

# Somerset County Council

## Preliminary Flood Risk Assessment Report

June 2011



# Revision Schedule

Revision	Date	Details	Prepared by	Reviewed by	Approved by
1	8 June 2011	Draft Report for internal and external consultation	Didier Lebrun (Somerset County Council)	Andrew Turner (Somerset County Council)	Chris Edwards (Somerset County Council)

## Executive Summary

Flooding is one of the greatest natural hazards faced by communities in the UK. This is particularly the case in Somerset where around 15% of the land is at, or a few metres above sea level. The number of properties and individuals at risk of flooding is increasing due to development in flood risk areas and increased run-off from urban sites, a trend that is likely to be exacerbated by climate change predictions. Central to mitigating flood risk and helping to build resilience to these events is an understanding of where flooding is most likely to occur.

Recent changes to legislation have given Somerset County Council new responsibilities regarding flood risk management relating to sources of local flood risk. This includes a requirement under the Flood Risk Regulations 2009 to prepare and submit to the Environment Agency a Preliminary Flood Risk Assessment (PFRA) for Somerset.

The PFRA is a high-level overview comprising mapping and a report identifying areas of local flood sources, specifically flood risk attributable to surface water, groundwater, ordinary watercourses and canals. The County Council must submit the PFRA to the Environment Agency by 22<sup>nd</sup> June 2011.

The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting national Indicative Flood Risk Areas, both published in December 2010.

A formal governance and partnership arrangement was formed in July 2010; the group known as the 'Somerset Flood Risk Management Partnership' comprises of external stakeholders representing the specific interests of the County Council.

To develop an understanding of local flood risk in Somerset, information has been collated from the following sources:

- Environment Agency
- Somerset Highways Asset Management System 'Confirm'
- Fire service
- District Councils
- Parish and Town Councils
- Internal Drainage Boards
- Wessex Water
- Media reports

This information has led to the discovery of over 900 past flood events across Somerset which has been analysed. Past flood events where the number of properties flooded were unknown, were excluded from the analysis.

However, the analysis using the local threshold (over 20 properties flooded) has identified 6 areas in Somerset to have had locally significant flood events with significant harmful consequences.

It is recognised that other flood events below this threshold might still be of concern as they would have impacted upon individuals, businesses and communities in Somerset. Therefore, these events will be assessed thoroughly as part of future flood risk management strategies by the County Council and its partners.

The assessment of future flood risk areas has revealed only two clusters within Somerset. Although these clusters are located in extra urban areas (Taunton and Yeovil) they do not exceed the nationally set threshold (over 30,000 people at risk within a cluster), therefore cannot be classed as 'Indicative Flood Risk Areas'.

A number of other duties for the County Council relating to flood risk management have been or will commence in the future and reference is made to these in this document, where appropriate.

## Table of Contents

Executive Summary .....	i
Table of Contents.....	iii
List of Figures .....	v
List of Tables.....	v
Abbreviations .....	vi
1. Introduction .....	1
1.1 Scope of the PFRA Report.....	2
1.2 Aims and Objectives .....	3
1.3 Study Area .....	4
2. Lead Local Flood Authority Responsibilities.....	6
2.1 Introduction .....	6
2.2 Governance and Partnership Arrangements.....	6
2.3 Public Engagement.....	7
2.4 Further Responsibilities .....	8
3. Methodology and Data Review .....	9
3.1 Introduction .....	9
3.2 Methodology .....	9
3.3 Data Management, Security, Licensing and Restrictions.....	11
4. Historical Floods .....	13
4.1 Types of Flooding .....	14
4.1.2 Surface Water Flooding .....	14
4.1.3 Ground Water Flooding.....	15
4.1.4 Sewer Flooding.....	16
4.1.5 Canal and Ordinary Watercourse Flooding.....	17
4.1.6 Interaction with Main Rivers and the Sea.....	17
4.1.7 Significant Harmful Consequences .....	17
4.2 Historical Records.....	18
4.2.1 Highways Records .....	18
4.2.2 Fire & Rescue Service Records.....	18
4.2.3 Environment Agency Records.....	18
4.2.4 Parishes & Town Council Records.....	19
4.2.5 District Councils Records.....	19
4.3 Adopted Methodology for Assessing Historic Flood Areas .....	19
5. Future Flood Risk.....	23
5.1 Future Floods and their consequences.....	23
5.2 Surface Water Flooding .....	23
5.3 Flood Risk Indicators .....	24
5.4 Summary of Future Flood Risk .....	24
5.5 Locally Agreed Surface Water Information .....	25
5.6 Climate Change Impacts on Flooding .....	26
5.7 Key Projections for South West River Basin District .....	27
5.8 Implications for Flood Risk.....	27
5.9 Long term Developments.....	28
6. Assessment of Indicative Flood Risk Areas .....	29

6.1 Overview and Methodology.....	29
6.2 Surface Water Management Plans .....	30
6.3 Local Flood Risk Areas and the Indication of New National Flood Risk Areas .....	30
7. Scrutiny and Review Process .....	32
7.1 Environment Agency Review .....	32
7.2 External Review .....	32
8. Next Steps .....	33
8.1 Local Strategy for Flood Risk Management .....	33
8.2 Reviewing and Updating Flood Data and Modelling .....	33
8.3 Post Flood Event Data Collection .....	34
8.4 Maintaining an Asset Register .....	34
8.5 Development and Planning .....	34
References .....	36
Annex 1: Records of Past Floods and their significant Consequences (Preliminary Assessment Report Spreadsheet) .....	37
Annex 2: Records of Future Floods and their Significant Consequences (Preliminary Assessment Report Spreadsheet) .....	37
Annex 3: Records of Flood Risk Areas and their Rationale (Preliminary Assessment Report Spreadsheet) .....	37
Annex 4: Preliminary Flood Risk Assessment Checklist .....	37
Annex 5: Maps & Plans.....	37

## List of Figures

Figure 1: Elements of work required from Somerset County Council under the Flood Risk Regulations 2009 .....	2
Figure 2: Somerset County study area .....	5
Figure 3: Somerset Flood Risk Management Partnership arrangements .....	7
Figure 4: Areas subjected to historical flooding events recorded in the SHFDB .....	13
Figure 5: Historic flood events caused by surface water flooding .....	15
Figure 6: Areas Susceptible to Groundwater Flooding.....	16
Figure 7: Locally Significant Past Flood Events from Annex 1 Spreadsheet..	22
Figure 8: Locally Agreed Surface Water information for Somerset .....	26
Figure 9: Example of a cluster .....	29
Figure 10: Areas above Nationally Set Flood Risk Thresholds .....	31

## List of Tables

Table 1: Definitions of thresholds set and indicators used to determine local and national harmful consequences for past and future flood risk assessment.....	3
Table 2: Partner organisations approached and their available data including limitations and licensing issues .....	10
Table 3: Data acquired from the Environment Agency.....	11
Table 4: Number of locally significant historic flooding records from local sources in Somerset for a range of threshold levels .....	21
Table 5: Summary table of Somerset's significant events in Annex 1 .....	21
Table 6: Possible significant flooding events which cannot be reported in Annex 1.....	21
Table 7: Flood Risk Indicators.....	24
Table 8: Receptors at risk of surface water flooding .....	25
Table 9: Total number of properties at risk of flooding during a rainfall event with a 1 in 200 chance of occurring in any year .....	31

## Abbreviations

Acronym	Definition
AEP	Annual Exceedance Probability
AStSWF	Areas Susceptible to Surface Water Flooding
AStGWF	Areas Susceptible to Groundwater Flooding
Defra	Department for Environment, Food and Rural Affairs
DEM	Digital Elevation Modem
DSM	Digital Surface Model
EA	Environment Agency
EC	European Commission
FRIS	Flood Reconnaissance Information System
FMfSW	Flood Map for Surface Water
FWMA	Flood & Water Management Act 2010
GHG	Greenhouse Gas
GIS	Geographical Information Systems
IDBs	Internal Drainage Boards
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NFCDD	National Flood and Coastal Defence Database
NRD	National Receptors Database
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PFRA	Preliminary Flood Risk Assessment
RFDC	Regional Flood Defence Committee
SAB	SUDS Approving Body
SCC	Somerset County Council
SFRA	Strategic Flood Risk Assessment
SHFDB	Somerset Historical Flooding Database
SPA	Special Protection Areas
SAC	Special Areas of Conservation
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Drainage Systems



# 1. Introduction

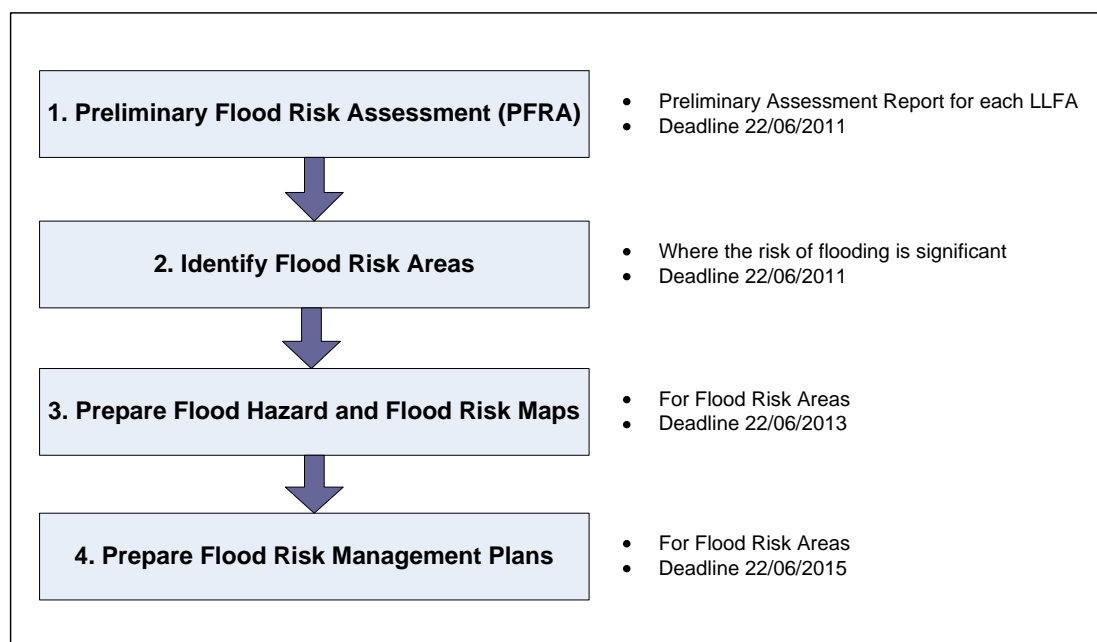
This document reports the findings of research undertaken by Somerset County Council towards the preparation of a Preliminary Flood Risk Assessment (PFRA) for its administrative area.

The chief drivers behind this research and preparation of the PFRA report are two sets of new legislation: the Flood Risk Regulations (The Regulations), which came into force on the 10th December 2009 as Statutory Instrument 3042, and the Flood & Water Management Act (The Act) which gained Royal Assent on the 8th April 2010. Under these pieces of legislation, all Unitary Authorities, and in two-tier systems, all County Councils including SCC, are designated as a Local Lead Flood Authority (LLFA) and have formally been allocated a number of key responsibilities with respect to local flood risk management. A brief overview of these responsibilities is provided in Section 2 of this report.

