

Walsall Council

Preliminary Flood Risk Assessment



Walsall Council





Council

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Revision History

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04/03/11	Minor grammatical.	Paul Lockhart – Environment Agency – Local Authority FRM Advisor.
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30/03/11	Minor grammatical.	Peter Clarke – Environment Agency

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We would like to thank everyone who has contributed to this report.



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Executive Summary

This report has been prepared by Walsall Council to help manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009). Walsall Council is defined as a Lead Local Flood Authority (LLFA) under the Regulations. The Preliminary Flood Risk Assessment (PFRA) which comprises of this document, 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, ordinary watercourses and canals. As a LLFA, Walsall Council must submit their 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 Flood Risk Areas, both published in December 2010.

The Environment Agency has used a national methodology, which has been set out by Defra, to identify indicative Flood Risk Areas across England. Of the ten indicative Flood Risk Areas that have been identified nationally, one is located across the midlands, incorporating parts of Walsall. Within this Flood Risk Area, the Regulations require Walsall Council to carry out two subsequent key stages:

- Flood hazard maps and flood risk maps; and
- Flood risk management plans.

The West Midlands Flood Risk Area includes parts of Birmingham, Wolverhampton, Sandwell, Dudley, parts of Solihull and approximately 70% of Walsall.

In order to develop a clear overall understanding of the flood risk across Walsall, flood risk data and records of historic flooding were collected from various sources, including local media and Council Highways records. Records relating to over 500 flooding events caused by flooding from local sources were collected and analysed.

Each flood record (both historic and future) has been individually analysed. If the event had significant harmful consequence on the on the local population it was included within this report and added to Annex 1 and 2 of the Preliminary Assessment Spreadsheets.

This PFRA has also reviewed the future flood risk to Walsall, by analysing various local and national data sets. Based on national surface water modelling approximately 8,100 properties are estimated to be at risk from flooding to a depth of 0.3m during a rainfall event with a 1 in 200 annual chance of occurring. Where future flood events pose a significant harmful consequence they have been added to Annex 2.

Walsall Council has challenged the geographical location of the indicative Flood Risk Area across Walsall. By using Walsall Councils own data sets (such as critical service locations) and running GIS queries which have counted the number of property and critical services that fall within the surface water flood map areas, Walsall Council has concluded that Walsall's indicative Flood Risk Area needs amending to take into account an extra 12 blue squares.



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Abbreviations

BW	British Waterways
CMT	Corporate Management Team
FLC	Flood Likelihood Category
LLFA	Lead Local Flood Authority
PFRA	Preliminary Flood Risk Assessment
PPS25	Planning and Policy Statement 25: Development and Flood Risk
SuDS	Sustainable Urban Drainage
WAG	Welsh Assembly Government



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1. Introduction

1.1 Scope of the report

Walsall Council is a Lead Local Flood Authority (LLFA) and is required by the Flood Risk Regulations 2009 to produce a Preliminary Flood Risk Assessment (PFRA).

The Flood Risk Regulations 2009 established four stages of a flood risk management cycle, scheduled for completion in June 2015. The PFRA is the first stage. The aim of this Regulation is to manage both the likelihood and the consequence of flooding.

This PFRA is an assessment of the local flood risk across Walsall Council. To complete this report the following flood risks have been considered:

- Surface water;
- Ordinary watercourses;
- Groundwater;
- Canals.

1.2 Aims and objectives

The following aims and objectives have been written to guide Lead Local Flood Authorities through the PFRA process.

1.2.1 Aim

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

1.2.2 Objectives

- To collect information on historic and future (potential) floods and flood risk;
- To assemble the information in the PFRA report template;
- To determine where in Walsall there is significant flood risk;
- To establish good professional partnerships arrangements.

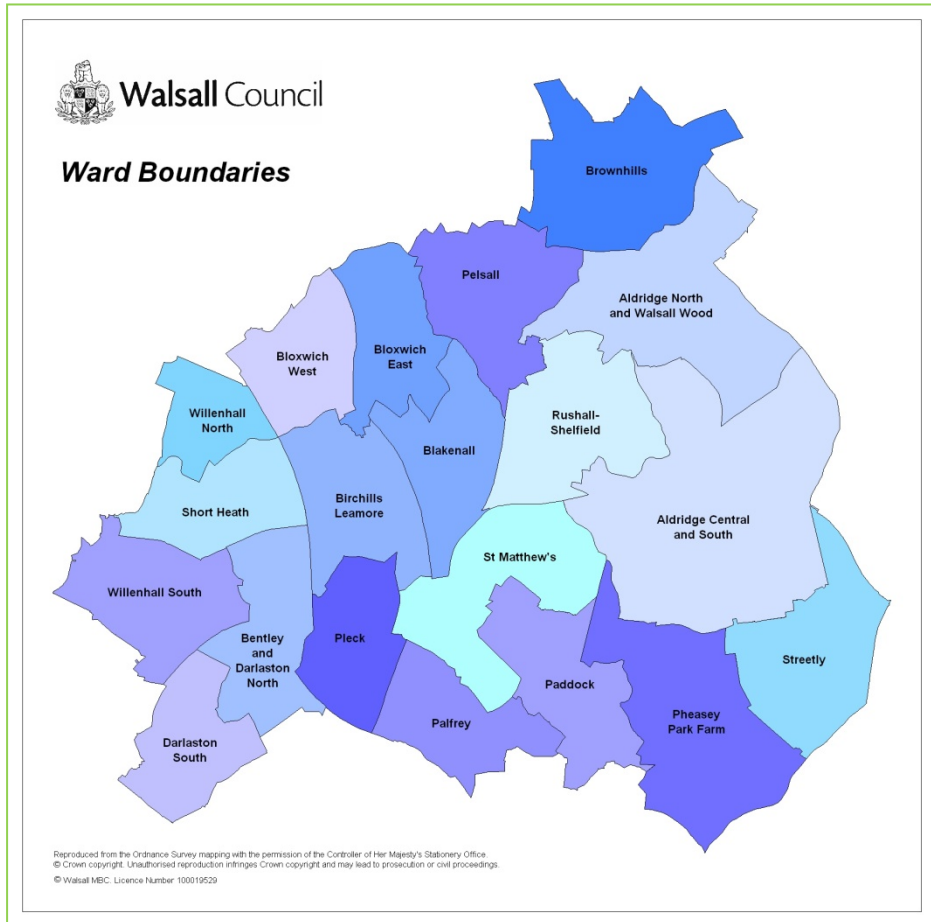
1.3 Study area

Walsall Metropolitan Borough Council is approximately 40sq miles in size and has a population of 254,500.¹ All information collated for this study is for areas within Walsall Metropolitan Borough Council boundaries (see Figure 1-1.)

¹ http://www.walsallpartnership.org.uk/scs_final_to_print_25_06_08-3.pdf



Figure 1-1 Walsall Council boundaries





2. LLFA Responsibilities

2.1 Introduction

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

2.1.1 LLFA responsibilities

During the review of the summer 2007 flooding, Sir Michael Pitt stated that “the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas”. As the designated LLFA, Walsall Council is therefore responsible for leading local flood risk management across Walsall.

2.1.2 Walsall flood stakeholder meetings

All LLFAs must establish appropriate partnerships to help with the collection and sharing of data, and the effective management of the PFRA process. The importance of working together is reflected in Regulation 35 of the Flood Risk Regulations and Section 13 of the Flood and Water Management Act. As such, a suitable governance structure has been set up within the LLFA. Further details can be found below.

Walsall Council has developed partnership meetings with key stakeholders from across Walsall to ensure local flood related issues are discussed and actions implemented. The following organisations are represented at these meetings:

- Walsall Council;
- Environment Agency;
- British Waterways;
- Severn Trent Water;
- Highways Agency.

