Torbay Council

Preliminary Flood Risk Assessment Report

Final Report

June 2011



Table of Contents

1.0	Executive Summary	4
2.0	Introduction	6
2.1	Preliminary Flood Risk Assessment	6
2.2	Scope of Preliminary Flood Risk Assessment Report	7
2.3	Aims and Objectives	7
2.4	Study Area of Torbay Council	8
3.0	Lead Local Flood Authority Responsibility	9
3.1	Introduction	9
3.2	Coordination of Flood Risk Management	9
3.3	Stakeholder Engagement	10
3.4	Public Engagement	11
3.5	Further Responsibilities	11
4.0	Methodology and Data Review	13
4.1	Introduction	13
4.2	Methodology	13
4.3	Assessing Future Flood Risk	15
4.4	Identifying Flood Risk Areas	16
4.5	Quality Assurance, Security and Data Restrictions	16
5.0	Historic Flood Risk in Torbay	18
5.1	Overview of Historic Flooding in Torbay	18
5.2	Surface Water Flooding	18
5.3	Groundwater Flooding	19
5.4	Sewer Flooding	19
5.5	Ordinary Watercourse Flooding	19
5.6	Interaction with Main Rivers and the Sea	20
5.7	Significant Harmful Consequences	20
5.8	Adopted Method doe Defining Locally Significant Harmful	21
5.0	Consequences Local and National Thresholds	22
5.9		22 23
6.0	Future Flood Risk	
6.1	Future Floods and their Consequences	23
6.2 6.3	Surface Water Flooding	23
6.4	Groundwater Flooding Locally Agreed Surface Water Information	23 24
6.5	Effects of Climate Change and Long Term Development	24 24
7.0	Flood Risk Areas	2 4 27
7.0	Overview	27
7.1	Local Flood Risk Areas and the Identification of New	27
1.2	National Indicative Flood Risk Areas	21
8.0	Next Steps	29
8.1	Future Data Management Arrangements	29
8.2	Local Strategy for Flood Risk Management	29 29
8.2	Review and Updating Flood Data and Modelling	29 29
8.4	Scrutiny and Review Procedures	29
8.5	Local Authority Review	30
8.6	Environment Agency Review	30
		-

31 32

References Abbreviations

- 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 Areas and their rationale (Preliminary Assessment Spreadsheet)
- Annex 4 Preliminary Flood Risk Assessment Checklist

Figures

- Figure 1 Geographical Extent of Study Area
- Figure 2 Torbay Flood Group Structure
- Figure 3 GIS Point Data
- Figure 4 Surface Water Flooding Incidents
- Figure 5 Blue Squares showing areas above the nationally set flood risk threshold
- Figure 6 Cluster Areas and rankings of local areas of flood risk
- Figure 7 Areas Susceptible to Groundwater Flooding
- Figure 8 Torquay Surface Water Flooding
- Figure 9 Paignton Surface Water Flooding
- Figure 10 Brixham Surface Water Flooding
- Figure 11 Clennon Valley Surface Water Flooding

Tables

TT 1 1 1		7
Table 1	Elements of Work required under the Flood Risk Regulations	/
Table 2	Data Availability from Partner Organisations	14
Table 3	Data Availability from Environment Agency	15
Table 4	Key Flood Risk Indicators	16
Table 5	Number of Locally Significant Flood Events within Torbay	22
	for a range of threshold levels	
Table 6	Summary of Torbay's Significant Flood Events	22
Table 7	Number of People at Risk from Surface water Flooding Based	28
	on "Blue Square" Mapping	

1.0 Executive Summary

This report has been prepared to assist Torbay Council meet their duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations 2009. Torbay Council is a Unitary authority covering the towns of Torquay, Paignton and Brixham and under the Flood Risk Regulations is defined as a Lead Local Flood Authority. The Preliminary Flood Risk Assessment (PFRA), comprising this document and the supporting spreadsheets and GIS layers represents the first stage of the requirements of the Regulations.

The PFRA process is aimed at providing a high level overview of flood risk from local flood sources, including surface water, groundwater and ordinary watercourses. As a Lead Local Flood Authority Torbay Council must submit its PFRA to the Environment Agency for review by 22nd June 2011. The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting national Indicative Flood Risk Areas, both of which were published in December 2010.

In order to develop a clear overall understanding of the flood risk across Torbay, flood risk data and records of historic flooding have been collected from a number of different sources including Torbay Council's flooding reports, the Environment Agency, South West Water, emergency services and other risk management authorities.

The assessment of past flood risk in Torbay has involved collecting information relating to over 100 past flooding events. These have been analysed, extracting information relating to surface water, ordinary watercourse and groundwater flood events. A local threshold level was set to determine the past events considered to have had local significant harmful consequences. This was set at more than 30 properties suffering internal flooding during any one event, due to the requirements to submit above threshold events in Annex 1 Preliminary Assessment Spreadsheet at a scale considered significant to report to Europe.

However, it is still noted that many flood events in Torbay fall below the threshold for inclusion within Annex 1 have had major impacts on people's lives and the economy. These are still considered to have been major incidents and locally significant and will therefore still be considered when assessing flood risk across Torbay. In addition to this, comprehensive details on flood extents and consequences were largely unavailable from many records, also limiting the number of past events to report in Annex 1.

Future flood risk has been assessed by using nationally set thresholds. The Environment Agency has used a national methodology, which has been set out by Defra, to identify national indicative Flood Risk Areas across England. Of the ten national Indicative Flood Risk Areas that have been identified, none are located within Torbay's administrative area.

However, it must be emphasised that there is a high risk of flooding from local sources across Torbay, particularly from surface water. Based on national surface water modelling approximately 5,100 residential properties are estimated to be at risk

from surface water flooding to a depth of greater than 0.3m during a rainfall event with a 1 in 200 (0.5%) annual chance of occurring.

2.0 Introduction

2.1 Preliminary Flood Risk Assessment

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

The main drivers behind this research and preparation of the PFRA report are two sets of new legislation: the Flood Risk Regulations, which came into force on 10th December 2009; and the Floods and Water Management Act which gained Royal Assent on 8th April 2010. Under these pieces of legislation, all Unitary Authorities including Torbay Council, and in two tier systems all County Councils are designated as a Lead Local Flood Authority and have formally been allocated a number of key responsibilities with respect to local flood management. A full description of these responsibilities is provided in Chapter 2.

The purpose of the Flood Risk Regulations is to transpose the EC Floods Directive into domestic law in England and Wales and to implement its provisions. In particular it places duties on the Environment Agency and Lead Local Flood Authorities to prepare a number of documents including:

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

Table 1 shows the elements of work required from Torbay Council under the Flood Risk Regulations 2009, along with the timescales of their respective delivery. The first two elements of work highlighted below, are covered by the preparation of this PFRA report. The further elements of work are not required to be undertaken by Torbay Council as there are no areas within Torbay that meet the national criteria of 30,000 people at risk in order to be classified as a National Flood Risk Area. Any data gathered as part of this report, however, will be used to support and inform the preparation of Torbay Council's Local Strategy for Flood Risk Management, which will be the next stage of legislation to progress. Section 4.3 of this report explains the difference between the national Flood Risk Area thresholds used and those used to determine the locally significant past flood events in Torbay.

22 nd June 2011	Prepare Preliminary	The PFRA should focus on local flood	
22 June 2011	1 2		
	Assessment Report	risk from surface water, groundwater and	
		ordinary watercourses.	
22 nd June 2011	On the basis of the	Flood risk areas are areas of significant	
	PFRA, identify and/or	risk identified on the basis of the	
	review Flood Risk	findings of the PFRA, national criteria	
	Areas	set by the UK Government and guidance	
		provided by the Environment Agency.	
22 nd June 2013	Prepare Flood Hazard	Used to identify the level of hazard and	
	Maps and Flood Risk	risk of flooding within each Flood Risk	
	Maps for each Flood	Area to inform Flood Risk Management	
	Risk Area	Plans	
22 nd June 2015	Prepare Flood Risk	Plans setting out risk management	
	Management Plans for	objectives and strategies for each Flood	
	each Flood Risk Area	Risk Area	

Table 1Elements of Work required under the Flood Risk Regulations 2009

Ii should be noted that in June 2017 the whole cycle identified in Table 1 above will be repeated.

2.2 Scope of Preliminary Flood Risk Assessment Report

The PFRA exercise is a high level screening process, to gather local and national information in order to describe both the probability and harmful consequences of past and potential future flooding. As a Lead Local Flood Authority, Torbay Council is responsible for assessing potential flood risk from:

- Surface water;
- Ordinary watercourses; and
- Groundwater

Flooding associated with the sea, main river and reservoirs is the responsibility of the Environment Agency and therefore does not need to be considered by Lead Local Flood Authorities as part of the PFRA, unless it is considered to interact with and affect flooding from the local sources listed above.

2.3 Aims and Objectives

The aim of this report is to review all of the existing flood risk information available from the Lead Local Flood Authority and partner organisations, consisting of data on local historic flood events, flood probabilities and harmful consequences of flood events on the local economy, environment and cultural heritage. This data collection exercise will then enable national surface water flood risk models to be verified and to ultimately identify areas of flood risk within the Lead Local Flood Authority area, whilst supporting the local strategy for flood risk management.

The key objectives can be summarised as follows:

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

2.4 Study Area of Torbay Council

The study area for this PFRA is defined by the administrative boundary of Torbay Council. This includes the towns of Torquay, Paignton and Brixham and is located on the South Devon coast. The geographical extent of the study area is illustrated in Figure 1.

The administrative area of Torbay Council covers approximately 63km².

Geographically, Torbay is located within the County of Devon, however politically Torbay is a Unitary Authority and as such Torbay Council is responsible for the local flood risk management responsibilities within this area. Devon County Council is responsible for the local flood risk management responsibilities within the area of the County surrounding Torbay. The PFRA for Torbay falls within the region of the South West river basin district (Water Framework Directive) and the South Devon Catchment Flood Management Plan.

The study area is currently served by one water company, namely South West Water and one Environment Agency region (South West Region). The Devon and Cornwall Regional Flood and Coastal Committee covers the Torbay area and Torbay Council have one representative on the committee.

3.0 Lead Local Flood Authority Responsibilities

3.1 Introduction

The preparation of a PFRA is just one of several responsibilities of Lead Local Flood Authorities under the new legislation. This section provides a brief overview of other responsibilities Torbay Council are obliged to fulfil under their role as a Lead Local Flood Authority.

Much of the local knowledge and technical expertise necessary for Torbay Council to fulfil their duties as Lead Local Flood Authority lies within the Councils Engineering Section and other partner organisations. It is therefore crucial that Torbay Council works alongside these organisations as they undertake their responsibilities to ensure effective and consistent management of local flood risk throughout the area and to contribute to the provision of a coordinated and holistic approach to flood risk management across the Torbay catchment area.

3.2 Coordination of Flood Risk Management

As a Lead Local Flood Authority, it is the role of Torbay Council to forge effective partnerships with the Environment Agency and South West Water, as well as other key stakeholders and risk management authorities. The importance of working together is highlighted in the Flood Risk Regulations 2009, Regulation 35 and The Flood and Water Management Act 2010, Section 12, which both require relevant authorities to cooperate with one another.

Since the major flooding within Torbay in 1999 which resulted in the death of one resident due to drowning, Torbay Council has organised an officer led Flood Steering Group which meets four times a year. As well as Council officers representing Engineering, Highways, Strategic Planning, Planning, Harbours and Emergency Planning the group includes the Cabinet member for Environment, the member who represents Torbay on the Regional Flood and Coastal Committee, the Environment Agency, South West Water and Torbay Development Agency. This group provides an overarching lead on flood risk management within Torbay.

In addition to the Torbay Flood Steering Group, an officer from Torbay Council also attends the Devon Strategic Drainage Group meetings and the South West Lead Local Flood Authority meetings.

An organogram of the overall flood group structure is provided in Figure 2.

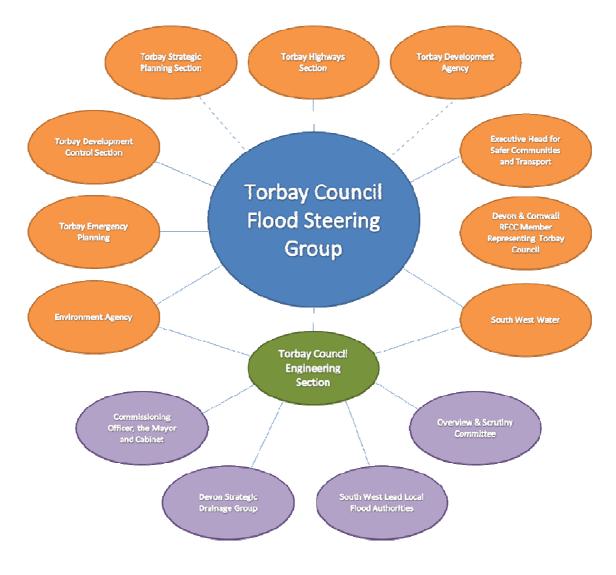


Figure 2 - Torbay Flood Group Structure

3.3 Stakeholder Engagement

As part of the PFRA, Torbay Council has sought to engage stakeholders representing the following organisations and authorities:

- Torbay Council
- Environment Agency
- South West Water
- Network Rail
- Devon and Somerset Fire and Rescue

It is important to note that we have communicated with and collated from various department leads within Torbay Council, including Emergency Planning, Strategic Planning, Highways and Parks.

3.4 Public Engagement

It is recognised that members of the public may also have valuable information to contribute to 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 chance 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 (for the flood risk area within Torbay) as this will help to inform future levels of public engagement. Torbay Council therefore propose to 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 a local resilience forums.

3.5 Further 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 and Water Management Act 2010 and the Flood Risk Regulations 2009. These responsibilities include:

- Investigating flood incidents Lead Local Flood Authorities have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what they have done or intend to do with respect to the incident, notifying risk management authorities where necessary and publishing the results of any investigations carried out. Further information in respect of this duty is provided in Chapter 7.
- Asset Register Lead Local Flood Authorities also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details of 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 contents of the register and records.
- SuDS Approving Body Lead Local Flood Authorities are designated as the SuDS Approving Body (SAB) for any new drainage system, and therefore must approve, adopt and maintain any new sustainable drainage systems (SuDS) within their area.
- Local Strategy for Flood Risk Management Lead Local Flood Authorities are required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy will build on information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments.

