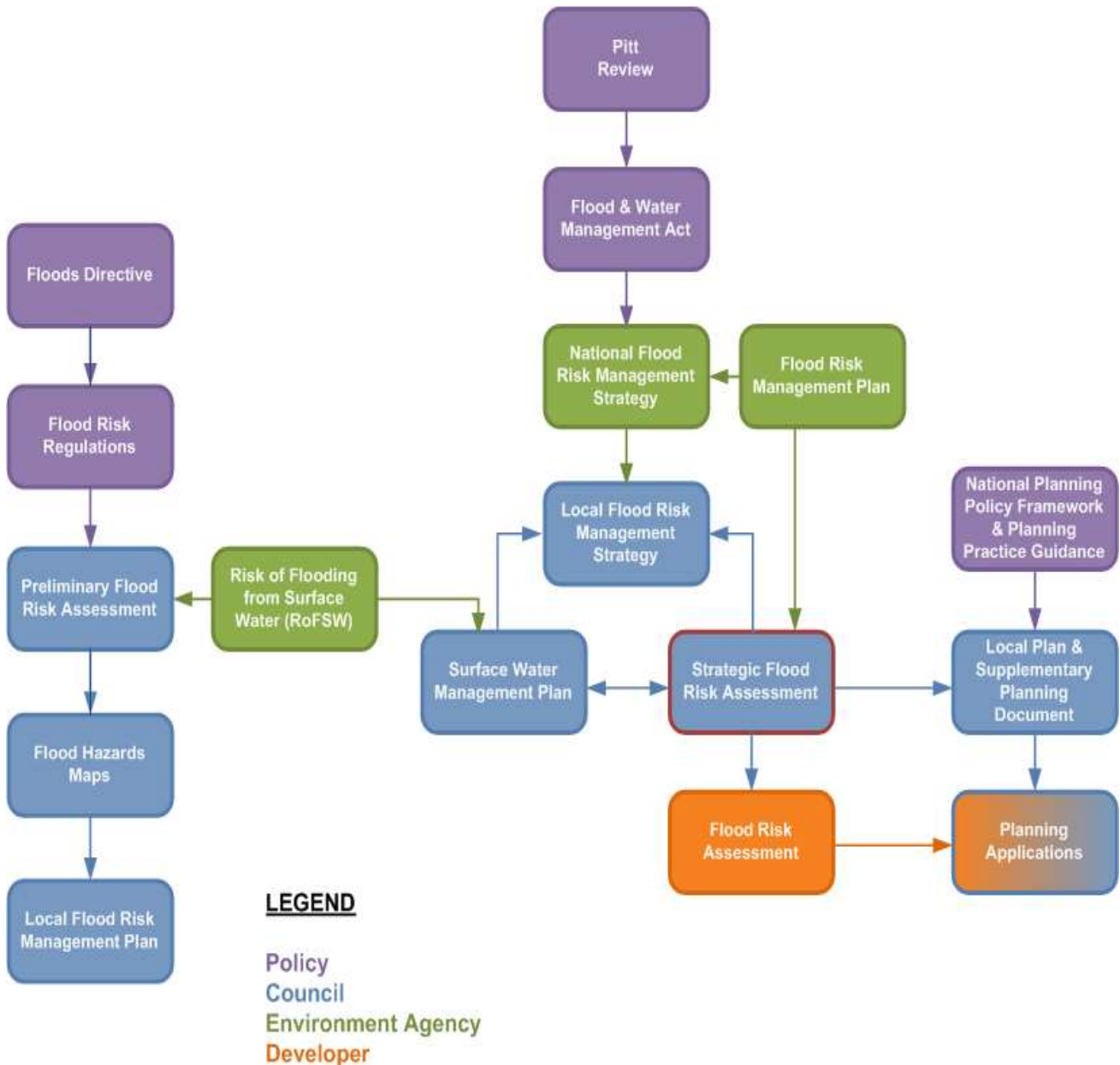
The main purpose of this section of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of the Lead Local Flood Authority's and Local Planning Authority's responsibilities 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.

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 SFRA's 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 Local Plan 2014/2032, the forthcoming review of the local plan and consideration of the 32 sites previously optioneered as part of the now concluded Penrith Strategic Masterplan and to help inform decision making in relation to planning applications.

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



## 4.2 Legislation

### 4.2.1 EU Floods Directive and the Flood Risk Regulations

The European Floods Directive (2007) sets out the EU's approach to managing flood risk and aims to improve the management of the risk that floods pose to human health, the environment, cultural heritage and economic activity. The Directive was translated into English law by the Flood Risk Regulations 2009 which require Lead Local Flood Authorities and the EA to produce Flood Risk Management Plans (FRMPs).

The Directive puts in place a six-year cycle of producing Preliminary Flood Risk Assessments (PFRAs) with the aim of identifying significant Flood Risk Areas; preparing flood hazard and risk maps; and preparing Flood Risk Management Plans. The first six-year cycle was completed in December 2015 and the second six-year cycle is currently underway.

Preliminary Flood Risk Assessments should cover the entire Lead Local Flood Authority area for local flood risk (focusing on ordinary watercourses, surface water and groundwater). Where significant Flood Risk Areas are identified using the national approach (and locally reviewed), the Lead Local Flood Authority is then required to undertake flood risk hazard mapping and to produce a Flood Risk Management Plan as illustrated in Figure 4-2. FRMPs are also completed for each River Basin District in England and Wales by the EA.



**Figure 4-2: EU Floods Directive**

The Flood Risk Management Plan should consider objectives for flood risk management (reducing the likelihood and consequences of flooding) and measures to achieve those objectives. Significant Flood Risk Areas were not identified in Eden therefore the LLFA was not required to produce a FRMP. A FRMP was however completed by the EA for the Solway Tweed RBD, which covers the majority of Eden.

See Section 4-2-4 and 6 for more information on FRMPs.

#### **4.2.2 Cumbria County Preliminary Flood Risk Assessments (PFRA) 2011 and 2017<sup>9</sup>**

The Lead Local Flood Authority for the Eden District is Cumbria County Council (CCC). The first cycle PFRA for CCC was submitted to the EA in June 2011. The PFRA provides a high-level overview of local flood risk, from sources including surface water, groundwater and ordinary watercourses.

The second cycle PFRA, reviewed during 2017, used all relevant current flood risk data and information to update the 2011 version, and was agreed with the EA in December 2017.

Whereas all the new information available to the LLFA on potential future floods has improved the understanding on local flood risk, the significance of this risk does not reach the indicators and criteria used in identifying Flood Risk Areas. CCC was therefore not required to produce flood hazard maps, flood risk maps and flood risk management plans for any area in the county.

#### **4.2.3 Catchment Flood Management Plans (CFMP)**

The CFMPs were carried out by the EA in 2009 and were designed to establish flood risk management policies which will deliver sustainable flood risk management for the long term. The CFMPs were used by the EA to help direct resources to areas of greatest risk.

The CFMPs contain useful information about how catchments work, details on historic flood events and the sensitivity of the river systems to increased rainfall. The EA draws on the evidence and previous measures and proposals set out in the CFMPs to help develop the FRMPs for River Basin Districts. There are several CFMPs which are relevant across the Eden District; the Lune CFMP<sup>10</sup>, Eden CFMP<sup>11</sup>, River Tyne CFMP<sup>12</sup>, and the River Tees CFMP<sup>13</sup>.

#### **4.2.4 Flood Risk Management Plans (FRMPs)**

Following on from the Catchment Flood Management Plans, FRMPs are designed to set out the risk of flooding from rivers, sea, surface water, groundwater and reservoirs within each River Basin District (RBD) and to detail how Risk Management Authorities will work with communities to manage flood risk up to 2021 for the current cycle, at the time of writing.

Both the River Basin Management Plans (RBMP), and the FRMPs have been developed by the EA in tandem to ensure that flood defence schemes can provide wider environmental benefits during the same six-year cycle. Both flood risk management and river basin planning form an important part of a collaborative and integrated approach to catchment planning for water. Each EU member country must produce FRMPs as set out in the EU Floods Directive 2007.

The Eden District authority area extends over three river basin districts; namely the Solway Tweed RBD which covers the central area from north to south, the North West RBD

<sup>9</sup> Cumbria PFRA: <https://www.cumbria.gov.uk/planning-environment/flooding/sub.asp>

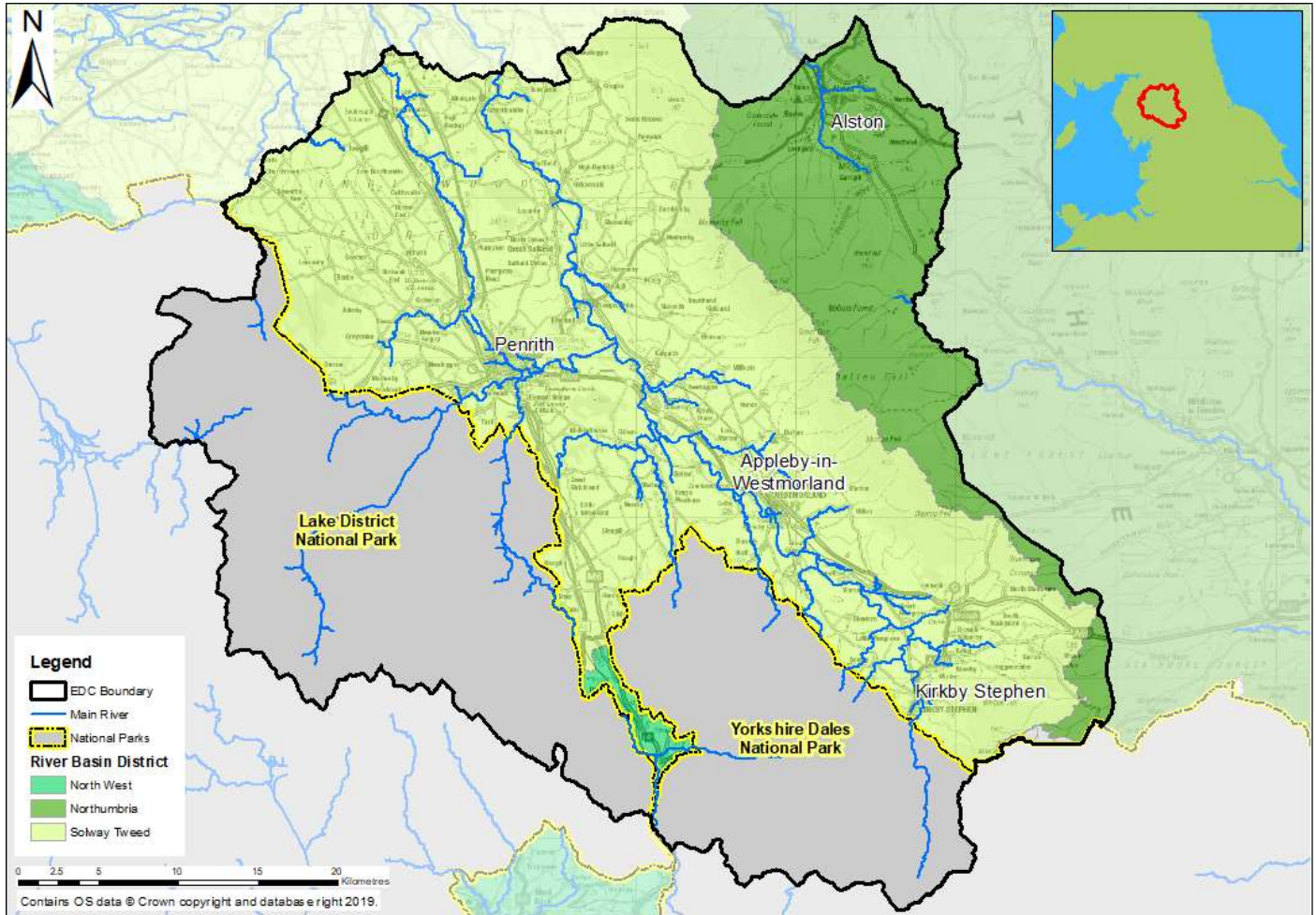
<sup>10</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/293698/Lune\\_Catchment\\_Flood\\_Management\\_Plan.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293698/Lune_Catchment_Flood_Management_Plan.pdf)

<sup>11</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/289422/Eden\\_Catchment\\_Flood\\_Management\\_Plan.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289422/Eden_Catchment_Flood_Management_Plan.pdf)

<sup>12</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/289171/River\\_Tyne\\_Catchment\\_Flood\\_Management\\_Plan.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289171/River_Tyne_Catchment_Flood_Management_Plan.pdf)

<sup>13</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/289194/River\\_Tees\\_Catchment\\_Flood\\_Management\\_Plan.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289194/River_Tees_Catchment_Flood_Management_Plan.pdf)

protruding on the western district boundary, and the Northumbria RBD extends into the eastern edge of the district boundary, as shown on Figure 4-3. Within the district there are many river catchments spanning across the different RBDs. There are four main river catchments in the Eden district; the Eden and Esk, River Lune, River Tyne and River Tees shown in Figure 4-4. It is clear that the Eden and Esk catchment is the most important for Eden district in terms of planning and flood risk.



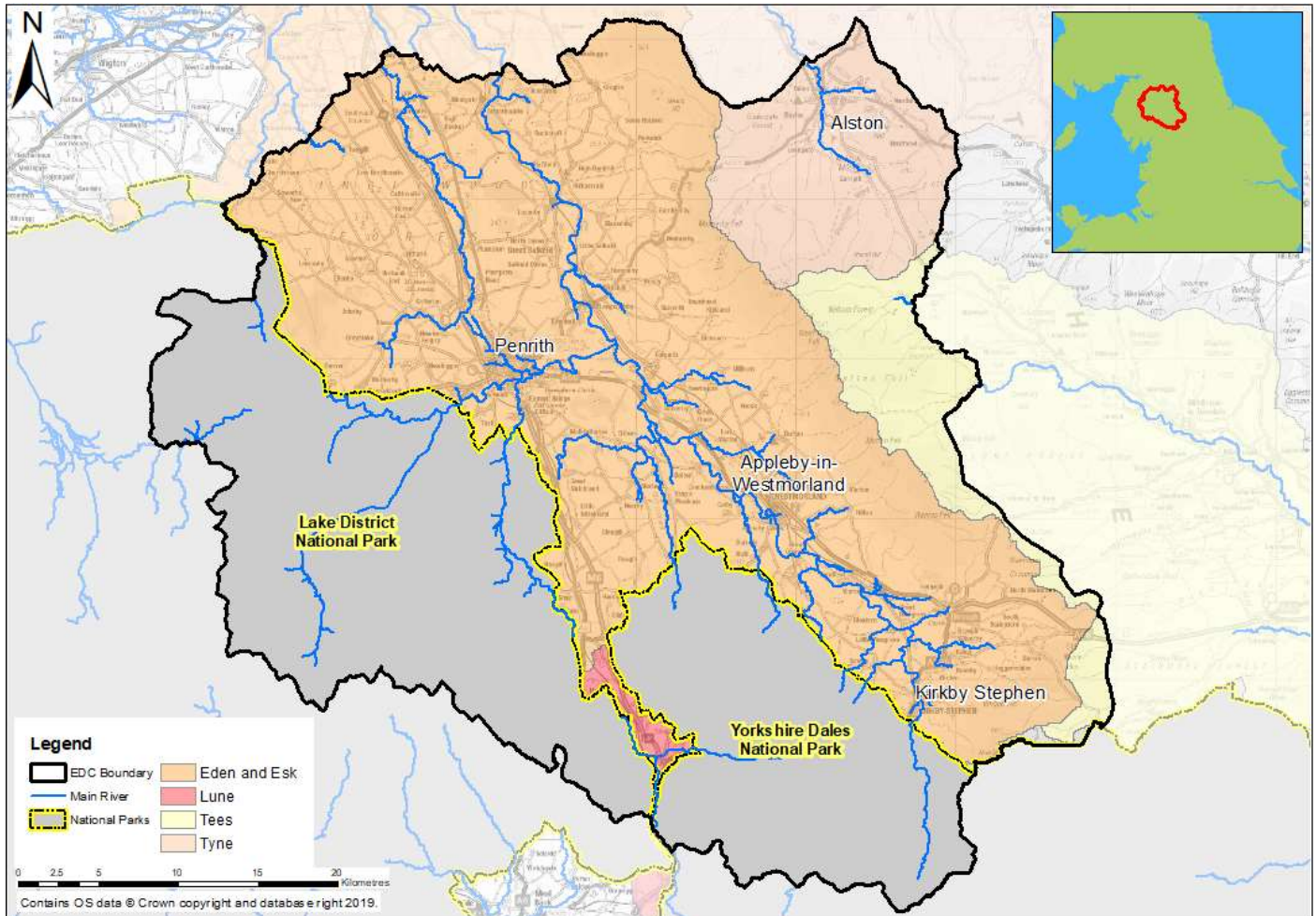
**Figure 4-3: North West, Solway Tweed and Northumbria River Basin Districts  
Solway Tweed River Basin District Flood Risk Management Plan, 2016<sup>14</sup>**

The majority of the Eden District is located within the Solway Tweed RBD which overall covers 13,160km<sup>2</sup> crossing the border between England and Scotland. Most of the RBD is in Scotland with the Scottish Environment Protection Agency working closely with the EA to cover both England and Scotland. The natural characteristics of these waters vary considerably from upland streams running over granite rocks to the wide-open mud flats of the Solway estuary. 211,300 people live in the Solway Tweed RBD, mostly in the towns of Penrith, Carlisle and Dumfries; 18,350 people are at risk flooding across 6,000 properties.

<sup>14</sup> <https://www.gov.uk/government/publications/solway-tweed-river-basin-district-flood-risk-management-plan>

Of the 6,000 properties at risk, 4,700 have fully registered to receive direct flood warning information and 1,350 have automatically been registered via their landline.

The Solway Tweed RBD is predominantly rural with agriculture and tourism providing the most significant economic benefits to the local economy. Agricultural areas in the lowland parts of the catchment support good quality land used for arable and livestock farming. Upland areas support more extensive farming or may be managed for grouse or forestry.



**Figure 4-4: Main river catchments in Eden district**

**Eden and Esk catchment**

The Eden catchment lies in the southern area of the Solway Tweed River Basin District. The steepness of the Upper Eden means that water levels in the river rise quickly after rainfall. Eden District is not at risk from tidal flooding, however it is at significant risk of flooding from ordinary watercourses.

The principal watercourses are the Eden, Eamont, Irthing, Petteril and the Caldew with a total catchment area of approximately 2,400km<sup>2</sup>. The catchment is predominantly rural with only 1% being classified as urban. Around 244,000 people live in the catchment, the principal population centres are Carlisle, Penrith and Appleby. The Flood Risk Management Plan states that more than 16,000 people are at risk from fluvial flooding within the Eden and Esk catchment.

Below Kirkby Stephen, the Eden's valley widens with the Lower Eden being characterised by wide floodplains and washlands. These areas are important to providing storage capacity during high water levels; the catchment is subject to some of the highest rainfall in England. Upstream of Penrith, average annual rainfall levels exceed 2,800mm compared to 920mm across England and Wales. In the upper catchment, high rainfall and the steep terrain make the Eden a 'fast-responding' catchment where high river levels occur soon after heavy rainfall.

The River Eamont drains the fells of the Lake District before flowing into the River Eden and can also be described as a fast responding river catchment. Impermeable rocks and high rainfall in the Lake District combine to produce high and fast run-off.

The Solway Tweed River Basin District Flood Risk Management Plan summarised various measures to help manage flood risk in the Eden and Esk catchment. The Risk Management Authorities must set objectives for managing flood risk in the Flood Risk Management Plan, that are consistent with the National Flood and Coastal Erosion Risk Management Strategy. Risk management Authorities, such as the Lead Local Flood Authority and the Environment Agency, should work together to achieve the objectives.

Measures that may apply to Eden and would be initiated by Cumbria County Council and/or the EA include:

#### Preventing risk:

- Where development must take place in areas at risk of flooding, we will seek to ensure that floor levels are raised to an appropriate level, flood resilience is incorporated into buildings and it is demonstrated that safe access can be provided during flood events
- Through the system asset management plans (SAMPS) that the EA have, identify locations where maintenance work to rural watercourses and raised defences will be reduced within the Eden and Esk policy unit
- Investigate and resolve complex flooding from different sources through combined improvement projects. (Cumbria County Council note that together with the EA and United Utilities through the Cumbria Strategic Flood partnership, programs to reduce flood risk are being developed but is very dependent on funding).

#### Preparing for risk:

- Investigate reports of annual flood to properties in Kirkby Stephen and investigate feasibility of flood warning service to be provided by the EA. Cumbria County Council confirm they are looking to develop schemes in Kirkby Stephen.
- Promote awareness within local residents regarding action to protect themselves and their property from flooding
- Investigate feasibility of flood warning service that could provide landowners with suitable advance warning to enable the movement of livestock from areas at risk to higher ground.