2.1.3 LLFA network events

The Environment Agency (EA) supports networking events where LLFA from the Black Country (Wolverhampton, Walsall Sandwell and Dudley) discuss flood related issues with neighbouring LLFAs. As these events promote LLFA communications, Walsall Council will continue to participate.

2.1.4 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 more generally across Walsall. Stakeholder engagement can afford significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chances of stakeholder acceptance of options and decisions proposed in future flood risk management plans.

It is important to undertake some public engagement when formulating local flood risk management plans (for the Flood Risk Area within Walsall) as this will help to inform future levels of public engagement.

While the timeframe in which the PFRA was produced precluded direct public engagement in the process, we intend to engage communities during the developments of our local FRM strategy.

It is recommended that Walsall Council follow the guidelines outlined in the EAs ‘Building Trust with Communities’ document which provides a useful process of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as local resilience forums.



2.1.5 Further responsibilities

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

- **Investigating flood incidents** – LLFAs have a duty to investigate and record details of significant flood events within their area. 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 with respect to this duty is provided in Chapter 8.
- **Asset Register** – LLFAs also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.
- **SuDS Approving Body** – LLFAs are designated 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** – LLFAs are required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy will build upon information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments. This PFRA will be a key resource when developing the Local Flood Risk Management Strategy for Walsall.
- **Works powers** – LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater, consistent with the local flood risk management strategy for the area.
- **Designation powers** – LLFAs, as well as district councils and the EA 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.

3. Methodology and Data Review

3.1 Introduction

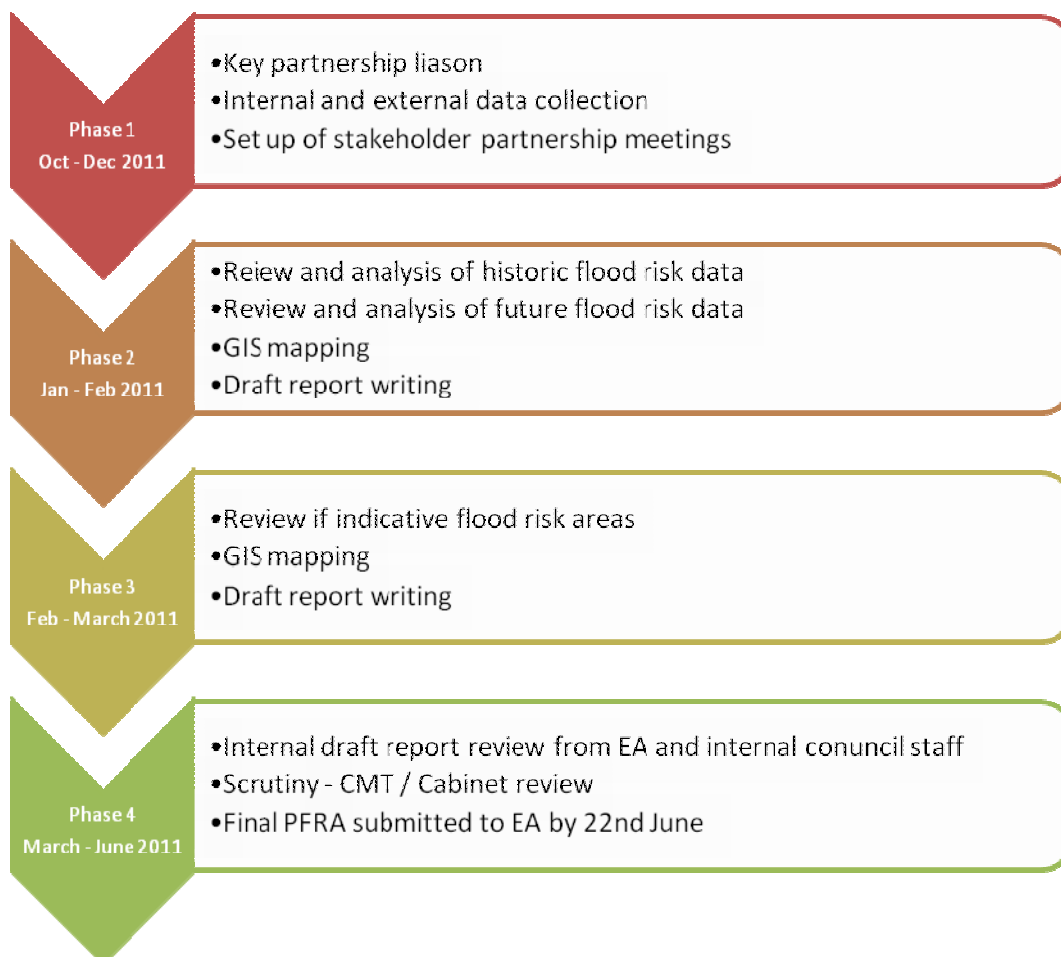
The PFRA is a high-level screening exercise used to identify areas where the risk of flooding is considered to be significant and warrants further examination through the production of flood risk and flood hazard maps and flood risk management plans. The definition of significant is defined in section 3.5.1.

The approach for producing this PFRA was based upon the EAs PFRA Final Guidance document, which was released in December 2010. The following methodology within this chapter has been used to undertake this PFRA:

3.2 Methodology

The following phases identified within Figure 3-1 and explained further within this chapter, were undertaken to produce this report.

Figure 3-1 PFRA methodology



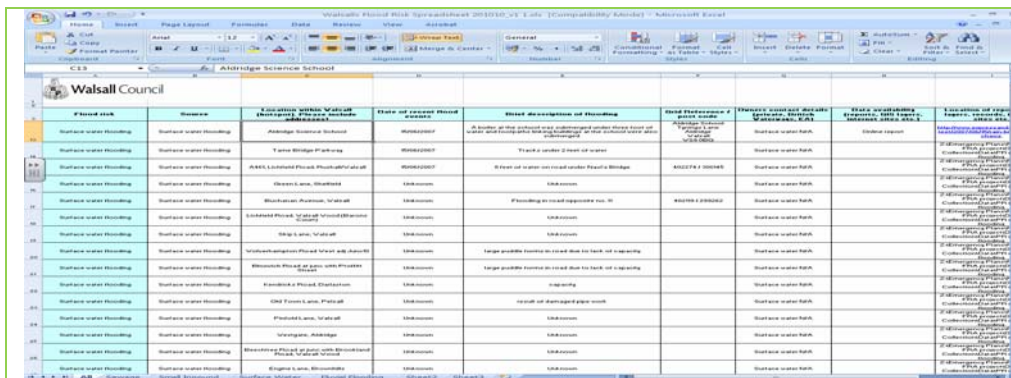
3.3 Phase 1: Partnership working

The following key external partners were consulted during the data collection phases of the PRFA:

- Walsall Council;
- Environment Agency;
- British Waterways;
- Severn Trent Water.

Figure 3-2 provides an example of the pro forma spreadsheets that were issued to partner organisations to assist in the collection of anecdotal information on known flooding hotspots.


Figure 3-2 Walsall data collection spreadsheet



3.4 Phase 1: Data collection

Through liaison with Walsall Councils key partners, the data in Table 3-1 has been collected and analysed. The results of the analysis can be found in the subsequent chapters within this report.

Table 3-1 Data collection

Organisation	Data Collection	Description	Purpose
 Environment Agency	Ford Brook Strategic Flood Risk Mapping Final Report	A flood risk mapping study of Walsall's Ford Brook including Arboretum Brook and Old Ford Brook.	Used to identify potential flood risk along the Ford Brook.
	Areas Susceptible to Surface Water Flooding	The first generation national mapping, outlining areas of risk from surface water flooding across the country with three susceptibility bandings (less, intermediate and more).	Used to identify potential flood risk and to review the indicative flood risk areas.
	Historic Flood Map	Attributed spatial flood extent data for flooding from all sources.	Used to identify historic flooding.
	Flood Map	Shows the areas across England and Wales that could be affected by flooding from rivers/from the sea/from rivers and, or the sea	Used to provide information on ordinary watercourses.
	Detailed River Network	The Detailed River Network (DRN) a large-scale, accurate and fully attributed digital river centreline covering England and Wales	Used to provide a spatial awareness of the river network across Walsall.
	National Receptor Dataset	A national dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations.	Used to identify the consequences of flooding across Walsall and review the indicative flood risk areas.
	Indicative Flood Risk Areas	Nationally identified flood risk areas, based on the definition of 'significant' flood risk described by Defra and WAG.	Used to identify the consequences of flooding across Walsall and review the indicative flood risk areas.

