Exeter City Council

Exeter City Council

Strategic Flood Risk Assessment

Level 2

May 2014

Contents

1 Introduction

1.1 Background

The National Planning Policy Framework (NPPF), published in March 2012, states that “inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.” The NPPF Planning Practice Guidance states that Local Planning Authorities must undertake a Strategic Flood Risk Assessment (SFRA) to fully understand the flood risk in the area to inform Local Plan preparation.

Flooding of properties from either fluvial flow, tidal or groundwater sources causes disruption, widespread and costly damage, temporary or even permanent displacement of residents, harm leading to or causing loss of life, and the personal blight of properties. The importance of flood risk in the UK and Europe is reflected by a complex and evolving legislative background. The various Directives, Regulations and Acts, and the responsibilities inferred by these, are summarised at Appendix A.

1.2 Overview of SFRA

A SFRA is an overview of flood risk within the City Council’s boundaries. It aims to provide general guidance to planning officers, developers, and other interested parties about areas where potential flood risk is an issue. The Council uses the SFRA to refine the information on the Environment Agency’s Flood Maps and determine flood risk from all sources of flooding. The SFRA is also used to inform the Sustainability Appraisal (incorporating the Strategic Environmental Assessment (SEA) Directive) of the Development Plan Documents (DPDs) which make up the Local Plan and will provide the basis from which to apply the Sequential Test and Exception Test.

A SFRA is carried out in 2 stages:

- Level 1 SFRA – Area wide review
  An area wide review of flooding, collating available information on flood sources to enable a sequential approach to spatial planning and identification of where further testing may need to be applied.
- Level 2 SFRA – Reducing uncertainty
  Specific assessments in areas of higher flood risk. Reduces uncertainty on flood risk and increases the quality and quantity of data to allow application of the Exception Test.

This staged approach is recommended by the NPPF Planning Practice Guidance.

1.3 Exeter City Council's SFRA Work

Exeter City Council's SFRA Level 1 was undertaken by consultants Pell Frischmann in 2007, and signed off by the Environment Agency (EA) in February 2008. The SFRA Level 1 is available to view on the Council's website.

Level 1 identified the extent of flood zones within the City's boundaries. The work produced large-scale maps identifying areas which were known to be at risk from flooding. This work allows both planning officers and developers to initially determine if any site is likely to be at risk of flooding, based upon its flood zone. Where flooding was perceived to be a significant risk, then this would trigger the need for an individual Flood Risk Assessment [1](FRA).

This work also assisted in preparing the spatial element for the Exeter Core Strategy and was used to inform the Sustainability Appraisal so that flood risk was taken into account when considering allocation options and in the preparation of plan policies.

The Level 1 work showed that some areas which were identified for development within the Core Strategy (specifically small parts of the Strategic Allocations and one of the Regeneration Areas), were within flood zone areas of significant risk and therefore a Level 2 SFRA was required in order to establish more detail about the flood issues in those areas.

The SFRA level 2 considers the detailed nature of the flood hazard including the flood probability, flood depth, flood velocity and the rate of onset of flooding. This can be significantly affected by the presence of flood defences and the increased scope of the SRFA level 2 allows the consideration of the effects of flood defences and flood risk management infrastructure in reducing the extent and severity of flooding when compared to the flood zones on the Flood Map[2].

The Level 2 work will influence the type, design and layout of future development within the strategic allocations identified in the Core Strategy and will inform additional land allocations identified in the Development Delivery DPD.

A close dialogue has been maintained with the Environment Agency throughout the preparation of the Level 1 and 2 reports. The Level 1 and 2 reports should be used in conjunction with each other for both plan making and to inform ongoing development control decisions.

[1] Guidance regarding requirements for site specific FRAs is provided in Appendix A of the level 1 SFRA.

