# CITY AND COUNTY OF SWANSEA
# DINAS A SIR ABERTAWE

# Preliminary Flood Risk Assessment

May 2011

City and County of Swansea
Dinas a Sir Abertawe

# Document Control Sheet

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| **Document Author:** | Mike Sweeney |
| **Project Manager:** | Geoff Sheel |

## Revision History

| Date | Version No. | Summary of Changes |
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| June 2011 | 1.1 | Summary Table added Para.6.51<br>Para. 8.6 added |
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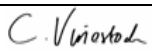
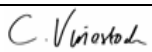
## Approvals

| Approved by | Signature | Date | Version |
|---|---|---|---|
| Chris Vinestock<br>Head of Service - Transportation |  | 20/06/2011 | Final |
| Chris Vinestock |  | 29/06/2011 | V 1.1 |
| Chris Vinestock |  | 06/09/2011 | V 1.2 |

## Distribution

| Name | Title | Date | Version |
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| Mr Richard Wicks | Environment Agency Wales | 20/06/2011 | Final |
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# Table of Contents

## Executive Summary

This Preliminary Flood Risk Assessment was produced by the City and County of Swansea, designated as a Lead Local Flood Authority (LLFA). The Council has an obligation under the Flood Risk Regulations 2009, to produce this Assessment in order to comply with the European Floods Directive, and to meet the requirements of Defra and Welsh Assembly Government guidance on selecting and reviewing Flood Risk Areas.

The Directive seeks to achieve a consistent approach to managing flood risk across Europe, through a six yearly planning cycle based on a four stage process of : undertaking a Preliminary Flood Risk Assessment (PFRA), identifying Flood Risk Areas, preparing Flood hazard maps and preparing flood risk management plans. This document focuses on the first two stages.

Under the Regulations and in line with the responsibilities under the Flood and Water Management Act, LLFAs are responsible for undertaking a PFRA for local sources of flood risk, primarily from surface water, groundwater and ordinary watercourses (excluding main rivers). The PFRA is a high level screening exercise which involves collecting information on past and potential future floods from these sources.

The Preliminary Flood Risk Assessment identifies areas most at risk within the City and County of Swansea area. The process is intended to provide a high level overview of flood risk. The methodology for producing the PFRA has been based on the Environment Agency's Final Guidance and Defra's Guidance on selecting Flood Risk Areas, both published in December 2010.

The PFRA uses information provided by the Environment Agency on Indicative Flood Risk Areas, derived from a common methodology applied across England and Wales. Of the eight Indicative Flood Risk Areas that have been identified in Wales, one is located within the City and County of Swansea's administrative area. For this Flood Risk Area, the Regulations require the City and County of Swansea to prepare Flood Hazard Maps; and Flood Risk Management Plans.

In order that the PFRA takes account of other flood risks in the City and County of Swansea, the information on Indicative Flood Risk Areas has been supplemented with flood risk data and records of historical flooding collected from local and national sources. The PFRA must focus on flooding that would have 'significant harmful consequences', and the additional data collected for Swansea did not identify other events and locations that would meet this national thresholds. For this reason the PFRA does not include records of past flooding events (which otherwise appear in Annex 1 of the PFRA).

This PFRA process has also considered future flood risk to the City and County of Swansea, by analysing national datasets on predicted surface water flooding using a 1 in 200 rainfall event, modelled against the catchment.

The potential flooding events which could exceed the national threshold of 'significant harmful consequences' have been included in Annex 2.

# 1. Introduction

1.1 The City and County of Swansea is a Lead Local Flood Authority (LLFA) as defined in the Flood Risk Regulations 2009 and Flood and Water Act 2010. Under the regulations, and in line with responsibilities under the Flood and Water Act, LLFAs are responsible for preparing a Preliminary Flood Risk Assessment for local sources of flood risk, primarily from surface water run-off, groundwater and ordinary watercourses (which exclude main rivers). The Environment Agency will be responsible for identifying flood risk from main rivers, sea and reservoirs.

1.2 The Flood Risk Regulations 2009 implement the requirements of the European Floods Directive. The European Floods Directive was developed in response to major pan-European flooding to enable a common understanding and co-ordinated management of flood risk. The main requirements are for member states to prepare a Preliminary Flood Risk Assessment (PFRA) of flooding from all sources, and then to use this evidence base to identify areas of significant flood risk (Flood Risk Areas).

1.3 Flood Hazard Maps and Flood Risk Maps must then be prepared for these significant Flood Risk Areas to further investigate the risk of flooding.

1.4 Finally, Flood Risk Management Plans must be developed for these areas with the objective of reducing the probability and/or consequences of flooding.

1.5 In England and Wales the Directive was transposed into law by the Regulations. These require the Environment Agency to assess, map and plan for flood risk from sea, main rivers and large raised reservoirs and Lead Local Flood Authorities (LLFAs), for all other sources of flooding including where the two interact.

1.6 The timetable for preparing assessments, maps and plans is driven by the Flood Directive and includes a 6-month review, collation and reporting process by the Environment Agency to ensure national consistency. Flood Hazard Maps to be submitted by 22 June 2013 and Risk Management Plans by 22 June 2015. The Environment Agency will publish each output by 22 December (after the 6-month review period) in the year it is due. Immediately after the plans are completed the second cycle begins, starting with a review of preliminary assessments by 2017.

## 2. Aims and Objectives

2.1 The PFRA is a high level screening exercise to identify areas of significant risk, based on available and readily derivable information, describing both probability and harmful consequences of past and future flooding on human health, the environment, cultural heritage and economic activity.

2.2 This PFRA will provide a strategic assessment of flood risk within the City and County of Swansea study area using the guidance from Welsh Assembly Government, Defra and the Environment Agency for identifying 'significant' flood risk areas.

The PFRA for the City and County of Swansea is intended to:

- Assess local sources of flood risk and to identify areas that are potentially significant flood risk
- Include, as sources of flood risk, surface water run-off, groundwater, ordinary watercourses, and any interaction with main rivers, sea, reservoirs and other artificial water-bearing infrastructure
- Collate information on past and future floods and their consequences
- Provide a summary of datasets
- Review Indicative Flood Risk Areas provided by the Environment Agency
- Assess the potential harmful consequences of future floods within the study area
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information.

2.3 The PFRA has been carried out by using the Key Principles as directed by Defra:

- Select only the highest risk areas for the first round.
- Use readily available information or derivable information(a directive requirement
- Focus on forward looking assessments, but maintain other information for future use
- Consider risk from a rainfall event which is approximately comparable to a 1 in 200 year flooding in any year
- Focus on assessing indicators of significant consequences particularly considering the impact on people from local flooding
- Consider multiple sources of flooding and residual risk where possible.
- Adopt consistent scales of assessment i.e.1km$^2$

## 3. Study Area

3.1 The study area is defined by the area administered by the City and County of Swansea. The Study area (shown in **Figure 1**) covers an area of approximately 378km 2. The south eastern extent of the council area is the most densely populated, consisting of Swansea and its suburban areas. The Western extent is predominantly rural, consisting of the Gower Pensinusula.

3.2 Within the study area there are two main River Basin Catchments, namely:

- River Tawe – This catchment drains to the East of the Study Area, emanating from the upper region of the Swansea Valley, above Penycae, entering the study area at Clydach and through to Swansea City Centre where it meets the sea.

- River Loughor – This catchment predominantly drains land in the North West of the County. It has its sources from underground lakes in the Black Mountains, flows south through various rural towns and enters the study area above Pontardulais and flows through to meet the sea at Loughor.

**3.3** The risk of flooding from Main River,Sea and Reservoirs area will be the responsibility of the Environment Agency to assess, and the flood risk from these sources within the study area is, to an extent, reduced through the protection provided by natural or manmade defences. Other Flood Risk Management Authorities within the study area include Dwr Cymru/Welsh Water( DCWW), British Waterways, Network Rail, Mid Wales Fire and Rescue Service and the City and County of Swansea Highways Department.

