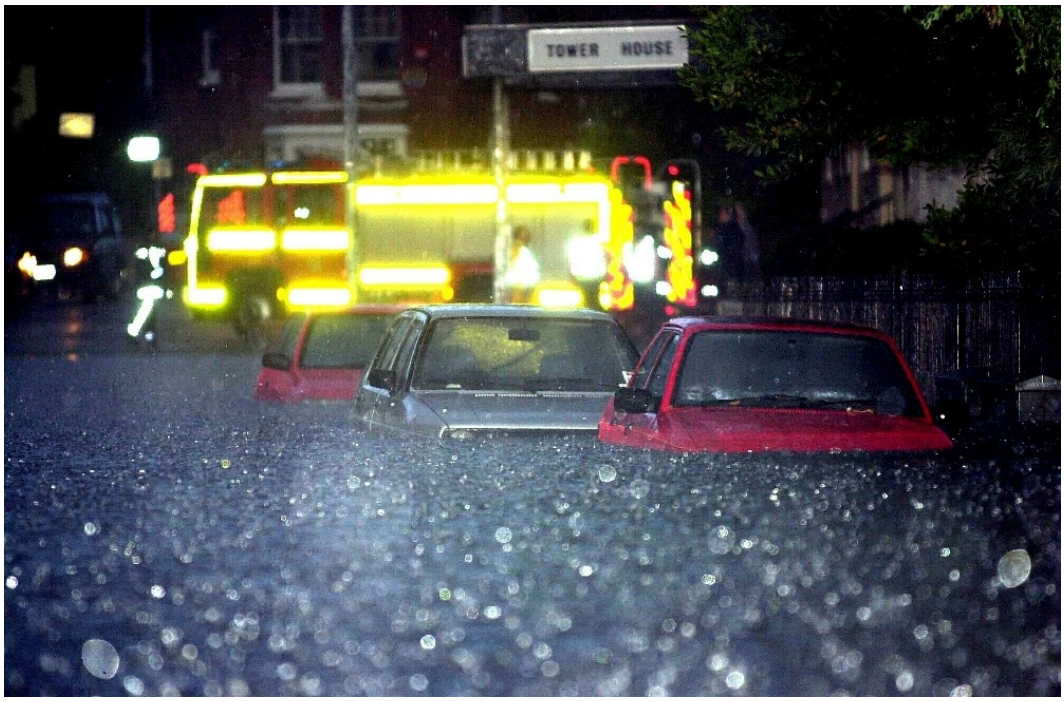
Halcrow

Portsmouth City Council

Preliminary Flood Risk Assessment



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Portsmouth CITY COUNCIL

In partnership with

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RELATED DOCUMENTS

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Executive Summary

This report summarises the Preliminary Flood Risk Assessment undertaken for Portsmouth City Council. The study forms part of a larger delivery project, the Surface Water Management Plan (SWMP). The PFRA has been undertaken to assist Portsmouth City Council to meet its duties as a Lead Local Flood Authority, with the delivery of the first stage of the Flood Risk Regulations (2009). These regulations implement the EU Floods Directive in the UK.

The PFRA is a high level screening exercise that compiles information on significant local flood risk (any flood risk that does not originate from main rivers, the sea or large reservoirs) from past and future floods, based on readily available and derivable information. The PFRA also includes the identification of flood risk areas where the subsequent two stages of the Flood Risk Regulations apply; stage two delivers Flood Risk Maps and stage three delivers Flood Risk Management Plans.

Glossary

Term	Definition
Aquifer	An underground layer of permeable rock or sediment (usually Sand, Gravel or Chalk) capable of yielding significant quantities of water.
AMP	Asset Management Plan
Asset Management Plan	A plan for managing water and sewerage company (WaSC) infrastructure to ensure sufficient supply of drinking water and that waste water is appropriately dealt with.
AStSWF	Areas Susceptible to Surface Water Flooding
Catchment Flood Management Plan	A high-level planning strategy through which the Environment Agency works with other key decision-makers within a river catchment, to identify and agree policies for sustainable flood risk management.
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
Civil Contingencies Act	This Act delivers a single framework for civil protection in the UK. As part of the Act, Local Resilience Forums must put into place emergency plans for a range of circumstances including flooding.
CLG	Government Department for Communities and Local Government
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions.
Culvert	A channel or pipe that carries water below the level of the ground.
Defra	Department for Environment, Food and Rural Affairs
DEM	Digital Elevation Model
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years.
DTM	Digital Terrain Model
EA	Environment Agency
Indicative Flood Risk Areas	Areas determined by the Environment Agency as indicatively having a significant flood risk, based on guidance published by Defra and WAG and the use of certain national datasets. These indicative areas are intended to provide a starting point for the determination of Flood Risk Areas by LLFAs.
FMfSW	Flood Map for Surface Water
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG.
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

Term	Definition
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a main river.
FRR	Flood Risk Regulations
IDB	Internal Drainage Board
IUD	Integrated Urban Drainage
LDF	Local Development Framework
Lead Local Flood Authority	Local Authority responsible for taking the lead on local flood risk management
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
Local Resilience Forum	A multi-agency forum, bringing together all the organisations that have a duty to cooperate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner.
LoSA	Level of Service Agreement
LPA	Local Planning Authority
LRF	Local Resilience Forum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers.
MoU	Memorandum of Understanding
NFCDD	National Flood and Coastal Defence Database
NRD	National Receptor Dataset – a collection of risk receptors produced by the Environment Agency
Ordinary Watercourse	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, IDBs.
Partner	A person or organisation with responsibility for the decision or actions that need to be taken.
PCC	Portsmouth City Council
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial Flooding	Flooding from water flowing over the surface of the ground; often occurs when rainfall falls on saturated soil or impermeable ground (such as pavement), and when natural drainage channels or artificial drainage systems have insufficient capacity to carry all the rainfall.
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PUSH	Partnership for Urban South Hampshire
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses, such as raising electrical sockets/appliances above flood levels.