Protecting from risk:

- Develop business case for EA withdrawal from rural land drainage – decommissioning Thacka Beck pumping stations

### **North West River Basin District Flood Risk Management Plan, 2016<sup>15</sup>**

There is a portion to the west-southwest of the Eden District located within the North West RBD which overall covers 13,160km<sup>2</sup> from Cumbria in the north to Cheshire in the south. The RBD comprises 12 river catchments, one of which, the Lune, lies partly within the Eden District around the Shap Fells and north Tebay.

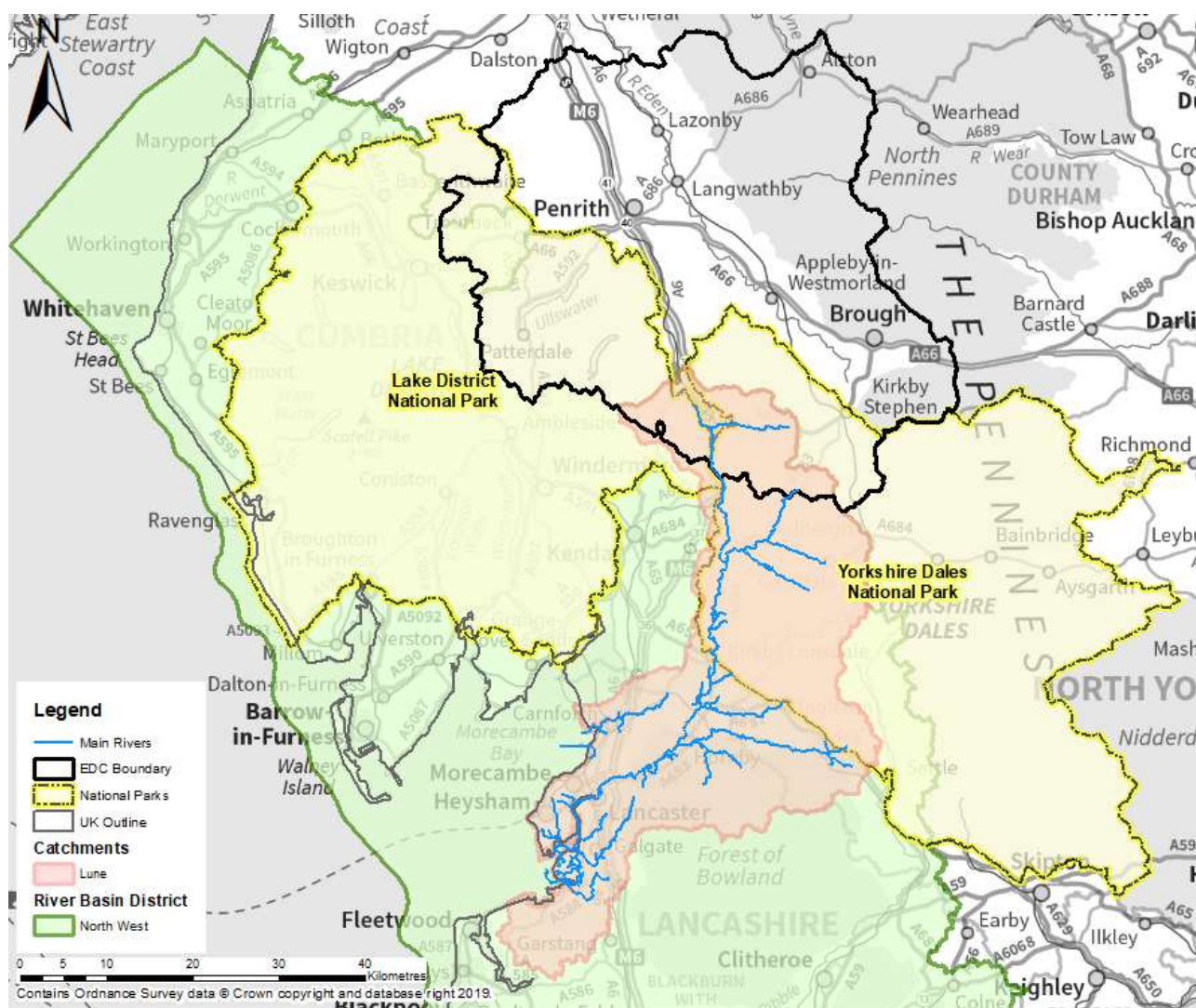
#### **Lune catchment**

The Lune is a rural catchment in the North West covering 1,300km<sup>2</sup>. The catchment is made up of steep slopes to the north and west, but there is flatter terrain to the east and south. The geology contributes to more rapid run-off in the upper catchment and slower run-off in the lower catchment.

By far the largest river in the catchment is the River Lune. This is a natural, relatively steep watercourse in its upper reaches and tributaries, with narrow floodplains and fast flowing watercourses. The main tributaries include the Rawthey, Greta and Wenning. These are all similar to the upper Lune: rural, natural, narrow floodplains and fast flowing. The middle reaches of the Lune consist of flat, wide floodplains covering better quality farmland, with little urban development.

Flood risk within the catchment is from a variety of sources; rivers, the sea (not applicable to Eden), surface water, ordinary watercourses, groundwater, sewers and reservoirs. There are more than 18,000 people at risk of flooding from rivers and the sea.

<sup>15</sup> <https://www.gov.uk/government/publications/north-west-river-basin-district-flood-risk-management-plan>



**Figure 4-5: North West River Basin District and Lune catchment in relation to the Eden district.**

The North West RBD FRMP summarises various measures to help manage flood risk in the Lune catchment although there are none that may apply to Eden.

### **Northumbria RBD FRMP, 2016<sup>16</sup>**

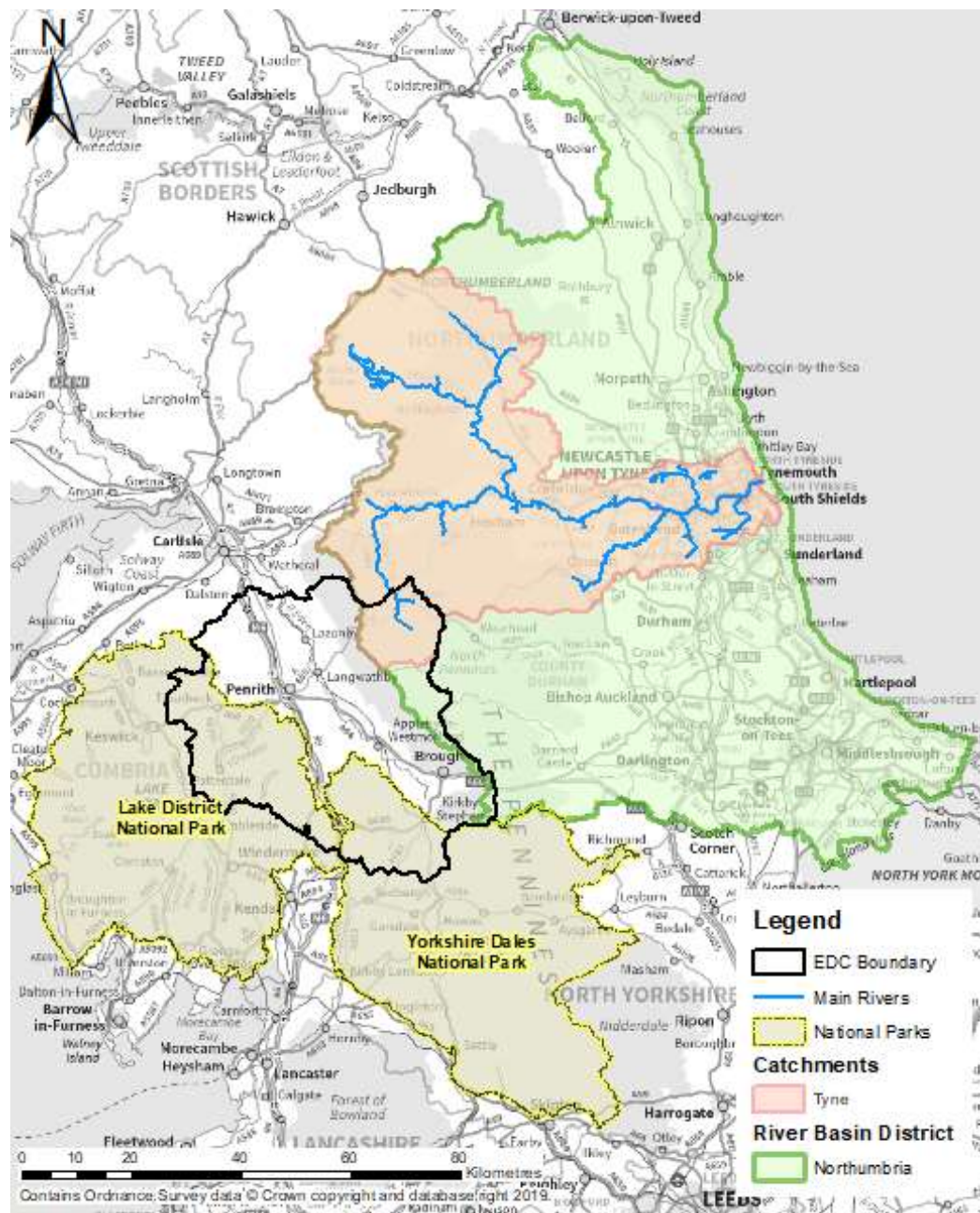
The eastern area of the Eden District is located within the Northumbria RBD from the settlement of Alston in the north through the rural areas of Alston Moor to the south around Dufton Fell. The RBD overall covers 9,029km<sup>2</sup> from the Scottish border to just south of Guisborough, and from the Pennines in the west across to the North Sea. The river basin district is made up of four catchments, two of which, the River South Tyne flows northwards through Alston and into Northumberland, and the River Tees flows southwards around Dufton Fell.

<sup>16</sup> <https://www.gov.uk/government/publications/northumbria-river-basin-district-flood-risk-management-plan>

## Tyne catchment

The Tyne catchment lies in the north east of England, covering an area of 2,300km<sup>2</sup>. Main rivers in the catchment include the Allen, Derwent, North Tyne, Rede, South Tyne and the Tyne.

The River Tyne is generally a rural catchment with an agriculturally based landscape in the west and the cities of Newcastle and Gateshead located in the eastern portion of the area. The headwaters drain remote moorland and flow through narrow, steep valleys. Other sources of flooding from reservoirs, surface water, ordinary watercourses, groundwater and sewers are also significant in this catchment.



**Figure 4-6: Northumbria River Basin District and Tyne catchment in relation to the Eden district.**

The Northumbria RBD FRMP summarised various measures to help manage flood risk in the Tyne catchment. Those that may apply to Eden and should be taken forward collectively by the Risk Management Authorities include:

#### Preventing risk:

- Developing a register of structures which may impact on flood risk and ensure that such structures are maintained. Cumbria County Council are not aware of any such register having been produced, at the time of writing.
- Promote creation of floodplain woodland where the research indicates that it would have a beneficial in the South Tyne catchment
- Within the upland peat areas seek opportunities to block grips and drainage channels where there is evidence it will reduce run-off rates in the South Tyne catchment. Cumbria County Council confirm that such work has been carried in several locations.

#### Preparing for risk:

- Ensure that key infrastructure can operate during flooding or recover rapidly after flooding. This will assist in making communities more resilient to flooding and speeds up the recovery process. This action is assigned to all six Lead Local Flood Authorities across the catchment. The Cumbria Strategic Flood Partnership has a 'task and finish' group that is, at the time of writing, looking at identifying critical infrastructure and what actions are required to protect it.
- Produce a Rapid Response Catchment Action Plan for Otterburn, Bellingham, Alston and Blackhall Mill so the community will be more aware of flood risk and be able to respond and recover more quickly.

#### Protecting from risk:

- Improving floodplain storage in the upper catchments of the Rede, South Tyne, Tyne and Team to reduce peak flood flows in the lower catchments.
- Carry out an assessment of water company assets to ensure they are operational and resilient at all times across the catchment. This would be carried out by the water companies.

### **Tees catchment**

The Tees catchment is located in the north east of England and is approximately 1,955km<sup>2</sup> in area. It has three main rivers, the River Tees, the River Skerne and the River Leven. The catchment for the River Tees has areas with distinctively different characteristics.

A large proportion of the catchment is rural and therefore managed, directly or indirectly, for agriculture, forestry, tourism or conservation. The rivers in the Upper Tees have steep channel gradients and valley sides.

The risk of flooding varies through the catchment with the changing character of the landscape and land use. Although there is a rapid, high volume of runoff from the upper part of the Tees, there are a low number of properties at risk of flooding. There is little floodplain storage in the upper catchment to slow the flow of floodwaters to lower reaches. Other

sources of flooding from reservoirs, surface water, ordinary watercourses, groundwater and sewers are also significant throughout this catchment.

The Northumbria RBD FRMP summarised various measures to help manage flood risk in the Tees catchment. Those that may apply to Eden and should be taken forward by the Risk Management Authorities include:

Preventing risk:

- Develop a Flood Risk Management Tool Kit of useful information and advice to support communities in managing flood risk.

Preparing for risk:

- Assessing Flood Risk to infrastructure and developing emergency plans for them to ensure that they are resilient to flood risk, across all the catchment.
- Establishing and maintaining a register for flood risk assets to ensure that they are identified and maintained across all Lead Local Flood Authorities (LLFA) areas.
- Develop and maintain local and multi-agency flood plans to ensure areas are prepared for flooding across LLFA areas.

#### **4.2.5 Flood and Water Management Act**

The Flood and Water Management Act (FWMA) was enacted in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for Local Authorities, as LLFAs, designed to manage local flood risk (from surface water, groundwater and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

The FWMA gives Risk Management Authorities specific powers and duties for local flood risk management. A duty is something the RMA is legally obliged to do; a permissive power can be used at the RMA's discretion. All RMAs have a duty under Section 13 of the FWMA to cooperate with one another when exercising functions relating to flood and coastal erosion risk management.

Table 4-1 following provides an overview of the key LLFA responsibilities as a RMA, under the FWMA.

<b>FWMA Responsibility</b>	<b>Description</b>	<b>LLFA status</b>
<b>Local Flood Risk Management Strategy (LFRMS)</b>	Under Section 9 of the FWMA, the Lead Local Flood Authority has a responsibility to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk-based approaches across different Local Authority areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	Final version produced March 2015. Note: the LFRMS will require updating in 2020 to stay consistent with the new National Strategy due for publication in 2020
<b>Duty to contribute to sustainable development</b>	The Lead Local Flood Authority has a duty to contribute towards the achievement of sustainable development.	Ongoing
<b>Duty to comply with national strategy</b>	The Lead Local Flood Authority has a duty to comply with national flood and coastal risk management strategy principles and objectives in respects of its flood risk management functions.	Ongoing (see above)
<b>Investigating flood incidents</b>	Under Section 19 of the FWMA, the Lead Local Flood Authority, on becoming aware of a flood in its area, has (to the extent it considers necessary and appropriate) to investigate and record details of "locally significant" flood events within their area. This responsibility includes identifying the RMAs and their functions and how they intend to exercise those functions in response to a flood. The responding Risk Management Authority must publish the results of its investigation and notify any other relevant Risk Management Authorities.	Ongoing

<b>FWMA Responsibility</b>	<b>Description</b>	<b>LLFA status</b>
<b>Asset register</b>	Under Section 21 of the FWMA, the Lead Local Flood Authority has a responsibility to maintain a register of structures or features, which it considers having a significant effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	Cumbria County Council hold various information on assets including highway assets, sewerage assets, surveys carried out as part of Section 19 reports. Cumbria County Council are currently awaiting guidelines on further development of the asset register as recommended as part of the Surface Water Management Plan.
<b>Duty to co-operate and Powers to request information</b>	The Lead Local Flood Authority must co-operate with other relevant authorities in the exercise of their flood and coastal erosion management functions.	Ongoing
<b>Ordinary watercourse consents</b>	Under Section 23 of the FWMA, the Lead Local Flood Authority has a responsibility to deal with enquiries and to issues Land Drainage Consents where the altering, removing or replacing of certain flood risk management structures or features that affect flow on ordinary watercourses is required. It also has provisions or powers relating to the enforcement of unconsented works.	Ongoing
<b>Works Powers</b>	Section 25 of the Act provides a Lead Local Flood Authority with permissive powers to undertake works to manage flood risk from surface runoff, groundwater and to maintain the free passage of flow on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Ongoing

<b>FWMA Responsibility</b>	<b>Description</b>	<b>LLFA status</b>
<b>Designation Powers</b>	The Act provides a Lead Local Flood Authority with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Ongoing
<b>Duty to drain the local highway network</b>	The Highways Authority has a duty under the Highways Act (1980) to drain the local Highway network (not Trunk Roads) of surface water where it creates a nuisance. Where drainage infrastructure is provided to assist in this duty then the Highways Authority must maintain it to be fit for purpose. Maintenance of roadside drainage ditches may be the direct responsibility of the Highways Authority or the adjacent landowner	Ongoing
<b>Emergency planning</b>	A Lead Local Flood Authority is required to play a lead role in emergency planning and recovery after a flood event.	Cumbria Local Resilience Forum (see Section 0)
<b>Community involvement</b>	A Lead Local Flood Authority should engage local communities in local flood risk management issues. This could include the training of community volunteers, the development of local flood action groups and the preparation of community flood plans, and general awareness raising around roles and responsibilities plans.	Various ongoing - Cumbria Community Risk Register - Cumbria County Council Emergency Plan (see Section 0) - Cumbria County Council Resilience Team



FWMA Responsibility	Description	LLFA status
<b>Sustainable Drainage Systems (SuDS)</b>	SuDS are a planning requirement for major <sup>17</sup> planning applications of 10 or more residential units or equivalent commercial development schemes with sustainable drainage. The Lead Local Flood Authority is now a statutory planning consultee and it will be between the Local Planning Authority and the LLFA to determine the acceptability of these proposed sustainable drainage schemes subject to exemptions and thresholds. Approval must be given before the developer can commence construction. Planning authorities should use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of any Sustainable Drainage Systems over the lifetime of the development.	CCC asks for Non-Statutory National Standards for SuDS and adequate water quality treatment in accordance with the SuDS Manual 2015. CCC also has a Design Guidance <sup>18</sup> document which details the requirements of CCC as LLFA. This document provides direction to the relevant design guidance for the successful implementation of SuDS and is the basis on which planning consultations from Local Planning Authorities are assessed.
<b>Latest changes to FWMA legislation<sup>19</sup></b>		

**Table 4-1: Key LLFA responsibilities under the FWMA**

## 4.3 Flood and water focused policies and plans

### 4.3.1 25 Year Environment Plan<sup>20</sup>

This Plan sets out Government’s action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first. The Plan also sets out how government will tackle the effects of climate change, considered to perhaps be the most serious long-term risk to the environment given higher land and sea temperatures, rising sea levels, extreme weather patterns and ocean acidification. The Plan aims to show that government will work with nature to protect communities from flooding by slowing the

<sup>17</sup> For housing, development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more. For non-residential development it means additional floorspace of 1,000m<sup>2</sup> or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015.

<sup>18</sup><https://cumbria.citizenspace.com/cumbria-county-council/cumbria-design-guide/>

<sup>19</sup> <http://www.legislation.gov.uk/ukpga/2010/29>

<sup>20</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/673203/25-year-environment-plan.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/673203/25-year-environment-plan.pdf)

flow of rivers and by creating and sustaining more wetlands to reduce flood risk and offer valuable habitats.

Focusing on flood risk, Government has updated the national flood and coastal erosion risk management strategy for England to produce a draft that is, at the time of writing, progressing through a consultation stage; the aim being to publish the final strategy in Spring 2020, which looks to strengthen joint delivery across organisations. In terms of funding, government will look at current partnership arrangements ahead of a review of funding needs beyond 2021, seeking to attract more non-public sector investment, and make sure all relevant agencies are able to respond quickly and effectively to support communities if and when flooding does occur. The Plan states that the EA will use its role in statutory planning consultations to seek to make sure that new developments are flood resilient and do not increase flood risk.

For flood mitigation, government will focus on using more natural flood management solutions; increasing the uptake of Sustainable Drainage Systems (SuDS), especially in new development; and improving the resilience of properties at risk of flooding and the time it takes them to recover should flooding occur.



**Figure 4-7 Main goals and policy areas the 25-year Environment Plan is intended to help work towards**

### **4.3.2 Water Framework Directive, Water Environment Regulations and River Basin Management Plans**

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through River Basin Management Plans. The Eden District Council area is covered by the Solway Tweed River

Basin Management Plan for the majority with smaller areas being covered by the North West and Northumbria RBMPs, managed by the EA and published in 2015.

Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The EA is responsible for monitoring and reporting on the objectives of the Water Framework Directive on behalf of Government. They work with Government, Ofwat, local government, non-governmental organisations (NGOs) and a wide range of other stakeholders including local businesses, water companies, industry and farmers to manage water<sup>21</sup>.

The second management cycle of the Water Framework Directive<sup>22</sup> has begun and the second cycle of River Basin Management Plans were completed in 2015, building upon the first set completed in 2009. RBMPs are designed to address the pressures facing the water environment in the river basin management plan districts and the actions that will address them. The plans describe required objectives and measures to protect and improve the water environment over the next 20 years and aim to achieve Water Framework Directive targets from 2015 onwards to 2021.

The RBMPs, like the Catchment Flood Management Plans, are important documents relevant to the development of the SFRA. The SFRA should take into account the wider catchment flood cell aims and objectives and understand how it can potentially contribute to the achievement of them.

The main responsibilities for Eden District Council as the Local Planning Authority and Cumbria County Council as the Lead Local Flood Authority, is to work with the EA to develop links between river basin management planning and the development of local authority plans, policies and assessments. In particular, the general programme of actions (measures) within the RBMPs relevant to Eden highlight the need for:

- Strategic working with United Utilities to seek partnership opportunities for improved infrastructure management e.g. reduced Combined Sewer Overflows (CSOs),
- Water Cycle Studies (WCS) to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan implementation,
- Consideration of the Water Framework Directive objectives (achieving good status or potential as appropriate) in the spatial planning process, including Local Development Documents (LDDs) and Sustainable Community Strategies, and
- Promotion of the wide scale use of Sustainable Drainage Systems (SuDS) in new development.

21 <https://www.gov.uk/government/publications/2010-to-2015-government-policy-water-quality/2010-to-2015-government-policy-water-quality#appendix-4-planning-for-better-water>

22 [http://ec.europa.eu/environment/water/water-framework/info/timetable\\_en.htm](http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm)

## **4.4 Other related plans and policies**

### **4.4.1 Catchment partnerships**

The Catchment Based Approach (CaBA) embeds collaborative working at a river catchment scale to deliver cross cutting improvements to our water environments. The CaBA partnerships drive cost-effective practical delivery on the ground, resulting in multiple benefits including reduced flood risk and resilience to climate change.

Catchment partnerships are groups of organisations with an interest in improving the environment in the local area and are led by a catchment host organisation. The partnerships work on a wide range of issues, including the water environment but also address other concerns that are not directly related to river basin management planning. Government is also working to strengthen or establish partnerships in the areas most affected by the December 2015 floods, caused by Storm Desmond, to encourage a more integrated approach to managing risk across all catchments.

The National Resilience Review will align closely with Defra's work on integrated catchment-level management of the water cycle in the Government's 25 Year Environment Plan. Government's aspirations for the next cycle of planning (to 2021 at the time of writing) is for more integrated catchment planning for water, where Flood and Coastal Risk Management, River Basin Management, nature conservation and land management are considered together.

Catchment partnerships relevant to Eden District include:

- Saving Eden hosted by the Eden Rivers Trust
- West Cumbria Catchment Partnership hosted by West Cumbria Rivers Trust
- Becks to Bay hosted by South Cumbria Rivers Trust
- Living Lune hosted by the Lune Rivers Trust
- The Tyne Catchment Partnership hosted by the Tyne River Trust
- The Tees Catchment Partnership hosted by the Tees Rivers Charitable Trust.

## **4.5 Planning legislation**

### **4.5.1 Housing and Planning Act, 2016**

The Act provides the statutory framework to build more homes that people can afford, expand home ownership, and improve housing management. The Act places a duty on local authorities to promote the development of starter homes, custom and self-build homes. This Act simplifies and speeds up the neighbourhood planning process to support communities that seek to meet local housing and other development needs through neighbourhood planning. In addition, the Act seeks to ensure that every area has a Local Plan and gives the Secretary of State further powers to intervene if Local Plans are not effectively delivered.

The Secretary of State must also carry out a review of planning legislation, government planning policy and local planning policies, concerning sustainable drainage in relation to the development of land in England.

## 4.5.2 Localism Act, 2011

The Localism Act was given Royal Assent in November 2011 with the purpose of shifting power from Central Government back to local councils, communities and individuals. The Government abolished Regional Spatial Strategies, providing the opportunity for councils to re-examine the local evidence base and establish their own local development requirements for employment, housing and other land uses through the plan making process.

Additionally, this act places a duty to cooperate on local authorities, including statutory bodies and other groups, in relation to the planning of sustainable development. This duty to cooperate requires local authorities to:

*“...engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter.”*  
(Provision 110).

This act, together with the Neighbourhood Planning (General) Regulations 2012, also provides new rights to allow Parish or Town Councils to deliver additional development through neighbourhood planning (Neighbourhood Plans). This means local people can help decide where new homes and businesses should go and what they should look like. Local planning authorities can provide technical advice and support as neighbourhoods draw up their proposals. Neighbourhood Plans have a number of conditions and requirements as set out in the National Planning Policy Framework. Also refer to Paragraph 061-064 of the Flood Risk and Coastal Change Planning Practice Guidance for information on neighbourhood planning and flood risk.

## 4.6 Planning policy

### 4.6.1 National Planning Policy Framework (NPPF)

The NPPF was published in March 2012 and received a significant revision in July 2018. The latest update took place in February 2019. It forms the national planning policy framework in England and is based on core principles of sustainability. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF is accompanied by Planning Practice Guidance (PPG) notes which are updated as the need arises.

**The PPG documents will, where necessary, be updated in due course to reflect the changes in the latest version of the NPPF.**

**The key changes in the 2019 NPPF compared to the 2012 NPPF include:**

- Strategic policies should also now consider the ‘cumulative impacts in, or affecting, local areas susceptible to flooding’ (para 156), rather than just to or from individual development sites;
- Future risk from climate change. The ‘sequential approach should be used in areas known to be at risk now or in the future from any form of flooding’ (para 158) (see Section 6.2 of this report);
- Natural Flood Management. ‘Using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques)’ (para 157c)

- Sustainable Drainage Systems (SuDS). 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165) (see Section 6.14 of this report) and;
- Emergency planning. Emergency plans are required as part of an Flood Risk Assessment that includes the inclusion of safe access and egress routes (para 163e) (see Section 7.1 and 7.12 of this report).

As explained, the FRCC-PPG sits alongside the NPPF and sets out detailed guidance on how this policy should be implemented.

#### 4.6.2 Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG)

At the time of writing, the current FRCC-PPG was published on 6 March 2014 and is available online via:

<https://www.gov.uk/guidance/flood-risk-and-coastal-change>

**Following the 2018 revision and 2019 updates of the NPPF, Government will, where necessary be updating the FRCC-PPG to reflect the changes discussed above in Section 4-6-1. It is advised that any hyperlinks within the FRCC-PPG that direct users to the previous 2012 NPPF should be disregarded.**

Whilst the NPPF concentrates on high level national policy, the FRCC-PPG is more detailed. The practice guidance advises on how planning can take account of the risks associated with flooding and coastal change in plan making and the development management process. This is in respect of local plans, SFRA's, the sequential and exception tests, permitted development, site-specific flood risk, Neighbourhood Planning, flood resilience and resistance techniques and the vulnerability of development to make development safe from flooding.

#### 4.6.3 Local Plan

A Local Plan<sup>23</sup> is a statutory document prepared in consultation with the local community. It is designed to promote and deliver sustainable development. Local Plans have to set out a clear vision, be kept up to date and to set out a framework for future development of the local area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure as well as safeguarding the environment and adapting to climate change and securing good design.

Local plans set the context for guiding decisions and development proposals and along with the National Planning Policy Framework, set out a strategic framework for the long-term use of land and buildings, thus providing a framework for local decision making and the reconciliation of competing development and conservation interests.

The aim of a Local Plan is to ensure that land use changes proceed coherently, efficiently, and with maximum community benefit. Local plans should indicate clearly how local residents, landowners, and other interested parties might be affected by land use change. They are subject to regular periods of intensive public consultation, public involvement,

<sup>23</sup> Town and Country Planning, England. The Town and Country Planning (Local Planning) (England) Regulations 2012

negotiation and approval. The Local Plan should be the starting point when considering planning applications.

The NPPF requires that the evidence base for the Local Plan must clearly set out what is intended over the lifetime of the plan, where and when this will occur and how it will be delivered. The NPPF states that Local Plans should be supported by a SFRA and should take account of advice provided by the EA and other flood risk management bodies. This SFRA should be used to ensure that when allocating land or determining planning applications, development is located in areas at lowest risk of flooding. Policies to manage, mitigate and design appropriately for flood risk should be written into the Local Plan and in any review of the Local Plan as was agreed by Eden Executive in September 2019, and will be informed by both this SFRA and the Sustainability Appraisal.

Government guidance on Local Plans can be found via:

<https://www.gov.uk/guidance/plan-making>

### **Eden Local Plan (2014 to 2032)<sup>24</sup>**

The adopted Eden Local Plan was produced to set out the vision, aims and objectives looking ahead over the period of 2014 to 2032. The plan is founded on a robust evidence base prepared over many years; the plan is also informed by the 2010 Core Strategy and policies which the plan replaced, as well as policies that were saved from the 1996 Local Plan.

Relative to flood risk, the Local Plan Strategic Policies state the need to:

- Contribute to reducing the causes of climate change and flood risk and respond by adaptation to those impacts that are unavoidable (Policy CS1);
- Relate to water management and flood risk and requires that development meets the sequential approach to development in flood risk areas, requiring Sustainable Drainage Systems to be implemented (Policy DEV2);
- Financial contributions may be required to assist in mitigation of possible flood impacts (Policy ENV4);
- Consider the use of permeable paving and green roofs within new development to manage on site surface water (Policy ENV5);
- Protect groundwater quality (Policy ENV10).

## **4.6. Sustainability Appraisals**

The Sustainability Appraisal (SA) is a key component of the Local Plan evidence base, ensuring that sustainability issues are addressed during the preparation of local plans. The SA is a technical document which has to meet the requirements of the Strategic Environmental Assessment Directive 2001/42/EC which assesses and reports on a plan's potential impact on the environment, economy, and society. The SA carries out an assessment of the draft policies at various stages throughout the preparation of the Local Plan, and does this by testing the potential impacts, and consideration of alternatives are

<sup>24</sup> <https://www.eden.gov.uk/media/5032/edenlocalplan2014-2032finalwithoutforeword.pdf>



tested against the plan's objectives and policies. This ensures that the potential impacts from the plan on the aim of achieving sustainable development are considered, in terms of the impacts, and that adequate mitigation and monitoring mechanisms are implemented.

### **EDC Sustainability Appraisal**

The SA Scoping Report<sup>25</sup>, updated in February 2014, was prepared for the first stage of the SA, published in July 2014 as a 'Preferred Options – Draft Sustainability Appraisal<sup>26</sup>'. Following the review of relevant plans, policies and programmes, the documents discuss sustainability issues and problems for Eden District that are relevant to the preparation of the Local Plan, namely the high number of potential development sites at some risk of flooding. Flood risk is likely to increase over the next 25 years due to the impacts of climate change.

## **4.7 Flood risk management policy**

### **4.7.1 Eden District Council Level 1 SFRA (September 2015)<sup>27</sup>**

In 2015, a Level 1 SFRA was commissioned by Eden District Council in order to update and review the existing SFRA from 2007. The 2015 SFRA was prepared in accordance with the now superseded National Planning Policy Framework (2012) and the Flood Risk and Coastal Change Planning Practice Guidance (2014). The study analysed current and future flooding issues in order to support the Local Planning Authority's assessment of future development sites, including providing data to inform the application of the Sequential Test.

A number of recommendations were made which are still relevant within this update, including:

- Regularly review and update SFRA to keep as a 'living' document due to emerging new policies and any updated information;
- Seek to continue to ensure that sustainable drainage techniques are employed through the imposition of conditions or requirements through development management;
- Flood Investigation Reports should be regularly reviewed, and actions followed up.

The previous SFRA focused equally on fluvial and surface water flood risk as these are thought to be the main issues. Flood risk from surface water was added to the 2015 update as it was initially poorly defined in the 2007 SFRA (or data was not available). Within the current SFRA, possible withdrawal (to sites where high risk areas cannot be avoided), redesign or relocation of sites at significant surface water risk will be considered (see Policy Recommendation 2, section 8.2).

<sup>25</sup> Eden Local Plan Sustainability Appraisal Scoping Report. February 2014

<sup>26</sup> Eden Local Plan – Preferred Options: Draft Sustainability Appraisal. July 2014

<sup>27</sup> Eden District Council. Level 1 Strategic Flood Risk Assessment. September 2015

#### 4.7.2 Water Cycle Studies (WCS)

The purpose of a WCS is to investigate whether the local water environment has the capacity to support planned levels of growth and provide a comprehensive and robust evidence to support Local Plan production.

To achieve this, the WCS investigates the capability of the water and sewerage suppliers to provide the services to enable housing and economic growth and identify key risks to the timing of housing delivery and impacts on customers and the local environment. A WCS is certainly useful in the Local Examination, where there is large growth and urban expansion planned within a local authority area.

There is currently no WCS in place for the Eden District.

#### 4.7.3 National and Local Flood Risk Management Strategies

As presented in Figure 4-1 in Section 4, the Flood and Water Management Act (FWMA) establishes how flood risk will be managed within the framework of National Strategies for England and Local Strategies for each Lead Local Flood Authority area.

The National Strategy for England has been developed by the EA with the support and guidance of Defra. The EA is, at the time of writing, in consultation with the public, partners and businesses on the Draft National Strategy with the aim of the final version being published in Spring 2020. The National Strategy sets out principles for how flood risk should be managed and provides strategic information about different types of flood risk and which organisations are responsible for their effective management. The FWMA requires risk management authorities (local authorities, EA, sewerage companies and highways authorities) to work together and act consistently with the National Strategy in carrying out their flood and coastal erosion risk management functions effectively, efficiently and in collaboration with communities, businesses and infrastructure operators to deliver more effective flood risk management.

Lead Local Flood Authorities have responsibility for developing a Local Flood Risk Management Strategy for their area covering local sources of flooding (see Table 4-1). **The local strategy produced must be consistent with the National Strategy.** The local strategy should set out the framework for local flood risk management functions and activities and should raise awareness of local organisations with responsibilities for flood risk management in the area. The strategy should also facilitate partnership arrangements to ensure co-ordination between local organisations and an assessment of flood risk and plans and actions for managing risk, as set out under Section 9 of the FWMA.

The following link provides links to guidance for RMAs and local authorities on various subjects of flood risk management, including tools to support Lead Local Flood Authorities in developing their Local Flood Risk Management Strategy.

<https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities>

## **Cumbria County Council Local Flood Risk Management Strategy (2015<sup>28</sup>)**

The Cumbria Local Flood Risk Management Strategy sets out how the Council will manage flood risk, from surface water runoff, groundwater, main rivers and ordinary watercourses for which the Council has responsibility as Lead Local Flood Authority, and other types of flooding where local agents can play a supporting role to lead agencies.

The Local Flood Risk Management Strategy has five objectives which aim to form policy on flood risk for Cumbria County Council:

- Reduction in flood risk to the people of Cumbria
- Increased knowledge and awareness of the factors affecting flood risk across Cumbria
- Ensure that flood risk management is integrated within the planning process in Cumbria
- Facilitate close partnership working between all risk management authorities
- Improve Community Resilience through awareness of flood risk

The Cumbria Local Flood Risk Management Strategy is developed and maintained by Cumbria County Council and is viewable online via:

<https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/5894/4212914154.pdf>

**The local strategy should be reviewed and updated in 2020 as it must remain consistent with the national strategy which is due for publication in Spring 2020. This is a requirement under the Flood and Water Management Act 2010.**

### **Review of the Local Flood Risk Management Strategy**

It is recommended that Cumbria County Council's LFRMS is updated in 2020 to take account of the:

- Revised (consultation) and final National Flood and Coastal Erosion Risk Management Strategy, noting the increasing emphasis on planning for adapting to climate change that runs through the new national strategy;
- The revised government policy statement on Flood and Coastal Erosion Risk Management due 2019;
- Revised flood risk datasets, including those collated for this SFRA that have emerged since 2016;
- Lessons learnt from severe surface water flooding events since 2016; and
- Revised approaches to flood risk management, partnership working and funding that have emerged since 2016.

<sup>28</sup> <https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/5894/4212914154.pdf>

The review should ensure:

- The views of all relevant stakeholders are taken into account;
- The flood risk evidence base is updated for all sources of flooding and presented in such a way that it can be used to prioritise actions across the District and to help justify funding for further appraisal work where this is deemed necessary;
- The objectives and actions from the previous 2016 LFRMS are reviewed against the progress that has been made in local flood risk management work in the District;
- A revised action plan is specific, achievable and fundable, with measurable success factors and that this can be aligned with the wider work the Council does i.e. in terms of managing open space, highways, etc.;
- A Strategic Environmental Assessment and Habitats Regulations Assessment are undertaken, if these are scoped in and appropriate; and
- The revised LFRMS is subject to public consultation.

## Surface Water Management Plans (SWMP)

In June 2007, widespread flooding was experienced in the UK. The Government review of the 2007 flooding, chaired by Sir Michael Pitt recommended that...

“...Local Surface Water Management Plans (SWMPs) ...coordinated by local authorities, should provide the basis for managing all local flood risk.”

The Government’s SWMP Technical Guidance document<sup>29</sup>, 2011, defines a SWMP as:

A framework through which key local partners with responsibility for surface water and drainage in their area, work together to understand the causes of surface water flooding and agree the most cost-effective way of managing surface water flood risk.

A tool to facilitate sustainable surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences.

A plan for the management of urban water quality through the removal of surface water from combined systems and the promotion of SuDS.

As a demonstration of its commitment to SWMPs as a structured way forward in managing local flood risk, Defra announced an initiative to provide funding for the highest flood risk authorities to produce SWMPs.

Defra’s framework for carrying out a SWMP is illustrated by the SWMP wheel diagram, as shown in Figure 4-8. The first three phases involve undertaking the SWMP study, whilst the fourth phase involves producing and implementing an action plan which is devised based on the evidence gained from the first three phases.

<sup>29</sup> Surface Water Management Plan Technical Guidance - <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>



Figure 4-8: Defra wheel (taken from SWMP Technical Guidance)

#### 4.7.4 Cumbria Surface Water Management Plan

Cumbria County Council was given funding, following a successful bid to the Defra Early Action Fund, to develop a SWMP in 2010. A SWMP study was undertaken in consultation with key local partners who are responsible for surface water management and drainage in their area. The SWMP was designed to identify which parts of the county are at greatest risk of flooding from surface water and to establish a strategy to manage those risks best. The SWMP study was undertaken in consultation with key local partners who are responsible for surface water management and drainage in their area. Partners worked together to understand the causes and effects of surface water flooding and agree the most cost-effective way of managing surface water flood risk in the long-term. A Steering Group was assembled to assist in governing the project, incorporating the six local authorities in Cumbria, two National Park Authorities, UU and the EA.

A key output of the SWMP was an Action Plan which was the incorporated into the Action Plan for the Local Flood Risk Management Strategy.

#### 4.7.6 Critical Drainage Areas (CDAs)

Certain locations known to be susceptible to localised flooding can be defined as Critical Drainage Areas (CDAs) and are based on areas of known surface water flood risk and where the sewer network may be at capacity. There are currently no CDAs within the Eden

District; however, work at a local level may identify locations susceptible to localised flooding where such advice might be applied in the future (see Section 0).

## **Green Infrastructure assessments**

Open space, or Green Infrastructure (GI), should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities and should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

Open space can provide many social, economic and environmental benefits close to where people live and work including:

- Places for outdoor relaxation and play;
- Space and habitat for wildlife with access to nature for people;
- Environmental education;
- Local food production – in allotments, gardens and through agriculture;
- Improved health and well-being – lowering stress levels and providing opportunities for exercise;
- Climate change adaptation – for example flood alleviation and cooling urban heat islands.

Paragraph 118b of the National Planning Policy Framework (2019) explains that open space can perform many functions, including flood risk mitigation, and that Local Plans should account for increased flood risk, resulting from climate change, through the planning of Green Infrastructure. GI can have an important role to play in reducing the likelihood of flooding by providing space for flood storage, reducing runoff and increasing infiltration, whilst also providing other benefits as stated above.