- Work Powers Lead Local Flood Authorities have powers to undertake works manage flood risk from surface run-off and groundwater, consistent with the local risk management strategy for the area.
- Designation Powers Lead Local Flood Authorities, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management

4.0 Methodology and Data Review

4.1 Introduction

The PFRA is a high level screening exercise used to identify areas where the risk of flooding is considered to be significant and warrants further examination and management though the production of flood risk and flood hazard maps and flood risk management plans.

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

4.2 Methodology

The following organisations were identified and contacted to share data for the preparation of the PFRA: South West Water, the Environment Agency, Devon and Somerset Fire and Rescue, Network Rail and the Torbay Harbour Master.

There are various published flood risk management reports, including Torbay Council's Strategic Flood Risk Assessment reports, South Devon Catchment Flood Management Plan, South West River Basin Management Plan, South Devon and Dorset Shoreline Management Plan and Multi Agency Flood Plans. These have been interrogated in order to retrieve information on current and past flood risk in the Torbay area.

Map Info GIS has been used in order to map the local flood risk using national and local data sets from local flood risk stakeholders.

Partner organisations have been contacted and relevant flood risk data requested in order to assist with the PFRA process. Table 2 and 3 detail the availability of the data and the information gathered from local flood risk stakeholders, in addition to any issues with access and the collation of this data.

Table 2

Data Availability from Partner Organisations

Partner Organisation and Available Data	Availability, Limitations, Storage and Data Licensing Issues
Torbay Council – Details held on local flood events consisting of reports of flooding of properties and roads from main rivers, ordinary watercourses, sewers, highway drains, surface water run-off and groundwater. South West Water – SWW have supplied Torbay Council with the DG5 flooding records identifying both internal and external flooding problems.	Data available for over 20 years however detailed flood reports have only been prepared since 1999. Data only to be shared at a postcode level.
Network Rail – The local network rail office has an informal flood plan which is updated yearly with information on areas of rail track prone to flooding. The majority of flood risk is from fluvial and tidal sources. Torbay Council Harbour Master – As the flood risk at Torquay, Paignton and Brixham harbours is predominantly from tidal sources data is not relevant for inclusion within PFRA.	Local office unable to supply data for inclusion within the PFRA at present. No significant additional flood risk issues above those already identified by Torbay Council relevant
Natural England – Hold data sets for assessing environmental impacts, such as location of SSSI's, Special Protection Areas and Special Areas of Conservation.	Torbay Council relevant for this PFRA report. Data layers available and downloaded from Natural England website.
Devon and Somerset Fire and Rescue – Data consists of GIS point data of recorded flood incidents.	Data available for last two years. Also specific data relating to the larger storm events experienced in Torbay over the last twenty years has previously been obtained in the form of log sheets.

Table 3

Data Available for the Environment Agency

Environment Agency Data Layer

Historic Flooding Map – Extent of past flood events from rivers, sea and groundwater Flood Event Outlines on NFCDD – Flood event outline covering records from all sources of flooding.

Flood Event Maps – Historic records of flood events from paper records, now digitised.

Flood Reconnaissance Information System (FRIS) – Information collected after flood events, detailing affected properties and the extent of flooding.

Detailed River Network (DRN) – This can display the classification of rivers to identify main rivers and ordinary watercourses.

National Receptor Dataset (NRD) – Includes social, economic, environmental and cultural receptors that could be at risk of flooding, such as residential properties.

Flood Map – Extent of flooding from sea and river catchments over 3km². Including:

- Flood defences
- Flood storage areas
- Areas benefiting from flood defences
- Flood Zone 3: Flood extent from rivers having a 1% annual probability of occurring and from coastal waters having a 0.5% annual probability.
- Flood Zone 2: Flood extent from rivers and coastal waters having a 0.1% annual probability of occurring or largest historic event if a greater extent.

Areas Susceptible to Surface Water Flooding (AStSWF) – Three nationally modelled outline layers. Namely:

- Areas more susceptible
- Areas with intermediate susceptibility
- Areas less susceptible

Flood Map for Surface Water (FMfSW) -2^{nd} generation version of the modelled surface water flood maps. These are categorised as follows:

- 200 year rainfall event with predicted depth of flooding greater than 0.1m
- 200 year rainfall event with predicted depth of flooding greater than 0.3m
- 30 year rainfall event with predicted depth of flooding greater than 0.1m
- 30 year rainfall event with predicted depth of flooding greater than 0.3m

Areas Susceptible to groundwater flooding (AStGWF) – 1km grid squares showing the risk of groundwater flooding

Paper Records – Photos, flood reports, newspaper reports and scheme reports available, some of this is digitally available.

4.3 Assessing Future Flood Risk

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 in addition to those 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 circulated to all Lead Local Flood Authorities. The

Flood Map for Surface Water uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events (1 in 30 annual chance and 1 in 200 annual chance).

4.4 Identifying Flood Risk Areas

Information regarding historic and future flood risk will be used to formally identify flood risk areas. To achieve this, the flood risk indicators will be 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. Details of the key flood risk indicators used are summarised in Table 4.

Table 4

Impacts of flooding on:Flood Risk IndicatorsHuman HealthNumber of residential properties.
Critical services (Hospitals, Police/Fire/Ambulance
Stations, Schools, Nursing Homes, etc).Economic ActivityNumber of non-residential properties.
Length of road or rail.
Area of agricultural land.Cultural HeritageCultural heritage sites (World Heritage Sites)EnvironmentDesignated sites (SSSIs, SACs, SPAs, etc) and BAP
habitat.

Key Flood Risk Indicators

The above indicators have been selected and analysed by Defra and the Environment Agency in order to identify the areas where flood risk and potential consequences exceed a pre-determined threshold. The areas that have been identified using this methodology and exceed 30,000 people at risk have been mapped and identified as Indicative Flood Risk Areas. For further details please refer to Defra's Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding (December 2010).

This process has been followed in order to assess the flood risk in Torbay and as a result there are no indicative flood risk areas identified within Torbay.

4.5 Quality Assurance, Security and Data Restrictions

Data sets used in the production of this PFRA were subjected to quality assurance measures in order to highlight any errors, which have been corrected. Data sharing agreements already exist between Torbay Council and the partner organisations. These agreements have been followed when presenting information within the PFRA report. Any data supplied by the Environment Agency and used within this report has been reproduced in accordance with the data licences supplied with each dataset. Data standards for documentation that will be submitted to the Environment Agency have been followed in accordance with Annex 5 of the PFRA guidance document. A number of issues arose during the data collection process and these are identified in this chapter to provide transparency with respect to the methodology. By flagging up the issues identified in the data collection phase it is hoped this could serve as a catalyst to improve the collection of flood risk data going forward.

The issues that arose during the data collection process are described below:

Historically, the lack of consistent flood data recording systems across the various organisations has resulted in major inconsistencies in the recording of flood event data. This has resulted in incomplete or sometimes nonexistent flood record datasets. Some of the datasets collated are not exhaustive and it is considered that they are unlikely to represent the complete flood risk issues in a particular area. It should be noted that the recording of flooding data has improved significantly following the completion of the Integrated Urban Drainage Management Pilot Study for Torbay.

It is crucial for flood risk assessments that data collected over long periods of time should be retained in order to improve confidence in predicting longer return period events. Therefore Torbay Council will ensure that data sets collected from now on will be retained for long periods, giving a larger range of data and increasing the certainty in assessments in the future.

5.0 Historic Flood Risk in Torbay

5.1 Overview of Historic Flooding in Torbay

Historically, there have been many flooding incidents recorded across Torbay from surface water and ordinary watercourses, with main river and tidal influences often contributing. The development and urbanisation of Torbay over the years has contributed towards the increased flood risk, where land management changes are increasing surface run-off rather than retaining water. Past flood records from local partners have been collated and analysed. However, records that fall into the following criteria have been discounted:

- Records where the main source is from a main river or tidal sources and there is no interaction with surface run-off or the ordinary watercourses.
- Records with uncertainties or without enough detail.
- Records from locations with improved drainage systems or recently constructed flood defences.

Figure 3 highlights all of the GIS point data gathered of past flood events from Torbay Council flood records, the Environment Agency FRIS database, South West Water DG5 records and Devon and Somerset Fire and Rescue.

5.2 Surface Water Flooding

Surface water flooding occurs when heavy rainfall exceeds the capacity of the local drainage systems or the permeability of the ground surface or soils, resulting in water flowing across the ground or ponding. The majority of the surface water flooding incident records have been acquired through Torbay Council's historic flooding reports and the Environment Agency FRIS database. Supporting information was also obtained from the local water company, South West Water, of areas known to have flooded due to hydraulic overload of the public sewer system. This indicates areas particularly prone to surface water flooding and has helped to verify historic records. Devon and Somerset Fire and Rescue Service data has been analysed and this has also been used in the verification of historic flooding data. Other sources of information that have been used to identify and verify historic surface water flooding include the South Devon CFMP and Torbay Council's Level 1 and Level 2 Strategic Flood Risk Assessments.

The majority of significant events reported in the Annex 1 spreadsheet are from surface water run-off. Many of the surface water flooding records although not considered to be nationally significant are still considered to be significant at a local scale. The records collated show localised areas across Torbay that have suffered from surface water flooding over the past twenty years, with all the towns that comprise Torbay having been affected. Although these are not reported in detail as part of this PFRA they will support research for Torbay's Local Strategy for Flood Risk Management.

Figure 4 highlights the extent of surface water flooding incidents (including ditch water, sewers, highways and ordinary watercourses) across Torbay including a range

of different sized storm events. Although this data is not exhaustive, it does represent the spatial pattern of flooding problems across Torbay.

5.3 Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from an underlying aquifer or from water from abnormal springs. This tends to occur after long periods of sustained rainfall, and the areas at most risk are often low-lying where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

The geotechnical framework of the Torbay area is complex, not only in terms of the lithological variations that abound, particularly in the Devonian strata, but also because of the complexity of the geological structure. Most of Torbay is underlain by a mixture of limestone, sandstone, breccias, mudstones, shales and slates however in the low-lying coastal areas and old river valleys relatively recent (in geological terms) alluvial and marine deposits are found.

There is limited detailed information available on flood risk from groundwater within the historical flooding records. Although groundwater may have been a contributing factor to a number of flooding incidents, there are no significant incidents reported in Annex 1 from groundwater flooding. It should be noted, however, that a number of events included in Annex 1 identify groundwater contributing as an additional source of flooding.

5.4 Sewer Flooding

Sewer flooding is often caused by excess water entering the drainage system. DG5 registers from South West Water were analysed to investigate the occurrence of sewer flooding incidents across Torbay. It was found that there were a total of 83 sewer flooding events that have been recorded by South West Water over the past fifteen years. However due to the data sharing agreements these events have not been published within this report. There is however a number of significant flood events across Torbay contained within Annex 1 that identifies flooding from the sewer system as an additional source.

5.5 Ordinary Watercourse Flooding

The historic records available on ordinary watercourse flooding incidents are from the Torbay Council historic flooding records and the Environment Agency FRIS database. It is not often clear from the records analysed whether the main source of flooding is from a main river or ordinary watercourse, however any records with a lack of detail on the source of flooding have been omitted. Ordinary watercourse appears as the cause of flooding in localised areas of Torbay and the flood water often interacts with surface water run-off. Ordinary watercourse is identified in Annex 1 as the main source of flooding for a number of significant historic events.

It should be noted that a number of critical ordinary watercourse in Torbay were enmained on 1st April 2006. Historic flooding data however will identify the source of

flooding associated with these main rivers as ordinary watercourses flooding prior to 2006.

5.6 Interaction with Main Rivers and the Sea

There is a large amount of data available from the Environment Agency regarding flooding from the sea and data is available for flooding from main rivers within Torbay since their enmainment in 2006. A number of the historic flood event records collated have some interaction with either main rivers or the sea.

There are several significant major historic floods that have occurred in Torbay over the last 50 years however as a result of these floods being caused by overtopping of coastal defences they have not been included in this report. It should be noted that surface water flooding is exacerbated in the low lying areas around the coast in Torquay, Paignton and Brixham, during high tidal cycles when the capacity of the surface water outfalls discharging to coastal waters is heavily restricted.

5.7 Significant Harmful Consequences

Annex 1 reports on past flood events from local sources, surface water and ordinary watercourses considered to have had significant harmful consequences to human health, the economy, the environment or cultural heritage. These events reported in Annex 1 are those that exceed the local significant threshold, set by Torbay Council as part of the PFRA process. However, it should be noted that any flood event that occurs will be significant on some scale to the local community and have a significant impact on people's lives and the economy.

National guidance issued by Defra sets thresholds for defining national Indicative Flood Risk Areas, where the current flood risk is significant. However, no guidance has been issued for defining locally significant harmful consequences for the assessment of past flood events and therefore it is up to each Lead Local Flood Authority to set its own definition. It has been suggested by the Environment Agency that the threshold should be an order of magnitude below the significance criteria for determining the national Indicative Flood Risk Areas. They also recommend that as a minimum, it should involve flooding of a number of properties, on more than one occasion.

A definition of locally significant flood events that was agreed at the South West Lead Local Flood Authorities, Flood Risk Managers Group is identified below.

For the purpose of reporting past floods, a flood is deemed significant if it meets the following criteria:

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

5.8 Adopted Method for Defining Locally Significant Harmful Consequences

In order to identify locally significant past flood events in Torbay the methodology and significance criteria outlined in the Environment Agency guidance has been followed as closely as possible. Data collated for the PFRA exercise in the form of spreadsheets and GIS data points and polygons have been analysed and any records with gaps, uncertainties, lack of detail or areas with improved flood defences now in place have been discounted. The locations where flood prevention now exists have been ignored, unless the residual risk is still considered to be significant.