Term	Definition
Resistance Measures	Measures designed to keep floodwater out of properties and businesses, such as flood guards.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Risk Management Authority	As defined by the Floods and Water Management Act
RMA	Risk Management Authority
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SIRF	'Sewer Incident Report Form – Southern Water's records of all incidents relating to sewerage, but in this context, all incidents of sewer flooding relating to hydraulic overload (as opposed to blockage or collapse)'
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
Stakeholder	A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems
Sustainable Drainage Systems	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Surface water	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.
SWS	Southern Water Services
SWMP	Surface Water Management Plan
WaSC	Water and Sewerage Company

Contents

1.0 Introduction

1.1 What is a Preliminary Flood Risk Assessment?

This report summarises the Preliminary Flood Risk Assessment (PFRA) undertaken for Portsmouth City Council. It has been carried out to assist Portsmouth City Council to meet its duties as a Lead Local Flood Authority, with the delivery of the first stage of the Flood Risk Regulations (2009). These regulations implement the EU Floods Directive in the UK.

The PFRA is a high level screening exercise that compiles information on significant local flood risk from past and future floods, based on readily available and derivable information. The PFRA also includes the identification of flood risk areas where the subsequent two stages of the Flood Risk Regulations apply; stage two delivers Flood Risk Maps and stage three delivers Flood Risk Management Plans.

Flood risk is defined in the PFRA Final Guidance as "*a combination of the probability of the occurrence with its potential consequences*". Local flood risk refers to flooding which originates from sources other than main rivers, the sea and large reservoirs, which principally means flood risk from surface runoff, groundwater and ordinary watercourses. This main definition of local flood risk requires further clarification: a) it includes lakes and ponds, b) it does not consider flooding from sewers unless this is wholly or partly caused by rainwater or other precipitation entering or otherwise affecting the system, c) it does not include flooding from water supply systems (for example burst water mains) and d) it considers the interaction with flooding from other sources of flooding including main rivers, the sea and sewers.

1.2 Background

The study forms part of a larger delivery project, the Surface Water Management Plan (SWMP).

Exemption from the PFRA could have been possible if Portsmouth City Council (PCC) had prepared in full the following as identified in the Flood Risk Regulations 2009, and submitted to the Environment Agency by 20 December 2010:

- Flood Hazard Map
- Flood Risk Map
- Preliminary Assessment Report, including historic flooding data

Unfortunately, PCC did not have the resource or sufficient time to compile the requirements for exemption. One of the major issues at the time was the sourcing and compilation of historic flood data.

This Preliminary Flood Risk Assessment has been completed for City of Portsmouth and was commissioned to Halcrow Group by Portsmouth City Council. This study has a working partnership with PCC to ensure all flooding knowledge has been captured and to improve the quality and robustness of the deliverables. This study has a close relation to the Surface Water Management Plan (SWMP) which is currently being undertaken by Halcrow for the City of Portsmouth which identifies critical surface water flooding hotspots within Portsmouth and investigates options.

1.3 Objectives

The main aim of this study was to undertake stage one of the flood risk regulations (the PFRA) as stipulated in Flood Risk Regulations 2009.

The timescales for undertaking the three stages of the flood risk regulations are summarised in **Table 1** below.

Table 1 – Stages of the Flood Risk Regulations

Stage	Flood Risk Regulations 2009 for LLFAs
1	LLFAs to undertake PFRAs on local flood risk by ***22 June 2011***, within their administrative boundaries. LLFAs or groups of LLFAs to confirm or to propose alternative Flood Risk Areas from indicative flood risk areas already identified in national datasets by ***22 June 2011***.
2	LLFAs to prepare Flood Hazard and Flood Risk Maps by ***22 June 2013*** for the flood risk areas and in relation to local flood risk.
3	LLFAs to prepare Flood Risk Management Plans of the identified flood risk areas by ***22 June 2015***.

Note 1: This table does not cover the tasks undertaken by the Environment Agency to comply with the Flood Risk Regulations in relation to flooding from main rivers, the sea and large reservoirs.
Note 2: Tasks 2 and 3 have not been undertaken as part of this study as they will be covered in future stages of the SWMP.

The key objectives for the PFRA are 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;
- 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;
- 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 an explanation and justification for any amendments required to the Flood Risk Areas;
- Provide a summary of the systems used for data sharing and storing, and provision for quality assurance, security and data licensing arrangements;
- Provide advice on the next steps required to ensure that Portsmouth City Council complies with its role as the LLFA.

1.4 Study Area

The study area covers the administrative boundary of Portsmouth City Council. It however needs to take account of interactions with adjacent boroughs (between Portsmouth City Council, Fareham BC, Winchester CC and Havant BC), particularly if floods are identified as covering more than one borough.