**Figure 1- City and County Administrative Boundary**

# 4. Lead Local Flood Responsibility

4.1 In his Review of the summer 2007 flooding, Sir Michael Pitt stated that "the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas". As the designated LLFA, the City and County of Swansea is therefore responsible for leading local flood risk management.

4.2 The City and County of Swansea currently has ad hoc partnership arrangements with neighbouring authorities, Carmarthenshire County Council (CCC) Neath and Port Talbot (NPT) and Bridgend Council (BCBC). Governance is through regular meetings between CCC, NPT, BCBC and the Environment Agency to ensure consistency of approach in the production of Preliminary Flood Risk Assessments. Although, there are no formal arrangements in place with utility and external companies for supply of data, Dwr Cymru/Welsh Water, British Waterways and Network Rail have been contacted with requests for information regarding flooding issues affecting their infrastructure.

4.3 The need to work in partnership with central government and other operating Authorities in its approach to Flood and Coastal defence is recognised.

4.4 In conjunction with other authorities, the Council has a key role in respect of emergency planning to ensure that there are adequate plans for flooding emergencies. The Council maintains an awareness of the Environment Agency Flood Warning Plan and plays an agreed role in any flood warning emergency exercises. As Local Planning Authority, the Council must consider the effects of new developments, particularly on flood plains and where there are issues in respect of flooding to highways.

4.5 The Council adopts a strategic approach to provision of flood and coastal defences, particularly by assessing any potential wider effects of proposed defences. To this end the council will continue to play a full role in Shoreline Management Plans and Environment Agency's Catchment Flood Management Plans.

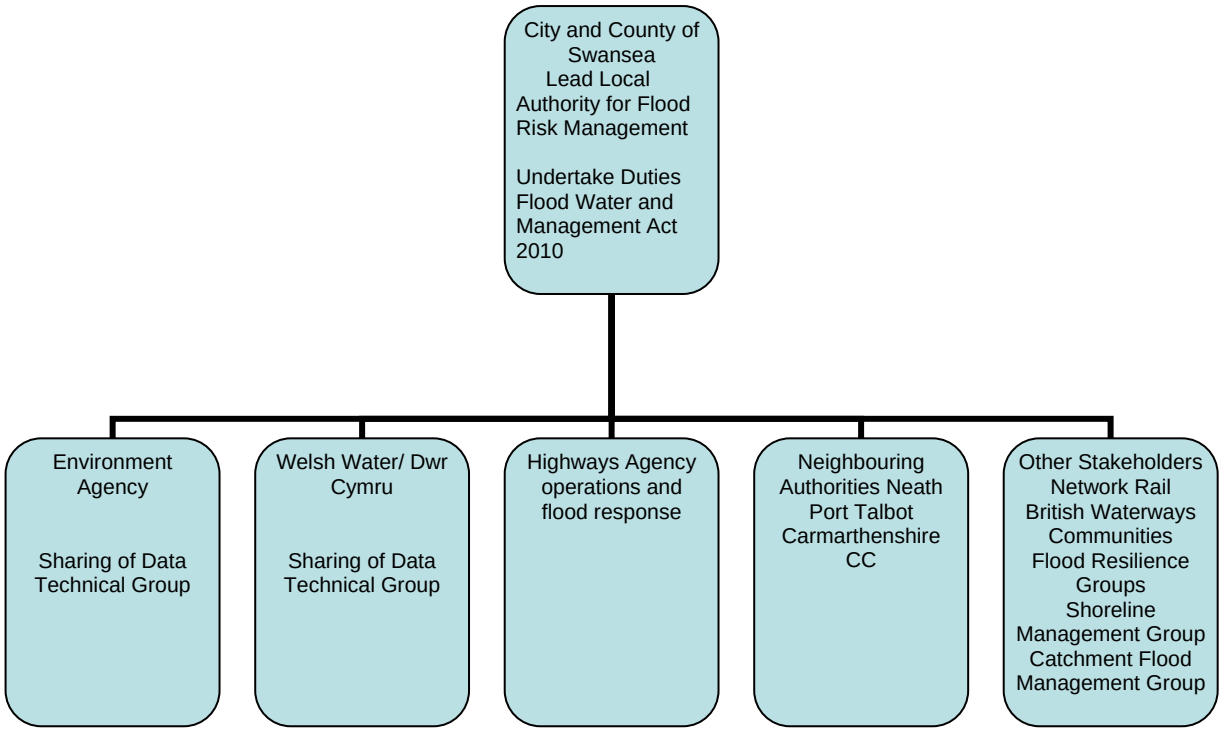
4.6 In its capacity as Lead Local Flood Authority the City and County of Swansea will:

- **Investigate flood incidents** -Develop, maintain, apply and monitor a strategy for local flood risk management in its area. Local flood risk includes surface water run-off, groundwater and ordinary watercourses
- **Develop a Local Strategy** -The local flood risk strategy will be consistent with the National Strategy.
- **Set up Governance Arrangements** with other Flood Risk Management Authorities

- **Become a SuDs Approving Body** - LLFAs are designated SuDS Approving Body (SAB) for any new **Su**stainable **D**rainage **S**ystems within their administrative area.
- **Exercise works powers** - LLFAs have powers to undertake works to manage flood risk from surface water run-off and groundwater, consistent with the local flood risk management strategy for the area.
- **Designate Structures** - LLFAs have powers to designate structures and features that affect flooding or coastal erosion and to maintain a register of these structures, to inform condition and ownership. The register must be available for inspection.

4.6 The existing arrangements in place with other flood risk management bodies are illustrated below:

**City and County Partnership Working**




4.7 The City and County of Swansea has good working relationships with key stakeholders, and a number of working groups specifically relating to flood risk management are in place. These include the Neath and Port Talbot City and County of Swansea Flood Group and the Carmarthen and Swansea Bay Coastal Engineering Group. The Council is also a member of the Catchment Flood Management Group. The above diagram shows existing arrangements, with some working arrangements to be formally agreed in order to comply with the requirement to provide a more co-ordinated and holistic approach to flood risk management.

# 5. Methodology and data review

5.1 The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010. 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.

## 5.2 Methodology

The PFRA is a high level screening exercise to identify areas where the risk of flooding is considered to be significant and warrants further examination through the production of flood hazard maps and flood risk management plans. The criteria for this are shown in paragraph 7.1 of this document.

The PFRA is based on existing and available information and the information contained within this report will also feed into other assessments including the local strategy for Flood Risk Management in the City and County of Swansea, in order to comply with the Act.

The following Table summarises the main steps taken to produce this report.

**Table 1**

| | |
|---|---|
| 1 | Set up governance & develop partnerships |
| 2 | Determine appropriate data systems |
| 3 | Collate information on past & future floods and their consequences |
| 4 | Determine locally agreed surface water information |
| 5 | Complete preliminary assessment report document |
| 6 | Record information on past & future floods with significant consequences in spreadsheet |
| 7 | Illustrate information on past and future floods |
| 8 | Review indicative Flood Risk Areas |
| 9 | Identify Flood Risk Areas |
| 10 | Record information including rationale |

## 5.3 Data Collection and Partner Organisations

Information was gathered from other organisations which were requested to share data for the preparation of the PFRA. These included:-

**Welsh Water/Dwr Cymru** – Spreadsheets were obtained highlighting specific areas which had been prone to internal and external sewage flooding, indicating which areas had experienced rain-induced flooding.

**Mid Wales Fire and Rescue Service** – Information was received on a spreadsheet format to show call outs to flooding incidents for the period April 2002 to January 2011. Historical recordings prior to 2002 were unavailable.

**Network Rail** were approached but no information was provided. It is understood that they know of no locations that regularly experience flooding problems.