Due to the inaccuracies associated with the historic flooding records and the level of protection provided by flood alleviation/improvement works that have been undertaken by Torbay Council, South West Water, the Environment Agency and third parties (e.g. flood storage solutions provided by developers) over the years only the flooding history since 1991 has been assessed in detail. This process resulted in 17 past local flood event records in Torbay. In addition to this, comprehensive details on flood extents and consequences were largely unavailable from many records, also limiting the number of past event records considered reliable and to therefore be included. Although historic flooding event data prior to 1991 has not been included within this report the records have been maintained as they provide a useful background to the susceptibility of flooding within areas of Torbay.

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

It appears that a reasonable threshold for Torbay would be 30 or more properties affected by internal flooding in any one event should be included in the Annex 1 submission, giving 7 locally significant past flood events. Table 5 shows the results of the range of threshold levels considered for the 17 events. Table 6 provides a brief summary of these seven events that will be included within the PFRA Annex 1 spreadsheet.

Table 5

Number of locally significant flood events within Torbay for a range of threshold levels

Significant Threshold Level – Number of Properties Flooded	Number of Locally Significant Flood Events
5 or more	17
10 or more	12
20 or more	10
30 or more	7
50 or more	3
100 or more	1

Table 6

Summary of Torbay's Significant Flood Events

Event Number	Location	Date	Properties Flooded	Main Source	Secondary Source
1	Torquay & Paignton	24/10/99	162	Surface run-off	Ordinary watercourse
2	Torquay	23/6/91	74	Surface run-off	Combined sewers
3	Torquay & Paignton	20/8/07	64	Surface run-off	Ordinary watercourse
4	Torquay & Paignton	22/9/92	46	Surface run-off	Ordinary watercourse
5	Torquay	19/8/00	41	Surface run-off	Combined sewers
6	Brixham	24/12/99	37	Ordinary watercourse (now designated as main river)	Surface run-off
7	Torquay	29/5/99	30	Surface run-off	Combined sewers

5.9 Local and National Thresholds

The threshold of 30 properties affected is for the assessment of past local flood events and should not be confused with the national thresholds set for the assessment of future flood risk. The locally significant past flood event threshold has been set locally by Torbay Council as part of this PFRA exercise. The national Indicative Flood Risk Areas are discussed in detail in Chapter 7 and the blue square and cluster areas referred to are shown in Figures 5 and 6 respectively.

6.0 Future Flood Risk

6.1 Future Floods and Their Consequences

The identification of the flood risk areas through the PFRA exercise should also take into consideration future floods, which are defined as any flood that could potentially occur in the future. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's Flood Map for Surface Water (FMfSW) which has been recently been issued to all Lead Local Flood Authorities. The FMfSW uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events having return periods of 1 in 30 and 1 in 200 years.

The following factors were considered when assessing future flood risk across the Torbay study area; topography, location of ordinary watercourses, location of plains that retain water, characteristics of the watercourses, effectiveness of any flood alleviation works that have recently been constructed, location of populated areas, areas in which economic activity is concentrated, the current and predicted impact of any long term developments that might affect the occurrence or significance of flooding, such as proposals for future development.

6.2 Surface Water Flooding

The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The first generation national mapping, areas Susceptible to Surface Water Flooding (AStSWF), contains three susceptibility bandings for a rainfall event with a 1 in 200 chance of occurring. The national methodology has since been updated to produce the FMfSW, a revised model containing flood extents for two rainfall events, 1in 30 and 1 in 200 chance of occurring and two flood depth bandings, greater than 0.1m and greater than 0.3m.

A comparison of the historic surface water flooding incidents and the two sets of national surface water flood mapping has been undertaken. The results of this comparison are that the FMfSW mapping most accurately identifies the locations of historic surface water flood risk within Torbay and therefore the data contained within this dataset will be used within this report. Using this datasets, the number of properties at risk of surface water flooding within Torbay has been estimated. For a rainfall event with a 1 in 200 annual chance of occurring, 13,600 properties are at risk from flooding to a depth of 0.1m and 6,500 properties are at risk from flooding to a depth of 0.3m. Of these properties at risk over 80% are residential properties. Further details of the potential harmful consequences of future flooding are included in Annex 2 of the Preliminary Assessment Spreadsheet.

6.3 Groundwater Flooding

There is little information available on future flood risk to groundwater. Figure 7 shows the Environment Agency's dataset, Areas Susceptible to Groundwater Flooding (AStGWF) for the Torbay area. This highlights 1km grid squares with different levels of risk to groundwater flooding. Details of properties at risk in Torbay according to AStGWF is given in Annex 2, the areas showing the highest

susceptibility in Torbay broadly tie in with historical flooding data, highway maintenances and drainage problem areas.

6.4 Locally Agreed Surface Water Information

In order to determine the locally agreed surface water information, the surface water data that best represents local conditions has been reviewed and agreed with the Environment Agency. This process has involved scrutinising the surface water flood maps, AStSWF and FMfSW by comparing the modelled areas with historic information and the surface water flood risk modelling works undertaken by Torbay Council for the major flood risk areas within Torbay as part of the Level 2 Strategic Flood Risk Assessment.

After analysing the data, in general the FMfSW flood mapping gives a good representation of the historic flooding and gives a reasonable representation of the surface water flood risk identified within the surface water modelling works undertaken by Torbay Council. As the Torbay Council modelling works were only undertaken for the major flood risk areas, it is proposed, that as part of the local strategy works the complete Torbay catchment area will be modelled in order to update the locally agreed surface water flood risk data. As part of these works the local differences previously identified between the Torbay Council modelling works and the FMfSW modelling will be investigated in detail.

Originally, it was proposed that the modelling works undertaken as part of Torbay Council's Level 2 Strategic Flood Risk Assessment would be used in the production of this PFRA, however this has not been possible as the data was not in a readily derivable form. Figures 8, 9, 10 and 11 highlight the results of the surface water flood risk modelling works for the major flood risk areas undertaken by Torbay Council as part of the Level 2 Strategic Flood Risk Assessment Report.

The flood risk mapping work produced as part of the Level 2 Strategic Flood Risk Assessment Report will continue to be used to guide future development and planning decisions whereas the FMfSW data is being used at a strategic level for some national consistency in assessing the number of properties at risk. As mentioned earlier, as part of the local strategy, Torbay Council proposes to undertake more detailed surface water modelling works over the entire Torbay catchment area in order to improve the locally agreed surface water data. In addition a more detailed assessment of the location and numbers of properties at risk from surface water flooding will be undertaken. The result of this work will be included within the next review of the PFRA report which will be completed by June 2017.

6.5 Effects of Climate Change and Long Term Development

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 the future. Past GHG emissions mean some climate change is inevitable in the next 20-30years. 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 2080's, 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%.

Key Projections for South West River Basin District

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

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

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

Implications for Flood Risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

Wetter winters and more of this rain falling in wet spells may increase river flooding. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

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

There is a risk of flooding from groundwater in the district. Recharge may increase in wetter winters, or decrease in drier summers.

Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help us adapt to climate change and manage the risk of damaging floods in future.

Adapting to Change

Past emissions 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 uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help ensure that we do not increase our vulnerability to flooding.

Long Term Developments

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

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk from 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).

7.0 Flood Risk Areas

7.1 Overview

In order to ensure a consistent national approach, Defra have identified significance criteria and thresholds to be used for defining national Indicative Flood Risk Areas. Guidance on applying these thresholds has been released in Defra's guidance document, Selecting and reviewing Flood Risk Areas for local sources of flooding. In this guidance document, Defra have outlined agreed key risk indicators and threshold values which must be used to determine the national Flood Risk Areas.

The methodology is based on using national flood risk information to identify 1km squares where local flood risk exceeds a defined threshold. Where there are 5 or more adjacent squares, a cluster area is formed, showing areas where flood risk is most concentrated. If a cluster area contains over 30,000 people predicted to be at risk from flooding, this area will be designated as a national Indicative Flood Risk Area.

The methodology outlined above has been followed at a national scale, identifying 10 Flood Risk Areas across England. None of these areas fall within the Torbay Council boundary and so there are no areas to review in the PFRA report. Within Torbay there are no cluster areas that exceed the threshold of 30,000 people at risk; the closest is in Paignton where 7,972 people are at risk.

7.2 Local Flood Risk Areas and the Identification of New National Indicative Flood Risk Areas

The 1km blue squares and cluster areas identified for Torbay have been issued by Defra and are shown on the maps identified in figures 5 and 6 respectively. The national thresholds used are explained on the maps, where these cluster areas do not exceed the nationally set threshold to become a national Indicative Flood Risk Area. The cluster areas have been analysed locally but it is still considered that there is no additional information to support any of these being identified as new Indicative Flood Risk Areas.

It is clear from the information collected and reviewed as part of this report that the surface water flood risk within Torbay is significant and therefore this will be identified as a priority in the local strategy.

Table 7 highlights the number of people at risk from surface water flooding in Torbay based on the "blue square" mapping. This figure has been split into the total number at risk in each town and within specific sub-catchments. The table also highlights the number of people at risk from flooding for a number of towns within Devon near Torbay.

Table 7

Town	Number of People	Sub-Catchment	Number of People
	At Risk of		At Risk of
	Flooding		Flooding
Brixham	1,675		
Galmpton	150		
Paignton	4,168	Clennon Valley	473
		Victoria Stream	1,404
		Occombe Valley	2,008
		Other areas	283
Torquay	3,908	Torre Abbey	1,137
		River Fleet	1,952
		Edginswell	367
		Babbacombe	452
Exeter	6,547		
Exmouth	913		
Dawlish & Dawlish	817		
Warren			
Teignmouth &	2,041		
Shaldon			
Newton Abbot	1,322		
Kingsteignton	480		
Totnes	1,020		
Dartmouth	803		
Ashburton	941		

Number of People at Risk from Surface Water Flooding Based on the "Blue Square" Mapping

8.0 Next Steps

8.1 Future Data Management Arrangements

In order to fulfil the role as Lead Local Flood Authority Torbay Council are required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information.

It is likely that this requirement will be met most effectively by the Engineering section of Torbay Council recording information on a simple spreadsheet. It is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive (2007/2/EC). Flooding data received from other flood risk authorities together with the Torbay records will be maintained on a centralised database will be kept up to date by Torbay Council, who will have overall responsibility to manage flood data through the whole administrative area of Torbay. This can then be used as an evidence base to inform future assessments and reviews and for input into mapping and planning exercises.

8.2 Local Strategy for Flood Risk Management

Torbay's Local Strategy for Flood Risk Management will be viewed as a major tool to make a difference to communities at risk from flooding. It will take a more detailed assessment of the local areas, identified as part of the PFRA process, as being at risk from flooding. The local strategy will focus on setting future direction on flood risk management.

8.3 Reviewing and Updating Flood Data and Modelling

Data management and providing information is a key role for measuring flood risk in Torbay. The data must be managed and maintained in such a way as to ensure the most up to date information is available in order to make the correct strategic decisions on future work. As a result, it is intended that external access will be available to Torbay Council's GIS flood risk mapping to ensure that information is freely available for the public, planning authorities and others.

The PFRA process forms part of a continuous 6 year cycle for Lead Local Flood Authorities under the Flood Risk Regulations. However as Torbay have no national Indicative Flood Risk Areas within its boundaries, there are no Flood Hazard, Flood Risk Mapping or Management Plans to produce. Torbay Council will, however, be required to produce a revised PFRA report which will have to be completed by June 2017. It should be noted that Torbay Council as part of the Level 2 Strategic Flood Risk Assessment report have produced flood hazard data for the major flood risk areas within Torbay.

8.4 Scrutiny and Review Procedures

The scrutiny and review procedures that must be adopted when producing the 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, as discussed below.

8.5 Local Authority Review

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

Within Torbay the PFRA will be taken to local flood risk partners for comments. It would have then been taken for approval by Torbay Council's Overview and Scrutiny Committee however due to the local elections in May 2011 it has not been possible to arrange a suitable committee meeting prior to the date identified for the PFRA to be submitted to the Environment Agency. It is proposed that the PFRA report will be presented to the Overview and Scrutiny Committee in either July or August 2011.

The Commissioning Officers Group has been provided with an overview of the PFRA together with the Flood and Water Management work in February 2011.

8.6 Environment Agency Review

Under the Flood Risk Regulations, the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRA documents 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 required standard. If satisfied, they will recommend submission to the relevant Regional Flood and Coastal Committee (RFCC) for endorsement. RFCCs will make effective use of their local expertise and ensure consistency at a regional scale. Once the RFCC 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 undertaken by Torbay Council and must be submitted to the Environment Agency by 22^{nd} June 2017. They will then submit it to the European Commission by 22^{nd} December 2017 using the same review procedure as described above.

References

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

Defra Making Space for Water: Integrated Urban Drainage Management: Torbay Pilot Study: Available from

www.defra.gov.uk/environ/fed/policy/strategy/ha2/Torbay/finalreport.pdf.