	Main Rivers	Watercourses shown on the statutory main river maps held by the EA, the Department of Environment, Food and Rural Affairs (in England) and the Welsh Assembly Government (in Wales)	Used to provide a spatial awareness of the river network across Walsall.
	BW canal centreline	British Waterways' owned or managed waterway network centre line	Used to provide a spatial awareness of the canal network across Walsall.
	Locks, sluices, weirs	Data set depicting all of the locks, sluice and weirs on British Waterways' network	Used to provide a spatial awareness of the canal locks, sluices and weirs across Walsall.
	Overtopping	A point dataset showing the location of historic overtopping events on BW's canal network, where they have been recorded centrally	Used to identify historic records of canal flooding.
	Breaches	A point dataset showing the location of historic breach events, where they have been recorded	Used to identify historic records of canal flooding.
	Sewer flooding register	Record of all sewer flooding incidents across Walsall	Used to identify historic records of sewer flooding.
	Severn Trent Water's drainage areas in the Walsall area	Severn Trent Water's drainage areas in the Walsall area	Used to identify drainage areas across Walsall.
	The Black Country Strategic Flood Risk Assessment	A review of the flood risk in Wolverhampton, Walsall, Sandwell and Dudley.	Used to identify both historic and future flood risk across Walsall.
	Black County Water Cycle Study Scoping Surface Water Management Plan	Phase 1 water cycle study and Scoping Surface Water Management Plan -	Used to identify both historic and future flood risk across Walsall.
	Media search	Review of flood media records in Walsall dating back to 2005	Used to identify both historic flood risk across Walsall.
	Flood records from the following departments: Planning and Building Control, Regeneration Services Development and Delivery, Highways.	Detailed flood records including dates, incident details	Used to identify both historic and future flood risk across Walsall.

3.4.1 Data limitation

Any specific data limitation issues are identified within subsequent chapters of this report.

3.4.2 Data sharing

The data collected during the PFRA process has been stored on Walsall Councils secure emergency planning network:




- Z:\Emergency Plans\Preliminary FRA project

This data will be used for the future stages of the flood risk management cycle scheduled for completion June 2015.

3.4.3 Licensing and restrictions

During the data gathering stages the following specific licensing and restriction issues were adhered to:

Table 3-2 Licensing and restrictions

Organisation	Restriction on Use of Data
 Environment Agency	The use of some data is restricted to Walsall Council for the preparation of the PFRA. The use of other data is unrestricted.
	On the 17th December 2010, a data confidentiality agreement was signed by Walsall Council to allow the use of Severn Trent Water flood data. The information provided must only be used for the specific purpose and the specific project, and must not be shared with a third party. If the same data is subsequently required for a different project or purpose that is also approved by Severn Trent Water, then a new Confidentiality Agreement is required.
	The use of some data is restricted to Walsall Council for the preparation of the PFRA. The use of other data is unrestricted.

3.5 Phase 2: Assessing historic flood risk

Existing datasets, reports and anecdotal information from stakeholders were collated and reviewed to identify details of past flood events which had significantly harmful consequences including economic damage, environmental and cultural consequences and impact on the local population. Significant harmful consequences have been defined specifically for Walsall Council in Table 3-3.

3.5.1 Significantly harmful consequences

During the data collections stages over 500 records of flooding were identified across Walsall. The PFRA requires that only past flood events which have had significantly harmful consequences and which could occur again are recorded.

For PFRA reporting purposes only flood events with significantly harmful consequences based on various national guidance and best practice will be included within this report. Walsall Council understands that every flood incident impacts on local people and each flood record will be reviewed as part of our longer term Local Flood Risk Management Strategy.

3.5.1.1 Walsall Council criteria

Walsall Council has gathered various national guidance's and best practices and reviewed these thresholds in order to define a "significant harmful consequence" for Walsall Council.

Historically Walsall Council does not suffer from serious fluvial or coastal flooding. Consequently the political and county interest related to low consequence flood events is high. This is the reason that we have decided to set up the local significant threshold of adverse consequences from flooding relatively low.

In order to identify if a flood event has had a significant harmful consequence the following criteria were applied:

- Where one or more significant harmful consequence is identified, that event will be classified as significant and will be recorded in Annex 1.

Table 3-3 Significant harmful consequence criteria

Consequence	Impact	
Health	number of people: .	10+ persons;
	risk to life	1+ persons;
	number of critical services:	1+ item of critical service
Economic activity	Business	2+ businesses
	number of non-residential properties	4+ properties;
	number of residential properties	4+ properties
	infrastructure network (length of roads and rail)	Transport links impassable for more than 5+ hours.
	Garden flooding	10 + gardens
Environmental	the consequences of pollution:	1+ event (for example sewage works flooded)
	the impact on internationally and nationally designated environmental sites:	1+ site;
	the impact on internationally and nationally designated heritage assets:	1+ site.

3.6 Phase 2: Assessing future flood risk

The PFRA also takes into account future floods, defined as any flood that could potentially occur in the future.

Walsall Council does not have locally agreed surface water information. As such the assessment of future flood risk will primarily rely on a technical review of EA Flood Map for Surface Water which has been recently provided to 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 Deep annual chance).

The following factors were considered when assessing future flood risk across the Walsall study area;

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

3.6.1 Future significant flood risks

The same significant harmful consequence criteria were used to assess if any of the future flood risks posed a significant flood risk as detailed in Table 3-3. Any future flood events that were classed as significant are recorded in Annex 2.

3.7 Phase 3: Reviewing indicative flood risk areas

Information regarding historic and future flood risk will be used to review and amend Flood Risk Areas. To achieve this, 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. Key flood risk indicators are summarised in Table 3-4.