**British Waterways** confirmed there were no recorded breaches of the canals located within the study area.

Existing datasets, reports and anecdotal information from the stakeholders listed above were collated and reviewed to identify details of major past floods events and associated consequences, including economic damage, environmental and cultural consequences and impact on the local population

## 5.4 Assessing Future Flood Risk

To assist LLFAs in determining Flood Risk Areas the Environment Agency has produced indicative Flood Risk Areas based on an assessment of national information. 1km grid squares of 'places where flood risk is an issue' have been identified wherever at least 200 people or 20 businesses or more than 1 critical service might be flooded. Other national data provided by the Environment Agency are included in **Table 2.**

## 5.5 Other Relevant Information

There are a number of plans which contain useful information relating to local flood risk and were used in the production of the report.

Catchment Flood Management Plans (CFMPs) are non statutory plans produced by the Environment Agency to provide an overview of flood risk across each river catchment. These also recommend ways of managing risk from all types of inland flooding now and over the next 50-100 years.

Shoreline Management Plans (SMPs) are non statutory plans which provide a large scale assessment of the risks associated with coastal processes and help reduce the risk to people and the developed, historic and natural environments. They include an assessment of flooding from the sea and therefore can be used to identify interactions with local flood risk.

## 5.6 Data Sources – National Datasets

The datasets shown in Table 2 below were used to support development of the PFRA.

**Table 2**

| Dataset | Description |
|---|---|
| Areas Susceptible to Surface Water Flooding | The AStSWF dataset contains one rainfall event, with three susceptibility bandings ,less, intermediate or more, to outline areas at risk from surface water flooding |
| Flood Map for Surface water | The FMfSW contains two rainfall events, devided into two depth bandings: 1in 200 and 1 in 30 events with two depth bandings, greater than 0.1m and greater than 0.3m. |
| Historical Flood Map | Attributed spatial flood extent data for flooding from all sources |
| Integrated Surface Water management Group data | A compilation of surface water data submitted to WAG by local Authorities and Welsh Water |
| Indicative Flood Risk Areas | Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG. |
| National Receptors Dataset | A national dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations. |
| Areas Susceptible to Groundwater Flooding | National mapping showing areas which are susceptible to groundwater flooding |

## 5.7 Data Management

The current system of collecting flood event data is held on the Authority's Highway Management System, a database which stores information on EXOR and MAYRISE systems. An example of current arrangements is shown below.

| EXOR Ref | Complaint Type | Date Rcvd | Enquiry Description | Complaint Location | SWANSEG LinkRef |
|---|---|---|---|---|---|
| 319653 | Drainage Problems | 01/03/11 | Water on Highway | Jewl Autos | 6855CW0015/00003 |
| 319596 | Drainage Problems | 28/02/11 | WATER PONDING ON C/WAY @ SIDE OF 2 CHAPEL ROAD | opposite 50 PENCAERFENNI LANE , CROFTY | 6855Z861__/00001 |
| 319582 | Blocked Gully | 28/02/11 | BLOCKED GULLY | LANE @ REAR OF 3 - 4 HOO STREET , PORT TENNANT | 6855ST0010/00008 |
| 319497 | Blocked Gully | 28/02/11 | Gulley Cover missing | Heol Tir Coed, Penllegear Acess Road | 6855Y1231_/00001 |
| 319496 | Blocked Gully | 28/02/11 | Blocked Gulley | Pencaerfenni Park Crofty o\s no 19 | 6855Z1905_/00001 |
| 319485 | Flooding (Out of hours) | 26/02/11 | Flooding. | Victoria Road Gowerton near Swansea Sound. | 6855B4296_/00063 |
| 319483 | Flooding (Out of hours) | 26/02/11 | Flooding. | Fabian Way opp Blazers Caravan Site | 6855A483__/00151 |
| 319482 | Flooding (Out of hours) | 26/02/11 | Excess of Surface Water | A 48 between Llangy felaxh & Penllegear | 6855A48___/00053 |

## 5.8 Data Limitations

A significant percentage of records do not identify the nature of flooding or possible causes. Some records do not list how many properties were flooded nor the extent of the flood event.

The recorded flood events from the EXOR system have not been identified with a National Grid Reference or similar.

The recorded historical data across the City and County of Swansea can therefore be considered inconsistent in terms of providing the necessary information of reporting the consequences of flooding. This is principally because the records were not intended to be used to measure and record the effects of flooding and the lessons learnt, but rather to manage the immediate response.

This PFRA can however be a catalyst to improve the way the Council maintains details of future flooding incidents.

## 5.9 Future Data Management

In order to fulfil its role as Lead Local Flood Authority, the City and County of Swansea is required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information.

The Authority will maintain records of flood events and will record details of flooding incidents in a spreadsheet format to be documented consistently and in accordance with the INSPIRE Directive (2007/2/EC).

## 5.10 External Parties

The data received from Welsh Water was presented in a spreadsheet format. The data shows locations of flood risk from the sewerage system across the City and County of Swansea, and is therefore relevant to the production of the PFRA. The data collected categorised the risk of flooding to locations, rather than to individual property address points, and the flooding is categorised into high to low flood risk. The data also identifies the source flooding depending on sewer type, date of flooding, differentiates between external and internal flooding and identifies the associated sewerage catchment.

No data has been received from Network Rail

Information supplied from the Mid Wales Fire and rescue service showed sporadic attendance to flooding emergencies across the area, these have been marked on the map provided as **Figure 2**. However, the data is poor in defining particular flooding incidents.

## 5.11 Data Licensing and Restrictions

The security of data is also a key consideration when it comes to collecting, collating and storing sensitive data. All data collected is stored on local servers which are password protected. The City and County of Swansea must adhere to data security measures to ensure that sensitive data is held in a secure manner. The Authority endorses and complies with the Data Protection Act 1998 and endorses the principles contained within the Act.

A summary illustrating the restrictions on the use of specific data from external bodies is included below.

**British Waterways** – The use of data provided is restricted to the City and County of Swansea for the preparation of its Preliminary Flood Risk Assessment and is not to be passed on to third parties. The information provided by British Waterways for the production of PFRAs can also be used to assist the production of the Local Flood Risk Management Strategies (i.e. this is an appropriate End User Purpose).

**Welsh Water** – The use of data provided is restricted to the City and County of Swansea for the preparation of the PFRA.

**Environment Agency –** The use of some data is restricted to City and County of Swansea for the preparation of the PFRA. The use of other data is unrestricted.

# 6. Past Flood Risk

## 6.1 Overview of Historic Flooding in City and County of Swansea

Flood records for the whole City and County of Swansea area were collected from the data sources detailed in **Table 2**. The Environment Agency provided information showing locations of historic flooding across the study area. This data, combined with that from internal highway and drainage records of historical flood events and flooding 'hotspots', was collated and a summary map produced. The locations of these past flood events is illustrated on the map provided as **Figure 2**. The flooding events have been categorised into high, medium or low depending on the level of impact to the local community and frequency of events. An example of the summary table for past flood events is shown below.

| Name | Location | Eastings | Northings | XY_ORGIN | HIST_MODEL | RECORDDATE | F_SOURCE | FS_CONFID | F_DEPTH | FD_CONFID | F_LEVEL | FL_CONFID | D_SOURCE | INT_PROP | P_CONFID | PHOTO_ID | COMMENTS | FLOODING RISK | LINAGE | SENSITIVE | PROTECTIVE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Swansea | Derwen Fawr Road / Birchtree Close, Sketty | 261990 | 192320 | Centroid taken from GIS Plan | | Not Known | Pluvial | Medium | | | | | Local Knowledge | | | | Flooding information obtained by local knowledge | High | OS 50k Mapping | Unknown | Unknown |
| Swansea | Birchgrove Road, Skewen | 270760 | 197290 | Centroid taken from GIS Plan | | Not Known | Pluvial | Medium | | | | | Local Knowledge | | | | Flooding information obtained by local knowledge | High | OS 50k Mapping | Unknown | Unknown |
| Swansea | Bryn Y Mor Road, Gowerton | 258550 | 196450 | Centroid taken from GIS Plan | | Not Known | Pluvial | Medium | | | | | Local Knowledge | | | | Flooding information obtained by local knowledge | High | OS 50k Mapping | Unknown | Unknown |
| Swansea | Capel Road, Clydach | 270000 | 201740 | Centroid taken from GIS Plan | | Not Known | Pluvial | Medium | | | | | Local Knowledge | | | | Flooding information obtained by local knowledge | High | OS 50k Mapping | Unknown | Unknown |
| Swansea | Llys Ddol, Morriston | 267160 | 199580 | Centroid taken from GIS Plan | | Not Known | Pluvial | Medium | | | | | Local Knowledge | | | | Flooding information obtained by local knowledge | High | OS 50k Mapping | Unknown | Unknown |

For the purpose of this report a local 'significant' flood event, which results in adverse harmful consequences, is defined as one where five or more residential properties are flooded and are categorised in the High Risk Category. City and County of Swansea understands that every flood incident impacts on local people and each flood record will be reviewed as part of our longer term Local Flood Risk Management Strategy (LFRMS).

