JBA consulting

Mid Devon Strategic Flood Risk Assessment

Final Report

October 2014

Mid Devon DISTRICT COUNCIL

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JBA Project Manager

Chris Smith
The Library
St Philip's Courtyard
Church End
COLESHILL
B46 3AD

Mid Devon District Council Project Manager

Poie-Yee Li
Mid Devon District Council
Phoenix House
Phoenix Lane
Tiverton
Devon
EX16 6PP

Revision History

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Final Report (version 1) October 2014	Amendments made to main report based on MDDC	• Poie-Yee Li (Mid Devon District Council)

Contract

This report describes work commissioned by Mid Devon District Council. Mid Devon District Council's representative for the contract was Poie-Yee Li. Andrew Waite and Claire Gardner of JBA Consulting carried out this work.

Prepared by ..... Andrew Waite BSc MRes
Assistant Analyst

Claire Gardner BSc MSc FRGS MCIWEM C.WEM
Chartered Senior Analyst

Reviewed by ..... David Kearney BSc MSc MCIWEM C.WEM
Principal Analyst

Purpose

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

Acknowledgements

We would like to acknowledge the assistance of Poie-Yee Li (Mid Devon District Council), Stephen Rosser (South West Water), Jessica Bott (Devon County Council) and Robin Leivers and Ian Hooper (Environment Agency).

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Executive Summary

Introduction

This updated version of the Mid Devon Strategic Flood Risk Assessment (SFRA) 2014 replaces the document "Mid Devon Strategic Flood Risk Assessment Final Report, June 2009". The updated report has been prepared to replace the work that was included in the previous SFRA and provide appropriate supporting evidence for the Mid Devon Local Plan.

Since the previous SFRA there have been a number of changes to the planning legislation and policy, including the Localism Act (2011) and the 2012 National Planning Policy Framework (NPPF) with accompanying Planning Practice Guidance (March 2014). In addition, the provisions of the Flood and Water Management Act (2010) have been substantially commenced under a programme that was initiated by Defra in April 2010 and the Flood Risk Regulations came into force in December 2009 (these regulations transposed the EU 'Floods Directive' into UK law).

The purpose of the SFRA is to

- provide information on the changes to planning, policy and guidance since the previous SFRA;
- provide an indicative assessment of the flood hazard within the Flood Zones;
- provide information on existing defences and flood risk management measures;
- allow a sequential approach to site allocation to be undertaken within a flood zone; and
- allow suggestions for the development of potential policies and practices that may be required to ensure that development in Flood Zones 2 and 3 satisfies the requirements of the Exception Test.

SFRA objectives

The Planning Practice Guidance advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

1. Level One: where flooding is not a major issue and where development pressures are low. The Assessment should be sufficiently detailed to allow application of the Sequential Test
2. Level Two: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the Assessment should consider the detailed nature of the flood characteristics within a flood zone.

The objectives of this SFRA update are a hybrid of level one and level two.

SFRA outputs

This SFRA delivers:

Level one outputs

- Maps showing the local planning authority area, Main Rivers, ordinary watercourses, and Flood Zones
- An assessment of the flood risk at potential development sites, including consideration of climate change implications
- Areas at risk from other sources of flooding, for example surface water or reservoir
- Flood risk management measures, including location and standard of flood defences, flood warning coverage and emergency plans
- Recommendations about the areas with possible existing drainage issues and the potential need for surface water management plans
- Identification of locations where additional development may significantly increase flood risk elsewhere (Environment Agency identified Critical Drainage Areas)
- Advice on the likely applicability of sustainable drainage systems for managing surface water runoff at key development sites
- Advice of the preparation of flood risk assessments for development sites

Level two outputs

- An appraisal of the current condition of flood defence infrastructure
- An appraisal of the probability and consequences of overtopping or failure of flood risk management infrastructure, including an allowance for climate change
- Definition and mapping of the functional floodplain
- Definition and mapping of (where available)
    - Flood depth
    - Flood velocity
    - Flood hazard
- Maps showing the distribution of flood risk across all Flood Zones from all sources of flooding
- Advice on potential policies for sites which could satisfy the first part of the Exception Test and on possible requirements that may be necessary for a site-specific flood risk assessment supporting a planning application to pass the second part of the Exception Test
- Advice on the preparation of site-specific flood risk assessments for sites of varying risk across the Flood Zones, including information about the use of sustainable drainage techniques
- Recommendations to inform policy, development control and technical issues

Summary

- The Mid Devon SFRA update has considered all sources of flooding, including fluvial, pluvial, groundwater, canal, reservoir and sewer flooding, within the Mid Devon District.
- An assessment of the flood defences in the District has been undertaken, including defence condition and standard and the residual risk.
- Flood risk has been assessed on all sites highlighted within the draft Local Plan, as well as an additional six sites identified during the Local Plan Options Consultation. Guidance for the requirements for a site specific Flood Risk Assessment for these sites is provided (Appendix A), as well as general guidance, throughout the SFRA, on flood risk assessment for any development proposals within the Mid Devon District.
- The updated Flood Map for Surface Water is provided, indicating the likelihood of surface water flooding in the Mid Devon District.
- Surface water flooding is a risk in many of the areas. Advice has been provided regarding suitable SuDS options.
- Green Infrastructure within the District has been assessed and the WFD status of the District's watercourses assessed.

Recommendations

- The report makes a number of recommendations for development control, in particular the requirements and considerations that should be given for development in different flood zones and taking account of all sources of flooding
- Recommendations have been made for the protection and enhancement of watercourses,
- Recommendations for further work have been made including further modelling to identify functional floodplain and understand the implications of climate change on flood risk, as well as provide more detailed depth, hazard and velocity information for Mid Devon. The need to consider residual risk for defence and canal breach has also been identified, where appropriate.

Use of SFRA data

It is important to recognise that the SFRA has been developed using the best available information at the time of writing. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated information is available prior to commencing a

detailed Flood Risk Assessment. New information on flood risk may be provided by Mid Devon District Council, Devon County Council (in its role as Lead Local Flood Authority), the Highways Authority, South West Water and the Environment Agency and should be considered at the planning application stage.

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Abbreviations and Glossary of Terms

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Cumecs	The cumec is a measure of flow rate. One cumec is shorthand for cubic metre per second; also m^3/s.
Defra	Department for Environment, Food and Rural Affairs
DEM	Digital Elevation Model
Designated Feature	A form of legal protection or status reserved for certain key structures or features that are privately owned and maintained, but which make a contribution to the flood or coastal erosion risk management of people and property at a particular location.
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
DPD	Development Plan Documents
DTM	Digital Terrain Model
EA	Environment Agency
EU	European Union
FEH	Flood Estimation Handbook
FMfSW	Flood Map for Surface Water
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river
FRA	Flood Risk Assessment - A site specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FZ	Flood Zones
GI	Green Infrastructure – a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and urban fringe
Ha	Hectare
Indicative Flood Risk Area	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.
JBA	Jeremy Benn Associates
LDDs	Local Development Documents

Term	Definition
LFRMS	Local Food Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
mAOD	metres Above Ordnance Datum
Mained River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
OS NGR	Ordnance Survey National Grid Reference
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
PPG	Planning Policy Guidance – superseded by the NPPF
PPS25	Planning and Policy Statement 25: Development and Flood Risk. This, along with the NPPF Technical Guidance, has now been superseded by the National Planning Policy Framework and Guidance.
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
SAB	SuDS Approval Body - responsible for approving, adopting and maintaining drainage plans and SuDS schemes that meet the National Standards
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SHLAA	Strategic Housing Land Availability Assessment - The Strategic Housing Land Availability Assessment (SHLAA) is a technical piece of evidence to support the Core Strategy and Sites & Policies Development Plan Documents (DPDs). Its purpose is to demonstrate that there is a supply of housing land in the District which is suitable and deliverable.
SFRA	Strategic Flood Risk Assessment
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
SUE	Sustainable Urban Extension
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
uFMfSW	Updated Flood Map for Surface Water
WFD	Water Framework Directive

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

This updated version of the Mid Devon Strategic Flood Risk Assessment (SFRA) 2014 replaces the document "Mid Devon Strategic Flood Risk Assessment Final Report, June 2009"[1]. The updated report has been prepared to replace the work that was included in the previous SFRA and provide appropriate supporting evidence for the Mid Devon Local Plan.

Since the previous SFRA there have been a number of changes to the planning legislation and policy, including the Localism Act (2011) and the 2012 National Planning Policy Framework (NPPF)[2] with accompanying Planning Practice Guidance (March 2014)[3]. In addition, the provisions of the Flood and Water Management Act (2010) have been substantially commenced under a programme that was initiated by Defra in April 2010 and the Flood Risk Regulations came into force in December 2009 (these regulations transposed the EU 'Floods Directive' into UK law).

The purpose of this SFRA update is to

- provide information on the changes to planning, policy and guidance since the previous SFRA;
- provide an indicative assessment of the flood hazard within the Flood Zones;
- provide information on existing defences and flood risk management measures;
- allow a sequential approach to site allocation to be undertaken within a flood zone; and
- allow suggestions for development of potential policies and practices that may be required to ensure that development in Flood Zones 2 and 3 satisfies the requirements of the Exception Test.

The SFRA will form an integral part of the Council's evidence base in terms of identifying locations for development and preparation of flood risk policies in the Local Plan. The primary objective of the SFRA is to be part of the evidence base supporting the Local Plan to inform site allocations so they are in accordance with the NPPF.

In order to achieve this, the Planning Practice Guidance states that SFRAs need to provide sufficient detail on all types of flood risk to enable the Local Planning Authority (LPA) to:

- Determine the variations in risk from all sources of flooding across their areas, and also the risks to and from surrounding areas in the same flood catchment
- Inform the sustainability appraisal of the Local Plan, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased
- Apply the Sequential and, where necessary, Exception Tests in determining land use allocations
- Identify the requirements for site specific flood risk assessments in particular locations, including those at risk from sources other than river and sea flooding
- Determine the acceptability of flood risk in relation to emergency planning capability
- Consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and storage of flood water

This document has been prepared under the requirements of the National Planning Policy Framework (NPPF) and accompanying Flood Risk and Coast Change Planning Practice Guidance to the National Planning Policy Framework published in March 2014, as well as the Environment Agency's Strategic Flood Risk Assessments guidance[4].

The extent of the study area is shown in Figure 1-1.

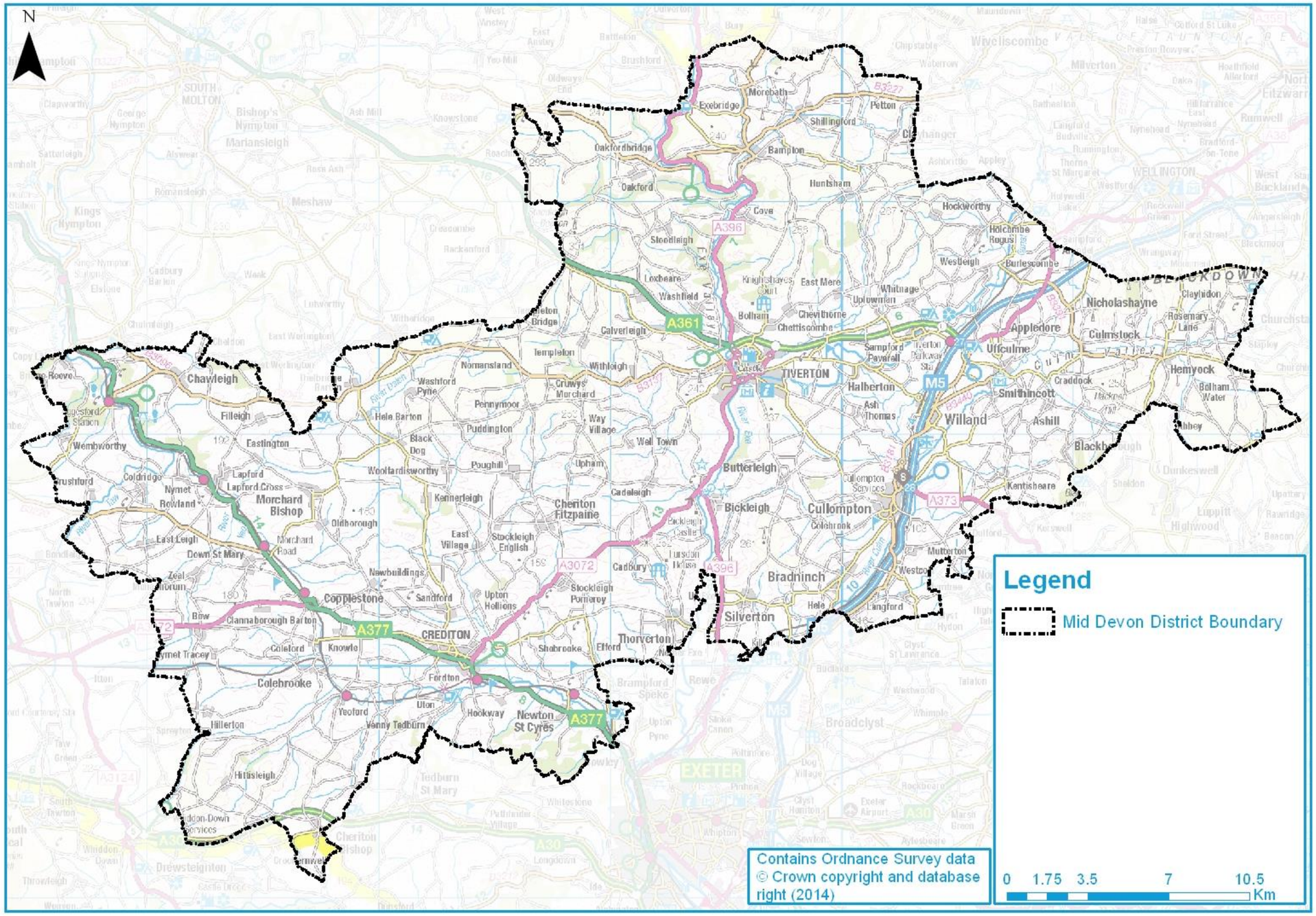
[1] Mid Devon District Council Strategic Flood Risk Assessment Levels 1 and 2 (Hyder, June 2009)

[2] National Planning Policy Framework (Department for Communities and Local Government, March 2012)

[3] National Planning Policy Framework Planning Practice Guidance: Flood Risk and Coastal Change (Department for Communities and Local Government, March 2014)

[4] Strategic Flood Risk Assessments: Guidance to support the National Planning Policy Framework (Environment Agency, July 2013)

Figure 1-1: Strategic Flood Risk Assessment study area



1.2 SFRA objectives

The Planning Practice Guidance advocates a tiered approach to risk assessment and identifies the following two levels of SFRA

3. Level One: where flooding is not a major issue and where development pressures are low. The Assessment should be sufficiently detailed to allow application of the Sequential Test
4. Level Two: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all the necessary development creating the need to apply the NPPF's Exception Test. In these circumstances the Assessment should consider the detailed nature of the flood characteristics within a flood zone.

The objectives of this SFRA update are a hybrid of level one and level two.

1.3 SFRA outputs

This SFRA delivers:

1.3.1 Level one outputs

- Maps showing the local planning authority area, Main Rivers, ordinary watercourses, and Flood Zones
- An assessment of the flood risk at potential development sites, including consideration of climate change implications
- Areas at risk from other sources of flooding, for example surface water or reservoir
- Flood risk management measures, including location and standard of flood defences, flood warning coverage and emergency plans
- Recommendations about the areas with possible existing drainage issues and the potential need for surface water management plans
- Identification of locations where additional development may significantly increase flood risk elsewhere (Environment Agency identified Critical Drainage Areas)
- Advice on the likely applicability of sustainable drainage systems for managing surface water runoff at key development sites
- Advice of the preparation of flood risk assessments for development sites

1.3.2 Level two outputs

- An appraisal of current conditions of flood defence infrastructure
- An appraisal of the probability and consequences of overtopping or failure of flood risk management infrastructure, including an allowance for climate change
- Definition and mapping of the functional floodplain
- Definition and mapping (where available) of
    - Flood depth (hazard)
- Maps showing the distribution of flood risk across all Flood Zones from all sources of flooding
- Advice on potential policies for sites which could satisfy the first part of the Exception Test and on possible requirements that may be necessary for a site-specific flood risk assessment supporting a planning application to pass the second part of the Exception Test
- Advice on the preparation of site-specific flood risk assessments for sites of varying risk across the Flood Zones, including information about the use of sustainable drainage techniques
- Recommendations to inform policy, development control and technical issues

1.4 SFRA user guide

Table 1-1 summarises the contents of this report.

Table 1-1: SFRA Report Contents

Section	Contents
1. Introduction	Provides a background to the study, defines objectives, outlines the approach adopted and the consultation performed
2 The Planning Framework and Flood Risk Policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation.
Level One Strategic Flood Risk Assessment	
3. How flood risk is assessed	Provides an overview of flooding and risk and Flood Zones
4. Understanding flood risk in the Mid Devon District	Gives an introduction to the assessment of flood risk and provides an overview of the characteristics of flooding affecting the Mid Devon District. Provides a summary of responses that can be made to flood risk, together with policy and institutional issues that should be considered.
5. Flood risk from canals and reservoirs	Summarises flood risk from canals and reservoirs.
6. Mapping and risk-based approach	Summary of the modelling used for the assessment. Description of mapping that should be used for Sequential and Exception testing. Application of the Sequential Approach and Sequential/Exception Test process.
7. Overview of future development	Summarises the development proposals for the Mid Devon District.
8. Drainage issues in Mid Devon District	Broad scale assessment to identify areas where there are potential existing drainage issues within the District. Description of Environment Agency identified Critical Drainage Area (CDA).
9. Managing surface water runoff	Advice on managing surface water run-off and flooding
Level Two Strategic Flood Risk Assessment	
10. Flood defences and 'critical structures'	Assessment of residual risk from flood defences, including future protection from climate change. Identification of possible 'designated features' that affect flood risk.
12. Development allocations summary	Summary of risk to site allocations brought forward in the Local Plan.
12. FRA requirements	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development.
13. Green Infrastructure and Water Framework Directive	Summarises the importance and role of Green Infrastructure. Describes the purpose and objectives of the Water Framework Directive and provides an assessment of the current ecological status of watercourses within Mid Devon and implications for development.
14. Summary and recommendations	Reviews SFRA and its implications.

1.5 Approach

1.5.1 General assessment of flood risk

The flood risk management hierarchy underpins the risk based approach and is the basis for making all decisions involving development and flood risk. When using the hierarchy, account should be taken of:

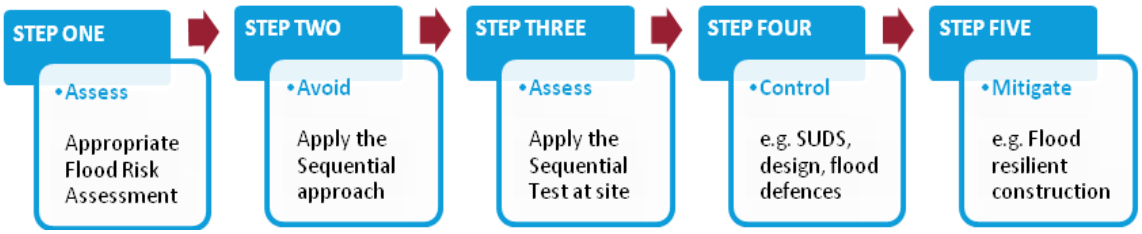
- The nature of the flood risk (the ***source*** of the flooding)
- The spatial distribution of the flood risk (the ***pathways*** and areas affected by flooding)
- Climate change impacts, and
- The degree of vulnerability of different types of development (the ***receptors***)

Developments should reflect the application of the Sequential Test using the maps produced for this SFRA. The information in this SFRA should be used as evidence and, where necessary, reference should also be made to relevant evidence in other documents referenced in this report. The Flood Zone maps and flood risk information on other sources of flooding contained in this SFRA should be used where appropriate to apply the Sequential Test.

Where other sustainability criteria outweigh flood risk issues, the decision making process should be transparent. Information from this SFRA should be used to inform decisions in allocating land as part of the Local Plan Review.

The flood risk management hierarchy is summarised in Figure 1-2.

Figure 1-2: Flood Risk Management Hierarchy



Based on flood risk management hierarchy outlined in PPS25 Practice Guide[5]

1.5.2 Technical assessment of flood hazards

Flood risk within Mid Devon District has been assessed using results from computer models supplied by the Environment Agency and existing Environment Agency Flood Zone mapping.

In particular:

- 2008 generalised (JFlow) modelling of the River Exe catchment, supplied by the Environment Agency
- The River Exe at Tiverton hydraulic model, supplied by the Environment Agency
- Current Flood Zone 2 and 3 outlines, supplied by the Environment Agency

1.6 Consultation

The following parties (external to Mid Devon District Council) have been consulted during the preparation of this version of the SFRA:

- The Environment Agency
- South West Water
- Devon County Council

[5] Planning Policy Statement 25: Development and Flood Risk Practice Guide (Department for Communities and Local Government, December 2009)

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2 The Planning Framework and Flood Risk Policy

2.1 Introduction

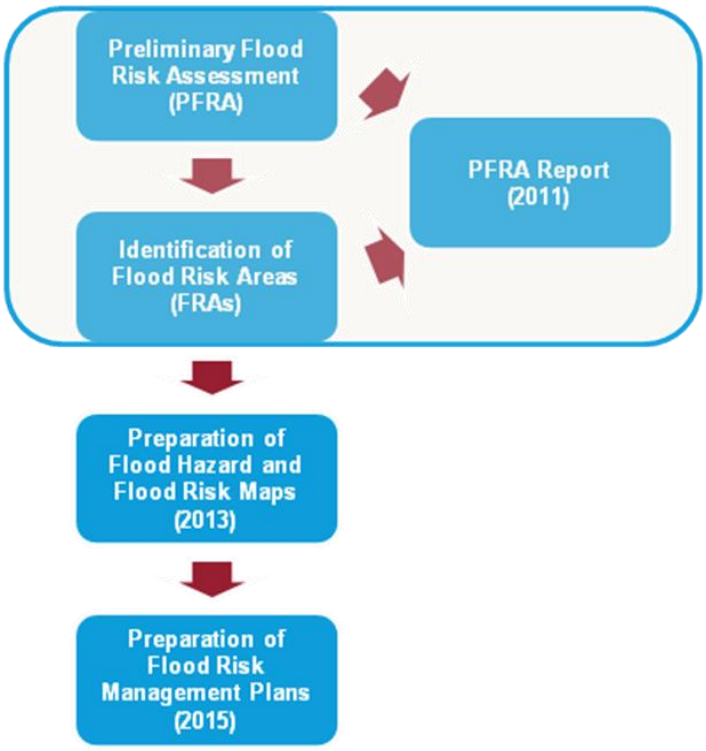
The over arching aim of planning policy on development and flood risk is to ensure that flood risk is taken into account at all stages of the planning process. The purpose of this section of the report is to provide information on the main changes to the planning framework, flood risk responsibilities and flood risk policy since the 2009 SFRA was published. These changes have been taken into account in preparing this SFRA update.

2.2 Flood Risk Regulations (2009) and Flood and Water Management Act (2010)

The Flood Risk Regulations transpose the EU Floods Directive into UK law and place responsibility upon all Lead Local Flood Authorities (LLFAs) to manage local flood risk. Under the Regulations the Environment Agency is responsible for flooding from rivers, the sea and reservoirs with Lead Local Flood Authorities (in this instance Devon County Council) being responsible for local and all other sources of flooding.

Figure 2-1 sets out the requirements and timescales for implementing the requirements of the Directive.

Figure 2-1: Flood Risk Regulation Requirements



Lead Local Flood Authorities prepared the PFRA reports in accordance with the regulations and Devon County Council (DCC) published the document that covers the local authority area in 2011. The purpose of the PFRA was to identify areas where the local flood risk (primarily surface water and ground water flooding) was significant and in those circumstances it would then be necessary to prepare a Flood risk Management Plan and Hazard Mapping in accordance with the Regulations. The PFRA prepared by DCC did not identify any areas where local flood risk was significant in Mid Devon.

The Environment Agency did not prepare a PFRA as they exercised an 'exception' that was permitted under the Regulations. Having exercised this exception the Environment Agency will have to prepare Flood Hazard and Flood Risk Maps and Flood Risk Management Plans for rivers, the sea and reservoirs.

The Flood and Water Management Act (FWMA) received Royal Assent in April 2010. The FWMA aims to create a simpler and more effective means of managing the risk of flood and

coastal erosion and is one of the principle outcomes contributing to the implementation of Sir Michael Pitt's recommendations following his review of the 2007 floods.

The FWMA also calls for the establishment of a SuDS Approving Body (SAB) to be set up in county, county borough or unitary local authorities. This requires SAB approval of drainage systems for new and redeveloped sites to be obtained before construction can commence. Additionally the proposed drainage system must meet the new National Standards for design, construction, operation and maintenance. The SAB will be responsible for approving, adopting and maintaining drainage plans and SuDS schemes that meet the National Standards. The responsibilities of the SAB are likely to rest with the LLFA (in this case, Devon County Council), although there is flexibility in the FWMA if it considered more effective for another body to take on the role.

2.2.1 Devon Preliminary Flood Risk Assessment

In the first instance, the regulations required Devon County Council (as the LLFA) to prepare and publish a Preliminary Flood Risk Assessment (PFRA) on past and future flood risk from local sources of flooding. The Regulations also require the LLFA to identify significant Flood Risk Areas. The PFRA reports on significant past and future flooding from all sources except Main River and Reservoir (covered by Environment Agency) and sub-standard performance of the adopted sewer network (under the remit of South West Water).

Key outputs of the Devon PFRA include:

- Nine past flooding events in Devon were noted as having significant harmful consequences; however, none of these events were within the Mid Devon District.
- There are no national Indicative Flood Risk Areas in the Mid Devon District.

2.3 Localism Act (2011)

The Localism Act was given Royal Assent on 15 November 2011 with the purpose of moving the balance of decision making from central government back to councils, communities and individuals.

Additionally Provision 110 of the Act places a duty to cooperate on local authorities in relation to 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"[6].

The Localism Act also provides new rights to allow local communities to shape new development by coming together to prepare neighbourhood plans. This means local people can decide where new homes and businesses should go and what they should look like. Local planning authorities will be required to provide technical advice and support as neighbourhoods draw up their proposals.

2.4 National Planning Policy Framework and Guidance

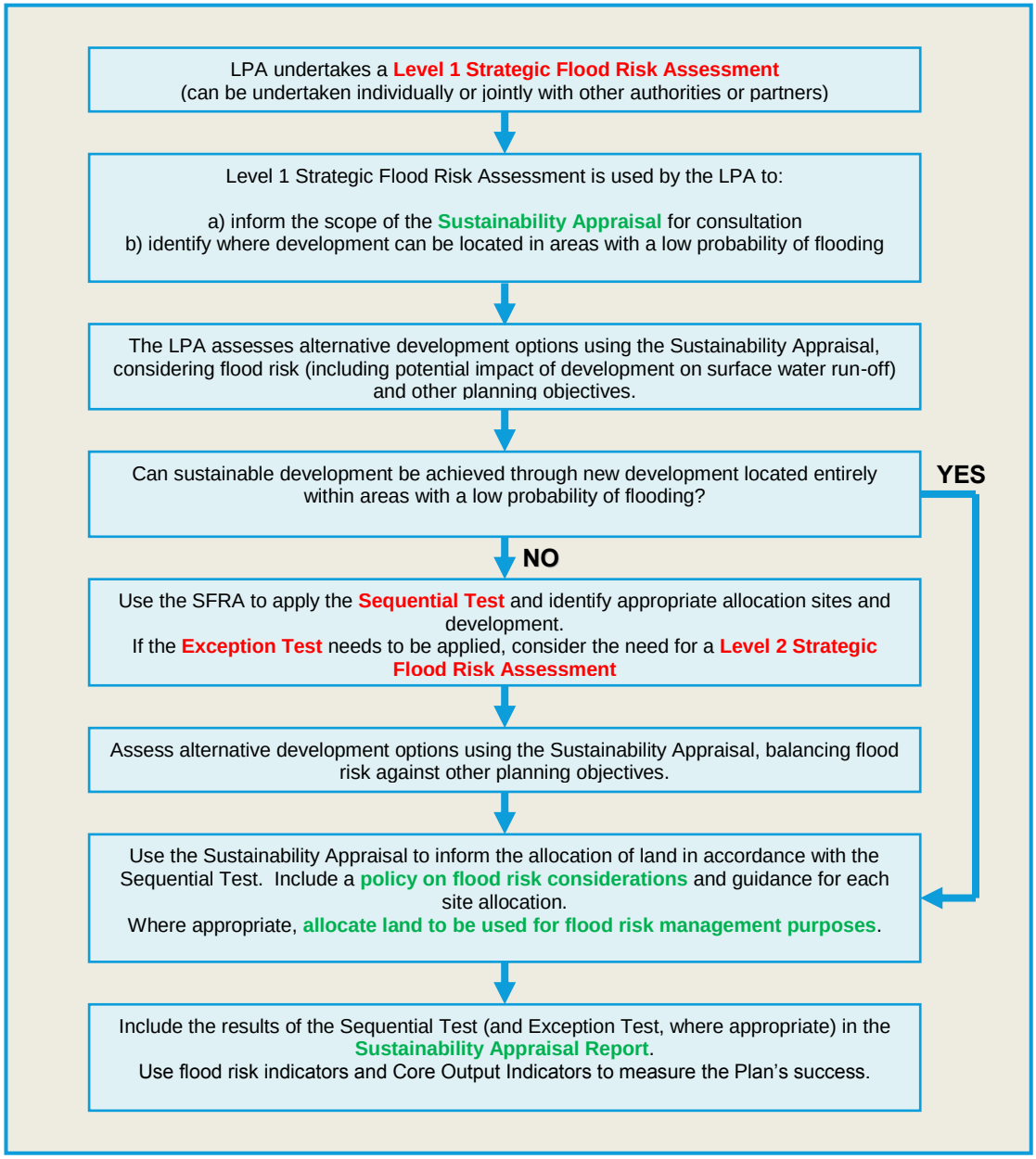
The National Planning Policy Framework (NPPF) was issued on 27 March 2012 to replace the previous documentation, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. It replaced a number of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs).

The NPPF is a source of guidance for local planning authorities to help them prepare Local Plans and for applicants preparing planning submissions. Paragraph 100 of the NPPF states "Local Plans should be supported by a strategic flood risk assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change"[2].

[6] Localism Act 2011: Section 110. http://www.legislation.gov.uk/ukpga/2011/20/section/110

In March 2014 Planning Practice Guidance on flood risk was published[7] and sets out how the policy should be implemented. The Planning Practice Guidance also sets out how flood risk should be taken into account in the preparation of Local Plans (Figure 2-2).

Figure 2-2: Flood risk and the preparation of Local Plans†



† Based on Diagram 1 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-021-20140306) March 2014

2.5 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location and are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in an area and should influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments. At the time of the publication of this SFRA update, no SWMP has been published that covers the Mid Devon District.

[7] Planning Practice Guidance: Flood Risk and Coastal Change (2014)
http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

As part of this SFRA update, an assessment has been prepared to identify areas with possible existing drainage issues. One CDA is identified by the EA in Mid Devon. CDAs can provide a good indication of areas that, if developed, may significantly increase flood risk downstream or to the wider community by the generation of increased surface runoff.

2.6 Association of British Insurers Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England

The Association of British Insurers (ABI) and the National Flood Forum have published guidance for local authorities on planning in flood risk areas. The guidance aims to help local authorities in England when producing local plans and dealing with planning applications in flood risk areas. The guidance complements the National Planning Policy Framework. The key recommendations from the guidance are[8]:

- Ensure strong relationships with technical experts on flood risk
- Consider flooding from all sources, taking account of climate change
- Take potential impacts on drainage infrastructure seriously
- Ensure that flood risk is mitigated to acceptable levels for proposed developments
- Make sure Local Plans take account of all relevant costs and are regularly reviewed

2.7 Implications for Mid Devon District

The new and emerging responsibilities under the Flood and Water Management Act and the Flood Risk Regulations are summarised in Table 2-1.