Table 3-4 Reviewing Indicative Flood Risk Areas

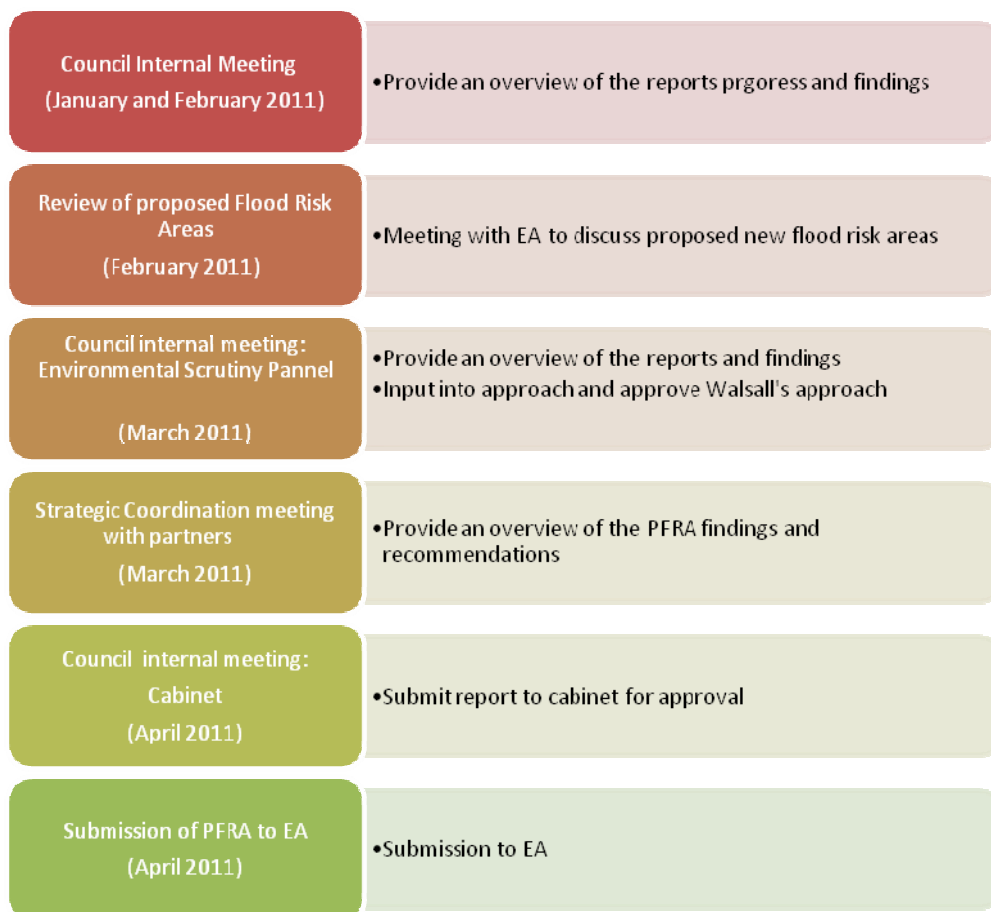
Impacts of flooding on	Flood risk indicators
Human health	Number of residential properties Critical services (Hospitals, Police/Fire/Ambulance Stations, Schools, Nursing Homes , etc)
Economic activity	Number of non-residential properties Length of road and rail Area of agricultural land
Cultural heritage	Cultural heritage sites
Environment	Designated sites (SSSI, SACs, SPAs, etc) and BAP habitat.

The above indicators have been selected and analysed by Defra and the EA in order to identify areas where flood risk and potential consequences exceed a pre-determined threshold. The areas that have been identified using this methodology and which 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).

3.8 Phase 4: Review

This PFRA has gone through the following review processes to ensure that the Walsall Council is satisfied that its products are fit for purpose in meeting the requirements of the Regulations.

Figure 3-3 Review process



4. Past Flood Risk

4.1 Introduction

Flood records across Walsall were collected from the data sources discussed in Table 3-1. Over 500 records of historical flood events and flooding hotspots were collected from across Walsall. While we had lots of flood records, the vast majority did not have property flooding.

These flood records came from a range of flood sources, and in many cases the source of flooding was unknown or not recorded. A summary of information specific to each source of flooding as part of the PFRA is included below.

4.2 Surface water flooding

During heavy rainfall events, overland flow and surface water runoff is caused by natural topographic gradients, but can also be generated by, if combined with:

- Highway drainage;
- Culvert blockages;
- Fly tipping;
- Canal bank failure / overtopping / maintenance works.

Walsall includes the following urban areas, Brownhills, Aldridge, Bloxwich, Willenhall and Darlaston. The south, west and centre of the borough are heavily urbanised but there are a number of isolated rural pockets in the north and east.

4.2.1 Data limitability

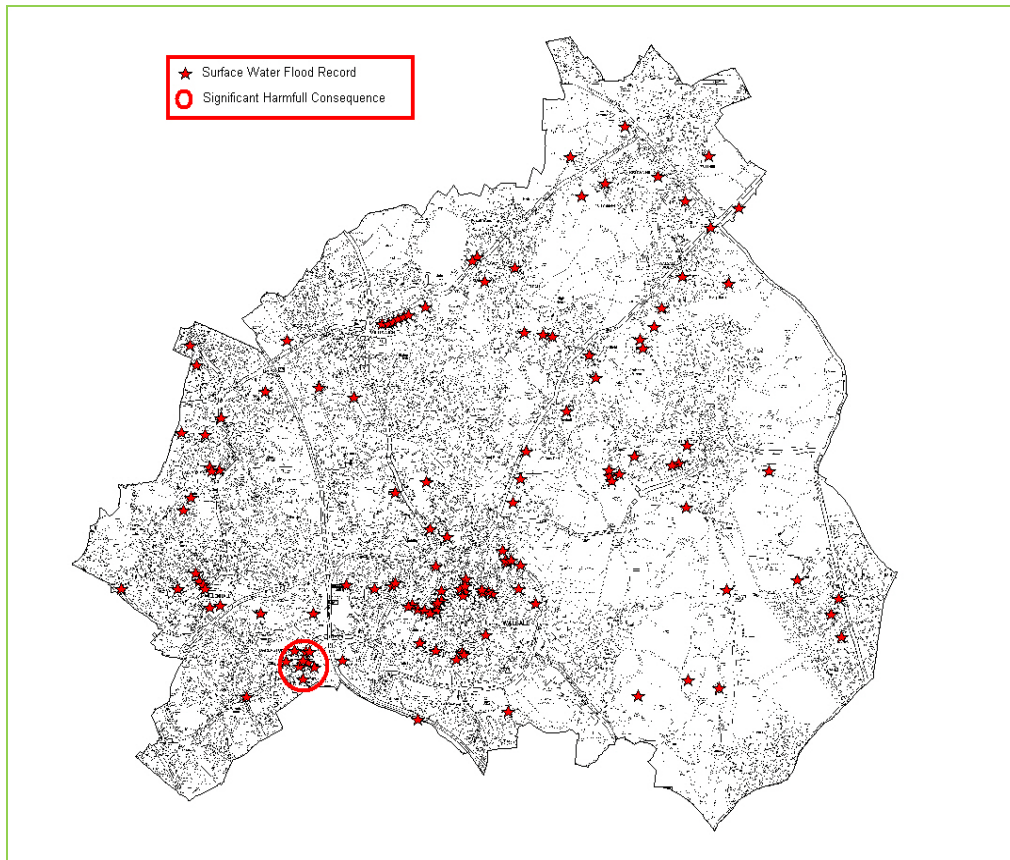
- A high percentage of records have been identified from media records and do not specifically identify the nature of the flooding, or the possible causes.
- Some records did not list how many properties had been flooded or for how long.
- There was often low confidence as to the precise location of properties affected in flood events as often only street names had been recorded.

4.2.2 Historic surface water events

During the PFRA data gathering process over 100 records of surface water flooding was collected with the majority of flood events dating from 2005 onwards. Figure 4.1 shows the spatial distribution of the historic surface water flood events.

Areas affected by surface water flooding which have not been classified as having a significant harmful consequence will be reviewed as part of our longer term strategy.

Figure 4-1 Spatial distribution of surface water flood events



The PFRA has identified that one particular area of Walsall had experienced repeat flooding which has also impacted on local infrastructure. The following flood event, as recorded in Table 4-1 has been identified as having a significant harmful consequence.

Table 4-1 Historic flooding - Significant Harmful Consequence Flood Events

Location and dates	Significant Harmful Consequence?	Reason
Darlaston Road including Station Street, Kendricks Road. – <ul style="list-style-type: none"> • 01/09/09 • 24/09/10 • 27/03/10 	Yes	Health and economic activity

4.3 Foul and sewer water flooding

Sewer flooding is often caused by excess surface water entering the drainage network. DG5 registers of reported sewage flooding provide by Severn Trent Water were analysed to investigate the occurrence of sewer flooding incidents across Walsall.

4.3.1 Data limitability

- Although the data provided by Severn Trent Water included over 220 flood records it is understood that some flood records were not reported by members of the public and are therefore not recorded in the DG5 register.