The flood incidents can be attributed to a range of sources, and in many cases the source of flooding was unknown or not recorded. A summary of information specific to each source of flooding considered as part of the PFRA is included below.

## 6.2 Surface Water Flooding

Surface water flooding occurs when heavy rainfall exceeds the capacity of local drainage networks and water flows across the ground. Information on surface water flooding incidents was obtained from a number of sources, as discussed in **Table 2**. Also, key sources of surface water records were the City and County of Swansea's highway maintenance team, which holds records of flooding incidents from highway drainage systems, culverts and ordinary watercourses.

## 6.3 Groundwater Flooding

Groundwater flooding occurs when the level of groundwater increases sufficiently so it rises above the level of the ground and causes flooding. It is often dependant on the underlying geology of an area and occurs following heavy rainfall.

Groundwater flooding within the majority of South Wales is typically a greater risk in areas with significant coal mining. However, the majority of the former coal mining areas within the City and County of Swansea are believed to be fully recovered and therefore do not present a significant risk flooding.

Historically, there are no records of any Groundwater Flooding in the City and County of Swansea which can be considered to have significant consequences.

## 6.4 Sewer Flooding

Sewer systems are typical to all urban locations within the study area. Modern sewer systems are typically designed to accommodate storm events with a 3.3% annual probability (1 in 30 year return period) and are normally separated into foul and surface water systems. Older sewer systems were designed to convey both foul and surface water flows in combination and these systems were generally designed to a lesser standard. Consequently, it is expected that sewer flooding will occur in the City and County of Swansea during a storm event which is less severe than a 1 in 30 year event.

Excess surface water entering the drainage network can result in significant harmful consequences and DCWW, the managing operator for public sewers in the area, was approached in order to provide information on significant flooding events. Registers which record internal flooding to properties (DG5 registers) and details of sewers which have contributed to serious external flooding have been provided and assessed accordingly. There were a total 317 of sewer flooding events that have been recorded by the DCWW over the past decade. The locations of the historical flooding problems within the catchment have been plotted on the map included as **Figure 3**. An example of information received is shown below.

| Authority | Address | Incident Date | Flooding Type | Flooding Risk | Sewer Type | Sewerage Catchment | Easting | Northing |
|---|---|---|---|---|---|---|---|---|
| SWANSEA | Danycoed Road, Birchgrove | 16/10/2006 | External | High | | Swansea Bay | 270217.1 | 197744.0 |
| SWANSEA | Danycoed Road, Birchgrove | 08/06/2008 | External | High | | Swansea Bay | 270217.1 | 197744.0 |
| SWANSEA | Heol Dulais, Birchgrove | 25/08/2010 | External | Low | F | Swansea Bay | 270014.3 | 198301.4 |
| SWANSEA | Heol Dulais, Birchgrove | 11/10/2006 | External | Low | | Swansea Bay | 270020.4 | 198240.7 |
| SWANSEA | Heol Las, Birchgrove | 20/07/2010 | External | Low | F | Swansea Bay | 269981.4 | 198584.7 |

## 6.5 Interaction with Main Rivers and the Sea

Insufficient historical flooding data is available to draw definitive conclusions at this stage. The main areas where there is possibility of interaction with ordinary watercourses are on the low lying areas of the study area around the Swansea Bay area on the Southern Boundary, and Crofty to Pontardulais on the Northern boundary.

## 6.6 Consequences of Historical Flooding

The limited information about past flooding does not identify any historical flood event which met the National Thresholds for past flood events considered to have had 'significant' harmful consequences. None have therefore been included in Annex 1 of the Preliminary Assessment spreadsheet.

However a complete record of flood incidents collected within the study area has been illustrated on **Figure 2** and the locations have been categorised as high, medium or low risk areas. These will be used as a future evidence base for the next cycle of the PFRA. It is intended that as specific flood data is recorded in the future it will be possible to provide a more accurate representation of flood risk within the City and County of Swansea. This will also provide invaluable information for future PFRA cycles as well as for the local flood risk strategy.