Figure 1.1 below shows the study area and the boundaries with other local authorities

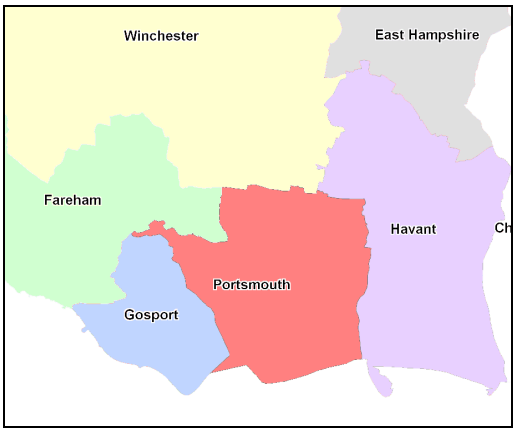
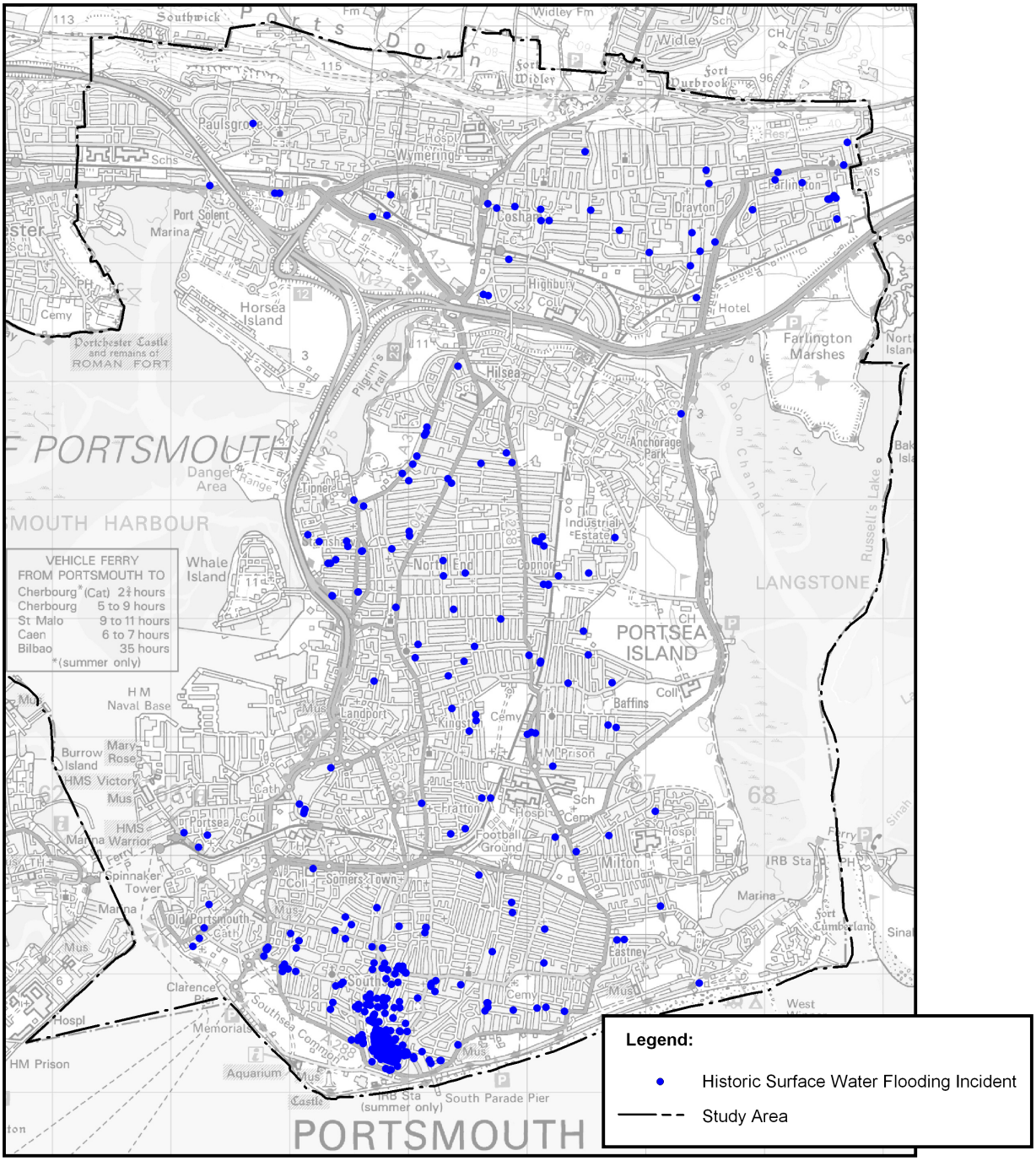


Figure 1.2 below shows the study area and the coverage of past flooding incidents (highlighted by blue dots).