[2] Information on the location, standard and condition of existing defences is obtained from those who operate and maintain these assets. Under Schedule 1 of the Flood and Water Management Act (2010), the Environment Agency, a local authority, or an internal drainage board may designate features in the environment that perform a flood or coastal erosion risk management function. Once designated, the owner of the feature cannot alter or interfere with it, without consent

2 SFRA level 2 – Area Specific Studies

2.1 Background

Exeter's SFRA level 1 identified areas where more detailed work was required. The areas for further study were:

1. The Seabrook watercourse – within the Newcourt Strategic Allocation
2. The Pinbrook watercourse – within the Monkerton and Hill Barton Strategic Allocation
3. Haven Banks Area – within the Water Lane Regeneration Area

The following sections summarise the findings of these area specific studies attached as Appendix B.

2.2 The Seabrook watercourse

Clarke Bond engineering consultants were employed to undertake the necessary hydraulic modelling to define flood zones (FZ) 1, 2, 3a and 3b for land south of the A379 Sandygate link road, between Old Rydon Lane and Topsham Road / Exeter Road.

The Seabrook watercourse is a small ordinary watercourse that drains an area of relatively open land east of the City between Countess Wear and Topsham. This land (formerly the Royal Navy Stores Depot) was drained mainly by a system of swales and ditches which discharged to the Seabrook watercourse or locally to the surface water sewers fronting Topsham Road.

A public surface water sewer was requisitioned by Tesco during 1990's and also serves the new residential area around the former Digby Hospital (north of the A379). This sewer discharges into the head of the watercourse just south of Old Rydon Lane. Improvements to the downstream watercourse and culvert at Topsham Road / Exeter Road were also undertaken as part of this scheme to increase flow capacities.

The hydraulic model has been generated using ISIS software, utilising LIDAR map data provided by the EA, and supplemented by further field work surveys to more accurately represent the watercourse's local characteristics. All bridge structures have been included in order to demonstrate and replicate any overland flow so as to determine the extents of the flood areas.

The lower reach of the watercourse is affected by tidal influence of the River Exe estuary. However, the report concludes that the tidal effect has no impact upstream due to the difference in ground levels.

Four flow scenarios (events) have been assessed to establish the flood zones. These events are the 25 year event (equivalent of FZ3b), the 100 year event (FZ3a), the 100 year event plus climate change, and the 1000 year flood event (FZ2).

All the flow models include the 'Greenfield' contribution and the actual amount of urban run-off that can be conveyed via the public surface water sewer (SWS) into the head of the watercourse (3.4 cumecs). There is still, however, the potential that this SWS system could be overwhelmed by a severe rainfall event causing surcharge

(backing up) and spillage from manholes or possibly from lateral connections to cause localised flooding (known as overland flows).

The results generally illustrate that even when bank full conditions are exceeded the watercourse flows are kept confined by the local topography of this naturally gentle sided valley. This prevents a large change in flood zoning under all the scenarios considered and results in most of the study area being in flood zone 1.

An ecological and maintenance buffer strip 5 metres wide either side of the top bank is required by the EA. The EA has stated that they accept a general lowering of ground levels in a 10 metre wide margin beside / straddling the watercourse channel. This area of land will need to be retained free of all built development. All new development schemes upstream will be required to mimic the existing Greenfield surface water runoff.

The study findings have influenced the production of the Newcourt Masterplan and have informed the recent proposals for development of this area.

The full report, which contains flood extent plans, is attached at Appendix B.

2.3 The Pinbrook Watercourse

Clarke Bond engineering consultants were employed to undertake the necessary hydraulic modelling to define flood zones (FZ) 1, 2, 3a & 3b for land between the Monkerton Relief Road and the M5 motorway.

Historic flooding in 1972 records a large flood extent within the Monkerton area. However, this incident occurred before the adjacent M5 motorway was constructed. It is assumed that as part of the motorway works ground levels to the south of the Pinbrook have been modified, with the channel width being made larger and hydraulically more efficient. Therefore, the flood extents determined by this modelling exercise do not necessarily correspond to flood extents in 1972.