Table 2-1: Roles and Responsibilities in Devon

Risk Management Authority (RMA)	Strategic Level	Operational Level
Environment Agency	National Statutory Strategy Reporting and supervision (overview role)	Main rivers, reservoirs • Preliminary Flood Risk Assessment (per River Basin District)[1] • Identify Significant Flood Risk Area[1] • Flood Risk and Hazard Maps • Flood Risk Management Plan Enforcement authority for Reservoirs Act 1975
Lead Local Flood Authority (Devon County Council)	Input to national strategy. Formulate and implement local flood risk management strategy.	Surface water, groundwater, other sources of flooding • Prepare and publish a PFRA • Identify Flood Risk Areas • Prepare Flood Hazard and Flood Risk Maps • Prepare Flood Risk Management Plans SuDS Approval Body
Lower Tier authorities (Mid Devon District Council)	Input to National and Local Authority Plans and Strategy • Mid Devon Local Plan	• Ordinary watercourse

1 – Environment Agency did not prepare a PFRA; instead they submitted an exception permitted under the Regulations

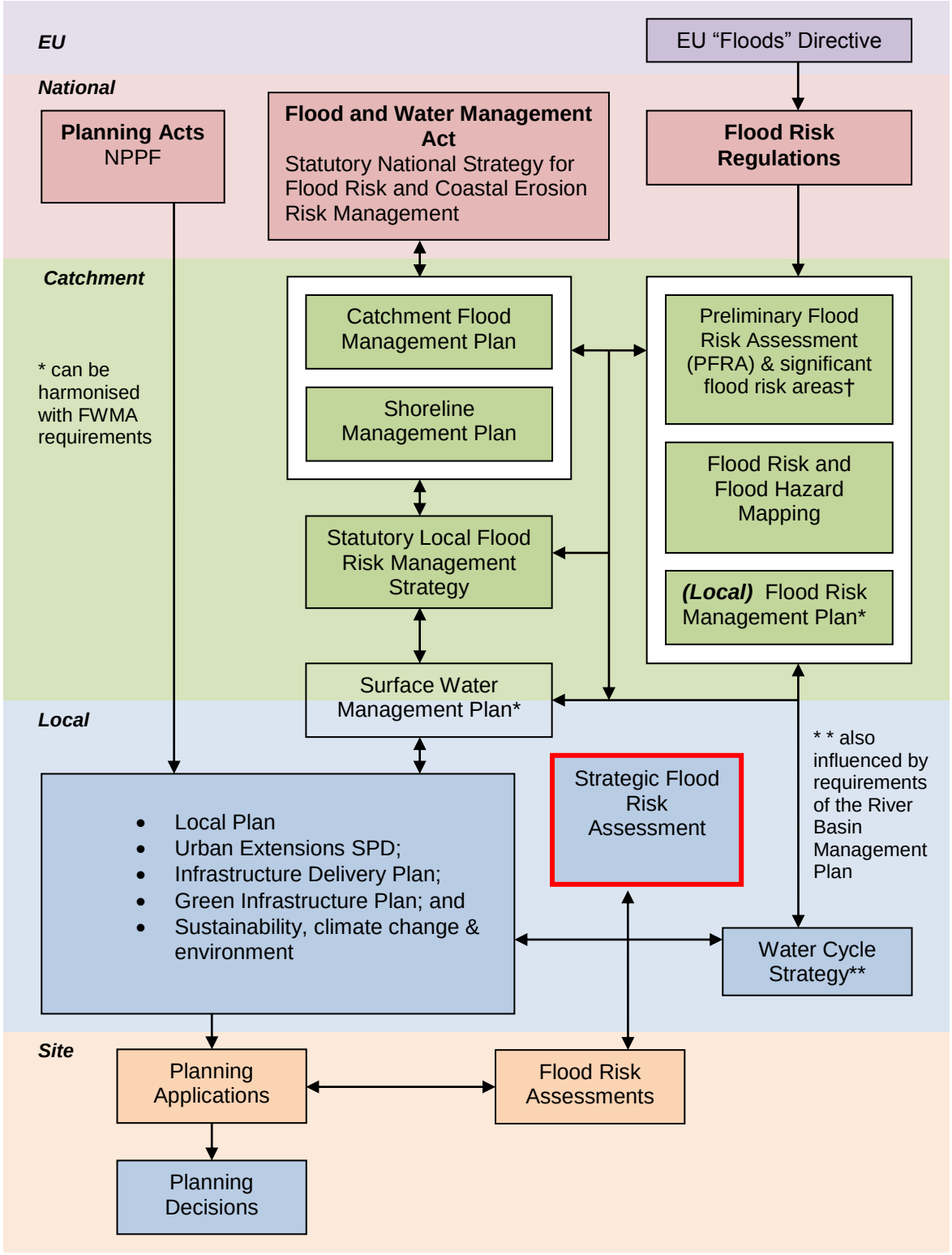
Figure 2-3 shows the key strategic planning links for flood risk and associated documents. It shows how the Flood Risk Regulations and Flood and Water Management Act, in conjunction with the Localism Act's "duty to cooperate", introduce a wider requirement for the exchange of information and the preparation of strategies and management plans.

SFRAs contain information that should be referred to in responding to the Flood Risk Regulations and the formulation of local flood risk management strategies and plans. SFRAs

[8] Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England (Association of British Insurers and National Flood Forum, April 2012)

are also linked to the preparation of Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs), Surface Water management plans (SWMPs) and water cycle strategies (WCSs).

Figure 2-3: Strategic planning links and key documents for flood risk



Legend: Responsibilities are indicated using colour coding as follows

European Union	National Government	Local Planning Authority	EA/LLFA/Maritime Local Authorities	Developer

† See Table 2-1 for roles and responsibilities for preparation of information

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Level One Strategic Flood Risk Assessment

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3 How flood risk is assessed

3.1 Definitions

3.1.1 Flood

Section1 (subsection 1) of the FWMA defines a flood as:

'any case where land not normally covered by water becomes covered by water'.

Section1 (subsection 2) states 'it does not matter for the purposes of subsection (1) whether a flood is caused by –

(a) Heavy rainfall

(b) A river overflowing or its banks being breached

(c) A dam overflowing or being breached

(d) Tidal waters

(e) Groundwater, or

(f) Anything else (including any combination of factors).

Note: Source does not include the following – flood from any part of a sewerage system, unless caused by an increase in the volume of rainwater, entering or affecting the system, or a flood caused by a burst water main.

3.1.2 Flood Risk

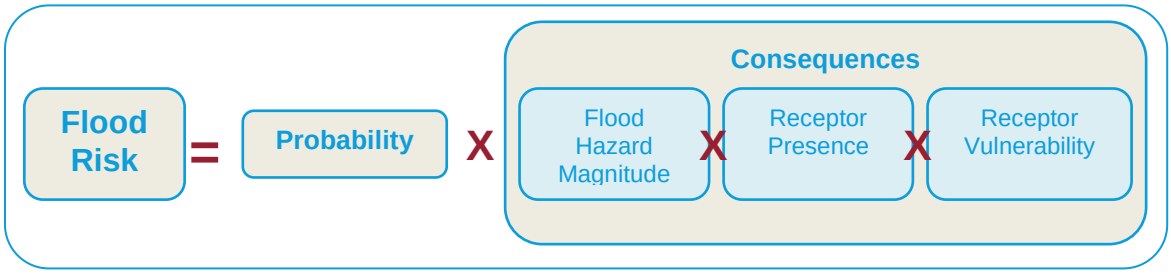
Section 3 (subsection 1) of the FWMA defined flood risk as:

'a risk in respect of an occurrence assessed and expressed (as for insurance and scientific purposes) as a combination of the probability of the occurrence with its potential consequences.'

Thus it is possible to define flood risk as:

Flood Risk = (Probability of a flood) x (Scale of the Consequences)

On that basis it is useful to express the definition as follows:



Using this definition it can be seen that

- **Increasing the probability or chance of a flood being experienced increases the flood risk.** In situations where the probability of a flood being experienced increases gradually over time, for example due to the effects of climate change, then the severity of the flood risk will increase (flooding becomes more frequent or has increased effect).
- **The scale of the consequences can increase the flood risk.**
  - Flood Hazard Magnitude: If the direct hazard posed by the depth of flooding, velocity of flow, the speed of onset, rate of risk in flood water or duration of inundation is increased, then the consequences of flooding, and therefore risk, is increased.
  - Receptor presence: The consequences of a flood will be increased if there are more receptors affected, for example with an increase in extent or frequency of flooding. Additionally, if there is new development that increases the probability of flooding (for example, increase in volume of runoff due to increased

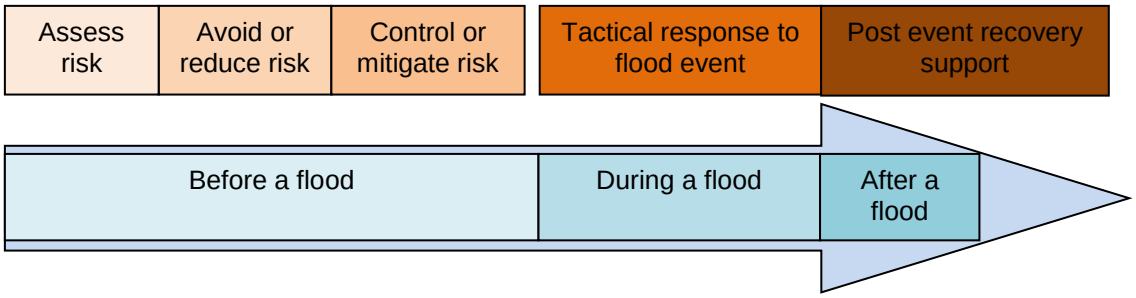
impermeable surfaces) or increased density of infrastructure then consequences will also be increased.

- Receptor vulnerability: If the vulnerability of the people, property or infrastructure is increased then the consequences are increased. For example, old or young people are more vulnerable if there is a flood.

3.2 Using SFRA risk information

This SFRA contains information that can be used at strategic, operational and tactical levels as shown by Figure 3-1.

Figure 3-1: Uses of SFRA information



The SFRA will aid in the preparation of the Local Flood Risk Management Strategy prepared by the Lead Local Flood Authority (Devon County Council).

The assessment of flood risk in the SFRA is primarily based on the following three types of information

3.2.1 Flood Zones

The SFRA includes maps that show the Flood Zones. These zones describe the land that would flood if there were no defences present. The NPPF Guidance identifies the following Flood Zones, see Table 3-1.

Table 3-1: Flood Zone descriptions

	Probability	Description
Zone 1	Low	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Zone 2	Medium	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (0.1% - 1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.1% – 0.5%) in any year.
Zone 3a	High	This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1.0%) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5%) in any year.
Zone 3b	Function Floodplain	This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of function floodplain should take account of local circumstances.

The preference when allocating land is, whenever possible, to place all new development on land in Zone 1. Since the Flood Zones identify locations that are not reliant on flood defences, placing development on Zone 1 land means there is no future commitment to spending money

on flood banks or flood alleviation measures. It also does not commit future generations to costly long term expenditure that would become increasingly unsustainable as the effects of climate change increase.

3.2.2 Actual Flood Risk

If it has not been possible for all future development to be situated in Zone 1 then a more detailed assessment is needed to understand the implications of locating proposed development in Zones 2 or 3. This is accomplished by considering information on the "actual risk" of flooding. The assessment of actual risk takes account of the presence of flood defences and provides a picture of the safety of existing and proposed development. It should be understood that the standard of protection afforded by flood defences is not constant and it is presumed that the required minimum standards for new development are:

- Residential development should be protected against flooding with an annual probability of river flooding of 1% (1 in 100 year chance of flooding) in any year; and
- Residential development should be protected against flooding with an annual probability of tidal (sea) flooding of 0.5% (1 in 200 year chance of flooding) in any year.

The assessment of the actual risk should take the following issues into account:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated;
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth then it will be a priority for the Flood Risk Management Strategy to be reviewed;
- The standard of safety must be maintained for the intended lifetime of the development (assumed to be 100 years for residential development). Over time the effects of climate change will erode the present day standard of protection afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present day levels of protection are to be maintained; and
- The assessment of actual risk can include consideration of the magnitude of the hazard posed by flooding. By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources. This assessment will be needed in circumstances where consideration is given to the mitigation of the consequences of flooding or where it is proposed to place lower vulnerability development in areas that are at risk from inundation.

For information on defences reference should be made to the Environment Agency's Asset Information Management System (AIMS) which contains details on the standard of protection of defences.

3.2.3 Residual Risk

The residual risk refers to the risks that remain in circumstances where measures have been taken to alleviate flooding. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a flood with a magnitude greater than that for which the defences or management measures have been designed to alleviate (the 'design flood'). This can result in over topping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming discharges; or
- Failure of the defences or flood risk management measures to perform their intended duty. This could be breach failure of flood embankments, failure of flood gates to operate in the intended manner or failure of pumping stations.

The assessment of residual risk demands that attention be given to the vulnerability of the receptors and the response to managing the resultant flood emergency. In this instance attention should be paid to the characteristics of flood emergencies and the roles and responsibilities during such events. Additionally for breach and overtopping events consideration

should be given to the structural safety of the dwellings or structures that could be adversely affected by significant flood flows or flood depths.

3.3 Possible responses to flooding

3.3.1 Assess

The first response to flooding must be to understand the nature and frequency of the risk. The assessment of risk is not just performed as a "one off" during the process, but rather the assessment of risk should be performed during all subsequent stages of responding to flooding.

3.3.2 Avoid

The sequential approach requires that the first requirement is to avoid the hazard. If it is possible to place all new growth in areas at a low probability of flooding then the flood risk management considerations will relate solely to ensuring that proposed development does not increase the probability of flooding to others. This can be achieved by implementing SuDS systems and other measures to control and manage run-off. In some circumstances it might be possible to include measures within proposed growth areas that reduce the probability of flooding to others and assist existing communities to adapt to the effects of climate change. In such circumstances the growth proposals should include features that can deliver the necessary levels of mitigation so that the standards of protection and probability of flooding are not reduced by the effects of climate change. In Mid Devon, consideration should be given not only to the peak flows generated by new development but also to the volumes generated during longer duration storm events

3.3.3 Substitute, Control and Mitigate

These responses all involve management of the flood risk and thus require an understanding of the consequences (the magnitude of the flood hazard and the vulnerability of the receptor).

There are opportunities to reduce the flood risk by lowering the vulnerability of the proposed development. For instance changing existing residential land to commercial uses will reduce the risk provided that the residential land can then be located on land in a lower risk flood zone.

Flood risk management responses in circumstances where there is a need to consider growth or regeneration in areas that are affected by a medium or high probability will include:

- Strategic measures to maintain or improve the standard of flood protection so that the growth can be implemented safely for the lifetime of the development (must include provisions to invest in infrastructure that can adapt to the increased chance and severity of flooding presented by climate change);
- Design and implement measures so that the proposed development includes features that enables the infrastructure to adapt to the increased probability and severity of flooding whilst ensuring that new communities are safe and that the risk to others is not increased (preferably reduced);
- Flood resilient measures that reduce the consequences of flooding to infrastructure so that the magnitude of the consequences is reduced. Such measures would need to be considered alongside improved flood warning, evacuation and welfare procedures so that occupants affected by flooding could be safe for the duration of a flood event and rapidly return to properties after an event had been experienced.

<u>It should be noted that the Flood and Coastal Risk Management Grant in Aid (FCRMGiA) funding arrangements introduced in 2011 do not make government funds available for any new development implemented after 2012.</u> Accordingly it is essential that appropriate funding arrangements are established for new development proposed in locations where a long-term investment commitment is required to sustain Flood Risk Management measures. The strategic investment commitment is required so that in future the Flood Risk Management measures can be maintained and afforded for the lifetime of the development, since the available funds from FCRMGiA will potentially not reflect the scale of development that is benefitting.

4 Understanding flood risk in Mid Devon District

4.1 Historic flooding

The district has a long history of flood events, with the main source of flooding being from fluvial sources. There are two main severe flooding events which have affected the district in the last 60 years. The first was in 1960 when 561mm of rainfall occurred between 27 September and 5 December, causing the River Exe to reach its highest ever-recorded level at Stoodleigh and Thorverton. Reports of flooding in Crediton, Fordton, Tiverton, Bickleigh, Bampton, Cullompon and Bridge Reeve were received. Major rail and road disruption was also caused. The second major flood event in the district occurred in Autumn 2000 when the Rivers Taw and Creedy reached record levels following heavy and sustained rainfall. Many homes and businesses were flooded in Mid Devon and serious disruption was caused to rail and road networks in the district. A month later, on 7 December 2000, the River Lowman caused flooding to the Tiverton Industrial Estate and residential properties in the vicinity of Station Road and Little Silver.

There have been various incidents of localised flooding. On the 7 August 1997, an intense thunderstorm caused flooding from the Crow Green Stream to properties on Brook Road, Duke Street and the Culm Valley Sports Centre car park in Cullompton. Properties adjacent to the Cole Brook at Cullompton were also affected. The overland flow reached a depth of approximately 300mm. The River Lowman has flooded part of Tiverton on a number of occasions. Flood defences have been constructed to provide some protection to the town of Tiverton (see Section 4.4). Since the publication of the 2009 SFRA there have been a number of flood events in the district, including November and December 2012. The 2012 event caused significant flooding and river levels not witnessed/recorded on parts of the River Exe and River Culm since the early/mid 1960's. Communities in Tiverton, Cullompton and numerous isolated properties were badly affected, some on more than one occasion. Flood alleviation measures at Cullompton and Exebridge were overtopped.

A Canal breach occurred along the Grand Western Canal during the winter of 2012. The canal breach occurred on the northern bank of the canal near Swing Bridge at Halberton after water spilled over the top of the embankment following a rainfall event.

Further information on historic flooding in the Mid Devon District is provided in Appendix J.

4.2 Topography, geology, soils and hydrology

The Mid Devon District encompasses an area of approximately 913km^2 and has boundaries with six other Devon Districts, as well as the county of Somerset. The three largest urban areas in the district are the towns of Tiverton, Cullompton and Crediton.

4.2.1 Topography

The present day landscape of Mid Devon has been gradually created by river erosion over the last two million years. The majority of the District is located within the catchment of the River Exe, with the westernmost part of the District drains to the River Taw. To the north of Tiverton the landscape consists of steeply rolling, narrow valleys, of the incised tributaries of the River Exe. The Taw catchment is more gently undulating but also consists of incised river valleys. The south of the District is characterised by a gently rolling landscape until the southernmost tip which is located within the steeply sloping land of the Dartmoor National Park.

To the east of the District, the Culm and its tributaries have eroded the landscape, creating steep slopes rising to a plateau.

4.2.2 Geology and soils

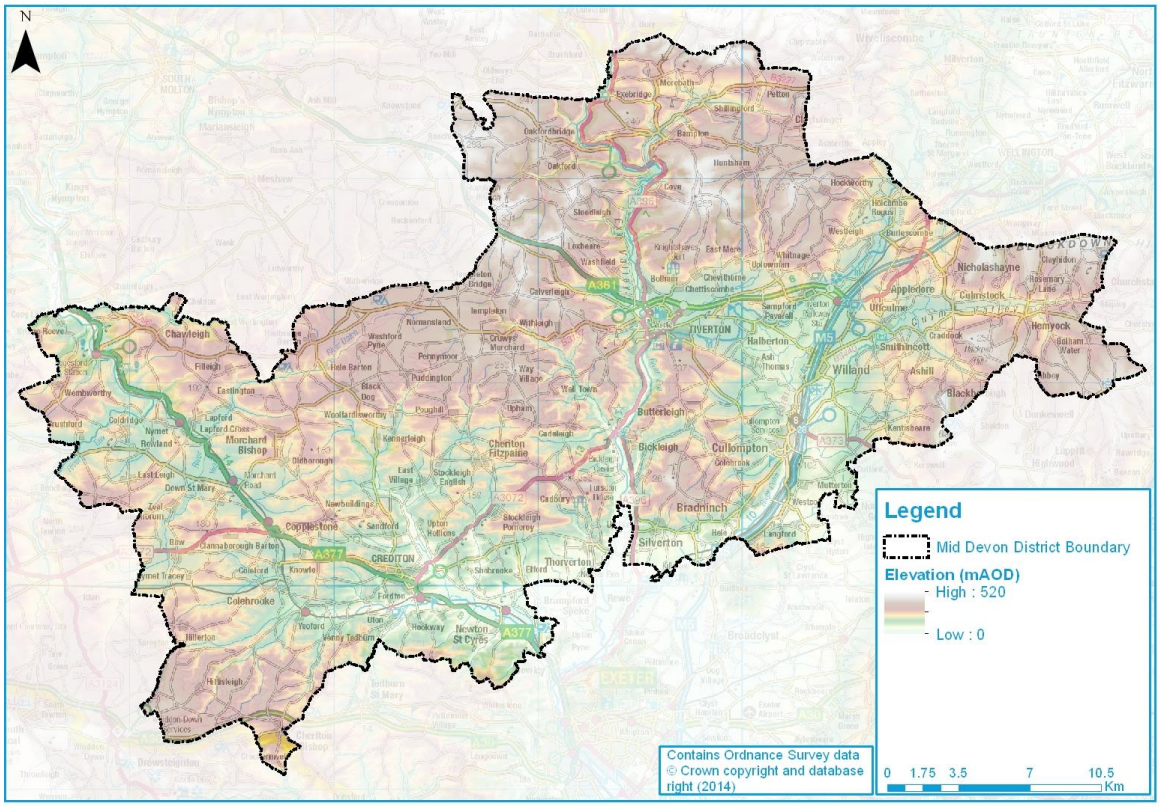
The geology of a catchment can be an important influencing factor on the way that a catchment responds to rainfall due to variations in permeability of the strata.

The geological history of Mid Devon is characterised by alternative periods of marine incursion and mountain building. Over half of Mid Devon is underlain by sandstones and slates of the Carboniferous period. The uplift of Devon above sea level, as a result of the mountain building event (Variscan Orogeny) towards the end of Carboniferous period, exposed the land to a sub-tropical climate. This climate led to the creation of thick deposits of wind-blown material, as well as coarse breccias and sandstones laid down by impermanent rivers, in the east and south of

the Mid Devon District. The easternmost boundary of Mid Devon is composed of sands and clays deposited by marine incursion that occurred during the Cretaceous period, resulting in springs and areas of impeded drainage, likely to produce high percentage runoff.

The soils in Mid Devon are a mixture of freely draining, slightly acidic loamy soils, slowly permeable seasonality wet acidic loamy and clayey soils, and slightly acidic loamy and clayey soils with impeded drainage.

Figure 4-1: Mid Devon: topography



4.3 Fluvial flood risk

The main source of flood risk in Mid Devon is from Mained rivers. Approximately 6% (55km^2) of the land in Mid Devon lies within the floodplain of rivers. There is a long history of river flooding throughout the district. Tiverton has the highest number of properties at risk from fluvial flooding, followed by Cullompton, Hemyock and Bampton. The main rivers in the Mid Devon District are detailed in Table 4-2 and a figure of their locations is provided in Appendix B.

Approximately 11 per cent of residential properties in Mid Devon are located in Flood Zone 2 and nine per cent of properties are located in Flood Zone 3.

Table 4-1, details the number of properties at risk within each main settlement in Mid Devon.

In addition to the flood risk shown by the flood risk mapping, there are a number of small watercourses and field drains which may pose a risk to development. Flood zone mapping is only available for watercourses with a catchment greater than 3km^2. There are several flooding events which have occurred from watercourses which are not included in the Environment Agency's modelling as they have a catchment size smaller than 3km^2. Therefore whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. Developers will have to assess the risk from these smaller watercourses as part of a detailed, site specific, flood risk assessment.

Note on property counts

The National Receptor Database property point dataset was filtered to remove the recommended standard list of property types to exclude, as described in the Environment Agency OI 353_109, in line with PFRAs. Properties with unknown property type (Multicoloured

[9] Environment Agency (2011) Operational Instruction 353_10: National Receptor Dataset: What it is, what it's used for,

Manual Code of 999) were left in the database. These may include garages, barns and field shelters which would not normally be considered when undertaking property counts. However, without verifying each property on the ground, it is not possible to determine whether properties with an 'unknown' class should be included or excluded. To allow more conservative estimates, properties with an 'unknown' class were kept in the dataset. A point count was then undertaken on key settlements at risk of fluvial flooding. The property numbers in Table 4-1 do not include all properties at risk of fluvial flooding in Mid Devon – there being numerous other properties in smaller villages and hamlets at risk.

Table 4-1: Estimated numbers of properties at risk of fluvial flooding.

Catchment	FZ3	FZ2	Catchment	FZ3	FZ2
River Batherm	**179**	**187**	**River Culm**	**881**	**1,100**
Bampton	172	180	Hemyock	168	172
Shillingford	7	7	Culmstock	34	51
River Taw	**2**	**14**	Uffculme	43	60
Lapford	2	14	Kentisbeare	21	21
River Yeo (Creedy)	**157**	**212**	Kingsford	38	38
Copplestone	9	10	Stoneyford	101	130
Colesford	15	36	Cullompton	469	612
Yeoford	33	36	Halburton	4	4
Binneford	3	7	Sampford Peverell	3	12
Salmonhutch	6	15	**River Exe**	**1,661**	**1,967**
Venny Tedburn	2	9	Exebridge	48	51
Crediton	5	8	Oakfordbridge	13	13
Fordton	84	91	Bolham	70	75
River Creedy	**40**	**48**	Tiverton	1,491	1,786
Cheriton Fitzpaine	19	20	Bickleigh	39	42
Binneford	2	4	**River Lowman**	**425**	**581**
Ford Cross and North Combe	11	13	Uplowman	3	3
Shobrook	3	4	Tiverton	422	578
Crediton	5	7			

Table 4-2: Watercourses in Mid Devon District

For a map of watercourse locations see Appendix B

KEY			
MR	Main River	EA	Environment Agency

River	Classification	Responsibility	Description
River Taw	MR	EA	Enters the Mid Devon district near Brushford from the slopes of Dartmoor. Flows in a north-eastwardly direction for approximately 6km and then converges with the River Yeo near Nymet Rowland. It flows through the villages of Chenson, Eggesford and Chawleigh Week Mill before leaving the Mid Devon district at Bridge Reeve. The River Taw converges with the Little Dart River at Bridge Reeve.
River Exe	MR	EA	Flows south-east from its source on Exmoor and enters the Mid Devon district near Exebridge. The River Exe flows southwards through Oakfordbridge, Cove, Bolham, Cotleigh, Tiverton, Bickleigh and Chitterley before leaving the district near Thorveton.
River Batherm	MR	EA	Flows from its source approximately 2.5km to the north of the district through Shillingford and Bampton. It converges with the River Exe approximately 8km north of Tiverton. The River Batherm is joined by the Shuttern Brook at Bampton.
Shuttern Brook	MR	EA	The Shuttern Brook is classed as ordinary watercourse from its source near Withywine Farm in the north of the District to the culvert under Blight's Hill Road. From this culvert it is classed as Mained River, flowing parallel to the B3190, through Bampton, before joining the River Batherm near Brook Street.
River Lowman	MR	EA	The north-east part of the district is drained by the River Lowman. The river flows eastwards from its source, approximately 2km west of Huntsham, through the village and into the parish of Uplowman. It converges with the River Exe in Tiverton town centre. Little Gornhay Stream, Aisla Brook and Moorhayes Stream are tributaries of the River Lowman.
Cottey Brook	MR	EA	The Cottey Brook is a small tributary of the River Exe. Its source is in Hensleigh Wood, approximately 2km west of Tiverton town centre. It flows north-eastwards and converges with the River Exe south of the Walronds Housing estate. Approximately 230m of the Cottey brook is culverted under a former bottling factory.
River Creedy	MR	EA	Formed near Upton Helions by the convergence of Binneford Water and Holly Water. Flows in a south-eastern direction and converges with the River Yeo approximately 3km south-east of Crediton. The Creedy then flows in a south-east direction through Newton St Cyres before leaving the district

River	Classification	Responsibility	Description
			approximately 1km to the south-east of Half Moon village.
River Yeo	MR	EA	The River Yeo has a number of tributaries, including the Colebrooke Watercourse, the River Troney, River Culvery and Yeo Tributary North. The Yeo Tributary North converges with the River Yeo in the village of Fordton.
River Culm	MR	EA	Flows in a south-westerly direction from its source in the Blackdown Hills and enters the Mid Devon district near Brimley Hill. It then continues south-westwards and flows through Hemyock, Culmstock, Uffculme and Cullompton, before leaving the Mid Devon district near Hele. Tributaries of the River Culm include the Spratford Stream, Halberton Stream, River Ken, Crow Green Stream, Cole Brook and River Weaver. In the 1960's, the M5 motorway was built on the floodplain of the River Culm. To compensate the loss in floodplain storage, a flood relief channel was constructed to the east of the motorway embankment between Junctions 27 and 28. This flood relief channel is 1.1km long and varies in width between 30m and 60m.
River Ken	MR	EA	The River Ken is classed as ordinary watercourse upstream of Stoneyford; at Stoneyford the watercourse is classed as Mained River, flowing past the village before joining the River Culm at Honiton Road.

4.4 Flood defences, assets and structures

A high-level review of formal flood defences was carried out for this SFRA including an assessment of their condition. Details of the flood defence locations and condition were provided by the Environment Agency for the purpose of preparing this assessment. No information was provided on the current standard of protection provided by flood defences; however, the 2009 SFRA states that the majority of flood defences in Mid Devon have a standard of protection of 1 in 75 years or less.

A summary of the grading system used by the Environment Agency is provided in Table 4-3.

Table 4-3: Defence asset condition rating

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the assets.
3	Fair	Defects that could reduce performance of assets.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required
5	Very Poor	Severe defects resulting in complete performance failure.
Source: Condition Assessment Manual – Environment Agency 2006		

The majority of flood defences are located around seven main locations. These locations are the following:

- Tiverton
- Cullompton
- Bampton
- Culmstock
- Uffculme
- Fordton
- Exebridge

Further details on the flood defences at the seven locations listed above are summarised on the following pages.

4.4.1 Tiverton

Figure 4-2 shows that the majority of flood defences in Tiverton are situated along the River Exe and River Lowman. The flood walls through the urban areas of Tiverton are maintained by the Environment Agency and are classed as either “good” or “fair” condition. These walls protect houses along the A3126 and Exeter Road, St Andrew’s Street, West Exe North and the factory at Leat Street. In the north of Tiverton there is an embankment maintained by the Local Authority and a private consortium, protecting the hospital. This embankment has a condition class ranging from “good” to “fair”. There are formal defences along the River Lowman through Tiverton that were constructed in the mid 1980’s, comprising mainly of channel improvements and some short lengths of flood wall. There are also defences in the east of Tiverton protecting the business park off Heathcoat Way. These defences were promoted by Devon County Council in the 1980s. Devon County Council own part of the River Corridor but the raised defences are under private ownership. In 2014, the Environment Agency and several businesses on the Heathcoat Business Park upgraded the defences with new walls and the raising of embankments, partly funded by Devon County Council and Mid Devon District Council.

4.4.2 Cullompton

Flood defences in Cullompton consist of a combination of flood walls and embankments, maintained by the Environment Agency, with the exception of an embankment, near Cullompton School and Sports Centre, which is maintained by the local authority. All the defences in Cullompton are classed as “Good” condition.

A flood relief channel on the River Culm was built in the 1960s to compensate for the resulting loss of floodplain storage due to construction of M5 motorway. This channel is located east of the motorway embankment between Junctions 27 (Tiverton) and 28 (Cullompton), and rejoins the River Culm just downstream of the Duke Street road bridge.