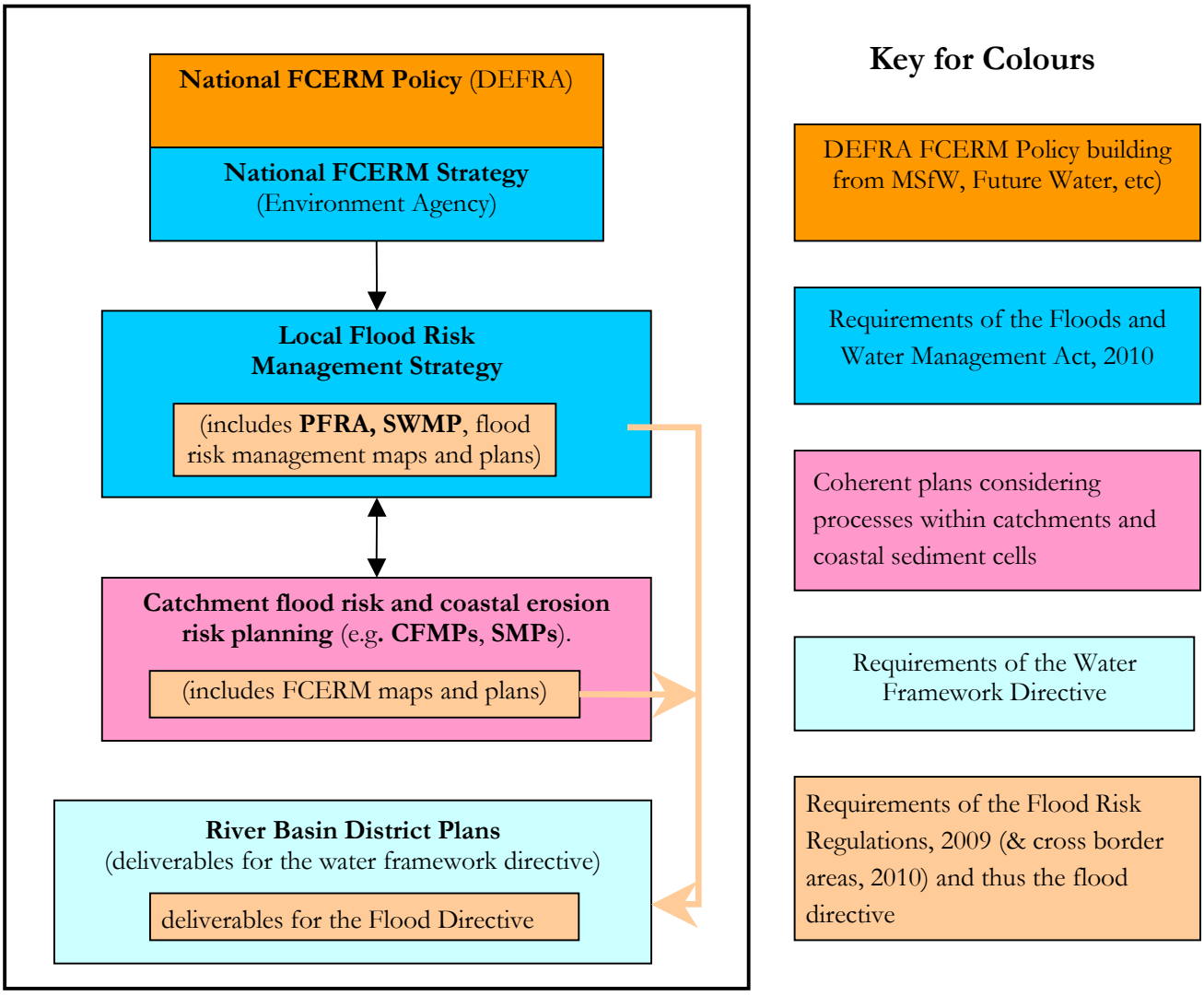


2.0 LLFA Responsibilities

2.1 Legislative Background

The legislative background showing how the PFRA fits within this context is summarised in **Figure 2.1** below:

Figure 2.1 – Legislative Background



FCERM = National strategy for Flood and Coastal Erosion Risk Management

DEFRA = Department of the Environment of Food and Rural Affairs

MSfW = Making Space for Water

CFMP = Catchment Flood Management Plan

SMP = Shoreline Management Plan

The **Floods and Water Management Act** was brought into UK law in 2010 to improve flood risk management and support continuity of water supply. A key feature of the Act is the implementation of recommendations from the Pitt Review into the summer 2007 flooding, thus increasing the emphasis on sources of flooding other than fluvial and tidal, in particular surface water which featured heavily in the 2007 flooding.

The Act gives a number of responsibilities and powers to both the Environment Agency and the Lead Local Flood Authorities. As mentioned in **Section 1.1**, the LLFA are made responsible for local flood risk and main rivers, the sea and large reservoirs are the responsibility of the Environment Agency. The Environment Agency will also be responsible for producing a **National Strategy for Flood and Coastal Erosion Risk Management** (**FCERM**) for England.

The PFRA and SWMP for Portsmouth City Council will inform the future Local Flood Risk Management Strategy and the future updates of the Strategic Flood Risk Assessment (**SFRA**) and other high level documents, such as Catchment Flood Management Plans (**CFMP**).

2.2 Leadership and Partnership

As Lead Local Flood Authority, it is the role of Portsmouth City Council to forge effective partnerships with the adjacent LLFA and the Environment Agency (this is currently the case with the Portsmouth SWMP project) as well as other key stakeholders – Southern Water, Highways Agency and Network Rail. Ideally these working arrangements should be formalised to ensure clear lines of communication, mutual co-operation and management through the provision of Level of Service Agreements (LoSA) or Memorandums of Understanding (MoU).

Figure 2.2 provides a schematic of the partnership and stakeholder arrangements:

Figure 2.2 – Partnership and Main Stakeholder Schematic Diagram

2.3 Stakeholder Engagement

The data collection and stakeholder engagement on historic flood events had already been undertaken for the SWMP so the need for stakeholder involvement at the beginning of the PFRA process was not required.