The Pinn Brook has recently been designated a “main river” and as such comes under the regulatory control of the E.A. This status identifies a 7 metre wide strip on either bank, within which the EA must be consulted on any works, and have the powers to refuse development on flood risk or ecological grounds. The Pinn Brook flood alleviation scheme, constructed during the 1980’s by ECC, is today maintained by the EA.
The hydraulic model of the watercourse has been generated using ISIS software, utilising LIDAR map data provided by the EA, and supplemented by further field work surveys to more accurately represent the watercourse’s local characteristics. The design flow rates for use in the modelling have been provided by the EA. All bridge structures have been included and a resultant overflow created in their modelling to replicate the overland flow to determine the extent of the flood areas.

Four flow scenarios (for the prescribed events) have been assessed to establish the flood zones. These events are the 25 year event (equivalent of FZ3b), the 100 year event (FZ3a), the 100 year event plus climate change, and the 1000 year flood event (FZ2).

The report has found that the majority of the study area is within flood zone 1. However, land between the Pinbrook and the drainage ditch west of Monkerton is within flood zone 2 and 3 with a conveyance between the two watercourses (the two

watercourses join together in times of flood). Areas around Monkerton Drive, Pinn Lane and Grasslands to the south of Pinbrook are also located within flood zones 2 and 3. The remaining areas of undeveloped land between Monkerton and the M5 are generally in flood zone 1. The study findings have influenced the production of the Monkerton and Hill Barton Masterplan and will inform any future development in this area.

The full report, which contains flood extent plans, is attached at Appendix B.

2.4 Haven Banks area

Clarke Bond engineering consultants were employed specifically to undertake the necessary hydraulic modelling to define flood zones (FZ) 1, 2, 3a & 3b for land south of Haven Road, between the Exeter Canal to the east and the main Paddington Railway line to the west, extending as far south as Alphin Brook Road.

This area is in close proximity to both the Exeter Canal and the River Exe and is shown to be predominantly within flood zone 3 on the EA's flood maps.

Some critical parts of the existing River Exe flood defences are located in close proximity to this study area, including Trews Weir which diverts floodwater into the flood relief channel via a high sided weir, and the flood banks at Exe Bridges which are predicted to be overtopped resulting in flooding to large parts of St Thomas. This resultant flood water is then able to spill back over the northern section of the study area before rejoining the river Exe.

The tidal influence upon the River Exe estuary only extends upstream as far as St. James Weir. The levels of the study area are all shown to be above the extreme climate change tidal surge.

Four flow scenarios have been assessed to establish the flood zones. These events are the 25 year event (equivalent of FZ3b), the 100 year event (FZ3a), the 100 year event plus climate change, and the 1000 year flood event (FZ2).

The report suggests that most of the study area lies within flood zone 3a, but that an area to the south remains free from flooding. The area that remains free from flooding arises due to the presence of an over land flow route towards the River Exe at the northern part of the study area. The modelling also confirms that the areas within flood zone 2 are not significantly greater than those with flood zone 3a, as the floodwaters are contained by the railway embankment along the south western boundary of the study area.

It should be noted that the hydraulic model does not take into account the presence of the Exeter Canal which will in reality act as an additional flow path / conduit for overland flood flow.

The report highlighted the need to carry out a further revised assessment of the flood risk upon the completion of the updated River Exe modelling by the EA.

The Haven Banks report is attached at Appendix B.

Update:

The EA have recently revised their River Exe modelling to incorporate two-dimensional (2D) elements within the model to more effectively replicate the overland flow paths through / along the Exe valley (see3.2 below). This latest update to the River Exe hydraulic model allows the flood risk and extent of flooding in the vicinity of Haven Banks to be more accurately defined and better represents the impact that a breach of the existing defences will have upon the study area.

A subsequent review of the Haven Banks report with the latest 2D modelling shows that the Clarke Bond flood extent map has a very good correlation with that produced independently by the EA. There is a slight tendency for the consultant's event flows to over predict and hence the resulting flood depths to be marginally greater than the EA results, yet it is still considered sufficiently accurate to highlight potential flood risk areas.

As part of the Exeter Flood Alleviation Scheme, the EA are currently re-running their hydraulic models for the River Exe to assess the individual capacities of the bridge structures, to ensure the design of the flood defences is adequate for the standard of protection delivered. This will marginally re-determine some of the predicted flood levels downstream.