The purpose of The Regulations was to transpose the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risk) into domestic law in England and Wales and to implement its provisions. In particular it places duties on the Environment Agency and LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood hazard and flood risk maps;
- Flood Risk Management Plans.

*Figure 1* shows the elements of work required from Somerset County Council under the Flood Risk Regulations 2009, along with the timescales for their respective delivery. The first two elements of work, highlighted in blue, are covered by the preparation of this PFRA report. The further elements of work are not required to be undertaken at this time as Somerset County Council has no Indicative Flood Risk Areas that meet the national criteria for England of 30,000 people at risk. However the data gathered and potential Flood Risk Areas identified will be used to support and inform the preparation of Somerset's Local Flood Risk Management Strategy, which will be the next stage of legislation to progress.



**Figure 1:** Elements of work required from Somerset County Council under the Flood Risk Regulations 2009

## 1.1 Scope of the PFRA Report

The PFRA is a high level screening exercise to locate areas in which the risk of local flooding is significant and warrants further examination through the production of maps and management plans.

It is noted that the scope of this PFRA is to consider past flooding and possible future flooding from the following local flood sources:

- Surface water
- Groundwater
- Ordinary Watercourses and Canals

It is noted that the PFRA report must consider floods which have significant harmful consequences for human health, economic activity, cultural heritage and the environment. *Table 1* shows the definitions and thresholds applied to determine local and national significance for the assessment of harmful consequences.

**Table 1:** Definitions of thresholds set and indicators used to determine local and national harmful consequences for past and future flood risk assessment

	<b>Threshold level set by</b>	<b>Number of properties at risk</b>	<b>Number of people at risk</b> (based on number of residential properties x 2.34, the average estimated number of residents per property)	<b>Number of critical services at risk</b> (including schools, hospitals, nursing homes, power and water services)
<b>National Indicative Flood Risk Areas</b> National significance threshold set for the assessment of future flood risk. Cluster Areas that exceed stated thresholds	Defra	–	>30,000	>150
Cluster Areas 3km square that contains 5 or more blue squares that are touching	Defra	5 or more blue squares touching		
Blue Squares 1km grid area	Defra	–	>200	>1
<b>Locally Significant Flood Event</b> SCC significance threshold set for the assessment of past flood events for reporting in Annex 1	<b>SCC</b>	<b>20</b>	–	–
<b>Local Flood Risk Areas</b>	Areas that will form part of Somerset's Local Strategy for Flood Risk Management (future work)			

Flooding associated with the sea, main rivers and large raised reservoirs is the responsibility of the Environment Agency (EA) and does not need to be considered by the LLFA as part of the PFRA, unless it is considered that it may affect flooding from one of the sources listed above. It is also noted, however, that some floods within Somerset can comprise of a combination of sources – Ordinary Watercourses and Main Rivers flood as one, surface water and fluvial flooding can occur together and coastal flooding creates river flooding through tide-locking.

## 1.2 Aims and Objectives

The aim of this PFRA is to provide an assessment of local flood risk across the study area, including information on past floods and the potential consequences of future floods.

The key objectives can be summarised as follows:

- Identify relevant partner organisations involved in future assessment of flood risk; and summarise means of future and ongoing stakeholder engagement;
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information;
- Provide a summary of the systems used for data sharing and storing, and data licensing arrangements;
- Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures;
- Assess historic flood events within the study area from local sources of flooding (including flooding from surface water, groundwater and ordinary watercourses), and the consequences and impacts of these events;
- Establish an evidence base of historic flood risk information, which will be built upon in the future and used to support and inform the preparation of Somerset's Local Flood Risk Strategy;
- Assess the potential harmful consequences of future flood events within the study area;
- Review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas.

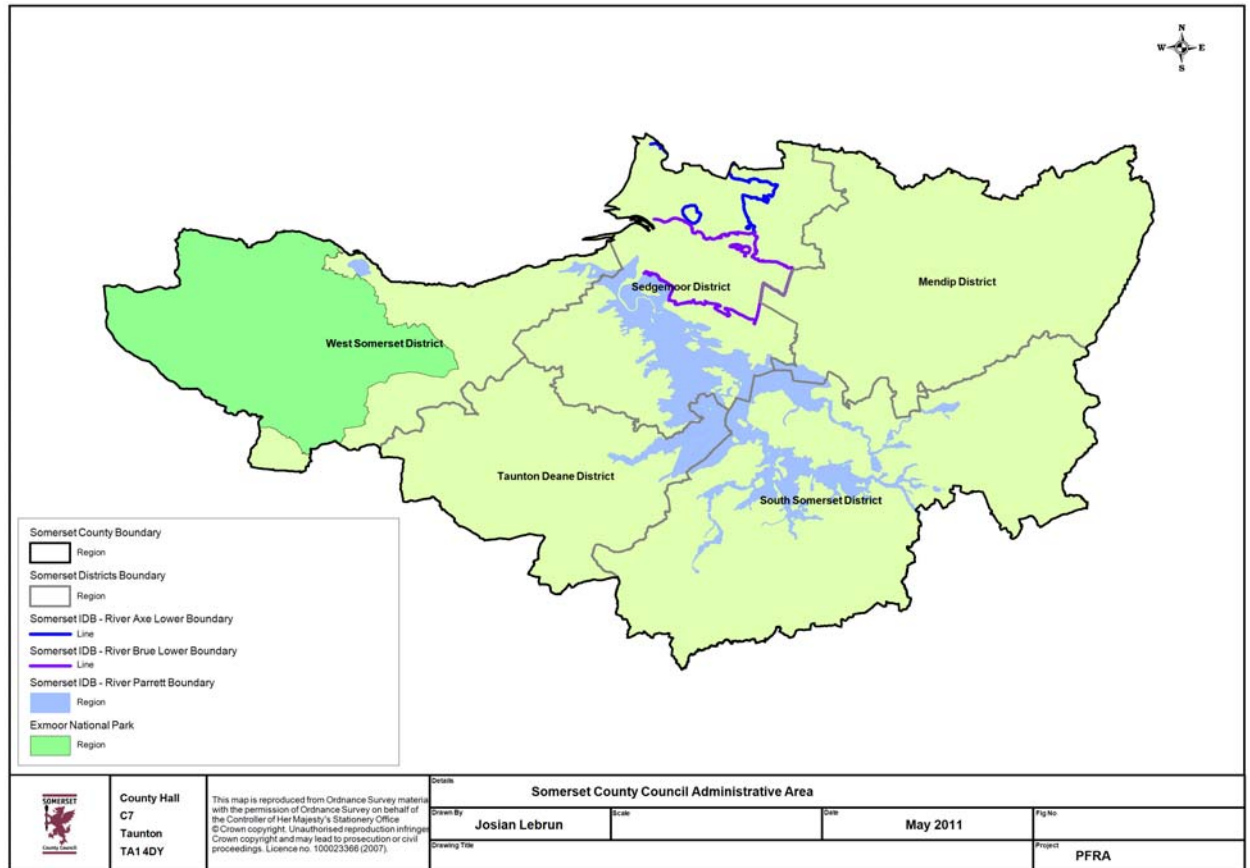
## 1.3 Study Area

Somerset is a rural county with beautiful hills such as the Mendip Hills, Quantock Hills and Exmoor National Park, and large flat expanses of land including the Somerset Levels. The county covers an area of 4,171 km<sup>2</sup> (1,610 sq mi) and has many rivers, including the Axe, Brue, Cary, Parrett, Sheppey, Tone and Yeo. These both feed and drain the flat levels and moors of mid and west Somerset.

The Levels are divided into two by the Polden Hills; land to the south is drained by the River Parrett while land to the north is drained by the River Axe and the River Brue. The total area of the Levels amounts to about 647.5 square kilometres and broadly corresponds to the administrative district of Sedgemoor; a significant area lies within the Taunton Deane district and also includes the south west of Mendip district. Approximately 70% of the area is grassland and 30% is arable. Stretching about 32 kilometres (20 mi) inland, this expanse of flat land barely rises above sea level. Before it was drained, much of the land was under a shallow brackish sea in winter and was marsh land in summer. Drainage began by the monks from Glastonbury Abbey from approximately the 1400s and during the Second World War, with the construction of the Huntspill River. Management of water levels through sluice gates, pumping stations and flood plains still continues to date. However, communities within the levels still occasionally suffer from flooding.

Compared to other South West Counties, Somerset has not had a significant number of major flooding incidents in the past. Although some major events did occur such as the 1960 flood which affected Taunton, they are considered unlikely to re-occur to that scale due to flooding defences being built recently. However, flood defences built along rivers and coastline may breach during flooding events with prolonged storm durations with over 1 in 100 chance of occurring in any year.

The Map below *figure 2* shows the Somerset County study area.



**Figure 2:** Somerset County study area

## 2. Lead Local Flood Authority Responsibilities

### 2.1 Introduction

The preparation of a PFRA is just one of several responsibilities of LLFAs under the new legislation. This section provides a brief overview of other responsibilities SCC are obliged to fulfil under their role as a LLFA.

*The regulations define new responsibilities for flood risk management based on the recommendations of the Pitt review. These are consistent with the Flood and Water Management Act. Below summarises the key terminology and responsibilities:*

**Environment Agency** – the competent authority for managing risk from main rivers, the sea and large raised reservoirs.

**Lead Local Flood Authority** – responsible for managing local flood risk in particular from ordinary watercourses, surface runoff and groundwater. In relation to England, the LLFA is the unitary authority for the area, or if there is no unitary authority, the county council.'

Much of the local knowledge necessary for SCC to fulfil their duties as LLFA lies with the District and Borough councils and other partner organisations. It is therefore crucial that SCC works alongside these groups and organisations as they undertake their responsibilities to ensure effective and consistent management of local flood risk throughout the county and to contribute to the provision of a coordinated and holistic approach to flood risk management across the study area.

### 2.2 Governance and Partnership Arrangements

The Flood Risk Regulations 2009, Regulation 35 and The Flood and Water Management Act 2010 Section 12 both state that the relevant authorities should co-operate. The PRFA guidance also states that the LLFA should set up governance and develop partnership as the first step of the PFRA process. Hence, the 'Somerset Flood Risk Management Partnership' was formed in July 2010; the group which comprise of external stakeholders representing the specific interests of County Council and meet quarterly. In addition to the 'Somerset Flood Risk Management', Somerset's Flood Risk Management Team also engages with the South West Flood Risk Management Group on a quarterly basis to promote best practice. The partnership arrangements have been engaged collectively to share data and manage the requirements of the PFRA.

Figure 3 represents the current partnership arrangements for Somerset County Council and its local flood risk partners.