However, in March 2011 a stakeholder engagement workshop took place to discuss: a) the indicative Flood Risk Areas (iFRAs), b) historical flooding records, c) SuDs approval (see **Section 2.5**), d) future approaches to local flood risk and e) public engagement.

2.4 Public Engagement

It is recommended that the best vehicle for engaging the public is by integrating the management of local flood risk with other council initiatives, such as integrating with emerging development proposals and improving the amenity of parks and open spaces. This approach will require a sustained coordinated approach within the council.

The public have been actively engaged in reporting historic flooding incidents within Portsmouth through a web-based tool which records location and details of individual flood events. This data has been fed into the historic flooding database as part of the data collection process to inform the SWMP and future cycles of the PFRA.

It is recognised that members of the public may also have valuable information to contribute to the future stages of the PFRA and to local flood risk management. Stakeholder engagement can afford 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.

It is important to undertake some public engagement when formulating local flood risk management plans as this will help to inform future levels of public engagement. It is recommended that the Portsmouth City Council follow the guidelines outlined in the Environment Agency's 'Building Trust with Communities' document which provides a useful process of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as local resilience forums.

2.5 Other future responsibilities

Aside from forging partnerships and coordinating and leading on local flood management, there are a number of other key responsibilities that have arisen for Lead Local Flood Authorities from the Flood & Water Management Act and the Flood Risk Regulations. These responsibilities include:

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area.

- **Asset Record and 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 inspection and the Secretary of State will be able to make regulations about the content of the register and records and will be made available to the public.

- **SuDS Approving Body** – The Floods and Water Management Act, 2010 establishes a SuDS Approval Body at county or unitary local authority level (in this case Portsmouth City Council) to ensure national standards of sustainable drainage are enforced. Developers will be required to gain approval of their proposed drainage systems before they can begin construction, and the SuDS Approving Body will then be responsible for adopting and maintaining SuDs which serve more than one property (other than on public roads which are the responsibility of the Highways authorities).

- **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.

- **Designation powers** – LLFAs, as well as 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. This includes assignment of features on private land with a duty to inform the land owner and having enforcement powers for the unauthorised alteration of privately owned designated features.

- **Works powers** – LLFAs have powers to undertake works to manage local flood risk, consistent with the local flood risk management strategy for the area.

3.0 Methodology and Data Review

3.1 Data Sources

Most of the required data has been made available from the previous stage (Stage 1) of the Portsmouth SWMP. The key information that was obtained is listed in ***Table 3.1*** below):

Table 3.1 – Summary of Key Portsmouth SWMP Data

Source	Data/Studies
Environment Agency	Flooding Records of the year 2000 event Environment Agency Asset Data (NFCDD); LiDAR Historic flood data Geostore data including Main River details, flood data for areas vulnerable to surface water flooding
Portsmouth City Council	Known Flooding Problems 2004 Portsmouth PEM System (2006) Portsmouth Flood Reports (2010) Highways Flooding Callout Logs (2010) PUSH SFRA report GIS data from the SFRA LiDAR Photos from flood events Flooding Reports Scheme Reports Farlington Marshes Study SHLAA Development Areas
Southern Water	Foul water and surface water sewer network in GIS format Foul water and surface water sewer network models SIRF Incidents
Other (Highways Agency, Network Rail, Local flood groups, fire brigade, etc)	These datasets are largely outstanding and will be included in the SWMP as it is unlikely this data will provide further information about significant flood risk areas.

3.2 Availability

All key datasets used for the SWMP have been used for the PFRA with no significant data gaps. For the PFRA there are some other datasets which were requested and are still outstanding, these will be included in the SWMP.

3.3 Limitations

The data acquired from the strategic providers were provided in various forms and required converting before being used by Halcrow. The data was of variable or unknown quality and/or accuracy, and there were some issues with incomplete data sets.

Much of the data collected for historic flood events were limited in relation to the exact locations, the source of flooding, the affected receptors and the consequences, such that details were unknown or were assumed.

3.4 Security, Licensing and Use Restrictions

In addition to the individual organisations licensing agreements, there are three 'Golden Rules' which need to be applied:

- Any data received for any use in SWMP may not, under any circumstances, be used for any other purpose whatsoever without the permission of the data owner;
- All rights to the data are reserved by and to the data owner; and
- The right of the data owner to use the sensitive data for commercial purposes must be protected at all times.

Table 3.2, overleaf, gives an overview of the data restrictions and licensing details for key data outlined in **Table 3.1**. The full licensing information for the strategic data providers is included in the Data Gap and Licensing Report, October 2010.

Table 3.2 – Data restrictions and licensing details for strategic data providers

Organisation	Restrictions on data and licensing agreements
Environment Agency	The use of some data is restricted to Local Authorities and their Consultants. Specific data, such as the Indicative Surface Water Flood Risk Areas, are supplied to the consultants via the Local Authorities, as per the Agency's licensing agreement. This data can only be used for surface water management plans, strategic flood risk assessments or preliminary flood risk assessments.
Portsmouth City Council	See 'Golden Rules' outlined under ***section 3.4***
Southern Water	• Necessary precautions must be taken to ensure that all information given to third parties is treated as confidential • The information must not be used for anything other than the purpose stated in the agreement • No information may be copied, reproduced or reduced to writing, other than what is necessary for the purpose stated in the agreement • A Data Sharing Protocol was signed by all SWMP Partners • Information is provided without a warranty; therefore Southern Water excludes any liability for any inaccuracy or incompleteness of disclosed information

3.5 Quality Assurance

Data collected were subject to quality assurance measures to monitor and record the quality and accuracy of acquired information and datasets. A data quality score was given, which is a qualitative assessment based on the Data Quality System provided in the SWMP, Technical Guidance document (March 2010). This system is explained in **Table 3.3**.