Environment Agency (2008) Managing Flood Risk: South Devon Catchment Management Plan

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

Environment Agency (2010) Environment Agency's Data Share service (online). Available from <u>http://www.geostore.com/environment-agency</u>

Environment Agency (2011) Preliminary Flood Risk Assessment – Annexes to the Final Guidance. Available from http://publications.environment-agency.gov.uk/pdf/GEHO1210BTHFe.e.pdf

European Commission (2007) EU Floods Directive. Available from http://floods.jrc.ec.europa.eu/eu-floods-directive.html

European Commission (2007) EU INSPIRE Directive. Available from http://inspire.jrc.ec.europa.eu/

Floods and Water Management Act (2010), London: HMSO

Torbay Council (2010): Torbay Level 1 Strategic Flood Risk Assessment

Torbay Council (2011): Torbay Level 2 Strategic Flood Risk Assessment

Abbreviations

Acronym	Definition		
AStSWF	Area Susceptible to Surface Water Flooding		
AStGWF	Area Susceptible to Groundwater Flooding		
BAP	Biodiversity Action Plan		
Defra	Department for Environment, Food and Rural Affairs		
CFMP	Catchment Flood Management Plan		
EC	European Commission		
FRIS	Flood Reconnaissance Information System		
FMfSW	Flood Map for Surface Water		
FWMA	Flood and Water Management Act 2010		
GHG	Greenhouse Gas		
GIS	Geographical Information Systems		
NFCDD	National Flood and Coastal Defence Database		
NRD	National Receptor Database		
PPS25	Planning and Policy Statement 25: Development and Flood Risk		
PFRA	Preliminary Flood Risk Assessment		
RFCC	Regional Flood and Coastal Committee		
SAB	Sustainable Urban Drainage System Approving Body		
SAC	Special Area of Conservation		
SPA	Special Protection Areas		
SSSI	Site of Special Scientific Interest		
SuDS	Sustainable Urban Drainage System		
SWW	South West Water		
UKCIP09	United Kingdom Climate Change Predictions 2009		

Figures

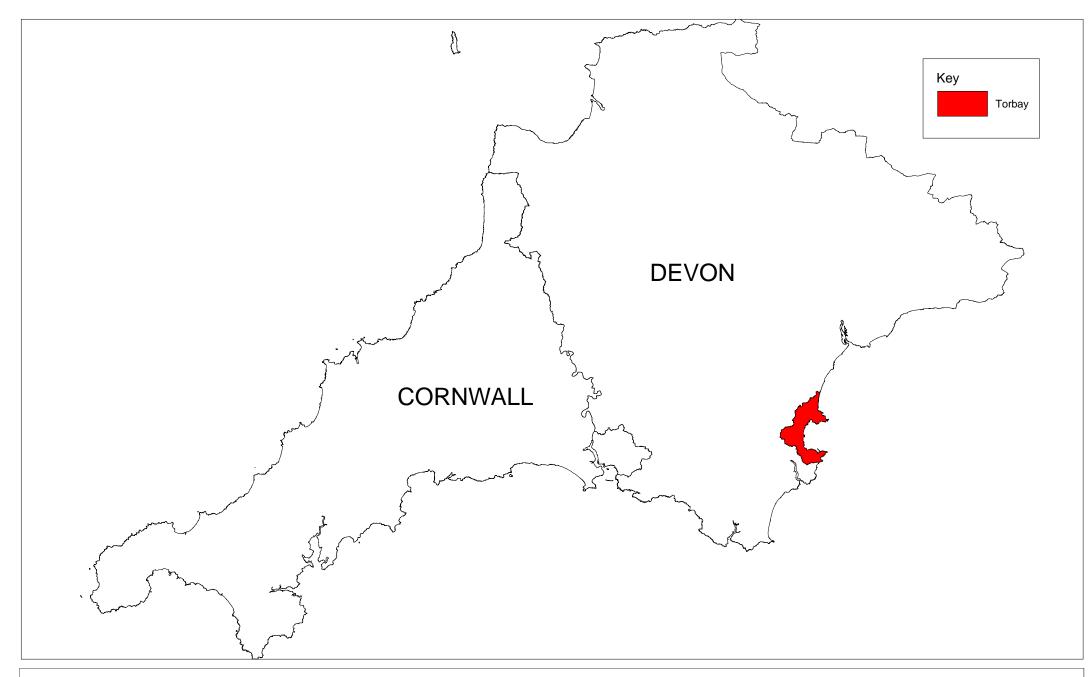


Figure 1 - Geographical Extent of Study Area



Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright. Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782

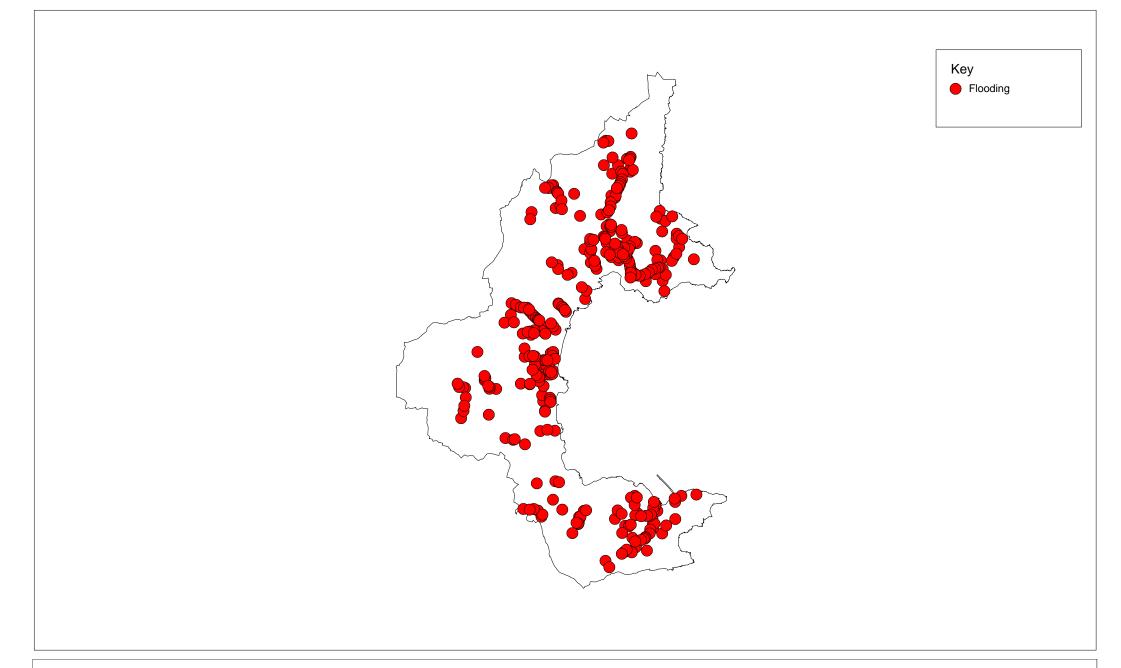


Figure 3 - GIS Point Data



Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright. Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782

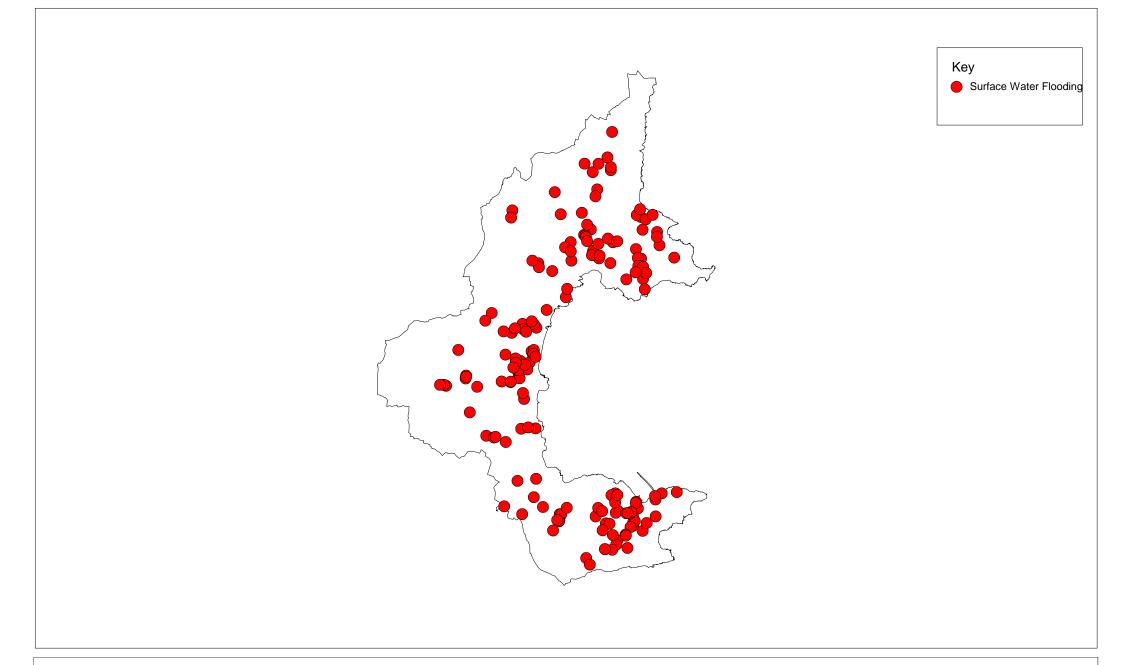


Figure 4 - Surface Water Flooding Incidents

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright. Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782