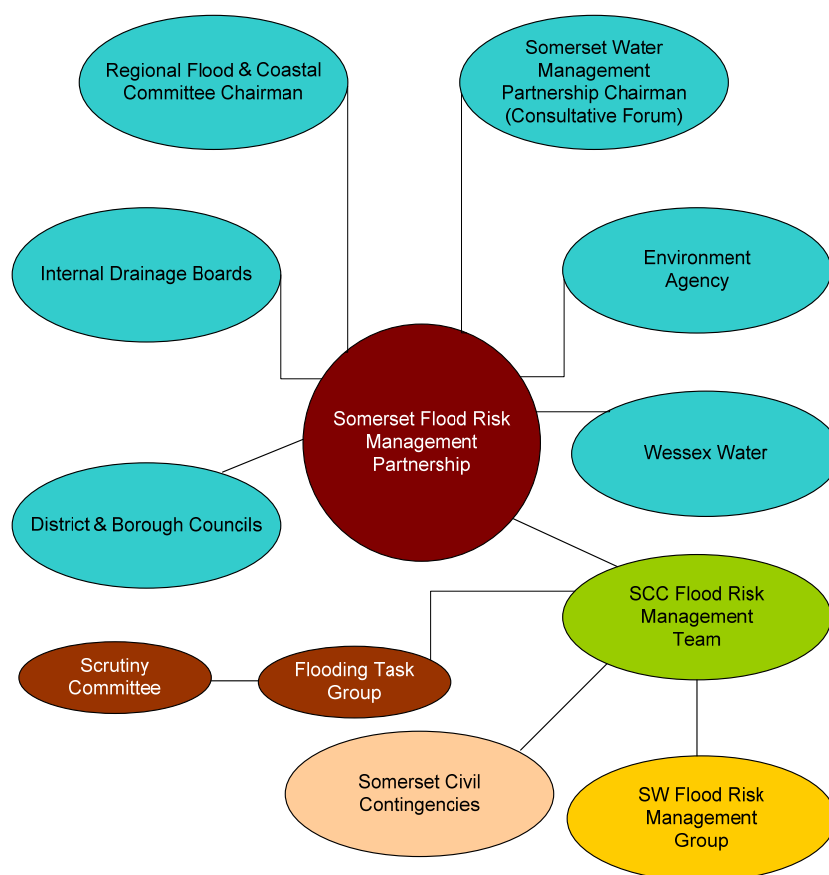


Figure 3: Somerset Flood Risk Management Partnership arrangements

## 2.3 Public Engagement

It is recognised that members of the public may also have valuable information to contribute to the PFRA process and to local flood risk management more generally across Somerset. Stakeholder engagement can contribute significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chances of stakeholder acceptance of options and decisions proposed in future flood risk management plans.

An article was published in the County Council’s news paper ‘Your Somerset’ in 2010 to invite residents to share their knowledge on past flooding events. Unfortunately, the response rate was very low. However, from those who responded, they have provided us with information and photographs on past flooding events.

In February 2011 a survey questionnaire was sent to all Parish & Town councils within Somerset, this was carried out in order to gather local flooding intelligence. The response rate of 39% was significant and valuable information was acquired together with other materials such as photographs and other records.

## 2.4 Further Responsibilities

In addition to forging partnerships and leading on local flood management, there are a number of other key responsibilities for Lead Local Flood Authorities that have arisen from the Act and the Regulations.

These responsibilities include:

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what they have done or intend to do with respect to the incident, notifying risk management authorities where necessary and publishing the results of any investigations carried out.
- **Asset Register** – LLFAs also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for public inspection and the Secretary of State will be able to make regulations about the content of the register and records.
- **SUDS Approving Body** – LLFAs are designated as the SUDS Approving Body (SAB) for any new sustainable drainage system (SUDS), and therefore must approve, adopt and maintain any new SUDS within their area. Whilst the provision for this duty is contained within the Act, it has not yet been enacted. The exact details of the new responsibility, including timescales and funding is yet to be concluded.
- **Local Strategy for Flood Risk Management** – LLFAs are required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy will build upon information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments.
- **Works Powers** – LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater, consistent with the local flood risk management strategy for the area.
- **Designation Powers** – LLFAs, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.
- **Consenting for Ordinary Watercourses** – LLFAs will take over this consenting role on ordinary watercourses from the Environment Agency. The Environment Agency will retain an overview role.



## 3. Methodology and Data Review

### 3.1 Introduction

One of the PFRA aims is to identify areas where the risk of flooding in Somerset is considered to be significant.

The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010 (updated March 2011). The PFRA is based on readily available or derivable data and with this in mind the following methodology has been used to undertake the PFRA.

### 3.2 Methodology

An information sweep was carried out in 2010 to gain an overview on what data local partners may have available to share with SCC. Request for relevant data were made to all partners and licensing agreements wherever necessary were put into place to share data. All Parish and Towns councils were approached directly to obtain data on past flooding events.

All data received were checked and digitised using Mapinfo GIS software and Microsoft Excel. Metadata is used to record restrictions and limitations of each dataset.

In order to avoid the duplication of any historical flood events being used in analysis, the information collated has been aggregated within 100 metre x 100 metre grid cells to produce a flooding outline and all records stored within the Somerset Historical Flooding Database (SHFDB). This GIS layer was shared with the district and borough councils and internal drainage boards for validation purposes using their local knowledge. Other datasets were obtained directly from the Environment Agency via the Datashare website Geostore and through their Wessex region office in Bridgwater.

In addition to datasets supplied by partners, there are various published flood risk management reports available in the public domain including the region's Strategic Flood Risk Assessments, Regional Flood Risk Appraisal, Catchment Flood Management Plans, River Basin Management Plan, Shoreline Management Plans, Multi Agency Flood Plan and additional information from National Parks such as Exmoor. These were all reviewed and any relevant information was extracted to inform the PFRA.

*Table 2* shows the partner organisation approached and their supplied data including limitations and licensing issues. *Table 3* shows data acquired from the Environment Agency.

**Table 2:** Partner organisations approached and their available data including limitations and licensing issues

Partner Organisation and Available Data	Any Availability, Limitations, Data Storage and Data Licensing Issues
<b>British Hydrological Society Chronology of British Hydrological Events:</b> An online database including details of historic flood events for catchment areas across the country.	Available to the public. Details of relevant flood events searched and retrieved.
<b>Devon and Somerset Fire and Rescue:</b> Data consists of GIS point data of recorded flood incidents.	Records go back to 2002. Data not to be published in public domain. Most of the data not Georeferenced correctly due to their system and categories difficult to validate.
<b>District Councils:</b> <i>West Somerset Council, Sedgemoor District Council, Mendip District Council, South Somerset District Council and Taunton Deane Borough Council.</i> The historical flood data available is limited. Most information available in the form of SFRA reports, sandbags issuing records and some GIS data.	Responses received from all. Dataset formats of spreadsheets, paper records and GIS data. Levels of record detail varied across Districts.
<b>Exmoor National Park:</b> The National Park Authority provides Exmoor's planning service, some flooding records are available from their website	Information retrieved from website, most incidents recorded within the Devon area.
<b>Harbour Authorities:</b> Watchet Harbour and Port of Bridgwater	No significant local flood risk issues relevant for this PFRA report.
<b>Natural England:</b> Hold data sets valuable for assessing environmental impacts, such as the location of SSSIs, Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).	Data layers available and downloaded from Natural England website.
<b>Navigation Authorities: British Waterways, Bridgwater and Taunton Canals</b>	There are no records of historic flood events held by the navigation authorities.
<b>Network Rail:</b> The local Network Rail office has an informal flood plan which is updated yearly with information on areas of rail track prone to flooding. The majority of flood risk is from fluvial and tidal sources.	Local office has no spare capacity to retrieve any data for the PFRA at present.
<b>Parish and Town Councils:</b> Parish councils were consulted for information regarding local flooding issues by means of a parish survey sent directly to town and parish councils.	39% of responses received from town/parishes councils in Somerset. Information received very useful but difficult to pinpoint individual properties which has flooded. Sources of flooding might also be unknown or incorrectly categorised
<b>Somerset County Council:</b> Details held on local flood events through the Somerset Highways Asset Management System 'Confirm', consisting of reports of flooding of residential and non-residential properties, flooding of roads and blocked surface water drainage.	Data only available since 2002 and does not include information on properties flooded. Also limited to reported incidents only

<p><b>The Somerset Drainage Boards Consortium</b> : manages the operations and affairs of three drainage Boards in Somerset; the Lower Axe District Drainage Board, the Lower Brue District Drainage Board and the Parrett Internal Drainage Board</p>	<p>Consulted and any relevant information were acquired and used in the PFRA including the Wessex Water 1979 Land Drainage Report – Flood Events from 1960s to 1970s.</p>
<p><b>Water Companies:</b> Wessex Water has supplied SCC with data for areas in which properties may flood internally and externally due to sewers being overwhelmed by heavy rainfall.</p>	<p>Data supplied at postcode level. Consulted on local drainage capacity and Locally Agreed Surface Water Information.</p>

**Table 3:** Data acquired from the Environment Agency

EA Data Layer
<p><b>Historic Flooding Map:</b> Extent of past flood events from rivers, sea and groundwater.</p>
<p><b>Flood Event Outlines on the National Flood and Coastal Defence Database (NFCDD):</b> Flood event outline, covering records from all sources of flooding.</p>
<p><b>Flood Event Maps:</b> Historic records of flood events from paper records now digitised.</p>
<p><b>Flood Reconnaissance Information System (FRIS):</b> Information collected after flood events, detailing affected properties and the extent of flooding.</p>
<p><b>Detailed River Network (DRN):</b> This can display the classifications of rivers to identify main rivers and ordinary watercourses.</p>
<p><b>National Receptor Dataset (NRD):</b> Includes social, economic, environmental and cultural receptors that could be at risk of flooding, such as residential properties.</p>
<p><b>Flood Map:</b> Extent of flooding from the sea and river catchments over 3Sqkm *. Including: • Flood Defences • Flood Storage Areas • Areas Benefiting from Flood Defences • Flood Zone 3: Flood extent from rivers with 1% annual probability of occurring and from the sea with 0.5% annual probability. • Flood Zone 2: Flood extent from rivers and the sea with 0.1% annual probability of occurring or largest historic event if a greater extent. * National policy is to map catchments over 3km<sup>2</sup>; however mapping is available on some smaller watercourses.</p>
<p><b>Areas Susceptible to Surface Water Flooding (AStSWF):</b> Three nationally modelled outline layers. • Areas More Susceptible • Areas with Intermediate Susceptibility • Areas Less Susceptible</p>
<p><b>Flood Map for Surface Water (FMfSW):</b> 2<sup>nd</sup> generation version of the modelled surface water flood maps. • 200 year rainfall event &gt;0.1m deep • 200 year rainfall event &gt;0.3m deep • 30 year rainfall event &gt;0.1m deep • 30 year rainfall event &gt;0.3m deep</p>
<p><b>Areas Susceptible to groundwater flooding (AStGWF):</b> 1km grid squares showing the risk of groundwater flooding.</p>

### 3.3 Data Management, Security, Licensing and Restrictions

The European INSPIRE (INfrastructure for SPatial InfoRmation in Europe) Directive requires that member states provide public access to location based data related to the environment according to specific technical standards. Legislation that enables INSPIRE in England, Wales and Northern Ireland came into force on 31 December 2009. The Directive applies to any public authority in the UK that creates spatial (or location based) environmental data.