Alongside GI should be the implementation of Sustainable Drainage Systems (SuDS), specifically within potential development sites, where possible. The suitability of GI and SuDS can be informed by this SFRA through utilisation of open space for water in the areas of greatest flood risk, which would be key to helping deliver sustainable development. Examples include:

- Restoration of natural character of floodplains;
- Reduction of downstream flood risk;
- Preserving of areas of existing natural floodplain; and
- Introduction of new areas and enhancing existing areas of greenspace whilst incorporating sustainable drainage within new development.

The Town and Country Planning Association together with the Wildlife Trusts produced a guidance document for Green Infrastructure<sup>30</sup>. The guidance states that local plans should identify funding sources for GI and provision should be made for GI to be adequately funded as part of a development's core infrastructure. For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. LPAs may include capital for the purchase, design, planning and maintenance of GI within the Community Infrastructure Levy (CIL) programme.

A GI strategy is not currently in place for the Eden District.

## **Flood risk partnerships and partnership plans**

Cumbria County Council has been involved in the development of several partnerships designed to provide collaboration between public agencies, businesses and the community. Partnerships and plans that affect the Eden district include:

- Cumbria Local Resilience Forum (CLRF)
- Cumbria Community Risk Register
- Cumbria County Council Resilience Unit
- EDC Emergency Plan
- Cumbria Strategic Flood Partnership (CSFP)
- Eden Catchment Partnership
- Eden Catchment Management Group
- Flood Action Groups / community action groups
- Key businesses and organisations – Eden District Council have ongoing relations with major land owners, employers and organisations such as Cumbria Wildlife Trust, Eden Rivers Trust, Forestry Commission, Highways England, Network Rail, Yorkshire Dales National Park and the Lake District National Park.

See Section 7 on Emergency Planning for more information.

## **4.8 Roles and responsibilities**

The responsibilities for the Risk Management Authorities under the Flood and Water Management Act and Flood Risk Regulations, as summarised by Government<sup>31</sup>, are summarised below.

### **4.8.1 Environment Agency as a RMA**

- Has a strategic overview role for all forms of flooding;

30 Planning for a Healthy Environment - Good Practice Guidance for Green Infrastructure and Biodiversity, Published by the Town and Country Planning Association and The Wildlife Trusts, July 2012

31 <https://www.gov.uk/government/collections/flood-and-coastal-erosion-risk-management-authorities>

- Provides and operates flood warning systems;
- Carries out work to manage flood risk from the sea and main rivers;
- Carries out works in estuaries to secure adequate outfalls for main rivers;
- Carries out surveys to inform Flood and Coastal Erosion Risk Management works and has the right to enter private land to carry out such works;
- Issues permits for flood risk activities, under Environmental Permitting (England and Wales) Regulations 2016, for works on or near a main river, on or near a flood defence structure, in a floodplain, and on or near a sea defence;
- Designates structures and features of the environment that affect flood or coastal erosion risk;
- Has the power to request information from any partner in connection with its risk management functions;
- Must exercise its flood or coastal erosion risk management functions in a manner consistent with the National Strategy and Local Strategies;
- Must be consulted by Local Strategies, if affected by the strategy, by the LLFA;
- Must help advise on sustainable development.

#### **4.8.2 Local Planning Authority as a RMA**

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the Lead Local Flood Authority;
- Has a duty to be subject to scrutiny from the LLFA;
- Has a duty to cooperate and share information with other RMAs.

#### **4.8.3 Lead Local Flood Authority as a RMA**

- Issues Ordinary Watercourse Flood Defence Consents for works affecting ordinary watercourses, under Section 23 of Land Drainage Act 1991;
- Must develop, maintain, apply and monitor a strategy for local flood risk management. This must be consulted on with all RMAs, the public and all other partners with an interest in local flood risk, and must comply with the National Strategy;
- Should prepare and maintain a preliminary flood risk assessment, flood hazard maps, flood risk maps and flood risk management plans;
- Is required to coordinate and share information on local flood risk management between relevant authorities and partners;
- Is empowered to request information from others when it is needed in relation to its flood risk management functions;



- Must investigate significant flooding incidents in its area where it considers it necessary or appropriate;
- Has a duty to establish and maintain a record of structures within its area that it considers having a significant impact on local flood risk;
- Is empowered to designate structures and features that affect flooding;
- Has powers to undertake works to manage flood risk from surface runoff, groundwater and ordinary watercourses;
- Must exercise its flood and coastal erosion risk management functions in a manner consistent with the National Strategy and the Local Strategy;
- Can carry out work that may cause flooding or coastal erosion in the interests of nature conservation, preservation of cultural heritage or people's enjoyment of the environment or cultural heritage;
- Can acquire land in or outside of their district for use in flood risk management if necessary;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a local strategy) to other RMAs;
- Can take the lead on preparing Surface Water Management Plans;
- Must aim to contribute to sustainable development;
- Should consider flooding issues that require collaboration with neighbouring Lead Local Flood Authority's and other RMAs.

#### **4.8.4 United Utilities as a RMA**

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the relevant LLFA;
- Has a duty to be subject to scrutiny from LLFAs;
- Has a duty to cooperate and share information with other RMAs;
- Is responsible for managing the risks of flooding from water and foul or combined sewer systems providing drainage from buildings and yards.

#### **4.8.5 Highways Authority (Cumbria County Council) and Highways England as RMAs**

- Have a duty to act in a manner that is consistent with the National Strategy and have regard to local strategies when:
  - Carrying out highway drainage works,
  - Filling in roadside ditches,
  - Diverting or carrying out works on part of a watercourse;

- Have responsibility for ensuring effective drainage of local roads in so far as ensuring drains and gullies are maintained;
- Must be consulted on Local Strategies, if affected by the Strategy, by the LLFA;
- Have a duty to be subject to scrutiny from LLFAs.

#### **4.8.6 The local community**

- Must be consulted on Local Strategies by the LLFA;
- Has a key role in ensuring local strategies are capable of being successfully delivered within the community. They should actively participate in this process and be engaged by the LLFA.

#### **4.8.7 Riparian owners**

A riparian owner is someone who owns land or property alongside a river or other watercourses. A watercourse is any natural or artificial channel through which water flows including through a culvert, ditch, cut, dyke, sluice or private sewer.

Riparian owners have statutory responsibilities, including:

- Maintaining watercourses;
- Allowing the flow of water to pass without obstruction;
- Controlling invasive alien species

Further guidance for riverside property owners can be found via:

<https://www.gov.uk/guidance/owning-a-watercourse>

#### **4.8.8 Developers**

Have a vital role in ensuring local flood risk management by avoiding development in areas at risk of flooding. Local Strategies should form a key element of local planning guidance, along with consultation of this SFRA.

## 5 Flood risk across Eden District

### 5.1 Flood risk datasets

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

<b>Flood source</b>	<b>Datasets / Studies</b>
<b>Fluvial</b>	EA Flood Map for Planning (Rivers and Sea) (May 2019)
	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) (November 2018)
	EA Recorded Flood Outlines (RFO) (November 2018)
	EA Areas Benefitting from Flood Defences (ABD) (November 2018)
	EA Flood Warning Areas (November 2018)
<b>Pluvial (surface water runoff)</b>	EA Risk of Flooding from Surface Water (RoFSW)
	CCC Preliminary Flood Risk Assessment 2011 and update 2017
<b>Sewer</b>	United Utilities Historical Flood Incident Data
<b>Groundwater</b>	JBA 5m Resolution Groundwater Flood Map
<b>Reservoir</b>	EA Reservoir Flood Maps (available online)
<b>All sources</b>	Solway Tweed RBD Flood Risk Management Plan 2015-2021
	North West RBD Flood Risk Management Plan 2015-2021
	Northumbria RBD Flood Risk Management Plan 2015-2021
	Eden District Council Local Plan SFRA 2015
	Cumbria County Council Historic Flood Records
	Eden Catchment Flood Management Plan (2009)
	Lune Catchment Flood Management Plan (2009)
	Derwent (NW) Catchment Flood Management Plan (2009)
	River Tyne Catchment Flood Management Plan (2009)
	River Tees Catchment Flood Management Plan (2009)
<b>Flood risk management infrastructure</b>	EA Spatial Flood Defence Data (November 2018)
	LLFA FRM Asset Register

**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 mapping in Appendix A present the EA's Flood Map for Planning which shows the fluvial coverage of flood zones 2 and 3 across the Eden District Council's area - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).

### 5.2.1 Main river

The Environment Agency decides which watercourses are Main Rivers. It consults with other Risk Management Authorities and the public before making these decisions.

The EA describes Main Rivers as usually being larger rivers and streams with other rivers known as ordinary watercourses. The EA carries out maintenance, improvement or construction work on Main Rivers to manage flood risk and will carry out flood defence work to Main Rivers only.

As noted in Section 2, Eden District Council area contains the Main Rivers of the Rivers Eden, Eamont, Lowther and Petteril. The mechanisms of flooding along these watercourses and their tributaries can be described as fluvial in nature. The Flood Map for Planning is used to assess fluvial risk to EDC's sites.

Judging by the Flood Map for Planning, the majority of fluvial risk within the EDC boundary comes from the River Eden that runs through the centre of the boundary affecting towns such as Appleby-in-Westmorland and Kirkby Stephen. The River Eamont also poses a significant risk to the town of Penrith.

### 5.2.2 Ordinary watercourses

Ordinary watercourses are any watercourse not designated as Main River. These watercourses can vary in size considerably and can include rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.

Lead Local Flood Authorities, district councils and Internal Drainage Boards have statutory permissive powers to carry out flood risk management work on ordinary watercourses.

### 5.2.3 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 (tidal flooding does not apply to Eden). This is supported by the Catchment Flood Management Plans and Flood Risk Management Plans 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 fluvial event (Flood Zone 3) and the 1 in 1000 AEP 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 do not take account of climate change. As directed by the Flood Risk and Coastal Change Planning Practice Guidance, this SFRA subdivides Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (functional floodplain – see Section 5.2).

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 SFRA uses the Flood Map for Planning downloaded in May 2019 to assess fluvial risk to assessed sites, as per the National Planning Policy Framework and the accompanying Flood Risk and Coastal Change Planning Practice Guidance. 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 2019:

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

## 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 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 natural 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, eg 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.”*

A technical note is provided in Appendix C which explains the methodology used in creating the functional floodplain outline. The area identified as functional floodplain should take into account the effects 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, eg 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 EA's most up-to-date Historic Flood Map (HFM), Areas Benefitting from Defences (ABD), Recorded Flood Outlines (RFO) and Flood Storage Areas (FSA) datasets were assessed when delineating the functional floodplain.

Additionally, the modelled flood outlines available from the latest EA hydraulic river models used to create the functional floodplain included:

- 2006 – River Lowther Model and Eden Tribs Models (Church Brough, Coupland, Kirkby Thore, Milburn, Newton Reigny, Skirwith, and Warcop);
- 2009 – Great Ormside;
- 2012 – River Eden Appleby;
- 2013 – River Eamont and Thacka Beck, River Eamont;
- 2015 – Greystoke;
- 2017 – Brockleymoor, Maulds Meaburn and Crosby Ravensworth, Kirkby Stephen, Morland, Soulby, Stockdalewath.

The functional floodplain methodology and resulting flood outline was assessed and agreed upon by the Local Planning Authority, the Lead Local Flood Authority and the EA, based on their local knowledge

## **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 a layer within Eden SFRA Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#). 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 Local Planning Authority 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 Flood Risk and Coastal Change Planning Practice Guidance.**

### 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 SFRA's 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 Local Flood Risk Management Strategy should assist with this and various mitigative measures, i.e. Sustainable Drainage Systems (SuDS), should be identified. Sections 0 and 0 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.

According to the 2011 Preliminary Flood Risk Assessment in Cumbria, approximately 23,500 properties are estimated to be at risk of flooding to a depth of 0.3m during a rainfall event with a 0.5% chance of occurring in any one year.

#### 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.

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 shown on a layer of the Eden SFRA map Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).

### **5.3.2 Sewer flooding**

Combined sewers spread extensively across urban areas serving residential homes, business and highways, conveying waste and surface water to treatment works. Combined Sewer Overflows (CSOs), provide an EA consented overflow release from the drainage system into local watercourses or large surface water systems during times of high flows. Some areas may also be served by separate waste and surface water sewers which convey waste water to treatment works and surface water into local watercourses.

Flooding from the sewer network mainly occurs when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. Pinch points and failures within the drainage network may also restrict flows. Water then begins to back up through the sewers and surcharge through manholes, potentially flooding highways and properties. Therefore, it is recommended that, where possible, when connecting foul and/or surface water to the public sewer system the cover levels or finished floor levels are not below the cover level of the receiving public sewer. It must be noted that sewer flooding in 'dry weather' resulting from blockage, collapse or pumping station mechanical failure (for example), is the sole concern of the drainage undertaker.

United Utilities (UU) is the water company responsible for the management of the majority of the drainage networks across the district.



### 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 Lead Local Flood Authority and Local Planning Authority 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<sup>32</sup> states that a Flood Risk Assessment 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 Critical Drainage Area. At the time of writing there are no ACDPs in EDC.**

CDAs can be designated by Local Planning Authorities or Lead Local Flood Authorities for their own purposes. The EA do not have to be consulted on sites that lie in a CDA if such sites are in Flood Zone 1.

### 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, Eden District Council should consider the RoFSW to be its locally agreed**

<sup>32</sup> <https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>

**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

Groundwater flooding is caused by the emergence of water from beneath the ground, either at point or diffuse locations. The occurrence of groundwater is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the local environment and ground stability.

There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall, high in-bank river levels, artificial structures, groundwater rebound and mine water rebound. Properties with basements or cellars or properties that are located within areas deemed to be susceptible to groundwater flooding are at particular risk. Development within areas that are susceptible to groundwater flooding will generally not be suited to Sustainable Drainage Systems (SuDS); however, this is dependent on detailed site investigation and risk assessment at the Flood Risk Assessment stage.

This SFRA uses groundwater data in the form of JBA's 5m Groundwater Map, which provides a general broad-scale assessment of the groundwater flood hazard. The Map is categorised by grid code where each code is explained in Table 5-2. The groundwater vulnerability dataset is shown on the SFRA Maps in Appendix B.

Groundwater head difference (m)*	Grid Code	Class label
0 to 0.025	4	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	3	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	2	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event. There is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.

Groundwater head difference (m)*	Grid Code	Class label
>5	1	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	0	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

\*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.

**Table 5-2: Groundwater flood hazard classification of JBA groundwater map.**

This dataset shows that the areas with the highest levels of groundwater vulnerability are areas such as Penrith, Shap, Plumpton, and Great Salkeld with a large proportion of groundwater vulnerability being located to the east of the River Eden in areas such as Ousby, Gamblesby, Appleby-in-Westmorland, and Kirkby Stephen. The east of the district is categorised as little risk that groundwater flooding would occur.

It is important to ensure that future development, i.e. within the Penrith Master Plan, is not placed at unnecessary risk therefore groundwater flood risk should be considered on a site by site basis in development planning. Where development is shown to lie within areas that are susceptible to groundwater flooding, detailed site hydrogeological investigation and risk assessment should be carried out at the Flood Risk Assessment stage to fully understand the risk.

Groundwater flood risk should be considered particularly when determining the acceptability of Sustainable Drainage Systems (SuDS) schemes as a way of managing surface water drainage. For example, infiltration SuDS will not be appropriate where there is a high groundwater table. Developers should consult with the Local Planning Authority, the Lead Local Flood Authority and the EA at an early stage of the assessment.

## 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. Canal flooding may occur either as a result of the facility being overwhelmed or as a result of dam or bank failure. This can happen suddenly resulting in rapid-flowing and deep water that can cause significant threat to life and major property damage.

There are no canal systems within the Eden District Council area.

### 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. All large reservoirs must be regularly inspected and supervised by reservoir panel engineers. Local Authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. The Local Planning Authorities should work with other members of the Cumbria Local Resilience Forum (see Section 6).

Paragraph 014 of the Flood Risk and Coastal Change Planning Practice Guidance 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.”*

### 5.5.3 Reservoir Flood Map

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 Flood and Water Management Act updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m<sup>3</sup> to 10,000m<sup>3</sup>. 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.

The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds, including information about the depth and speed of the flood waters. In September 2016, the EA produced the Reservoir Flood Map guidance ‘Explanatory Note on Reservoir Flood Maps for Local Resilience Forums – Version 5<sup>33</sup>’ which provides information on how the maps were produced and what they contain.

The Reservoir Flood Map can be viewed nationally at:

[https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater#Reservoirs\\_3-ROFR](https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater#Reservoirs_3-ROFR)

The Reservoir Flood Map shows that there are two reservoirs within the Eden District Council boundary; Haweswater and Wet Sleddale Reservoirs would have adverse effects on locations such as Penrith in the unlikely event of a breach.

## 5.6 Historic flooding

As the Lead Local Flood Authority, Cumbria County Council has a responsibility, under the Flood and Water Management Act, to maintain and update a historic flood incidents database as and when any locally significant flood incidents occur.

In 2011, a £5.6m flood alleviation scheme was carried out in Penrith providing a flood storage reservoir and fixing and replacing more than 675m of culverting to protect homes and businesses in Penrith. Appleby is also protected partially by flood defences being used in times of high rainfall. The largest flood on record occurred in Appleby in 1968 when 61 residential properties and 31 commercial premises were affected.

### 5.6.1 Historic pluvial/fluviial flooding

The districts within Cumbria suffered greatly due to Storm Desmond in December 2015 where record amounts of rainfall fell within a short period of time. On 4<sup>th</sup> December 2015 there were 23 flood warnings and 21 flood alerts across Cumbria issued by the EA.

According to the EA, within Eden District, 432 residential properties and 87 business properties were flooded during Desmond, mainly centred around Penrith and Appleby-in-Westmorland<sup>34</sup>. Following the floods, advice and assistance was provided to 37 households directly affected by the flooding and the Eden Housing Association (EHA) housing teams remained in regular contact with all displaced tenants. 82.6km of Eden's highway network was damaged, equalling 23.3% of the county's total damage, meaning it was the second highest district in Cumbria in terms of overall damaged network length and costs.

### 5.6.2 EA Historic Flood Map (HFM)

The Historic Flood Map (HFM) is a spatial dataset 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. The EA's Recorded Flood Outlines (RFO) dataset however does include details of flood events, including date of event and flood source. The difference between the two datasets is that the HFM contains flood outlines that are 'considered and accepted' by the EA following adequate verification using certain criteria whereas the RFO contains outlines all records and also records surface water flood events. For those areas not within an HFM or RFO outline, this does not mean these areas have never flooded, only that the EA does not have records of flooding in the area.

The HFM shows areas of flooding having occurred, mainly along the River Eden at locations like Langwathby, Armathwaite, Appleby-in-Westmorland, and Great Ormside and smaller

<sup>34</sup><https://www.cumbria.gov.uk/eLibrary/Content/Internet/536/671/4674/17217/17225/43312152830.pdf>

areas of flooding located along the River Petteril. There is a large area of historic flooding located on the River Eamont at Penrith, which should be accounted for in the Penrith Master Plan.

The HFM and RFO datasets are shown on the SFRA Maps in Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).

## 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)

The EA maintain a spatial 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 protection provided;
- Design standard (SoP);
- Asset length;
- Asset age;
- Asset location; and
- Asset condition. See Table 5-3 for condition assessment grades using the EA's Condition Assessment Manual<sup>35</sup> (CAM).

<sup>35</sup> Environment Agency. (2012). Visual Inspection Condition Grades. In: EA Condition Assessment Manual. Bristol: Environment Agency. P9.

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.

**Table 5-3: EA flood defence condition assessment grades**

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.

Defence Location	Asset Type	Flood Source	Watercourse	Design Standard	Asset Condition
Penrith	7 Embankments 4 Flood Walls	Fluvial	River Petteril and Eamont	0 (1) 10 (2) 20 (2) 25 (1) 50 (1) 70 (1) 100 (3)	2 (6) 3 (5)
Appleby-in-Westmorland	5 Embankments 1 Flood Gate 20 Flood Walls	Fluvial	River Eden	5 (1) 25 (1) 70 (3) 90 (2) 100 (18) 200 (1)	1 (2) 2 (13) 3 (10) 4 (1)
Kirkby Stephen	2 Flood Walls	Fluvial	River Eden	50 (1) 70 (1)	4 (2)
South of Langwathby	1 Embankment	Fluvial	River Eden	70 (1)	3 (1)
<b>Number in brackets = number of assets</b>					

**Table 5-4: Major flood defences in Eden district**

In total, there are 61 flood defences assets within Eden District, according to the EA's spatial flood defence dataset. Table 5-4 highlights the main locations within the district that have significant Flood Risk Management assets, the majority of which are located along the River Eden around the main towns of Appleby-in-Westmorland and Kirkby Stephen with

others being located around Penrith. The locations of all the major flood defences are shown on the SFRA Mapping in Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).