4.3.2 Historic foul water and sewer flooding

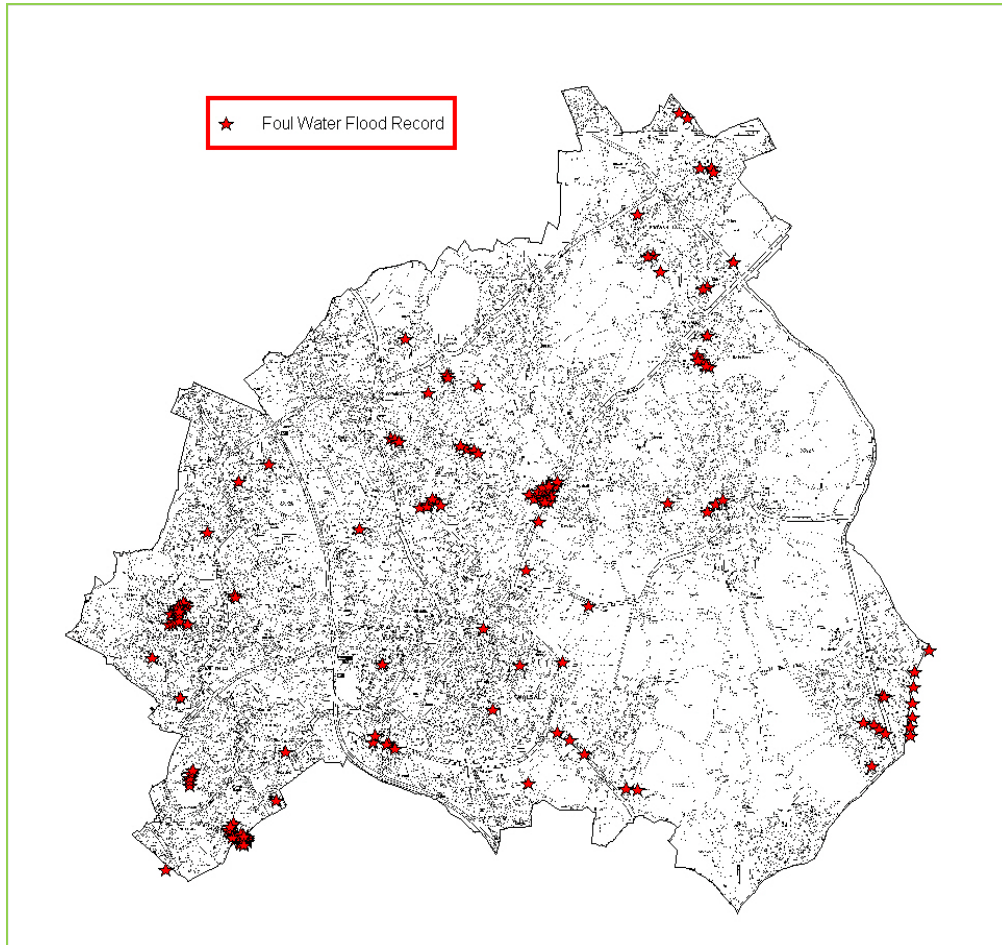
There were over 150 records of sewer floods across Walsall. Once a property has been identified on the DG5 register, it typically means that the water company can put funding in

place to take off the DG5 register. Figure 4-2 shows the spatial distribution of the historic foul and sewer water flood events.

This PFRA has concluded that there are no past foul and sewer water floods that had a significant harmful consequence and which could occur again within Walsall.

Areas affected by foul water flooding which have not been classified as having a significant harmful consequence will be reviewed as part of our longer term strategy.

Figure 4-2 Spatial distribution of sewer flooding events



4.4 Groundwater

Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from abnormal springs. This tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at 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.

Groundwater flooding can also lead to the inundation of farmland, roads, commercial, residential and amenity areas.

In the Black Country area it is thought that groundwater flooding may occur from:

- Sustained heavy rainfall causing the water table to rise over a short period of time;
- Continuing rebound of groundwater levels following a significant reduction in industrial abstraction from aquifers underlying the district over the last 40 years; a
- Groundwater discharge at disused mine shafts.

4.4.1 Past flood events

There are there no records of ground water flooding incidents across Walsall although it is possible that some groundwater flooding may have contributed to some of the surface water flood records. This PFRA has concluded that there are no past groundwater floods that had a significant harmful consequence and which could occur again within Walsall.

4.5 Fluvial - ordinary watercourses

LLFAs are responsible for assessing risk from sources of flooding other than main rivers, the sea and reservoirs². Generally main rivers are larger streams or rivers, but can be smaller watercourses. Ordinary watercourses are any river, stream, ditch, cut, sluice, dyke or non-public sewer which is not a main river.

There are very few historic records of ordinary watercourses flooding within Walsall. Walsall Borough Council area does incorporate some key watercourses such as Ford Brook and River Tame (including the Wolverhampton Arm), which generates the main fluvial flood risk for the area. Prior to work being completed on both main and ordinary watercourses by various agencies and authorities, flooding did occur in Walsall from rivers as shown by Figure 4-3 although this risk is now significantly lower.

Figure 4-3 Historic flood event ³



4.5.1 Data limitability

- There was little historic data available, distinguishing between main river flooding and ordinary watercourse flooding.

4.5.2 Ordinary water course past flood events

There have been very few reported ordinary watercourse fluvial flood events recorded in Walsall in recent history although in 2007, the Arboretum area flooded, although no property or businesses were affected. As such there have been no significant harmful consequences recorded.

Areas affected by ordinary watercourse flooding which have not been classified as having a significant harmful consequence will be reviewed as part of our long term strategy.

4.6 Reservoirs

There is no requirement for LLFAs to include reservoir flood data within this PFRA. ⁴

² PFRA guidance page 2.

³ <http://blackcountryhistory.org>

⁴ PFRA final guidance.

4.7 Canals - British Waterways

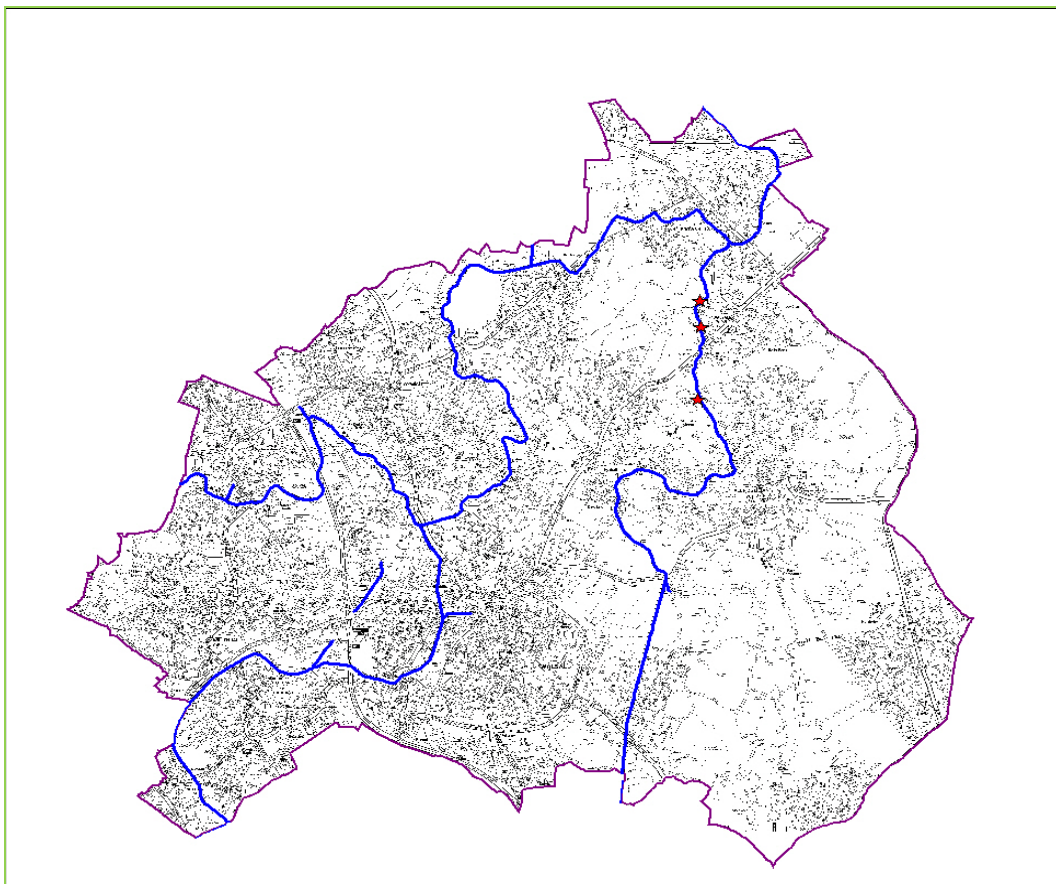
British Waterways is the public body responsible for the care and enhancement of the nation's 2,200-mile, two centuries-old network of canals and rivers. There is one canal network in Walsall.