All local authorities creating such data under statutory duty must make them available to comply with INSPIRE.

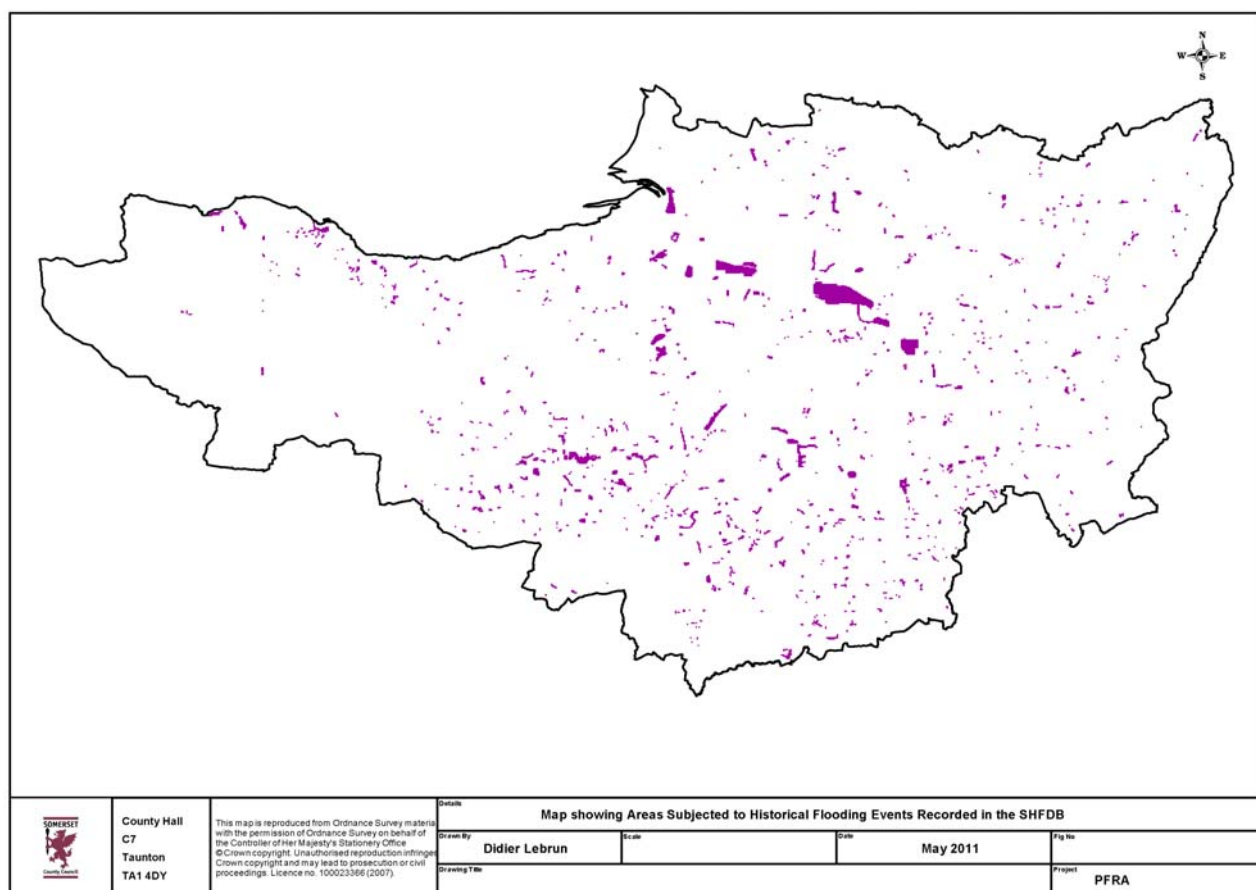
The Directive broadly defines location based environmental data and includes geographic reference data not normally categorised as environmental. It therefore applies to significant data created or used by local authorities, including addresses; roads; protected sites; administrative areas; land use, and other map based datasets. Although compliance with INSPIRE has been followed as closely as possible, some of the datasets used in this report cannot be made publicly available at smaller map scales due to the risk of property blighting or avoid breaches of SCC's licensing agreements with its partners.

All datasets listed in tables 1 & 2, have been scrutinised to identify and correct any errors. Somerset Guidance on Data Quality was adopted to ensure that adequate measures are in place to store and maintain all datasets. All computers which are used to analyse sensitive data supplied by partners are encrypted to national standard for security purposes. The use of metadata is also being adopted for individual dataset to ensure that data licensing and restrictions are respected.

## 4. Historical Floods

The historical information collated from various sources now populates the Somerset Historical Flooding Database, the data were analysed and the results indicate that there have been over 900 flooding events recorded across Somerset for surface water, river, ordinary watercourses and tidal floods. There are also indications of interactions between the sources of flooding. This section describes the methodology employed in the analysis and findings to be reported to Europe in Annex 1.

The Map below *figure 4* shows areas subjected to all types of historical flooding recorded in the SHFDB.



**Figure 4:** Areas subjected to historical flooding events recorded in the SHFDB

## 4.1 Types of Flooding

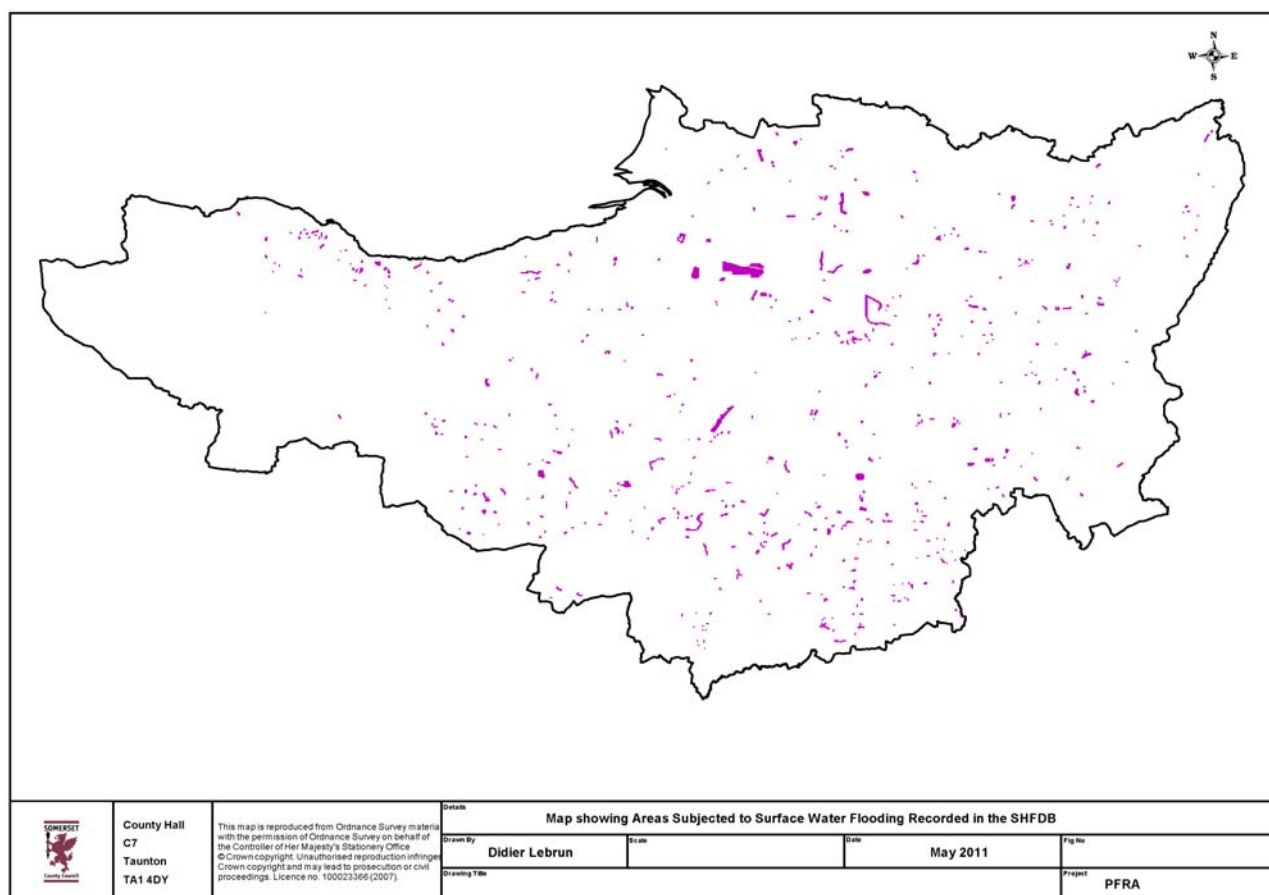
### 4.1.2 Surface Water Flooding

Surface water flooding (also known as pluvial flooding) occurs when heavy rainfall overwhelms the capacity of local drainage (both natural and man-made) and water flows across the ground. The route the water takes and the depth of flooding will depend on local features and can be difficult to predict.

Surface water flooding may also be the result of blockages in the drainage system or high river water levels backing up along drainage pipes. The Pitt Review highlighted the impact of surface water during flood events and the recommendations have led to the LLFAs being given greater responsibility for surface water management within the Act.

Flooding data resulting from surface water flooding has been collated from various sources including; the Somerset Highways Asset management system 'Confirm', Parish council surveys, Flood Reconnaissance Information System (FRIS), Fire & Rescue service, District Councils and drainage boards.

The map in *figure 5* shows areas of Somerset which has had historic flood events caused by surface water flooding.