Therefore, until any development proposal is put forward within this area, or the proposed River Exe Flood Management Scheme is constructed (due for completion in 2017), there is little need to re-assess/fine tune the hydraulic model.

3 SFRA level 2 - Other Flood Risk Modelling

3.1 Background

In addition to the SFRA level 2 area specific studies undertaken by the City Council, there are other sources of data and modelling relating to main river, surface water and ordinary watercourse flooding.

3.2 Main River Flooding

River Exe 2D Hydraulic Modelling

The EA have recently revised their River Exe modelling to incorporate 2D elements within the model to more effectively replicate the overland flow paths through / along the Exe valley. This latest update to the River Exe hydraulic model allows the flood risk and extent of flooding in the vicinity of Haven Banks to be more accurately defined and better represents the impact that a breach of the existing defences will have upon the study area. This detailed hydraulic model has been used to assess the performance of the existing flood prevention scheme and highlights the need for the current flood defences to be improved.

The outputs of the 2D modelling include mapping showing the extent and depth of flooding for the prescribed rainfall events and mapping showing hazard areas (taking into account depth and velocity).

If you are proposing development that may be affected by Main River flooding or if you require information on the 2D modelling outputs you are advised to contact the Environment Agency directly (see Contacts 5).

3.3 Surface Water Flooding

A surface water flood results from rainfall generated overland flow before the runoff enters any watercourse or sewer. Surface water flooding can occur almost anywhere when it rains hard enough for the local topography and circumstances to be unable to absorb the rainfall.

Surface Water Flood Maps

A Surface Water Flood Risk Map has been produced by the Environment Agency.

The map shows areas that are susceptible to surface water flooding. The map provides four bandings which indicate ‘High’, ‘Medium’, ‘Low’ and ‘Very Low’ susceptibility to surface water flooding.

The map is available to view on the EA website.

Note: The map does not show the susceptibility of individual properties to surface water flooding, and is not appropriate to act as the sole evidence for any specific planning decision at any scale without further supporting studies or evidence. Additional information should be obtained from the Environment Agency.

Surface Water Management Plans

As required by the Flood Risk Regulations (see Appendix A), Surface Water Management Plans are being prepared by Devon County Council (the Lead Local Flood Authority (LLFA)) in partnership with ECC and other stakeholders.

A 'Preliminary Flood Risk Assessment' for Devon was completed in 2011 and identified a number of areas as having significant risk of flooding from surface runoff, ground water and ordinary watercourses. A detailed assessment of Exeter was undertaken to further assess those areas identified as 'wetspots' ('Exeter Surface Water Management Plan' – Phase 2, Oct 2013). This work is available to view on Devon County Council's website. The next and final phase of the work (Options Testing – Phase 3) is due to be completed by the end of 2014.

You are advised to contact Devon County Council for updates on this work (see Contacts 5).

Integrated Urban Drainage Study

An 'Integrated Urban Drainage Study' for Exeter is being undertaken by South West Water, in partnership with Devon County Council, Exeter City Council and the Environment Agency. The study is looking to ascertain the level of risk from all forms of flooding across the catchment, develop outline options and investigate ways to promote multi-agency schemes. The study is proceeding in parallel with the ongoing Exeter Surface Water Management Planning and should be complete by Summer 2014.

You are advised to contact South West Water for updates on this work (see Contacts 5).

3.4 Ordinary Watercourse Flooding

Northbrook Watercourse Study

The City Council has undertaken a study of the Northbrook watercourse (including Mincinglake Stream) that improves the accuracy of the mapping for that area. A hydraulic model of the full catchment is now available that identifies the extent of each of the flood zones and identifies those properties that are at potential risk. This study has also enabled flood hazard maps to be produced for this watercourse. A desk top study of both the environmental and ecological impact of possible future flood relief options and strategies has also been undertaken.

The study was completed in 2011 and has been validated by some flow monitoring during 2011/12.