4.7.1 Canal historic flood events

There have been minor canal flood incidents dating back to 1799 across Walsall. Figure 4-4 shows the spatial distribution of the historic canal flood incidents. No recent incidents have had a significant harmful consequence.

Areas affected by canal water flooding which have not been classified as having a significant harmful consequence will be reviewed as part of our longer term strategy.

Figure 4-4 Spatial distribution of canal flooding events



5. Future Flood Risk

5.1 Introduction

Future Flood Risk aims to identify what the future flood risk is for Walsall. This includes looking at flood modelling data that has been created for Walsall, both locally and nationally.

5.2 Surface Water flooding

Walsall Council has not had a specific Surface Water Management Plan written although the Black Country SFRA does make reference to historic surface water flood events. There are no locally available surface water flood maps. For this section of the PFRA, Walsall Council is relying upon the nationally available data provided by the EA.

The EA 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 (ASStSWF), 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 Flood Map for Surface Water (FMfSW), a revised model containing two flood events (1 in 30 annual chance and 1 in 200 annual chance) and two depth bandings (greater than 0.1m and greater than 0.3m).

For the purpose of the PFRA Walsall Council has used:

- Flood Map for surface water 1 in 200 rainfall event (FMfSW_200yr (0.1m) and FMfSW_200yr_deep (0.3m).

Table 5-1 and Table 5-2 show the estimated number of properties including residential at risk of surface water flooding across Walsall.

Table 5-1 Properties at risk from surface water flooding (0.1m)

County	Estimated number of ALL properties at risk of surface water flooding (flooding to a depth of 0.1m from an event with a 1 in 200 annual chance of occurring)	Estimated number of residential properties at risk of surface water flooding (flooding to a depth of 0.1m from an event with a 1 in 200 annual chance of occurring)
Walsall	26,100	21,900

Table 5-2 Properties at risk from surface water flooding (0.3m)

County	Estimated number of ALL properties at risk of surface water flooding (flooding to a depth of 0.3m from an event with a 1 in 200 annual chance of occurring)	Estimated number of residential properties at risk of surface water flooding (flooding to a depth of 0.3m from an event with a 1 in 200 annual chance of occurring)
Walsall	8,100	6,700

5.2.1.1 Surface Water Flooding of the M6 Motorway

The Black Country SFRA identifies that during a major flooding event there would be significant disruption including flooding of the M6 Motorway through Walsall. The M6 could become gridlocked, preventing the emergency services from reaching flooded areas.⁵ This could have a major adverse impact on the local economy. Therefore, surface water flooding on the M6 has been identified as having a significant harmful consequence as shown in Table 5-3.

⁵ Black Country SFRA page 27

Table 5-3 Future Surface Water Flooding - Significant Harmful Consequence Flood Events

Location	Significant Harmful Consequence?	Reason
M6 through Walsall	Yes	Economic, health, pollution

5.3 Canal flooding

Walsall Council commissioned High-Point Rendel to write a feasibility study for Daw End Mines, Walsall. Above the mines is the Daw End Canal, part of the Walsall Canal network. Included within this study was an analysis of the likelihood and consequences of the mine collapsing, causing the Daw End Canal to fail and collapse.

Were there to be a collapse, there would either be 68.8 million litres of water lost (if safety gates were closed in time) or, in a worst case scenario where the safety gate was not closed in time, 500,000 million litres of water would be lost⁶.

If a breach did occur, the water would tend to flow down to Daw End Lane, then onto the Rushall Traffic Lights, then onto the A460, the main Lichfield Road, and then flow down to Harden Road to the Ford Brook. The Ford Brook is unlikely to be able to cope with this quantity of water and it is expected that Walsall Town Centre would flood.⁷

Therefore Canal flooding around the Daw End Mines area has been identified as having a significant harmful consequence as shown in Table 5-4.

Table 5-4 Future Canal Flooding - Significant Harmful Consequence Flood Events

Location	Significant Harmful Consequence?	Reason
Daw End Canal - Daw End Mines	Yes	Although it is low probability, if a breach were to occur up to 500,000m ³ litres of water could inundate Walsall Town Centre.

5.4 Ordinary watercourses

In 2009 the EA carried out the Ford Brook Strategic Flood Risk Assessment. The Ford Brook is a main river, but the Old Ford Brook and the Arboretum Brook are ordinary watercourses and managed by Walsall Council. Both the Old Ford Brook and Arboretum Brook were included within the study.

5.4.1 Old Ford Brook and Arboretum Brook

The nationally available flood maps show possible flooding of properties with a 1 in 100 chance of flooding in any given year near the confluence with the River Tame at Bescot, at Walsall Arboretum, near Cartbridge Lane South and near the railway at Hatherton Road.

The EA Ford Brook Strategic Flood Risk Mapping Study has identified that even with the new Ford Brook, there is a possibility that flooding could occur with a 1 in 100 chance of flooding in any given year. Models suggest that up to 800m of railway line could be flooded along with property, businesses and infrastructure.

Therefore ordinary watercourse flooding from the Old Ford Brook has been identified as having a significant harmful consequence as shown in Table 5-5.

⁶ Walsall MBC Daw End Mines Treatment Feasibility Study page 38-39.

⁷ Walsall MBC Daw End Mines Treatment Feasibility Study page 38-39.

Figure 5-1 Surface Water Flooding 1-100yr - Bescot, railway line and Arboretum

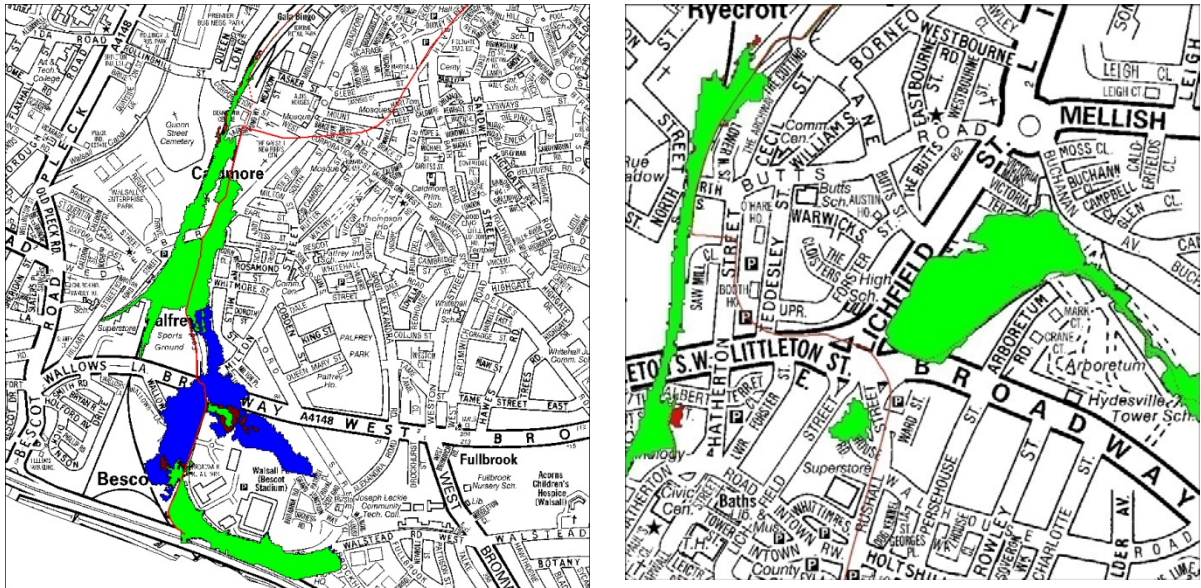


Table 5-5 Future Fluvial Flooding - Significant Harmful Consequence Flood Events

Location	Significant Harmful Consequence?	Reason
Arboretum Brook	Yes	A blockage scenario or 100yr plus climate change event would flood parts of Walsall including major infrastructure
Old Ford Brook	Yes	A blockage scenario or 100yr plus climate change event would flood parts of Walsall including major infrastructure

5.5 Groundwater flooding

There is no local information available which provides evidence on future groundwater flood risks across Walsall.