**Figure 5:** Historic flood events caused by surface water flooding

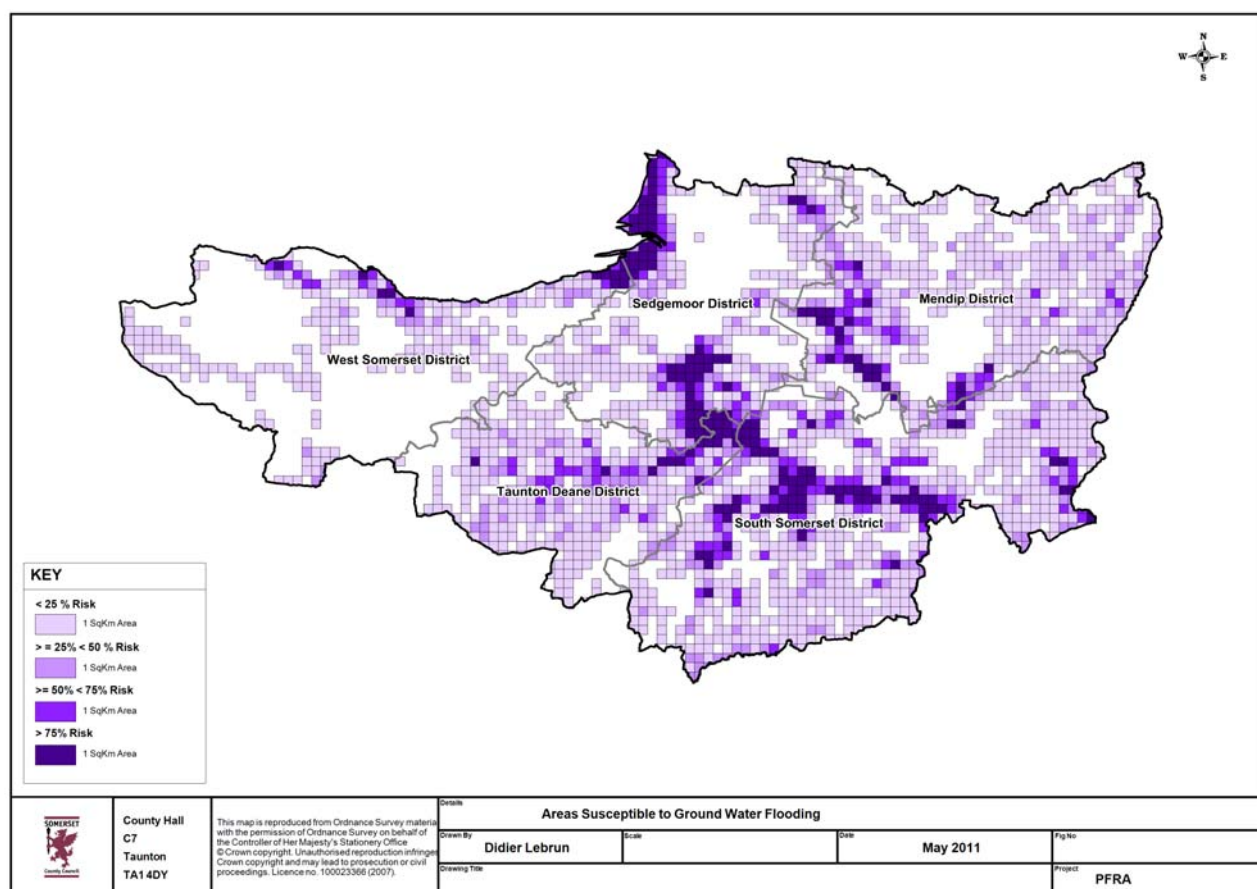
### 4.1.3 Ground Water Flooding

Groundwater flooding occurs when water levels in the ground rise above the land surface.

This type of flooding is most likely to occur in areas above an aquifer. Groundwater levels within an aquifer generally rise and fall according to an annual cycle, but periods of prolonged rainfall may cause water levels to rise above the land surface. This type of flooding can last for weeks or months.

There is limited detailed information available on flood risk from groundwater from historical records. Although groundwater may have been a contributing factor to few flood incidents, there are no significant incidents reported in Annex 1 to suggest that groundwater is the main source flooding. The EA has provided a national dataset 'Areas Susceptible to Groundwater Flooding' representing the risk of flooding in quartiles at 1 Km<sup>2</sup> resolution, the Somerset Area is represented in *figure 6*. However, the data is provided in a summarised form and cannot be used as flood outlines; therefore, this limits the ability to carry out further GIS analysis. As a result, further investigations

and work is imminent to identify any interaction with other sources of flooding and this should be undertaken as part of the work for the local flooding strategy.



**Figure 6:** Areas Susceptible to Groundwater Flooding

### 4.1.4 Sewer Flooding

Sewer flooding occurs when sewers are overwhelmed by heavy rainfall or when pipes become blocked.

In urban areas, surface water flooding and sewer flooding often combine, polluting the floodwater. Wessex Water has provided data of sewer hydraulic overload spots which derive from their DG5 register, this data was supplied at postcode level. This implies that all properties within the postcode sectors are at risk which might not be the case. Therefore, we have not included this dataset in our analysis as more detailed investigation is required and this will be undertaken when informing the Local Flood Risk Strategy.



#### **4.1.5 Canal and Ordinary Watercourse Flooding**

The Navigation Authorities within Somerset consist of the British Waterways, responsible for the Bridgwater and Taunton Canal. Canals can attenuate flows and store flood water. However, data provided by British Waterways shows no records of historic flood events in Somerset. The historic records available on ordinary watercourse flood incidents are from the Environment Agency FRIS database, with additional supporting information from the District Council records supplied. It is often unclear from the records analysed whether the main source of flooding is from a main river or an ordinary watercourse. There are also many flood prevention schemes being implemented by various partners within Somerset which details have not been provided yet. This should be investigated and reviewed in the Somerset Local Flooding Strategy.

#### **4.1.6 Interaction with Main Rivers and the Sea**

Floods can originate from a variety of sources and the most severe flooding often occurs when sources combine. In Somerset interaction between main rivers and the sea occurs in areas such as Bridgwater causing tidal surges and tide-locking. The EA are responsible for managing risk from sea flooding. However, tide-locking can cause fluvial flooding from both Main Rivers and Ordinary Watercourses and can result in significant surface water problems. There are several significant flooding events in Somerset which have such interactions. The SHFBD holds records of events with such interactions and all locally significant events has been assessed and included in the analysis.

#### **4.1.7 Significant Harmful Consequences**

The Floods Directive (Article 4(2)) and the Regulations (Regulation 12(3)) require PFRAs to include information on past floods that had significant harmful consequences and which could occur again.

This is separate from the identification of Flood Risk Areas which was based on Defra guidance providing a national perspective of significant (potential) flood risk (Regulation 14(3)). Each LLFA should therefore determine what is appropriate for them. However, it is recommended that as a minimum, it should include flooding of a number of properties, on more than one occasion.

The definition and reasoning set out by the South West Flood Risk Managers Group for the definition of local significant past flood event is shown below:

**Definition:**

For the purpose of reporting a past flood, a flood is deemed significant if it:

- Caused internal flooding to five or more residential properties, or
- Flooded two or more business premises, or
- Flooded one or more items of critical infrastructure, or
- Caused a transport link to be totally impassable for a significant period.

The definition of “significant period” is dependant on the transport link affected as follows (Highway categories are as set out in Table 1 of the UKRLG Code of Practice for Highway Maintenance):

- Category 1 highways (motorways) and major rail links – 2 hours or more
- Category 2 and 3a highways and other railway links – 4 hours or more
- Category 3b and 4a highways – 10 hours or more
- Category 4b highways – 24 hours or more

## **4.2 Historical Records**

### **4.2.1 Highways Records**

Somerset Highways Asset Management System ‘Confirm’ contains flood incidents reported by the public and investigated since 2002. Details are logged by Somerset first point of contact ‘Somerset Direct’ who input all enquiries to be investigated by Highways officers directly into the Confirm system. All records related to flooding were extracted, added to the Somerset Historical Flooding Database.

### **4.2.2 Fire & Rescue Service Records**

The Devon and Somerset Fire & Rescue Service keep records of any incidents which have resulted in team call outs. Data with records since 2002 was provided to Somerset County Council for analysis. However, much of the information provided was difficult to categorise and sufficient details were lacking. Therefore, only records which could be validated were added to the Somerset’s Historical Flooding database for analysis.

### **4.2.3 Environment Agency Records**

Information collected after flood events, detailing affected properties and the extent of flooding are maintained in the EA’s Flood Reconnaissance Information System (FRIS). It is important to note the last data entry made in

this database for Somerset is dated 2001. Although there are gaps, this data was matched to our SHFDB and important records such as the 1980s and 1990s flood events which are not found elsewhere were added to our database.

#### **4.2.4 Parishes & Town Council Records**

In February 2011 a survey questionnaire was sent to all Parish & Town councils within Somerset, this was carried out in order to gather local flooding data and other materials such as photographs and other records which they may hold. The response rate was 39% and from those who responded, 93% reported to have had flooding issues in their area. Information obtained from this survey has been added to the Somerset's Historical Flood Database.

#### **4.2.5 District Councils Records**

Some of the District Councils have provided data in form of GIS layers, paper records, etc. This data was added to the SHFDB and a GIS layers showing historical floods for each district areas was extracted from the SHFDB and these were reviewed and validated by each District in April 2011

### **4.3 Adopted Methodology for Assessing Historic Flood Areas**

In order to identify and assess locally significant past flood events in Somerset, the methodology and significance criteria outlined in Environment Agency guidance has been followed as closely as possible. Data collated for this PFRA exercise in the form of spreadsheet tables, parish council surveys and GIS data points and polygons have been analysed and any records with gaps, uncertainties and lack of detail have been discounted.

The locations where flood prevention now exists have not been ignored; as SCC feels that detailed assessment or investigations for those areas is required to ensure that flood defences are adequate and flood risk is minimal for longer return periods. The logic behind this reasoning is that flood defences built along rivers and coastline can withstand events with a 1 in 100 chance of occurring in any year. However, these areas remain susceptible to flooding for events with a 1 in 200 chance of occurring in any year. Therefore, further investigation will be carried out as part of Somerset's Local Strategy for Flood Risk Management. The different criteria assessed in the historic records available to SCC and limitations of data are shown below:

**Number of Properties Flooded:** This data is often unavailable, therefore, wherever applicable analysis was carried out using the threshold of 5 or more properties flooded. However, major flooding events without this information have been included in a separate table.

**Number of Business Premises Flooded:** This information is rarely available. However, wherever applicable analysis was carried out using the threshold of 2 or more properties flooded.

**Critical Infrastructure Flooded:** Similarly to the above categories, this information is rarely available, therefore wherever applicable analysis was carried out using the threshold of 1 or more services flooded.

**Transport link flooded and impassable:** Some records can be found in the Somerset Highways Asset Management System 'Confirm' and the FRIS database. However, this data is related to blocked drains and does not contain any details on the duration of road closures, etc. Therefore, this criterion has not been assessed. Future data collection of flood incidents will require this information to be recorded and categorised accordingly.

**Location to have flooded on more than one occasion:** For the events recorded it was considered that they were still too significant to be discounted, even if the location had only flooded once

The historical information collated was analysed using the criteria for residential properties as this information was more consistent throughout our records. The results were ranked locally by the number of properties flooded and 88 flood events were identified to meet the criteria. Furthermore, the occurrences of flooding for each of those areas were also taken into account.

The requirements for populating the Annex 1 Preliminary Assessment Spreadsheet on past flood events suggests that the flood events should be significant enough for reporting to Europe and that the threshold level should be determined by each individual LLFA. Therefore, a high threshold has been set by SCC to determine the 'locally significant' events, although many smaller events are still considered to have had significant impacts on Somerset's economy and people's lives. These smaller events will not qualify for inclusion in the Annex 1 spreadsheet but will form part of Somerset's Local Strategy for Flood Risk Management where those areas will be investigated and assessed more thoroughly.

It appears that a reasonable threshold for Somerset would be 20 or more properties affected in one event to be included for the purpose of the Annex 1 submission, resulting in 6 locally significant past flood events being identified. It was considered to set the threshold at 20 as it is estimated that these are likely to affect 45 or more residents based on a national average weighting of 2.34 residents per dwelling.

*Table 4* shows the results of the range of threshold levels considered for the 88 events. *Table 5* shows the top 6 significant events meeting the 20 plus properties criteria in Somerset; their locations are represented in *figure 7* and these will be included in the PFRA Annex 1 spreadsheet for submission.

Table 6 shows some of the events which we believe were significant events. However, the number of properties flooded is unknown; therefore, these were excluded from the assessment and will not be reported in Annex 1.