Of the 61 constructed fluvial flood defence assets within Eden District, 26 are flood embankments and 35 are floodwalls. The floodwalls aim to prevent the flooding of residential and commercial properties and infrastructure. There are four floodwalls located in and around the town of Penrith; the design standards vary between 10, 20 and 25 with the condition being stated as 2/3, which means 'Good/Fair' according to the EA's Condition Assessment Manual (see Table 5-3). The embankments aim to protect against flood risk along the Main Rivers in the district.

Along the majority of the Main Rivers within Eden District, there are areas of high ground, offering protection from fluvial flooding. The condition grade of the majority of these defences is stated as 2/3, which means 'Good/Fair', as per the EA's Condition Assessment Manual meaning there could be defects that could reduce the performance of the asset or the defects are only minor and would not compromise performance.

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 the existing flood defences, structures and watercourses.
- Enforcement and maintenance where riparian owners unknowingly carry out work that may be detrimental to flood risk.
- Identifying and promoting new flood alleviation schemes (FAS) where 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 Mapping in Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).
- 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.

### **5.7.2 Cumbria County Council assets and future Flood Risk Management schemes**

The Lead Local Flood Authority owns and maintains a number of assets throughout the district which include culverts, bridge structures, gullies, weirs 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 many cases, responsibility for maintenance of private assets lies with the riparian / land owner.



Cumbria County Council (as the Lead Local Flood Authority), under the provisions of the Flood and Water Management Act, 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 Lead Local Flood Authority to maintain any third-party features, only those for which the authority has responsibility as land/asset owner.

**The Lead Local Flood Authority should carry out a strategic assessment of structures and features on the Flood Risk Management Asset Register to inform capital programme and prioritise maintenance programme. Critical assets (i.e. culverts in poor condition) should be prioritised for designated works.**

At the time of writing, Cumbria County Council do not have any specific areas of land which have been identified or reserve for future flood risk management schemes. This is because areas that have been identified as flood risk are in the early stage of project development or have not yet started.

The most advanced project is associated with Alston Mill Race, however, as yet there is no specific area that has been identified for a project that can move forward. The areas in Table 5-5 will be under review in the future according to CCC.

<b>Area</b>	<b>Timescale</b>
<b>Remwick</b>	2021/27 (CSR2)
<b>Croglin</b>	2027/35 (CSR3)
<b>Alston</b>	Current
<b>Nentsberry/Haggs Mine</b>	2021/27 (CSR2)
<b>Glassonby</b>	2021/27 (CSR2)
<b>Hoff</b>	2021/27 (CSR2)
<b>Greystoke</b>	2021/27 (CSR2)
<b>Kirkby Stephen</b>	2021/27 (CSR2)
<b>Shap</b>	2021/27 (CSR2)
<b>Plumpton</b>	2021/27 (CSR2)
<b>Old Tebay</b>	2021/27 (CSR2)
<b>Stainton, Penrith</b>	2027/35 (CSR3)

**Table 5-5: Future flood risk management schemes in Eden area according to Cumbria County Council**

### **5.7.3 Water company assets**

The sewerage infrastructure within Eden District 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. United Utilities (UU) is responsible for the management of the

adopted sewerage system for Cumbria. Such sewerage systems include surface water and foul sewers. There may however be some private surface water sewers in the district as only those connected to the public sewer network that were transferred to the water companies under the Private Sewer Transfer in 2011 are likely to have been constructed since this transfer date. Surface water sewers discharging to watercourses were not part of this transfer and would therefore not be under the ownership of UU, unless adopted 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. Working with Natural Processes 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. Natural Flood Management and Working with Natural Processes are used interchangeably in the UK though the term Working with Natural Processes 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 (eg people, property, infrastructure, etc.). Working with Natural Processes involves taking action to manage flood and coastal erosion risk (although coastal erosion is not applicable to Eden District Council) by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts.

Both the European Commission (EC) and UK Government are actively encouraging the implementation of Working with Natural Processes 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 Working with Natural Processes 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 Working with Natural Processes to reduce flood risk**

There has been much research on WwNP, but 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 now produced the Working with Natural Processes evidence base which includes three interlinked projects:

- Evidence directory
- Mapping the potential for Working with Natural Processes
- 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 Flood and Coastal Risk Management 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 Working with Natural Processes when developing business cases.

### **Open access opportunity maps**

The open access opportunity maps can be used with key partners to help think about the types of measure that may work in a catchment and where to potentially locate them. The maps cover those Working with Natural Processes measures that have been prioritised – based on the need for mapping – in consultations with Environment Agency staff and external partners.

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, supported by a user guide and a detailed technical guide.

The Working with Natural Processes types are listed in Table 5-6.

WWNP Type	Open data licence details
<b>Floodplain reconnection</b>	<ul style="list-style-type: none"> <li>• Risk of Flooding from Rivers and Seas (April 2017)</li> <li>• 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).</li> <li>• Constraints data</li> </ul>
<b>Run-off attenuation features</b>	<ul style="list-style-type: none"> <li>• 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.<sup>2</sup></li> <li>• Constraints data</li> <li>• Gully blocking potential (a subset of run-off attenuation features on steeper ground)</li> <li>• Data derived from OS Terrain 50 (2016) to classify each run-off attenuation feature based on median slope.</li> </ul>
<b>Tree planting (3 categories)</b>	<ul style="list-style-type: none"> <li>• Floodplain: Flood Zone 2 from Flood Map for Planning (April 2016) and new constraints layer</li> <li>• Riparian: 50m buffer OS water features from Section 2.2.3 with constraints layer</li> <li>• Wider catchment woodland: <ul style="list-style-type: none"> <li>- Based on slowly permeable soils.</li> <li>- 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.</li> <li>- 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.</li> <li>- To the south of this line, particular bedrock geologies have shown a similarly strong spatial relationship to the presence of slowly permeable soils.</li> </ul> </li> </ul>

**Table 5-6: Working with Natural Processes measures and data<sup>36</sup>**

The Working with Natural Processes datasets are available via:

<https://catchmentbasedapproach.org/learn/working-with-natural-processes-evidence-base/>

They are also included for Eden on the SFRA Maps in Appendix A **Error! Reference source not found.** and should be used to highlight any sites or areas where the potential for

<sup>36</sup>[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/677592/Working\\_with\\_natural\\_processes\\_mapping\\_technical\\_report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/677592/Working_with_natural_processes_mapping_technical_report.pdf)

Working with Natural Processes 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 0), 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 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 Working with Natural Processes 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 the Eden District Council area

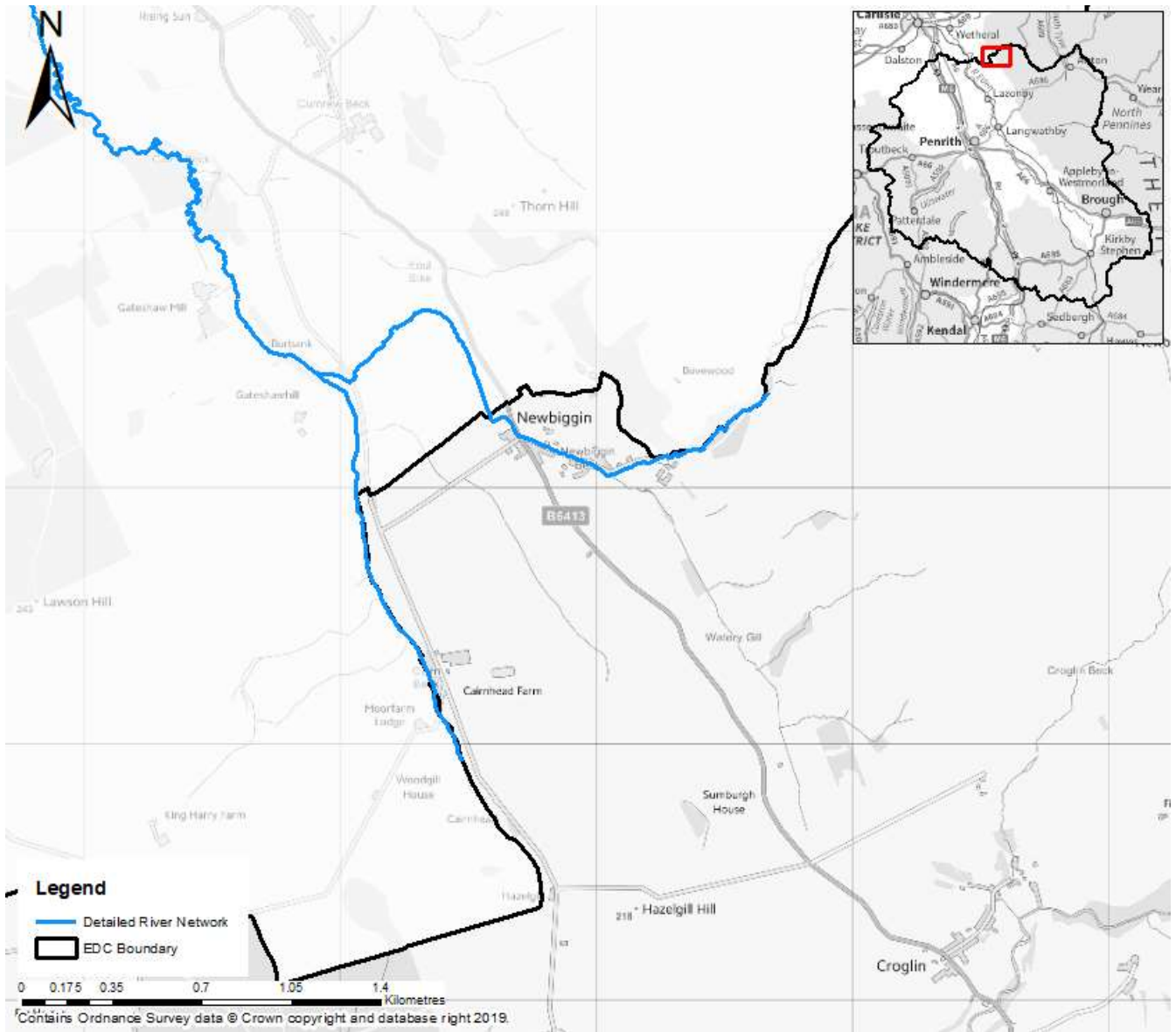
The Cairn Beck Natural Flood Management project started in August 2018 with a scoping stage to identify Natural Flood Management opportunities throughout the Cairn Beck catchment funded by the Environment Agency as part of the national Defra Natural Flood Management project. Cairn Beck lies just outside of the EDC boundary but as it is in close

proximity, there may be cross-boundary impacts from this Natural Flood Management project. This is located in the north-eastern corner of the district boundary.

Initially, the project involved scoping and landowner engagement to identify suitable options and the development and implementation of the monitoring strategy to measure the effectiveness of these measures, including the installation of rain gauges, measuring devices and time-lapse cameras.

During the summer of 2019, eight leaky dams were installed on Newbiggin Beck and 15 leaky dams that were installed in 2016 were modified in order to improve their performance. A river restoration project has been recently completed (at the time of writing) which involved restoring a section of 200m straightened channel to re-instate meanders, bars, riffles, and pools along with secondary and tertiary channels and ponds. This has created more storage of water on the floodplain as well as slowing the flow of the water in the channel<sup>37</sup>.

<sup>37</sup> <https://edenriverstrust.org.uk/projects/natural-flood-management/cairn-beck/>



**Figure 5-1: Cairn Beck and Newbiggin Beck in relation to the Eden authority boundary**

## 6 Development and flood risk

### 6.1 Introduction

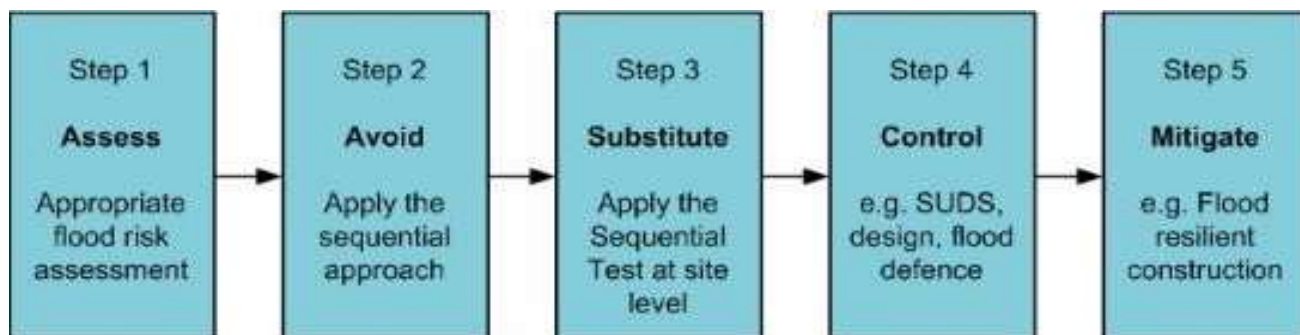
This section of the SFRA provides a strategic assessment of the suitability, relative to flood risk, of the potential Penrith Strategic Masterplan development site allocations and allocated Eden Local Plan 2014/2032 development sites.

The information and guidance provided in this chapter (also supported by the SFRA Maps in Appendix A and the Development Site Assessment spreadsheet in Appendix B) can be used by the Local Planning Authority to inform the Penrith Strategic Masterplan and provide the basis from which to apply the Sequential Approach in the development allocation and development management process.

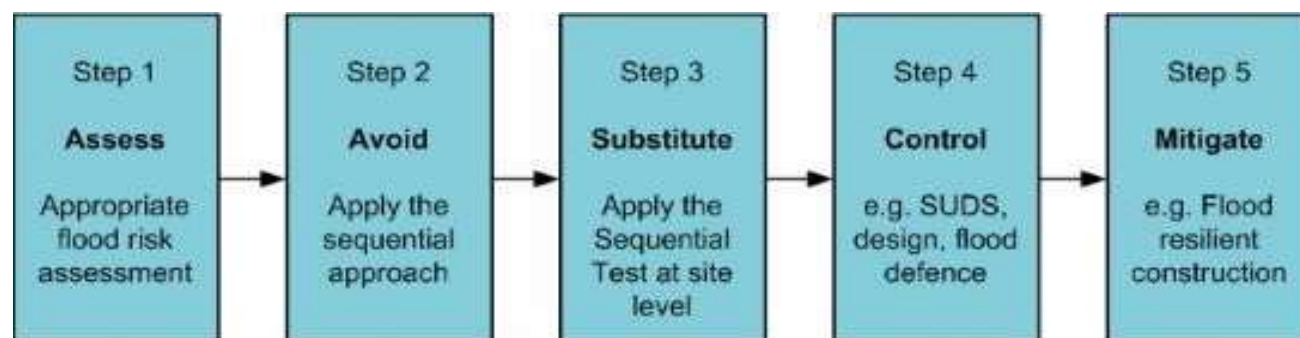
### 6.2 The Sequential Approach

The Flood Risk and Coastal Change Planning Practice Guidance 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 Flood Risk Management 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 Flood Risk Management opportunities identified.



**Figure 6-1** illustrates the Flood Risk Management hierarchy with an example of how these may translate into the site-specific Flood Risk Assessment stage.





## 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 very 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. Local Planning Authorities allocating land in Local Plans or determining planning applications for development by Development Management. This SFRA does not remove the need for a site-specific Flood Risk Assessment to be required 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 Flood Risk and Coastal Change Planning Practice Guidance, 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 National Planning Policy Framework, paras 160-161, 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 Local Planning Authority 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.

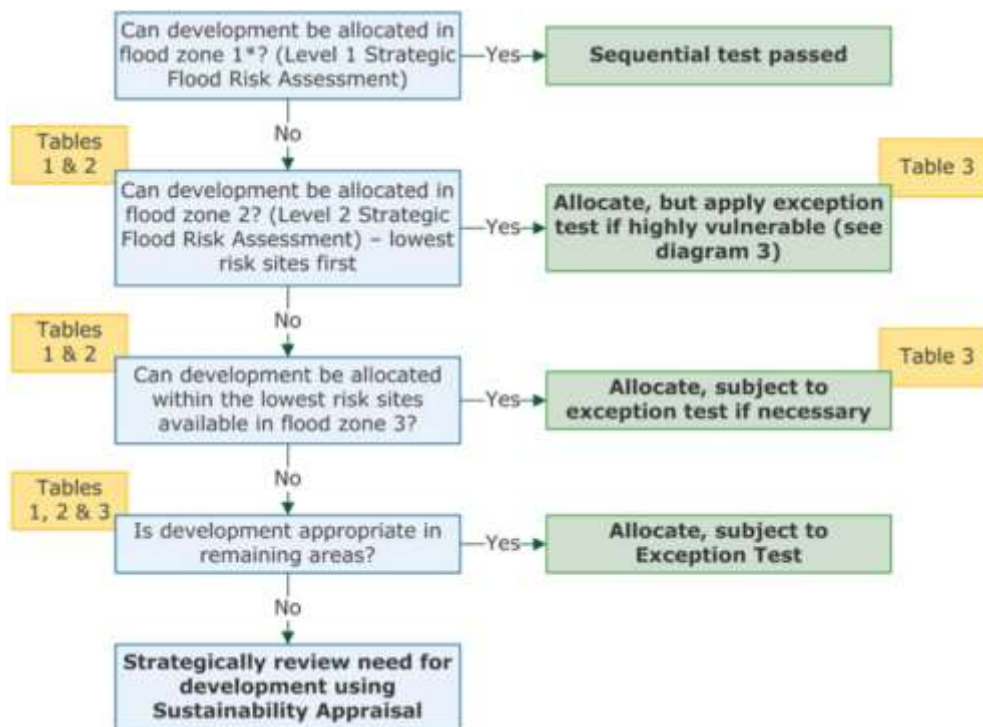
At a strategic level within Eden, this should have been carried out as part of the LPA's Local Plan 2014/20132 and should be included in the forthcoming review of the Local Plan. This should be done broadly by:

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 Working with Natural Processes data);
3. Using opportunities offered by new development to reduce the causes and impacts of flooding, such as through Sustainable Drainage Systems;
4. Identifying where flood risk is expected to increase with climate change so that sustainable development can be ensured in the long term; and
5. Seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.

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

This is 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 achieved through the Development Site Assessment spreadsheet in Appendix B. This spreadsheet will help show that the Local Planning Authority, through the SFRA, has applied the Sequential Test for sites at fluvial risk and also considered surface water flood risk in equal standing and thus considered development viability options for each proposed site.**



**Figure 6-2: Local Plan sequential approach to site allocation<sup>38</sup>**

\*Other sources of flooding also need to be considered

(Tables 1, 2, 3 refer to the Flood Zone and flood risk tables of the Flood Risk and Coastal Change Planning Practice Guidance Paragraphs 065-067).

The approach shown in

Figure 6-2 provides an open demonstration of the Sequential Test being applied in line with the National Planning Policy Framework and the Flood Risk and Coastal Change Planning Practice Guidance. The EA works with local authorities to agree locally specific approaches to the application of the Sequential Test and any local information or consultations with the LLFA should be taken into account.

This SFRA provides the main evidence 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 Local Planning Authority and developers should refer to 'Table 3: Flood risk vulnerability and flood zone 'compatibility'' of the Flood Risk and Coastal Change Planning Practice Guidance (Paragraph 067) when deciding whether a development may be suitable or not.

Although passing the Exception Test will require the completion of a Level 2 SFRA by the Local Planning Authority followed by a site-specific Flood Risk Assessment at the application stage, the LPA should be able to assess the likelihood of passing the test at the

<sup>38</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Sequential-Test-to-Local-Plan>

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) Does the flood risk appear to be too high; and will this mean that the criteria for passing the Exception Test are unachievable?
- c) Does it appear that risk could be sustainably managed through appropriate development techniques (resilience and resistance) and incorporate Sustainable Drainage Systems without compromising the viability of the development?
- d) Does it seem possible that any residual risks to the site could 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 Local Planning Authority should consider avoiding the site altogether.

Once this process has been completed, the Local Planning Authority 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 Site assessments**

Eden District Council provided a GIS layer of the 61 allocated sites within the Eden Local Plan 2014/2032 and another layer of 32 sites for the Penrith Strategic Masterplan. Altogether, the sites had varied proposed uses with 80 residential, 12 employment and 1 mixed use.

In order to inform the Sequential Approach, this review entails a high-level GIS screening exercise overlaying the sites against Flood Zone 1, 2, 3a and 3b, and calculating the area of each site at risk. Flood Zones 1, 2 and 3a are sourced from the EA's Flood Map for Planning (Rivers and Sea) and Flood Zone 3b (functional floodplain) has been delineated as part of this Level 1 SFRA. The flood zones are displayed on the GeoPDF maps in Appendix A. Surface water risk to assessed sites is analysed by way of the EA's Risk of Flooding from Surface Water dataset (RoFSW). The outcomes of the site assessments are presented in the Sites Assessment spreadsheet in Appendix B.