5.6 Major developments

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

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

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



5.7 Climate Change

5.7.1 The impacts of climate change

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

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation, however the broad trends are in line with projections from climate models.

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

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

5.7.2 Adapting to change

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

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

5.7.3 Long term developments

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

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

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

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

6. Review of Indicative Flood Risk Areas

6.1 Introduction

To ensure a consistent and proportionate approach, Defra and WAG have identified significance criteria and thresholds for defining Flood Risk Areas. The EA has applied these criteria and thresholds to produce indicative Flood Risk Areas. These areas are only based on certain nationally available data.

The indicative Flood Risk Areas have been produced as a starting point for LLFAs. They are based on available national datasets and will therefore need to be reviewed using local knowledge and evidence in the PFRA.

Walsall Council has where possible used the Council's own data sets such as GIS layers with schools to check the national data. This combined with the historic and future flood event data reported within this PFRA has allowed Walsall to amend the Flood Risk Areas suggested by the EA and Defra.

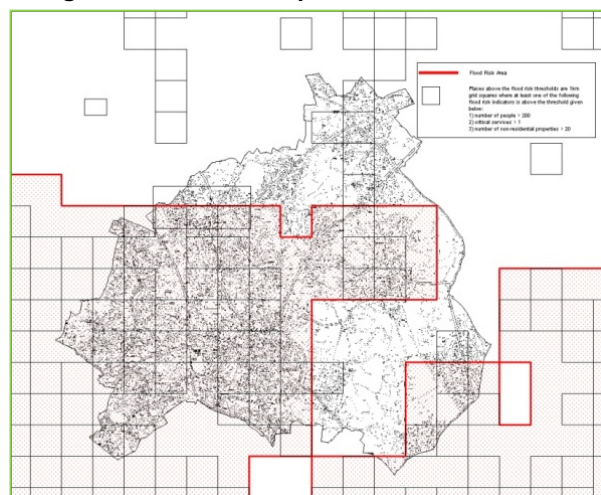
6.1.1 1km grid squares

To ensure a consistent and proportionate approach Defra have identified 1km square places above flood risk thresholds (informally referred to as "blue squares"), using new Flood Map for Surface Water (deep - for 1 in 200 annual probability rainfall) based on:

- 1) number of people > 200
- 2) critical services > 1
- 3) number of non-residential properties > 20

Figure 6-1 shows which 1km grid squares have been identified within Walsall.

Figure 6-1 1km Grid Squares - Walsall



6.1.2 Indicative Flood Risk Areas - Clusters

Clusters of these 1km grid squares were formed on the basis of 5 or more touching blue squares in England in a 3km by 3km grid.

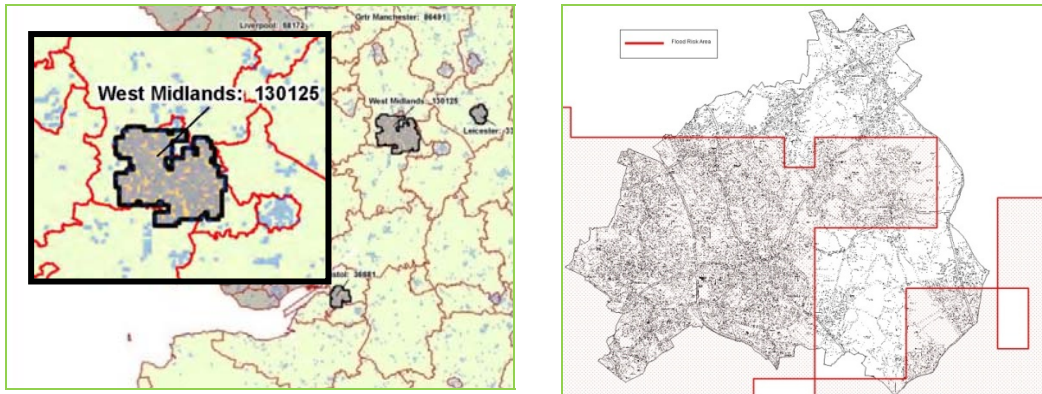
The clusters were ranked on the basis of the total number of people at risk, the number of critical services and the number of non-residential properties:

- number of people (based on number of residential property numbers X 2.34)
- number of critical services
- number of non-residential properties

- A threshold of 30,000 people was applied in England to determine the indicative Flood Risk Area.

A cluster has been identified across the West Midlands as shown in Figure 6-2.

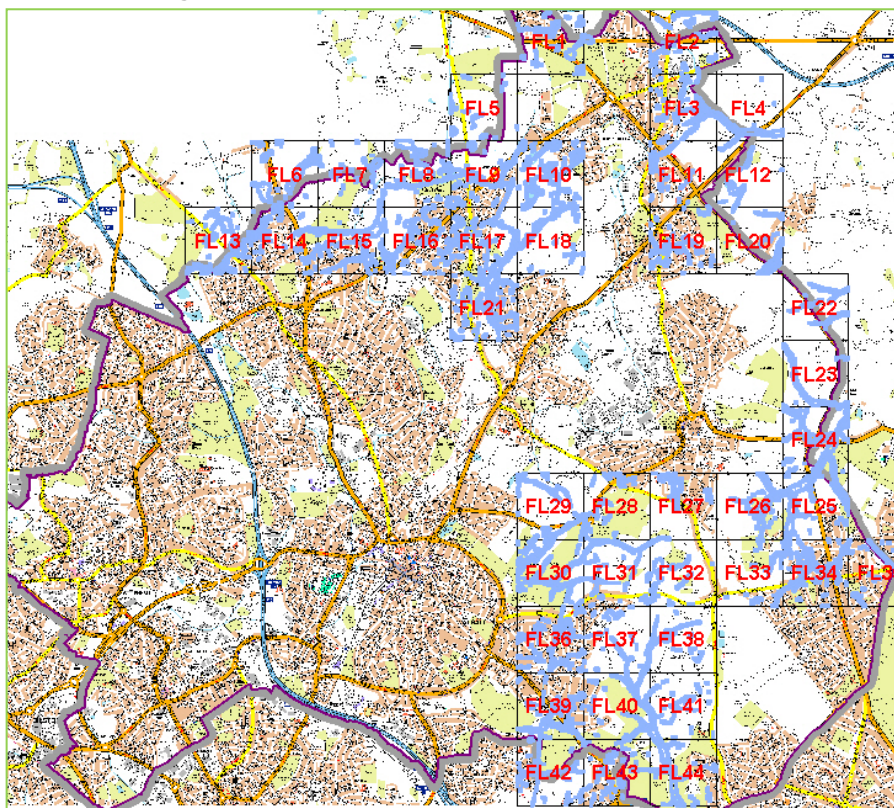
Figure 6-2 West Midlands Indicative Flood Risk Area



6.2 Indicative Flood Risk Area review criteria

Following a review of the historic and potential flood records, Walsall Council believes that there should be additional 1km blue squares across Walsall. Figure 6-3 shows 44, 1km square grids that have not met national criteria as detailed in section 6.1.1.