**Table 4:** Number of locally significant historic flooding records from local sources in Somerset for a range of threshold levels

Significance Level Threshold (No of Properties Affected)	Number of Flood Events Recorded
5 or more	88
10 or more	14
20 or more	6
30 or more	3
40 or more	2
50 or more	2
Over 100	0

**Table 5:** Summary table of Somerset's significant events in Annex 1

Rank	Date	Town/ Village	Properties Flooded	Details	Source
1	10-Jul-68	Cheddar	58	Flood water came down the gorge.	Surface
2	16-Apr-96	Bathpool	50	Flooding to village after heavy storm.	Stream/Sewerage
3	06-Aug-07	Compton Dundon	31	31 homes and 53 gardens/outbuildings flooded	Surface
4	30-Oct-00	Norton Fitzwarren	29	Parts of village flooded from stream and surface water.	Stream
5	Oct-02	Minehead	25	At least 25 shops and offices were flooded.	Surface
6	10-Jul-68	Kilmersdon	20	20 houses flooded due to storm.	Surface

**Table 6:** Possible significant flooding events which cannot be reported in Annex 1

Date	Town/ Village	Properties Flooded	Details	Source
1872	Wookey	Unknown	Axe Valley affected by the great floods of 1872	Stream
30-Oct-00	Taunton	Unknown	Large scale flooding to town centre & riverside. Main source, River flooding	River/Surface
09-Feb-09	Taunton	Unknown	Dozens of homes affected.	Surface
24-Jun-05	Ash	Unknown	Village flooded by heavy rain.	Surface
20-May-79	Bruton	Unknown	Town flooded after river burst the banks.	Stream
09-Feb-09	Evercreech	Unknown	Extensive flood to homes and land.	Surface

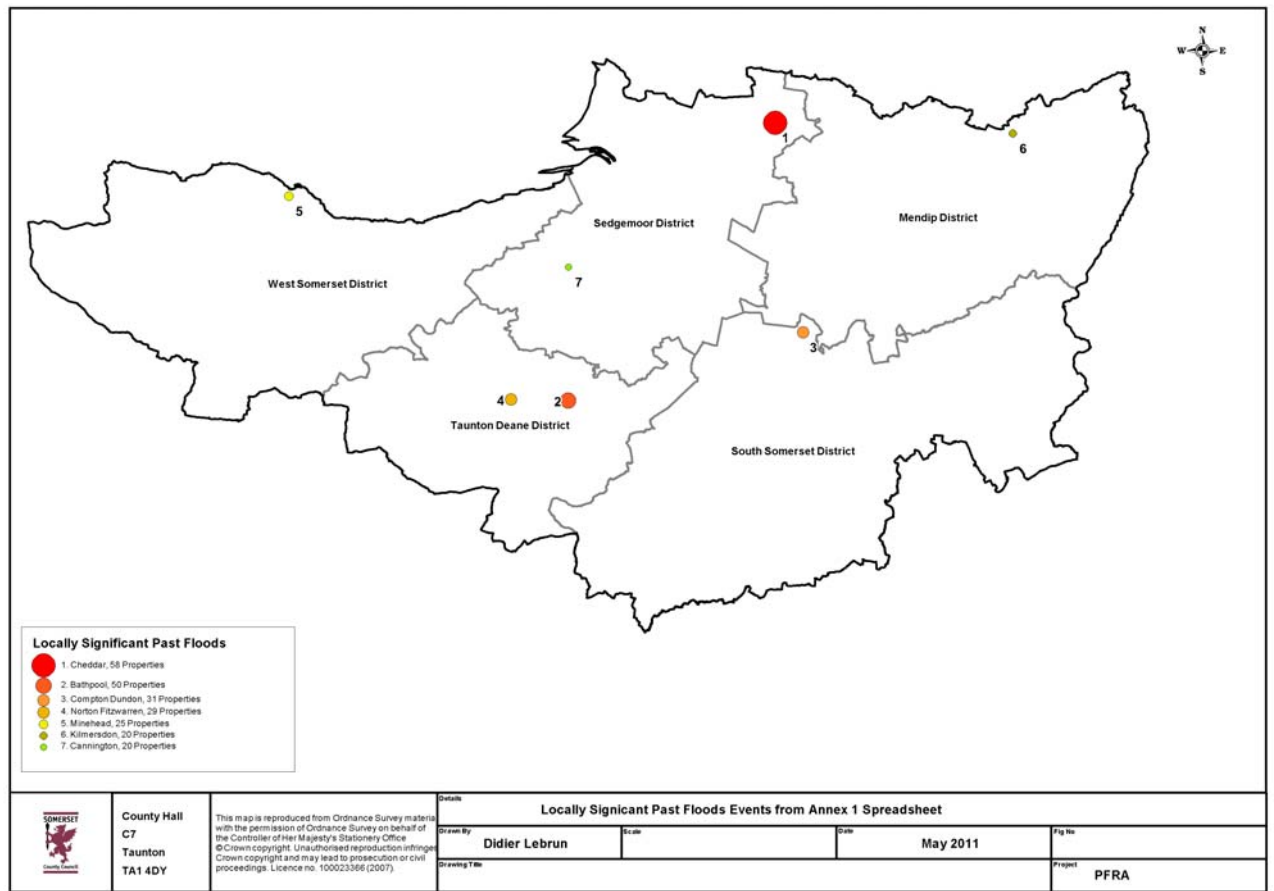


Figure 7: Locally Significant Past Flood Events from Annex 1 Spreadsheet

## **5. Future Flood Risk**

### **5.1 Future Floods and their consequences**

In England, it is estimated that one in six properties could suffer flood damage. The impacts or consequences of flooding depend on both the nature of the flood and on the area affected. In the worst cases, flooding has the potential to cause loss of life and personal injury. Whatever the severity of a flood, the results for the people affected can often be complex and far-reaching. Flooding can also have significant financial implications for individuals, businesses, local communities, regional and national governments.

To improve the understanding of flooding, the concept of risk is often used. A statement on the risk of flooding takes into account both the likelihood of a specific flood event usually referred to as return period and the consequences that flood event would have. The longer the return period, the less chance it will occur annually. However, should it occur, the consequences are usually greater.

It is suggested in the PFRA guidance that LLFAs should consider local flood risk based on existing information. Since tidal and fluvial flooding is the responsibility of the Environment Agency and detailed information is unavailable for other sources of flooding such as groundwater. Surface water and ordinary watercourses have been the main focus in identifying potential local flood risk areas.

### **5.2 Surface Water Flooding**

The Environment Agency has produced and recently made available, two national datasets to assist LLFAs in the assessment of surface water flooding:

The Areas Susceptible to Surface Water Flooding (AStSWF) map layer was the first generation map (2009) and is based on a Digital Elevation Model (DEM) with surface features removed, the Digital Terrain Model (DTM) or “bare earth model”. The rainstorm event was modelled to create a map based on a 1 in 200 chance of occurring in a given year (0.5% AEP) with 6.5 hours storm duration. The map is divided into three zones: More Susceptible (rapid onset, deep water), Intermediate Susceptibility and Less Susceptible (slow onset, shallow depth) to surface water flooding.

The Flood Map for Surface Water (FMfSW) is the second generation map (2010) and is based on a more refined DEM with surface features included.

Two rainstorm events are modelled to create the map; a 1 in 30 year (3.3% AEP) storm with 1 hour duration and a 1 in 200 year (0.5% AEP) storm with 1 hour duration. Each map is divided into two zones: shallow flooding (> 0.1 m depth) and deep flooding (> 0.3 m depth).

## 5.3 Flood Risk Indicators

In order to formally assess Future Flood Risk Areas, flood risk indicators are used to determine the impact of flooding on; human health, economic activity, cultural heritage and the environment. This leads to better understanding of the impacts and consequences of flooding. A list of flood risk indicators as specified in the PFRA guidance are summarised below in table 7

**Table 7:** Flood Risk Indicators

Impacts of flooding on:	Flood Risk Indicators (receptors)
Human Health	Number of residential properties. Critical services (Hospitals, Police/Fire/Ambulance Stations, Schools, Nursing Homes, etc).
Economic Activity	Number of non-residential properties. Length of road or rail. Area of agricultural land.
Cultural Heritage	Cultural heritage sites (World Heritage Sites). Listed buildings.
Environment	Designated sites (SSSIs, SACs, SPAs, etc) and BAP habitat.

## 5.4 Summary of Future Flood Risk

Table 8 show a summary of the results of applied GIS analyses using flood risk indicators (receptors) and the various surface water map layers. It also shows a breakdown of critical service receptors and the impact of flooding on human health, economic activity and cultural heritage. The risk of flooding was not assessed for environmental designations sites such as the SSSI, SPA, BAP habitats, etc. because these sites need to be considered on a case by case basis.

The number of people at risk is calculated by multiplying the number of properties at risk by the national average weighting of 2.34 people per household.

This approach is a replication of the methodology described in the EA guidance (EA 2010d): The properties (points) originating from the NRD database were overlaid with the Ordnance Survey (OS) MasterMap layer to identify individual buildings (polygons) that are associated with individual properties. These buildings polygons were then overlaid by each of the flood zones (polygons) to identify which buildings encroach onto flood zones.