Figure 4-2: Tiverton Flood Defences

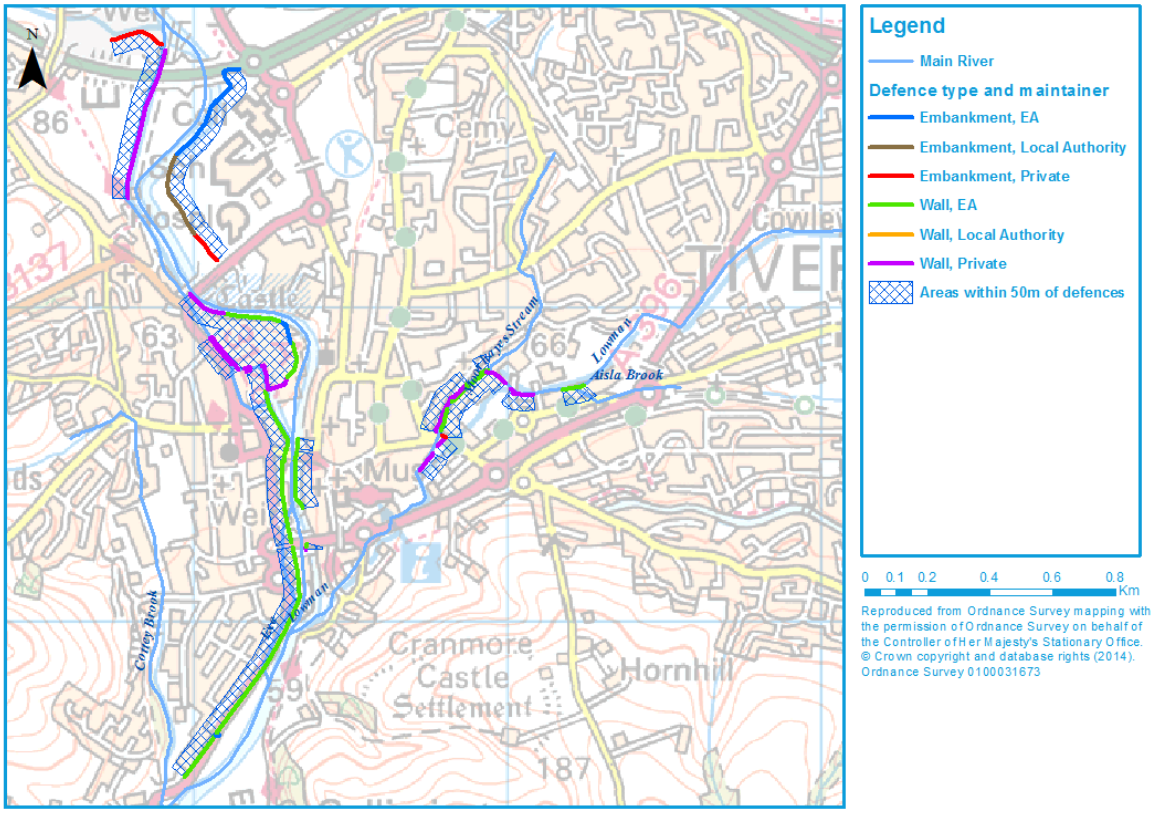
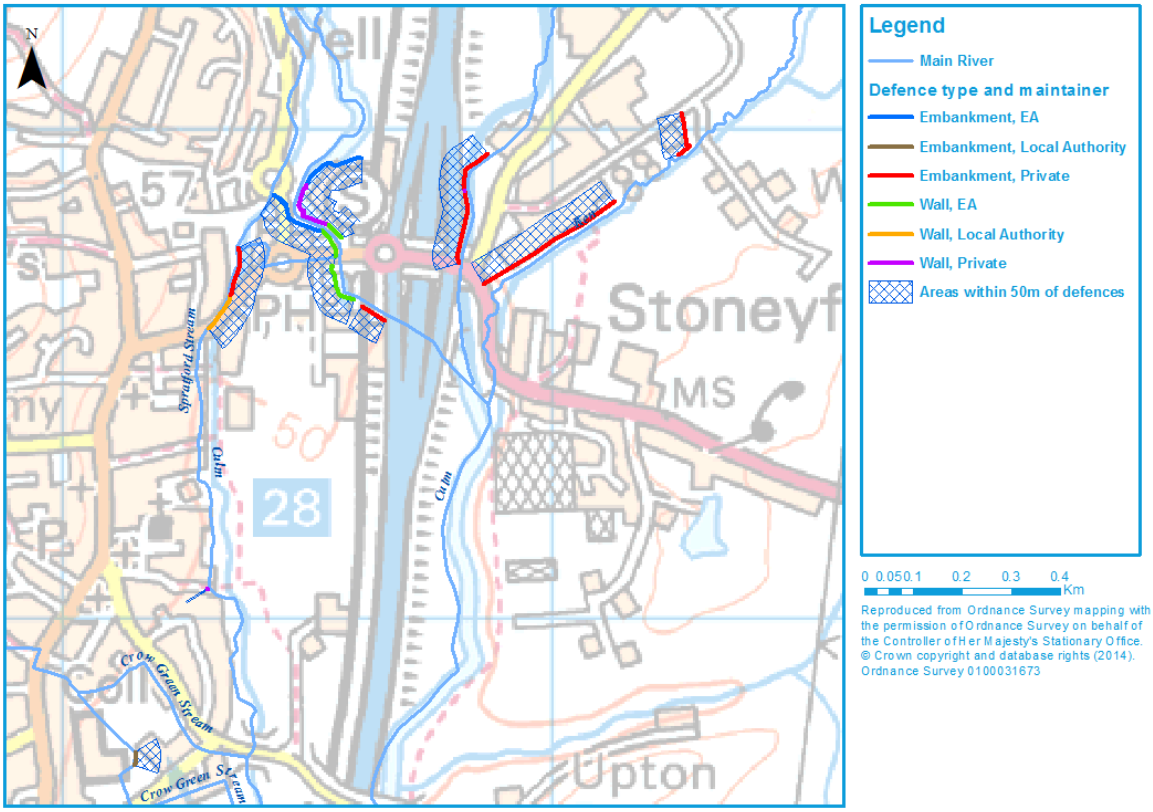


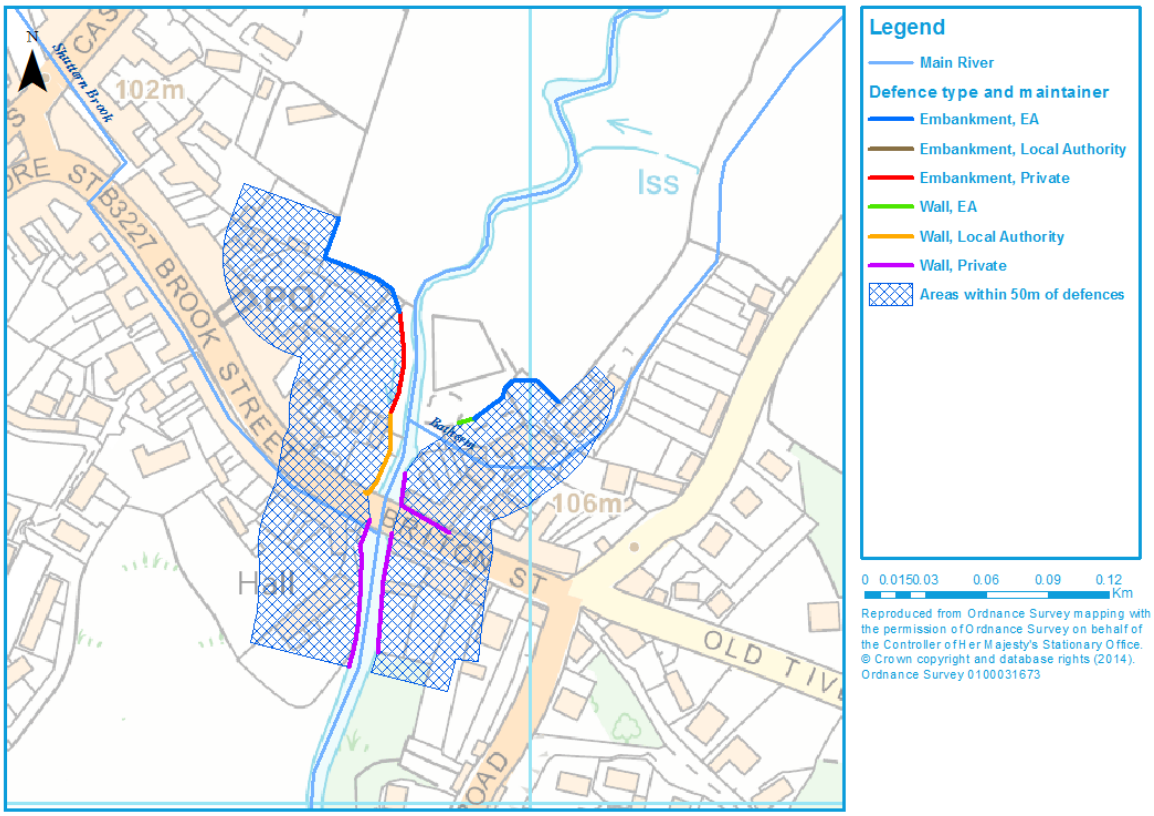
Figure 4-3: Cullompton Flood Defences



4.4.3 Bampton

Flood defences on the River Batherm were constructed in Bampton in 2006 (Figure 4-4). A wall, maintained by the local authority, was built on the right bank at Brook Street. An embankment, maintained by the Environment Agency, is located on the right bank behind properties off Britton Street. Both defences have a condition class of “good”.

Figure 4-4: Bampton Flood Defences



4.4.4 Culmstock

Flood defences in Culmstock consist of an embankment on the left bank of the River Culm as it flows parallel to Blackwater road, and a flood wall on the left bank as the river flows parallel to The Strand (Figure 4-5). Both defences are maintained by the Environment Agency and have defences condition classes of “Good” and “Fair” respectively.

4.4.5 Uffculme

Flood defences in Uffculme consist of an Environment Agency maintained embankment and wall on the right bank of the River Culm, protecting properties at Mill Street (Figure 4-6). Both defences have a condition class of “Good”. There are also some private defences downstream of Bridge Street which protect industrial land. These defences consist of an embankment and flood wall.

4.4.6 Fordton

Flood defences at Fordton consist predominantly of an embankment on the left bank of the River Yeo (Creedy), protecting properties on Four Mills Lane. There is also a shorter section of flood wall between the embankment and Four Mills Lane (Figure 4-7), as well as flood arches situated next to the original road bridge. The defences are maintained by the Environment Agency and have a condition class of “Good”.

4.4.7 Exebridge

Flood defences in Exebridge consist mainly of an Environment Agency maintained embankment, which runs along the B3222 from Rose Cottage to Exe Bridge. At Exe Bridge there is a local authority maintained wall between the embankment and the River Exe (Figure 4-8).

The condition of the embankment is variable, with condition classes ranging from “Good” to “Poor”. The condition of the flood wall is classed as “Good”.

Figure 4-5: Culmstock Flood Defences

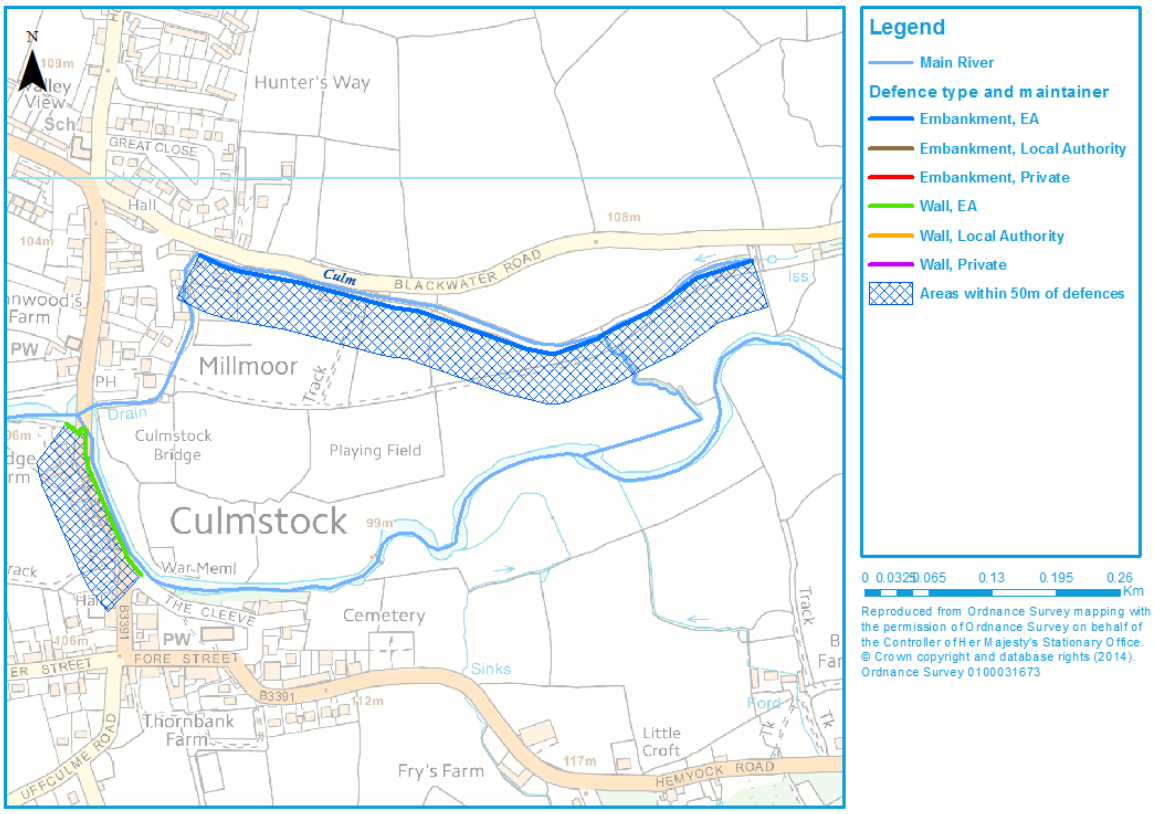


Figure 4-6: Uffculme Flood Defences

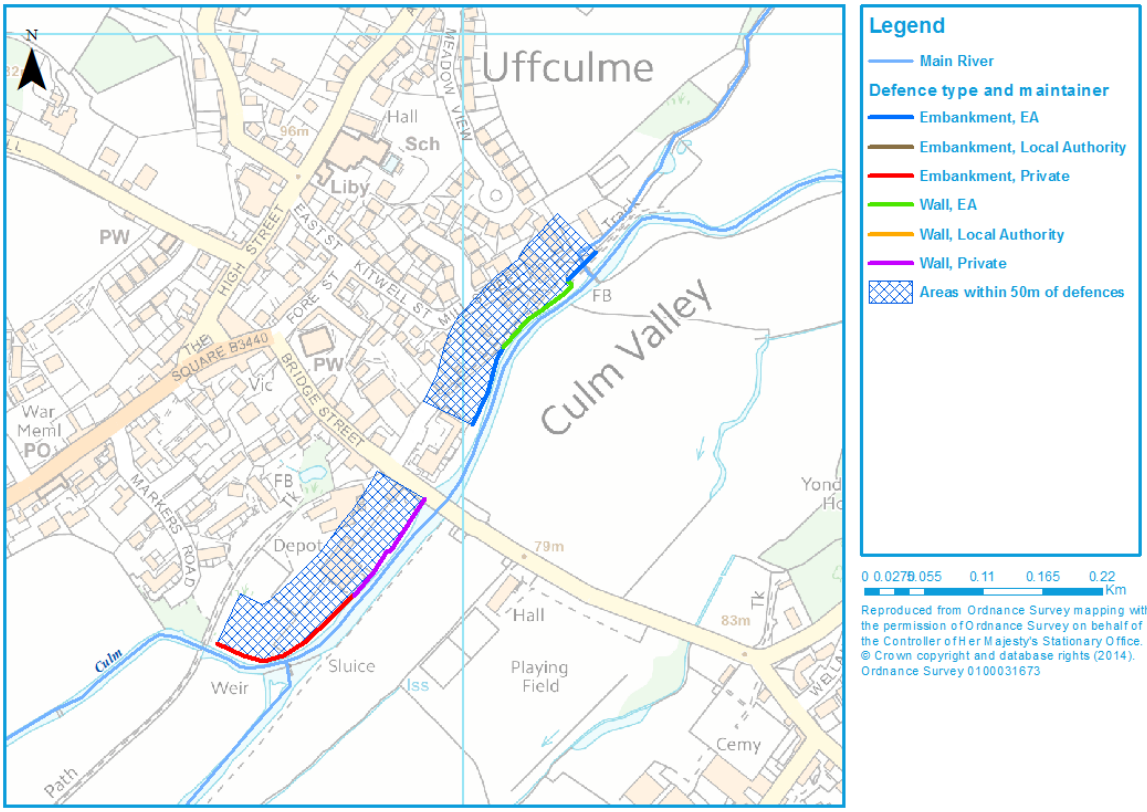


Figure 4-7: Fordton Flood Defences

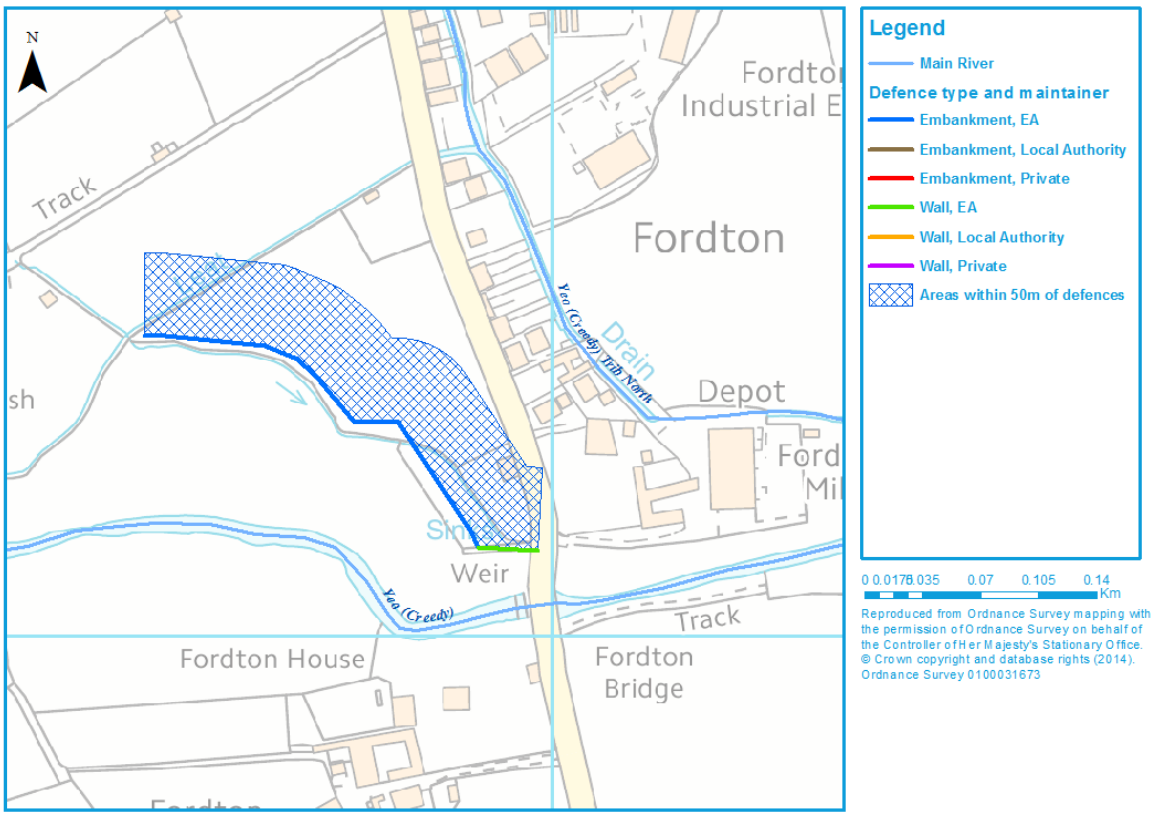
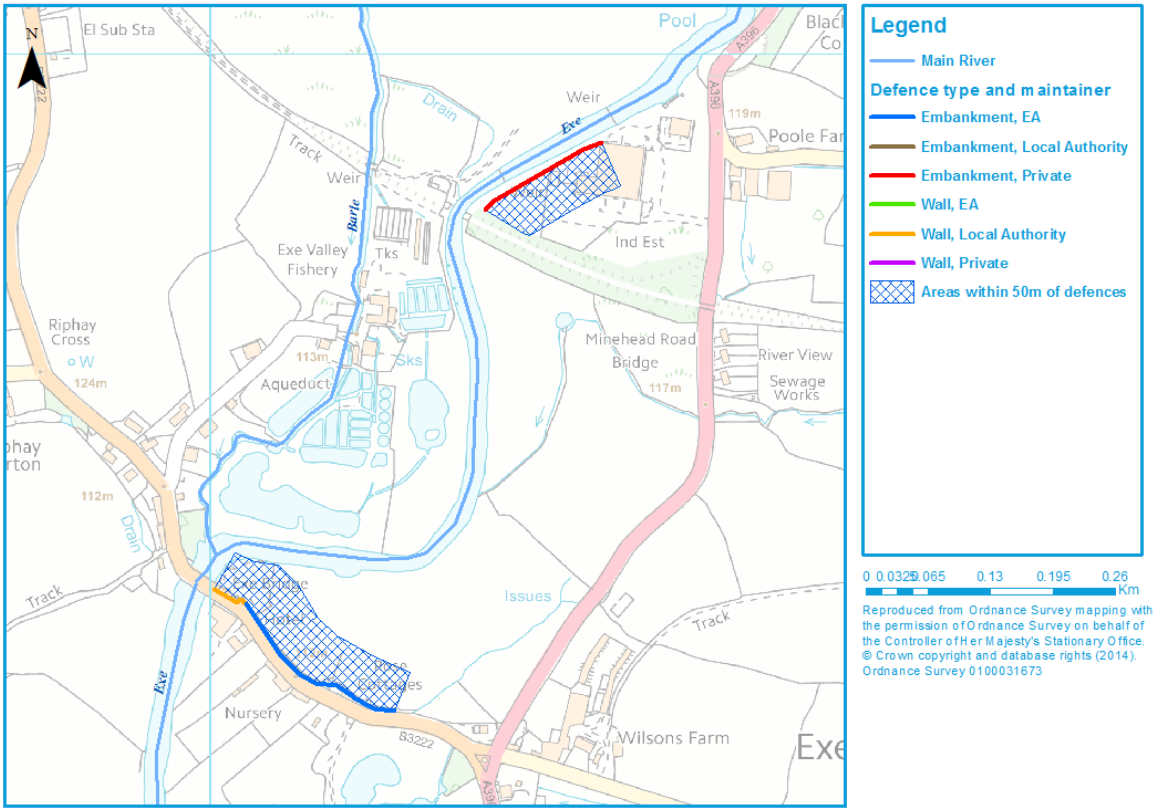


Figure 4-8: Exebridge Flood Defences



4.5 Surface water flooding

Flooding from surface water runoff is usually caused by intense rainfall that may only last a few hours and usually occurs in lower lying areas, often where the drainage system is unable to cope with the volume of water. Surface water flooding problems are inextricably linked to issues of poor drainage, or drainage blockage by debris, and sewer flooding.

The geology of the Mid Devon District has areas underlain with clay deposits. Extensive areas of clay and undulating topography results in catchments the District responding quickly to rainfall events and therefore increases the risk of surface water flooding. In addition, areas with an abundance of impervious surfaces may also be at risk of surface water flooding, especially when local intense rainstorms occur. Any site-specific FRA would need to adequately assess the risk from surface water flooding; not only at the site but to also ensure there is not an increased risk of flooding to areas downstream. Further information on surface water flooding and mitigation measures is provided in Section 9.

4.6 Groundwater flooding

In comparison to fluvial flooding, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. There is currently no one organisation with responsibility to respond to groundwater flooding, therefore the risks and mechanisms of groundwater flooding are poorly reported. However, under the Flood and Water management Act (2010), LLFAs have powers to undertake risk management functions in relation to groundwater flood risk. Groundwater level monitoring records are available for areas on Major Aquifers. However, for lower lying valley areas, which can be susceptible to groundwater flooding caused by a high water table in mudstones, clays and superficial alluvial deposits, very few records are available.

Approximately 14 per cent of Mid Devon lies within a groundwater emergence zone, where groundwater levels could be expected to be at or close to the ground surface during exceptionally wet winters. Parts of Tiverton, Cullompton and Crediton are included in this groundwater emergence zone. However, being in a groundwater emergence zone does not necessarily mean that groundwater flooding will be a problem in these areas. There have been three reports of groundwater flooding in Mid Devon, but the direct source was not identified and therefore it may be that flooding was caused by a burst underground pipe rather than flooding from hard rock aquifers or superficial deposits. Developers planning to build within groundwater emergence zones should still investigate whether groundwater flooding is likely to be a problem locally.

The Areas Susceptible to Ground Water Flooding (AStGWf) map is provided in Appendix G. The AStGWf is a strategic scale map showing groundwater flood areas on a 1km square grid. The data was produced to annotate indicative Flood Risk Areas for PRFA studies and allow the LLFAs to determine whether there may be a risk of flooding from groundwater.

The map indicates the proportion of each 1km grid square which geological and hydrogeological condition show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. The dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The AStGWf data should be used only in combination with other information, for example local data or historic data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. The data can however help to identify areas for assessment at a local scale where finer resolution datasets exist.

4.7 Flooding from sewers

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and/or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur in the sewerage system. Infiltration, entry of soil or groundwater into the sewer system via faults within the fabric of the sewerage system, is another cause of sewer flooding. Infiltration is often related to shallow groundwater, and may cause high flows for prolonged periods of time.

Since 1980, the Sewers for Adoption guidelines have meant that most new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that, even where sewers are built to current specification, they are likely to be overwhelmed by larger events of the magnitude often considered when looking at river or surface water flooding (e.g. a 1 in 100 chance of occurring in a given year). Existing sewers can also become overloaded as new development adds to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the District.

Information provided by South West Water suggests that only a few isolated properties have been flooded by sewers. Many of these reports lie within Flood Zones which suggests high river levels may have prevented surface water drains from discharging rather than a problem with the sewer network.

4.8 Flooding from reservoirs, canals and other artificial sources

4.8.1 Reservoirs

Within the Mid Devon district there are no large raised reservoirs. Wimbleball Reservoir is located 3km to the north of the Mid Devon district boundary and therefore failure of this reservoir could affect communities within the district. The reservoir supplies water to Exeter and parts of East Devon. The reservoir is classified as a Category A reservoir, and therefore in the event of dam failure, more than ten lives would be at risk. Further information on flood risk from reservoirs can be found in Section 5.3 or the Environment Agency's website.

4.8.2 Canals

There is one canal in the Mid Devon district, the Grand Western Canal. This was built in 1814 and runs from Tiverton to Lowdswell, via Halberton, Sampford Peverell and Burlescombe. The canal is 18km long and holds an estimated 180,000m^3 of water. There are no locks on the canal and therefore in the event of a canal breach, large volumes of water could be released posing a danger to people, property and the environment.

There is a small watercourse, near Fenacre Bridge, where high flows can enter into the canal, approximately 1km north of Burlescombe. Although this watercourse has a limited catchment area, understanding the interactions of the canal and the watercourse are important to understanding the flood risk in the area.

At present canals do not have a level of service for flood recurrence (i.e. there is no requirement for canals to be used in flood mitigation), although the Canal and River Trust, as part of its function, will endeavour to maintain water levels to control the risk of flooding from canals to adjacent properties. It is important, however, that any development proposed adjacent to a canal be investigated on an individual basis regarding flooding issues and should be considered as part of any FRA.

Further information on flood risk from canals can be found in Section 5.2.

4.9 The impact of climate change

4.9.1 Fluvial flooding

Climate change mapping has been provided for the Mid Devon District in Appendix C as well the site-specific summary tables provided in Appendix A. The effect tends to be a noticeable increase in the mapped flood extent.

However, climate change does not just affect the extent of flooding. It is important to remember that even where extent does not significantly increase; flooding is likely to become more frequent under a climate change scenario. For example, what is currently an event with a 2% probability of occurring in any one year, may increase to say a 5% probability under climate change.

The impact of an event with a given probability is also likely to become more severe. For example depths, velocities, hazard and therefore risk to people will increase. Although qualitative statements can be made as to whether extreme events are likely to increase or decrease over the UK in the future, there is still considerable uncertainty regarding the

magnitude of these changes locally. Further details regarding the uncertainties in predicting the impacts of climate change can be found in

- Environment Agency (2011) Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities. September 2011
- UK Climate Projections (UKCP09)

4.9.2 Surface Water

Climate change is predicted to increase rainfall intensity in the future by up to 30%. This will increase the likelihood and frequency of surface water flooding, particularly in impermeable urban areas, and areas that are already susceptible such as Crediton, Bampton, Culmstock, Bradninch and Hemyock.

4.9.3 Groundwater

The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows is more uncertain. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels more during the summer months.

4.10 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

There are six pre-defined national policies provided in the CFMP guidance and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to cover the full range of long-term flood risk management options in the catchment that can be applied to different locations.

The six national policies are:

1. No active intervention (including flood warning and maintenance). Continue to monitor and advise.
2. Reducing existing flood risk management actions (accepting that flood risk will increase over time).
3. Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
4. Take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change).
5. Take action to reduce flood risk (now and/or in the future).
6. Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

The SFRA will help support the policies for policy units within the Mid Devon District by aiding the Council in identifying where future flood risk management measures may be required.

4.10.1 River Exe CFMP

The Mid Devon District is covered by the River Exe CFMP. The Policy Units of importance to Mid Devon Borough are Policy Units 1, 3, 4 and 7. The SFRA will help support the policies for each unit by aiding the Council in identifying where future flood risk management measures may be required.

Policy Unit 1 (Headwaters and high ground): within this policy unit the CFMP states that Policy 6 applies.

Policy Unit 3 (Tiverton): within this policy unit the CFMP states that Policy 5 applies.

Policy Unit 4 (Cullompton): within this policy unit the CFMP states that Policy 5 applies.

Policy Unit 7 (Mid Exe and Creedy): within this policy unit the CFMP states that Policy 2 applies.

4.10.2 North Devon CFMP

The Mid Devon District is also covered by the North Devon CFMP. The Policy Unit of relevance to Mid Devon District are Policy Unit 3.

Policy Unit 3 (Rural North Devon): within this policy unit the CFMP states that Policy 3 applies.

4.11 Emergency planning in the District

4.11.1 Flood Warning Areas

Flood warnings supplied by the Environment Agency's Floodline Warnings Direct service can be provided to homes and businesses within Flood Zones 2 and 3. Developers should encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.

Figure 4-9: Flood warning codes

	**Flood Alerts** are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advice notice of the possibility of flooding, but before we are fully confident that flooding in Flood Warning Areas is expected.
	**Flood Warnings** warn people of expected flooding and encourage them to take action to protect themselves and their property.
	**Severe Flood Warnings** warn people of expected severe flooding where there is a significant threat to life.
Warnings no longer in force	Informs people that river or sea conditions begin to return to normal and no further flooding is expected in the area. People should remain careful as flood water may still be around for several days.

There are currently six Flood Alert Areas and 20 Flood Warning Areas (FWAs) covering all, or part of, the Mid Devon District. These are summarised in Table 4-4 and Table 4-5. Maps showing the coverage of each FWA are provided in Appendix H.

4.11.2 Multi-agency Flood Response Plan

The 2010 Devon, Cornwall & Isles of Scilly Local Resilience Forum (DCIOS LRF) Multi-agency Flood Plan (MAFP)[10] covers the Mid Devon area. The flood response plan is an 'over-arching' plan based on the identified risk of flooding within the DCIOS LRF area'. It sets out arrangements and provides information for a multi-agency response to a flood or potential flooding incidents affecting the DCIOS LRF area. It aims to facilitate effective response to the threat of flooding by initiating a multi-agency response at the earliest possible stage. It sets out the roles and responsibilities of Category 1 and 2 responders but does not detail the operational responses of individual organisations.

The response plan also informs the public by providing information on what to do before, during and after a flood, and how to prepare property for flooding.

The following 'At Risk' communities and community response plans in the Mid Devon District have been identified in the Response Plan.

[10] LRF Multi-agency Flood Plan (Devon, Cornwall & Isles of Scilly Local Resilience Forum, April 2010, updated March 2011)

- Bampton[11]
- Crediton
- Cullompton
- Hemyock
- Tiverton

The information provided is based on the updated March 2011 DCIOS LRF Flood Plan. The next scheduled update of the plan was due in February 2013. No update was available at the time of publication of this SFRA.

[11] http://www.bampton.org.uk/BTC/Flood-ResponsePlan2013.pdf

Table 4-4: Flood Alert coverage

Flood Alert Code	Flood Alert Name	Coverage
113WABTW10	Lower Exe Area	The Lower River Exe from Tiverton to Exeter, including Bickleigh and Stoke Canon areas
113WAFTW06	Middle Exe Area	The Middle River Exe from Exebridge to Tiverton and the Rivers Haddeo, Batherm and Lowman
113WAFTW07	Rivers Clyst and Culm and their tributaries	Hemyock, Cullompton, Stoke Canon, Broadclyst and Clyst St Mary areas
113WAFTW11	Mid Devon Rivers	The Rivers Creedy, Creedy Yeo, Little Dart, Lapford Yeo and their tributaries
113WAFTW12	North Dartmoor Rivers	The Upper River Taw from Sticklepath to Newnham Bridge and the River Okement and its tributaries
112WAFRTC	River Tone Catchment	River Tone from Clatworthy Reservoir to Currymoor, the Hillfarrance Brook, the Halsewater Stream and other tributaries in the River Tone catchment

Table 4-5: Flood Warning Coverage

Flood Warning Code	Flood Warning Name	Coverage
113FWF2E1A	River Taw (Upper) from Sticklepath to Taw Bridge	Riverside locations and roads between Sticklepath and Taw Bridge, including Taw Green, Newland Cross, Bondleigh, Taw Bridge, vulnerable parts of North Tawton and the A3072 at Newland Mill
113FWF2E1C	River Taw (Middle) from Taw Bridge to Newnham Bridge	Riverside locations and roads between Taw Bridge and Newnham Bridge, including Coldridge, Chenson, Eggesford, Chawleigh, Bridge Reeve, Colleton Mills and the B3220 at Taw Bridge.
113FWF2G0A	River Yeo (Creedy) from Yeoford to Fordton	Riverside locations and roads between Yeoford and Fordton, including Yeoford, Neopardy, Gunstone, Salmonhutch, Downes Mill and the A377 at Downes Mill.
113FWF2G0B	River Yeo (Creedy) at Fordton	Low lying properties and roads in Fordton, including Fordton Bridge, Fordton Terrace and Fordton Industrial Estate.
113FWF2G1A	River Creedy from Upton Hellions to Cowley	Riverside locations and roads between Upton Hellions and Cowley, including Creedy Bridge (A3072), Half Moon Village, Lower Marsh, Three Horse Shoes, Upton Pyne, and the A377 at Downes Bridge.
113FWF2G2A	River Barle from Simonsbath to Brushford, including Withypool	Riverside locations and roads between Simonsbath and Brushford, including Simonsbath, Withypool, Newbridge, Northmoor Road, Brushford and the B3222 and B3223 at Dulverton.
113FWF2G3A	River Exe (Upper) from Exford to Exebridge, including Winsford and Bridgetown	Riverside locations and roads between Exford and Exebridge, including Winsford, Bridgetown and Exebridge, the B3224 at Exford and the B3223 at Exebridge.
113FWF2G3D	River Exe (Middle) from Exebridge to Tiverton	Riverside locations and roads between Exebridge and Tiverton, including Oakford Bridge, Chain Bridge, Cove, Washfield, vulnerable parts of Bolham, the B3226 at Black Cat and the A396 at Bolham
113FWF2G3E	River Exe (Middle) at Tiverton	Properties and roads in low lying areas of Tiverton, including Bridge Street, West Exe and The Walronds
113FWF2G3F	River Exe (Lower) from Tiverton to Exeter, including Bickleigh	Riverside locations and roads between Tiverton and Exeter, including Bickleigh, Thorverton Mill, Nether Exe, Brampford Speke, Upton Pyne, the A396 and A3072 at Bickleigh and the Exeter to London Paddington railway line.