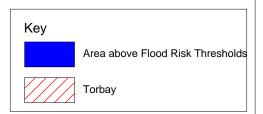


Figure 5 - Blue Squares Showing Areas Above Nationally Set Flood Risk Threshold



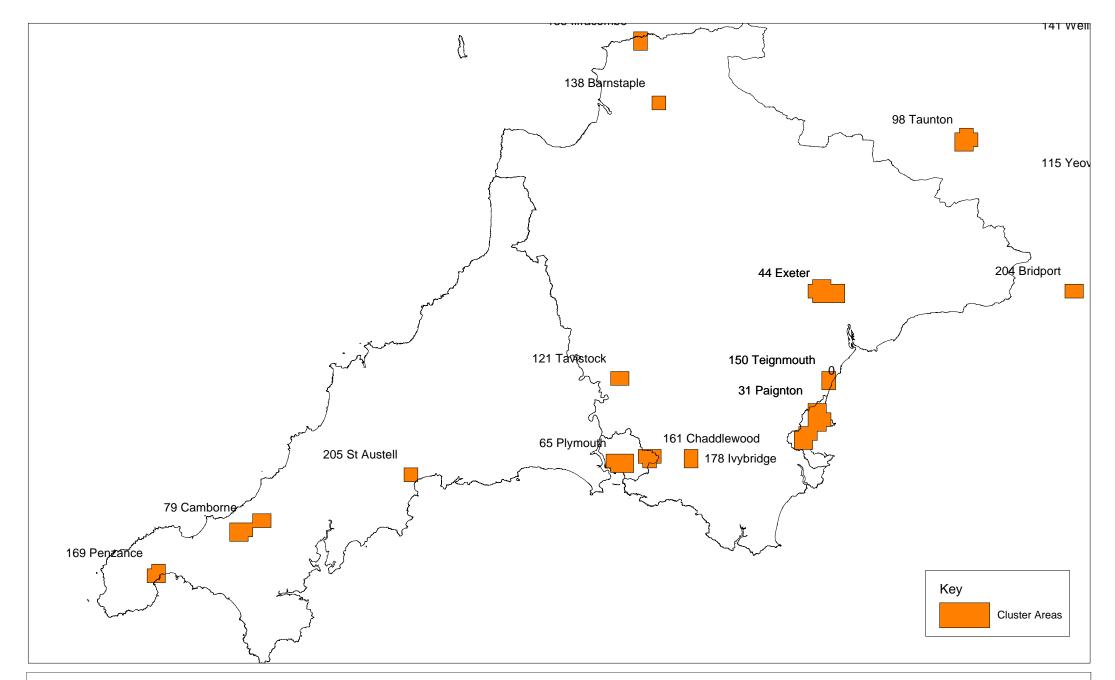


Figure 6 - Cluster Areas and Rankings of Local Areas of Flood Risk



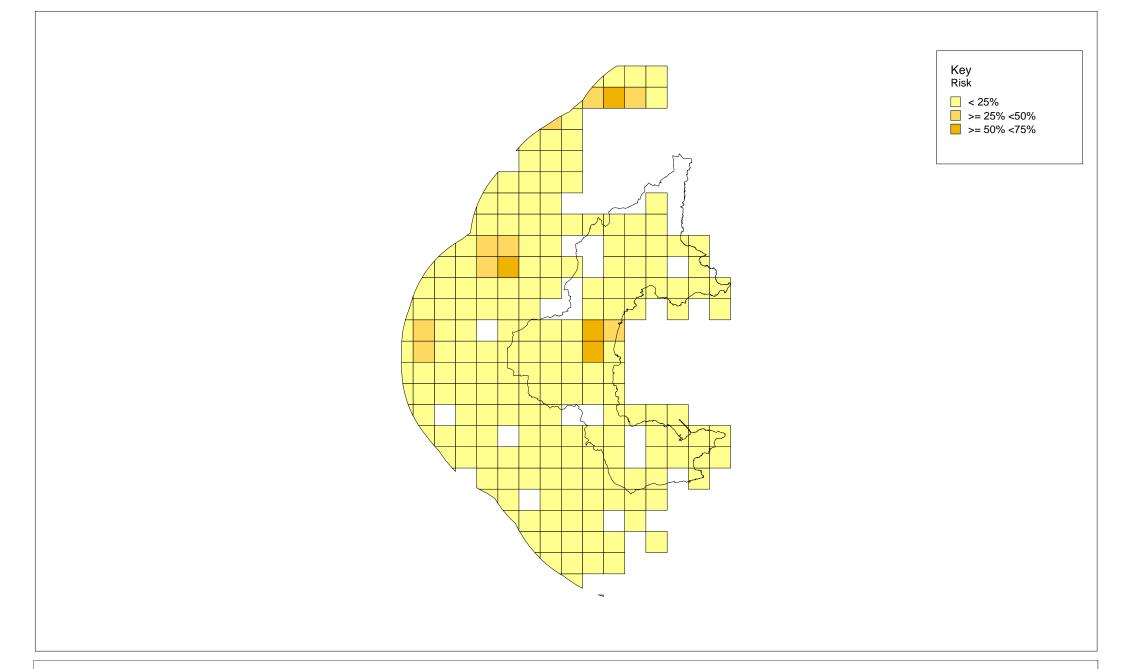


Figure 7 - Areas Susceptible to Groundwater Flooding



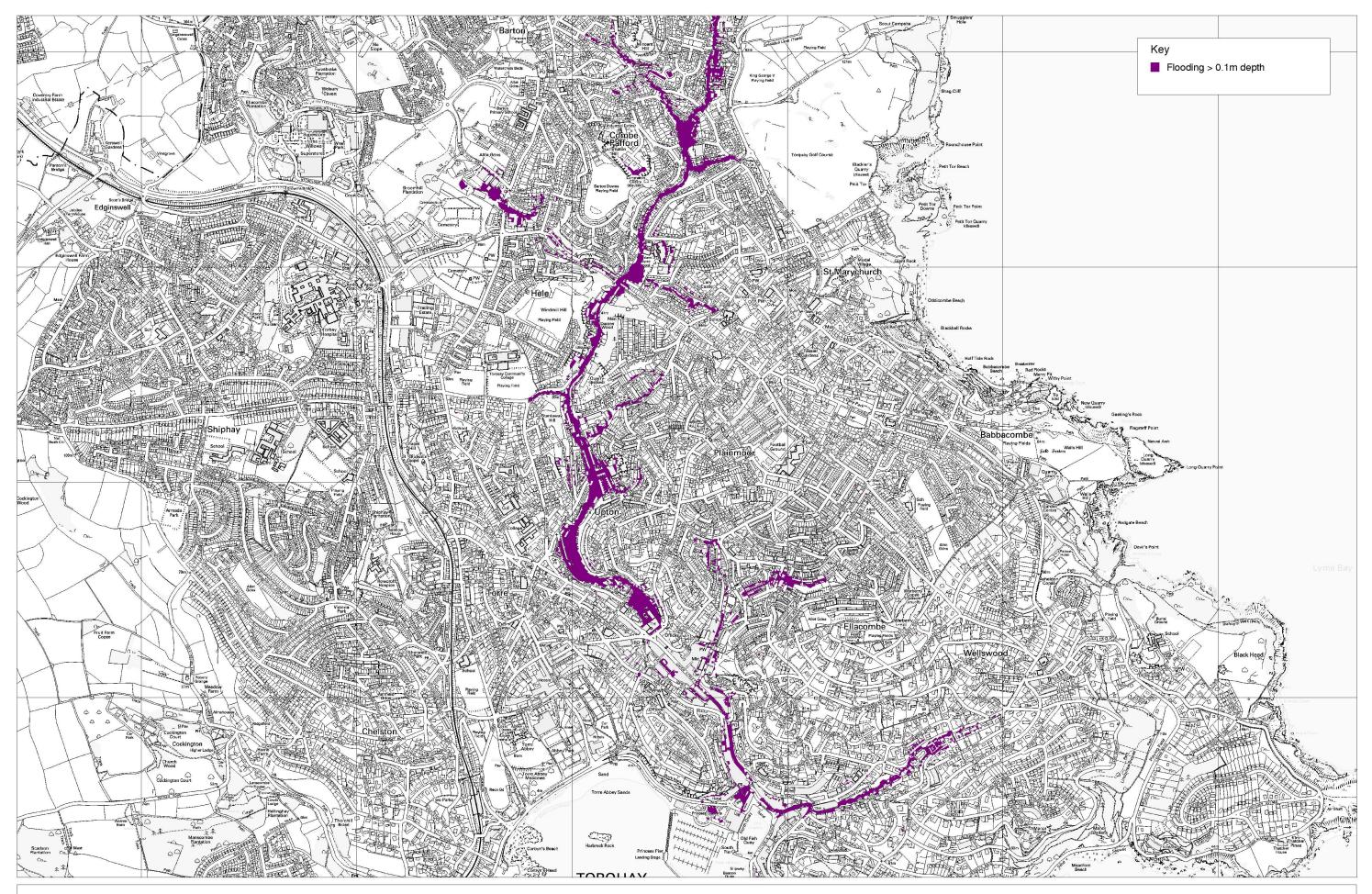


Figure 8 - Torquay Surface Water Flooding



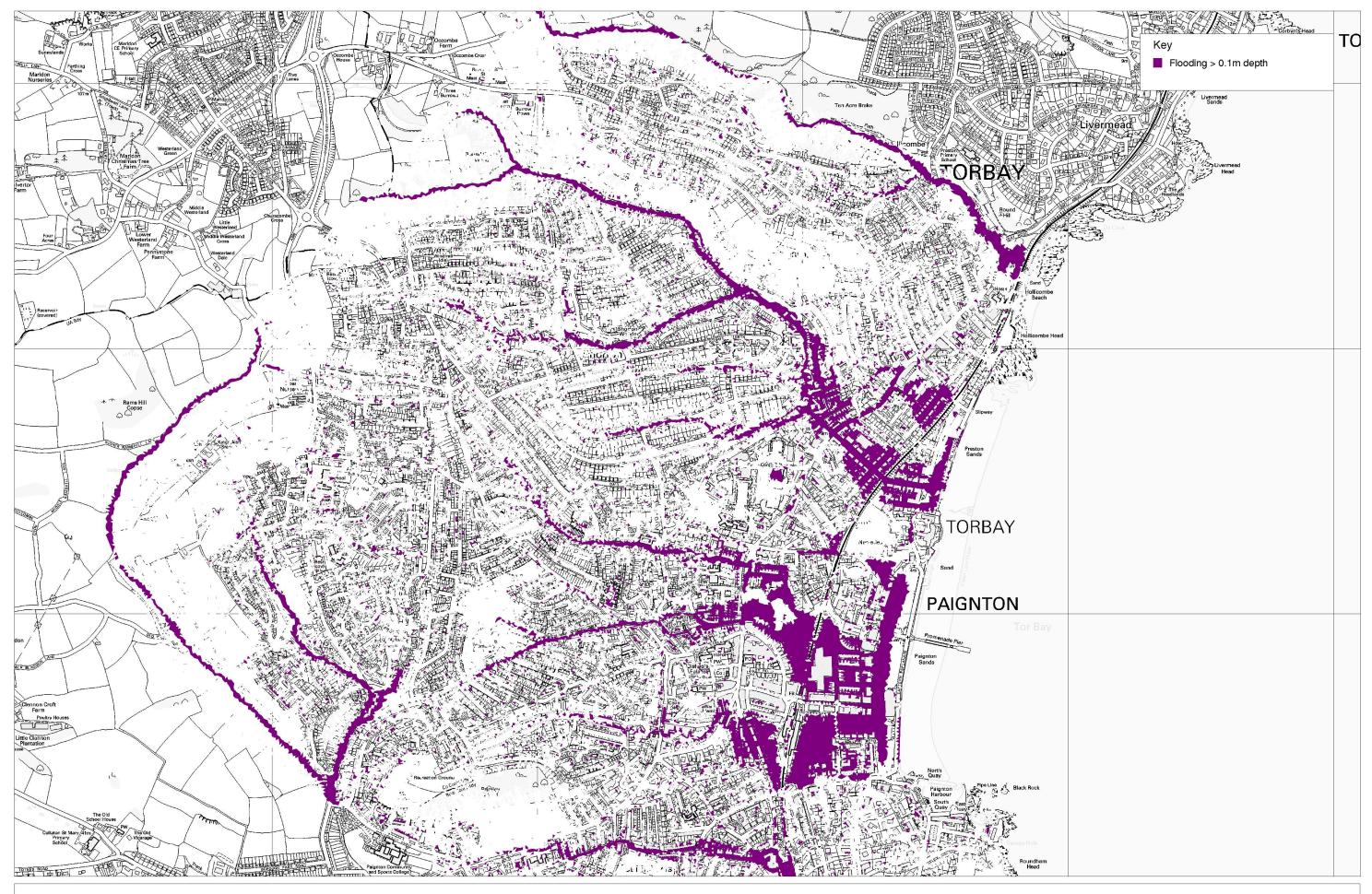


Figure 9 - Paignton Surface Water Flooding



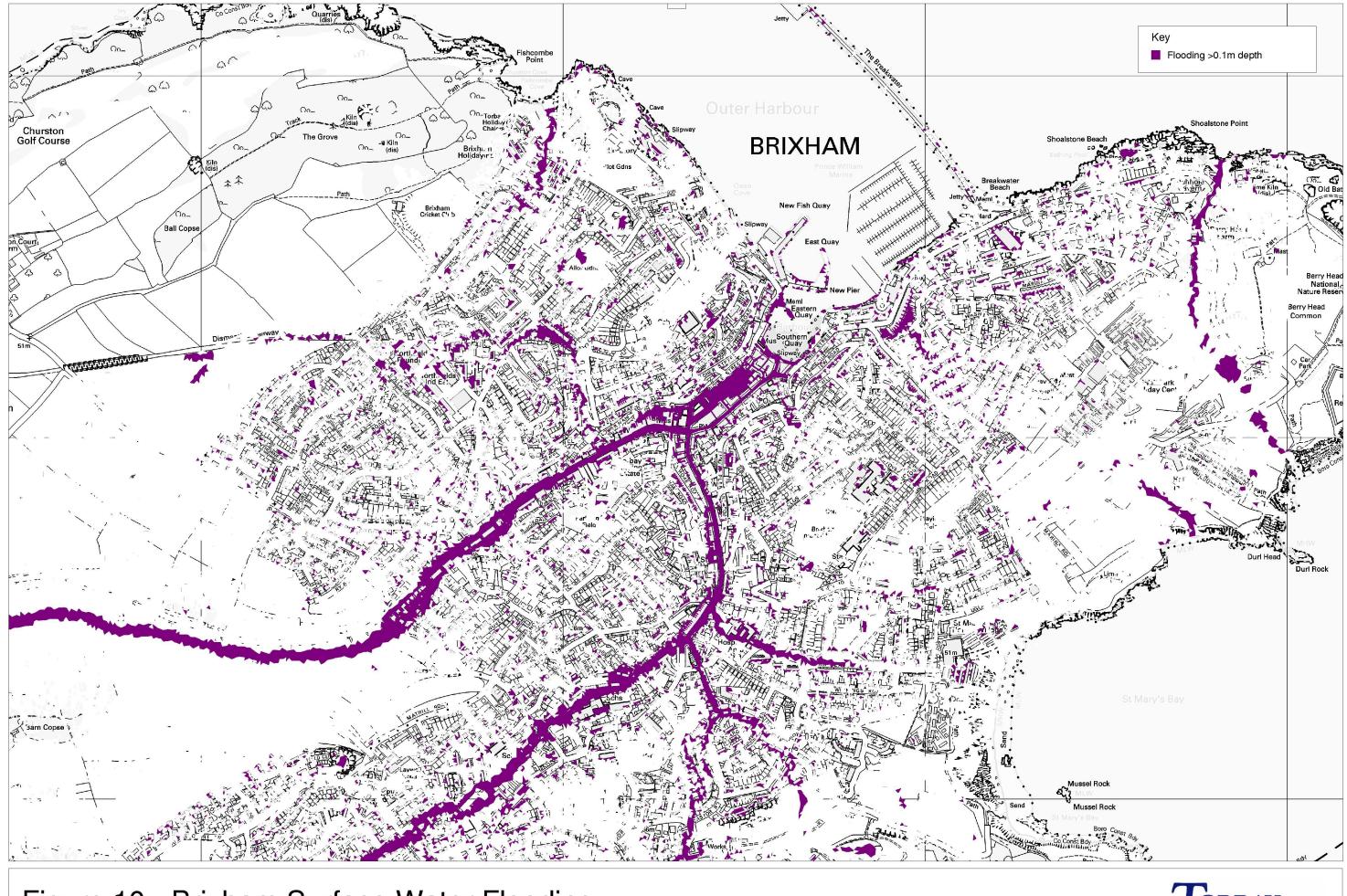


Figure 10 - Brixham Surface Water Flooding



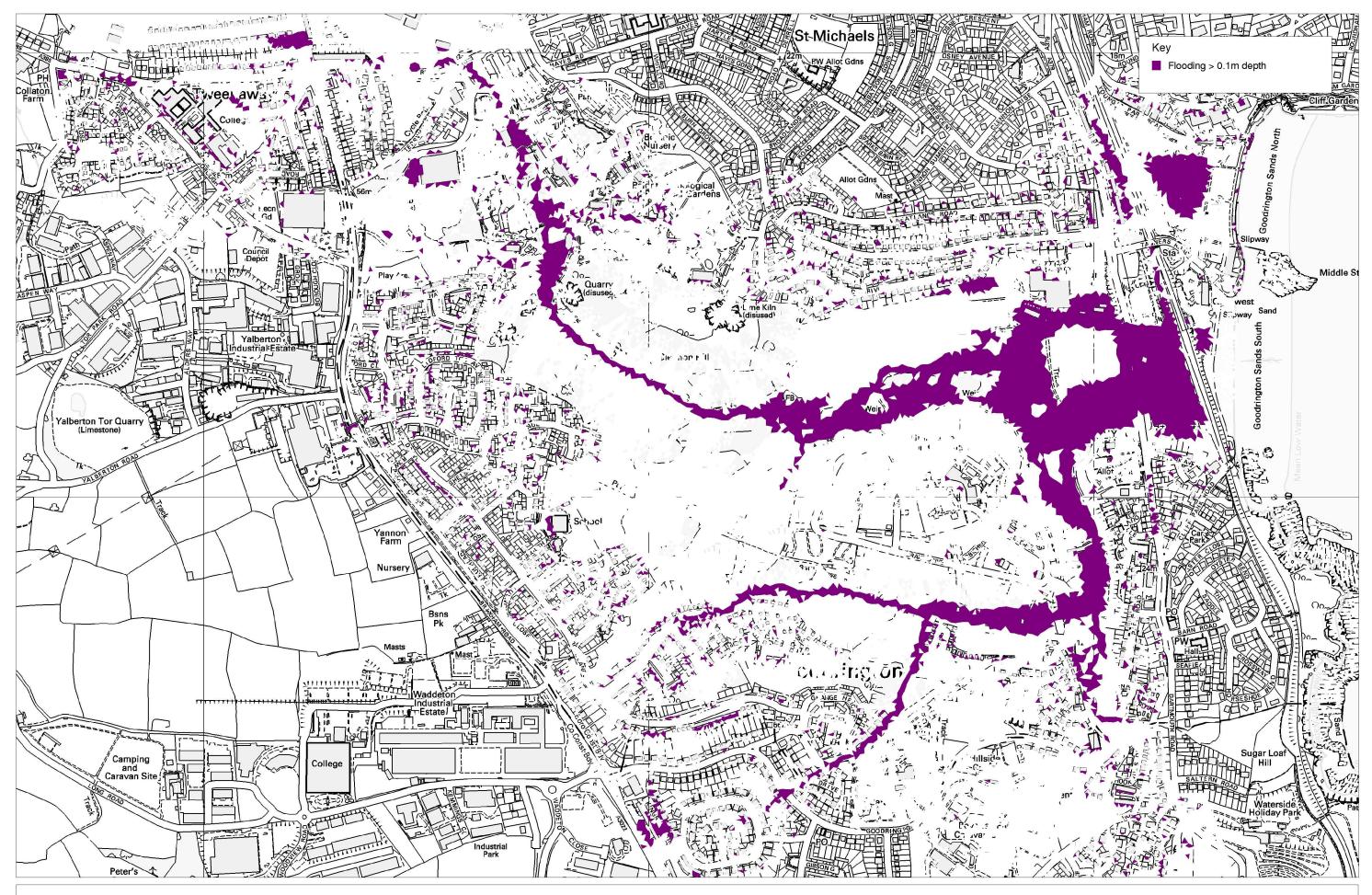


Figure 11 - Clennon Valley Surface Water Flooding



Records of Past Floods and Their Significant Consequences

field:	Flood ID	da and their algolficant consequences (preliminary assessment report spreadsheet) Summary description	Name of Location	National Grid Reference	Location Description	Start date	Days duration	Probability		Additional source(s) of flooding			Main characteristic of flooding	Significant consequences to human health	Human health consequences - residential proper	Property count in ties	ethod Other human health consequences	Significant economic consequences	Number of non- residential properties flooded	Property count method Other const	er economic Signif exquences conse the en	ficant Environment	vironment naequences	Significant consequences to cultural heritage	Cultural heritage consequences	Comments	Data owner		Flood event outline confidence			Photo ID	Lineage	Senaitive data Prot des	tective marking Ex scriptor	uropean Flood Event Code
landatory / optional: format:	Mandatory Unique number between 1-9999	Mandatory Max 5,000 characters	Mandatory Max 250 characters	Mandatory 12 characters: 2 letters, 10 numbers	Max 250 characters	www.er.www-mmi.er	Optional for first cycle Number with two decimal places	Optional for first cycl Max 25 characters	 Optional for first cyl Pick from drop-dow 	de Optional n Max 250 characters, same source terms	Optional Pick from drop-dow	Optional for first cycle m Pick from drop-down	 Optional for first cycle Pick from drop-down 	Mandatory Pick from drop-dow	Optional an Number between	Optional 1- Pick from drop-d	Optional own Max 250 characters	Mandatory Pick from drop-down	Optional n Number between 1- 10.000.000	Optional Optio Pick from drop-down Max	onal Mandi 250 characters Pick fr	failory Opti from drop-down Max	tional x 250 characters	Mandatory Pick from drop-down	Optional Max 250 characters	Optime#1,000 characters	Optional Max 250 characters	Optional Number with two decimal places	Optional Pick from drop-down	Optional Pick from drop-dow	Optional in yyyy' or yyyy-mm'o yyyy-mm-dd	Optional or Max 50 characters	Optional Max 250 characters	Optional Opti Pick from drop-down Maa	ional Au x 50 characters M	uto-populated fax 42 characters
Notes:	A sequential number starting at 1 and		 associated with the flood, using recognised postal 	National Grid Reference of the centroid (centre point, fails within polygon) of the flood extent, or of the tood extent, or of there is no extent information.	A description of the general location that was flooded.	The date when the flood commenced - when land not normally covered by water became covere by water.	The number of days (duration) of the flood that land not normally covered by water water	 flood occuring in any given year - record X from "a 1 in X chance of occurring in any given year". Where this is difficult to estimate, a range ca 	 which the majority of fooding occurred. Refer to the PFRA guidance for definitions of source 	If flooding occurred of from, or interacted with, any other sources (other than the Main source of sources), here, using the same source terms.	confidence in the M <u>ansurce of flooding</u> . fores, High ¹ (compaling evidence is correct), Medium (score evidence of source) and not compaling - about 50% confident that source is correct). (source samed - about 20% confident that source is correct).	him form: Natural exceedances'(of capacity), Defence capacity), Defence casceedances' of (floodwater or overtopping or overtopping of defences or pumping), Tälockage or earticitor (natural or an eraticitor of a natural or artificial blockage or readicitor of a conveyance channel or system), or No	hom; Plash Bood (rines and table quite rapidly with Hills or no advances warming). Natural Bood' (due to algoriticari a precipitation, at a abover rate than a flash Bood'. (Snow mait Bood' (due to or rapid snow mill). * "Dabta Bow" (conveying a high degree of dabra), or No data'. Most UK	significant consequences to human health when the flood occurred, would there be if it	residential proper where the building or athracture was affe or either internally or externally by the 1 or that would be a affected if the floc	ties non-residential g properties have I acted counted, it is imp r to record the me flood, of counting, to al	Significant ben operating and the second bottom human health, the discribe fram discribe fram discribe fram the second including information were such as the number fooded. as 1, as 1, a	significant economic consequences when the flood occurred, o would there be if it were to re-occur? of	c non-reaidential n properties where the or building structure was affected either internally or externally by the flood, or that would be so affected if the flood were to re-	Where residential or Three rono-residential <u>Street</u> <u>Control</u> , it is reported to <u>control</u> <u>Control</u> , it is reported to <u>control</u> <u>Control</u> , is an <u>Control</u> inclus of counting to skill <u>control</u> , to skill <u>control</u> <u>control</u> , to <u>control</u> <u>control</u> , <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u>control</u> <u></u>	dicant economic signific expandes conse zibs them enviro ding information flood of nas the area of would subural land were t ded, length of	icant Sign quences to the con- coment when the any occurred, or them d there be if it infor to re-occur? natio inter deal floor	inficant tasquences to the visonment, describe im including ormation such as	consequences to cultural heritage when the flood occurred, or would there be if it were to re-occur?	Senticant consequences to cultural heritage, describe them including information	Any additional comments about the past flood record.		The total area of the land flooded, in km ²	Choose from: 'High' (data includes one of: Arreita video, Annal photos, Photessional information, EA Bood information, EA Bood information, EA Bood photos, 'Anderse' (data includes one of: EALA ground photos, EALA ground photo	: a. A.	yyyy enn-au	relevant specific photographa, or to a set of relevant photographa. It may not be practical to reference all relevant photographa for each	what the data is made from. Has this data been created by using data owned or derived from data owned by 3rd party (external) organizations? If yes please give details.	time limit where known. Note: If	anisations apply na Government's the tective Marking init wme. If Fig. 1 fig. 1	No fail and anticipotatio using the LU and provided on the Franchiston ¹ with the Thoras LB, is an EU-selle unspection formation formation. In the CANE Code of the Server formation. ONE Code of a server formation when the set of the CANE of the server server is work of the the Server sequential number beginning with COD