**Table 8:** Receptors at risk of surface water flooding

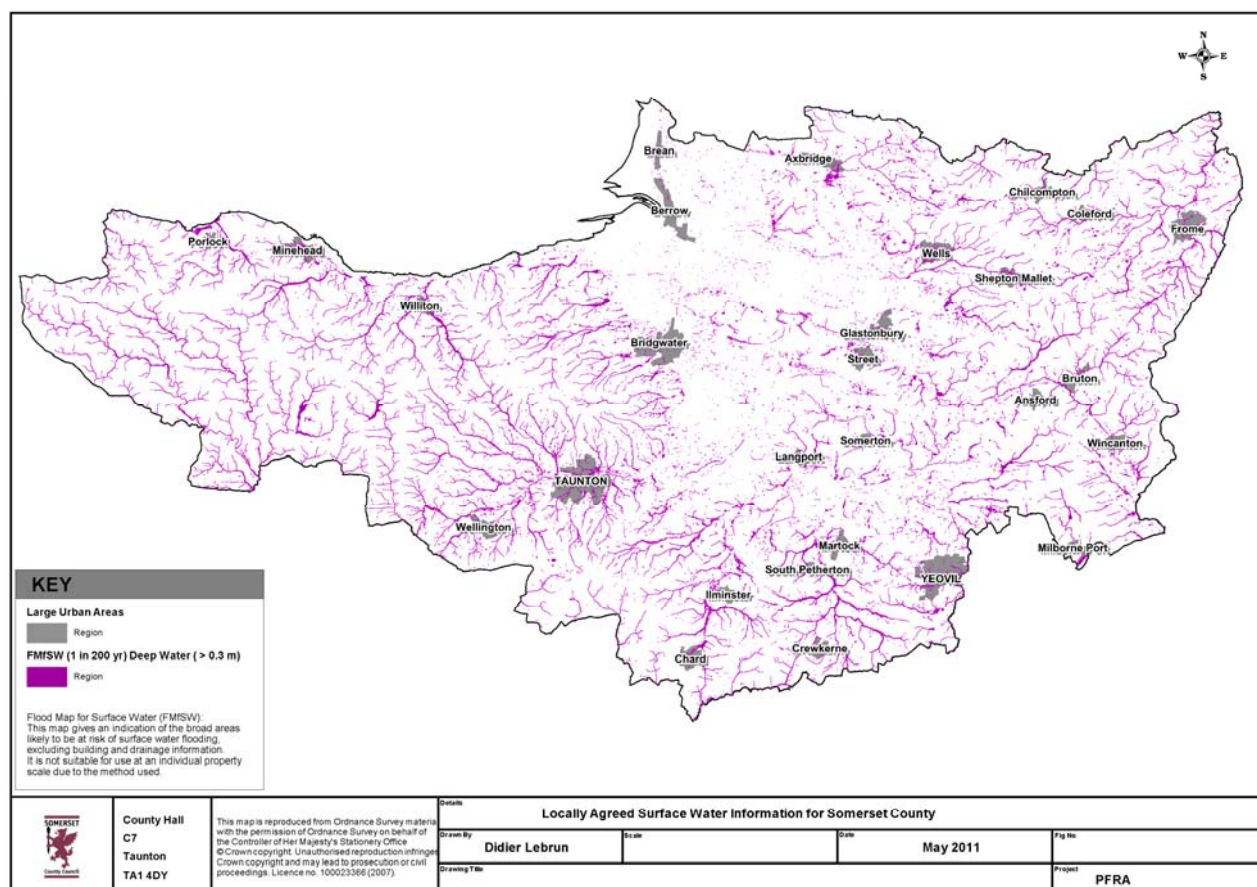
Receptors	Areas Susceptible to Surface Water Flooding (AStSWF)			Flood Map for Surface Water (FMfSW)			
	Less	Inter.	More	1 in 30 yr (Shallow)	1 in 30 yr (Deep)	1 in 200 yr (Shallow)	1 in 200 yr (Deep) Locally Agreed Surface Water Information
<b>Human Health</b>							
Residential Properties	45532	19696	3587	27250	9557	53290	18906
No of People	106545	46089	8394	6377	22363	124699	44240
<b>Critical Services</b>							
Care Homes and Prisons	4	2				2	
Electricity Installations	706	348	70	246	76	504	188
Fire and Ambulance Stations	24	12	2	4	2	8	2
Hospitals	2	2					
Police Stations	4	2		2		4	4
Schools	132	48	10	22	16	48	20
Sewage Treatment Works	118	68	30	42	16	62	36
Total (Critical Services)	990	482	112	316	110	628	250
<b>Economic Activity</b>							
Non-residential Buildings	19809	9389	2048	7745	2858	13690	5575
<b>Cultural Heritage</b>							
Listed Buildings	2180	1114	271	1054	487	1690	846
Total Buildings (Residential + Non-residential)	<b>65341</b>	<b>29085</b>	<b>5635</b>	<b>34995</b>	<b>12415</b>	<b>66980</b>	<b>24481</b>

## 5.5 Locally Agreed Surface Water Information

In order to determine the locally agreed surface water information to be used in the PFRA, the surface water data layers supplied by the EA were reviewed, by Somerset County Council, the Environment Agency, District councils, Wessex Water and the Somerset Drainage Board Consortium in April 2011. This process has involved scrutinising the surface water flood maps, both the AStSWF and FMfSW by comparing the modelled areas with historic information and any other available modelling or local knowledge. After analysing the data and liaising with partners, it was concluded that FMfSW generally best represents the area of Somerset with the most accuracy and local drainage capacity was determined to be reasonable.

It was also agreed that the worst scenario should be applied when assessing future flood risk caused by surface water. This has led to decision that the FMfSW 1 in 200 year Deep Water dataset should be used for the analysis.

The Flood Map below *figure 8* shows the Locally Agreed Surface Water information for Somerset and gives an indication of the broad areas likely to be at risk of surface water flooding (based on the scenario of deep flooding from a rainfall event with a 1 in 200 chance of occurring in any year with depth over 0.3 metre), excluding building and drainage information. A total of 24,481 properties were identified to be at risk from surface water flooding in Somerset.



**Figure 8:** Locally Agreed Surface Water information for Somerset

## 5.6 Climate Change Impacts on Flooding

There is clear scientific evidence that global climate change is happening now and therefore cannot be ignored.

Over the past century, we have experienced sea level rise and increasing winter rain falling in intense wet spells across the UK. Seasonal rainfall is now highly variable, it seems to have decreased in summer and increased in winter. Although winter amounts changed little in the last 50 years, some of

the changes might reflect natural variation. However, the broad trends are in line with projections from climate models.

Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is very likely in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but modelling results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we cannot be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance or rarer) could increase locally by 40%.

## **5.7 Key Projections for South West River Basin District**

If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are:

- Winter precipitation increases of around 17% (very likely to be between 4 and 38%)
- Precipitation on the wettest day in winter up by around 12% (very unlikely to be more than 24%)
- Relative sea level at Plymouth very likely to be up between 12 and 42cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 11 and 21%

Increases in rain are projected to be greater near the coast than inland.

## **5.8 Implications for Flood Risk**

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in wet spells may increase river flooding. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

There may be an increased risk of flooding from groundwater in the area. Recharge may increase in wetter winters, or decrease in drier summers. Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help us adapt to climate change and manage the risk of damaging floods in future

## **5.9 Long term Developments**

It is possible that long term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

Adherence to Government policy ensures that new development does not increase local flood risk. However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased contrary to Government policy, usually because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which are "significant" (in terms of the Government's criteria).

## 6. Assessment of Indicative Flood Risk Areas

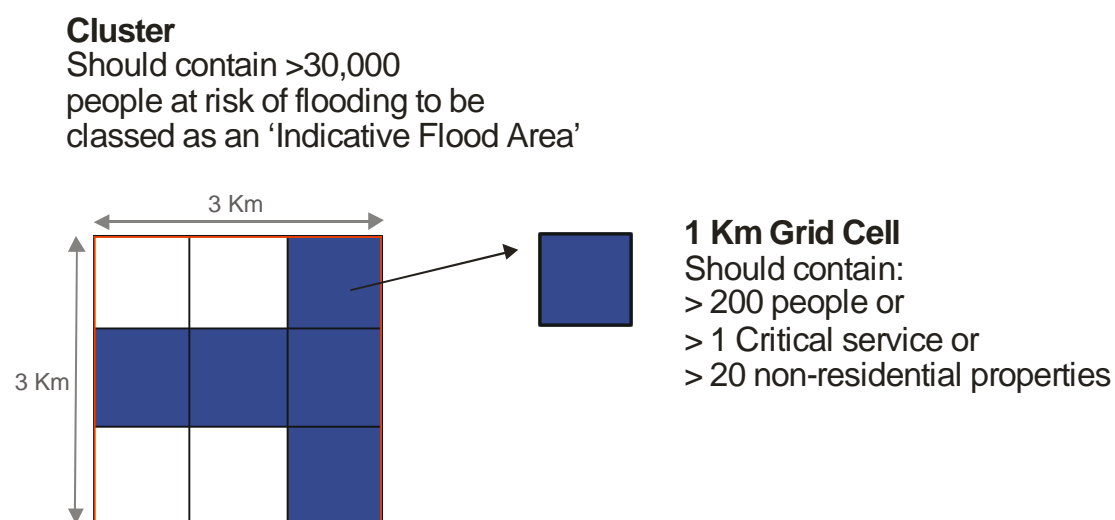
### 6.1 Overview and Methodology

The flood map for Locally Agreed Surface Water (based on the scenario of deep flooding from a rainfall event with a 1 in 200 chance of occurring in any year) and the National Receptors Dataset (NRD) were used as the primary information sources for defining the indicative Flood Risk Areas.

A national threshold set by Defra using 1km<sup>2</sup> places above flood risk thresholds (informally referred to as 'blue squares') were identified based on:

- More than 200 people (i.e. 201 or more) or
- More than 1 critical service (i.e. 2 or more) or
- More than 20 non-residential properties (i.e. 21 or more).

Clusters of these 1km grid squares were formed on the basis of 5 or more touching blue squares in a 3km by 3km (9km<sup>2</sup>) grid. *Figure 9* shows an example of a cluster



**Figure 9:** Example of a cluster

The clusters were ranked on the basis of the total number of people, critical services and non-residential properties at risk of surface water flooding. The number of people at risk is calculated by multiplying the number of residential properties within the flood zone by the national average of occupants (2.34 people) per household.

A threshold of over 30,000 people as suggested in the PFRA guidance was applied to determine whether any identified cluster should be classed as indicative Flood Risk Areas.

Please note that these thresholds only relate to local flood risks from surface runoff, groundwater and ordinary watercourses. There are no significance thresholds for flooding from main rivers, the sea and large raised reservoirs as the Environment Agency will be preparing flood risk and hazard maps and flood risk management plans for these sources across the country.

Since, the indicative Flood Risk Areas are based on surface runoff only; LLFAs also need to consider flooding from groundwater, ordinary watercourses and interactions with other sources of flooding such as rivers and the sea. However, as noted in section 3.5.1 of the Environment Agency's PFRA Guidance (p16), the Flood Map for Surface Water may show areas which are at risk from ordinary watercourses or groundwater flooding (as flooding is dependent on topography and depressions). However, LLFAs do not need to consider flooding from rivers, the sea or reservoirs as these are the responsibility of the Environment Agency under the Regulations.

## **6.2 Surface Water Management Plans**

Somerset Council has two Surface Water Management Plans for Taunton and Minehead in progress. Unfortunately the modelling results of these two study areas were not yet available for inclusion in the PFRA. However, once available, the results will be used to inform the Somerset Local Flooding Strategy which will be published at the end of this year.

## **6.3 Local Flood Risk Areas and the Indication of New National Flood Risk Areas**

A comprehensive GIS analysis method for assessing residential properties and the minimal method was employed for assessing non-residential properties and critical services at risk of surface water flooding. The results revealed only two clusters identified in Somerset. Although these clusters are located in extra urban areas they do not exceed the nationally set threshold, therefore cannot be classed as 'Indicative Flood Risk Areas'.