Flood Warning Code	Flood Warning Name	Coverage
113FWF2G3H	River Exe (Middle) at Bolham	Low lying properties and roads in Bolham, including the A396, The Otters, Beeley Orchard, Hartnoll Hotel and Bolham Primary School.
113FWF2G3I	River Exe (Middle) at Tiverton from Petroc College to Mountbatten Trading Estate	Low lying properties and roads in Tiverton from Petroc College to Mountbatten Trading Estate, including Tiverton High School, Tiverton and District Hospital, Morrisons Supermarket, Kennedy Way, Tiverton Rugby and Football Grounds, Underhill Park Homes
113FWF2G3J	River Exe (Lower) at Up Exe and Thorverton	Low lying properties and roads in Up Exe and Thorverton, including Latchmoor Green
113FWF2G4A	River Culm (Upper) from Hemyock to Cullompton	Riverside locations and roads between Hemyock and Cullompton, including Hemyock, Whitehall, Hayne Barton and Venn.
113FWF2G4B	River Culm (Upper) at Cullompton	Properties and roads in low lying areas of Cullompton, including Station Road, Longbridge Meadow, Alexandria Industrial Estate, Rivermead, Meadow Lane and Knightswood areas.
113FWF2G4C	River Culm (Lower) from Cullompton to Stoke Canon, including Hele	Riverside locations and roads between Cullompton and Stoke Canon, including Woodmill, Hele, Silverton Mills, Rewe, Huxham, the A396 at Stoke Canon, the B3185 at Silverton, and the Exeter to London Paddington railway line
113FWF2G4E	River Culm (Upper) at Culmstock and Uffculme	Riverside properties and roads in Culmstock and Uffculme, including Culmstock Bridge, The Strand and the B3391 at Culmstock, and Bridge Street and Denners Way in Uffculme.
113FWF2G5A	River Batherm at Bampton	Properties around Bampton Bridge and on the B3277 Brook Street and Britton Street, including New Buildings, Manor Mill and Bridge Terrace
113FWF2G6A	River Lowman at Tiverton	Properties and roads in low lying areas of Tiverton, including Tiverton Business Park, Chapel Street, Station Road, Lowman Green, Blundells Road and Tumbling Fields
112FWFTON10A	River Tone from Waterrow to Taunton	Waterrow Bridge to Silk Mills Bridge including Tracebridge, Greenham, Kittisford Mill, Wellisford, Harpford, Tonedale and Lowmoor Industrial Estates, Tone Green, Longaller and other low lying properties and roads

5 Flood risk from canals and reservoirs

5.1 Introduction

The only canal within the Mid-Devon district is the Grand Western Canal. This canal was built to link the Bristol Channel with the English Channel but was never completed. Constructed in 1814, the canal is approximately 18km long and runs from Tiverton to Lowdswell flowing through Halberton, Sampford Peverell and Burlscombe.

The Grand Western Canal was calculated in the 2009 SFRA to hold approximately 180,000m^3 of water. There are no locks along the length of the canal so in the event of a breach it is likely that a large volume of water may escape the canal system.

5.2 Flood risk from canals

Canals do not generally pose a direct flood risk as they are regulated water bodies. The residual risk from canals tends to be associated with lower probability events such as overtopping and embankment failure.

The residual risk associated with canals is more difficult to determine as it depends on a number of factors including, for example, the source and magnitude of surface water runoff into the canal, the size of the canal, construction materials and level of maintenance. The probability of a breach is managed by continued maintenance.

In the Mid-Devon area the Grand Western Canal has no locks and therefore potentially a large volume of water could spill out of canal system in the event of a breach. To counter this Devon County Council has stopboards that can be installed at selected bridge sections to isolate sections of the canal and limit the volume of water escaping the canal in the event of a breach.

In regards to interactions with watercourses there is only one watercourse where high flows can enter into the canal. This is near Fenacre Bridge, approximately 1km north of Burlescombe. There are no other locations where water can overflow into the Grand Western Canal.

5.2.1 Assessing Flood Risk

This SFRA does not assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of flooding need to be considered. If a breach event were to occur then the consequences to people and property could be high. Developers should be aware that any site that is at or below canal bank level may be subject to canal flooding and this should be taken into account when building resilience into low level properties.

Potential breach impact zones have been defined (low, medium, high and very high) based on distance from the canal. They do not take into account local topography or potential flow paths, and are not an indication of likelihood of a breach. These zones are provided in Appendix I.

Only two records of past canal flooding events have been found. A leak in the embankment was noted in 2006 at an unknown location. The embankment was subsequently monitored for one year and was approved safe by Devon County Council Engineering and Design Group[1]. The second flood event from the canal began on 21 November 2012. The breach occurred on the Swing embankment in the vicinity of Shuteslade Farm. The canal was shown to be overtopping the highest part of the embankment to a depth 200mm along a 50-75m stretch. In order to reduce the flow, stop boards were placed at Rock Bridge and Tiverton Road Bridge. By 2.40pm the canal bank had fully breached flooding local farmland. Due to the significant nature of the canal breach Devon County Council has documented the event in a short report which can be found on their website[12].

Devon County Council are currently undertaking a range of studies and improvements on the Grand Western Canal, including a study on why the 2012 breach occurred, what lessons could be learnt and how breaches could be prevented in the future. Outputs for this study were unavailable at the time of the preparation of this SFRA. It is recommended that planners and

12 Report into the breach of the Grand Western Canal Version 0.2 (Devon County Council, Summer 2013) http://www.devon.gov.uk/gwc-report-breach.pdf

developers refer to the Devon County Council study's outputs, when they become available, when considering land for development and preparing site specific flood risk assessments.

5.2.2 Implications for development in Mid Devon District

Previous flood events highlight the importance of understanding flood risk posed from the canal. Any development within the vicinity of the canal will require further, detailed assessment to take account of site specific risks both current and in the future. Additionally, inundation from a canal breach should be included in detailed, site specific, FRAs. This should be based on a more detailed appreciation of the hazard and implication during a flood emergency.

Development of any sites adjacent to the canal will need to consider residual risk as part of a detailed FRA. Any development should be set back seven metres from the canal, providing a buffer strip to 'make space for water' and to allow access for maintenance or repair should it be required.

Potential breach impact zones have been defined (very high, high, medium and low), based on the distance from the canal (see Appendix I).

5.3 Flood risk from reservoirs

The risk of inundation to the Mid-Devon district as a result of reservoir breach was assessed as part of the National Inundation Reservoir Maps (NRIM) study. Reservoirs whose inundation mapping is shown to affect the Mid-Devon district are detailed in Table 5-1

Table 5-1: Reservoirs in the vicinity of the Mid-Devon area

Reservoir	Location (grid reference)	Reservoir owner	Environment Agency area	Local authority
Shobrooke Park Lake	284856 101050	Shelley	Devon & Cornwall Area	Devon County
Wimbleball Reservoir	296442 129403	South West Water Services Ltd	Devon & Cornwall Area	Somerset County

No large raised reservoirs which hold over 25,000m^3 of water above natural ground levels are found within Mid-Devon. However, the Wimbleball Reservoir, located approximately 3km north of the Mid-Devon district is shown on the inundation mapping to affect communities within the District. The Wimbleball Reservoir was built in 1976, damming the River Haddeo, and supplies water to Exeter and parts of Eastern Devon. The previous SFRA has highlighted that this reservoir is classed as a Category A reservoir meaning that more than ten lives would be at risk in the event of a dam failure.

In addition to the Wimbleball Reservoir, the Shobrooke Park Lake is shown in the inundation mapping for Mid Devon. This lake is located to the east of Crediton.

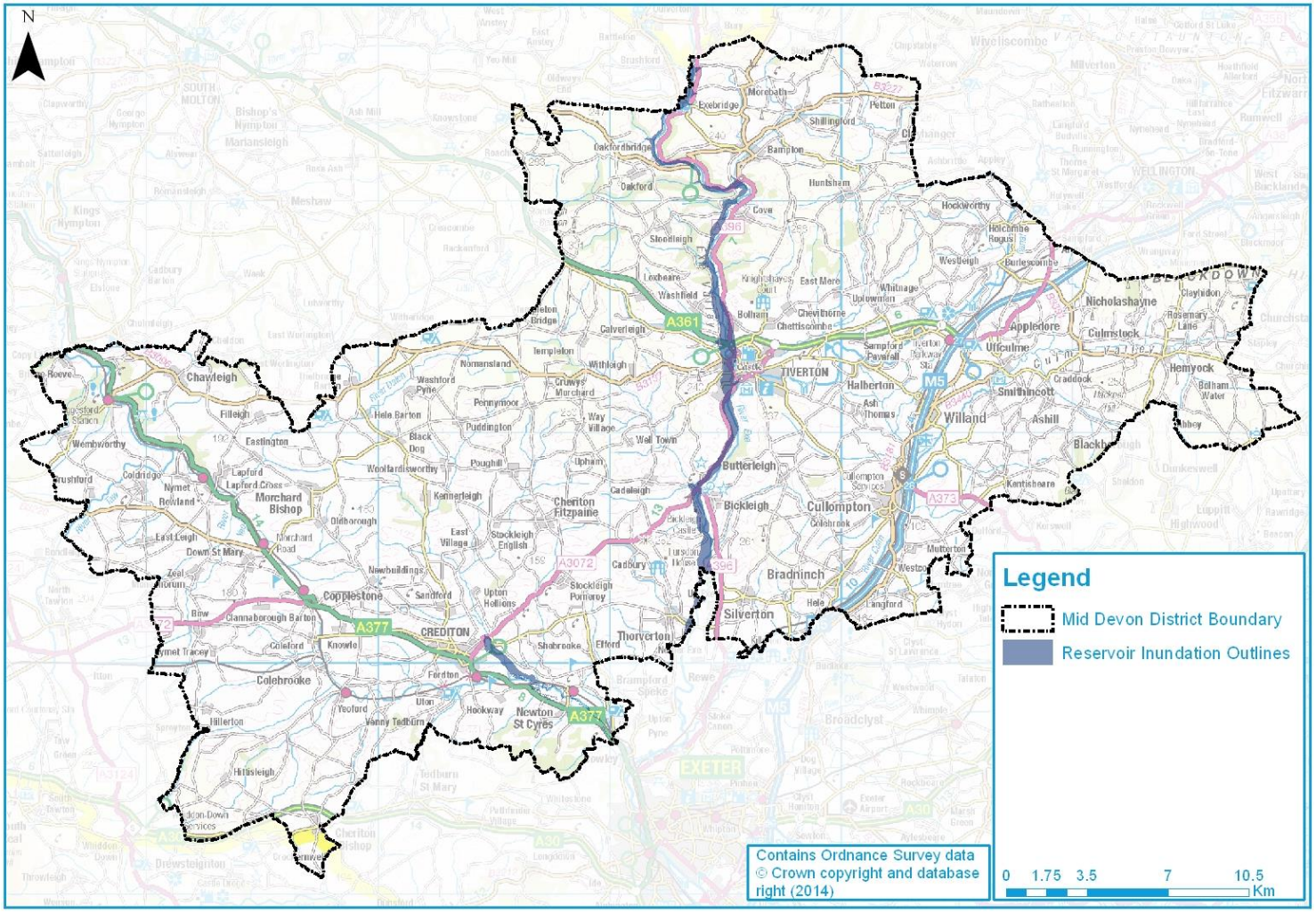
Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is very difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge from floodwaters upstairs as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The Environment Agency maps represent a credible worst case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential. This information is not made available to the public.

The risk to development for reservoirs is residual but developers should consider reservoir flooding during the planning stage.

- Developers should seek to contact the reservoir owner to obtain information which may include
    - Reservoir characteristics: type, dam height at outlet, area/volume, overflow location
    - Operation: discharge rates / maximum discharge
    - Discharge during emergency drawdown
    - Inspection / maintenance regime

- Developers should apply the sequential approach to locating development within the site. The following questions should be considered:
    - Can risk be avoided through substituting less vulnerable uses or by amending the site lay-out?
    - Can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted?
    - Can layout be varied to reduce the number of people or flood risk vulnerability or building units located in higher risk parts of the site?
- Consult with relevant authorities regarding emergency plans in case of reservoir breach

Figure 5-1: Reservoir inundation



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6 Mapping and risk based approach

6.1 Summary of mapping for all sources of flood risk

6.1.1 Fluvial

The data used to prepare the mapping is based on the results from hydraulic models provided by the Environment Agency for the Mid Devon Area. The following datasets have been used for assessing flood risk:

- 2008 JFlow modelling of the River Exe catchment including outlines and depth grids for the 100-year, 200-year and 1,000-year. The 200-year outline has been used to represent climate change, where available.
- Environment Agency Flood Zones: including Flood Zone 2 and 3. This information has been used for the watercourses not covered by the 2008 JFlow modelling of the River Exe catchment.

6.1.2 Surface Water

Mapping of surface water flood risk has been taken from updated Flood Maps for Surface Water (uFMfSW) published online by the Environment Agency in December 2013. This information is based on a national scale map identifying those areas where surface water flooding poses a risk. Flooding is separated into the following four categories:

- **High** – An area has a chance of flooding greater than 1 in 30 (3.3%) each year.
- **Medium** – An area has a chance of flooding between 1 in 100 (0.1%) and 1in 30 (3.3%) each year.
- **Low** – An area has a chance of flooding between 1 in 1,000 (0.1%) and 1in 100 (1%) each year.
- **Very Low** – An area has a chance of flooding of less than 1 in 1,000 (0.1%) each year.

6.1.3 Flood hazard

Based on research undertaken in 2006[13] the calculation of a flood hazard indicator can be used to indicate the flood conditions in which people are likely to be swept over or drown in a flood. The flood hazard is calculated as a combination of flood depth, velocity and the presence of debris. The UK flood hazard formula which was developed as part of the EA/Defra funded research is

$$HR = d*(v+0.5) + DF$$

where HR is flood hazard rating, d is depth of flooding in m, v is velocity of flood waters in m/sec, and DF is debris factor. The debris factor is a value of 0, 0.5 or 1, depending on the probability that debris will significantly increase the flood hazard.

Four categories of flood risk were defined (Table 6-1), which define the basis for flood hazard mapping.

Table 6-1: Categories of flood hazard

	Range	Classification
Flood Hazard values	0 – 0.75	Low hazard - caution
	0.75 – 1.50	Danger for some
	1.50 – 2.50	Danger for most
	2.50 – 20	Danger for all

There is currently no velocity or modelled hazard outputs for the Mid Devon area, and it is beyond the scope of this study to derive them from computer modelling. As a result, assessment of hazard for the purposes of this SFRA update will be based upon flood depth alone. However, it should be noted that these should not be used for the purpose of determining whether a site is,

[13] Flood Risks to People Defra Report FD2321 (2006)

or can be, made safe. Hazard will need to be assessed when more detailed consideration is given to preparing development proposals at the respective sites where development is proposed. This should be done at the planning application stage through a site specific Flood Risk Assessment (FRA). At that time it is likely that more detailed 1D-2D modelling will have to be prepared to enable results with an appropriate level of detail and resolution.

Table 6-2 to Table 6-4 shows the combinations of depth and velocity and their associated hazard rating for a debris factor of 0, 0.5 and 1). The depth mapping produced for this SFRA can provide an indication of hazard. Given that many catchments within Mid Devon are rural with narrow floodplains, where woody debris may be present, the debris factor is likely to be 0.5 or 1. In rural areas that are wooded, or downstream of woodlands, the debris factor is likely to be 1.

In urban areas, the debris factor is higher due to floating debris increasing the flood hazard.

Table 6-2: Hazard rating (debris factor of 0)

		Depth (m)									
		0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**
Velocity (m/s)	**0.00**	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
	0.50	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
	1.00	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
	1.50	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	2.00	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
	2.50	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
	3.00	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
	3.50	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
	4.00	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
	4.50	1.25	2.50	2.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
	5.00	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Table 6-3: Hazard rating (debris factor of 0.5)

		Depth (m)									
		0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**
Velocity (m/s)	**0.00**	0.63	0.75	0.88	1.00	1.13	1.25	1.38	1.50	1.63	1.75
	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
	1.00	0.88	1.25	1.63	2.00	2.38	2.75	3.13	3.50	3.88	4.25
	1.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
	2.00	1.13	1.75	2.38	3.00	3.63	4.25	4.88	5.50	6.13	6.75
	2.50	1.25	2.00	2.75	3.50	4.25	5.00	5.75	6.50	7.25	8.00
	3.00	1.38	2.25	3.13	4.00	4.88	5.75	6.63	7.50	8.38	9.25
	3.50	1.50	2.50	3.50	4.50	5.50	6.50	7.50	8.50	9.50	10.50
	4.00	1.63	2.75	3.88	5.00	6.13	7.25	8.38	9.50	10.63	11.75
	4.50	1.75	3.00	4.25	5.50	6.75	8.00	9.25	10.50	11.75	13.00
	5.00	1.88	3.25	4.63	6.00	7.38	8.75	10.13	11.50	12.88	14.25

Table 6-4: Hazard rating (debris factor of 1.0)

Velocity (m/s)	Depth (m)									
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
0.00	1.38	1.75	2.13	2.50	2.88	3.25	3.63	4.00	4.38	4.75
0.50	1.50	2.00	1.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
1.00	1.63	2.25	2.88	3.50	4.13	4.75	5.38	6.00	6.63	7.25
1.50	1.75	2.50	3.25	4.00	4.75	5.50	6.25	7.00	7.75	8.50
2.00	1.88	2.75	3.63	4.50	5.38	6.25	7.13	8.00	8.88	9.75
2.50	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
3.00	2.13	3.25	4.38	5.50	6.63	7.75	8.88	10.00	11.13	12.25
3.50	2.25	3.50	4.75	6.00	7.25	8.50	9.75	11.00	12.25	13.50
4.00	2.38	3.75	5.13	6.50	7.88	9.25	10.63	12.00	13.38	14.75
4.50	2.50	4.00	5.50	7.00	8.50	10.00	11.50	13.00	14.50	16.00
5.00	2.63	4.25	5.88	7.50	9.13	10.75	12.38	14.00	15.63	17.25

6.1.4 Suite of Maps

All of the mapping can be found in the appendices and is presented in the following structure

- Flood Zones
- Climate change outlines
- Depth/hazard mapping
- Surface water flood risk mapping
- Ground water flooding
- Flood warning coverage
- Defences

6.2 Other relevant flood risk information

The mapping prepared for this SFRA provides information on:

- The extent of flooding,
- The depth of flooding

Note: depth mapping is only available within the extent of the River Exe model where 2D modelling exists.

Other relevant information on flood risk should be referred to by users of this SFRA, where available and appropriate. This information includes:

- River Exe Catchment Flood Management Plan (2012) – Environment Agency
- Devon County Council Preliminary Flood Risk Assessment (2011) – Devon County Council
- Flood Risk Management Plan in accordance with the Flood Risk Regulations (available in 2015) – Environment Agency and Lead Local Flood Authority
- Environment Agency's Asset Information Management System (AIMS) – users should note that recently completed schemes may not yet be included in this dataset.

6.3 The Sequential, risk-based approach

This approach is designed to ensure areas with little or no risk of flooding (from any source) are developed in preference to areas at higher risk, with the aim of the Sequential Test to steer new development to areas of lowest probability of flooding. It is often the case that it is not possible for all new development to be allocated on land that is not at risk from flooding. In these

circumstances the Flood Zone maps (that show the extent of inundation assuming that there are no defences) are too simplistic. A greater understanding of the scale and nature of the flood risks is required.

When deciding on the ability to manage flood risk for new development located in flood zones consideration must be given to a wide range of issues. The issues to be addressed include how any evacuation of the occupants would be handled, how the new development fits in with the existing flood management provision and, in circumstances where flooding is experienced how quickly the wider area would recover and return to normal. At some of the locations it could be found that Flood Risk Management measures are more easily integrated alongside proposed new development to address the flood risk issues, usually as a consequence of the prevailing natural or artificial topography. In these circumstances the Flood Risk Management proposals could be deployed without causing a significant alteration to the design and its place setting. However, even in these circumstances it should be recognised that Flood risk Management Measures at one location can have the potential to cause an alteration to the flood risk to adjacent property or in flood cells on the opposite bank.

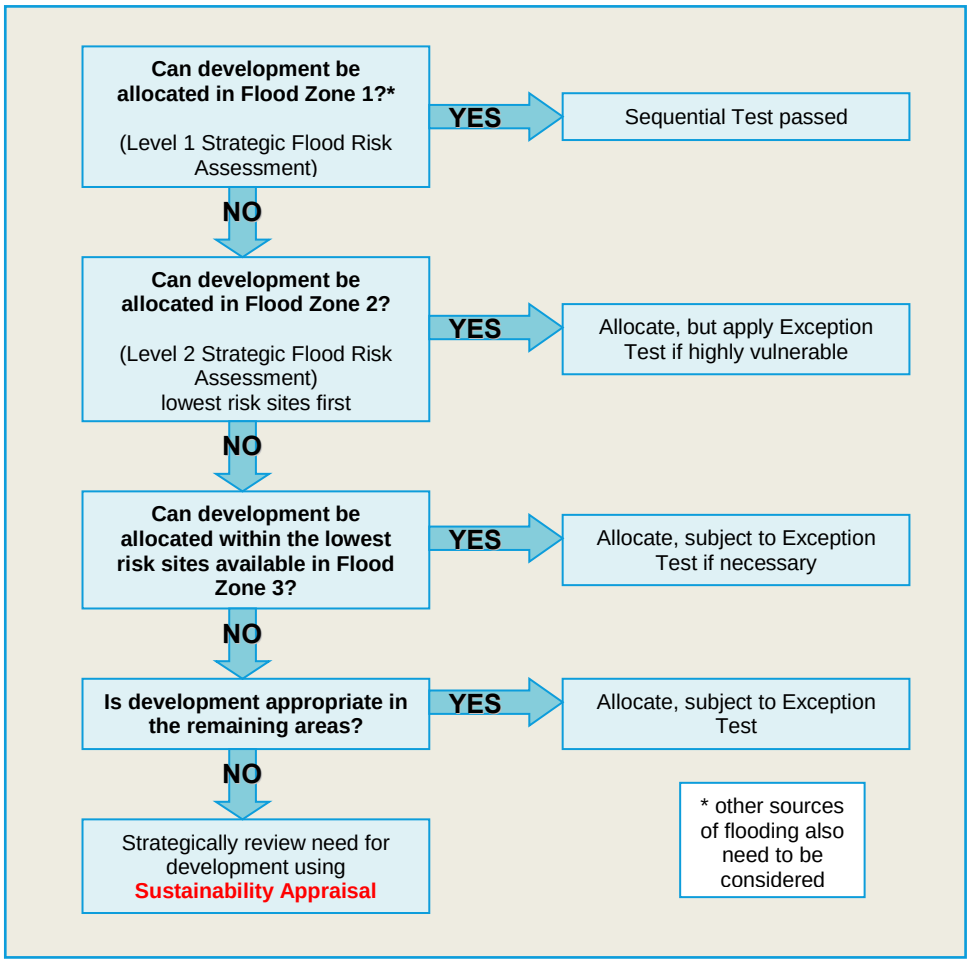
6.4 Applying the Sequential Test and Exception Test in the preparation of a Local Plan

When preparing a local plan, the Local Planning Authority should demonstrate it has considered a range of site allocations, using Strategic Flood Risk Assessments to apply the Sequential and Exception Tests where necessary.

The Sequential Test should be applied to the whole local planning authority area to increase the likelihood of allocating development in areas not at risk of flooding. The Sequential Test can be undertaken as part of a local plan sustainability appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of strategic housing land or employment land availability assessments. NPPF Planning Practice Guidance for Flood Risk and Coastal Change describes how the Sequential Test should be applied in the preparation of a Local Plan (Figure 6-1).

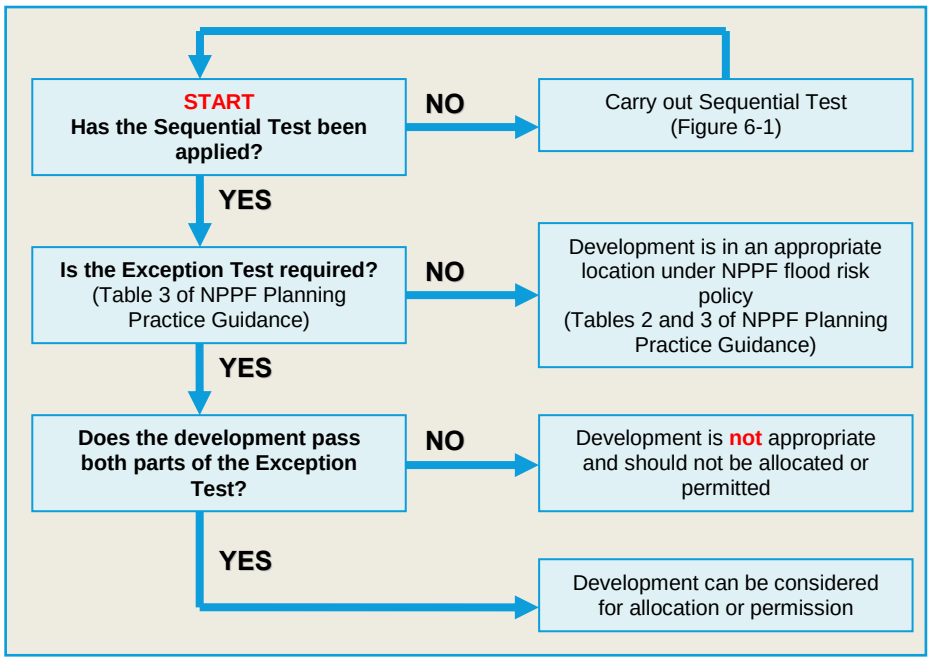
The Exception Test should <u>only</u> be applied *following* the Sequential Test and as set out in Table 3 of the NPPF Planning Practice Guidance: Flood Risk and Coastal Change. NPPF Planning Practice Guidance for Flood Risk and Coastal Change describes how the Sequential Test should be applied in the preparation of a Local Plan (Figure 6-2).

Figure 6-1: Applying the Sequential Test in the preparation of a Local Plan†



† Based on Diagram 2 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 020, Reference ID: 7-021-20140306) March 2014

Figure 6-2: Applying the Exception Test in the preparation of a Local Plan†



† Based on Diagram 3 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 028, Reference ID: 7-021-20140306) March 2014

6.5 Applying the Sequential Test and Exception Test to individual planning applications

Diagram 3 in the NPPF Planning Practice guidance describes how the Exception Test should be applied and is reproduced as Figure 6-2. In addition the Guidance[14] sets out how developers and planners need to consider flood risk to, and from, the development site, following the broad approach of assessing, avoiding, managing and mitigating flood risk. A checklist for Site Specific Flood Risk Assessments is provided in Paragraph 68 of the Guidance.

A site-specific flood risk assessment should be carried out to assess flood risk to, and from a development. The assessment should demonstrate how flood risk will be managed over a development's lifetime, taking climate change and the user vulnerability into account.

The NPPF Planning Practice Guidance sets out the following objectives for a site specific Flood Risk Assessment (FRA). An FRA should establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source
- Whether it 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 required) the Sequential Test
- Whether the development will be safe and pass the Exception Test (where applicable), taking into account the effects of climate change over the lifetime of the development.

6.5.1 Sequential Test

The Sequential Test must be performed when considering the placement of future development and for planning application proposals. The sequential approach to locating development should be followed for all sources of flooding. The Flooding and Coastal Change Planning Practice Guidance to the NPPF gives detailed instructions on how to perform the test.

The Sequential Test does not need to be applied for individual developments under the following circumstances

- The site has been identified in development plans through the Sequential Test
- Applications for minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site)

The Sequential Test does not normally need to be applied for individual developments under the following circumstances

- Development proposals in Flood Zone 1 (unless the SFRA for the area, or any other recent information, indicates there may be flooding issues now or in the future)

For developments that do not fall under the above categories, local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear, in other cases it may be identified by other Local Plan policies[14]. A pragmatic approach should be taken when applying the Sequential Test.

Local planning authorities, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied, and will need to be satisfied that the proposed development would be safe and not lead to increased flood risk elsewhere.

The information provided in this SFRA can be used to

- Identify the area to be assessed (including alternatives) on the Flood Zone Maps that are provided with this assessment;
- Establish the risk of flooding from other sources

14 NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 033, Reference ID: 7-056-20140306) March 2014

- Follow the instructions given in the Planning Practice Guidance.

6.5.2 Exception Test

If, following application of the Sequential Test, it is not possible for the development to be located in areas with a lower probability of flooding then the Exception Test must be applied, if appropriate. The aim of the Exception Test is to ensure that more vulnerable property types, such as residential development can be implemented safely and are not located in areas where the hazards and consequences of flooding are inappropriate. For the Test to be satisfied, both of the following elements have to be accepted for development to be allocated or permitted:

1. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared

   Local planning authorities will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied, and provide advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the local planning authority should consider whether the use of planning conditions and/or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused[15].

2. A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

   The site specific flood risk assessment should demonstrate that the site will be safe and the people will not be exposed to hazardous flooding from any source. The following should be considered[16]

   - The design of any flood defence infrastructure
   - Access and egress
   - Operation and maintenance
   - Design of development to manage and reduce flood risk wherever possible
   - Resident awareness
   - Flood warning and evacuation procedures
   - Any funding arrangements required for implementing measures

The NPPF and Technical Guidance provide detailed information on how the Test can be applied.

6.6 Cumulative impact of development

When allocating land for development, consideration must be given to the potential cumulative impact of the loss of floodplain or flood cell storage volume. The effect of the loss of volume should be assessed, at both the development and elsewhere within the catchment or cell and, if required, the scale and scope of appropriate mitigation should be identified[2]. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk the cumulative effect of multiple developments may be more severe.

Application of the flood risk management hierarchy should be used before measures such as land raising or new defences are considered[2]. Developers should also consider how development can be used to provide flood risk benefits downstream or within a flood cell.

[15] NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 037, Reference ID: 7-056-20140306) March 2014

[16] NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 038, Reference ID: 7-056-20140306) March 2014

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7 Overview of future development

7.1 Review of future development

The Mid Devon Local Plan Review: Options Consultation Document was published in January 2014. The current Core Strategy for Mid Devon was adopted in 2007 and contained targets for the level of development up to 2026. The allocation of land to meet those targets was set out in the Allocations and Infrastructure Development Plan Document (AIDPD) which was adopted in 2010. As the Core Strategy was adopted over six years ago, Mid Devon District Council are reviewing the targets, allocations and policies to reflect latest evidence.

The revised Local Plan describes how the Council have assessed the need for homes taking into account population projections with an assumed interim housing requirement of 8,400 new homes in the district during the plan period (2013 – 2033). A new Strategic Housing Market Assessment (SHMA) has been commissioned to determine the level of housing need and demand, allowing the council to allocate sufficient development sites in the Local Plan Review; as a result the figure of 8,400 dwellings may be revised.

The following market towns are to be the main focus of new development, along with a network of villages with sufficient services and public transport provision that will provide locations for limited development.

- Tiverton
- Cullompton
- Crediton

Site summary tables have been produced for all potential allocations set out in the Site Allocations chapter of the Mid Devon Local Plan Review: Options Consultation Document (2014) and for an additional six sites which were identified through the Local Plan Review consultation process. Each table sets out the following information:

- Site area
- Proportion of the site in each Flood Zone
- Guidance on whether the Exception Test may need to be passed and the possibility for a site to pass the Exception Test. If the Exception Test is not required, information for the planning application stage is provided.
- Mapping including Flood Zones, climate change and surface water
- An broad scale assessment of suitable SuDS techniques and considerations
- The presence of any flood defences
- Whether the site falls within a canal breach zone
- Whether the site is covered by a flood warning service
- Whether there are any access and egress issues for the site
- The potential impacts of climate change in the future
- Advice on the preparation of site-specific flood risk assessments and considerations for developers

Note on Flood Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain). In the absence of detailed hydraulic model information, a precautionary approach can be adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3.