xample:		1 Cu the 14 April 1928 an interas atom system probadi sufficience water flooding across Bases, concernation the new of the occury. The flooding laster due to flow, and 22 maiderial properties was recorded as aufform interaction of the system and there water. The sufficience and occurded the divergence (process) manual systems, and so probably had at in 20 to 1 th dd thereas of occuring in any given year.			Several towns and vitages across west Essex	1998-04-15	0.3	5 20-50	Surface runoff		High	Natural exceedance	Natural flood	Yes	23	Observed numbe	×	No			No			No			Epping Forest District Council		Medium	Site survey	1998-04-20		Ordnance Survey AddressPoint, CEH 1:50k River Centreline, NextMap DTM.	Urenarked Priv	ata U	KE 10000012P0001
conts begin here:		1 On-24th October 1999 an interne storm system produced surface water flooding, waterscrame flooding, hydrwy zhanagang flooding and contrained saver flooding to Traupa management of search as a proceeding of the search of the search of the search of the memory of realistic lass proceeding was a two period with non-64th control of the statement of the search as a processing of the search of the search of the statement of the search as a processing of the search of the search of the statement of the search as a processing of the search of the search of the search of the statement of the search of the statement of the search of the search of the search of the search of the search of the search of the search of the search of the search of the search of the search of the search of the search of the search of the search of			The lowns of Tonquay and Paignton	24/10/192	ο ο.	5 1 in 50 year alorn event	Surface runoff	Ordinary watercourse	i High	Natural exceedance	Flash flood	Ye		88 Observed numbe	Υ.	Yes	74		shopping area of No painy flooded cling retail shops			No		Detailed report produced identifying properties affected and rainfall interaity	Torbay Council		High-Medium	Professional staff notes			Ordnance Survey	Unmarked	U.	KE09000002P0001
		2 to 32-bit Abox 1929 an interne altern overlippeduod suffex wetter flooding and contribute some flooding to transpur. The neihibit last for 9 hones (internet) at 31 min) with he peak internetly lasting seconded over a one hone period when 1.6.6mm of internet are recorded. Islement flooding ware reported to A relativishill and commencial properties. This storm overh has been randysed and the minifal was assessed as being a 1 in 5 year neturn storm overh.		532916864162	Torquay	23/05/199	1 0.3	5 1 in 5 year storm eve	int Surface runoff	Combined sewers	High	Natural exceedance	Natural flood			38 Observed numbe		Yes	3	Observed number Main Torqu affect	n shopping area of No pasy flooded cting retail shops			No		Detailed report produced identifying properties affected and rainfall intensity	Torbey Council		High-Medium	Professional staff notes			Ordnanos Survey	Unmarked	U	KE0900002P0002
		3-200 August 2007 on retriess stems were produced unless were freedowd, belawy dawneys floetog, outwarranze Koulog and control states and the state of the sta	y, and Brisham	532889260869	The towns of Tongusy, Palgnton and Brisham	23/08/200	7 0.3	5	Surface runof	Ordinary watercourse	i High	Natural exceedance	Flash flood	1 888		41 Observed numb	×	Yes	2	Torqu affect and a	n shopping area of No pany flooded diring retail shops a number of Is were flooded in pton			No		Detailed report produced identifying properties affected and rainfall intensity	Torbay Council		High-Medium	Professional staff notes			Ordnance Survey	Unmarked	u	#E09000002F0003
		4 On 22nd Seytember 1922 an interna storm event produced surface water flooding. highway drainage flooding, ordnary watercourse flooding and combined aware flooding in Topopay and Papara. The initial event statistical for battware 22 and 22 minute during which time 1 time of earthal was encoded at a toping backet rainague boated at Torquay combined properties. The storm event has been analyzed and the simbilit was assessed an banking in 11 stray are many produce.	in Ny	\$32885162543	The towns of Tonquay and Paignton	22/09/199	2 0.3	in excess of 1 in 30 y 5 1 in 2 year storm eve	vea int Surface runoff	Ordinary watercourse	i High	Natural exceedance	Natural flood	Yes		38 Observed numb	*	Yes		flood	mber of hotels No small shops were ded in Torquay Palgnton			No		Detailed report produced identifying properties affected and rainfall intensity	Torbay Council		High-Medium	Professional staff notes			Ordnance Survey	Unmarked	U	8(E/39000002P0004
		5 Dn 190 August 2000 an interess storm event produced survice water fooding, highway, drainage fooding, ordenay satisfactorus fooding and combine taware floading and analysis of a product and the satisfactorus assessed as being a 1 in 24 year return product and event.	properties affected in	\$2285162543	The lowns of Torquay and Paignton	19/08/200	0 03	5 1 in 24 year storm event	Surface runoff	Combined sewers	Hip	Natural exceedance	Flash flood			26 Observed numb	-	Yes		were	ember of hotels, No to and garages if looded in pasy and Palgnton			No		Detailed report produced identifying properties affected and rainfall interaity	Torbay Council		High-Medum	Professional staff notes			Ordnance Survey	Unmarked		
		σ from the boundary 1000 mills already 2000 Tubuy experiences principles durated with the shart part of a strategies of the strategies	village of Galmpton fy	\$32904936096	Brisham and Galmpton	24/12/199	• •	5 more than 1 in 50 ye	ar Ordinary watercour	sea Surface runoff	High	Natural exceedance	Flash food			37 Observed numbs	×	No			No			No		Detailed report produced identifying properties affected and rainfall intensity	Torbay Coundi		High	Professional staff notes			Ordnance Survey	Unmarked	u	#£09400002P4005
		7 Do 2011 May (2022 at Information wave) produced and/own wave/ trading, or charge and the start of the start scene locality and notice from waterconsen in Dahan. The start all event lated the specimicality (-hour plant and all -three) with be past binard by lead work lated by specimicality (-hour binard all -three) with be past binard by lead or the start of the start and the start binary in the start binard locality and specimical by 2-hour binard all -three binary near specimica and shows the start binary start and the start binary binary near properties are sitted. The specimical by 3-properties because the start binary binary near properties are sitted. The start binary b	number of properties in Brixham 5	SX2916864162	Torquay and Brisham	29/05/199	ə 0.3	5 1 in 13 year alorm event	Surface runoff	Combined servers	High	Natural exceedance	Flash flood	Yes Yes		15 Observed numbe		Yes	15		n shopping area of No pany flooded ting retail shops			No		Detailed report produced identifying properties affected and rainfall interaily	Torbay Council		High-Medium	Professional staff notes			Ordnance Survey	Unmarked	U	KE09000029'0007