Table 3.3: Data Quality System from SWMP Technical Guidance (March 2010)

Data Quality Score	Description	Explanations	Example
1	Best available	No better available; not possible to improve in the near future	High resolution LiDAR, river flow data, rain gauge data
2	Data with known deficiencies	Best replaced as soon as new data is available	Typical sewer or river model that is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	Location, extent and depth of surface water flooding
4	Heroic assumptions	An educated guess	Ground roughness for 2d models

The use of this system provides a basis for analysing and monitoring the quality of data that is being collected and used in the preparation of the PFRA. As mentioned in **Section 3.3** the information provided lacked in level of detail (an average data quality score of 2 was given).

4.0 Past flood risk

4.1 Summary of Past Floods

This **Chapter** focuses on past floods that had *significant harmful consequences* to human health, the local economy, local environmental sensitive areas and cultural heritage. It also reports floods with no *significant harmful consequences*.

Appendix A of this report contains all historical recorded flooding incidents held by Portsmouth City Council and should be used more as a guide since there is a high level of uncertainty of the data gathering standards (e.g. for maximum flood depths).

Table 4 overleaf provides a summary of local past floods, with or without significant harmful consequences, identified through historical records. **Map B.1** in Appendix B provides a visual representation of past floods for different sources of flood risk; it shows flood incident data as well as the past floods listed in **Table 4**. The information provided does not include dates when the flood events occurred, as many of these have happened more than once at the same location.

Table 4 – Summary of Past Floods

Location	Source of flooding (? Indicates uncertainty)	Description: Source, Pathway and Receptor information and Interactions with Other Flooding Sources	Consequence
Farlington Marshes	Surface water Tide locking?	Surface water which drains large areas of the northern part of Portsmouth drains into Farlington Marshes. The drainage system is very low-lying and therefore can flood during heavy rainfall events. The drainage arrangement of Farlington Marshes is via sluice to sea which can become tide locked during high tide events and cause additional flooding of the marshes. The Environment Agency led study on Farlington Marshes aims to recommend a long term strategy for the future of the sea defences which may include realignment of defences and provisions for surface water it may also include pumping stations (report to be issued shortly). The future of the marshes is not clear; if the flood defences are to be removed flood risk will increase in the future due to the reduction of storage capacity available for surface water.	Transport and properties affected/potentially affected.
Copnor	Surface water Sewers?	Surface water flooding occurring from the local combined system sewers. Generally low-lying ground with the railway line embankment which holds back flood waters during extreme events (according to the EA's AStSWF).	Transport and properties affected/potentially affected.
Great Salterns Golf Course	Surface water	Large parts of Portsea Island drain through the golf course to Great Salterns Lake before discharging via a recently upgraded (early 2011) Environment Agency maintained pump system through an outfall to sea. The lake has recently had its capacity increased (early 2011), and reed beds realigned to improve flow. Due to the low-lying nature of the land during extensive heavy rainfall events localised flooding occurs, particularly when there is tide locking at the outfall caused by a high tide.	Transport and properties affected/potentially affected.
Penrose Close	Surface water	Surface water flooding of the highways caused due to the overloaded Western Interceptor sewer running along the west of Portsea Island. The low-lying topography of Penrose Close exacerbates the highway flooding from the sewers. The flood waters stand for long periods after a rainfall event has occurred.	Transport and properties affected/potentially affected.

Location	Source of flooding (? Indicates uncertainty)	Description: Source, Pathway and Receptor information and Interactions with Other Flooding Sources	Consequence
Hambrook Street	Surface water Ground water flooding?	Surface water flooding caused by a possible ground water issue in the localised area. A number of properties have flooded in the past.	Transport and properties affected/potentially affected.
Pier Road (Little Morass)	Surface water Ground water flooding	Known flooding from surface water and ground water in the area. The Morass is low-lying which exacerbates the extent of flooding in the area.	Transport and properties affected/potentially affected.
Southsea (Great Morass)	Surface water	Extensive surface water flooding of Southsea area during the 2000 year rainfall event coupled with the failure of Eastney Pumping Station. The source of flooding is thought to be from the Southern Interceptor which runs along the south of Portsea Island. The flooding originates from the combined sewerage system which caused pollution of all land which was flooded.	Transport and properties affected/potentially affected.

4.2 Significant Harmful Consequences

The Portsmouth City Council does have a past flood with *significant harmful consequences* to report to the EU, based on the following definition of significance:

- Standing water of depth 0.6m or more, or
- water entering 6 or more adjacent properties, or
- a road (of at least 'C' class) rendered impassable by flood water.

Annex 1 has the local information to report.

The flooding of Portsmouth on the 15 September 2000 caused widespread disruption across Portsmouth resulting in internal flooding of approximately 750 properties in the vicinity of Eastney Pumping Station and in the upstream catchment. A combination of events led to a significant flooding for a prolonged period of time in central Southsea.

What Caused the Flood Event of 2000?

All of the below is sourced from: Preliminary Report – Flooding of Eastney Pumping Station on 15 September 2000 (Mark Whittingham, 9th October 2000, MW/430/M14), which itself was compiled from various sources (the local paper, Southern Water letter dated 21.09.00, EA interim report 20 September 2000)

Drizzle started 6am, steady rain by 8am, early evening rain stopped. Intensity estimated at 58mm rainfall in 4.5 hours at its peak, heaviest rain since 1986. Total rainfall measured at 65mm in Havant. 1 in 108 year storm event.