If a site is shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

Note on Flood Zones: Only one detailed 1D-2D hydraulic model was available for this study – the River Exe at Tiverton. The undefended outlines from this hydraulic model were used to

assess flood risk to sites in Tiverton; the remaining sites were assessed using the Environment Agency Flood Zones datasets.

Note on climate change: Where modelling output is not available, the Environment Agency's Flood Zones can provide some indication of areas where rare, more extreme flows might affect the flood plain extents, by comparing Flood Zone 3 with Flood Zone 2. For the purposes of this study, a precautionary approach has been adopted where Flood Zone 2 has been used as a guide to provide an indication of the likely increase in extent of Flood Zone 3 with climate change.

Developers should assess the flood risk implications of climate change to development as part of a detailed Flood Risk Assessment.

7.2 Summary assessment of proposed development allocations

A large number of the proposed allocation sites lie outside of the Flood Zones (see Appendix A.3). Of the proposed sites that do lie within Flood Zones, the majority of More Vulnerable sites only have a relatively small proportion of the site that falls within Flood Zone 3; therefore it is likely that, by applying the sequential approach to site layout, development can be placed outside of Flood Zone 3. If, following the application of the Sequential Test, development pressures create a need to develop areas within the Flood Zone, then the Exception Test would need to be passed. Further details regarding whether individual sites will require the Exception Test, and the requirements for, and potential to pass, the Exception Test, is provided within Appendix A.

Sites highlighted in green are sites where it is likely that all, or part of, the site falls within the Flood Zone 3b (Functional Floodplain). With the exception of Essential Infrastructure and Water Compatible development, no development is permitted in Flood Zone 3b. Essential Infrastructure may be permitted, subject to the Exception Test.

Sites that are 100% in Flood Zone 1 have been excluded from as they do not need to pass the Exception Test. Although it should be noted, that sites greater than 1ha in Flood Zone One will require a flood risk assessment. Further details and recommendations for these sites are provided in the Summary Tables in Appendix A.3.

Outlines of Flood Zone 3b were not available for this study; if a site is currently shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

Sites highlighted in green are sites where it is likely that all, or part of, the site falls within the Flood Zone 3b (Functional Floodplain). With the exception of Essential Infrastructure and Water Compatible development, no development is permitted in Flood Zone 3b. Essential Infrastructure may be permitted, subject to the Exception Test.

Sites that are 100% in Flood Zone 1 have been excluded from as they do not need to pass the Exception Test. Although it should be noted, than sites greater than 1ha in Flood Zone One will require a flood risk assessment. Further details and recommendations for these sites are provided in the Summary Tables in Appendix A.3.

Outlines of Flood Zone 3b were not available for this study; if a site is currently shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

Table 7-1 shows the results of the sequential testing carried out to identify which proposed sites within Flood Zone 2 and 3 are at least risk of flooding. More details of the flood risk to each site is provided in Appendix A.3. Further details on the possibility of sites lying within Flood Zone 2 or 3 to potentially pass the Exception Test are provided within the individual site summary tables in Appendix A.

The scoring for the sequential testing was based on the following criteria.

1. What proportion of the site lies within Flood Zones 2 and 3?

	0	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Score	0	1	2	3	4	5	6	7	8	9	10

2. What proportion of the site lies within Flood Zone 3?

	0	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Score	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Sites highlighted in green are sites where it is likely that all, or part of, the site falls within the Flood Zone 3b (Functional Floodplain). With the exception of Essential Infrastructure and Water Compatible development, no development is permitted in Flood Zone 3b. Essential Infrastructure may be permitted, subject to the Exception Test.

Sites that are 100% in Flood Zone 1 have been excluded from as they do not need to pass the Exception Test. Although it should be noted, than sites greater than 1ha in Flood Zone One will require a flood risk assessment. Further details and recommendations for these sites are provided in the Summary Tables in Appendix A.3.

Outlines of Flood Zone 3b were not available for this study; if a site is currently shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

Table 7-1: Summary of flood risk to all sites

(PP) – sites with planning permission **(PPP)** – sites with partial planning permission

Sites where it is likely that all, or part of, the site falls within the Flood Zone 3b (Functional Floodplain)

a) More Vulnerable

Increasing flood risk ↓ / Increasing suitability for More Vulnerable development ↑

Site Name	Score	Proportion of site in Flood Zone 3	Proportion of site in Flood Zone 2
Land West of Uffculme	1.0	0%	1%
Court Farm, Cullompton (PPP)	1.0	0%	1%
Land at Cromwells Meadow, Crediton	1.0	0%	3%
Land at Blundells Road Halberton	1.5	1%	-
Land North of Culmbridge Farm, Hemyock	1.5	1%	8%
Ware Park and Footlands, Cullompton	1.5	2%	-
Pedlerspool, Crediton	1.5	2%	1%
Wynnards Mead, Tiverton	1.5	3%	-
Eastern Urban Extension, Tiverton	1.5	3%	-
North West of Cullompton (PPP)	1.5	4%	1%
Land adjoining Dulings Meadow, Copplestone	1.5	6%	1%
Westwood Farm, Crediton	1.5	9%	-
Land at Old Butterleigh Road, Silverton	1.5	10%	-
Morrell's Farm, Sampford Peverell	2.5	8%	5%
Farleigh Meadows, Tiverton	2.5	8%	8%
East Cullompton Urban Extension	2.5	10%	1%
Glebe, Cheriton Fitzpaine	3.0	12%	1%
Court Orchard, Newton St Cyres	3.0	12%	5%
Landboat Farm, Cheriton Fitzpaine (b)	3.0	15%	2%
Land at East Culm Farm, Cullompton	3.5	4%	20%
Town Hall, Tiverton	4.5	6%	33%
Knowle Lane, Cullompton (PPP)	4.5	21%	1%
Land at Colebrook, Cullompton	4.5	22%	-
Leat Street, Tiverton	9.0	11%	67%
Blundells School, Tiverton	11.5	62%	18%
Land at the Foundry, Tiverton	15.0	100%	-

b) Less Vulnerable*

Increasing flood risk ↓ / Increasing suitability for Less Vulnerable development ↑

Site Name	Score	Percentage of site in Flood Zone 3	Percentage of site in Flood Zone 2
South of Wellparks, Crediton	1.0	0%	8%
NE Kingsmill, Cullompton	1.5	3%	4%
Lloyd Maunder, Willand	2.5	10%	9%
Week Farm, Cullompton	3.0	12%	7%
Venn Farm, Cullompton	5.0	1%	41%
NW Kingsmill, Cullompton	6.5	9%	42%

* It has been assumed that the proposed development at these commercial sites falls under the less vulnerable category. For sites with mixed use, the overall vulnerability of the site should be that with the highest risk.

c) Essential Infrastructure

Site Name	Score	Percentage of site in Flood Zone 3	Percentage of site in Flood Zone 2
Cullompton Infrastructure (b)	13.5	83%	6%
Cullompton Infrastructure (a)	15.0	99%	1%
Eastern Relief Road	15.0	100%	-

The following sites are not currently shown as being in Flood Zone 2 or 3; however there is an ordinary watercourse running adjacent to, or through, the site, which may potentially pose a risk of flooding. For the purpose of determining sites suitable for allocation, the uFMfSW maps provided in the summary tables can give an indication of the likely flow routes and potential flood extents from these watercourses. At the planning application stage hydrological and hydraulic assessment of the ordinary watercourse will be required to verify flood extent and inform development zoning in the site, allowing location of residential development in areas outside of flood risk. If residential development is unable to be located outside of flood risk areas (1 in 100-year flood) the Exception Test would be required. More details for these sites is provided in the individual site summary tables provided in Appendix A.3.

- Land South of Glen View, Bickleigh
- Glebe, Cheriton Bishop
- Land near the church (a), Cheriton Bishop
- Land off Church Lane, Cheriton Bishop
- Land north of Brakes View, Cheriton Bishop
- Land adjacent to Woodleigh Hall, Cheriton Bishop
- Bewsley Farm Copplestone
- Growen Farm, Cullompton
- Culmbridge Farm, Hemyock
- South West of Conigar Close, Hemyock
- Land South of Sandhurst, Lapford
- Land at Oakford
- Land off Mountain Oak Farm, Sampford Peverell
- Land off Whitnage Road, Sampford Peverell
- East of Hederman Close, Silverton
- Glebe, Silverton
- Livinghayes Road, Silverton
- Land at Hartnoll Farm, Tiverton
- Moorhayes, Tiverton
- Hay Park, Tiverton
- Tidcombe Hall, Tiverton
- Land at Junction 27 and adjoining Willand (a), Willand
- Land at Junction 27 and adjoining Willand (b), Willand

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8 Drainage issues in Mid Devon District

8.1 Environment Agency Critical Drainage Areas (CDAs)

The Town and Country Planning Order 2006 defines Critical Drainage Areas (CDAs) as "an area within Flood Zone 1 which has critical drainage problems and which has been notified...[to]...the local planning authority by the Environment Agency". However, the Environment Agency Standing Advice also recognises the part that SFRAs play in identifying areas with potential drainage problems and in doing so highlighting areas that need a FRA to consider drainage in detail. Certain locations are particularly sensitive to an increase in the rate of surface water runoff and or/volume from a new development. There are generally known local flooding problems associated with these areas.

The Environment Agency consider an area to be a CDA if there is an existing problem and/or history of flooding and where there is significant development pressure upstream. These catchments are typically small and urban in nature. The channels are typically culverted in part and/or have suffered a reduction in capacity.

The Environment Agency has carried out a screening process to determine CDAs and they have identified just one CDA, at Cullompton (see Figure 8-1).

8.2 Areas with potential existing drainage issues.

CDAs are a mechanism to ensure new development does not increase downstream risk. They do not identify existing areas at risk where there is no development pressure.

As part of this SFRA, a broad scale assessment of areas, where there is no development pressure, which may have existing drainage problems has been undertaken. Specific drainage requirements may be required in these areas to help reduce local flood risk. These are areas with possible complex surface water flooding problems that would benefit from further assessment; a Surface Water Management Plan and subsequent drainage strategy may be required.

The SFRA has identified areas where there is a high risk of localised flooding from ordinary watercourses or Mained Rivers including culverts surcharging and overland surface water flows, and the potential for flooding from the sewer network due to failure/blockage or exceedance events when the storm return period is greater than that for which the sewer was designed.

Broad scale screening within the Mid-Devon area was undertaken using data from the following sources:

- Past flooding information from the Devon PFRA
- The updated Flood Map for Surface Water (uFMfSW)
- An assessment of properties at risk based on the uFMfSW
- South West Water DG5 register

The past flooding information was analysed to help identify any areas with possible existing drainage issues throughout the district, regardless of development pressure. It was assumed that where a historical record exceeded an eight metre distance from a watercourse, the event was presumed to be from surface water runoff or by exceeding sewer capacities.

South West Water provided historical flooding records for this SFRA. Details of the sewer network were not available for use in the assessment. The sewer network can have a significant impact on the location of surface water and sewer flooding for more frequent events. It can also affect the distribution of water throughout urban catchments during flood events, passing excess flows from the combined network into watercourses through combined sewer overflows.

8.2.1 Possible areas with existing drainage issues identified in this SFRA

Using the available data described in Section 8.2 possible areas with existing drainage issues, regardless of development pressure, have been identified as part of the SFRA update and are detailed in Table 8-1 and Figure 8-1.

It is seen that without risk based information for sewer networks these areas cover an extensive area. Although the study area is predominately rural, sewer network details such as sewer capacities and drainage direction would help verify and refine information in urban areas. The

areas identified in the SFRA should be confirmed and refined over time as more detailed information on flood risk and local flood management assets becomes available. In addition it should be noted that assessment utilised existing historic flooding data including South West Water's and Devon County Council's past flooding records. These datasets only include reported and known flooding events. There may have been other flood events within the borough that are not included in these datasets and therefore were unavailable for this analysis. The areas suggested here should, therefore, only be taken as a starting point in the identification of potential areas that may have existing drainage issues for which a SWMP may be beneficial.

Note: the areas identified here are not CDAs. They are areas when potential existing drainage problems may exist, regardless of whether there is any development pressure upstream.

Table 8-1: Possible existing drainage issues

Areas with possible existing drainage issues	Reason
Bampton	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Sewer records show flooding in this area Note: this area also lies within the River Batherm Flood Zones – high river levels may have prevented surface water drains from discharging rather than a problem with the sewer network
Bradninch	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Records of past flooding (cause unknown) in Devon County Council records • Sewer records show flooding in this area Note: this area also lies within the River Culm Flood Zones – high river levels may have prevented surface water drains from discharging rather than a problem with the sewer network
Copplestone	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Sewer records show flooding in this area
Crediton	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Records of past surface water flooding in Devon County Council records • Sewer records show flooding in this area
Culmstock	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Records of past surface water flooding in Devon County Council records • Sewer records show flooding in this area Note: this area also lies within the River Culm Flood Zones – high river levels may have prevented surface water drains from discharging rather than a problem with the sewer network
Hemyock	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Records of past surface water flooding in Devon County Council records • Sewer records show flooding in this area
Hornhill, Tiverton	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Sewer records show flooding in this area Note: this area also lies within the River Exe Flood Zones – high river levels may have prevented surface water drains from discharging rather than a problem with the sewer network
South west Tiverton	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Sewer records show flooding in this area Note: this area also lies within the River Exe Flood Zones – high river levels may have prevented surface water drains from discharging rather than a problem with the sewer network
Willand	• SFRA analysis showed that this area is shown to be affected by surface water flooding. • Sewer records show flooding in this area

8.2.2 Recommendation for Surface Water Management

Under the FWMA county councils and unitary authorities have a leadership role in local flood risk management, for which the production of a SWMP may be required. However, unitary and county local authorities can delegate the production of a SWMP to a lower tier. A SWMP is undertaken in consultation with key local partners who are responsible for surface water management and drainage in their area.

Devon County Council, as the lead for local flood risk management, should co-ordinate any future surface water management plans. The Defra Surface Water Management Plan Guidance (2010) supports the use of SFRAs in providing the evidence base for where SWMPs are required.

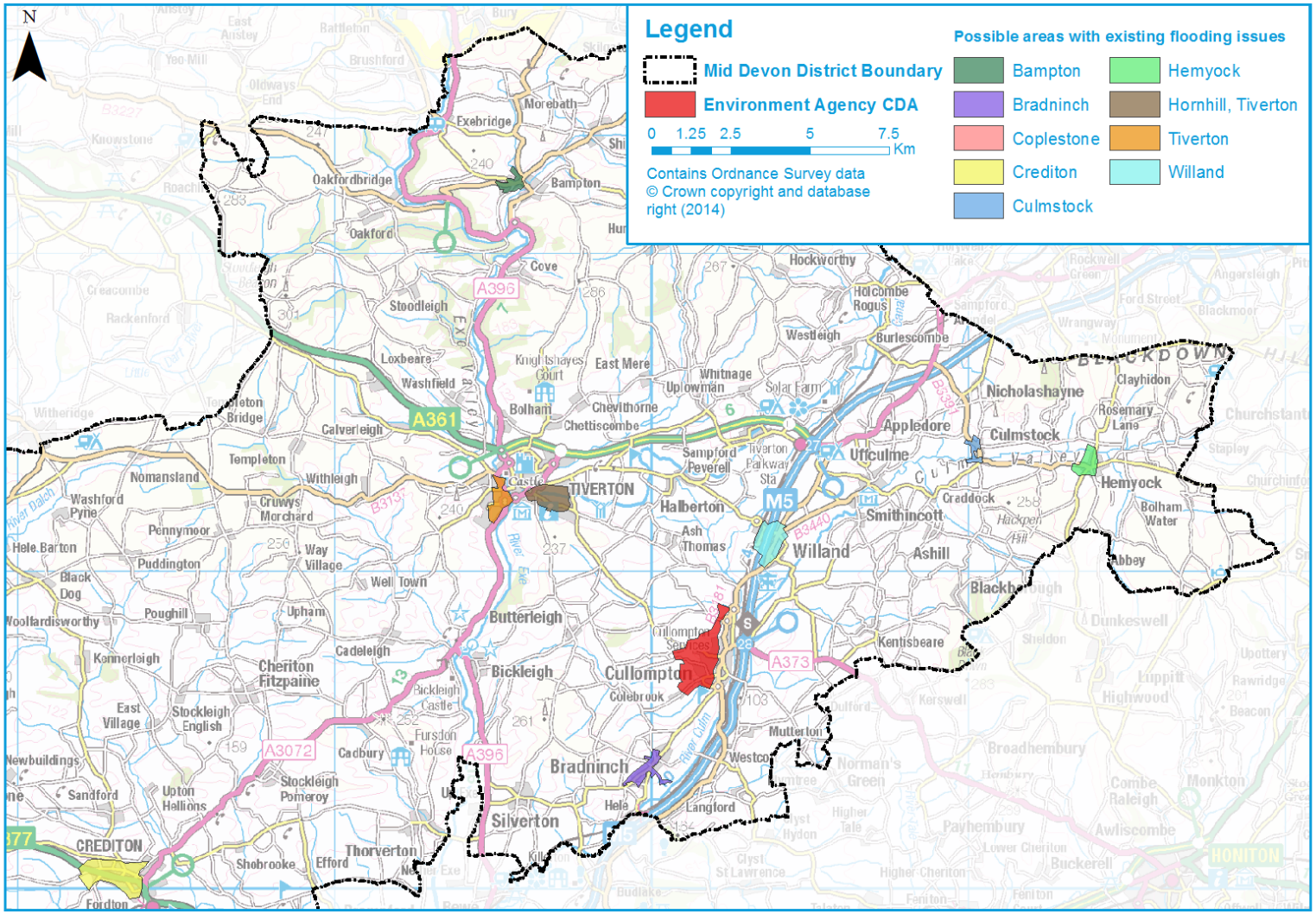
Currently there are no SWMPs covering the Mid Devon area. Mid Devon District Council, the Environment Agency, South West Water and Devon County Council should work closely together to identify any requirement for potential SWMPs where there is a high priority to investigate the impact of surface water on an area. They should identify particular hotspots where surface water solutions can be identified or more detailed modelling is needed.

Surface water management needs to take a holistic approach, taking into account all the sources of local flood risk, including from sewers, overland flow, culverted and open watercourses and groundwater. A suite of options are available for surface water management including source control, such as the implementation of SuDS, increasing the capacity of sewers or watercourses, storing excess water and managing exceedance flows through urban design and "Green Infrastructure". SWMPs provide the opportunity to undertake detailed sewer modelling and pool together the knowledge and understanding from different organisations to help assess options to reduce surface water flood risk to new and existing development.

Where possible there should be an integrated solution for managing surface water across development sites. This is best investigated further through a Drainage Strategy during the detailed FRA stage. Such solutions can provide great benefits besides water management, including providing recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would share a communal facility, such sites may be funded through developer Section 106 or Community Infrastructure Levy payments. Drainage Strategies can be particularly useful for considering, recommending the implementation of, and long term management arrangements for, SuDS and setting appropriate runoff rates from new development.

Further information on surface water management is provided in Section 9.

Figure 8-1: Environment Agency CDA and possible areas with existing drainage issues



9 Managing Surface Water Runoff

9.1 What is meant by Surface Water Flooding?

In the context of this SFRA, the definition of surface water flooding is set out in the Defra SWMP Guidance. Surface water flooding describes flooding from sewers, drains and ditches that occurs during heavy rainfall in urban areas.

Surface water flooding includes the following:

- Pluvial flooding: flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
- Sewer flooding: flooding which occurs when the capacity of underground systems is exceeded, resulting in flooding inside and outside of buildings. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters.
- Overland flows from the urban/rural fringe entering the built-up area, including overland flows from groundwater springs.

Flow interactions between surface water and larger main rivers can be important mechanisms that significantly influence the extent and frequency of surface water flooding. It is therefore important to consider the impact that surface water flows from a development might have on any receiving watercourse.

9.2 Assessment of Surface Water Flood Risk

In order to assess surface water flood risk across the Mid-Devon study area the Environment Agency updated Flood Map for Surface Water (uFMfSW) has been utilised. These maps are designed to help the LLFA, the Environment Agency and developers view surface water flood risk consistently across all of England and Wales and to help focus the management of surface water flood risk.

The updated Flood Map for Surface Water (uFMfSW) predominantly follows topographical flow paths of existing watercourses or dry valleys with some isolated ponding located in low lying areas. They provide a map which is separated into a number of categories which depict different levels of surface water flood risk. This is defined below in Table 9-1.

Table 9-1: uFMfSW categories

Category	Definition
High	Flooding occurring as a results of rainfall with a greater than 1in 30 chance in any given year (annual probability of flooding 3.3%)
Medium	Flooding occurring as a results of rainfall of between 1in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
Low	Flooding occurring as a results of rainfall of between 1in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
Very Low	Flooding occurring as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

Although the uFMfSW offers improvements on previously available datasets the results should not be used to understand flood risk for individual properties but, rather, used for high level assessments such as SFRAs. If a particular site is shown to be at risk from surface water flooding, a more detailed assessment should be considered which can more accurately represent the flood risk on a site specific scale. This should use the uFMfSW in conjunction with other sources of local flooding information to confirm the presence of a surface water risk.

9.3 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are management practices which enable surface water to be drained in a way which mimics, as closely as possible, the run-off prior to site development. The choice of flow management facilities within a single site can be heavily influenced by constraints including (but not limited to):

- Topography
- Geology (soil permeability)
- Available area
- Former site use
- Proposed site use
- Groundwater conditions
- Future adoption and maintenance possibilities

The design, construction and ongoing maintenance regime of such a scheme must be carefully defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential.

For infiltration SuDS techniques it is imperative that the water table is low enough and a site-specific infiltration test is undertaken. Where sites lie within or close to groundwater protection zones or aquifers further restrictions may be applicable, and guidance should be sought from the Environment Agency.

There are many different SuDS techniques which can be implemented. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA).

The inclusion of SuDS within developments should be seen as an opportunity to enhance ecological and amenity value, and promote Green Infrastructure, incorporating above ground facilities into the development landscape strategy. SuDS must be considered at the outset, during preparation of the initial site conceptual layout to ensure that enough land is given to design spaces that will be an asset to the development rather than an after-thought.

Under the Flood and Water Management Act, the SuDS Approval Body will be responsible for approving, adopting and maintaining drainage plans and SuDS schemes that meet the National Standards for sustainable drainage.

All new developments will require planning approval from both the SAB and the local planning authority. The Environment Agency will be a statutory consultee when delivering SuDS for any proposed discharge of surface water into a watercourse. Devon County Council is expected to become the SuDS Approval Body (SAB) when the Schedule 3 of the FWMA 2010 is implemented in 2014.

Local planning bodies should:

- Promote the use of SuDS for the management of run off
- Ensure their policies and decisions on applications support and complement the building regulations on sustainable rainwater drainage, giving priority to infiltration over watercourses, then sewers
- Incorporate favourable policies within development plans
- Adopt policies for incorporating SuDS requirements into Local Development Documents
- Encourage developers to utilise SuDS wherever practicable, if necessary, through the use of appropriate planning conditions
- Develop joint strategies with sewerage undertakers and the Environment Agency to further encourage the use of SuDS

Table 9-2: Example of SuDS Techniques

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Living roofs	✓	✓	✓
Basins and ponds	✓	✓	✓
Constructed wetlands	✓	✓	✓
Balancing ponds	✓	✓	✓
Detention basins	✓	✓	✓
Retention ponds	✓	✓	✓
Filter strips and swales	✓	✓	✓
Infiltration devices	✓	✓	✓
Soakaways	✓	✓	✓
Infiltration trenches and basins	✓	✓	✓
Permeable surfaces and filter drains	✓	✓	
Gravelled areas	✓	✓	
Solid paving blocks	✓	✓	
Porous pavements	✓	✓	
Tanked systems	✓		
Over-sized pipes/tanks	✓		
Storm cells	✓		

9.4 SFRA assessment of potential SuDS

As part of this SFRA, an indication of potential SuDS which can be used for each of the development areas has been undertaken. This is based on catchment characteristics and additional datasets such as the AStGWf map and Soil maps of England and Wales which allow for a basic assessment of the soil characteristics on a site by site basis. The OS Opendata Terrain_50 dataset was used as a basis for determining the topography and average slope across each development site. This data was then collated to provide an indication of particular groups of SuDS system which might be suitable at a site. This should not be used as a definitive guide to which SuDS would be suitable but used as an indicative guide of suitability. Further site specific investigation should be conducted to determine what SuDS techniques could be utilised on a development.

For further details on the SuDS suitability summary please refer to Appendix A.

9.5 Additional Guidance on SuDS

The FWMA establishes a SuDS Approval Body (SAB) at county or unitary local authority levels. For the Mid-Devon area Devon County Council will become a SAB and will have responsibility for the approval of proposed drainage systems in new developments and redevelopments which serve more than one property. The SAB must also arrange for SuDS on private property, whether they are adopted or not, to be designated under the FWMA as features that affect flood risk.

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Level Two Strategic Flood Risk Assessment

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10 Flood defences and critical structures

10.1 Flood defences

The Mid-Devon SFRA presents the risk of flooding from watercourses across the district. It focuses on those areas at greater risk, where strategic development sites have been proposed by the council. The river modelling data used to determine flood risk to these sites is strategic in nature and therefore more detailed studies should seek to refine the understanding of flood risk from all sources where a specific site risk assessment is required.

Consideration of residual risk behind flood defences has been undertaken as part of this study. The residual risk of flooding in an extreme flood event or from failure of defences should also be considered carefully.

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future is an issue that needs to be considered as part of the risk based sequential approach and in the light of this, whether proposed land allocations are appropriate and sustainable. In addition, detailed Flood Risk Assessments (FRAs) will need to explore the condition of defences thoroughly, especially where these defences are informal and contain a wide variation of condition grades. It is important that all of these assets are maintained in a good condition.

Developers should consider the standard of protection provided by defences and residual risk as part of a detailed flood risk assessment.

10.1.1 National Flood Risk Assessment (NaFRA) mapping

Flood defences reduce, but do not completely remove, the risk of flooding. They are built to withstand a flood of a certain magnitude but can be overtopped or fail either in extreme weather conditions or due to poor condition.

The National Flood Risk Assessment (NaFRA) gives an indication, at a national level, of the likelihood, and consequences, of areas of land flooding from fluvial sources. The likelihood of flooding has been calculated using predicted water levels and taking the location, type and condition of any flood defences into account.

The NaFRA maps do not include other forms of flooding such as from highway drains, sewers, overland flow or rising groundwater.

The mapping is classified into four different classes for likelihood of flooding. These classes are shown in Table 10-1.

Table 10-1: NaFRA classifications

NaFRA Class	Description
Very Low	These areas have a chance of flooding of less than 1 in 1,000 (0.1%).
Low	These areas have a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%).
Medium	These areas have a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
High	These areas have a chance of flooding of greater than 1 in 30 (3.3%).

The following set of maps show the NaFRA mapping for the key areas of the Mid Devon district protected by flood defences identified in Section 4.4. Areas where the NaFRA mapping shows high or medium risk behind defences suggests the standard of protection may be lower and the condition poorer, increasing the residual risk.