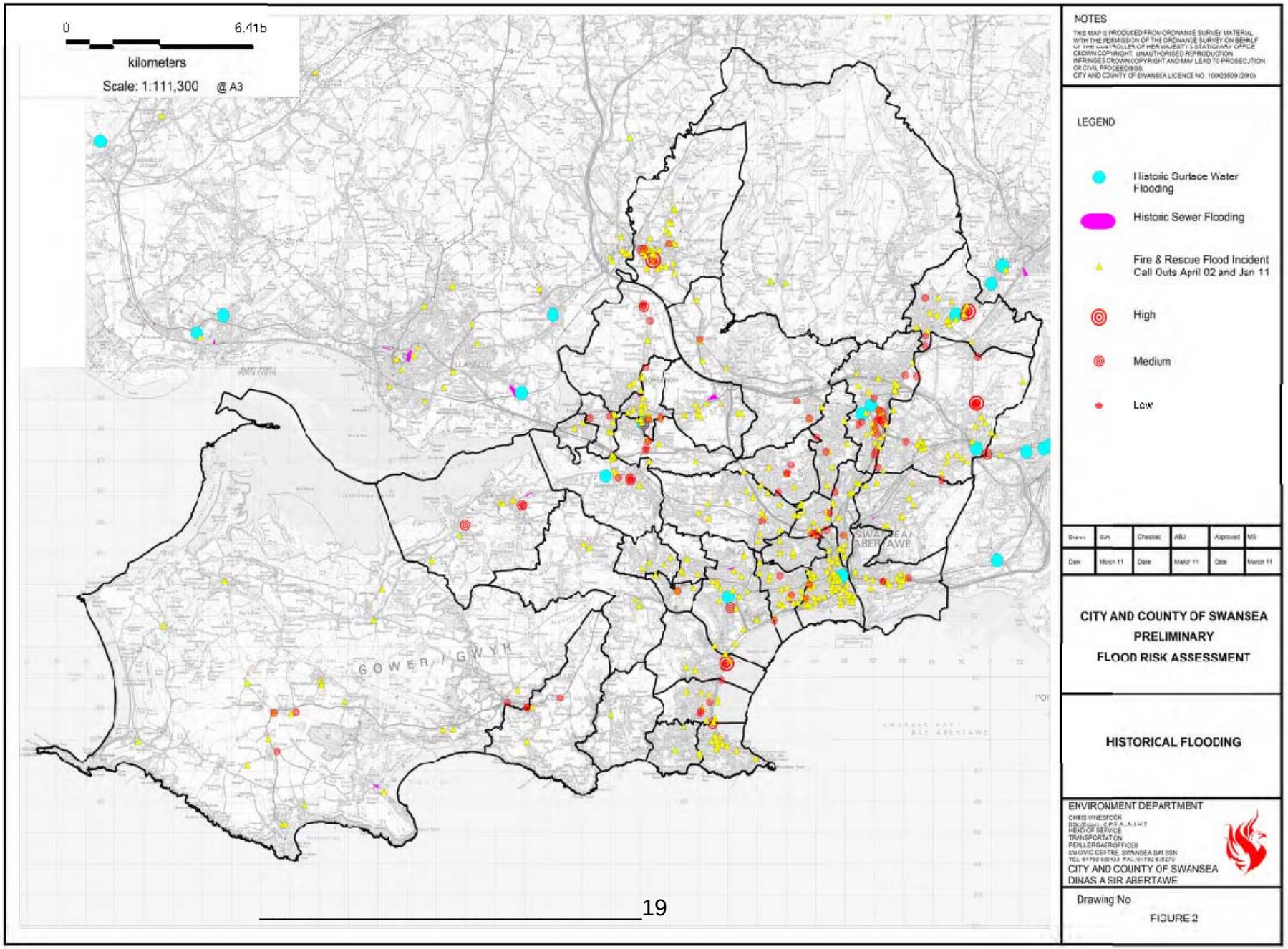
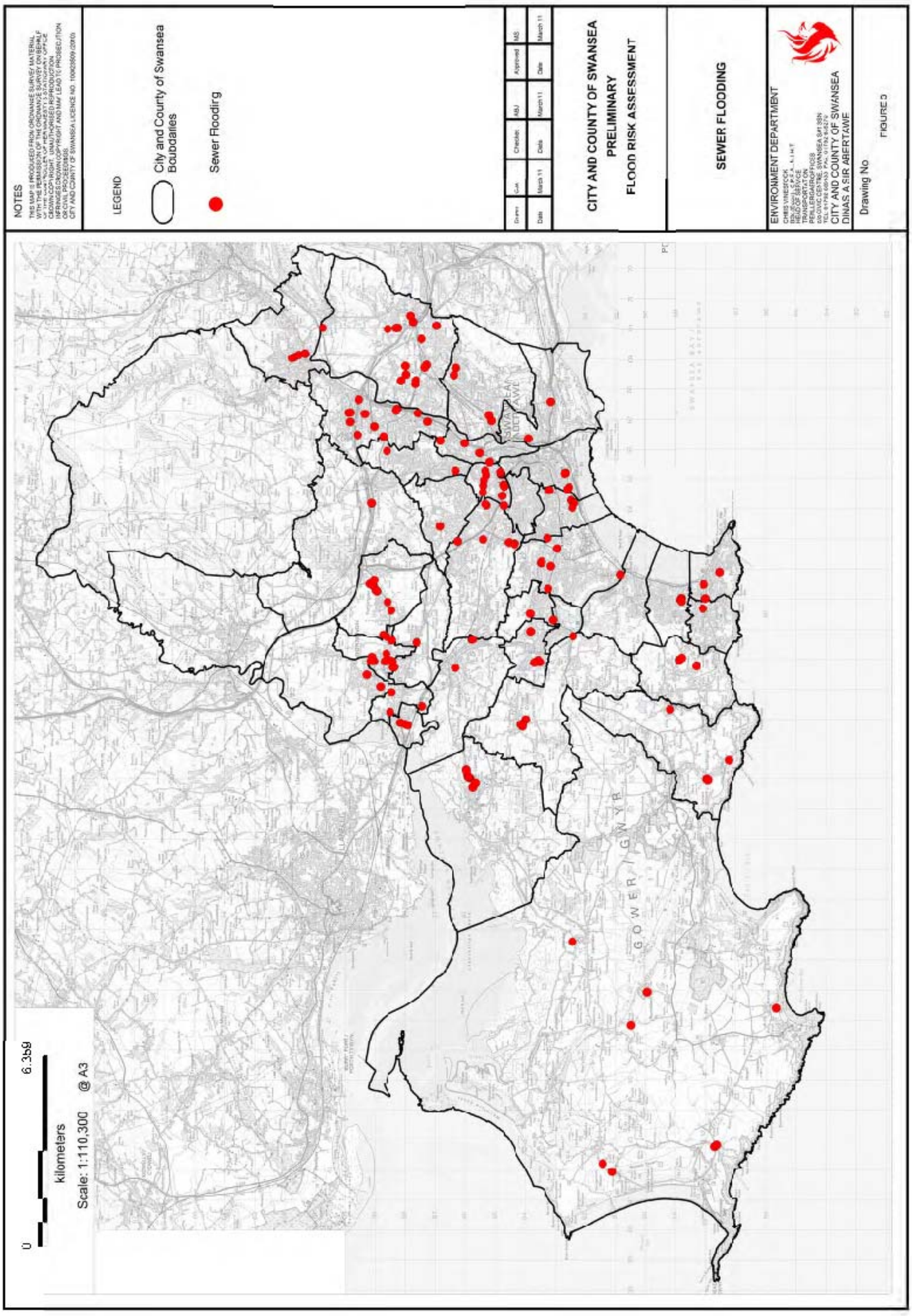





Figure 2 – Map to show Historical Flooding

# Figure 3 – Map to show Flooding from Sewers



# 7. Assessing Future Flood Risk

7.1 The identification of Flood Risk Areas through the PFRA should also take into account future floods, defined as any flood that could potentially occur in the future. This definition includes predicted floods extrapolated from current conditions with an allowance for climate change. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's Flood Map for Surface Water which has been recently circulated to Lead Local Flood Authorities. As there is no local information on future flooding available, the 'locally agreed surface water information' is the Flood Map for Surface Water dataset as shown on **Figure 4.** This gives an overview of the future flood risk from Surface water across the City and County of Swansea and is considered the most appropriate source of information.

7.2 The following factors were considered when assessing *future* flood risk across the City and County of Swansea study area:

- Topography
- location of ordinary watercourses
- location of flood plains that retain water
- characteristics of watercourses (lengths, modifications)
- effectiveness of any works constructed for the purpose of flood risk management
- location of populated areas
- areas in which economic activity is concentrated
- the current and predicted impact of climate change
- the predicted impact of any long-term developments that might affect the occurrence or significance of flooding, such as proposals for future development.

7.3 Typically, areas of lower ground which coincide with the main rivers and larger scale watercourses are the areas which are considered significant in terms of risk of surface water flooding. The Flood Map shows areas most susceptible to surface water flooding in the Tawe corridor, such as Morriston and Llansamlet, as well as areas adjacent to the River Loughor and River Lliw /Llan in and around Pontardulais, Gowerton and Gorseinon. There are also relatively significant areas in the southern areas of Swansea such as Blackpill, Sketty, the city centre, as well as the Crymlyn Bog and the Docks

## 7.4 Identifying Indicative Flood Risk Areas

In order to ensure a consistent approach, Defra and WAG have identified significance criteria and thresholds to be used for defining flood risk areas.

The methodology is based on using National Flood Risk Information to identify 1km squares where local flood exceeds a defined threshold. Where a cluster of these grid squares forms an area where flood risk is most concentrated and over 5,000 people area would be affected, the area has been identified as an Indicative Flood Risk Area.

Information regarding historic and future flood risk is used to identify formally Flood Risk Areas. To achieve this, *flood risk indicators* are used to determine the impacts of flooding on human health, economic activity, cultural heritage and the environment. The use of flood risk indicators helps to develop understanding of the impacts and consequences of flooding. Key flood risk indicators are summarised in **Table 3**.

**Table 3 : Key Flood Risk Indicators**
**Impacts of flooding on: Flood Risk Indicator**

| Impacts on Flooding | Flood Risk Indicators | Threshold |
|---|---|---|
| Human Health | Number of people (based on number of residential properties x 2.34)<br><br>Critical Services(Hospitals, Police/Fire/Ambulance Station, Schools etc | 5,000 (national threshold)<br><br>25 (national) |
| Economic Activity | Non-Residential Properties (including shops and businesses) | 500,although number of people is the deciding threshold for indicative Flood Risk Areas |
| Cultural Heritage | Cultural Heritage Sites Scheduled monuments, listed buildings etc | LLFA should consider potential consequences |
| Environment | Special Areas of conservation Sites of Special Scientific Interest etc | LLFA should consider potential consequences |

For further details, reference can be made to Defra 's Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding(December 2010)

## 7.5 Locally Agreed Surface Water Flooding Information

The Environment Agency has identified one indicative area within the administrative boundary of the City and County of Swansea. This satisfies the national threshold of more than 5,000 people being considered at risk of flooding. The Indicative Flood Risk Area is shown on **Figure 5** and in the main it represents surface water flooding in the most urbanised area of Swansea, with the consequences of flooding affecting 6962 population, equivalent to 2975 properties. Within this flood risk area the regulations require the City and County of Swansea to undertake further work, to produce flood hazard maps by June 2013 and to produce flood management plans for this area by June 2015. The area has been reviewed and is included in **Annex 3** of this report.