Records of Future Floods and Their Significant Consequences

Annex 2 Future floods

Mandatory / optional: Mandator Format: Unique ris between 1	Description of assessment method Name of S y Mandatory Mandatory Mandator mbar Max (JOX dramadars JAA 200 2020	Location National Grid Reference ry Mandatory characters 12 characters: 2 letters, 10 numbers	Costion Description Name Plood modelled Program Cost Cost Cost Cost Cost Cost Cost Cost	obability Main source of flooding andatory Mandatory as 25 characters Pick from drop-dos	Optional source(s) of Optional source(s) of Max 250 characters, F same source terms	Optional Manual Ma Manual Manual Manu	and the second s	Adverse consequences human health Mandatory Pick from drop-d	rumai health consequences - residential properti Optional lown Number between 1 10,000,000	consequences C	Adverse consequences clera Pick from	residential properties flooded Copional Mumber between 1- 10,000,000	Optional Opt	Aprestie consequences to th environment Mandatory irs Pick from drop-down	Optional Max 250 characters	Adverse Consequences to cultural haritage cultural haritage cultural haritage Cultural haritage Cultural haritage Consequences Mandatory Pick from drop-down Mas 250 charach		Optional Cers Max 250 characters	Area sodded Optional Number with two decimal places	Confidence in Mode modelled outline Option Pick from drop-down yyyy/ yyyyr	nal Option 'or 'yyyy-mm' or Max 23 -mm-dd	ype Hydrology Type Gotornal D characters Mox 250 characters	Lineage Sensitive Optional Optional Max 250 characters Pick from		
Notes: A surgard stating torreson each reco	The Termination of the Section of th	The locally National Grid with the Reference of the central digenter boot rearrange of central fails with the polygon rames such the Bood exists, or the such as a Model of the whole such as a factor of the best LLFA. LLFA, then record central of the LLFA		e chance of the Pick the source while do countrig is any generations the major generation of the pick of the pick of the minimum sector of the pick of the pick of the definitions of assure any year'.	hich If the flood is price presentation by or to interacts with, any to be orbite sources (other to be observed), provide the best provided in the source be able to be the best provided by the source to be source be source to the source the source to the source to the source to the source to the source to the source to the source to the source to the source the source to the source to the source to the source to the source to the source to the source to the source to the source to the source to the the source to the the the the the the the the the the the the the the the the the	Pick a brand level of Pick confidence in the <u>Alexi</u> ho <u>murce of flooding</u> as the horn; HgH, can (compaling evidence as of nource-about 80%; file confident that source to in correct, Wedenn' Tr (acrea evidence of murces but not acrues but not to murce but not compelling - shout pick confident that or sources but not nource is correct) or unaver, and assumed that nource is correct or or Unknown. data	kk a medaniam prika a disasateristic organizati papelriji, bahnon papelriji, bahnon papelriji, bahnon papelriji, bahnon papelriji, bahnon papelriji, bahnon papelriji, bahnon majelji, ali liški se ra papelriji, bahnon majelji, ali liški se ra papelriji, bahnon majelji, Bioclaga bahnost, som raliji, bahno santostrum, santostrum, som raliji, bahno santostrum, som raliji, bahno santostrum, santostrum, santost	Would then be injuficant consequences to human health if in future flood were occur?	wy Record the number residential property where the building structure would be to affected either internally or externs if the flood were to occur.	ref When muddeniad or if them sound is more stational. Counted in the second state of the counted is in process the state of the increased here must be and any state of the state of the state of the state of the state of the state based on the state of the state of the based of the state of the state of the property collection, property points, property points, the state of the state of the state of the property points, the state of the state of the state of the property points, the state of the state of the state of the property points, the state of the state of the state of the property points, the state of the state of the state of the property points, the state of the state of the state of the the state of the state of the state of the the state of the state of the state of the the state of the state of the state of the the state of the state of the state of the state of the the state of the state of the state of the state of the the state of the state of the state of the state of the the state of the state of the state of the state of the the state of the state of the state of the state of the state of the the state of the state of the state of the state of the state of the the state of the state of the state of the state of the state of the the state of the state of	as other Would to significa consequ future fic occur? nation mber of s	sere be any Record the number of economic no-residential properties where the ord verre to Luddrog structure would be afficient and eather internative or ever to occur.	Critical Pack to mission data and a 20 classical procession and a classical statistical procession and a classical statistical statistical procession and a classical statistical statistical statistical procession and a classical statistical statistical statistical procession and a classical statistical statistical statistical statistical statistical procession and a classical statistical statistical statistical statistical statistical statistical statistical procession and a classical statistical stati	other Would there be any comequences to the environment if the environment is the environment if the environment is the environment if the environment is the environment is the environment is the environment is the environment is the environment is the environment is the environment is the environment is the environ	If there would be <u>Significant</u> consequences to the <u>environment</u> describe thermition such as realronal and international designated alles ficoded, and polalition access fiboded.	Nichel frem ba any significant consequences to consequences to conseq	comments about t future flood record	tha £	The total areas of the land flooded, in kn ²	Pick tiom dtsp-down (VVV) VVVV Pick a brand lived of confidence in the modeled food outline them; high (good match to past flood antich	Type o to crea informa	adhara und Tipe of hydrologr method usel io na food hare food information.	create Loange is how and thes the 1 host the table to each best the table host the table table table to each best been created by using Protective data owned or derived by using Protective data owned or derived by Using Schemel Table party using table table table data owned or derived by Schemel Der party using table table organizations? If yes isnow. N please give details	formation For use where table under organizations spo mmerfs. the Gouverneet's Marking Protectics Markin Induka Scheme marking ahare are I for Access" d'.	This faild will a pay name provided the Flood D is desting and the flood D is information. Format UK-CI Pload ID- To Pload
Example:	1 San match below for examples of description of management method. Eases	52(1224512345	Pixed May for Software Probability where is a 20 Whater - 1 to 200 dawy five probability of the minimal waver, in this actual producing floating of granter from 0.2m signth.	0 Suface runolf		High Na	bitural exceedance Natural flood	Yas	12000	Detailed GIS	No			No		No		Epping Forest Diatris Council	a	Medum-Low 2008	-08 2D-Tul	low FEH (Revised Rainfall Runoff)	Ordnance Survey Unmarke AddressPoint, CEH 150k River Cantabiline; NextMap DTM.	d Private	UKE10000012F
Records begin here:	1 Segregardy decode thesis LOB and Comparison of the Decode Test Segregardy decode the topological and approprint, the decode Decode Test Segregards and the Decode Test Segregards and	532889260669	The lowes of Topage, Areas Consolible to Postability refers to Pogeton and Binhard and Antonio Pooling (AGXNY) - Microlina wasa twas Lawa	200 Surface runoff		High No	atural exceedence Natural flood	Yes	7	500 Detailed GIS	Yes	256	0 Detailed GIS	No		No		JBA Consulting (diatributed by Environment Agency under licence)	Ŷ	Low 2009-	-07 JFLOV	-GPU DDF curves from FEH CD, contre Sim model, with await induction to applied. Curve then used to derive 1,200 chance rainbal depth; conver- hystograph, using summer cainbal	of each Protect dor 6.2 hr, 6.6 hr, 6.6 hr, fed to protile.	Commercial	UKE09000028
	An endowine is the segmentation. The second second section of the second	54288260689	The towns of Tongany, Areas Susceptible to Photoelily rolline to Pagintos and Bohan Schenk Water bearredates bearredates bearredates and the scheduling of the bearredates bearredates advises water Boodings	200 Sufface runoff		High Na	atural exceedance Natural flood	Yes		000 Detailed GIS	Yes	164	0 Detailed GIS	No		No		JBA Consulting (distributed by Environment Agency under licence)	A	Low 2009-	-07 JFLOV	-GPU DDF curves from FEH CD, contex Sem model, with await induction to applied. Curve then used to derive 1:200 chance minibial depth; conve hystograph, using summer minibial;	of such Pittlect dor C.5 Ar, fact to profile.	Commercial	LIKE09000002F
	The discussion shall be determined by the second standards of the spread of the second standards of th		Ansas Susceptible to Probability refere to Sundras Water Nore Nore Sundras Water Nore Sundras Ansas Sundras Ansas Sundras Ansas Sundras Ansas Sundras Ansas Sundras Ansas Sundras Ansas Sundras Maria Sundras Ansas Sundras Maria Sundras Maria	200 Serface runoff	,	High Na	latural exceedance Natural flood	Yes			Yes			No		No		JBA Consulting (datributed by Environment Agency under licence)	A	Low 2009	-07 JFLOW	GPU DDF curves from FEH CD, certies Sim model, with awain induction to applied. Curve then used to derive 1:200 chance minibial deptr, conve hystograph, using summer minibial;	of each Protect dor C.S.br., feed to profile.	Commendial	LBRE7090000028
	of modeling uncentrinkes. 4 Topography detwold from 64.0% LIDAR & 35.5% NECTMap SAR, processed to remove Torbay buildings & vegetation, then cerebined on 2m grid; buildings added with arbitrary height of 5m based on CG Massettelike 2000 building topolymics, then resampted to Em grid DTM. Manual edits applied where flow paths clearly ontiled e.g. balow bridges. Flow troaded clearlab of buographs: allowance of Ummit mode for mannada drainage in	54288.0200609	Pood May for Sufface Probability when to Water (PMESW) - 1 in the probability of the 20 (PMESW) - 1 in the probability compared of the probability fooding of granter than 0. In dept.	20 Surface runoff		High Na	atural exceedance Natural flood	Yes			Yes			No		No		Environment Agency	a	Medum-Low 2010	-11 JFLOW	GPU FEH ODF curves. Sen model prid. reduction factor applied. Convex de http://domonicational.gov/ naihilliprofile. Sen "Stackpionol assessment method" for aslowance infiliation and dratage.	areal Rainfal Hyelograph, Umrarke reter 1.1 EA 2m Composite generate TML Composite generate TML COSMM Topography is for	8	LINE 090000028
	stream. In this calculate advances used to 35% is to advance and 75% is advances. The stream is the rest for advances are rest to 35% is advances and 35% is advanced at the stream is a stream is advanced at the stream is advan	complete \$X2880260609	Pood May for Sufface Probability refers to Water (7M2576) - 1 is free probability offen 20 days Boddy - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	30 Surface runoff		High Na	latural exceedance Natural flood	Yes			Yes			No		No		Environment Agency	A	Medum-Low 2010	-11 JFLOW	GPU FEH DDF curves. Sim model grid, metacion tector opplied. Curves de hr. (12) d'annos minhal depti: uni minhal profile. Sam "Description assessment method" for aslessance infittation and dhalage.	amal Rainfal Hystograph, Umrarka rine 1.1 EA.2m Composite genemer DTN, CXMM Topography is for		1802030000028
		512880260609	The toxes of Torpay, Flood Map for Surface Probability refer Pageton and Bridney Water (VIISW) - 1 is the penhality of the 200 methods of the second second second second second include the second second second second second second flooding of passer than 6.1m depth.	200 Surface runoff	,	Hgh Na	htural exceedance Natural food	Yes	10	800 Detailed GIS	Yes	270	0 Detailed GIS	No		No		Environment Agency	¥	Medium-Low 2010	-11 JFLOV	-GPU FEH DOF corver, Sen model girl, molicitor factor applies. Curren de sentence raintel profiles. Sen Torse aumenter raintel profile. Sen Torse aussesterten restruct for allowance initiation and drainage.	anal Raidal Hysiograph, Unmarke niar 11 EA En Composite 12 EA En Composite 2 EA En Composite ription of Topography is for	8	UWE090000028
	Nettern under annen. Nettern von der annen. The software of the software of	5x208026069	The turns of Tonyany, Flood May for Softwar Phaladity when its Psigrino and Entry Water (TMS20) - 1 in the packadity of the additional software (TMS20) - 1 in the packadity of the case posturing the software (TMS20) - 1 is the packadity of the case posturing that n 3 in digit.	200 Surface runolf		High Na	atural exceedance Natural food	Yes	5	100	Yes	140	0 Detailed GIS	No		No		Environment Agency	Ŷ	Medum-Low 2010	-11 JFLOV	CPU FEH DDF curves, Skm model grid, web.ction factor applied. Curves de http://db.dbc.com/saturation/ summer canadar profile. Sea "Pass assument restor" for allowance elification and destage.	ansal Rainfall Hystograph, Unmarks striss 1.5 EA 2m Composite ng DTAL COMM DTAL COMM profiles of Topography is for		LIKE09000027
	The S-S2 for Taylor beam service and the decision of grades than 2.3 m deep. 18 - Vacas Science State is Cascinater for the decision of the d	5X288526069	Anna Societta De Don ed ducida a Un Countemer Prodette probability. Na forma (ASCRY) postaver en encountemer en anna en anna encountemer en anna en annanna en anna en anna en anna en anna en anna e	krown Groundwater		High Na	atural exceedance Natural flood	Yes			Yes			No		No	Data developed specifically for PT and is unlikely to b suitable for any of purposes.	Environment Agency RA, ba her	A	Low 2016	-11 AncGiS	Uses data which is developed from BCS groundwater level contours, groundwater levels in BCS Weildla database and zome mine their states probability is associated with this d	n publishediritish Geological Unmarks Society (IRGS) ster DiGAlapGB-50 to [Sacargothily to Sacargothily to Record and the Sacargothily to Record and the Sacargothil Sacargothil Record and the Sacargothil Sacargothil Sacargothil Record and the Sacargothil Sacargothil Sacargothil Sacargothil Record and the Sacargothil	8	UNE 090000028
	 Appendix control and particle a	\$3286026069	Flood May So Name Flood 1 in 100, load 1 ad ann) - Flood more in 200 3	100 Main rivers	Sea, ordinary I watercourses	Medium Na	atural exceedance Natural food	Yes			Yes			No		No	Data updated quastery. To understand the Nailbooding, taking account of defano netro to Anasa Benefiting them Defences and Nat Plood Risk Aussamment (NaT)	Environment Agency alas, tional 18A)	¥	Medum 2010	-11 Varians JIFLDV RAS, 3 Social, for tide	sof nakiy Lood Burket modelling uses FEH m (JSC, HEC – Peak tidal water trends from either in FUCM for Tanse (JCI) of bod das about not VYDRKP 2020, JCI) of bod about in cluding an PGL CEX model.	Time Faster	Commercial	UNE 09000027
	 In the second sec	512880260609	Pland May Sor Farm Calcura Red data and may benering a training the second second and may benering the second second second second second second second second second gene as in decision of use second secon	1000 Main rivers	Sea, ordnary I watercornen	Medum Na	atural accedence Natural food	Yes			Yes			No		No	Data späteler quarterij, To staliziood of fluare tealiziood of fluare floating, taking accessed of deleter methods and the best of deleter method of the Deleticous and Net Picco Risk, Anthe Maximum Vietness deletate only. Data updated dataset only. Data updated dataset only. Data updated dataset only. Data updated dataset only. Data updated methods of the sectors of the Balalocoof fluare refer to National Pi Risk Assessment (MaRR4) den, Ma	tecf Invitorment Agency Envitorment Agency ass, Taod assed asted aster rely.	¥	Medum 2010	-11 Varies JRLOV RAS, 1 kortida	sel nakinj IZC, HCC – Pask ktele vaster Hverde Non eliber i Pask ktele vaster Hverde Non eliber i Pask ktele vaster Hverde Non eliber MCH/TCROF 1000 charces Kele kresk indukting a PCL, CEX model.	Calibration Locations, CS 1:10 Boundary Line MWV Bebote National Country, CD 1 Calibratic Advantage Country, CD 1 CS K Schume Wahr Levels, Proc CS 11:10 Attransminical Talas, Advances Country, Country, Country, Country, CS K Schume Wahr Levels, Proc CS 1:10 MeV, Namer Finad May	Commercial	Like 05000002F

an Filed Event Code opdated it will autopopulate using the LLPA soudded on the "Twittectoral" bill, and are med with a used to report the flood fator. U.KCORS Code+2 or Tr-ALLPA Dr. "ONG Code+1 is unique code reach LLPA or Tr-Andlane wert is patt or future. "LLFA Flood D