10.1.2 Tiverton

Figure 10-1: NaFRA mapping at Tiverton

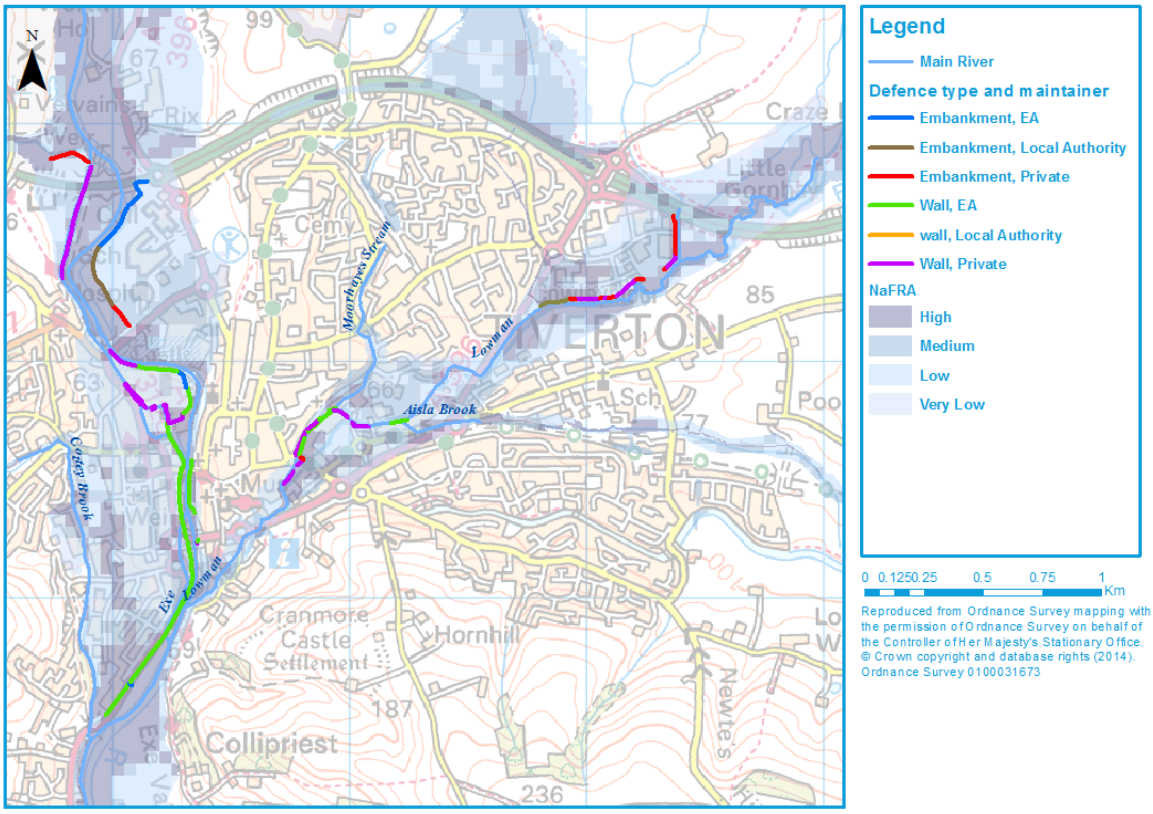


Figure 10-2: NaFRA mapping at Cullompton

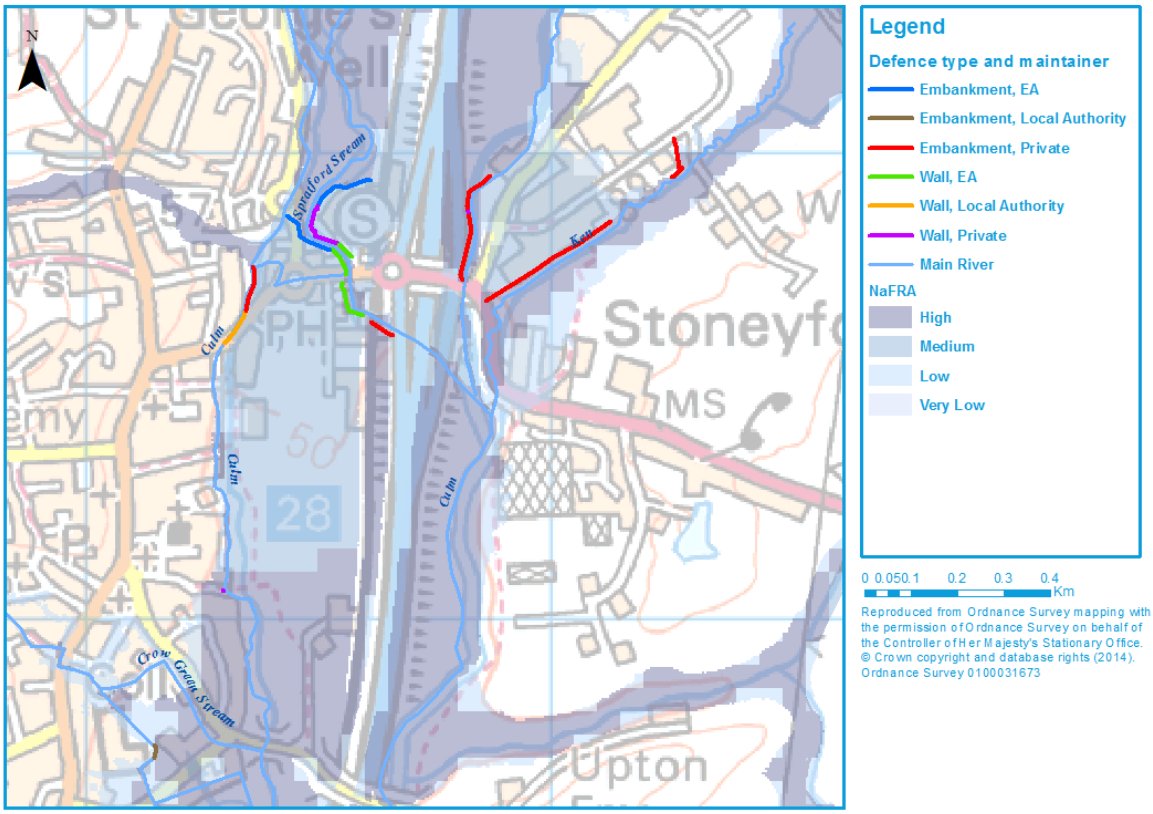


Figure 10-3: NaFRA mapping at Bampton

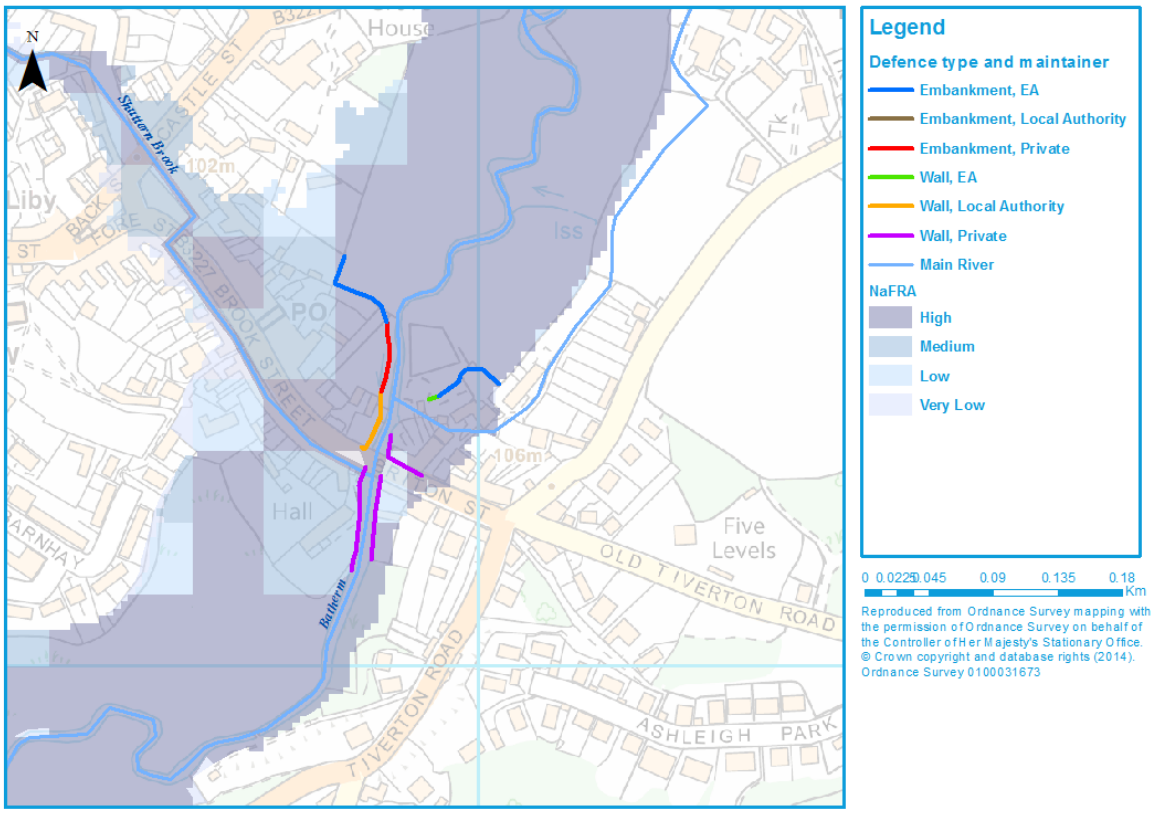


Figure 10-4: NaFRA mapping at Culmstock

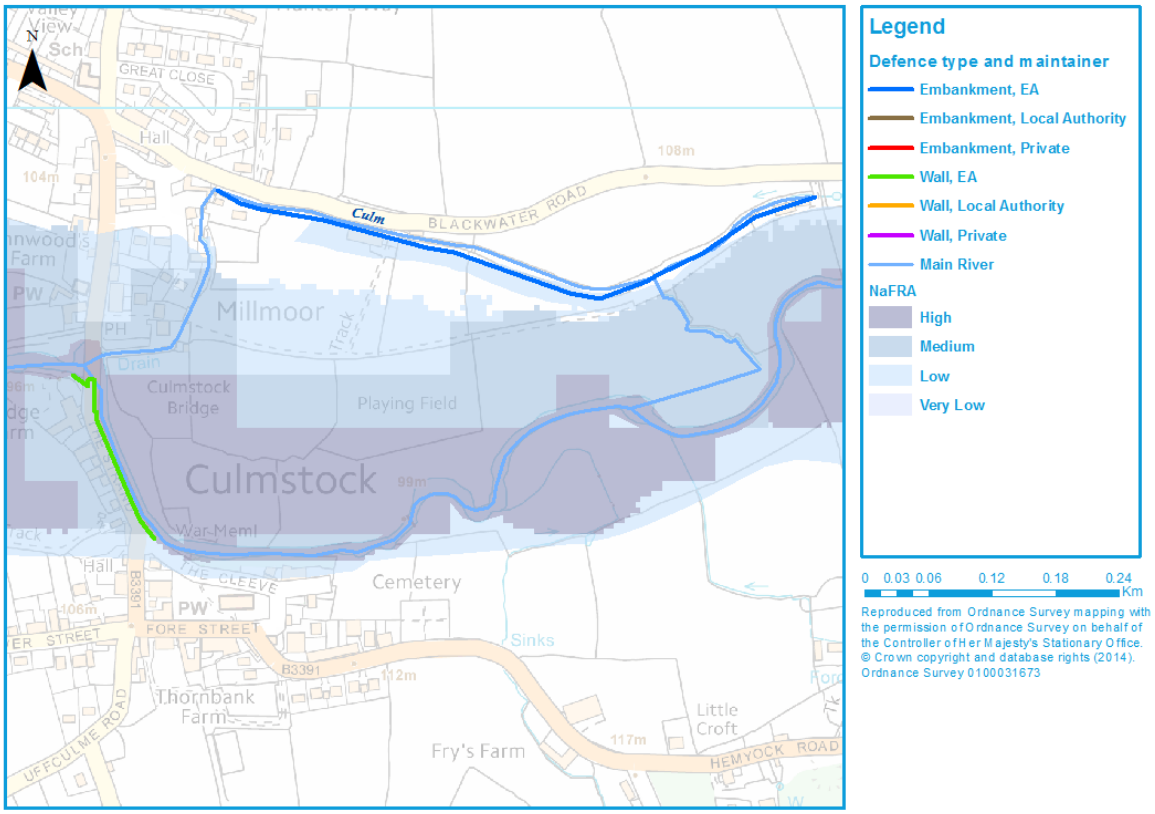


Figure 10-5: NaFRA mapping at Uffculme

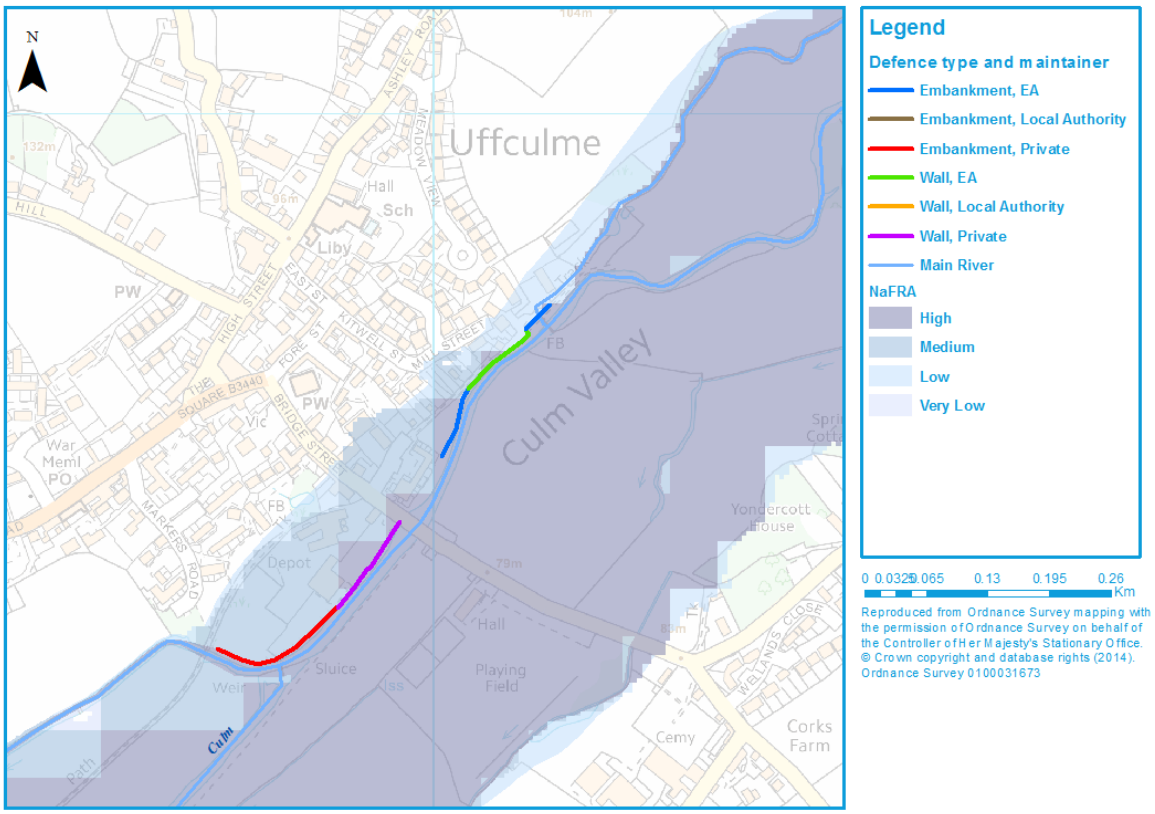


Figure 10-6: NaFRA mapping at Fordton

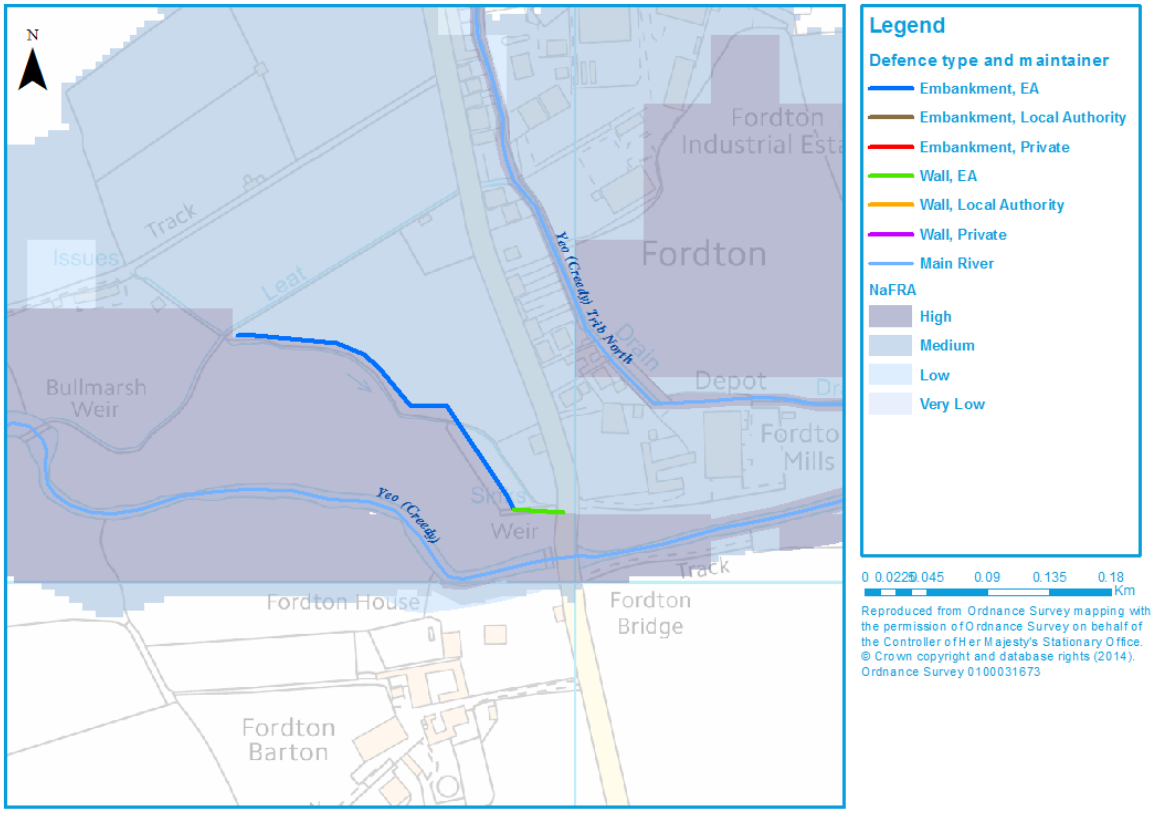
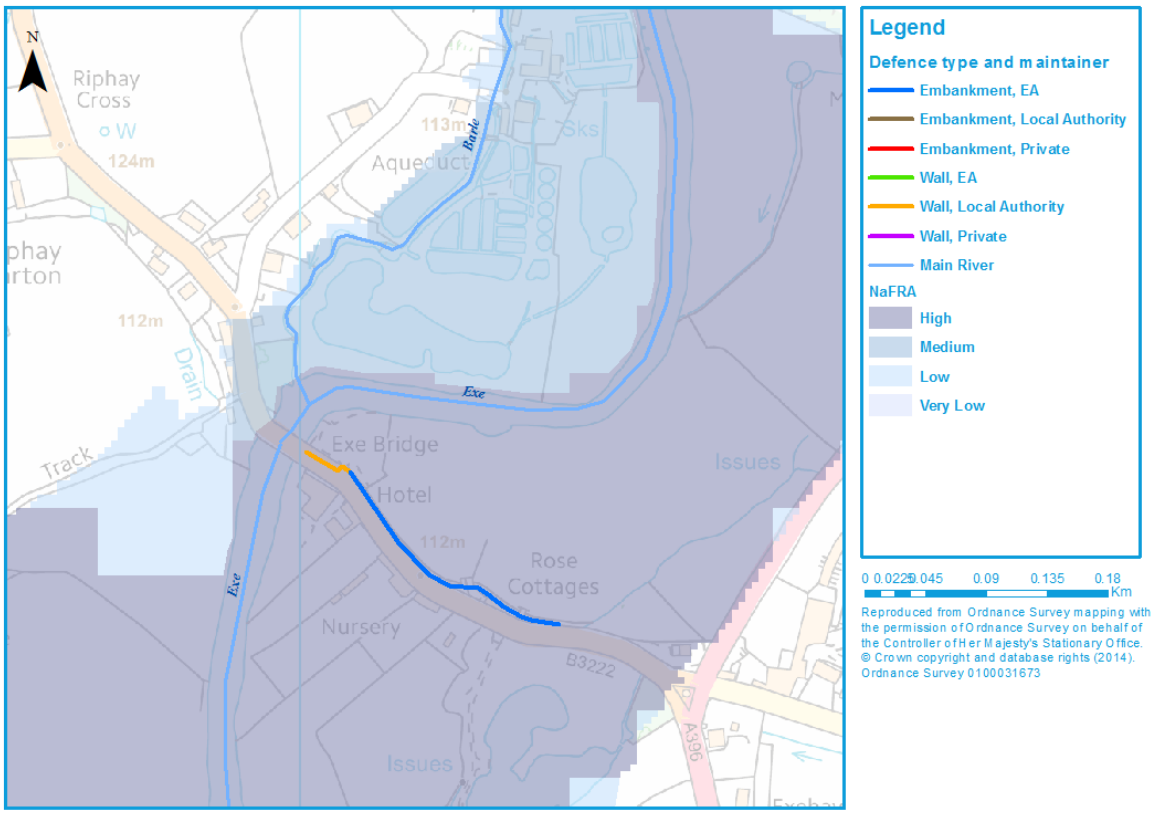


Figure 10-7: NaFRA mapping at Exebridge



10.2 'Critical Structures'

In addition to the Environment Agency's formal flood defence assets, there are other flood risk management (FRM) measures in place in Mid Devon district. These include:

- Council owned assets
- Environment Agency Flood Warning Areas (FWAs)
- Critical structures such as bridges, weirs, culverts and trash screens which may affect local hydraulics and flood risk.

10.2.1 Designation of features/structures

Under the FWMA 2010 EA, LLFAs, district councils, the EA and internal drainage boards have legal powers to "designate" structures and features that affect flood or coastal erosion risk (whether or not it was originally intended to do so) and are not directly maintained by these organisations.

A designation is a legally binding notice served by the designating authority on the owner of the feature and will automatically apply to anyone dealing with the land and to successive owners or occupiers of a particular property or parcel of land[17]

Four conditions must be satisfied to enable a structure or feature to be designated. These are outlined in Table 10-2. If any of the four conditions cannot be met then designation is not possible.

Should a feature/structure be designated the owner should be able to continue to use the structure/feature. They may also alter, remove or replace the structure of feature providing they have the prior consent of the designating authority.

[17] Information Note: Designation of structures and features for flood and coastal erosion risk management purposes (Defra, July 2012)

Table 10-2: Designation conditions

Condition	
1	The designating authority thinks the existence of the structure or feature affects flood or coastal erosion (or both) risk.
2	The designating authority has flood or coastal erosion risk management functions in respect of the risk being affected.
3	The structure or feature is not already designated by another designating authority.
4	The owner of the structure or feature is not a designating authority.

The following factors should also be considered[17].

- An assessment of flood or coastal risk associated with the structure/feature in terms of the consequences of its alteration, removal or replacement.
- Consider the general circumstances of the owner of the structure/feature. (A designating authority may reach an agreement with a third party, with respect to flood risk management, without recourse to a designation.)
    - If the designating authority is confident that the owner is aware of the flood or coastal erosion risk management function that their structure/feature serves then designation may not be relevant
    - If the designating authority is confident that the management, use or treatment of the structure/feature does not give rise to adverse risks then designation may not be relevant.
- Assess the vulnerability of the structure/feature to change or damage
- Assess any need for emergency repairs by the owner or intervention by the designating authority.

Further information on the designating of structures and features can be found in the Defra Information Note: Designation of structures and features for flood and coastal erosion risk management purposes (July 2012).

10.2.2 Critical structures within Mid Devin District

As part of the SFRA, we have prepared an outline assessment of critical structures which may affect flood risk.

In additional to railway embankments and culverts under major roads within the District, critical structures identified in the SFRA include:

- Crow Green Stream culverts under Crow Green and Exeter Hill (Figure 10-8)
- Spratford Stream culverts under the dismantled railway embankment near Willand (Figure 10-9)

It is recommended that the ownership of these structures is identified to determine whether they are owned by a designating authority. Designation is not possible on any structures owned by a designating authority.

For any of the structures/features not owned by a designating authority it is recommended the factors outlined in Section 10.2.1 above should be considered and a more detailed assessment be prepared, if required. The resolution of the assessment possible for the SFRA is less than that required to identify all appropriate features.

Figure 10-8: Potential criticial structures (Crow Green Stream)

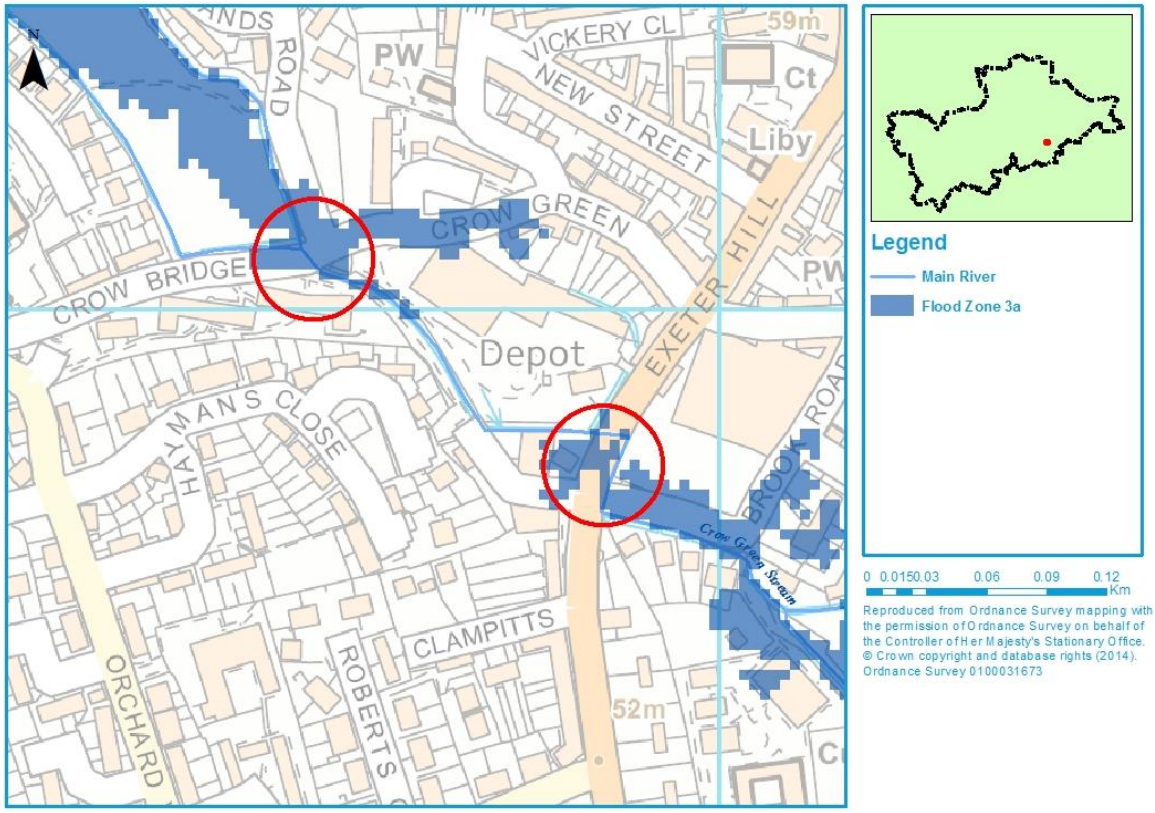
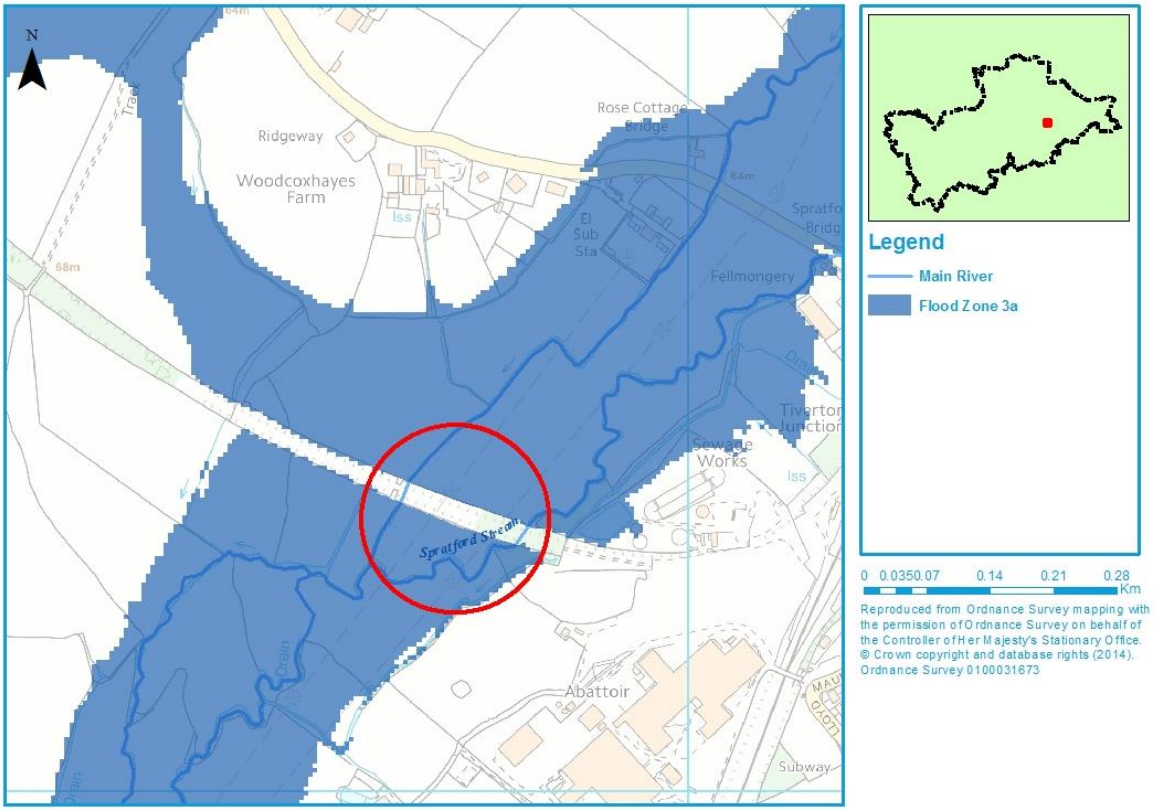


Figure 10-9: Potential criticial structures (Spratford Stream)



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11 Summary assessment of proposed development sites

Flood risk to the proposed strategic site allocations has been assessed and summarised in a series of summary tables proved in Appendix A.

Site summary tables have been produced for potential allocations set out in the Site Allocations chapter of the Mid Devon Local Plan Review: Options Consultation Document (2014) and for an additional six sites which were identified through the Local Plan Review consultation process. Each table sets out the following information:

- Site area
- Proportion of the site in each Flood Zone
- Guidance on whether the Exception Test may need to be passed and the possibility for a site to pass the Exception Test. If the Exception Test is not required, information for the planning application stage is provided.
- Mapping including Flood Zones, climate change and surface water
- An broad scale assessment of suitable SuDS techniques and considerations
- The presence of any flood defences
- Whether the site falls within a canal breach zone
- Whether the site is covered by a flood warning service
- Whether there are any access and egress issues for the site
- The potential impacts of climate change in the future
- Advice on the preparation of site-specific flood risk assessments and considerations for developers

Note on Flood Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain). In the absence of detailed hydraulic model information, a precautionary approach can be adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3.

If development is shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

Note on Flood Zones: Only one detailed 1D-2D hydraulic model was available for this study – the River Exe at Tiverton. The undefended outlines from this hydraulic model were used to assess flood risk to sites in Tiverton; the remaining sites were assessed using the Environment Agency Flood Zones datasets.

Note on climate change: Where modelling output is not available, the Environment Agency's Flood Zones can provide some indication of areas where rare, more extreme flows might affect the flood plain extents, by comparing Flood Zone 3 with Flood Zone 2. For the purposes of this study, a precautionary approach has been adopted where Flood Zone 2 has been used as a guide to provide an indication of the likely increase in extent of Flood Zone 3 with climate change.

Developers should assess the flood risk implications of climate change to development as part of a detailed Flood Risk Assessment.

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12 FRA guidance for developers

12.1 Over-arching principles

The Mid-Devon SFRA focuses on delivering a strategic assessment of flood risk within the area. Prior to development, site-specific assessments will need to be undertaken, as part of the planning application, to ensure all forms of flood risk at a site are fully addressed. In addition, following the Sequential Test, some sites may be put forward for the Exception Test. These will require further work in a detailed FRA. Any site that does not pass the Exception Test should not be allocated for development. It is the responsibility of the developer to provide a FRA with an application. However, a LPA can decide to commission a detailed, site-specific FRA to help them decide upon allocations in the high risk zone. The SFRA cannot provide this level of site-specific information.

It should be acknowledged that a detailed FRA may show that a site is not appropriate for development of a particular vulnerability, or at all. Where the FRA shows that a site is not appropriate for a particular usage, a lower vulnerability classification may be appropriate

12.2 Requirements for flood risk assessments

The aim of a FRA is to determine the risks of flooding and whether or not a specific development proposal meets, or could meet, the policy aims of NPPF. Development proposals requiring FRAs should:

- Apply the Sequential and when, necessary, Exception, Tests
- Not increase flood risk, either upstream or downstream, of the site, taking into account the impacts of climate change
- Not increase surface water volumes or peak flow rates, which would result in increased flood risk to the receiving catchments
- Use opportunities provided by new development to, where practicable, reduce flood risk within the site and elsewhere
- Ensure that where development is necessary in areas of flood risk (after application of Sequential and Exception Tests), it is made safe from flooding for the lifetime of the development, taking into account the impact of climate change
- All sources of flood risk, including fluvial, surface water and drainage need to be considered.

FRAs for proposed developments in the Mid-Devon district area should follow the approach recommended by the NPPF and associated guidance, and guidance provided by the Environment Agency.

12.3 Mitigation measures

In accordance with the Flood Risk Management Hierarchy described in Figure 1-2, mitigation measures should be seen as a last resort to address flood risk issues. Following application of the Sequential Test, consideration should given to minimising risk by planning sequentially across a site. Once risk has been minimised, only then should mitigation measures be considered.

Often the determining factor in deciding whether a particular development is appropriate is the practical feasibility, financial viability and long term maintenance implications of flood risk mitigation rather than technical limitations. Detailed technical assessments are required in the FRA to assess the practical feasibility, together with a commercial review by the developer of the cost of the mitigation works and how contributions will be made for their long term maintenance. At the SFRA stage, broad assumptions must be made regarding the feasibility of flood risk mitigation to highlight sites with greater development potential. The formulation of measures that not only provides an appropriate standard of protection to new development, but also reduces the risk to existing communities will be an important consideration.

Attention must also be paid to the provision of safe access and egress during flood events including climate change and how this is linked to flood warning and emergency evacuation

where necessary. The Emergency Services and local authority should be consulted on the evacuation and rescue capabilities and any advice or requirements included.

There should be no interruption to flood flows or loss of flood storage as a result of any proposed development. Flood storage compensation may be appropriate for sites on the edge of the existing floodplain or within a flood cell.

Whilst it might be possible to identify appropriate flood mitigation measures for some sites, it is worth noting that in some instances the findings of individual FRAs may determine that the risk of flooding to a proposed development is too great and mitigation measures are not feasible or appropriate. In these instances, the development is likely to be subject to an objection by the Environment Agency.

The minimum acceptable standard of protection against flooding for new residential property within flood risk areas is 1% annual probability for fluvial flooding, 0.5% annual probability of tidal flooding and a breach during a 0.5% annual probability tidal event. An allowance for climate change over the lifetime of the development must be made when assessing all these scenarios. The measures chosen will depend on the nature of the flood risk.

12.4 Reducing flood risk

12.4.1 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of Greenfield surface water drainage, allowing water to flow along natural flow routes and reducing the runoff rates and volumes during storm events, while providing some water treatment benefits. SuDS also have the advantage of providing effective Blue and Green infrastructure, ecology and public amenity benefits when designed and maintained properly.

The inclusion of SuDS within developments should be seen as an opportunity to enhance ecological and amenity value, and promote Green Infrastructure, incorporating above ground facilities into the development landscape strategy. SuDS must be considered at the outset, during preparation of the initial site conceptual layout to ensure that enough land is given to design spaces that will be an asset to the development rather than an after-thought. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA).

12.4.2 Reducing flood risk through site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) may be appropriate in higher risk areas. However vehicular parking in floodplains should be based on nature of parking, flood depths and hazard including evacuation procedures and flood warning.

Waterside areas, or areas along known flow routes, can act as Green Infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise.

12.4.3 Modification of ground levels

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the risk is entirely from tidal flooding and the land does not act as conveyance for flood waters. However, care must be taken at locations where raising ground levels could adversely affect existing communities and property.

In most areas of fluvial flood risk, conveyance or flood storage in flood cells would be reduced by raising land above the floodplain, adversely impacting on flood risk downstream or on neighbouring land. Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the

floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to ensure that it would not cause increased ponding or build up of surface runoff on third party land.

12.4.4 Raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain or flood cell. It would be preferable for schemes to involve an integrated flood risk management solution.

Temporary or demountable defences are not acceptable forms of flood protection for a new development but might be appropriate to address circumstances where the consequences of residual risk are severe. In addition to the technical measures the proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate.

12.4.5 Developer contributions

In some cases and following the application of the sequential test, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS).

It should be noted that the Flood and Coastal Risk Management Grant in Aid (FCRMGiA)[18] funding arrangements introduced in 2011 do not make government funds available for any new development implemented after 2012. Accordingly it is essential that appropriate funding arrangements are established for new development proposed in locations where a long-term investment commitment is required to sustain Flood Risk Management measures. The strategic investment commitment is required so that in future the Flood Risk Management measures can be maintained and afforded for the lifetime of the development, since the available funds from FCRMGiA will potentially not reflect the scale of development that is benefitting.

For new development in locations without existing defences, or where the development is the only beneficiary, the full costs of appropriate risk management measures for the life of the assets proposed must be funded by the developer.