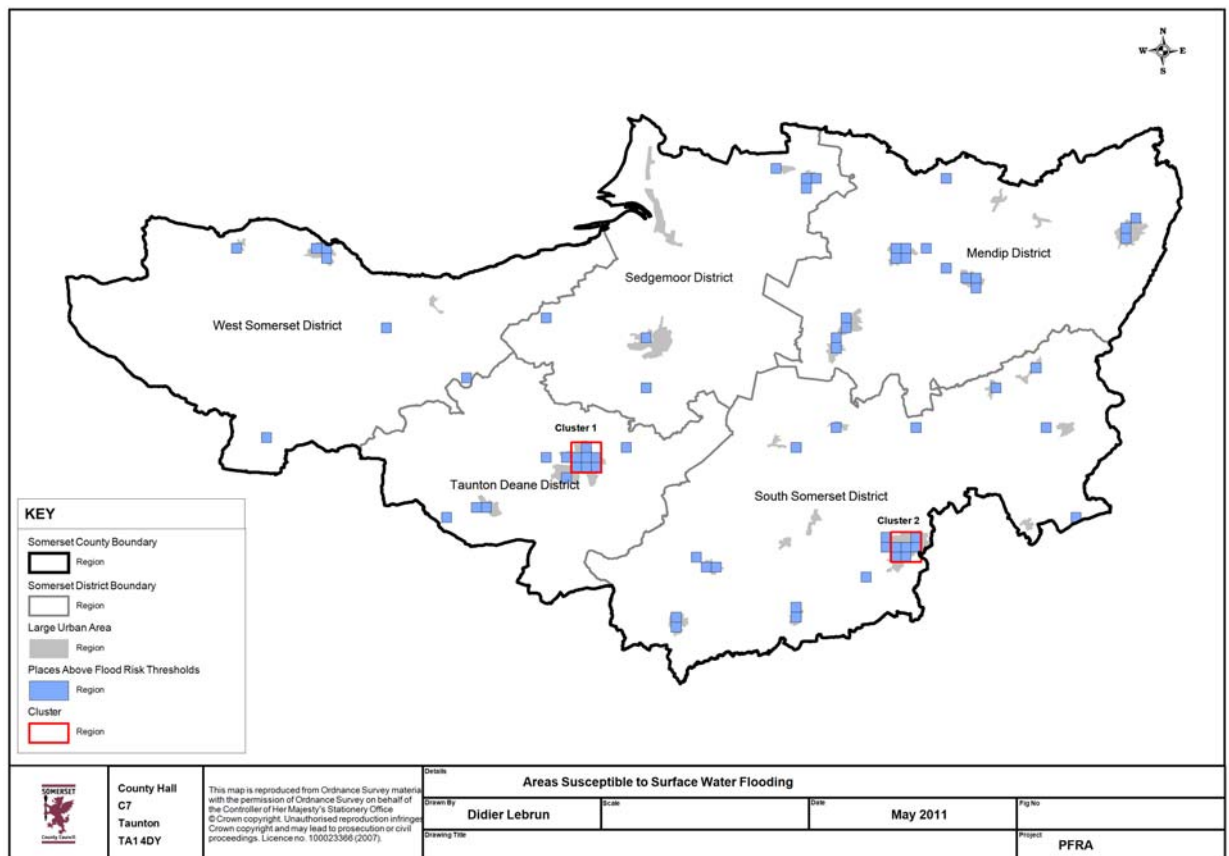
Furthermore, there are no additional information to support that any of these clusters should be reported to the EA as new national 'Indicative Flood Risk Areas'. Consequently, no additional flood risk areas are proposed in this PFRA report.

*Table 9* shows the total number of people, non-residential properties and critical services at risk of deep surface water flooding (FMfWF) in a 1 in 200 chance of occurring in any year for Somerset. The map below (*figure 10*) shows the 1 Km<sup>2</sup> grid cells (blue squares) where at least one of the following flood risk indicators is above the threshold given below:

- More than 200 people (i.e. 201 or more) or
- More than 1 critical service (i.e. 2 or more) or
- More than 20 non-residential properties (i.e. 21 or more).

**Table 9:** Total number of properties at risk of flooding during a rainfall event with a 1 in 200 chance of occurring in any year

NRD (Receptors)	No of Properties within FMfSW 1 in 200 yr Deep
Residential Properties	18906
Non-Residential Properties	5575
Critical Service	250



**Figure 10:** Areas above Nationally Set Flood Risk Thresholds

## **7. Scrutiny and Review Process**

It is suggested in the PFRA guidance that LLFAs should review and approve their PFRAs in accordance with their own internal governance processes. This may be through consideration by Cabinet, Council or an overview and scrutiny committee. The purpose of such review is to ensure the LLFA is satisfied that its products are fit for purpose in meeting the requirements of the Regulations.

In Somerset a progress note was presented to the Scrutiny Task Group in April 2010 and it was agreed that a final review will take place in June 2011. The Scrutiny Committee Flooding Task Group was presented a draft copy for review and approval on the 8<sup>th</sup> of June 2011. This internal process was carried out to ensure that Somerset's PFRA meets the required standards and is fit for purpose before the final report is submitted to the EA on the 22<sup>nd</sup> of June 2011.

### **7.1 Environment Agency Review**

Under the Flood Risk Regulations, the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRAs once submitted. The Environment Agency will undertake a technical review (area review and national review) of the PFRA, which will focus on instances where Flood Risk Areas have been proposed or amended and ensure the format of these areas, meets the provided standard and complies with the regulatory requirements. If satisfied, they will recommend submission to the relevant Regional Flood Defence Committee (RFDC) for endorsement. RFDCs will make effective use of their local expertise and ensure consistency at regional scale. Once the RFDC has endorsed the PFRA, the relevant Environment Agency Regional Director will sign it off, before all PFRAs are collated, published and submitted to the European Commission.

The first review cycle of the PFRA will be led by SCC and must be submitted to the Environment Agency by the 22 June 2017. They will then submit it to the European Commission by the 22 December 2017 using the same review procedure described above.

### **7.2 External Review**

A copy of the draft PFRA was sent to external stakeholders, including the District and Borough Councils, Somerset Drainage Consortium, Wessex Water and the South West Flood Risk Management Group for consultation.



## **8. Next Steps**

### **8.1 Local Strategy for Flood Risk Management**

The local strategy will build upon the work undertaken for the PFRA to provide a more detailed assessment of areas at risk of flooding in Somerset. This information will be key in raising flood risk awareness within our communities, developing consistent management plans, preparing emergency responses and building resilience to future events.

The County Council has placed great importance on flood risk management and this is reflected in the authority's new County Plan for the period 2011-13.

To accord with The Act the local strategy must specify the following:

- the risk management authorities in Somerset;
- the flood and coastal erosion risk management functions that may be exercised by those authorities in relation to Somerset;
- the objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Regulations 2009);
- the measures proposed to achieve those objectives;
- how and when the measures are expected to be implemented;
- the costs and benefits of those measures, and how they are to be paid for;
- the assessment of local flood risk for the purpose of the strategy;
- how and when the strategy is to be reviewed; and
- how the strategy contributes to the achievement of wider environmental objectives.

In the production of the local strategy, lead local flood authorities must consult and involve other affected risk management authorities, as well as the public. The process of preparing the local strategy will therefore include the need to build upon and formalise the working relationships with these other flood risk management partners and stakeholders.

Public engagement will be a fundamental part of the development of the local strategy to understand the local impacts of flooding on our communities and to share with them the work the County Council is undertaking in its role as LLFA.

### **8.2 Reviewing and Updating Flood Data and Modelling**

The PFRA is a process which forms part of a 6 year cycle under the Flood Risk Regulations. Although Somerset has not identified any national 'Indicative Flood Risk Area', SCC will have to produce Flood Hazard Mapping

and prepare a revised PFRA report before June 2017. Therefore, data management and maintenance will be key to ensure that up to date information is available to inform strategic decisions on any future work. Further detailed analysis will also be carried out as part of the Somerset Local Flood Risk Strategy; this will review the data already been collated and used for this PFRA.

### **8.3 Post Flood Event Data Collection**

As set out in Water Management Act 2010 the implementation of the duty of LLFAs to investigate following significant floods will lead to the development of a database similar FRIS, along with actions agreed in response to the investigation. There is a need to ensure that this is done in partnership with the other partners such as the EA to ensure that effort is not duplicated and processes are implemented to fully share information. Therefore, formal arrangements will need to be agreed, although discussion with the EA and other partners has already taken place and is ongoing.

### **8.4 Maintaining an Asset Register**

As stated in the regulations, LLFAs have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for public inspection and the Secretary of State will be able to make regulations about the content of the register and records. Discussion has already taken place by SCC with partners and other neighbouring authorities to evaluate which system will be used to maintain the asset register. It is likely that a new system will be implemented and this should also include adopted SuDs features. Further details are still emerging from Defra on the level of detail required to be recorded and decision for which system should be used is still being evaluated.

### **8.5 Development and Planning**

Traditional drainage systems for developed land seek to expedite the capture and removal of water from a site using methods such as channels, gulleys, pipes, and outfalls, which can lead to flooding downstream due to the speed and volume of the discharge.

Sir Michael Pitt's review of the serious flooding events in 2007 identified the contribution that Sustainable Drainage Systems (SUDS) can make in managing surface water and preventing flooding by mimicking natural drainage to retain and slow the release of water back into watercourses. However, the review noted SUDS are less prevalent than traditional

engineered drainage systems and it is claimed that this is mainly due to difficulties in securing their adoption once constructed.

One of the provisions of The Act that is yet to be enacted would designate County Councils and Unitary Authorities as SUDS Approval Bodies (SAB). As a SAB the County Council (or its agent) will be responsible for approving and adopting drainage schemes associated with new developments in Somerset. Development will not be able to proceed without SAB drainage approval. Current indications from DEFRA are that the duties are likely to commence in either April 2012 or October 2012.

It is anticipated that these arrangements will not only bring surface water management benefits to new developments, but will also reduce the local flood risk for communities downstream of these developments.

Somerset County Council is currently in the early stages of establishing how the SAB function could be managed within its core business to ensure that the workload of these new duties are managed and funded appropriately.

## References

DCLG (2006). Planning Policy Statement 25: Development and Flood Risk. Department for Communities and Local Government.

Defra (2008). The Pitt Review - Learning lessons from the 2007 floods. Cabinet Office, June 2008.

Defra / WAG (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities. Available from:  
<http://www.defra.gov.uk/environment/flooding/documents/research/flood-risk-method.pdf>

Environment Agency (2010a). Preliminary flood risk assessments. “Living Draft” Guidance for Lead Local Flood Authorities. Report GE00410BSLS-E-E. May 2010.

Environment Agency (2010b). Flood Risk Regulations – Information for LLFAs. December 2010, on CD.

Environment Agency (2010c). Preliminary Flood Risk Assessment -Final Guidance (Report – GEHO1210BTGH-E-E). Available from: <http://publications.environment-agency.gov.uk/pdf/GEHO1210BTGH-e-e.pdf>

Environment Agency (2010d). Flood Map for Surface Water -Property Count Method. November 2010.

Environment Agency (2011). Preliminary Flood Risk Assessment – Annexes to the Final Guidance (Report – GEHO1210BTHF-E-E). (Updated 2 March 2011). Available from: <http://publications.environment-agency.gov.uk/pdf/GEHO1210BTHFe-e.pdf>

Getting Started, Initial Guidance to Data Providers and Publishers Guide 1: UK Location

The Inspire Directive, <http://inspire.jrc.ec.europa.eu>

**Annex 1: Records of Past Floods and their significant Consequences (Preliminary Assessment Report Spreadsheet)**

**Annex 2: Records of Future Floods and their Significant Consequences (Preliminary Assessment Report Spreadsheet)**

**Annex 3: Records of Flood Risk Areas and their Rationale (Preliminary Assessment Report Spreadsheet)**

**Annex 4: Preliminary Flood Risk Assessment Checklist**

**Annex 5: Maps & Plans**