Recently a draft Project Appraisal Report has been produced to take forward the possibility of promoting a Flood Alleviation Scheme to protect vulnerable properties and highlights specific areas that are at risk.

You are advised to contact the City Council if you are proposing development within this area (see Contacts 5).

Taddiforde Brook Watercourse Study

Known historical flooding in the Red Cow Village area has led to a feasibility study being undertaken with regard to the potential flood risk in this area as a result of the flows generated from the upstream catchment. A general “bare earth” model has been produced and has confirmed that a number of properties are at risk. Consequently a bid for future funding to promote a flood alleviation scheme is being put forward as part of the Medium Term Plan six year programme of works.

It should be noted that many of these properties are also at risk of flooding from the River Exe. Whilst these properties will benefit from the Exeter Flood Alleviation Scheme, they will remain at risk from the Taddiforde Brook watercourse.

You are advised to contact the City Council if you are proposing development within this area (see Contacts 5).

4 Other Flood Risk Plans and Strategies

4.1 Background

Plans and strategies produced by DCC and the Environment Agency provide yet other sources of flood risk information, policy and guidance.

4.2 Local Flood Risk Management Strategy

Work is underway on a 'Strategy for Local Flood Risk Management'. This document will guide the approach to flood risk management within the County and will be a useful toolkit for flood risk management practitioners and others. This Strategy is expected to be adopted in May 2014 and will be available to view on the Devon County Council website.

4.3 Exe Catchment Flood Management Plan

The Exe Catchment Flood Management Plan (CFMP) was adopted by the EA in 2008 and has since been updated and revised. This is a high level strategic plan for the management of the river catchment area; it gives an overview of the flood risk in the Exe catchment and sets out the preferred plan for sustainable flood risk management over the next 50 to 100 years. It looks to identify the most appropriate approach to managing flood risk and allocates one of six generic flood risk management policies for each of the sub-areas. The conclusion for Greater Exeter (sub-area 2) is that this is an 'Area of moderate to high flood risk where we can generally take further action to reduce flood risk'. The summary report, adoption statement, and revised action plan are available to view on the Environment Agency website.

4.4 South Devon and Dorset Shoreline Management Plan

Shoreline Management Plans (SMP) are large-scale reports, assessing the risks associated with coastal processes. They aim to help reduce erosion and coastal flooding risks to people, property and the historic and natural environment. The South Devon and Dorset SMP sets jointly agreed broad coastal management policies for the whole South Devon coast. The Shoreline Management Plan is available to view on the South Devon and Dorset Costal Advisory Group website.

4.5 Exe Estuary Flood and Coastal Erosion Risk Management Strategy

The Environment Agency published the draft Exe Estuary Flood and Coastal Erosion Risk Management Strategy on 24 September 2013. The Strategy explains the current level of flood risk and coastal erosion and effects of climate change, and makes recommendations for managing these risks. This draft Strategy draws on the South Devon and Dorset Shoreline Management Plan and is available on the Environment Agency website.

5 Useful Contacts

Environment Agency steve.j.moore@environment-agency.gov.uk	Steve Moore
Devon County Council (as Lead Local Flood Authority) martin.hutchings@devon.gov.uk	Martin Hutchings
South West Water rbehan@southwestwater.co.uk	Richard Behan
Exeter City Council peter.stewart@exeter.gov.uk	Peter Stewart

Abbreviations

AOD	Above Ordnance Datum
EA	Environment Agency
EU	European Union
FRA	Flood Risk Assessment
FRD	Flood Risk Directive
FWMA	Flood and Water Management Act, 2010
FZ	Flood Zone
LDD	Local Development Document
LDF	Local Development Framework
LLFA	Lead Local Flood Authorities
LPA	Local Planning Authority
MHWS	Mean high water spring
NPPF	National Planning Policy Framework
SFRA	Strategic Flood Risk Assessment
SAB	SuDS Adoption Body
SHLAA	Strategic Housing Land Availability Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan

Appendix A

Relevant Flood Risk Legislation

The European Flood Risk Directive (FRD)

The European Flood Risk Directive of 2007[3] requires Member States to assess and manage potential flood risk from all sources and set a phased timescale for implementing the specific requirements. The Directive requires Members to put in place "appropriate objectives" for the management of flood risk, focusing on the reduction of potential adverse consequences of flooding upon human health, the environment, cultural heritage, and economic activity.