- First diesel pump started 10.25am, all pumps on line by midday
- 11.30am balancing tanks at Fort Cumberland full, pumped discharge started into Langstone Harbour entrance
- 11.36am first report of flooding in Southsea from public to fire service
- Dry well began to flood around midday, eventually flooded pumping station. Last of diesel pumps stopped 1.07pm, all other pumps subsequently affected
- 4.15pm mobile pumps operating
- 8.25pm fire service started pumping into Langstone Harbour

At a public consultation in Taswell Road Portsmouth on 2 October 2000, Southern Water confirmed the pumping station had 1 in 50 year storm capacity and was overwhelmed by an exceptional event

The above definition of *significant harmful consequence* has been defined locally by the LLFA and it is based on a recent Environment Agency briefing paper on reporting information on past floods (Feb 2011).

The past flood event which meets the criteria was at Southsea (see rows highlighted in orange in **Table 4** above).

4.3 Interactions with Other Flooding Sources

Interactions with other flooding sources are shown in the description column of **Table 4.** Of particular importance is the interaction of surface water flooding with the sea along the low lying areas in the vicinity of the Farlington Marshes and the Great Salterns Lake. Surface water in this case is heavily influenced by the water levels in the sea.

5.0 Future flood risk

5.1 Summary of Future Flood Risk

Future flood risk is estimated to be high by Portsmouth City Council.

Table 5 summarises the number of properties at risk of surface water flooding based on the Environment Agency's AStSWF & FMfSW model outputs (some of this information has been copied in **Annex 2** for reporting to the EU).

Table 5 – Number of properties at risk of Flooding

Location	AStSWF Less Susceptible	AStSWF Intermediately Susceptible	FMfSW 200 year event (greater than 0.1m deep)	FMfSW 200 year event (greater than 0.3 deep)
Portsmouth	33,500	11,800	17,700	3,800

There has been very significant investment in the sister pumping station at Eastney, which provides a further 9m3/s installed pump capacity (~50% addition to the capacity of the main diesels in the old pumping station). This has provided a much greater level of resilience in the event of extreme conditions. Further significant investment up to 2015 is planned by means of surface water separation schemes, although these will not be undertaken specifically at the locations of past floods identified in **Table 4**. The flow volume reductions are difficult to quantify however, but it is expected that a significant amount of flow during storm events will be removed from the foul sewer system once the schemes have been implemented**.** Much of the past flooding in the locations identified in **Table 4** can be considered to be where similar floods could still occur, and this is confirmed by the following: a) PCC, b) historic flooding incidents and c) the Environment Agency's Areas Susceptible to Surface Water (AStSWF) national dataset.

5.2 Locally Agreed Surface Water Information

A comparison of the information on surface water flooding identified in **Section 5.1** was undertaken. The agreed conclusion was that the Environment Agency's Flood Areas Susceptible to Surface Water Flooding (AStSWF) national dataset was most representative of the study area. This is because from local experience it is noted the AStSWF is more indicative of surface water flooding in Portsmouth in a 200 year event (see **Map B.2** in Appendix B).

The maximum pump capacity of the Eastney Pumping Station is 18,500 litres/sec according to the Preliminary Report – Flooding of Eastney Pumping Station on 15th September 2000 (Mark Whittingham, 9 October 2000, MW/430/M14). Southern Water

confirmed the pump rate and also stated there is approximately 9,000 litres/sec of extra capacity built into the station.

5.3 Impact of Climate Change

5.3.1 *The Evidence*

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

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is 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 inevitable 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 model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't 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%.

5.3.2 *Key Projections for South East 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 18% (very likely to be between 2 and 39%)

• Precipitation on the wettest day in winter up by around 16% (very unlikely to be more than 34%)

• Relative sea level at Portsmouth very likely to be up between 10 and 40cm 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 24%

Increases in rain are projected to be greater at the coast and in the west of the district. 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, especially in the rapidly responding catchments draining the South Downs and Weald. 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 will also likely be an increase in the possibility of flooding resulting from overtopping of sea defences

There is a risk of flooding from groundwater in the district. Recharge may increase in wetter winters, or decrease in drier summers. Rising sea levels may lead to an increase in groundwater levels

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.

5.3.3 *Adapting to Change*

Past emission means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, we have to make local decisions with a degree of uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

5.3.4 *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 03/03/2011 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). However, Portsmouth is in an exceptional situation whereby it will be impossible to meet growth targets for housing without developing in flood risk areas

6.0 Review of Indicative Flood Risk Areas

6.1 Extent of Indicative Flood Risk Areas

The Environment Agency map showing the indicative flood risk areas for Portsmouth City Council is provided in **Map B.3** in Appendix B (set at a national level of 1km^2 squares).

These have been obtained as a result of adopting a consistent and proportionate approach at national level, taking account of: a) the number of people (based on property numbers x 2.34), b) the number of critical services and c) the number of non-residential properties. The national datasets used were: a) the FMfSW (which indicated some flood risk), b) the AStSWF (which indicated significant flood risk) and c) the National Receptor Database (NRD).

An important principle of the method is that the assessment of significance is based on flooding in the order of a 1 in 100 chance in any given year. For the purposes of the PFRA process the rainfall event with a 1 in 200 chance of occurring in any year scenario is the most appropriate as this is equivalent to the chance of flooding on the ground in the order of a 1 in 100 chance in any given year.