It is important to consider that each individual site will require further investigation, following this Level 1 review, as local circumstances may dictate the outcome of the strategic recommendation.

For this SFRA, surface water flood risk is afforded the equivalent level of importance as fluvial risk in terms of strategic recommendations assigned to each potential development site.

## **6.5 Screening of assessed sites**

This section of the report draws together the results of the sites assessment. The Local Planning Authority should use the spreadsheet (Appendix B) to identify which sites should be avoided through application of the Sequential Test. Where the Sequential Test is not

passed, or where wider strategic objectives require development in areas already at risk of flooding, then the Local Planning Authority should consider the compatibility of vulnerability classifications and Flood Zones (refer to Flood Risk and Coastal Change Planning Practice Guidance) and whether or not the Exception Test will be required.

The decision-making process on site suitability should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

The Appendix B assessment spreadsheets provide a breakdown of each site and the area (in hectares) and percentage coverage of each fluvial flood zone and each surface water flood zone. Fluvial Flood Zones 3b, 3a, 2 and 1 are considered in isolation. Any area of a site within the higher risk Flood Zone 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any within Flood Zone 3a is excluded from Flood Zone 2. This allows for the sequential assessment of risk at each site by addressing those sites at higher risk first. The risk from the surface water flood zones is assessed cumulatively as surface water risk is not included in the Sequential Test. Table 6-1 Table 6-2 show the number of sites within each fluvial flood zone for the allocated sites for the Eden Local Plan 2014/2032 and the Penrith Strategic Masterplan sites provided by Eden District Council.

Indicative land use	Number of sites within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	46	1	2	1
Employment	8	0	1	1
Mixed Use	1	0	0	0
<b>Total</b>	<b>55</b>	<b>1</b>	<b>3</b>	<b>2</b>

**Table 6-1: Number of allocated sites for the Eden Local Plan 2014/2032 at risk from Flood Map for Planning flood zones**

Indicative land use	Number of sites within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	22	0	4	4
Employment	2	0	0	0
<b>Total</b>	<b>22</b>	<b>0</b>	<b>4</b>	<b>4</b>

**Table 6-2: Number of Penrith Strategic Masterplan sites at risk from Flood Map for Planning flood zones**

Indicative land use	Risk of Flooding from Surface Water flood zone		
	Low risk (1 in 1000)	Medium risk (1 in 100)	High risk (1 in 30)
Residential	26	13	10
Employment	6	5	5
Mixed Use	1	1	0
<b>Total</b>	<b>33</b>	<b>19</b>	<b>15</b>

Table 6-3

show the number of sites within each surface water flood zone for both the Local Plan 2014/2032 allocated sites and the Penrith Strategic Masterplan sites.

**Table 6-3: Number of Eden Local Plan 2014/2032 allocated sites at risk from surface water flooding as per the Risk of Flooding from Surface Water map**

Indicative land use	Risk of Flooding from Surface Water flood zone		
	Low risk (1 in 1000)	Medium risk (1 in 100)	High risk (1 in 30)
Residential	29	26	25
Employment	2	2	2
<b>Total</b>	<b>31</b>	<b>28</b>	<b>27</b>

**Table 6-4: Number of Penrith Strategic Masterplan sites at risk from surface water flooding as per the Risk of Flooding from Surface Water map**

The Sites Assessment spreadsheet includes high-level broad-brush strategic recommendations and consequential development considerations for each site. Development considerations are based on Tables 1, 2 and 3 of the flood risk and flood zone

tables<sup>39</sup> of the Flood Risk and Coastal Change Planning Practice Guidance (Paragraphs 065 – 067). The strategic recommendations are intended to assist the Local Planning Authority in carrying out the Sequential Test and to highlight those sites at greatest flood risk. It is important to reiterate that surface water flood risk is afforded the equivalent level of importance as fluvial risk in terms of the strategic recommendations assigned to each assessed site.

Strategic recommendations:

- Strategic Recommendation A – consider withdrawal based on significant level of fluvial or surface water flood risk; **(if development cannot be directed away from high risk areas the site will be unsuitable for development)**
- Strategic Recommendation B – Exception Test required if site passes Sequential Test;

Indicative land use	Number of sites within...				
	A	B	C	D	E
Residential	1*	0	7	22	0
Employment	0	0	0	2	0
*1 due to Flood Zone 3b					

Strategic Recommendation C – consider site layout and design around the identified flood risk if site passes Sequential Test i.e. redraw development boundaries to remove risk or incorporate risk on-site through appropriate mitigation;

- Strategic Recommendation D – site-specific FRA required; and
- Strategic Recommendation E – site could be allocated or permitted for development on flood risk grounds due to little perceived risk, subject to consultation with the Local Planning Authority/Lead Local Flood Authority.

<sup>39</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables>

**Table 6-5: Number of allocated sites for the Eden Local Plan 2014/2032 per strategic recommendation**

**Table 6-6: Number of Penrith Strategic Masterplan sites per strategic recommendation**

Flood depths and hazards will differ locally to each at risk site therefore modelled depth, hazard and velocity data should be assessed for the relevant flood event outlines including climate change (using the EA’s February 2016 allowances. It is important to note that each individual site will require further investigation before development is allocated or permitted, as local circumstances may dictate the outcome of the strategic recommendation. Such local circumstances may include the following:

Indicative land use	Number of sites within...				
	A	B	C	D	E
Residential	2	0	2	34	12
Employment	0	0	2	8	0
Mixed Use	0	0	0	1	0

- currently, however using the EA’s UKCP18 allowances once published), as part of a site-specific Flood Risk Assessment or Level 2 SFRA.
- Current surface water drainage infrastructure and applicability of SuDS techniques are likely to differ at each site considered to be at risk from surface water flooding. Further investigation would therefore be required for any site at surface water flood risk. The Lead Local Flood Authority requires that all planning applications must be



accompanied by an appropriate drainage strategy, independent of the requirement for a site-specific Flood Risk Assessment.

- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development eg finished flood levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been granted.
- It may be possible at some sites to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be viable and deliverable if part of it needs to be retained to make space for flood water?
- Surrounding infrastructure may influence scope for layout redesign/removal of site footprints from risk.
- Safe access and egress must exist at all times during a flood event for emergency response and evacuation.
- Current land use. A number of sites included in the assessment are likely to be brownfield, thus the existing development structure could be taken into account as further development may not lead to increased flood risk.
- Existing planning permissions may exist on some sites where the EA may have already passed comment and/or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations/Flood Risk Assessments may already have been carried out at some sites.
- Cumulative effects. New development may result in increased risk to other potential or existing sites. This should be assessed through a Level 2 SFRA/site-specific FRA or drainage strategy, if required.

Surface water flood risk, which should be assessed with equal importance with fluvial flood risk. To check the surface water flood risk to a particular area, use the most up-to-date surface water map via: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

The following strategic recommendations provide only a guide, based on the fluvial and surface water flood risk information made available for this Level 1 SFRA. Information regarding local, site specific information is beyond the scope of this Level 1 SFRA. It is EDC's responsibility to carry out sequential testing of each site using the information provided in this SFRA and more specifically using their local, site specific knowledge and advice from the EA and Lead Local Flood Authority. The strategic recommendations should be read alongside the Development Site Assessment spreadsheet in Appendix B, which assists the Local Planning Authority in carrying out the Sequential Test for each site.

#### **6.5.1 Strategic Recommendation A – consider withdrawal based on significant level of fluvial or surface water flood risk (if development cannot be directed away from areas at risk)**

This strategic recommendation DOES NOT take into account local circumstances, only that part of a site area falls within a flood zone.

Site ID	Site area (ha)	% area in FZ3b	% area at medium risk (1 in 100 AEP event)	% area at high risk (1 in 30 AEP event)
AP24	<b>0.50</b>	0.00	12.5	<b>2.92</b>
LNE3	<b>0.59</b>	0.00	38.00	<b>28.96</b>
22	<b>121.57</b>	15.34	<b>7.9</b>	4.22

Strategic Recommendation A applies to any site where one or more of the following criteria is true:

- A significant proportion (10%) of the site area is within Flood Zone 3b. The Flood Risk and Coastal Change Planning Practice Guidance flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test and water-compatible uses must be designed and constructed to remain operational and safe for users in times of flood; must result in no net loss of floodplain storage; and not impede water flows and not increase flood risk elsewhere. Development should not be allocated or permitted for sites within the highly, more or less vulnerable categories (when allocated) that fall within Flood Zone 3b. If the developer can avoid 3b however, then part of the site could still be delivered.
- A significant proportion (10%) of the site area of any site type is within the high risk surface water flood outline, and therefore at high surface water flood risk.

It is important to state that it may still be possible to deliver a site that has been recommended for withdrawal from allocation upon more detailed investigation through a Level 2 SFRA.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the developable area from Flood Zone 3b to a lower risk zone then development should not be allocated or permitted.

Within the assessed sites, Strategic Recommendation A applies to 3 sites, of which one is located on the functional floodplain (a Penrith Strategic Masterplan allocation site) and two Eden District Council allocation sites which are subject to significant surface water flood risk. The three sites are displayed below in Table 6-7

**Any area within Flood Zone 3b must be left as open green space or the site boundary amended to remove the developable area from the risk area. If this is not possible, the site should be withdrawn. The EA supports recommendations for withdrawing sites within Flood Zone 3b.**

**Table 6-7: Sites that are potentially unsuitable for development based on fluvial or significant surface water flood risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)**

All 3 of the sites recommended as being potentially unsuitable for development have an indicative residential use. The Penrith Strategic Masterplan site 22, has more than 15% of its site area within the functional floodplain; any area within the functional floodplain must either be removed from the site boundary (i.e. redrawn boundaries) or the risk area incorporated into the site design as open space / amenity areas free from development for the development's lifetime. As this site is so large, it should not be difficult to exclude this area from the site boundary without impacting upon residential yields. This site will require a more detailed assessment to gauge the viability of development going forwards.

The two sites, AP24 and LNE3, that have been recommended as potentially unsuitable (if development cannot be directed away from flood risk areas, the site will be unsuitable for development) based on significant surface water risk (listed in table 6-7). Residential site LNE3 is at particularly significant risk from surface water with almost 29% of its area within the 1 in 30 AEP event outline and 38% within the 1 in 100 AEP event outline. At 0.59 ha in size, this site may struggle to accommodate surface water on site.

### **6.5.2 Strategic Recommendation B – Exception Test required**

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

Strategic Recommendation B applies to sites where it is likely the Exception Test would be required, assuming the Sequential Test has been passed in the first instance. This does not include any recommendation on the likelihood of a site passing the Exception Test. A more in-depth investigation such as a Level 2 SFRA would be required to assess this. The developer / Local Planning Authority should always attempt to avoid the risk area where possible.

Strategic Recommendation B applies to sites where the following criteria is true:

- A significant proportion (10%) of a more vulnerable site (residential and mixed use) is within Flood Zone 3a. Less vulnerable (employment) uses of land do not require the Exception Test.

NOTE: All development proposals in Flood Zone 3a must be accompanied by a flood risk assessment.

Strategic Recommendation B does not apply to any sites within the EDC boundary.

### 6.5.3 Strategic Recommendation C – consider site layout and design

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Strategic Recommendation C applies to sites where one or more of the following criteria is true:

- A small proportion of any site type is within Flood Zone 3b.
- A small proportion of any residential or mixed use (more vulnerable) site is within Flood Zone 3a.
- A small proportion of any more vulnerable site is within the high or medium risk surface water flood zone.

Overall there are 11 sites to which Strategic Recommendation C applies, 7 of which are Penrith Strategic Masterplan sites. Of these sites, 9 of them have above 97% of the site area within Flood Zone 1 meaning that surface water risk is what needs to be mitigated. For these sites, the developer should consider the site layout with a view of removing the developable area from the flood zone that is obstructing development i.e. the high and medium risk surface water flood risk 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 Sustainable Drainage Systems. Site JBA-E4 is an outlier however, as it has over 35% of its areas located within Flood Zone 3a but as the indicative use is employment and thus less vulnerable the site layout and design should be considered to mitigate against this risk.

Penrith Strategic Masterplan site?	Site Reference	Site area (ha)	% area in FZ3a	% area in high SW risk	% area in medium SW risk
No	<b>AP18</b>	2.46	0.37	0.57	1.71
No	<b>LNE1</b>	0.20	1.22	1.47	6.44
No	<b>JBA-E4</b>	0.12	35.48	0.00	0.00
No	<b>JBA-E6</b>	3.62	11.49	1.51	2.76
Yes	<b>14</b>	107.06	0.00	0.03	0.16
Yes	<b>16</b>	40.92	0.10	0.27	0.57
Yes	<b>17</b>	82.04	0.04	0.99	1.26
Yes	<b>18</b>	78.85	0.01	0.09	0.13
Yes	<b>19</b>	71.62	0.09	0.27	0.46

Penrith Strategic Masterplan site?	Site Reference	Site area (ha)	% area in FZ3a	% area in high SW risk	% area in medium SW risk
Yes	<b>23</b>	114.21	0.21	0.55	0.95
Yes	<b>27</b>	39.18	0.13	0.01	0.04

**Table 6-8: Sites that Strategic Recommendation C applies to**

Strategic Recommendation C applies in instances where, due to only a small proportion of a site being at risk, from a high-level strategic viewpoint, there is a greater possibility that a detailed review of site layout and design around the flood risk, as part of a detailed Flood Risk Assessment at the development planning stage, may enable the site to be allocated. Or it may be possible to incorporate suitable Sustainable Drainage Systems into the site layout to mitigate surface water risk on-site, following a detailed FRA or drainage strategy. Similarly, in line with the daylighting policy and where there may be opportunities to do so, there could be potential to remove culverts and restore watercourses to a more natural condition. In many cases, opening culverts can reduce flood risk when combined with Sustainable Drainage Systems. A Level 2 SFRA and/or detailed site-specific Flood Risk Assessment would be required to help inform on site layout and design.

Where Strategic Recommendation C applies to a potential site, the developer should consider the site layout with a view to excluding the developable area from the flood extent that is obstructing development. If this is not possible then the alternative would be to investigate the incorporation of on-site storage of water into the site design. Depending on local circumstances, if it is not possible to adjust the site boundary to confine the developable area to a lower risk zone then this part of the development should not be permitted (for any site in Flood Zone 3b), or the Exception Test should be undertaken and passed as part of a site-specific FRA for the more vulnerable sites within Flood Zone 3a.

Development planning should always be aware of the requirement to not develop within 8 metres of any watercourse, flood defence structure or culvert, or within 16 metres on a tidal river which is likely to be a regulated flood risk activity under Schedule 25 of the Environmental Permitting (England and Wales) Regulations 2016. Site layout and design will have to take this into consideration for development proposals. The 8 metre buffer is recommended by the EA to allow ease of access to watercourses for maintenance works. Any site redesign, where Flood Zones 3b and 3a, are included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of suitable Sustainable Drainage Systems.

#### **6.5.4 Strategic Recommendation D – development could be allocated subject to FRA**

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

This recommends that development could be allocated due to low flood risk perceived from the EA flood maps, assuming a site-specific Flood Risk Assessment shows the site can be safe for its lifetime and it is demonstrated that the site is sequentially preferable. A site within Flood Zone 2 could still be rejected if the conclusions of the Flood Risk Assessment decide development is unsafe or inappropriate.

Strategic Recommendation D applies to sites where one or more of the following criteria is true:

- Any site within Flood Zone 2 that does not have any part of its footprint within Flood Zone 3a, with the exception of highly vulnerable development which would be subject to, and have to pass, the Exception Test.
- Less vulnerable and water compatible sites within Flood Zone 3a. No part of the site can be within Flood Zone 3b.
- Less vulnerable sites which are 100% within Flood Zone 1 where surface water flood risk is apparent but not considered significant.
- Any site which is 100% within Flood Zone 1 that is greater than or equal to 1 hectare in area.

Strategic Recommendation D applies to 67 assessed sites, 24 of which are Penrith Strategic Masterplan sites. 66 of the sites are 100% within Flood Zone 1 with the remaining site LBR2 having almost 95% within Flood Zone 1. The surface water risk at these sites will be nominal although will still require appropriate assessment through an FRA. Each site-specific Flood Risk Assessment should investigate the risk and mitigate accordingly, including consideration of plans for site access and egress during a possible flood event.

#### **6.5.5 Strategic Recommendation E – development could be allocated on flood risk grounds subject to consultation with the LPA / LLFA**

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

This recommends that development could be allocated on flood risk grounds, based on the evidence provided within this SFRA. Further investigation (i.e. Flood Risk Assessment) may be required by the developer at planning application stage if any further or new information becomes available since the publication of this SFRA. Recommendation E applies to 12 sites, none of which are sites for the Penrith Strategic Masterplan.

Strategic Recommendation E applies to any site with 100% of its area within Flood Zone 1 and not within any surface water flood zone.

#### **6.5.6 Assessment of climate change**

Modelled flood outlines for fluvial climate change were not available within the Environment Agency's river models provided for this SFRA. A Level 2 SFRA should look to model climate change using the appropriate allowances available at the time (see Section 6-13-1 for information on the allowances). **A site-specific Flood Risk Assessment may be required to model the effects of climate change in the absence of a Level 2 SFRA or any further detailed assessment.**

In the absence of any modelled climate change information, a precautionary approach to assessing future flood risk is therefore adopted for this SFRA. The assumption being that the extent of the current day Flood Zone 3a may become larger and similar in extent to the present day Flood Zone 2 in the 2080s or longer term. This is within the 100-year assumed

lifetime for residential development specified in the Flood Risk and Coastal Change Planning Practice Guidance.

This precautionary approach to estimating the effects of climate change is considered to be the most pragmatic methodology available and is also consistent with other SFRA and professional modelling experience. It is also important to consider that the sites that are partially within Flood Zone 3a and are also additionally at risk from Flood Zone 2 may have larger areas at risk from Flood Zone 3a in the future. For example, a site that may have 10% of its area currently within Flood Zone 3a and a further 60% within Flood Zone 2, may have 70% of its area within Flood Zone 3a in the longer term. This would impact on the more vulnerable sites in particular with potentially further, more detailed mitigation techniques required to satisfy the second part of the Exception Test. Predicting the future expansion of the functional floodplain would be more difficult due to the differing criteria used to define the functional floodplain outline.

It should however be noted that changes in flood zone extents in well-defined floodplains will be more negligible compared to very flat floodplains. However, changes in flood depth within the more well-defined floodplains will be greater. The expected increase in flood extents and depths as a result of climate change will have implications for the type of development that is considered appropriate according to its vulnerability. Flood risk to areas around estuaries may be more difficult to predict using this precautionary approach as estuarine flooding can result from the combined effects of high peak river flows and high tidal surges.

The same approach should also be applied to the surface water flood zones whereby the 1 in 100 AEP event outline (currently medium risk outline) may increase in the future to cover the extent of the 1 in 1000 AEP event outline (currently the low risk outline).

The Sites Assessment spreadsheet (Appendix B) alongside the SFRA mapping (Appendix A) should be consulted to ascertain which sites may be at increased risk in the future based on this approach.

**A more detailed assessment of the impacts of climate change on flooding from the land and rivers should be carried out as part of any Level 2 SFRA before allocation or Flood Risk Assessment after allocation carried out by a developer. This should be carried out using the EA's latest allowances which will provide an appropriately robust response to the uncertainty about climate change impacts on rainfall intensities and river flows.**

## **6.6 Summary of site assessment outcomes and sequential testing process**

There are several consequential development considerations which could come out of the site assessment sequential testing process. Each outcome is discussed below. The Local Planning Authority should refer to Section 6.4 of this report, and Appendix B, for details on the site assessments carried out for this SFRA.

### **6.6.1 Rejection of site**

A site which fails to pass the Sequential Test and / or the Exception Test should be rejected, and development should not be permitted or allocated. Rejection would also apply to any more (residential, mixed use inclusive of residential) or less vulnerable (employment) sites within Flood Zone 3b where development should not be permitted or allocated. The Flood

Risk and Coastal Change Planning Practice Guidance flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test and clearly demonstrate that it does not increase or exacerbate flood risk elsewhere. If the developer is able to avoid Flood Zone 3b, part of the site could still be delivered. However, depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from Flood Zone 3b to a lower risk zone, or to incorporate the risk into the site via a blue/green corridor, then development should not be permitted.

In terms of surface water flood risk, if risk is considered significant, based on AEP or development vulnerability, or where the size of the site does not allow for on-site storage or application of appropriate SuDS then such sites could be rejected.