## 7.6 Review of Indicative Flood Risk Areas

To ensure a consistent and proportionate approach, Defra and WAG have identified significance criteria and thresholds for defining Flood Risk Areas.

The EA has applied these criteria and thresholds to produce Indicative Flood Risk Areas and these areas are based on certain nationally available data. The City and County of Swansea has reviewed this area using the best local information available and agrees with the areas which have been identified as Indicative Flood Risk Area. No amendments are considered necessary.

## 7.7 Places above Flood Risk Thresholds (Future)

The Environment Agency has also provided information on other potential areas which exceed the Flood Risk Thresholds. These areas have been reviewed and are included in **Annex 2**. The Indicators used to identify these places are:-

Number of people > 200
Critical Services > 1
Number of Non-Residential Properties > 20

Places above Flood Risk Thresholds provided by the Environment agency have been identified based on the new Flood Map for Surface Water (30cm deep water at a 1 in 200 annual probability rainfall) are shown on **Figure 6**.

## 7.8 Groundwater Flooding

There is no local information available which provides evidence of future ground water flooding risk across the area. Consequently the national dataset, Areas Susceptible to Groundwater Flooding, provides a basis for assessing flood risk from groundwater. The dataset is illustrated in **Figure 7**.

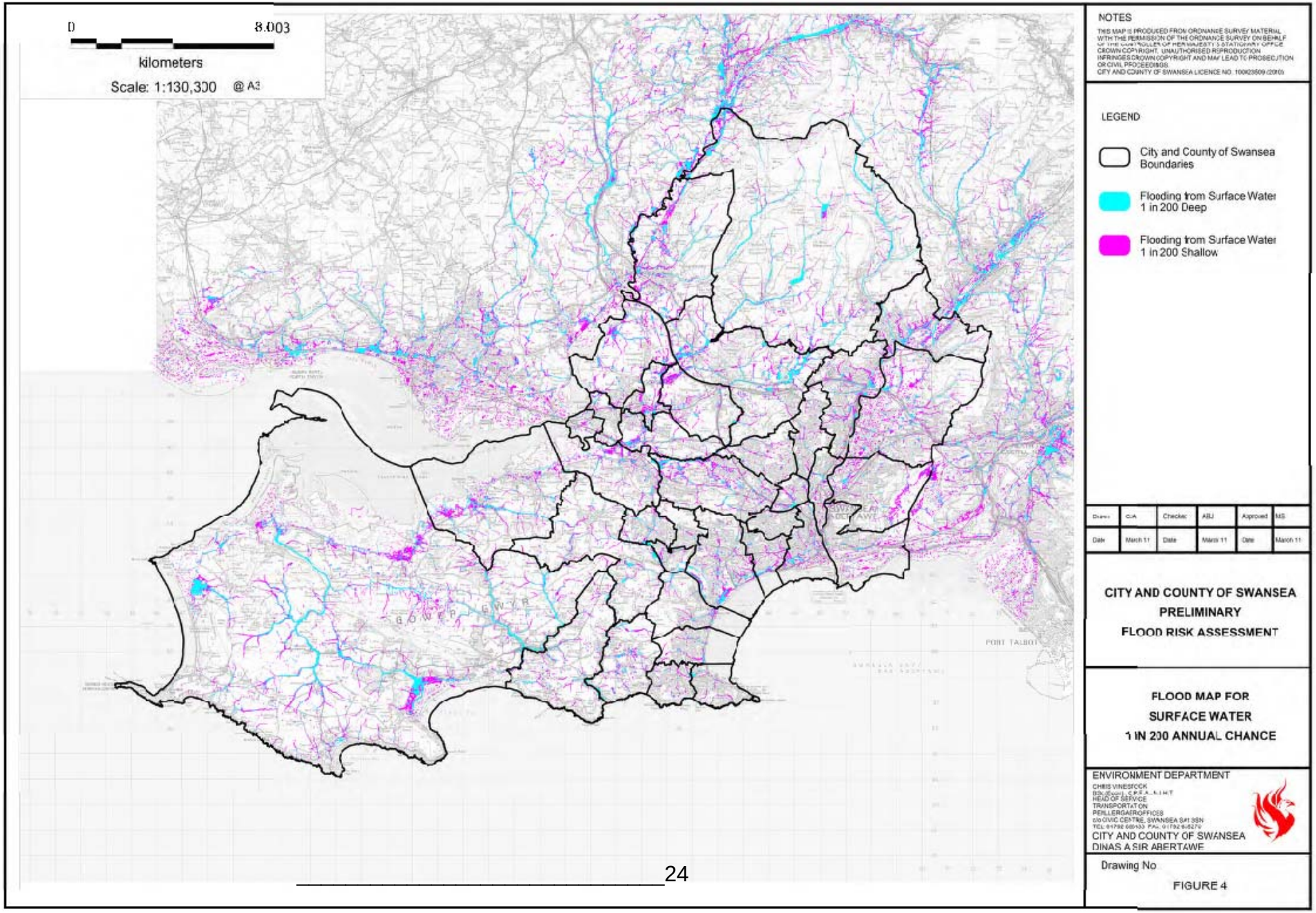



Figure 4 – Map to show Flood Risk Area – Surface Water

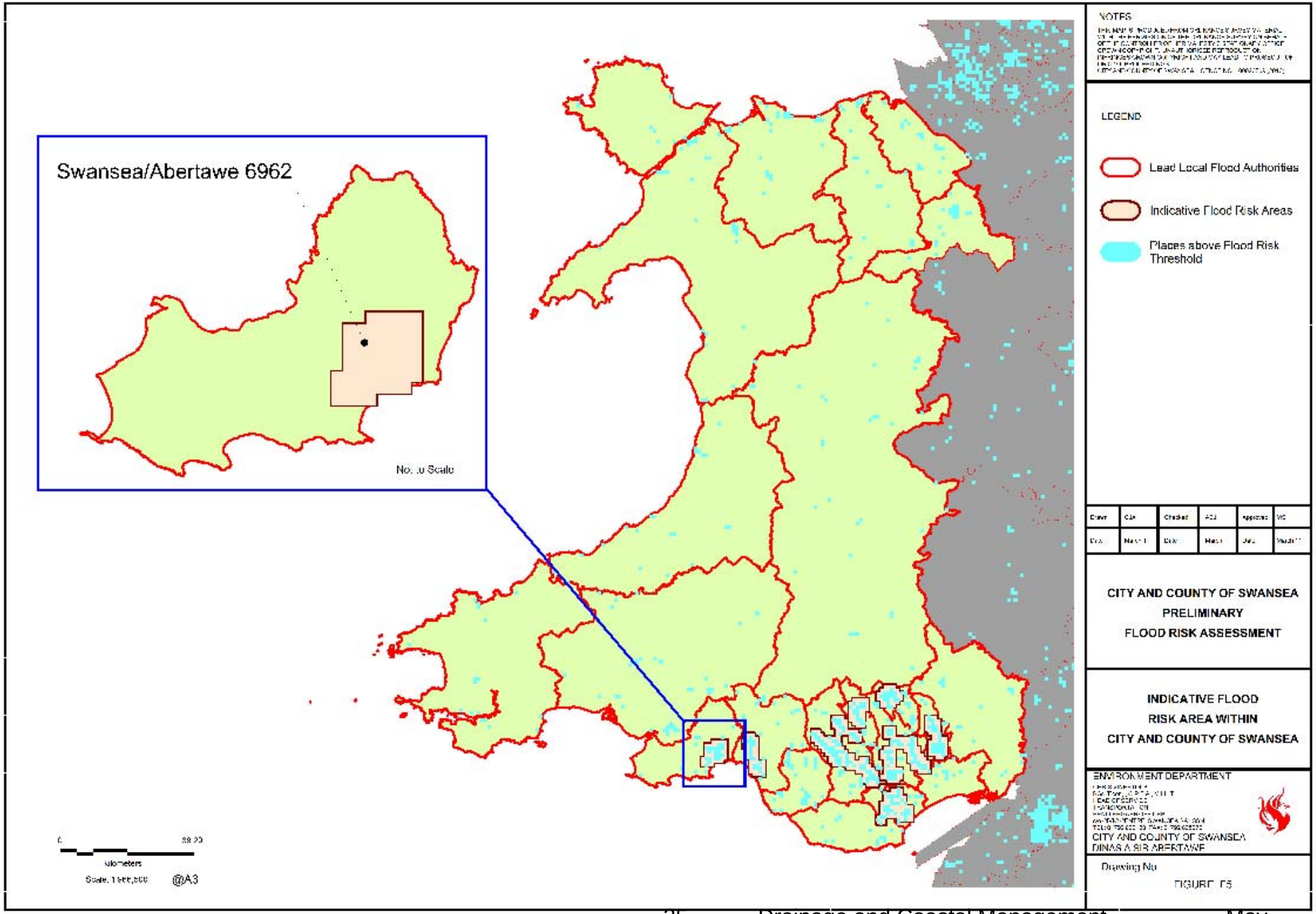



**Figure 5 – Map to show Indicative Flood Risk Areas**

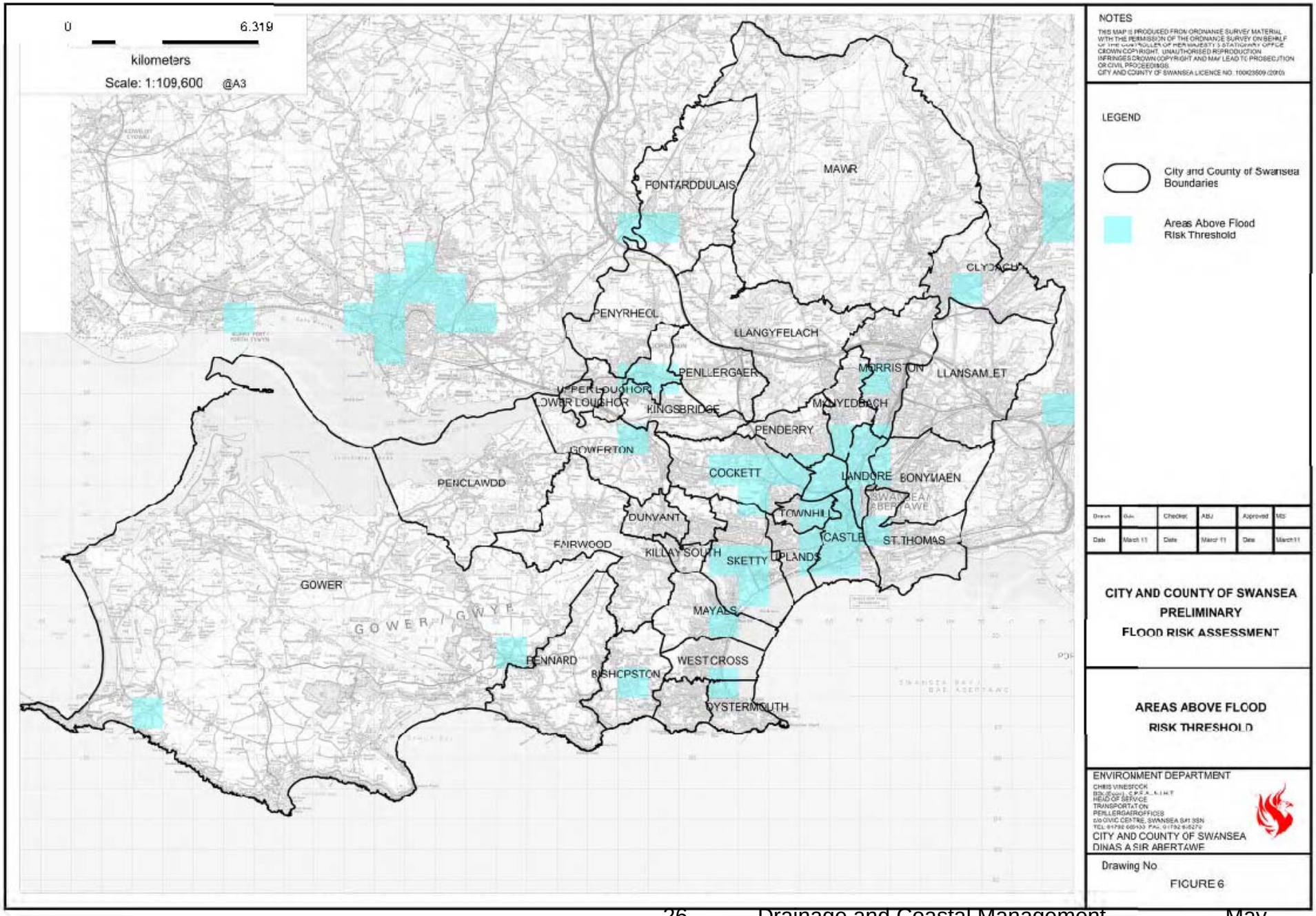



**Figure 6 – Map to show Areas above Flood Risk Threshold**

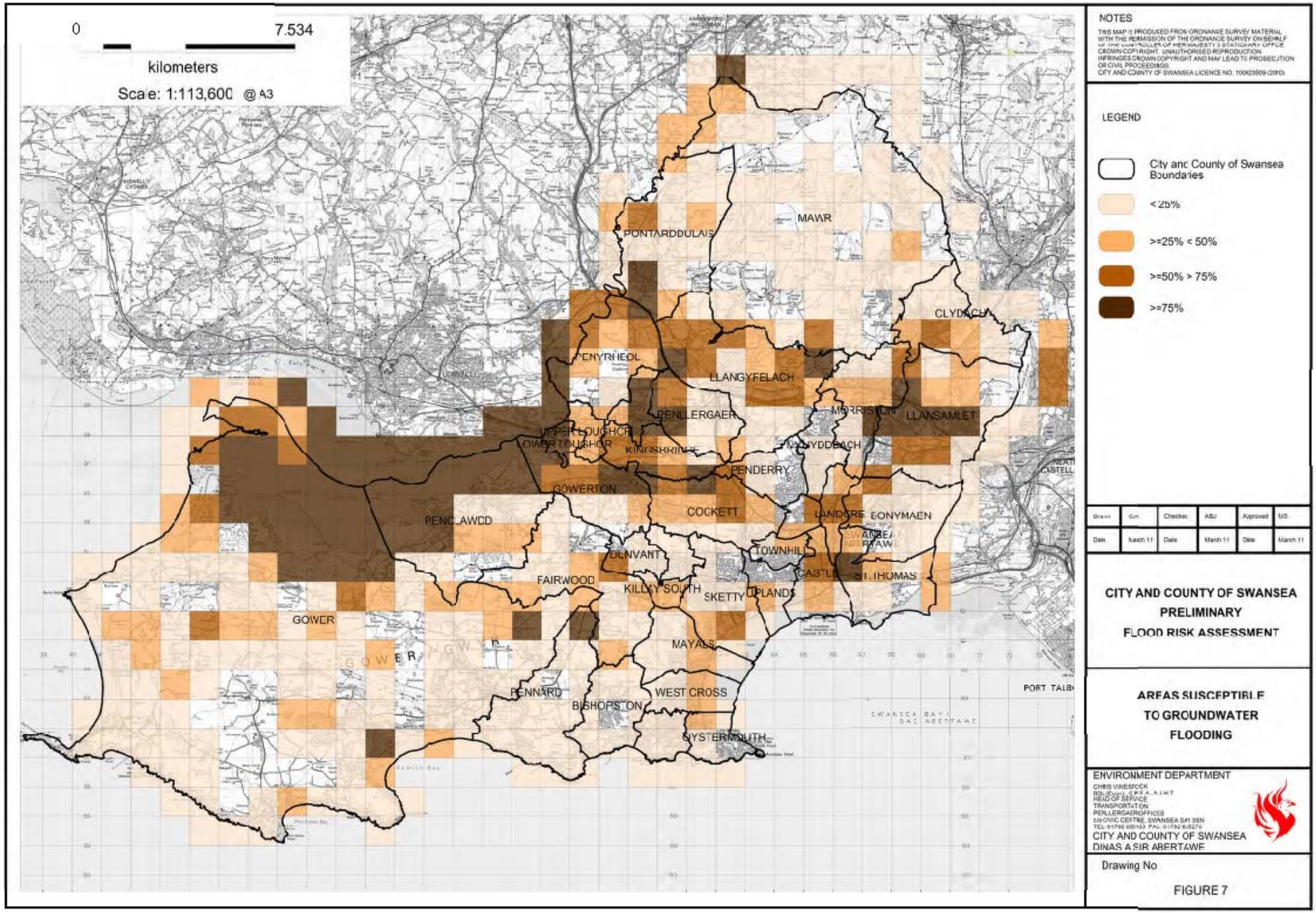



**Figure 7 – Map to show Areas Susceptible to Groundwater Flooding**

## 7.8 Impacts of Climate Change

The impact of climate change on local flood risk is relatively poorly understood. Several national flood maps have informed the preliminary assessment report – specifically the Flood Map for Surface Water (surface runoff), Areas Susceptible to Surface Water Flooding (surface runoff), Areas Susceptible to Groundwater Flooding (groundwater) and Flood Map (ordinary watercourses). However these do not show the impact of climate change on local flood risk.

There was consensus amongst climate model projections presented in the IPCC fourth assessment report for northern Europe suggesting that in winter high extremes of precipitation are very likely to increase in magnitude and frequency. These models project drier summers with increased chance of intense precipitation – intense heavy downpours interspersed with longer, relatively dry periods (Solomon et al., 2007).

United Kingdom Climate Projections 2009 (UKCP09) provides the most up to date projections of future climate for the UK (http://ukclimateprojections.defra.gov.uk/). In terms of precipitation, the key findings are that:

By the 2080s, under Medium emissions, over most of lowland UK

- Central estimates are for heavy rain days (rainfall greater than 25mm) to increase by a factor of between 2 and 3.5 in winter, and 1 to 2 in summer.

By the 2080s, under Medium emissions, across regions in England and Wales