However, the provision of funding by a developer for the cost of the necessary standard of protection from flooding or coastal erosion does not mean the development is appropriate as other policy aims must also be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the local planning authority and the Environment Agency.

The appropriate route for the consideration of strategic measures to address flood risk issues is the Local flood Risk Management Strategy (LFRMS)prepared by the Lead Local flood Authority. The LFRMS should describe the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS, can be afforded and have an appropriate priority.

The Environment Agency is committed to working in partnership with Developers to reduce flood risk. Where assets are in need of improvement or a scheme can be implemented to reduce flood risk, the EA request that Developers contact them to discuss potential solutions. The Partnerships and Strategic Overview Team who manage these partnerships can be contacted by calling **03708 506 506 (Mon-Fri, 9am - 5pm).**

[18] Principles for implementing flood and coastal resilience funding partnerships (Environment Agency, 2012)

12.4.6 Building design

Internal areas of new development should be designed to be dry during the 1 in 1,000-year flood event.

The raising of floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood. If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, they should be raised to 600mm above the maximum water level caused by a 1 in 100-year (1% AEP) event plus climate change. This additional height that the floor level is raised to is referred to as the "freeboard".

Allocating the ground floor of a building for less vulnerable use is an effective way of raising living space above flood levels.

The Environment Agency do not consider that putting a building on stilts is an acceptable means of flood mitigation for new development. However it may be allowed in special circumstances if it replaces an existing solid building, as it can improve flood flow routes. In these cases attention should always be paid to safe access and egress and a legal agreement should be entered into to ensure the ground floor use is not changed.

Two or three storey properties

Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water, such as that experienced during a breach. This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route. Access and egress would still be an issue, particularly when flood duration covers many days.

12.4.7 Resistance and resilience

There may be instances where flood risk remains to a development. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk at the 0.1% annual probability. In these cases (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not be relied on as the only mitigation method.

Temporary barriers

Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

Permanent barriers

Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

Wet-proofing

Interior design to reduce damage caused by flooding, for example:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level.
- Water-resistant materials for floors, walls and fixtures.
- Non-return valves to prevent waste water from being forced up bathrooms, kitchens or lavatories.

If redeveloping existing basements, new electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level to minimise damage if the development floods.

Resilience measures will be specific to the nature of flood risk, and as such will be informed and determined by the FRA.

12.5 Reducing flood risk from other sources

12.5.1 Surface water and sewer flooding

Where new development is in an area where the public sewerage network does not currently have sufficient spare capacity to accept additional development flows it is recommended that the developer discusses such issues with the water utility company at the earliest possible stage. The development should improve the drainage infrastructure to reduce flood risk on site. It is important however that a drainage impact assessment shows that this will not increase flood risk elsewhere, and the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary flood-proofing and resilience measures could prevent against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains, within the property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained. Additionally, manhole covers within the property's grounds could be sealed to prevent surcharging.

12.5.2 Groundwater

Groundwater flooding has a very different flood mechanism to any other and for this reason many conventional flood defence and mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design, ensuring floor levels are raised above the water levels caused by a 1% annual probability fluvial / 0.5% annual probability tidal plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

When redeveloping existing buildings it may be acceptable to install pumps in basements as a resilience measure. However for new development this is unlikely to be considered an acceptable solution.

12.6 Making development sites safe

12.6.1 Safe access and egress

The NPPF Planning Practice Guidance outlines how developers can ensure safe access and egress to and from development in order to demonstrate that development satisfies the second part of the Exception Test[19]. Access considerations should include the voluntary and free movement of people during a 'design flood' as well as for the potential of evacuation before a more extreme flood. The access and egress must be functional for changing circumstances over the lifetime of the development. The NPPF Planning Practice Guidance sets out that[19]

- Access routes should allow occupants to safely access and exit their dwellings in design flood conditions. In addition, vehicular access for emergency services to safely reach development in design flood conditions is normally required
- Where possible, safe access routes should be located above design flood levels and avoid flow paths. Where this is unavoidable, limited depths of flooding may be acceptable providing the proposed access is designed with appropriate signage etc to make it safe. The acceptable flood depth for safe access will vary as this will be dependent on flood velocities and risk of debris in the flood water.

The depth, velocity and hazard mapping and visualisations from this SFRA update should help inform the provision of safe access and egress routes.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the Environment Agency.

[19] NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 039, Reference ID: 7-056-20140306) March 2014

12.6.2 Flood warning and evacuation

A consideration for any new development is how to make it safe from flood risk over the developments lifetime (including the likely impacts of climate change). The NPPF Planning Practice Guidance outlines the main options and considerations for making a development safe; this includes flood warning and evacuation plans (these can also be referred to as flood plans or flood response plans etc)[20]. Flood warning and evacuation plans should detail actions to assist residents / building users in preparing and responding to the risk of flooding and remaining safe, as well as defining procedures in the event an evacuation is required.

The practicality of safe evacuation from an area will depend on[21]:

- the type of flood risk present, and the extent to which advance warning can be given in a flood event;
- the number of people that would require evacuation from the area potentially at risk;
- the adequacy of both evacuation routes and identified places that people could be evacuated to (and taking into account the length of time that the evacuation may need to last), and;
- sufficiently detailed and up to date evacuation plans being in place for the locality that address these and related issues.

It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding used for holiday or short-let caravans and camping and are important at any site that has transient occupants (e.g. hostels and hotels)[20].

Flood warning and evacuation plans can be prepared at a personal, site specific, community \ group level (see Figure 12-1), in consultation with the local planning authority and emergency services.

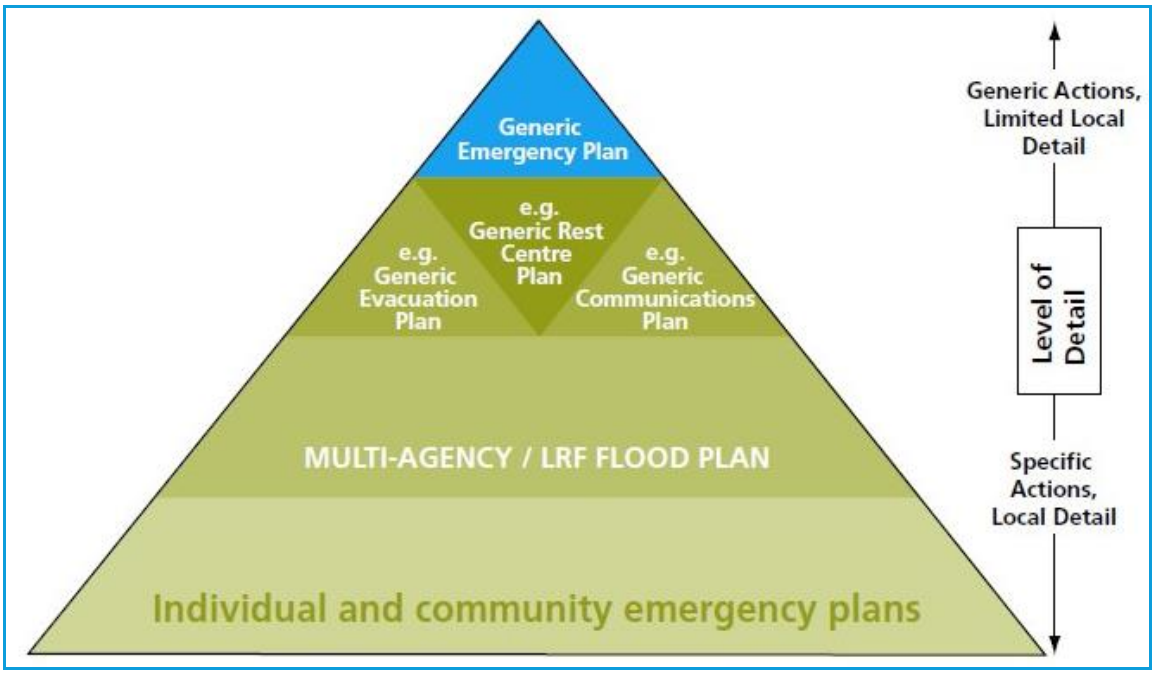
Guidance documents for preparation of flood response plans

- Environment Agency (2011) Flooding – minimising the risk, flood plan guidance for communities and groups https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/292939/LIT_5286_b9ff43.pdf
- Environment Agency (2011) Community Flood Plan template
- Environment Agency Personal flood plans http://apps.environment-agency.gov.uk/flood/151256.aspx
- Flood Plan UK 'Dry Run' - A Community Flood Planning Guide http://www.floodplanuk.org/userfiles/file/AVI10_40%20Floodplan%20Guide.pdf

[20] NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 056, Reference ID: 7-056-20140306) March 2014

[21] NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 057, Reference ID: 7-057-20140306) March 2014

Figure 12-1: Types of emergency plans



Source: DEFRA (2011) Detailed Guidance on Developing Multi-Agency Flood Plans[22]

Flood warnings supplied by the Environment Agency's Floodline Warnings Direct service can be provided to homes and businesses within Flood Zones 2 and 3, although the service is not available everywhere. Developers should encourage those owning or occupying developments, where flood warnings can be provided, to sign up to receive them. This applies even if the development is defended to a high standard.

12.7 Making space for water

The NPPF sets out a clear policy aim in Flood Zone 3 to create space for flooding by restoring functional floodplain.

All new development close to rivers should consider the opportunity presented to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

12.7.1 Buffer strips

As a minimum, developers should set back development seven metres from the landward toe of fluvial defences or top of bank where defences do not exist. This provides a buffer strip to 'make space for water', allow additional capacity to accommodate climate change and ensure access to defences is maintained for maintenance purposes.

For watercourses classed as 'Main River' a minimum eight metre easement from the top of bank is recommended for maintenance purposes to avoid disturbing riverbanks, benefiting ecology and having to construct engineered riverbank protection. Building adjacent to riverbanks can also cause problems to the structural integrity of the riverbanks and the building, making future maintenance of the river much more difficult.

[22] DEFRA (2011) Detailed Guidance on Developing Multi-Agency Flood Plans, Figure 12.1 How a MAFP fits with other emergency plans, page 3.

12.7.2 Drainage capacity

The capacity of internal drainage infrastructure is often limited and is at or near capacity under existing conditions. Development that leads to increased peak runoff within the drainage catchments may lead to infrastructure capacity being exceeded, with the potential for increased flood risk. Development locations should be assessed to ensure capacity exists within both the on and off site network.

13 Green Infrastructure and WFD

Green Infrastructure (GI) is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe and consist of:

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

The identification and planning of GI is critical to sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development. GI is also central to climate change action and is a recurring theme in planning policy.

With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. GI can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

A Green Infrastructure Assessment was published by Mid Devon District Council in December 2013. The assessment identifies existing environmental assets at the landscape scale and by catchment areas within Mid Devon and includes an analysis of different GI functions and deficiencies[23].

13.1 Water Framework Directive

The EU Water Framework Directive (WFD) is a piece of European water legislation that is designed to improve and integrate the way waterbodies are managed throughout Europe. The WFD was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003[24]. The Directive requires that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve Good Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. These Environmental Objectives are listed below:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters.
- Aim to achieve at least good status/potential for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status/potential by 2021 or 2027.
- Meet the requirements of Water Framework Directive Protected Areas.
- Promote sustainable use of water as a natural resource.
- Conserve habitats and species that depend directly on water.
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment.
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.
- Contribute to mitigating the effects of floods and droughts.

In England, the Environment Agency (EA) is responsible for the delivery of the WFD objectives. The EA has produced River Basin Management Plans (RBMP) for the whole of England which describe how the WFD will be achieved. Mid Devon is covered by the South West River Basin District RBMP. RBMPs set out the ecological objectives for each waterbody and give deadlines by when objectives need to be met. All waterbodies have to achieve Good Ecological Status or Good Ecological Potential (GEP) by a set deadline. GEP is the best ecological improvements that can be achieved for a water body while still enabling Flood and Coastal Erosion Risk Management (FCERM) works to be undertaken to protect people and property from flooding.

[23] Mid Devon District Council (December 2013) Green Infrastructure Assessment

[24] http://www.legislation.gov.uk/uksi/2003/3242/contents/made

The WFD defines the flow, shape and physical characteristics of a watercourse as its 'hydromorphology.' Any in-channel works can impact upon the shape of a watercourse and the natural processes that occur within it, including:

- flow patterns
- width and depth of a channel
- features such as pools, riffles, bars and bank slopes
- sediment availability/transport
- interaction between a channel and its floodplain
- ecology and biology (i.e. habitats which support plants and animals)

Any adverse impacts can cause a water body's ecology to deteriorate and prevent environmental improvements from being undertaken. Nevertheless, in-channel works can also be beneficial if they can be designed to help achieve environmental improvements included in the RBMP, thus enhancing the water environment for plants and animals.

13.1.1 Preventing Deterioration in Status

Any activity which has the potential to have an impact on the ecology of a waterbody will need consideration in terms of whether it could cause deterioration in its Ecological Status or Potential.

For each waterbody, three different status objectives are identified. These are the overall status objective, the ecological status or potential objective and the chemical status objective. A default objective for all water bodies is to prevent the deterioration in the Ecological Status (or Ecological Potential for Heavily Modified and Artificial Water Bodies) of the waterbody.

The Ecological Status of a waterbody is determined through analysis of its constituent biological Quality Elements (listed below). These elements are in turn supported by a series of physio-chemical and hydromorphological Quality Elements. These Quality Elements are taken from Annex V of the Directive and are listed below. The overall Ecological Status is determined by the lowest element status. Further details of the method of classification can be found in the Environment Agency's Water Framework Directive: Method Statement for the Classification of Surface Water Bodies v3 (2013)[25].

Biological Quality Elements

- Fish
- Invertebrates
- Macrophytes
- Phytobenthos

Any activity that has the potential to have an impact upon any of the Quality Elements will need consideration in terms of whether it could cause deterioration in the status of a waterbody. The activity will also need to be considered in terms of whether it will compromise the ability of the waterbody to reach Good Ecological Status or Good Ecological Potential by the date specified in the RBMP.

A map showing the 2013 overall status of the main water bodies in the Mid Devon District is provided in Figure 13-1. The majority of the surface water bodies in the District are classified as 'moderate' or 'poor'. Only two water bodies in the district fall into the 'bad' category – River Lowman and Jackmoor Brook. Future development should ensure there is no adverse impact on the quality of watercourses within the District.

13.1.2 Artificial or Heavily Modified Water Bodies

Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial and heavily modified water bodies are unable to achieve natural

[25] Water Framework Directive: Method Statement for the Classification of Surface Water Bodies v3. (Environment Agency 2013)
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT_5769_ed4e2b.pdf

conditions. Instead, artificial and heavily modified water bodies have a target to achieve Good Ecological Potential, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad. The chemical status of these water bodies is measured in the same way as for natural water bodies.

Specific mitigation measures have been identified for each Artificial and Heavily Modified Waterbody and are listed in the RBMP. These mitigation measures are necessary to reduce the existing hydromorphological impacts on the waterbody and all measures need to be in place in order for the waterbody to achieve Good Ecological Status or Potential.

13.1.3 WFD Assessments

An assessment should be undertaken to determine the effects that any proposed works could have upon Quality Elements. Any impacts identified should then be considered in relation to the Ecological, Hydromorphological and Chemical Status of the waterbody and the status objectives.

The following assessment objectives should then used to determine whether the proposed works comply with the overarching objectives of the WFD. These objectives were therefore derived from the Environmental Objectives of the Directive

- Objective 1: The proposed scheme does not cause deterioration in the Status of the Biological Elements of the waterbody.
- Objective 2: The proposed scheme does not compromise the ability of the waterbody to achieve its WFD status objectives.
- Objective 3: The proposed scheme does not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD.
- Objective 4: The proposed scheme contributes to the delivery of the WFD objectives.

In order to establish whether the strategy complies with the WFD it is necessary to ascertain whether the preferred options have the potential to result in:

- Failure of a water body to achieve good ecological status or potential; or
- Failure to prevent a deterioration in the ecological status or potential of a water body

If the answer to these questions is ‘no’ the strategy can be considered WFD compliant. If either of these failures is identified, further assessment may be required to identify if the strategy meets all of the conditions set out by the WFD Legislation.

13.1.4 Examples of measures that could be undertaken to improve WFD classification

De-Culverting

- Opening up buried watercourses and restoring them to more natural conditions
- Multiple benefits - both to society and the environment

Structure Removal (e.g. Weir)

Benefits include

- Improved in-channel morphology and sediment transport
- Dynamics of flow more natural
- Structure of river bed more varied

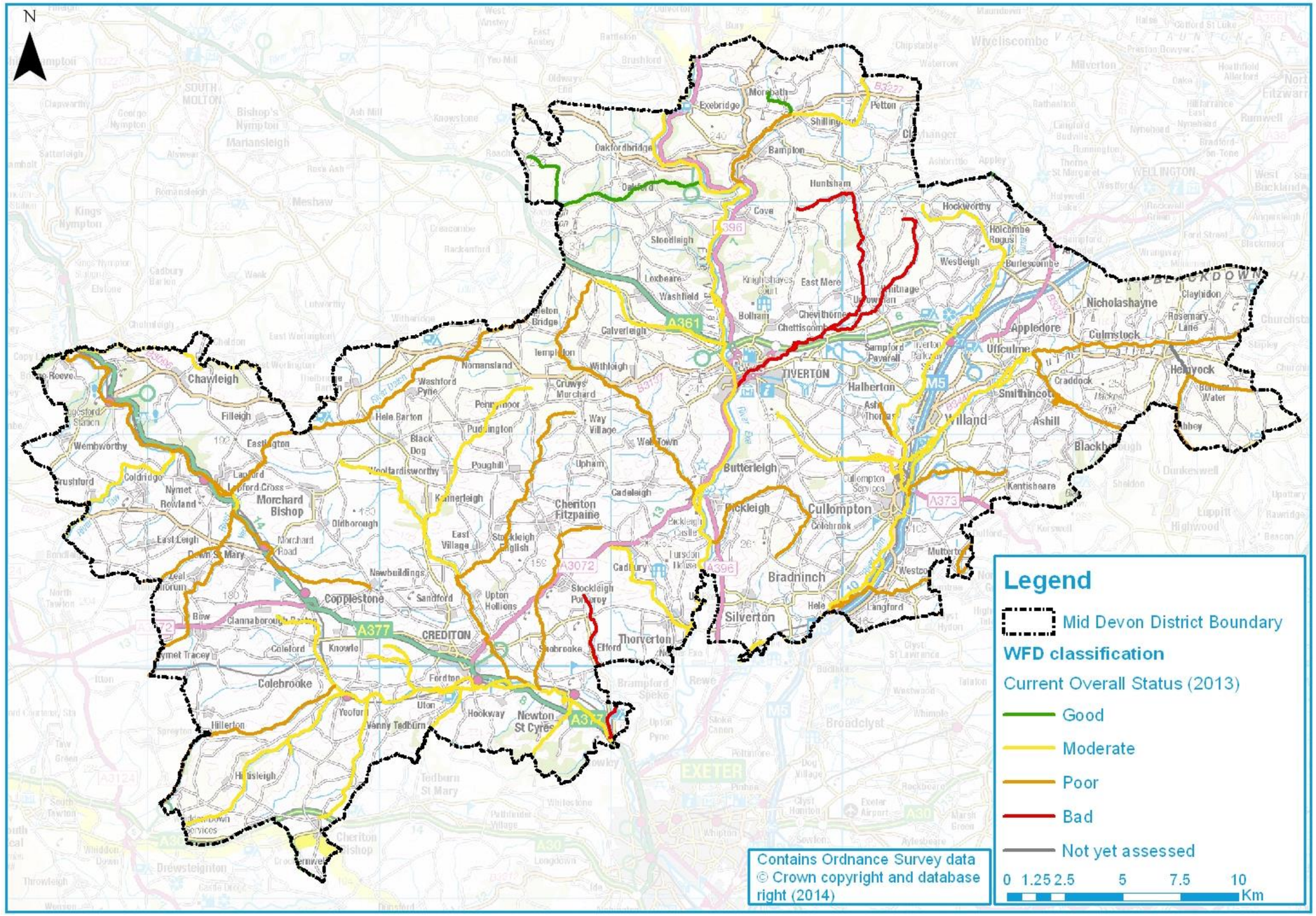
Backwater creation

- These areas are connected to the main channel and are characterised by slow currents, shallow water and silt substrates. These can be used to improve channel diversity

Improved Fish Passage

- Installation of structures designed to facilitate and improve the passage of migratory and non-migratory fish where structures cannot be removed.

Figure 13-1: WFD overall classification of surface water bodies in the Mid Devon District



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14 Summary and recommendations

14.1 Summary

- The Mid Devon SFRA update has considered all sources of flooding, including fluvial, pluvial, groundwater, canal, reservoir and sewer flooding, within the Mid Devon District.
- An assessment of the flood defences in the District has been undertaken, including defence condition and standard and the residual risk.
- Flood risk has been assessed on all sites highlighted within the draft Local Plan. Guidance for the requirements for a site specific Flood Risk Assessment for these sites is provided (Appendix A), as well as general guidance, throughout the SFRA, on flood risk assessment for any development proposals within the Mid Devon District.
- The updated Flood Map for Surface Water is provided, indicating the likelihood of surface water flooding in the Mid Devon District.
- Surface water flooding is a risk in many of the areas. Advice has been provided regarding suitable SuDS options.
- The Environment Agency have identified one Critical Drainage Area for the Mid Devon District, at Cullompton. The aim of this Critical Drainage Area is to ensure there is no increase in flood risk downstream as a result of development pressure.
- A broad scale assessment of areas where there is possibly existing drainage problems have been undertaken. These include areas in Bampton, Bradninch, Copplestone, Crediton, Culmstock, Hemyock, Tiverton and Willand. These areas would benefit from further assessment and refinement to determine if a SWMP may be required.
- Green Infrastructure within the District has been assessed and the WFD status of the District's watercourses assessed.

14.2 Recommendations – development control

14.2.1 Flood Zone 1

Flood risk is not a significant constraint to development within Flood Zone 1. However, there are a number of locations where flooding has occurred in the past from surface water, sewers or from ordinary watercourses or drains which are not covered by Environment Agency flood maps. There is also residual risk, in some locations, from the Grand Western Canal and Wimbleball Reservoir.

The following proposed development sites are shown to be 100% in Flood Zone 1. Sites with an ordinary watercourse flowing through, or adjacent to, are highlighted in green, sites that may have some residual risk from the Grand Western Canal or Wimbleball Reservoir are highlighted in purple, and sites with both are highlighted in orange.

When making decisions regarding development sites to be brought forward as an allocation in the development plan, where flood zones do not currently exist for smaller watercourses and drains (those with a catchment area less than 3km^2), the updated Flood Map for Surface Water can give a broad indication of the potential flow path and flood extent from these watercourses. At the planning application stage, developers need to undertake hydrological and hydraulic assessments of the watercourses) to verify flood extent, inform development zoning within the site and prove, if required, whether the Exception Test can be passed.

Table Key

Sites with an ordinary watercourse flowing through or adjacent to

Sites that may have some residual risk from the Grand Western Canal or Wimbleball Reservoir

Sites with both

Settlement	Site name	Settlement	Site name
Bampton	Bourchier Close	Culmstock	Hunter's Hill
	Stone Crushing Works Scotts Quarry		Linhay Close
	Ashleigh Park		Culmstock Glebe and Rackfields

Settlement	Site name	Settlement	Site name
Bampton	Land at Ball Hill	Halberton	Land adjacent to Fishers Way
	Former school/School Close	Hemyock	Depot
	South Molton Road		Land SW Conigar Clos
	Newton Square		Culmbridge Farm
Bickleigh	Land south of Glen View	Kentisbeare	Land by Kentisbeare village hall
Bow	South West of Junction Road	Lapford	Land South of Sandhurst
	South of Iter Cross,		Land between primary school and church
	Land adj to Bow Mill Lane	Morchard Bishop	Greenaway, Morchard Bishop
	West of Godfrey Gardens		Tatepath Farm
	Land adj Jackman car park		Church Street
	East Langford Farm	Newton St Cyres	Land west of Tytheing Close
	Land adj to Hollywell		Land east of Tytheing Close
Bradninch	Hele Road	Oakford	Land at Oakford
Burlescombe	Churchyard Field	Sampford Peverell	Higher Town
Butterleigh	Land NW of Homefield		Land off Whitnage Road,
Chawleigh	Tower Meadow		Land off Mountain Oak Farm
	Barton		Former Tiverton Parkway Hotel
Cheriton Bishop	Glebe	Sandford	Fanny's Lane,
	Land near the church (a)	Shillingford	Land off Bowdens Lane (a)
	Land near the church (b)		Land off Bowdens Lane (b)
	Land off Church Lane,	Silverton	Livinghayes Road
	Land adj Woodleigh Hall		Glebe
	Land east of Hill View		The Garage
Cheriton Fitzpaine	Landboat Farm (a)		East of Hederman Clos
	Land adj School	Thorverton	South of Broadlands
	Barnshill Close		
	Land adj school	Tiverton	William Street
Colebrooke	Glebe		Phoenix Lane
Copplestone	The Old Abbatoir		Land at Hartnoll Farm
	Bewsley Farm		Tidcombe Hall
Crediton	Wellparks (a)		Hay Park
	Land east of Exeter Road		Exeter Hill
	Land south of Common Marsh Lane		The Avenue
	Land at Chapel Down Farm		Moorhayes
	Land at Alexandra Close		Howden Court
	George Hill		Palmerston Park
	Stonewell Lane Playing Field		Roundhill
	Red Hill Cross	Uffculme	Land off Chapel Hill
	Sportsfield, Exhibition Road		Land adj Poynings
	Land at Barn Park		Land off Ashley Road
	Barnfield		Land adj to Sunnydene
	The Woods Group	Willand	Willand Industrial Estate
	Wellparks (b)		Land at M5 Junction 27 and adjoining Willand (a)
Cullompton	Acklands		Land adj B3181
	Land south of Springbourne, East of Exeter Road		Land east of M5

Settlement	Site name	Settlement	Site name
Cullompton	Land adj Venndale, NW Long Moor Road	Willand	Lloyd Maunder Way
	Court Farm (a)		Quicks Farm
			Dean Hill Road, (a)
	Bradninch Road		Dean Hill Road, (b)
	Land at Exeter Road		Land at M5 Junction 27 and adjoining Willand (b)
	Growen Farm	Yeoford	Land off Lower Road (a)
	Land south of Tiverton Road		Land off Lower Road (b)

Recommendations

- A flood risk assessment (FRA) is required for all developments over one hectare and should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development. The Local Planning Authority and Environment Agency should be consulted to confirm the level of assessment required and to provide any information on any known local issues. Guidance on the preparation of FRAs is provided in the NPPF Planning Practice Guidance Flood Risk and Coastal Change.
    - If a small watercourse (i.e. catchment area less than 3 km^2) is located within 100m of a site, assessment of this watercourse should be undertaken so the flood risk from the site can be defined
    - The Local Planning Authority should consult the Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014 when reviewing planning applications for proposed developments at risk of flooding.
- No climate change outlines were available for Flood Zone 2 with climate change. For sites that lie adjacent to Flood Zone 2 consideration should be given to whether the extent of Flood Zone 2 could extend into the site within the lifetime of the development.
- Through a Surface Water Drainage Strategy it should be demonstrated that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water, allowing for climate change effects. They should also show that flood risk elsewhere will not be increased by increased levels of surface runoff post-development.
- Surface water runoff management should be undertaken, wherever practicable, through the utilisation of appropriate SuDS techniques.
- No buildings should be constructed within seven metres of the banks of watercourses. This will allow access for maintenance, as well as provide an ecological corridor.

  Access and/or buffer strips should be within public open space and not within private gardens. This will prevent loss of functionality of the watercourses and buffer by building over or filling in.
- Further investigation should be undertaken to determine whether groundwater flooding is a problem in the area if the site is shown to lie within an area susceptible to groundwater flooding (Appendix G). This may include requesting groundwater level information from the Environment Agency or conducting borehole tests.
- Any development within a Grand Western Canal breach impact zone should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required. This buffer strip should be within public open space and not within private gardens. Appropriate mitigation measures should be incorporated into the design of the development.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Appendix A as well as the general guidance on flood risk assessment in Section 12.
- The FRA requirements defined in Appendix A and Section 12 of this Level 2 SFRA should be considered for all future development brought forward.

14.2.2 Flood Zone 2

Most development is permitted in Flood Zone 2 with the exception of Highly Vulnerable development. Highly vulnerable development is only permitted if it has passed the Exception Test. Consideration needs to be given to the effects of climate change, particularly the likelihood of land within this zone being reclassified as Flood Zone 3a within the lifetime of the development.

The following proposed development sites are shown to be partially within Flood Zone 2.

Settlement	Site name	Proportion of site in Flood Zone 2 (%)
Crediton	Land at Cromwells Meadow	3
	South of Wellparks and A377	8
Cullompton	Court Farm (b)	1
Uffculme	Land west of Uffculme	1

Recommendations

- A flood risk assessment (FRA) is required for all developments within this zone and should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development. Highly Vulnerable development will need to pass the Exception Test. The Local Planning Authority and Environment Agency should be consulted to confirm the level of assessment required and to provide any information on any known local issues. Guidance on the preparation of FRAs is provided in the NPPF Planning Practice Guidance Flood Risk and Coastal Change.
    - If a small watercourse (i.e. catchment area less than 3 km^2) is located within 100m of a site, assessment of this watercourse should be undertaken so the flood risk from the site can be defined
    - The Local Planning Authority should consult the Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014 when reviewing planning applications for proposed developments at risk of flooding.
- Development design should incorporate mitigation measures, to manage any flood risk to the development, including residual risk. Floor levels should be above the 1 in 100-year flood level, plus an allowance for climate change.
- The layout of buildings and access routes should adopt a sequential approach, steering buildings (and hence people) towards areas of lowest risk within the boundaries of the site. This will also ensure that the risk of flooding is not worsened by, for example, blocked flood flow routes.
- For sites that lie adjacent to Flood Zone 3a consideration should be given to whether Flood Zone 2 could be reclassified as Flood Zone 3a within the lifetime of the development.
- Through a Surface Water Drainage Strategy it should be demonstrated that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water, allowing for climate change effects. They should also show that flood risk elsewhere will not be increased by increased levels of surface runoff post-development.
- Surface water runoff management should be undertaken, wherever practicable, through the utilisation of appropriate SuDS techniques.
- No buildings should be constructed within seven metres of the banks of watercourses. This will allow access for maintenance, as well as provide an ecological corridor.

  Access and/or buffer strips should be within public open space and not within private gardens. This will prevent loss of functionality of the watercourses and buffer by building over or filling in.
- Further investigation should be undertaken to determine whether groundwater flooding is a problem in the area if the site is shown to lie within an area susceptible to groundwater

flooding (Appendix G). This may include requesting groundwater level information from the Environment Agency or conducting borehole tests.

- Any development within a Grand Western Canal breach impact zone should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required. This buffer strip should be within public open space and not within private gardens. Appropriate mitigation measures should be incorporated into the design of the development.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Appendix A as well as the general guidance on flood risk assessment in Section 12.
- The FRA requirements defined in Appendix A and Section 12 of this Level 2 SFRA should be considered for all future development brought forward.

14.2.3 Flood Zone 3a

Development in Flood Zone 3a is significantly constrained by flood risk. Highly Vulnerable development is not permitted within this zone and More Vulnerable development and Essential Infrastructure are only permitted if the Exception Test can be passed. Climate change will exacerbate problems within this zone in the future. Development must ensure flood risk is not made worse in the area or elsewhere.

The following proposed development sites are shown to be partially or wholly within Flood Zone 3a. Sites that may have some residual risk from the Grand Western Canal or Wimbleball Reservoir are highlighted in purple.