This is the first European Directive that deals specifically with floods, requiring Members to provide assessment and management of flood risks. This approach has shifted the previous strategy from protection against floods to managing the risks of flooding. Its purpose is to establish a framework for the assessment and management of flood risks in order to reduce these risks. The FRD defines flood risk as the combination of the probability of a flood event and the potential adverse consequences for human health, the environment, cultural heritage and economic activity. The source of the flood water can be from rivers, watercourses, sea or groundwater.

Flood risk management has been split into a three-stage process by the FRD whereby Member States are required to complete each stage by specific dates:

The first stage (to be completed by 22 December 2011) is a preliminary flood risk assessment of all river basins and the identification of areas with a potential significant flood risk.

The second stage (to be completed by 22 December 2013) is the preparation of flood hazard maps and flood risk maps for areas with potential significant flood risks. The maps have to give information on the flood extent; water depths & flow velocities based upon three scenarios based upon statistical probability – low, medium and high risk. The potential adverse consequences of potential flooding also have to be shown.

The third stage (to be completed by 22 December 2015) is the preparation of flood risk management plans. The plans have to contain "appropriate objectives" for the management of flood risks, focusing on the reduction of potential adverse consequences of flooding upon human health, the environment, cultural heritage and economic activity. Thereafter, Flood Risk Management Plans must be reviewed and updated every 6 years.

In addition, the Members are required to implement the European Water Framework Directive (2000/60/EC).

Flood Risk Regulations

The purpose of the Flood Risk Regulations is to transpose the European FRD Directive into domestic law and to implement its provisions. Flood Risk Regulations came into force on the 10 December 2009 and set duties and responsibilties for the EA and the Lead Local Flood Authorities (LLFAs). The EA have a duty under the

[3] Directive 2007/60/EC on the assessment and management of flood risk

Flood Risk Regulations to review, collate and publish the reports, maps and plans produced (by the EA and LLFAs) to provide quality assurance and ensure national consistence. The EA has determined that it will need to see the products (outlined in paragraph above) from the LLFAs six months before the European FRD deadlines for each of the three identified stages.

The Flood Risk Regulations also require that a Surface Water Management Plans (SWMP) is undertaken by the Lead Local Flood Authorities in partnership with other stakeholders.

The Pitt Review

In Britain, following the severe floods of Summer 2007, the government initiated a review of the way flooding was dealt with by all the various stakeholders, including the EA, local councils, highway agencies, water companies and emergency services. The Review (December 2007)[4] raised some serious concerns over the roles and responsibilities regarding surface water management and led to over ninety recommendations (see below).

The Flood and Water Management Act

The new Flood & Water Management Act (FWMA)[5], 2010, sets the new framework for stakeholders and establishes roles and responsibilities particularly for the EA, and the Lead Local Flood Authorities (LLFA's), who will assist and require close stakeholder engagement to find and/or broker solutions. The FWMA is the delivery mechanism to implement the majority of the recommendations set out previously by the Pitt Review.

The LLFA (Devon County Council) will deliver surface water management, mainly through developing the required SWMP's. Each LLFA is also required to create and maintain a register of structures or features which, in the opinion of the authority, are likely to have a significant effect on a flood risk in its area. The LLFA's are also to become the SuDS Approval Body (SAB).

The Act also introduces a requirement to improve the flood resistance of existing buildings by amending the Building Act 1984.

[4] The Pitt Review: Interim Report, December 2007 (sourced 19/12/11 from http://webarchive.nationalarchives.gov.uk/20100807034701/http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/interim_report.html)

[5] Flood and Water Management Act, 2010 (sourced 22/11/11 from http://www.legislation.gov.uk/ukpga/2010/29/contents)

Appendix B