- The central estimate (50% probability) for winter mean precipitation % change ranges from +14 to +23
- Central estimate for summer mean precipitation % change ranges from -18 to -24.

Certain key processes such as localised convective rainfall are not represented within this modelling so there is still considerable uncertainty about rarer extreme rainfall events for the UK. There is more certainty that heavy rainfall will intensify in winter compared to summer. The proportion of summertime rainfall falling as heavy downpours may increase. The impact of these changes on local flood risk is not yet known.

## 7.9 Appraisal guidance

Current project appraisal guidance (Defra, 2006) provides indicative sensitivity ranges for peak rainfall intensity, for use on small catchments and urban/local drainage sites. These are due to be updated following the UKCP09 projections above. They describe the following changes in peak rainfall intensity; +5% (1990-2025), +10% (2025-2055), +20%

(2055-2085) and +30% (2085-2115). This was reviewed by the Met Office in 2008 using UKCP09 models (Brown et al., 2008). They suggest that, on the basis of current understanding, these levels represent a pragmatic but not a precautionary response to uncertainty in future climate impacts. In particular for a 1 in 5 year event, increases in precipitation intensity of 40% or more by the 2080s are plausible across the UK.

## 7.10 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 Wales, Technical Advice Note 15 (TAN15) on development and flood risk sets out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is “to direct new developments away from those areas which are at high risk of flooding”.

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” (using the Government’s criteria).

## 8.0 Next Steps

8.1 A review of the information contained in this report is required to be undertaken by 22nd June 2017 and every six years thereafter.

8.2 The Council will continue to fulfil its role as Lead Local Authority during this period in order to collect, assess and record new flood risk events and information in order to update a continued database of flood related matters. The proposed method for flood event data collection and management will be in spreadsheet format to record details of flooding within the Council's Administrative Area.

8.3 The City and County of Swansea recognises that Partnership working is essential in the management of local flood risk. The Authority will ensure that appropriate partnerships are in place, which will help the collection and sharing of data, and the effective management of flood risk data. The Authority will encourage and set up a mutually agreed framework which will enable staff who supply and receive information to plan the work more efficiently. It is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive (2007/2/EC). It is recommended that the centralised database will be kept by this Authority who will have overall responsibility to manage flood data through the whole administrative area of the City and County of Swansea.

8.4 The Authority will use the national strategy for Flood and Coastal Erosion Risk Management (FCERM) as a framework for local strategies which LLFAs are to develop and implement under the Act. These will be based on an assessment of risk which should incorporate evidence gathered as part of the PFRA process.