### **6.6.2 Exception Test required**

Applies to those sites that, according to the Flood Risk and Coastal Change Planning Practice Guidance vulnerability tables, would require the Exception Test. Only water-compatible and less vulnerable uses of land would not require the Exception Test in Flood Zone 3a. More vulnerable uses, including residential, and essential infrastructure are only permitted if the Exception Test is passed and all development proposals in Flood Zone 3a must be accompanied by a Flood Risk Assessment. To ensure the Exception Test can be passed, the developer / Local Planning Authority should attempt to avoid the risk area altogether by altering the site boundary.

### **6.6.3 Consideration of site layout and design**

Site layout and site design is important at the site planning stage where flood risk exists. The site area would have to be large enough to enable any alteration of the developable area of the site to remove development from the risk area, or to leave space for on-site storage of flood water. Surface water risk and opportunities for Sustainable Drainage Systems should also be assessed during the planning stage.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from Flood Zone 3b to a lower risk zone then development should not be allocated or permitted. If it is not possible to adjust the developable area of a site to remove the indicative development from Flood Zone 3a to a lower risk zone or to incorporate the on-site storage of water within site design, then the Exception Test would have to be passed as part of a site-specific Flood Risk Assessment. Highly vulnerable sites would be rejected.

Any development within 8 metres of any flood defence structure or culvert on a Main River is likely to be regulated flood risk activity under Schedule 25 of the Environment Permitting (England and Wales) Regulations 2016. Any site redesign, where Flood Zone 3a is included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of appropriate Sustainable Drainage Systems techniques. Similarly, any change or alteration to an ordinary watercourse within the site would need consent from the Lead Local Flood Authority under the Land Drainage Act 1991<sup>40</sup>.

40 <https://www.legislation.gov.uk/ukpga/1991/59/contents>



#### 6.6.4 Site-Specific Flood Risk Assessment

A site-specific Flood Risk Assessment should assess whether an indicative development is likely to be affected by current or future flooding (including effects of climate change) from any source. This should include referencing this SFRA to establish sources of flooding. Further analysis should be performed to improve understanding of flood risk including agreement with the Local Planning Authority and Lead Local Flood Authority on areas of functional floodplain that have not been specified within this SFRA.

According to the Flood Risk and Coastal Change Planning Practice Guidance (Para 030), a site-specific Flood Risk Assessment is:

*“...carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 50 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development’s lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability of Flood Risk and Coastal Change Planning Practice Guidance).”*

**The objectives of a site-specific Flood Risk Assessment are to establish:**

- Whether the development will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate;
- The evidence for the local planning authority to apply (if necessary) the Sequential Test;
- Whether the development will be safe for its lifetime and pass the Exception Test, if applicable; and
- That an appropriate Emergency Plan is in place that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood. (Para 030)

## **When is a Site-Specific Flood Risk Assessment Required?**

According to the National Planning Policy Framework (2019) footnote 50, a site-specific Flood Risk Assessment should be prepared when the application site is:

- Situated in Flood Zone 2 and 3; for all proposals for new development (including minor development and change of use);
- 1 hectare or greater in size and located in Flood Zone 1;
- Located in Flood Zone 1 on land which has been identified by the EA as having critical drainage problems (i.e. within an Area with Critical Drainage Problems);
- Land identified in the SFRA as being at increased flood risk in future (i.e. based on Risk of Flooding from Surface Water mapping; sites within Flood Zone 2 that may be within Flood Zone 3 in the longer term (in the absence of modelled climate change outputs));
- At risk of flooding from other sources of flooding, such as those identified in this SFRA; or
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding.

The Local Planning Authority may also like to consider further options for stipulating Flood Risk Assessment requirements, such as:

- Situated in an area currently benefitting from defences;
- At residual risk from reservoirs or canals;
- Within a council designated Critical Drainage Area (if applicable);
- Situated over a culverted watercourse or where development will require controlling the flow of any river or stream or the development could potentially change structures known to influence flood flow; or
- Situated within 20 metres of a Main River.

These further options should be considered during the preparation and development of the Local Plan.

Paragraph 031 of the Flood Risk and Coastal Change Planning Practice Guidance contains information regarding the level of detail required in that Flood Risk Assessments should always be proportionate to the degree of flood risk whilst making use of existing information, including this SFRA. Paragraph 068 of the FRCC-PPG contains an easy to follow FRA checklist for developers to follow.

Together with the information in the FRCC-PPG, there is further detail and support provided for the Local Planning Authority and developers via the EA's standing advice for developers:

<https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>

and also for Local Planning Authorities:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

also, EA guidance for Flood Risk Assessments for planning applications:

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

Section 6.12 of this report provides further guidance on Flood Risk Assessments for developers.

### **6.6.5 Sites passing the Sequential and Exception Tests**

Development sites can be allocated or granted planning permission where the Sequential Test and the Exception Test (if required) are passed. In addition, a site is likely to be allocated without the need to assess flood risk where the indicative use is for open space. Assuming the site is not to include any development and is to be left open then the allocation is likely to be acceptable from a flood risk point of view. However, for sites where there is potential for flood storage, options should be explored as part of a Flood Risk Assessment.

In terms of opportunities for reducing flood risk overall as a requirement of the Exception Test, the Flood Risk and Coastal Change Planning Practice Guidance states:

*“Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally.” (Paragraph 50).*

### **6.6.6 Surface water risk to assessed sites**

For sites at surface water flood risk the following should be considered:

- Possible withdrawal, redesign or relocation for those sites considered to be at significant risk;
- A detailed site-specific Flood Risk Assessment incorporating surface water flood risk management;
- A Flood Risk Assessment may want to consider detailed surface water modelling, particularly for the larger sites which may influence sites elsewhere;

- Ensuring future maintenance of surface water and sustainable drainage assets through s106 agreements;
- The size of development and the possibility of increased surface water flood risk caused by development on current Greenfield land (where applicable), and cumulative impacts of this within specific areas;
- Management and re-use of surface water on-site, assuming the site is large enough to facilitate this and achieve effective mitigation. Effective surface water management should ensure risks on and off site are controlled;
- Larger sites could leave surface water flood-prone areas as open greenspace, incorporating social and environmental benefits;
- Sustainable Drainage Systems should be used where possible. Appropriate Sustainable Drainage Systems may offer opportunities to control runoff to Greenfield rates or better. Restrictions on surface water runoff from new development should be incorporated into the development planning stage. For brownfield sites, where current infrastructure may be staying in place, then runoff should attempt to mimic that of Greenfield rates, unless it can be demonstrated that this is unachievable or hydraulically impractical. Developers should refer to the national 'non-statutory technical standards for sustainable drainage systems'<sup>41</sup> and other guidance documents cited in Section 4 of this report;
- Runoff up to and including the 1 in 100 AEP event (1%) should be managed on site where possible;
- Measures of source control should be required for development sites;
- Developers should be required to set part of their site aside for surface water management, to contribute to flood risk management in the wider area and supplement green infrastructure networks;
- Developers should be required to maximise permeable surfaces;
- Flow routes on new development where the sewerage/drainage system surcharges as a consequence of exceedance of the 1 in 30 AEP design event should be retained; and
- Whether the delineation of Critical Drainage Areas may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the Lead Local Flood Authority and United Utilities would be required. It may then be beneficial to carry out a local Surface Water Management Plan or drainage strategy for targeted locations with any such critical drainage problems. Investigation into the capacity of existing sewer systems would be required in order to identify critical parts of the system i.e. pinch points. Drainage model outputs could be obtained from United Utilities to confirm the critical parts of the drainage network and subsequent recommendations could then be made for future development i.e. strategic Sustainable Drainage Systems sites, parts of the drainage system where any new

41 <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>

connections should be avoided, and parts of the system that may have additional capacity and recommended runoff rates.

## 6.7 Site-specific constraints to development

It is important to note that each individual site will require further investigation before development is allocated or permitted, as local circumstances may dictate the outcome of any strategic recommendation made in this SFRA. Such local circumstances may entail the following:

- Flood depths and hazards will differ locally to each at risk site therefore modelled depth, hazard and velocity data should be assessed for the relevant flood events, including climate change (using the EA's latest allowances), as part of a site-specific Flood Risk Assessment or Level 2 SFRA.
- Current surface water drainage infrastructure and applicability of Sustainable Drainage Systems techniques are likely to differ at each site considered to be at risk from surface water flooding. Further investigation would therefore be required for any site at surface water flood risk. All planning applications for new development should be accompanied by an appropriate drainage strategy, independent of the requirement for a site-specific Flood Risk Assessment.
- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finished flood levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been granted and has not expired.
- It may be possible at some sites to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water?
- Surrounding infrastructure may influence the scope for layout redesign / removal of site footprints from risk.
- Safe access and egress routes must exist at all times during a flood event for emergency response and evacuation.
- Current land use. For brownfield sites existing development structures should be taken into account as redevelopment within existing development footprints may not lead to increased flood risk.
- Existing planning permissions may exist on some sites where the EA may have already passed comment and/or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations/Flood Risk Assessments may already have been carried out at some sites. The developer should consult the Local Planning Authority in this regard.
- Cumulative effects. New development may result in increased risk to other potential or existing sites. This should be assessed through a Level 2 SFRA/site specific Flood Risk Assessment or drainage strategy, if required.

## 6.8 Sustainability Appraisal and flood risk

The Sustainability Appraisal 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 6-1.

By avoiding sites identified in this SFRA as being at significant risk, such as those listed in Section 5.6.2 or by considering how changes in site layout can avoid those parts of a site at flood risk, such as any site included within Recommendation C (Section 6.5.3), 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 Sustainable Drainage Systems techniques (see Section 6.15).

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

Once the Local Planning Authority has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a site-specific Flood Risk Assessment, 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.

## 6.9 Safeguarded land for flood storage

Where possible, the Local Planning Authority may look to allocate land designed for flood storage functions. Such land can be explored through the site allocation process whereby an assessment is made, using this SFRA, 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 157 of the revised National Planning Policy Framework 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'*

A strategic assessment has been made of the assessed sites and their applicability for flood storage. Applicable sites 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 is 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 any existing buildings and conversion to greenspace.

By using the sequential approach to site layout, the Local Planning Authority and developers should be able to avoid the areas at risk and leave clear for potential flood storage. To spatially assess the areas of the sites at risk, see the SFRA Mapping in Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).

## 6.10 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 0 for information on Natural Flood Management and Working with Natural Processes).

## 6.11 Cumulative impacts

The National Planning Policy Framework (2019) 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 156)*

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.

This SFRA considers cumulative impacts of new development through much of the generic advice provided on mitigation throughout Section 0 of this report. Consideration is given to the following:

- The importance of phasing development, as discussed in Section 6.10;
- Cross boundary impacts i.e. there should be dialogue between Eden District Council and neighbouring authorities upstream and downstream of the district, particularly Carlisle which receives the River Eden from the Eden District. Decisions on flood risk management practices and development in Eden should involve discussion with Carlisle Local Planning Authority and the Lead Local Flood Authority, given the possible downstream impacts of development on flood risk;
- Leaving space for floodwater, utilising greenspace for flood storage and slowing the flow; and
- Sustainable Drainage Systems and containment of surface water on-site as opposed to directing elsewhere (see Section 6.6)

## **6.12 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 Flood Risk Assessment. Before carrying out a Flood Risk Assessment, developers should check with the Local Planning Authority whether the Sequential Test has been carried out. If not, the developer must apply the Sequential Test as part of their Flood Risk Assessment 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 via:

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



When initially considering the development options for a site, developers should use this SFRA, the National Planning Policy Framework and the Flood Risk and Coastal Change Planning Practice Guidance to:

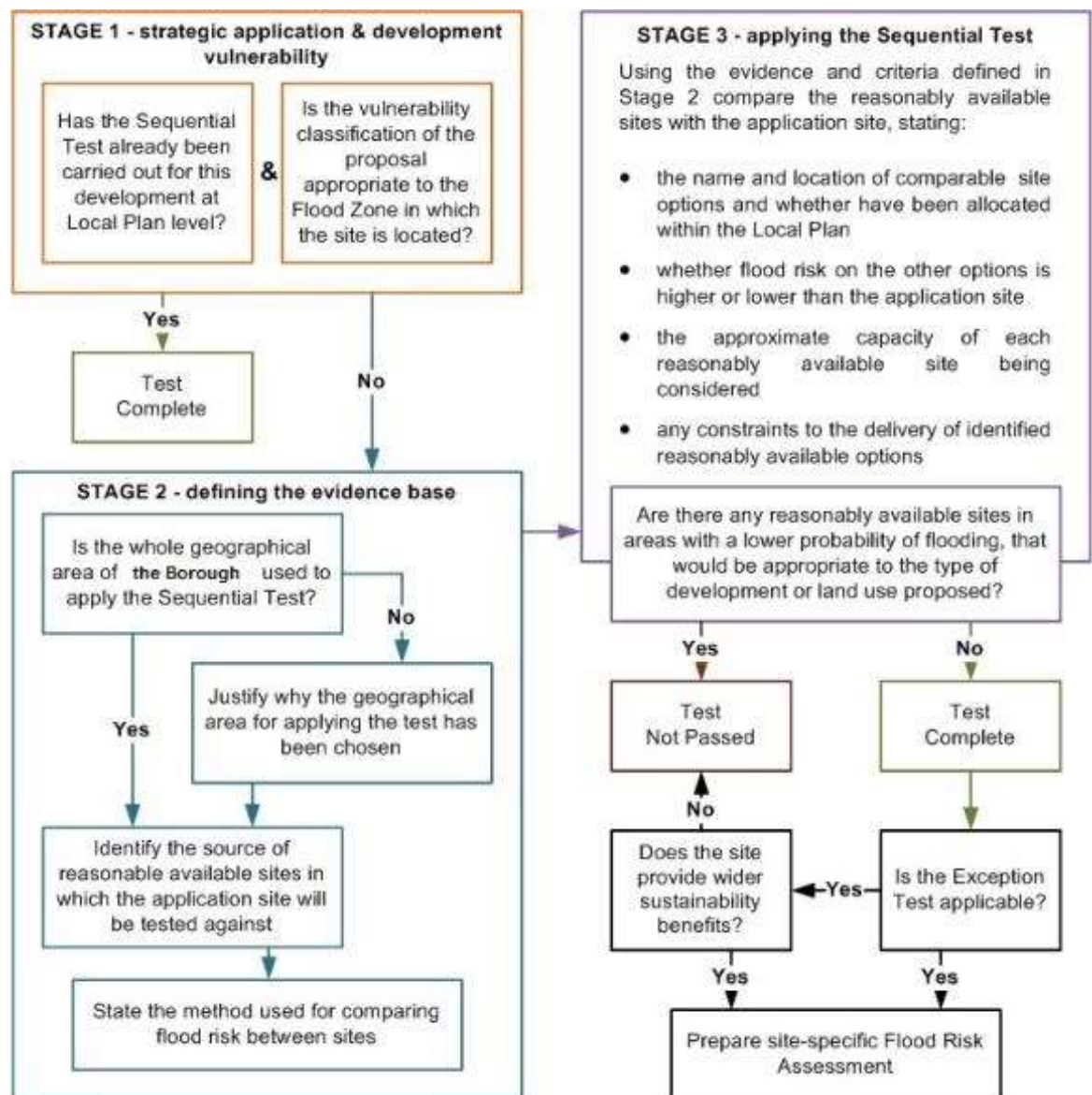
- **Identify whether the site is:**
  - A windfall development, allocated development, within a regeneration area, single property or subject to a change of use to identify if the Sequential and Exception Tests are required.
- **Check whether the Sequential Test and / or the Exception Test have already been applied.**
  - Request information from the Local Planning Authority on whether the Sequential Test, or the likelihood of the site passing the Exception Test, have been assessed;
  - If not, provide evidence to the Local Planning Authority that the site passes the Sequential Test and will pass the Exception Test.
- **Consult with the Local Planning Authority, the Lead Local Flood Authority and the EA and the wider group of flood risk consultees, where appropriate, to scope an appropriate Flood Risk Assessment if required.**
  - Guidance on Flood Risk Assessments provided in Section 4.8 of this SFRA;
  - Also, refer to the EA Standing Advice, the NPPF and the FRCC-PPG;
  - Consult the LLFA.
- **Submit Flood Risk Assessment to the Local Planning Authority and the EA for approval, where necessary**

Table 6-9 below 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 tests if required.

<b>Development</b>	<b>Sequential Test Required?</b>	<b>Who Applies the Sequential Test?</b>	<b>Exception Test Required?</b>	<b>Who Applies the Exception Test?</b>
Allocated Sites	No (assuming the development type is the same as that submitted via the allocations process)	Local Planning Authorities should have already carried out the test during the allocation of development sites	Dependent on land use vulnerability	Local Planning Authority 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 Flood Risk Assessment.
Windfall Sites	Yes	Developer provides evidence, to the Local Planning Authority 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 Flood Risk Assessment
Regeneration Sites Identified Within Local Plan	No	-	Dependent on land use vulnerability	Local Planning Authority 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 Flood Risk Assessment

<b>Development</b>	<b>Sequential Test Required?</b>	<b>Who Applies the Sequential Test?</b>	<b>Exception Test Required?</b>	<b>Who Applies the Exception Test?</b>
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 Flood Risk Assessment
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 Local Planning Authority 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 Flood Risk Assessment

**Table 6-9: Development types and application of Sequential and Exception Tests for developers**



**Figure 6-3: Development management Sequential Test process**

Figure 6-3 shows what developers should do with regards to applying the Sequential Test if the Local Planning Authority 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 Flood Risk and Coastal Change Planning Practice Guidance).

**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 should 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 Local Planning Authority 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 Flood Risk and Coastal Change Planning Practice Guidance.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific Flood Risk Assessment has not already been carried out, a site-specific FRA should be completed in line with the National Planning Policy Framework 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, Local Planning Authorities 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 the vulnerability of units located in higher risk parts of the site.

Eden District Council should have adopted this approach for the Penrith Strategic Masterplan.

The Northwest Regional Flood and Coastal Committee have developed a proforma and associated guidance to assist developers to consider and provide appropriate information that should be submitted in line with planning applications. The information is available at:

<https://thefloodhub.co.uk/planning-development/#section-4>

### **6.13 Planning for climate change (NPPF, 2019)**

In relation to flood risk and climate change in the planning system, the revised National Planning Policy Framework 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 157).*

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.

### **6.13.1 EA climate change allowances**

The EA revised the climate change allowances in 2016, for use in Flood Risk Assessments and SFRA's and will, at the time of writing, use these revised allowances when providing advice:

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

The revised climate change allowances are predictions of anticipated change for:

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

RBD	Allowance Category	Total Potential Change Anticipated for...		
		2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Solway Tweed	Upper end	+20%	+30%	+60%
	Higher central	+15%	+25%	+30%
	Central	+10%	+20%	+25%
Northumbria	Upper end	+20%	+30%	+50%
	Higher central	+15%	+20%	+25%
	Central	+10%	+15%	+20%
North West	Upper end	+20%	+35%	+70%
	Higher central	+20%	+30%	+35%
	Central	+15%	+25%	+30%

**Table 6-10 Recommended peak river flow allowances per RBD**

Deciding on which of the peak river flow allowances to use is based on the flood zone the development is within and the associated vulnerability classification (see Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance).

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

**Table 6-11 Peak rainfall intensity allowances in small and urban catchments for England**

Climate change allowances for river flows are based on which River Basin District the river is located within. As discussed, Eden District Council is within the Solway Tweed, Northumbria and North West RBDs with the majority being within the Solway Tweed RBD. The peak rainfall intensity allowance applies to the whole of England. SFRA and Flood Risk Assessments should assess both the central and upper end allowances to gauge the range of impacts.

The EA will also require consideration, if appropriate, of the 'high++ allowances' for peak river flows and mean sea level rise (although sea level rise does not apply to Eden District Council) where a development is considered to be very sensitive to flood risk and with lifetimes beyond the end of the century. This could include infrastructure projects or developments that significantly change existing settlement patterns. The high++ allowances can be found in the EA's *Adapting to Climate Change: Advice for Flood and Coastal Erosion*

*Risk Management Authorities*<sup>42</sup>, which uses science from UKCP09. This guidance is based on Government's policy for climate change adaptation and is specifically intended for projects or strategies seeking Government FDGiA funding. However, Risk Management Authorities in England may also find it useful in developing plans and making FCERM investment decisions even if there is no intention of applying for central government funding. This is important for any future large-scale infrastructure used to support the delivery of strategic sites such as flood defence schemes.

Although, it is anticipated that increases in river flows will lie somewhere within the range of the central to upper end estimates of the February 2016 allowances, more extreme change cannot be discounted. The high++ allowances can be used to represent more severe climate change impacts and help to identify the options that would be required.