0012F0001

Records of Flood Risk Areas and Their Rationale

(Note there are no National Indicative Flood Risk Areas within Torbay therefore there is no requirement to complete Annex 3)

Annex 3 Flood Risk Areas

ANNEX	: Records of Floo	d Risk Areas and their	rationale (preliminary a	ssessment report sprea																						
Field:	Flood Risk Area	ID Name of Flood Ris	sk National Grid	Main source of				Main characteristic	Significant	Human health	Property count	Other human health	Significant			Other economic	Significant	Environment	Significant	Cultural heritage	Origin of Flood Ris		New Flood Risk	Rationale detail		European Flood Risk Area Code
		Area	Reference	flooding	of flooding	source of flooding	flooding	of flooding	consequences to	consequences -	method	consequences	economic	residential properties	method	consequences	consequences to	consequences	consequences to	consequences	Area	Risk Area rationale	Area rationale			
									human health	residential properties			consequences	flooded			the environment		cultural heritage							
Mandatory / optional		Mandatory	Mandatory	Mandatory	Optional	Optional	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional	Mandatory	Mandatory		Mandatory		Auto-populated
Format:	Unique number	Max 250 character	s 12 characters: 2	PICK from drop-down		Pick from drop-down	Pick from drop-down	Pick from drop-down	Pick from drop-down		Pick from drop-dow	n Max 250 characters	PICK from drop-down		Pick from drop-down	Max 250 characters	PICK from drop-down	Max 250 characters	PICK from drop-down	Max 250 characters	PICK from drop-down	PICK from drop-down	PICK from drop-dow	Max 1,000 characters		Max 42 characters
	between 1-9999	ber Name of the localit	letters, 10 numbers		same source terms					10,000,000				10,000,000							B11.0 11.0		P (1)			The second secon
Notes:				Pick the source from		Pick a broad level of																		Summarise the rationale for amending an in new Flood Risk Area, Refer to Defra & WAR		
	starting at 1 and		 Reference of the 	which there is a		confidence in the		from; 'Flash flood' (rises and falls quite	Area been identified				is Area been identified											reviewing Flood Risk Areas for local source		name provided on the "Instructions" tab,
	each record.	1 for Flood Risk Area; a		of Refer to the PFRA		e flooding from: 'High'	exceedance' (of	rapidly with little or no	as a result of	where the building structure would be		Significant	as a result of significant economic		properties have been counted, it is	Significant economic		a result of Significant consequences to the		a result of Significant consequences to				indicative Flood Risk Area and has not bee		
	each record.	town, city, or count	the Flood Risk Area			(compelling evidence			consequences to	affected either	important to record		consequences?	would be affected			consequences to the			cultural heritage,			 provide further deta 		n amended, record indicative Flood Risk	report the Flood Risk Area information.
			the Hood Kisk Alea		s. flooding), report the			'Natural flood' (due to		internally or external		human health,	consequences:			describe them (such			cultural heritage?	describe them (such		further detail in		Alea.		report the Flood Kisk Area Information.
				deminions of sources		confident that source		significant	numan nealur:	by the flood		describe them (such			d. counting. to aid			information about	cultural nentage:	as information about			This is not mandato			Format: UK <ons code=""><a><llfa flood<="" th=""></llfa></ons>
						is correct). 'Medium'				by the hood.		en as information about		externally by the libb	comparisons between			national and		the number and type			he if the Flood Risk Are			ID>. "ONS Code" is a unique reference for
					terms			slower rate than a				 the number of critical 			counts. Choose from:			international		of heritage assets		Flood Risk Area was				each LLFA. "A" indicates it is a Flood Risk
						source but not	defences or	flash flood), 'Snow				q services flooded).			'Detailed GIS' (using		01	designated sites		flooded)		an indicative Flood				Area, "LLFA Flood ID" is a sequential
						compelling - about	infrastructure or of				property outlines, as				property outlines, as			flooded, and pollution	n		Flood Risk Area	Risk Area and has n				number beginning with 0001.
						50% confident that					per Environment	-			per Environment			sources flooded).			rationale is	been amended, or is				
						source is correct)					Agency guidance),				Agency guidance),							a new Flood Risk				
						'Low' (source	or artificial blockage	or (conveying a high			'Simple GIS' (using				'Simple GIS' (using							Area.				
						assumed - about 20%	6 restriction of a	degree of debris), or			property points),				property points),											
						confident that source	conveyance channel	'No data'. Most UK			'Estimate from map'				'Estimate from map',											
						is correct) or	or system), or 'No	floods are 'Natural			or 'Observed number	er'.			or 'Observed number'.											
						'Unknown'.	data'.	floods'.																		
Example:	1	London	SX1234512345	Surface runoff	NA	High	Natural exceedance	Natural flood	Yes	50000	Detailed GIS		No				No		No		Indicative	NA	NA	indicative Flood Risk Area		UKE10000012A0001
Records begin here:																										

Preliminary Flood Risk Assessment Checklist

LLFA Na	me:	Preliminary Flood Risk Asses	ssment Checklist		
					Environment Agency
	Checklist questions	Notes for completion	LLFA	Environment Agency area review	national review
Step 1 1.1	Set up governance and develop partnerships Have appropriate governance and partnership	Refer to section 2.3 of guidance. Governance and partnership	Yes		
1.2	arrangements been set up? Who in the LLFA reviewed the PFRA and when was it done?	arrangements should be to the satisfaction of the LLFA. Please state the review and approval process and when approval was gained e.g. Officer, Scrutiny Committee, Cabinet. Refer to			
Step 2	Determine appropriate data systems	Section 5 of the guidance.			
2.1		See Annex 5 for information about data standards	Yes		
Step 3 3.1	Collate information on past and future floods and Has information been requested from all relevant	d their consequences See Flood Risk Regulations Part 6 Co-operation.	Yes		
3.1	partners? Are there any gaps in available information? (This could include gaps which could have been filled but	LLFAs - Are there gaps in certain locations, or for certain events that you are aware of, or for certain sources of flooding (such as			
3.2	weren't, or gaps which couldn't be filled because the information wasn't available)	groundwater). Respond with Yes/No and provide comments on any missing information. EA Review - Has all available information has been gathered and			
		included?			
Step 4	Determining locally agreed surface water inform Which dataset (or combination of datasets) has been determined as "locally agreed surface water	LLFAs - Select from drop down. Refer to "Locally agreed surface water information" text box in section 3.5.1 (p.17) of guidance.	Flood Map for Surface Water		
4.2	information"? Has the locally agreed surface water information been clearly stated and presented (on a map) in	EA review - Has this been agreed? LLFAs - Select Yes/No from drop down list. Refer to "locally agreed surface water information" text box in section 3.5.1 (p.17)	No		
	the Preliminary Assessment Report? If available, what is the total property count for	of guidance. If known, please enter the total number of properties at risk in the			
4.3	locally agreed surface water information in the LLFA? If applicable, has the method for counting	LLFA. Refer to text box on page 17 of guidance	Yes		
4.4	properties been described in the Preliminary Assessment Report? Has available information on local drainage	Refer to text box on page 17 of guidance. Information provided on	N/A		
4.5	capacity (where used to inform the determination of locally agreed surface water information) been included in the report?	drainage may inform options for any future improvements to the Flood Map for Surface Water.			
Step 5	Complete Preliminary Assessment Report Docur		N		
5.1	Does the Preliminary Assessment Report cover all the content described in Annex 1 of the Environment Agency's PFRA guidance?	LLFAs - If the Preliminary Assessment Report contains all the content described in Annex 2 of the PFRA guidance, respond with a 'Yes'. If there are some elements missing, please provide a brief	Yes		
5.2	Has a summary table of flood events been	explanation. EA Review - Include comments on any missing content. Refer to section 3.4 and 3.5 of guidance	Yes		
5.2	produced? Has a description of past flood events been included?	Refer to section 3.4 and 3.5 of guidance	Yes		
5.4	Has additional information been included on climate change and long term developments?	Refer to 3.6 of guidance. Standard text has been provided for Preliminary Assessment Reports which meets the minimum requirements of the Flood Risk Regulations. Please respond with	Yes		
		Yes or No, and if additional information has been included, please state the information source(s)			
Step 6		LLFAs - past flooding should be recorded on the spreadsheet and	Yes		
6.1	consequences recorded on the Preliminary Assessment Report spreadsheet (Annex 1 of Prelminary Assessment Report) ?	included as Annex 1 of the Preliminary Assessment Report. EA review - Are all the mandatory fields complete?			
6.2	Are there any past floods with significant harmful consequences that have not been recorded? If so, please explain why not.	LLFAs - Respond with Yes or No. If No, provide additional information e.g. anecdotal information on flood, but not enough evidence to include	No		
	Have any additional records of future flooding	EA review - Do you agree with LLFA response and comments? LLFAs - future flooding information should be recorded on the	No		
6.3	(other than the national dataset information which is already completed) been recorded on the future flooding Preliminary Assessment Report	spreadsheet and included as Annex 2 of the Preliminary Assessment Report. EA review - Are all mandatory fields complete?			
	spreadsheet (Annex 2 of Preliminary Assessment Report)				
Step 7 7.1	Illustrate information on past and future floods Have summary maps been produced for past and future floods?	Refer to section 3.4 and 3.5 of guidance	No		
Step 8	Review indicative Flood Risk Areas				
8.1	Is your LLFA within an indicative Flood Risk Area?	Indicative Flood Risk Areas were provided to LLFAs by the Environment Agency in December 2010. Refer to section 4 of guidance. LLFAs should identify whether	No N/A		
8.2	using the locally agreed surface water information, and relevant local information in the Preliminary Assessment Report?	they have reviewed against local information or just used the indicative Flood Risk Area information provided by the Environment Agency.			
Step 9	Identify Flood Risk Areas			· · · · · · · · · · · · · · · · · · ·	
9.1	Is a Flood Risk Area proposed?	LLFA - select a response from the drop down list and then complete the relevant questions 9.1.1 - 9.1.5. (NB. Indicative Flood Risk Areas can be amended due to Geography, past	No - no Flood Risk Area is proposed (go to question 9.3)		
9.1.1	If the proposed Flood Risk Area is exactly the same as the indicative Flood Risk Area, please	flooding and/or future flooding.) LLFA - please confirm that the boundary of the indicative Flood Risk Area has not been changed and no change has been made			
0.1.1	confirm. If changes have been made to the indicative Flood	to the flood risk indicators. EA review - please confirm Use the drop down list to identify the reasons for the change.			
9.1.2	Risk Area because of geography, please identify what changes have been made.	Options are the same as the table on page 26 of the PFRA guidance. EA review - please confirm evidence supports change			
	If changes have been made to the indicative Flood Risk Area because of past / historic flooding, please indicate the changes and the reasons why.	LLFA - identify the scale of the changes made e.g. major/minor increase or decrease in size of Flood Risk Area and the source of information used e.g. records of historic flooding.			
9.1.3	prodoc manate the changes and the reasons Why.	EA review - confirm scale of the changes made and provide indication of confidence in the evidence provided e.g. anecdotal			
	Risk Areas because of future flooding, please	evidence versus detailed report on flooding event. LLFA - identify the scale of the changes made e.g. major/minor increase or decrease in size of Flood Risk Area and the source of			
9.1.4	indicate the changes and the reasons why.	information used e.g. detailed modelling as part of SWMP. EA review - confirm scale of the changes made and indication of confidence in the evidence			
9.1.5	If a new Flood Risk Area is being proposed, does it meet the Defra / WAG thresholds?	Criteria and thresholds are set out in the Defra/WAG guidance on selecting and reviewing Flood Risk Areas for local sources of flooding			
-	Does the proposed Flood Risk Area include	EA review - identify the evidence provided to support this and indicate degree of confidence in the evidence. LLFAs should respond with Yes or No.			
9.2	flooding from interactions with main river, reservoirs or the sea? Has an indicative Flood Risk Area been deleted?	ELFA's should respond with res of No. EA Review - Summarise the location and nature of interactions i.e. river or sea. LLFA - Respond with Yes/No and if an indicative Flood Risk Area	No		
9.3	i ias an muicative riouu RISK Area been deleted?	has been deleted please provide a short description why. EA - confirm the evidence presented to support this is aligned to			
Step 10	Record information including rationale - ONLY C	llocally agreed surface water information			
		LLFAs - the spreadsheet indicates mandatory columns to be completed. EA Review - Are all mandatory fields complete?	N/A		
	Has a rationale and evidence for amending/adding/deleting Flood Risk Areas been included in the Distinguest Accessment Report?	LLFAs - Refer to Table 5 on page 26 of the PFRA guidance and Annexes A-D of the Defra/WAG Guidance. Rationale should be	N/A		
10.2	included in the Preliminary Assessment Report?	included in "Identification of Flood Risk Areas" section of Preliminary Assessment Report. EA Review - Confirm that supporting evidence for any			
		amendments/additions/deletions has been provided in the Preliminary Assessment Report and annexes			