8.5 The City and County of Swansea will adopt a consistent approach in identifying whether a flood event has had a significant harmful consequence and this will inform the Local Flood Risk Management Strategy and subsequent management of the flood risk.

8.6 Flood Hazard and Flood Risk Maps to be produced by the Authority for the Flood Risk Area identified within the City and County of Swansea and these need to be completed by 22nd June 2013.

## 9.0 Scrutiny and Review Procedure

9.1 The Environment Agency has a duty under the regulations to review, collate and publish all of the PFRAs. The City and County of Swansea has worked closely with the Environment Agency to ensure that this PFRA has been produced in an agreed way and is consistent with neighbouring LLFAs. The Environment Agency will be agree the PFRA, prior to publication and submitted to the European Commission.

9.2 The methodology used in the production of this report has been considered by the Council's Environment & Communities Overview and Scrutiny Board. This PFRA will be considered by the Council's Cabinet prior to submission.

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

No flood events have been considered to have 'significant harmful consequences', so none have been recorded in this section.

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

Please refer to Annex 2 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes a complete record of future flood risk within City and County of Swansea including details of the potential consequences of flooding to key risk receptors within the county.

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

Please refer to Annex 3 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes information and details about the identified Flood Risk Area within City and County of Swansea

## Annex 4: Review Checklist

Please refer to Annex 4, attached to this report, which contains the Review Checklist that has been provided by the EA to act as a checklist for reviewing PFRA submissions

## 10. References

Flood and Water Management Act 2010
http://www.legislation.gov.uk/ukpga/2010/29/contents/

The Flood Risk Regulations 2009
http://www.legislation.gov.uk/uksi/2009/3042/contents/made

Preliminary Flood Risk Assessment (PFRA)
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Preliminary Flood Risk Assessment (PFRA)
Annexes to the final guidance
Report – GEH01210BTHF-E-E
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Selecting and Reviewing Flood Risk Areas for local sources of flooding
Guidance to Lead Local Flood Authorities
Flood Risk Regulations 2009
DEFRA / Welsh Assembly Government
http://ww2.defra.gov.uk/environment/flooding/

United Kingdom Climate Projections 2009 (UKCP09)
http://ukclimateprojections.defra.gov.uk/

Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller (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

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Defra (2006) Flood and Coastal Defence Appraisal Guidance, FCDPAG3 Economic Appraisal, Supplementary Note to Operating Authorities – Climate Change Impacts October 2006.
http://www.defra.gov.uk/environment/flooding/documents/policy/guidance/fcdpag/fcd3climate.pdf