The threshold for the significance criteria is set at 30,000 people at risk of surface water flooding.

6.2 Review Comments

The indicative flood risk areas have been reviewed within the council area. These areas cover a large number of the past and future floods identified in **Chapters 4** and **5**. This is not surprising as the majority of recorded flooding incidents coupled with the backing of the PFRA partners suggest a very similar pattern. There is no reason therefore to believe that there will be additional areas outside the indicative flood risk areas which will reach the national threshold.

7.0 Identification of Flood Risk Areas

7.1 Amendments to FRA

Based on the comments in **Section 6.2** no changes are proposed for the Portsmouth Indicative Flood Risk Areas.

7.2 New FRA

The new FRA proposed is therefore the same as the Indicative FRA.

8.0 Next Steps

8.1 Scrutiny and Review

The scrutiny and review procedures that must be adopted when producing a PFRA are set out by the European Commission. Meeting quality standards is important in order to ensure that the appropriate sources of information have been used to understand flood risk and the most significant flood risk areas are identified. Another important aspect of the review procedure is to ensure that the guidance is applied consistently; a consistent approach will allow all partners to understand the risk and manage it appropriately.

The scrutiny and review procedure will comprise two key steps:

The first part of the review procedure is through an internal Local Authority review of the PFRA, in accordance with appropriate internal review procedures. Internal approval should be obtained to ensure the PFRA meets the required quality standards, before it is submitted to the Environment Agency.

The second part of the review procedure is through the Environment Agency. 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 amended and ensure the format of these areas meets the provide standard. 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 a 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 Portsmouth City Council and must be submitted to the Environment Agency by 22 June 2017. They will then submit it to the European Commission by 22 December 2017 using the same review procedure described above.

8.2 Data Collection and Management

Data gaps that will require future collection activities are listed as follows:

1) A systematic approach to recording local flood risk is recommended, in particular for locations where there are interactions with other sources of flooding and locations where significant hazards have been identified.

There is an opportunity to work with the Environment Agency in developing an integrated system for collecting and managing data, based on the systems that are already in place for fluvial and tidal flooding.

2) A better understanding of how the drainage system operates will be gained by obtaining and interrogating the relevant Southern Water models. These models will be critical for the further stages of the SWMP which will also benefit the PFRA.

8.3 Incident Recording

An action plan for the recording of incidents for Portsmouth is likely to be done by using a secure website, which could be developed to assist in the logging of information consistently.

It is recommended that the recording of flood incidents should follow the principles given in the INSPIRE European Directive (these are listed in the final guidance document for PFRA). The use of a spreadsheet similar to the PFRA spreadsheet (the spreadsheet that will be used for reporting significant flood risk to the EU) is proposed to Portsmouth City Council for consideration as the vehicle for recording flood incidents. The reason is that this format are fully aligned to the INSPIRE directive.

Future data capture provisions are being made by PCC which include GPS data loggers which will have a table for completion by handheld GPS device on site, and the point / polygon data can be exported to digital format (i.e. GIS or AutoCAD).

8.4 Other Flood Risk Regulation Requirements

Other planned actions that will be required to comply with the Flood Risk Regulations are:

1) Development of an action plan on how Portsmouth City Council will perform its duties as the SuDs approval body (approval, adoption and maintenance of SuDs which serve more than one property) – to be published imminently.

2) Links with Flood Risk Assessments and SuDs approvals to be developed as an integrated approach to the approval of SuDs proposals.

9.0 References

Brown, S. Beswick, M. et al. (2008) Met Office Submission to the Pitt Review - Executive Summary, The extreme rainfall of Summer 2007 and future extreme rainfall in a changing climate

Defra (2006) Flood and Coastal Defence Appraisal Guidance, FCDPAG3 Economic Appraisal, Supplementary Note to Operating Authorities – Climate Change Impacts. October 2006. Available from http://www.defra.gov.uk/environment/flooding/documents/policy/guidance/fcdpag/fcd3cl

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Defra (2010) Surface Water Management Plan Technical Guidance

Environment Agency (2010) Preliminary Flood Risk Assessment - Final Guidance (Report – GEHO1210BTGH-E-E). Available from http://publications.environment-agency.gov.uk/pdf/GEHO1210BTGHe-e.pdf

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Miller, H.L. (eds.). Summary for Policymakers. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 9. Available for download from http://www.ipcc.ch/ipccreports/ar4-wg1.htm

The Pitt Review (2008) Learning lessons from the 2007 floods

Preliminary Report – Flooding of Eastney Pumping Station on 15th September 2000 (Mark Whittingham, 9 October 2000, MW/430/M14)

Annex 1 – Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)

Annex 2 – Records of future floods and their significant consequences (Preliminary Assessment Spreadsheet)

Annex 3 – Records of Flood Risk Area and its rationale (Preliminary Assessment Spreadsheet)

Annex 4 – Review Checklist (Spreadsheet containing PFRA Review coversheet and Review checklist)

Annex 5 – GIS Layer of Flood Risk Area(s)

Not applicable to Portsmouth City Council as no Flood Risk Areas have been proposed.

Appendix A – All Recorded Flooding Incidents

Appendix B – All GIS Maps

Map B.1 – Historical Flood Events

Map B.2 – Future Flood Events using FMfSW

Map B.3 – Areas Above Flood Risk Threshold