Table Key

Sites that may have some residual risk from the Grand Western Canal or Wimbleball Reservoir

Settlement	Site name	Proportion of site in Flood Zone 3a (%)
Cheriton Fitzpaine	Glebe	12
	Landboat Farm (b)	15
Copplestone	Land adj Dulings Meadow	6
Crediton	Pedlerspool	2
Crediton	Westwood Farm	9
Cullompton	Ware Park and Footlands	2
	North West of Cullompton	4
	NE Kingsmill,	3
	East Cullompton Urban Extension	10
	Week Farm	12
	Knowle Lane	21
	Land at Colebrooke	22
	Cummings Nursery	4
	Venn Farm	1
	NW Kingsmill Industrial Estate	9
	Cullompton Infrastructure (a)	83
	Eastern Relief Road	100
	Cullompton Infrastructure (b)	99
Halberton	Land at Blundells Road	1
Hemyock	Land north of Culmbridge Farm	1
Newton St Cyres	Court Orchard	12
Sampford Peverell	Morrell's Farm	8
Silverton	Land at Old Butterleigh Road	10
Tiverton	Eastern Urban Extension	3
	Land at Wynnards Mead	3
	Farleigh Meadows	8

	Town Hall/St Andrew Street	6
	29-31 Leat Street	11
Tiverton	Blundells School	62
	Land at the Foundry	100
Willand	Lloyd Maunder	10

Recommendations (defended areas)

- It is recommended that all types of new development behind flood defences is avoided, if possible, due to the residual risks of breach and overtopping
- A flood risk assessment (FRA) is required for all developments within this zone and should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development. More Vulnerable development and Essential Infrastructure will need to pass the Exception Test. The Local Planning Authority and Environment Agency should be consulted to confirm the level of assessment required and to provide any information on any known local issues. Guidance on the preparation of FRAs is provided in the NPPF Planning Practice Guidance Flood Risk and Coastal Change.
    - If a small watercourse (i.e. catchment area less than 3 km^2) is located within 100m of a site, assessment of this watercourse should be undertaken so the flood risk from the site can be defined
    - It should be demonstrated that flood defences provide an acceptable standard of protection, including an allowance for climate change.
    - Residual risks should be assessed, and the Environment Agency consulted regarding whether there is a need for a breach analysis to map a rapid inundation zone.
    - The Local Planning Authority should consult the Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014 when reviewing planning applications for proposed developments at risk of flooding.
- The layout of buildings and access routes should adopt a sequential approach, steering buildings (and hence people) towards areas of lowest risk within the boundaries of the site. This will also ensure that the risk of flooding is not worsened by, for example, blocked flood flow routes. Where rapid inundation zones have been identified, development should be avoided in these areas
- Development should not impede flow routes or reduce floodplain storage. If the development does result in a loss of storage, compensatory floodplain storage should be provided on a 'level for level' and 'volume for volume' basis
- If existing defences are to be upgraded as part of the development, an assessment should be undertaken to ensure it does not result in an increase in flood risk elsewhere
- Development design should incorporate mitigation measures, to manage any flood risk to the development, including residual risk. Floor levels should be above the 1 in 100-year flood level, plus an allowance for climate change.
- Consideration should be given to the type of building that will be permitted, for example single-storey buildings and basements should be avoided
- Through a Surface Water Drainage Strategy it should be demonstrated that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water, allowing for climate change effects. They should also show that flood risk elsewhere will not be increased by increased levels of surface runoff post-development.
- Surface water runoff management should be undertaken, wherever practicable, through the utilisation of appropriate SuDS techniques.
- No buildings should be constructed within seven metres of the banks of watercourses. This will allow access for maintenance, as well as provide an ecological corridor.

  Access and/or buffer strips should be within public open space and not within private gardens. This will prevent loss of functionality of the watercourses and buffer by building over or filling in.

- Further investigation should be undertaken to determine whether groundwater flooding is a problem in the area if the site is shown to lie within an area susceptible to groundwater flooding (Appendix G). This may include requesting groundwater level information from the Environment Agency or conducting borehole tests.
- Any development within a Grand Western Canal breach impact zone should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required. This buffer strip should be within public open space and not within private gardens. Appropriate mitigation measures should be incorporated into the design of the development.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Appendix A as well as the general guidance on flood risk assessment in Section 12.
- The FRA requirements defined in Appendix A and Section 12 of this Level 2 SFRA should be considered for all future development brought forward.

Recommendations (undefended areas)

- It is recommended that no type of development (with the exception of Water Compatible uses) is permitted in this zone, unless a thorough search has failed to identify any suitable, reasonable alternatives in areas of lower flood risk, and the development is essential for meeting wider sustainability needs of a community
- A flood risk assessment (FRA) is required for all developments within this zone and should be proportionate to the degree of flood risk, as well as the scale, nature and location of the development. More Vulnerable development and Essential Infrastructure will need to pass the Exception Test. The Local Planning Authority and Environment Agency should be consulted to confirm the level of assessment required and to provide any information on any known local issues. Guidance on the preparation of FRAs is provided in the NPPF Planning Practice Guidance Flood Risk and Coastal Change.
    - If a small watercourse (i.e. catchment area less than 3 km^2) is located within 100m of a site, assessment of this watercourse should be undertaken so the flood risk from the site can be defined
    - The Local Planning Authority should consult the Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014 when reviewing planning applications for proposed developments at risk of flooding.
- The layout of buildings and access routes should adopt a sequential approach, steering buildings (and hence people) towards areas of lowest risk within the boundaries of the site. This will also ensure that the risk of flooding is not worsened by, for example, blocked flood flow routes.
- Development should not impede flow routes or reduce floodplain storage. If the development does result in a loss of storage, compensatory floodplain storage should be provided on a 'level for level' and 'volume for volume' basis
- Development design should incorporate mitigation measures, to manage any flood risk to the development, including residual risk. Floor levels should be above the 1 in 100-year flood level, plus an allowance for climate change.
- Consideration should be given to the type of building that will be permitted, for example single-storey buildings and basements should be avoided
- Through a Surface Water Drainage Strategy it should be demonstrated that the proposed drainage scheme, and site layout and design, will prevent properties from flooding from surface water, allowing for climate change effects. They should also show that flood risk elsewhere will not be increased by increased levels of surface runoff post-development.
- Surface water runoff management should be undertaken, wherever practicable, through the utilisation of appropriate SuDS techniques.
- No buildings should be constructed within seven metres of the banks of watercourses. This will allow access for maintenance, as well as provide an ecological corridor.

Access and/or buffer strips should be within public open space and not within private gardens. This will prevent loss of functionality of the watercourses and buffer by building over or filling in.

- Further investigation should be undertaken to determine whether groundwater flooding is a problem in the area if the site is shown to lie within an area susceptible to groundwater flooding (Appendix G). This may include requesting groundwater level information from the Environment Agency or conducting borehole tests.
- Any development within a Grand Western Canal breach impact zone should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required. This buffer strip should be within public open space and not within private gardens. Appropriate mitigation measures should be incorporated into the design of the development.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Appendix A as well as the general guidance on flood risk assessment in Section 12.
- The FRA requirements defined in Appendix A and Section 12 of this Level 2 SFRA should be considered for all future development brought forward.

14.2.4 Flood Zone 3b (Function Floodplain)

Development is highly constrained within Flood Zone 3b. Only Essential Infrastructure and Water Compatible uses are permitted in this zone, and only if the Exception Test has been passed.

Functional floodplain is vital for the conveyance and storage of floodwater. Development within this zone will impede the flow of floodwater as well as result in a loss of flood storage, increasing flood risk both within the area and further downstream. Consideration should be given to 'rolling back' development in this zone, withdrawing development from the floodplain and allowing it to return back to a natural floodplain. This has an additional benefit of reducing flood risk to communities further downstream. The area identified as functional floodplain should take into account the effects of defences and other flood risk management infrastructure. 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.

Outlines of Flood Zone 3b were not available for this study; if a site is currently shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

The table below shows proposed sites where there is a high possibility that the site lies substantially within Flood Zone 3b, given the proportion of the site within Flood Zone 3a and that has been flooded in the past. Further work will be required to define Flood Zone 3b.

Sites that may have some residual risk from the Grand Western Canal or Wimbleball Reservoir are highlighted in purple

Table Key

Sites that may have some residual risk from the Grand Western Canal or Wimbleball Reservoir

Settlement	Site name	Proportion of site in Flood Zone 3a (%)	Proportion of site in EA's Historic flood Map
Cullompton	Cullompton Infrastructure (a)	83	100
	Eastern Relief Road	100	87
	Cullompton Infrastructure (b)	99	100
Tiverton	Blundells School	62	71
	Land at the Foundry	100	100

Recommendations

- Essential infrastructure should only be allocated in this zone if no reasonable alternative sites are available in areas of lower flood risk
- A detailed site-specific flood risk assessment (FRA) is required for Essential Infrastructure within this zone and should show that the Exception Test has been passed. Should the site pass the Exception Test, it should be designed and constructed to:
    - remain operational and safe for users in times of flood
    - result in no net loss of floodplain storage
    - not impede water flows and not increase flood risk elsewhere

  The Local Planning Authority and Environment Agency should be consulted to confirm the level of assessment required and to provide any information on any known local issues. Guidance on the preparation of FRAs is provided in the NPPF Planning Practice Guidance Flood Risk and Coastal Change.
    - If a small watercourse (i.e. catchment area less than 3 km^2) is located within 100m of a site, assessment of the risk posed by this watercourse should be undertaken.
- The Local Planning Authority should consult the Environment Agency's 'Flood Risk Standing Advice (FRSA) for Local Planning Authorities', published in March 2014 when reviewing planning applications for proposed developments at risk of flooding.Drainage Strategies should be prepared, demonstrating that the proposed drainage scheme and site layout and design will prevent properties from flooding from surface water, allowing for climate change effects. They should also show that flood risk elsewhere will not be increased by increased levels of surface runoff post-development.
- Development should not impede flow routes or reduce floodplain storage. If the development does result in a loss of storage, compensatory floodplain storage should be provided on a 'level for level' and 'volume for volume' basis
- Development design should incorporate mitigation measures, to manage any flood risk to the development, including residual risk. Floor levels should be above the 1 in 100-year flood level, plus an allowance for climate change.
- Surface water runoff management should be undertaken, wherever practicable, through the utilisation of appropriate SuDS techniques.
- No buildings should be constructed within seven metres of the banks of watercourses. This will allow access for maintenance, as well as provide an ecological corridor.

  Access and/or buffer strips should be within public open space and not within private gardens. This will prevent loss of functionality of the watercourses and buffer by building over or filling in.
- Further investigation should be undertaken to determine whether groundwater flooding is a problem in the area if the site is shown to lie within an area susceptible to groundwater flooding (Appendix G). This may include requesting groundwater level information from the Environment Agency or conducting borehole tests.
- Any development within a Grand Western Canal breach impact zone should take account of residual risk from breach or failure and it is recommended the development incorporates a buffer zone next to the canal to allow access for maintenance and repair, should it be required. This buffer strip should be within public open space and not within private gardens. Appropriate mitigation measures should be incorporated into the design of the development.
- It is recommended that developers refer to the FRA recommendations provided in the proposed development site summary tables in Appendix A as well as the general guidance on flood risk assessment in Section 12.
- The FRA requirements defined in Appendix A and Section 12 of this Level 2 SFRA should be considered for all future development brought forward.

14.3 Other recommendations

14.3.1 Protection and Enhancement of Watercourses

It is recommended that planning permission for development should only be granted where:

- the natural watercourse system which provides drainage of land is not adversely affected;

  a minimum 7m width access strip is provided adjacent to the top of both banks of any watercourses for maintenance purposes and is appropriately landscaped for open space and Biodiversity benefits, this width may be reduced in particular circumstances with agreement from the Environment Agency and LPA;
- it would not result in the loss of open water features through draining, culverting or enclosure by other means and culverts are opened up where ever possible;
- surface water drainage is delivered by sustainable drainage systems (SuDS); and
- betterment in the surface water runoff regime is ensured; with any residual risk of flooding, from drainage features either on or off site not placing people and property at unacceptable risk.

14.3.2 Recommendations for further work

Understanding of flood risk within Mid Devon could be improved by undertaking the following further work

- Existing hydraulic models, including the Environment Agency's Jflow model should be re-run to account for changes in hydrological assessment techniques and updated ground model data (Digital Terrain Model). The models should be run for the 1 in 20-year, 1 in 100-year, and 1 in 1,000-year, as well as climate change scenerios for the 1 in 100-year and 1 in 1,000-year. Model outputs should include depth, velocity and hazard.
- The 1 in 20-year outline should be a starting point for definition of functional floodplain. The definition of functional floodplain should be undertaken in consultation with the Environment Agency as identification of functional floodplain should also take account of local circumstances and not be defined solely on rigid probability parameters.
- The climate change scenerios for the 1 in 100-year and 1 in 1,000-year should be used to produce a map that will give an indication of areas in Flood Zone 1 and 2 that may be reclassified as Flood Zones 2 and 3 in the future
- The residual risks to development should be assessed including
  - undertaking breach analysis of defences, including mapping of rapid inundation zones
  - assessment of the flood inundation map for Wimbleball reservoir
  - reference to the Devon County Council study's outputs, when they become available, when considering land for development and preparing site specific flood risk assessments, and undertaking canal breach analysis where required
- The broad scale assessment of areas which may potentially have existing drainage issues should be looked at in greater detail to determine whether there is a need for a Surface Water Management Plan.

14.4 Use of SFRA data

It is important to recognise that the SFRA has been developed using the best available information at the time of writing. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated information is available prior to commencing a detailed Flood Risk Assessment. New information on flood risk may be provided by Mid Devon District Council, Devon County Council (in its role as Lead Local Flood Authority), the Highways Authority, South West Water and the Environment Agency.

The SFRA will be periodically updated in the future when the Local Plan is reviewed.

Appendices

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A Detailed site summary tables

The detailed site summaries are provided as a separate attachment to this main report.

A.1 Introduction

Site summary tables have been produced for potential allocations set out in the Site Allocations chapter of the Mid Devon Local Plan Review: Options Consultation Document (2014) and for an additional six sites which were identified through the Local Plan Review consultation process. Each table sets out the following information:

- Site area
- Proportion of the site in each Flood Zone
- Guidance on whether the Exception Test may need to be passed and the possibility for a site to pass the Exception Test. If the Exception Test is not required, information for the planning application stage is provided.
- Mapping including Flood Zones, climate change and surface water
- An broad scale assessment of suitable SuDS techniques and considerations
- The presence of any flood defences
- Whether the site falls within a canal breach zone
- Whether the site is covered by a flood warning service
- Whether there are any access and egress issues for the site
- The potential impacts of climate change in the future
- Advice on the preparation of site-specific flood risk assessments and considerations for developers

Note on Flood Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain). In the absence of detailed hydraulic model information, a precautionary approach can be adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3.

If development is shown to be in Flood Zone 3, then it should be considered to be Flood Zone 3b unless, following further work undertaken as part of a detailed site specific flood risk assessment, and in consultation with the Environment Agency, it can be proven as Flood Zone 3a.

Note on Flood Zones: Only one detailed 1D-2D hydraulic model was available for this study – the River Exe at Tiverton. The undefended outlines from this hydraulic model were used to assess flood risk to sites in Tiverton; the remaining sites were assessed using Environment Agency Flood Zones.

Note on climate change: Where modelling output is not available, the Environment Agency's Flood Zones can provide some indication of areas where rare, more extreme flows might affect the flood plain extents, by comparing Flood Zone 3a with Flood Zone 2. For the purposes of this study, a precautionary approach has been adopted where Flood Zone 2 has been used as a guide to provide an indication of the likely increase in extent of Flood Zone 3 with climate change.

Developers should assess the flood risk implications of climate change to development as part of a detailed Flood Risk Assessment.

A.2 SuDS suitability

The hydraulic and geological characteristics of each development site were assessed to determine the constraining factors for surface water management at the proposed development sites. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments.

From catchment characteristics and additional datasets (areas susceptible to groundwater flooding map, Soil map of England and Wales, Environment Agency 'What's in your Backyard' online mapping) a broad criterion for the applicability of SuDS techniques was determined. These criteria were then used to carry out a simple assessment of the likely feasibility of different

types of SuDS techniques at each of the proposed development sites. SuDS techniques were categorized into 5 main groups as follows.

Table A-1: Summary of SuDS Categories

SuDS Type	Technique
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench
Conveyance	Dry Swale, Underdrained Swale, Wet Swale

The suitability of each SuDS type for the proposed developments has been displayed using a traffic light colour system in the summary tables. The assessment of suitability is broad scale and indicative only; more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS.

Suitability	Description
	The SuDS Group and its associated techniques are unlikely to be suitable at the development site based on the results of this assessment.
	The SuDS Group and its associated techniques may be suitable at the development but is likely to require additional engineering works. Some techniques from this group may not be suitable for use at the development.
	The SuDS Group and its associated techniques are likely to be suitable at the development site based on the results of this assessment.

A.3 Summary assessment of risk to all sites

A large number of the proposed allocation sites lie outside of the Flood Zones. Of the proposed sites that do lie within Flood Zones, the majority of More Vulnerable sites, only have a relatively small proportion of the site that falls within Flood Zone 3; therefore it is likely that, by applying the sequential approach to site layout, development can be placed outside of Flood Zone 3. If, following the application of the Sequential Test, development pressures create a need to develop areas within the Flood Zone, then the Exception Test would need to be passed. Sites within Flood Zone 3 are highlighted in orange.

Sites highlighted in green are sites where it is likely that all, or part of, the site falls within the Flood Zone 3b (Functional Floodplain). With the exception of Essential Infrastructure and Water Compatible development, no development is permitted in Flood Zone 3b. Essential Infrastructure may be permitted, subject to the Exception Test.

Whilst some sites are not currently shown as being in Flood Zones, some have an ordinary watercourse running through, or adjacent to, the site, which may potentially pose a risk of flooding. At the planning application stage hydrological and hydraulic assessment of the ordinary watercourse will be required to verify flood extent and inform development zoning in the site, allowing location of residential development in areas outside of flood risk. If residential development is unable to be located outside of flood risk areas (1 in 100-year flood) the Exception Test would be required.

Note: It has been assumed that the proposed commercial sites fall under the less vulnerable category. For sites with mixed use, the overall vulnerability of the site should be that with the highest risk; for the purposes of this assessment it has been assumed the highest risk development will be residential.

Table A-2: Summary assessment of risk to all sites

Sites within Flood Zone 3

Sites where it is likely that all, or part of, the site falls within the Flood Zone 3b (Functional Floodplain)

(PP) – sites with planning permission

(PPP) – sites with partial planning permission

Location	Site name	Site area (ha)	Proposed development type	Existing land use of the site	Proportion of site in Flood Zone 3	Proportion of site in Flood Zone Two	Proportion of site in Flood Zone One	uFMfSW (lowest return period of risk – years)	Canal Breach Impact Zone	Small watercourse within, or adjacent, to site?	Proportion of site flooded in the past (based on EA Historic Flood Map
Tiverton	Land at the Foundry	1.79	Commercial	Brownfield	100%	0%	0%	100	Medium	-	100%
	William Street	0.89	Mixed use	Brownfield	0%	0%	100%	1000	Medium	-	0%
	Eastern Urban Extension	108.07	Mixed use	Greenfield	3%	0%	97%	30	High	-	0%
	Phoenix Lane	1.41	Mixed use	Brownfield	0%	0%	100%	-	High	-	0%
	Blundell's School	13.13	Mixed use	Partial Brownfield	62%	18%	20%	30	Medium	-	71%
	Leat Street	0.23	Residential	Brownfield	11%	67%	22%	1000	Low	-	9%
	Town Hall/St Andrew Street	0.52	Residential	Brownfield	6%	33%	61%	1000	Medium	-	18%
	Land at Hartnoll Farm	94.8	Residential	Greenfield	0%	0%	100%	30	V High	Y	0%
	Tidcombe Hall	8.51	Residential	Partial Brownfield	0%	0%	100%	1000	V High	Y	0%
	Hay Park	0.32	Residential	Brownfield	0%	0%	100%	-	High	Y	0%
	Exeter Hill	6.26	Residential	Greenfield	0%	0%	100%	-	High	-	0%
	The Avenue	0.34	Residential	Brownfield	0%	0%	100%	1000	V High	-	0%
	Moorhayes	0.28	Residential	Greenfield	0%	0%	100%	1000	-	Y	0%
	Farleigh Meadows	11.27	Residential	Greenfield	8%	8%	84%	30	-	-	29%
	Howden Court	0.53	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Palmerston Park	0.78	Residential	Greenfield	0%	0%	100%	-	Low	-	0%
	Roundhill	0.42	Residential	Brownfield	0%	0%	100%	-	-	-	0%
	Land at Wynnards Mead	6.53	Residential	Predominantly Greenfield	3%	0%	97%	30	-	-	0%
Crediton	Pedlerspool	24.13	Mixed use	Greenfield	2%	1%	97%	30	-	-	0%
	South of Wellparks and A377	1.33	Commercial	Greenfield	0%	8%	92%	30	-	-	0%
	Wellparks	1.36	Commercial	Brownfield	0%	0%	100%	100	-	-	0%
	Land east of Exeter Road	5.47	Commercial	Greenfield	0%	0%	100%	-	-	-	0%
	Land south of Common Marsh Lane	3.33	Commercial	Greenfield	0%	0%	100%	-	-	-	0%
	Westwood Farm	3.73	Residential	Greenfield	9%	0%	91%	100	-	-	0%
	Land at Chapel Down Farm	10.38	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Land at Alexandra Close	0.64	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	George Hill **(PP)**	1.18	Residential	Predominantly Greenfield	0%	0%	100%	-	-	-	0%

Location	Site name	Site area (ha)	Proposed development type	Existing land use of the site	Proportion of site in Flood Zone 3	Proportion of site in Flood Zone Two	Proportion of site in Flood Zone One	uFMfSW (lowest return period of risk – years)	Canal Breach Impact Zone	Small watercourse within, or adjacent, to site?	Proportion of site flooded in the past (based on EA Historic Flood Map
Crediton	Stonewell Lane Playing Field	3.18	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Red Hill Cross **(PP)**	2.78	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land at Cromwells Meadow	1.49	Residential	Greenfield	0%	3%	97%	-	-	-	0%
	Sportsfield, Exhibition Road	2.84	Residential	Greenfield	0%	0%	100%	100	-	-	0%
	Land at Barn Park	0.67	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Barnfield	0.24	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	The Woods Group	0.18	Residential	Brownfield	0%	0%	100%	100	-	-	0%
	Wellparks	23.02	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
Cullompton	Acklands	1.50	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	East Cullompton Urban Extension	160.54	Mixed use	Greenfield	10%	1%	89%	30	-	-	0%
	Knowle Lane **(PPP)**	12.00	Residential	Greenfield	21%	1%	78%	30	-	-	0%
	North West of Cullompton **(PPP)**	100.58	Mixed use	Greenfield	4%	1%	95%	30	-	-	1%
	Eastern Relief Road	20.76	Essential Infrastructure	Greenfield	100%	0%	0%	30	-	-	87%
	Cullompton Infrastructure (a)	3.48	Essential Infrastructure	Brownfield	99%	1%	0%	30	-	-	100%
	Cullompton Infrastructure (b)	0.23	Essential Infrastructure	Brownfield	83%	6%	11%	30	-	-	100%
	Land south of Springbourne, East of Exeter Road	1.70	Commercial	Greenfield	0%	0%	100%	-	-	-	0%
	Week Farm	10.52	Commercial	Greenfield	12%	7%	81%	30	-	-	1%
	NE Kingsmill	3.13	Commercial	Greenfield	3%	4%	93%	1000	-	-	0%
	Land adj Adjacent Venndale, NW Long Moor Road	3.03	Commercial	Greenfield	0%	0%	100%	30	-	-	0%
	Venn Farm	4.50	Commercial	Greenfield	1%	41%	58%	100	-	-	15%
	NW Kingsmill Industrial Estate	5.98	Commercial	Greenfield	9%	42%	49%	30	-	-	44%
	Court Farm (a) **(PPP)**	0.18	Residential	Brownfield	0%	0%	100%	1000	-	-	0%
	Court Farm (b) **(PPP)**	1.48	Residential	Brownfield	0%	0%	100%	1000	-	-	0%
	Bradninch Road	1.16	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land at Exeter Road	1.39	Residential	Greenfield	0%	0%	100%	100	-	-	0%
	Cummings Nursery	3.04	Residential	Brownfield	4%	20%	76%	100	-	-	0%
	Growen Farm	22.99	Residential	Greenfield	0%	0%	100%	100	-	Y	0%
	Land south of Tiverton Road	1.91	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Ware Park and Footlands	2.07	Residential	Greenfield	2%	0%	98%	100	-	-	0%
	Land at Colebrook	5.24	Residential	Greenfield	22%	0%	78%	100	-	-	1%
Bampton	Bourchier Close	2.38	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Stone Crushing Works Scott's Quarry **(PP)**	0.61	Mixed use	Partial Brownfield	0%	0%	100%	-	-	-	0%
	Ashleigh Park **(PP)**	0.25	Residential	Greenfield	0%	0%	100%	30	-	-	0%
	Land at Ball Hill	0.48	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Former school/School Close **(PP)**	0.60	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	South Molton Road	4.12	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Newton Square	0.24	Residential	Greenfield	0%	0%	100%	30	-	-	0%
Bickleigh	Land south of Glen View	1.38	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
Bow	South West of Junction Road	0.50	Commercial	Brownfield	0%	0%	100%	-	-	-	0%
	South of Iter Cross	0.54	Commercial	Greenfield	0%	0%	100%	-	-	-	0%
	Land adj to Bow Mill Lane	1.96	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	West of Godfrey Gardens **(PP)**	0.25	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Land adj Jackman car park	0.93	Residential	Greenfield	0%	0%	100%	1000	-	-	0%

Location	Site name	Site area (ha)	Proposed development type	Existing land use of the site	Proportion of site in Flood Zone 3	Proportion of site in Flood Zone Two	Proportion of site in Flood Zone One	uFMfSW (lowest return period of risk – years)	Canal Breach Impact Zone	Small watercourse within, or adjacent, to site?	Proportion of site flooded in the past (based on EA Historic Flood Map
Bow	East Langford Farm	1.31	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Land adj to Hollywell	1.50	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Bradninch	Hele Road	0.31	Residential	Greenfield	0%	0%	100%	100	-	-	0%
Burlescombe	Churchyard Field	0.61	Residential	Greenfield	0%	0%	100%	-	Low	-	0%
Butterleigh	Land NW of Homefield	0.77	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Chawleigh	Tower Meadow	0.46	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Barton	1.38	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Cheriton Bishop	Glebe	0.95	Residential	Greenfield	0%	0%	100%	1000	-	Y	0%
	Land near the church (a)	1.89	Residential	Greenfield	0%	0%	100%	30	-	-	0%
	Land near the church (b)	0.87	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
	Land off Church Lane	2.02	Residential	Partial Brownfield	0%	0%	100%	30	-	Y	0%
	Land adj Woodleigh Hall	8.84	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
	Land east of Hill View	0.14	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
Cheriton Fitzpaine	Glebe	2.16	Residential	Greenfield	12%	1%	87%	30	-	-	0%
	Landboat Farm (a)	0.21	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Barnshill Close	0.34	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land adj school	1.13	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Landboat Farm (b)	2.08	Residential	Partial Brownfield	15%	2%	83%	30	-	-	0%
Colebrooke	Glebe	1.02	Residential	Greenfield	0%	0%	100%	30	-	-	0%
Copplestone	The Old Abattoir	1.50	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Bewsley Farm	9.88	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
	Land adj Dulings Meadow	6.09	Residential	Greenfield	6%	1%	93%	100	-	-	0%
Culmstock	Hunter's Hill	0.58	Residential	Greenfield	0%	0%	100%	100	-	-	0%
	Linhay Close	0.22	Residential	Partial Brownfield	0%	0%	100%	1000	-	-	0%
	Culmstock Glebe and Rackfields	3.54	Residential	Predominantly Greenfield	0%	0%	100%	1000	-	-	0%
Halberton	Land adjacent to Fishers Way	0.55	Residential	Greenfield	0%	0%	100%	-	Medium	-	0%
	Land at Blundells Road	1.25	Residential	Predominantly Greenfield	1%	0%	99%	30	Medium	-	0%
Hemyock	Depot	0.57	Residential	Partial Brownfield	0%	0%	100%	100	-	-	0%
	Land SW Conigar Close	1.08	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
	Culmbridge Farm	6.46	Residential	Predominantly Greenfield	0%	0%	100%	30	-	Y	0%
	Land north of Culmbridge Farm	5.16	Residential	Greenfield	1%	8%	91%	30	-	-	9%
Kentisbeare	Land by Kentisbeare village hall	0.84	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Lapford	Land South of Sandhurst	0.94	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land between primary school and church	1.30	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Morchard Bishop	Greenaway	1.31	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Tatepath Farm	0.57	Residential	Brownfield	0%	0%	100%	-	-	-	0%
	Church Street	2.57	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Newton St Cyres	Court Orchard	2.27	Residential	Greenfield	12%	5%	83%	1000	-	-	0%
	Land west of Tytheing Close	1.84	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land east of Tytheing Close	2.06	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Oakford	Land at Oakford	0.50	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
Sampford Peverell	Higher Town	5.90	Residential	Greenfield	0%	0%	100%	-	High	-	0%
	Land off Whitnage Road	6.17	Residential	Greenfield	0%	0%	100%	30	V High	Y	0%
	Land off Mountain Oak Farm	8.95	Residential	Greenfield	0%	0%	100%	100	V High	Y	0%
	Former Tiverton Parkway Hotel	0.47	Residential	Greenfield	0%	0%	100%	-	High	-	0%
	Morrell's Farm	38.0	Mixed use	Greenfield	8%	5%	87%	30	Medium	-	3%

Location	Site name	Site area (ha)	Proposed development type	Existing land use of the site	Proportion of site in Flood Zone 3	Proportion of site in Flood Zone Two	Proportion of site in Flood Zone One	uFMfSW (lowest return period of risk – years)	Canal Breach Impact Zone	Small watercourse within, or adjacent, to site?	Proportion of site flooded in the past (based on EA Historic Flood Map
Sandford	Fanny's Lane **(PPP)**	1.69	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Shillingford	Land off Bowdens Lane (a)	1.29	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
Shillingford	Land off Bowdens Lane (b)	0.39	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Silverton	Land at Old Butterleigh Road	0.37	Residential	Greenfield	10%	0%	90%	-	-	-	0%
	Livinghayes Road	0.53	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
	Glebe	1.07	Residential	Greenfield	0%	0%	100%	1000	-	Y	0%
	The Garage	0.13	Residential	Brownfield	0%	0%	100%	100	-	-	0%
	East of Hederman Close	1.84	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
Thorverton	South of Broadlands	0.73	Residential	Greenfield	0%	0%	100%	-	-	-	0%
Uffculme	Land off Chapel Hill	2.02	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land adj Poynings	2.77	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land off Ashley Road	1.14	Residential	Partial Brownfield	0%	0%	100%	-	-	-	0%
	Land adj to Sunnydene	0.60	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land west of Uffculme	2.24	Residential	Greenfield	0%	1%	99%	30	-	-	2%
Willand	Willand Industrial Estate **(PPP)**	10.67	Commercial	Brown/Greenfield	0%	0%	100%	30	-	-	0%
	Lloyd Maunder	8.20	Commercial	Brownfield	10%	9%	81%	30	-	-	0%
	Land at M5 Junction 27 and adjoining Willand (a)	81.29	Commercial	Greenfield	0%	0%	100%	30	Low	Y	0%
	Land adj B3181	0.97	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Land east of M5	4.36	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
	Lloyd Maunder Way	1.86	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Quicks Farm	2.87	Residential	Greenfield	0%	0%	100%	1000	-	-	0%
	Dean Hill Road (a)	0.53	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Dean Hill Road (b)	1.40	Residential	Greenfield	0%	0%	100%	-	-	-	0%
	Land at M5 Junction 27 and adjoining Willand (b)	123.23	Residential	Greenfield	0%	0%	100%	30	-	Y	0%
Yeoford	Land off Lower Road (a)	0.25	Residential	Brownfield	0%	0%	100%	30	-	-	0%
	Land off Lower Road (b)	0.40	Residential	Greenfield	0%	0%	100%	-	-	-	0%

B Mid Devon watercourses

A map of Mid Devon watercourses is provided as a separate attachment to this main report.

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C Flood Zone mapping

The flood zone mapping is provided as a separate attachment to this main report.

The District has been divided into 61 grid squares and a map provided for each grid square. A mapping index has been provided to allow look up on the relevant map for a required grid square.

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D Climate change mapping

The climate change mapping is provided as a separate attachment to this main report.

The District has been divided into 61 grid squares and a map provided for each grid square. A mapping index has been provided to allow look up on the relevant map for a required grid square.

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E Depth (hazard) mapping

The depth (hazard) mapping is provided as a separate attachment to this main report.

The District has been divided into 61 grid squares and a map provided for each grid square. A mapping index has been provided to allow look up on the relevant map for a required grid square.

E.1 100-year depth mapping

E.2 1,000-year depth mapping

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F Surface water mapping

The surface water mapping is provided as a separate attachment to this main report.

The District has been divided into 61 grid squares and a map provided for each grid square. A mapping index has been provided to allow look up on the relevant map for a required grid square.

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G Groundwater mapping

The groundwater mapping is provided as a separate attachment to this main report.

The District has been divided into 61 grid squares and a map provided for each grid square. A mapping index has been provided to allow look up on the relevant map for a required grid square.

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H Flood warning coverage

The flood warning coverage is provided as a separate attachment to this main report.

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I Canal breach impact zones

A map of canal breach zones is provided as a separate attachment to this main report.

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J Historic records of flooding

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Offices at

Coleshill
Doncaster
Edinburgh
Exeter
Haywards Heath
Limerick
Newcastle upon Tyne
Newport
Saltaire
Skipton
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Registered Office
South Barn
Broughton Hall
SKIPTON
North Yorkshire
BD23 3AE

t:+44(0)1756 799919
e:info@jbaconsulting.com

Jeremy Benn Associates Ltd
Registered in England
3246693