Figure 6-3 New 1km Grid Squares - Walsall



6.2.1.1 Additional data sets

Walsall Council owns various data sets that may contain more reliable data than used by Defra and the EA to identify the 1km square grids. The following Council owned data has been used to review the additional 1km square grids:

- Residential address data
- Commercial data
- Day nurseries
- Primary school
- Secondary schools
- Emergency Services
- Hospitals
- Electrical Sub Stations
- A roads

6.2.1.2 Surface Water Flood Maps

The following surface water flood maps were used to review the additional 1km square grids and flood risk across Walsall:

- Flood Map for surface water 1 in 200 rainfall event (FMfSW_200yr and FMfSW_200yr_deep).

6.2.1.3 Referencing criteria

GIS queries were run to identify if any of the additional 1km square grids meet the significant criteria of:

- number of people > 200
- critical services > 1 (including A roads)
- number of non-residential properties > 20

6.2.1.4 Additional significant criteria

Walsall Council has decided to include “A roads” within the significant criteria. This has been agreed with the Environment Agency. Walsall Council requires A roads to be open and functional for trade and emergency services access and egress. If such roads were flooded there would be a significant impact on Walsall.

7. Identification of Flood Risk Areas

7.1 Introduction

Walsall Council has identified that 12 new blue squares need to be added to Walsall Councils Flood Risk Area. This information has been shared and agreed with the EA as requested by the PFRA Final Guidance Document.

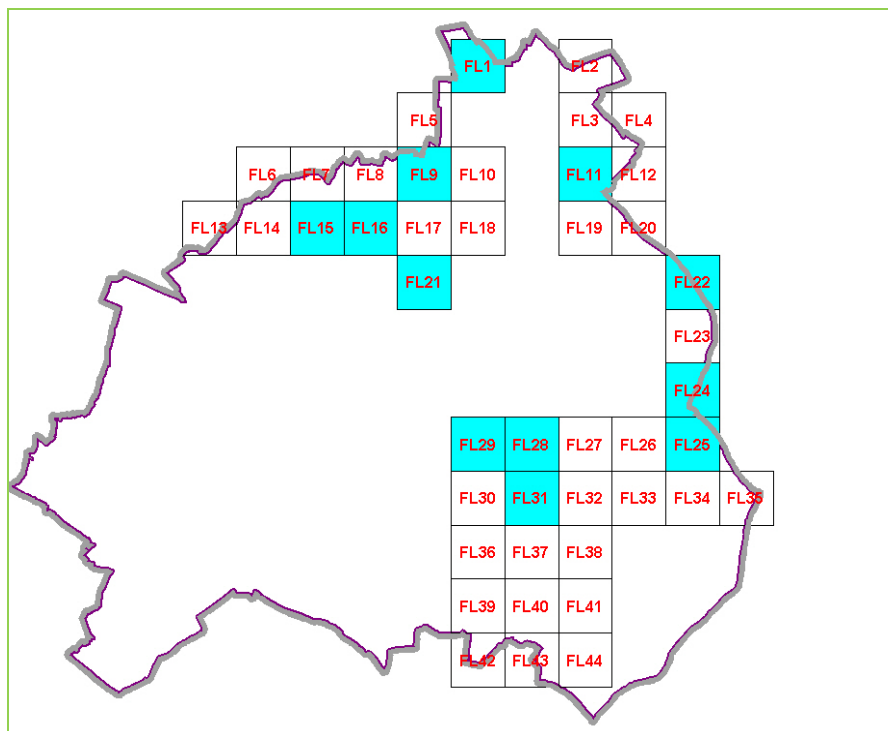
7.2 Amendments

The following additional blue squares as shown in Table 7-1 and Figure 7-1 have been identified and agreed with the EA. The new blue squares have been included in Annex C.

Table 7-1 Proposed blue squares

Reference Number	Criteria
FL1	A roads
FL9	A roads
FL11	A roads
FL15	Primary School, Electrical substation, A roads
FL16	A roads
FL21	Electrical sub station
FL22	A roads
FL24	A roads
FL25	A roads
FL28	A roads
FL29	A roads
FL31	SSSI

Figure 7-1 Proposed blue square distribution



7.3 West Midlands Flood Risk Area

Walsall Council has proposed to the Environment Agency that the Flood Risk Area for the West Midlands is amended to reflect the additional blue squares.

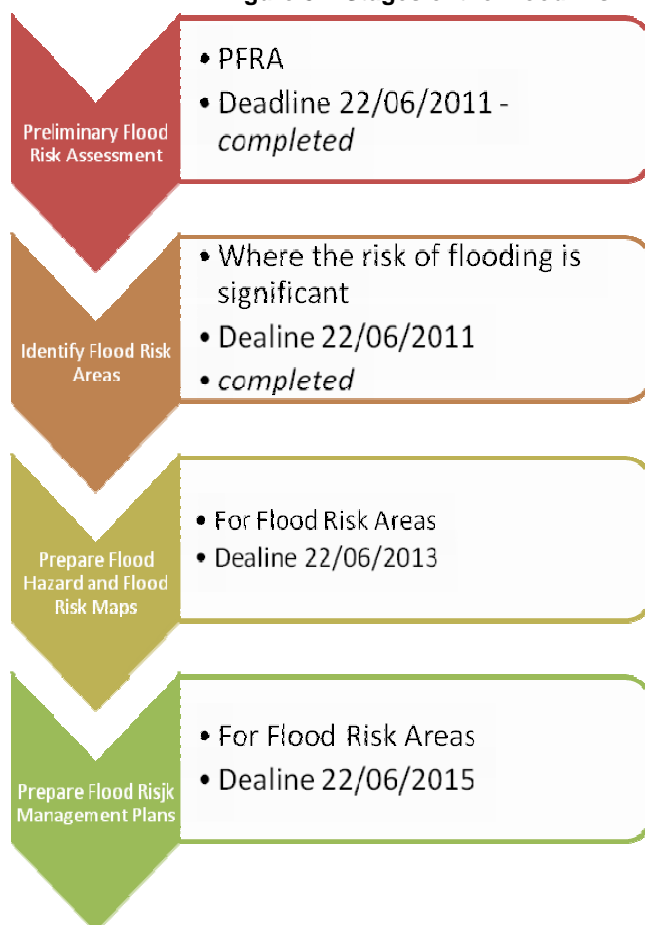
8. Next Steps

8.1 Flood Risk Regulations

The Flood Risk Regulations 2009 (the Regulations) implement the requirements of the European Floods Directive. The aim of the Directive is to provide a consistent approach to managing flood risk across Europe. It establishes four stages of activity within a six year flood risk management cycle. Figure 8-1 shows the stages of the cycle, the products required and the timescale for LLFA delivery.

Walsall Council will continue to support the Flood Risk Regulations through the six year cycle.

Figure 8-1 Stages of the Flood Risk Regulations



8.2 Continuation of collection and assessment of flood risk data

In order to continue to fulfil their role as Local Lead Flood Authority, Walsall Council are required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information. A central flood data collection spreadsheet will be created and updated with each flood event.



9. References

- The Black Country Strategic Flood Risk Assessment (SFRA), February 2009 (Final)
- Black Country Water Cycle Study and Scoping Surface Water Management Plan (Final Report – Sept 2009).
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- Essex County Council Preliminary Flood Risk Assessment (Final Report January 2011)
- Flood Risk Regulations (2009),
<http://www.legislation.gov.uk/uksi/2009/3042/contents/made>
- Walsall Partnership Report,
http://www.walsallpartnership.org.uk/scs_final_to_print_25_06_08-3.pdf
- Walsall MBC Daw End Mines Treatment Feasibility Study (September 2004)



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Annex

1. Annex Records of past floods and their significant consequences

Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report.

2. Records of future floods and their consequences

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

3. Records of Flood Risk Areas and their rationale

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

4. Review checklist

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

5. GIS layer of flood risk areas

Please see enclosed CD.

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