### 6.13.2 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 terms of applying climate change to SFRA and FRAs, the EA's February 2016 allowances are, at the time of writing, still the best representation of how climate change is likely to affect flood risk for peak river flows and peak rainfall intensities. The guidance has been changed on how to apply peak river flow allowances so that the approach is the same for both flood zones 2 and 3.

**As discussed, modelled climate change outputs, using the February 2016 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, could involve the modelling of appropriate climate change events, where fully functioning EA hydraulic models are available.**

### 6.14 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, Community and Local Government (MHCLG)) announced, in December 2014, that the local planning authority, in consultation with the Lead Local Flood Authority, should be responsible for delivering SuDS<sup>43</sup> 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

<sup>42</sup> Environment Agency Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities

<sup>43</sup> <http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/>



systems<sup>44</sup>, published in March 2015. A Practice Guidance<sup>45</sup> document has also been developed by the Local Authority SuDS Officer Organisation (LASOO) to assist in the application of the non-statutory technical standards.

### **Cumbria County Council Sustainable Drainage<sup>46</sup>**

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 National Planning Policy Framework and its accompanying Planning Practice Guidance, applicants must demonstrate that priority has been given to the use of SuDS in their development proposals. Where priority use of SuDS cannot be achieved, applicants must justify this by submitting robust and acceptable evidence.

In November 2017, Cumbria County Council adopted its updated Development Design Guide which will now include guidance in relation to SuDS<sup>47</sup> as well as detailed guidance in relation to highways.

#### **6.14.1 SuDS and the revised National Planning Policy Framework, 2019**

The Revised NPPF (2019), para 165, 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".*

As since 2014, the NPPF still states only 'major' developments should incorporate SuDS. However, all developments, both major and minor, can include some kind of 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 to the site's opportunities and constraints. At a strategic level, this should mean identifying SuDS opportunities according to geology, soil type, topography, groundwater / mine water conditions, their potential impact on site allocation, and setting out local SuDS guidance and opportunities for adoption and maintenance.

In terms of what kind of evidence would show SuDS to be inappropriate for a certain site, it is possible that clarity on what evidence is required may be subsequently set out in the

<sup>44</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415773/sustainable-drainage-technical-standards.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf)

<sup>45</sup> [http://www.susdrain.org/files/resources/other-guidance/lasoo\\_non\\_statutory\\_suds\\_technical\\_standards\\_guidance\\_2016\\_.pdf](http://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf)

<sup>46</sup> <https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/43115144751.pdf>

<sup>47</sup> <https://www.cumbria.gov.uk/eLibrary/Content/Internet/544/3887/43115151648.pdf>

revised Flood Risk and Coastal Change Planning Practice Guidance, and that these circumstances would be exceptional.

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 sustainable drainage systems must be maintained.

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.

### **6.14.2 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:

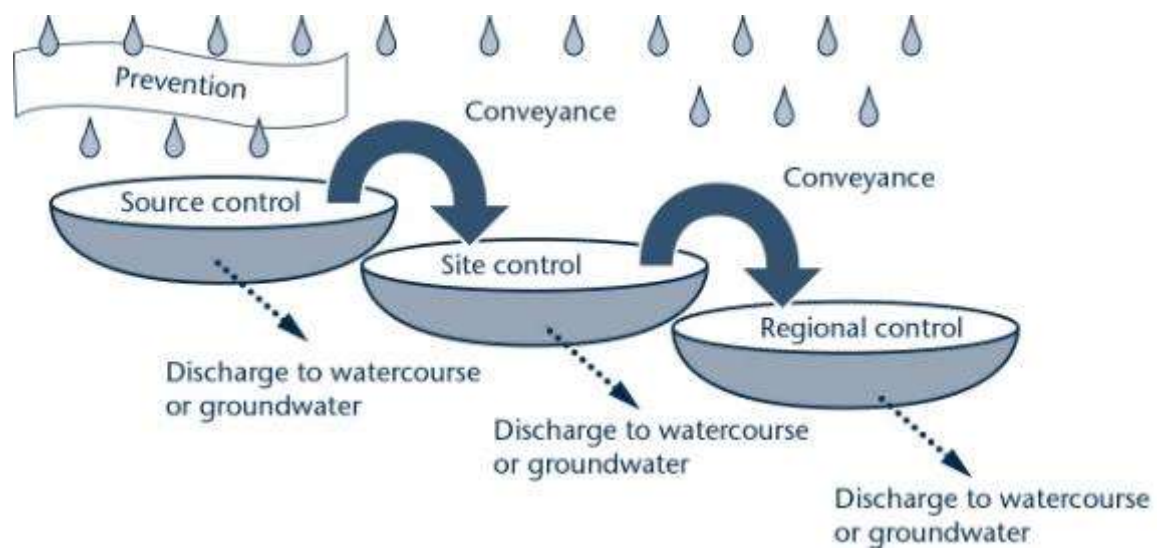
1. To ground;
2. To surface waterbody;
3. To surface water sewer;
4. To combined sewer.

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 Lead Local Flood Authority, Environment Agency and United Utilities as appropriate.

The non-statutory technical standards for sustainable drainage systems (March 2015) sets 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 following), will be required, where source control is the primary aim.



**Figure 6-4: SuDS management train principle<sup>48</sup>**

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 Flood Risk Assessment. 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 Local Planning Authority 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 areas. This could include improvements on Greenfield runoff rates. The LPA should always be contacted with regards to its local requirements at the earliest opportunity in development planning.

The CIRIA SuDS Manual<sup>49</sup> 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.

## 6.15 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

<sup>48</sup> CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative

<sup>49</sup> [https://www.ciria.org/Memberships/The\\_SuDs\\_Manual\\_C753\\_Chapters.aspx](https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx)

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.**

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.

### **6.15.1 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.

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 Flood Risk Assessment, the likely extents, depths and associated hazards of surface water flooding on a development site, as shown by the RoFSW dataset. This is considered to be an appropriate approach to reduce the risk of flooding to new developments. Green/blue infrastructure should be used wherever possible to accommodate such flow paths. **Floor levels should always be set a minimum of 300 mm above the design flood level** to reduce the consequences of any localised flooding.

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 on-site 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.

## **6.16 Property Flood Resilience (PFR)**

The National Planning Policy Framework (2019) states that, where development must be located in an area of flood risk, following application and passing of the Sequential and Exception Tests (if applicable), the development must be appropriately flood resistant and resilient (para 163b).

Flood resilience and resistance measures are 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 Department for Communities and Local Government (DCLG) (now Ministry of Housing, Community and Local Government (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, 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 will help manage residual flood risks not addressed by resistance measures alone such as rising groundwater.

### **6.16.1 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.

### **6.16.2 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 (eg 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 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<sup>50</sup>. 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<sup>51</sup> (September 2019).

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 0 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)<sup>52</sup>, the Lead Local Flood Authority and Local Planning Authorities 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;

<sup>50</sup> <https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england>

<sup>51</sup> <https://www.adeptnet.org.uk/floodriskemergencyplan>

<sup>52</sup> <https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act>

- 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;
- 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<sup>53</sup>**

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 including 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

<sup>53</sup> <https://www.cumbria.gov.uk/emergencyplanning/supportingpages/crr.asp>



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<sup>54</sup>. Cumbria County Council have created an emergency management plan on how to protect the community, which offers a range of advice before, during and after an emergency, which is 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 Local Planning Authority 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, 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>

<sup>54</sup> <https://www.gov.uk/guidance/resilience-in-society-infrastructure-communities-and-businesses#community-resilience>

## 7.2 Flood warning and evacuation plans

Developments that include areas that are designed to flood (eg 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 Local Planning Authority to determine whether the flood warning and evacuation plans, or equivalent procedures, are sufficient or not. If the Local Planning Authority 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, Local Planning Authorities 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 Local Planning Authority between emergency planners and policy planners / development management officers, the Lead Local Flood Authority, drainage engineers and also to external stakeholders such as the emergency services, the EA, United Utilities and Canal and River Trust (if applicable).

It may be useful for both the Lead Local Flood Authority 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. The Local Resilience Forum is 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 Local Planning Authority and Lead Local Flood Authority regarding maintenance and updating of the plan.

At the time of writing there are 12 EA Flood Warning Areas within the Eden District Council region located along the Rivers Eden and Eamont, as shown on the SFRA mapping Appendix A - this is only available online on our [Interactive Eden Strategic Flood Risk Assessment map](#).

### 7.2.1 What should the evacuation plan include?

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

<b>Consideration</b>	<b>Purpose</b>
Availability of existing flood warning system	The Environment Agency 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	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 Flood Risk and Coastal Change Planning Practice Guidance. This is closely linked to its occupiers.
How easily damaged items will be relocated, and the expected time taken to re-establish normal use following a flood event	The impact of flooding can be long lasting well after the event has taken place affecting both the property 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 monitor river levels within the main rivers affecting the authority area and based upon weather predictions provided by The Met Office, making 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 defined FWA, encouraging residents to take action to avoid damage to property in the first instance.

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

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

Live information on flood warning and flood alerts 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 Conclusions and recommendations**

### **8.1 Conclusions**

This SFRA provides a single repository planning tool relating to flood risk and development in the district of Eden. Key flood risk stakeholders namely the Environment Agency, Local Planning Authority, Lead Local Flood Authority and United Utilities were consulted to collate all available and relevant flood risk information on all sources into one comprehensive assessment. Together with this report, this SFRA also provides a suite of interactive GeoPDF flood risk mapping (Appendix A) and a development site assessment spreadsheet (Appendix B) illustrating the level of risk to current sites allocated through the Penrith Strategic Masterplan and potential development sites for allocation through Eden's Local Plan.

The flood risk information, assessment, guidance and recommendations of the 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, detailed 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 this 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. Once new, updated or further information becomes available, the Local Planning Authority 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 Local Planning Authority and / or the Lead Local Flood Authority can decide when to update the SFRA, and the Environment Agency as a statutory consultee can also advise on when an update is required.**

## **8.2 Planning policy and 8 flood risk recommendations**

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

### **Recommendation 1: No development within Flood Zone 3b...**

...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 Flood Zone 3b nor should it reduce the volume available for the storage of floodwater. Sites within Flood Zone 3b may still be developable if the site boundary can be removed from the floodplain or the site can accommodate the risk on site and keep the area free from development.

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

### **Recommendation 2: 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 and Lead Local Flood Authority must always be consulted during this process, as should United Utilities and the EA, if required.

### **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 Local Planning Authority, Lead Local Flood Authority, EA and United Utilities.

#### **Recommendation 4: Requirement for a site-specific Flood Risk Assessment...**

...from a developer when a site is:

- 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 Local Planning Authority, Lead Local Flood Authority and United Utilities. The Flood Risk Assessment should be submitted to and be approved by the Local Planning Authority including suitable consultation with the Lead Local Flood Authority and the EA and any other applicable parties.

#### **Recommendation 5: Use of appropriately sourced SuDS...**

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

As per the NPPF (2019), in terms of Sustainable Drainage Systems, development in areas at flood risk should only be permitted where Sustainable Drainage Systems are

incorporated into the design, unless clear evidence suggests demonstrates this would be inappropriate.

Sustainable Drainage Systems 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 Sustainable Drainage Systems within the development.

The Local Planning Authority, Lead Local Flood Authority, and 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 Sustainable Drainage Systems must be designed to meet industry standards, as specified below, including any replacement standards/documents which update or are in addition to those listed:

- Cumbria Development Design Guide (Cumbria County Council)
- Interim national standards published in March 2015
- Technical Standards for Sustainable Drainage Systems (Defra)
- C753 The SuDS Manual
- Sewers for Adoption 8

### **Recommendation 6: Natural Flood Management techniques...**

...must be considered, to aid with flood alleviation and implementation of suitable Sustainable Drainage Systems, 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.

### **Recommendation 7: Phasing of development...**

...must be considered 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.

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

### **Recommendation 8: 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.
- 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.
- Appropriate Sustainable Drainage Systems techniques have been considered and are to be incorporated into the design of the site, where applicable.
- 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 Sustainability Appraisal, Local Flood Risk Management Strategy and Flood Risk Management Plan, 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 below that may be of benefit to the Local Planning Authority, in developing their flood risk evidence base to support the delivery of their Local Plan or in the forthcoming review of the Local Plan, or to the Lead Local Flood Authority to help fill critical gaps in flood risk information.

Type	Study	Reason	Timeframe
Understanding of local flood risk	Level 1 SFRA update	As and when potential development sites become available, flood risk information or policy becomes available.	As required
	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 <sup>2</sup> 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
	<b>Level 2 SFRA</b>	<b>Further, more detailed assessment of flood risk to high risk sites, as notified by this Level 1 SFRA. Dependant on the availability of EA river model data.</b>	<b>Short term</b>
	Preliminary site screening FRAs / outline drainage strategy	Further, more detailed assessment of larger strategic sites.	Short term
	Local Flood Risk Management Strategy Review	It is recommended that the LFRMS is updated in 2020 to ensure it remains consistent with the National Flood and Coastal Erosion Risk Management Strategy that, at the time of writing, is currently being revised.	Short term

Type	Study	Reason	Timeframe
	Surface Water Management Plan / drainage strategy	The SWMP for Cumbria County Council was developed in 2010 and due to the changes in policy and legislation, requires an update. It is recommended that the Lead Local Flood Authority uses information from this SFRA to ascertain whether certain locations at high surface water flood risk may benefit from an update to the SWMP.	Short term
	Water Cycle Study (WCS)	Cumbria County Council has not developed a WCS for the district, nor for any areas or communities within Eden. If the Local Plan highlights large growth and urban expansion ie in Penrith, the Lead Local Flood Authority 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 (and FRAs)	Modelling of climate change, using EA's most up-to-date 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 approach is the same for both flood zones 2 and 3.	Short term
	Possible Critical Drainage Area (CDA) delineation	Whether the delineation of CDAs may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the Lead Local Flood Authority and United Utilities would be required. It may then be beneficial to carry out a local Surface Water Management Plan or drainage strategy for targeted locations with any such critical drainage problems.	Long term
Flood storage and attenuation	Community Infrastructure Levy (CIL) / Working with Natural Processes	For new developments, Green Infrastructure (GI) assets can be secured from a landowner's 'land value uplift' and as part of development agreements. The Local Planning Authority could include capital for the purchase, design, planning and maintenance of GI within its CIL programme. Further assess Working with Natural Processes options in upper catchments to gauge possible areas for Natural Flood Management.	Short term

Type	Study	Reason	Timeframe
	Natural Flood Management	Promote creation of floodplain and riparian woodland, floodplain reconnection and runoff attenuation features where the research indicates that it would be beneficial in Eden.	Ongoing
Data collection	Flood Incident data	Cumbria County Council, as Lead Local Flood Authority, has a responsibility to investigate and record details of significant flood events within its 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
	Flood Risk Management Asset Register	Cumbria County Council has a responsibility to update and maintain a register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Risk Assessment	Asset Register Risk Assessment	Cumbria County Council, as Lead Local Flood Authority, should carry out a strategic flood risk assessment of structures and features on the Asset Register to inform capital programme and prioritise maintenance programme.	Short Term / Ongoing
Capacity	Sustainable Drainage Systems (SuDS) review / guidance	The Lead Local Flood Authority should clearly identify its requirements of developers for Sustainable Drainage Systems in new developments. Internal capacity, within Cumbria County Council should be in place to deal with SuDS applications, set local specification and set policy for adoption and future maintenance of SuDS.	In place
Partnership	United Utilities	The Local Planning Authority and Lead Local Flood Authority should continue to collaborate with United Utilities on sewer and surface water projects. The Local Planning Authority should be kept informed concerning 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

Type	Study	Reason	Timeframe
	Environment Agency	Eden District Council and Cumbria County Council 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
	Community	Continued involvement with the community through Cumbria County Council's existing flood risk partnerships.	Ongoing

**Table 8-1: Recommended further work for EDC 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 60 of this report, the SFRA mapping in Appendix A and the development site assessment spreadsheet in Appendix B. A Level 2 SFRA will be required if 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 Level 2 SFRA may also be required if the majority of sites are within Flood Zone 2 or are at significant risk of surface water flooding. Residual flood risk should also be taken account of when considering options for future work.

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 to others and will be safe for its lifetime, once developed, and the likelihood of passing the Exception Test, if required, as part of a FRA.

As discussed in Section 0, 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.

Ultimately, the LPA will need to provide evidence in respect of both their Eden Local Plan 2014/2032 and in the forthcoming Local Plan Review to show that housing numbers, economic needs and other sites can be delivered. Proposals within the Local Plan and the forthcoming Local Plan review 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 their SFRA.

## Appendices

### A SFRA mapping

The SFRA mapping consists of all flood risk information used within the SFRA. The SFRA mapping is only available online, on the website of Eden District Council using the following link - [Interactive Eden Strategic Flood Risk Assessment map](#). This is a public facing GIS mapping system which contains a series of categories available to the public including the SFRA (June 2020). Open the SFRA category, which will show 7 of the 17 available data layers. This basic data will be all most people require, but you can toggle off and on between data layers to enable you to focus in on your relevant search criteria. Please be aware that opening all the layers at once will make the search plan overly complex in some urban areas and very slow to operate.

Within the detailed GIS map you can search by postcode, use the zoom tools and the hand tool to zoom in/out and pan around the open detailed map which covers the Eden District Planning Authority area (excluding those areas of Eden covered by the Lake District National Park and the Yorkshire Dales National Park who have their own planning authority). In the legend on the left-hand side of the SFRA category list, data layers can be switched on and off when required by way of a tick box set against each layer. The site references labels can also be switched on and off if, for example, smaller sites are obscured by labels.

If you have problems accessing this information on the EDC Web site please contact the Eden Policy team directly at [loc.plan@eden.gov.uk](mailto:loc.plan@eden.gov.uk) or by telephone on 01768 817817.

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

Dataset	Description
<b>Areas Benefitting from Defences</b>	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 EDC). 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.
<b>Boundary</b>	A shapefile showing Eden District Council's administrative area.
<b>Detailed River Network</b>	Dataset from the Environment Agency symbolised to show the Main Rivers and Ordinary watercourses flowing through the EDC region.
<b>Flood Alert Areas</b>	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.

<b>Dataset</b>	<b>Description</b>
<b>Flood Storage Areas</b>	Areas that act as a balancing reservoir, storage basin or balancing pond. Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak. Note: it is assumed that flood storage areas act perfectly and give the same level of protection as when the assessment was carried out. They do not completely remove the chance of flooding and can be overtopped or fail in extreme weather conditions.
<b>Flood Warning Areas</b>	Geographical areas where we expect flooding to occur and where the Environment Agency provide a Flood Warning Service.
<b>Flood Zone 3b (functional floodplain)</b>	The functional floodplain was delineated as part of this 2019 SFRA (see Appendix C for methodology note) as it is not included in the Flood Map for Planning. This zone is for the use of LPAs and developers.
<b>Flood Zones 2 and 3</b>	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.
<b>Historic Flood Map</b>	Dataset from the Environment Agency showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater. It differs from the Recorded Flood Outlines dataset as the HFM only contains outlines that are 'considered and accepted'.
<b>JBA Groundwater Map</b>	The JBA 5m Groundwater map provides a general broad-scale assessment of the groundwater flood hazard and is categorised into grid code which is explained in Section 0 of the report.

<b>Dataset</b>	<b>Description</b>
<b>Main River buffer</b>	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.
<b>National Parks</b>	A shapefile showing the Lake District National Park and Yorkshire Dales National Park. This area is excluded due to the National Parks being separate with their own authority.
<b>Recorded Flood Outlines</b>	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.
<b>Risk of Flooding from Rivers and Sea (RoFRS)</b>	Dataset from the Environment Agency showing the chance of flooding from rivers and/or the sea, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition.
<b>Risk of Flooding from Surface Water (RoFSW)</b>	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 cannot be used at property level.
<b>Spatial Flood Defences</b>	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 EDC region.
<b>Working with Natural Processes</b>	There are 6 shapefiles located on the maps showing working with natural processes interventions that can be used across the district as more natural forms of flood management.

## **B Development site assessment spreadsheet**

Excel spreadsheet containing an assessment of flood risk to the sites based on Flood Zones 1, 2, 3a and 3b, as delineated through this SFRA, and also the Risk of Flooding from Surface Water dataset (RoFSW).

## **C Functional floodplain delineation**

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

## **D Strategic Recommendation sites maps**

Figures depicting the site allocations colour coded by strategic recommendation to easily identify those that can proceed through allocation and those recommended for removal or further investigation.

## **E Eden SFRA user guide**

A support document to provide guidance on the use of the SFRA to developers and planners.



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Wallingford  
Warrington

Registered Office  
1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0)1756 799919  
info@jbaconsulting.com  
www.jbaconsulting.com

Jeremy Benn Associates Limited

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