



Southern Staffordshire Surface Water Management Plan

Phase 1 Addendum

Stafford Borough, Lichfield District, Tamworth
Borough, South Staffordshire District and Cannock
Chase District Councils

April 2011

Final Report

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EXECUTIVE SUMMARY

In November 2009 Royal Haskoning was appointed to produce a Phase 1 and Phase 2 Surface Water Management Plan (SWMP) and a Phase 1 and Phase 2: Scoping and Outline Stage Water Cycle Study (WCS). The Phase 1 SWMP and WCS was finalised in July 2010 and the draft Phase 2 SWMP reports submitted in March 2011. However, during the course of this project Staffordshire County Council, as part of its new responsibilities as Lead Local Flood Authority, completed a Preliminary Flood Risk Assessment (PFRA) report for the County. The PFRA process required a major review of all sources of historical and future flooding which included the provision of new datasets provided by the Environment Agency. As a result, some of the information included within the original Final Phase 1 SWMP has been superseded. The aim of this Addendum is therefore to bring the PFRA and SWMP in line with each other. It introduces the PFRA report and outlines the updated data and impact of this data upon the Phase 2 SWMP assessment.

The Partnership formed between various organisations within the Phase 1 SWMP has now been extended to include the additional organisations contacted during the PFRA process. This has resulted in significant additional historic flooding information being made available and this data has been collated by Staffordshire County Council and centralised into a single spreadsheet. New symbology has been assigned to the updated historical flood records to reflect the source of the data, the frequency of the flooding and the impact of the flooding on properties. The future flooding information, provided by the Environment Agency at the time the Phase 1 SWMP was written, has also been refined through new modelling and remapped. It also been analysed on a national scale to provide 1km² 'risk areas' and 3km² 'clusters' of surface water flood risk. With regards to the assessment of the potential impacts of future flooding on property and infrastructure the property dataset originally used within the Phase 1 SWMP (the National Property Dataset, NPD) has been replaced by a National Receptor Database (NRD)¹, produced by the Environment Agency, and critical infrastructure locations held by Staffordshire County Council. All of the above information has been utilised within the Staffordshire PFRA and Phase 2 SWMP, and this Addendum introduces the detail of the information used within the context of the Phase 1 SWMP.

Summary figures and text are provided for each Local Authority area, providing a brief review of the new data. Although additional information is provided, no significant new flood risk areas are identified. All the conclusions and recommendations within the Phase 1 SWMP are still considered valid and are not to be rejected as a result of this addendum.

¹ The NRD is a spatial dataset which contains a number of GIS layers categorised into themes of information including buildings, environment, heritage, transport, utilities.

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GLOSSARY

Environment Agency	Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales.
Flood	The temporary covering by water of land not normally covered with water.
Flood probability	The estimated likelihood of a flood of a given magnitude occurring or being exceeded in any specified time period.
Flood Map for Surface Water	Second edition national surface water flood mapping produced by the Environment Agency.
Flood risk	An expression of the combination of the flood probability and the magnitude of the potential consequences of the flood event.
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG.
Flood Risk Threshold	1km national grid squares created through an overlay of the FMfSW and the NRD that exceed a threshold determined by the Environment Agency.
Indicative Flood Risk Area	Areas determined by the Environment Agency as indicatively having a significant flood risk, based on guidance published by Defra and WAG and the use of certain national datasets. These indicative areas are intended to provide a starting point for the determination of Flood Risk Areas by LLFAs.
Lead Local Flood Authority	Unitary Authorities or County Councils which issue Local Flood Risk Management Strategies for surface water run-off, groundwater and non-main rivers and have powers to carry out works for the management of surface water run-off and groundwater.
Local Authority	Administrative authorities (Districts and Boroughs) that operate in a two tier local government system under the County Councils.
Local Flood Risk	Flood risk from sources other than main river, the sea and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses.
Main River	A watercourse shown as such on a Main River Map, and for which the Environment Agency has responsibilities and powers.

National Property Dataset	Database listing the location and details of residential and commercial properties produced by the Environment Agency.
National Receptor Database	A collection of risk receptors produced by the Environment Agency.
Ordinary Watercourses	All watercourses that are no designated Main River and which are the responsibility of Local Authorities or where they exist, Internal Drainage Boards.
Preliminary assessment report (PFRA)	A high level summary of significant flood risk, based on available and readily derivable information, describing both the probability and harmful consequences of past and future flooding.
Preliminary assessment spreadsheet (PFRA)	Reporting spreadsheet which LLFAs need to complete. The spreadsheet will form the basis of the Environment Agency's reporting to the European Commission.
Receptor	Something that may be harmed by flooding.
Regulations	The Flood Risk Regulations 2009
Risk	Measures the significance of a potential event in terms of likelihood and impact.
River basin district	There are 11 river basin districts in England and Wales, each comprising a number of contiguous river basins and catchments. The Environment Agency is responsible for collating LLFA reports at a river basin district level.
Runoff	Water flow over the ground surface to the drainage system.
Source	The origin of a hazard (e.g. heavy rainfall, strong winds, surge etc).
Surface runoff	Rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving) and has not entered a watercourse, drainage system or public sewer.

ABBREVIATIONS

AStSWF	Areas Susceptible to Surface Water Flooding
CFMP	Catchment Flood Management
Defra	Department for Environment, Flood and Rural Affairs
FMfSW	Flood Map for Surface Water
FWMA	Floods and Water Management Act
GIS	Geographical Information Systems
LLFA	Lead Local Flood Authority
NPD	National Property Dataset
NRD	National Receptor Database
PFRA	Preliminary Flood Risk Assessment
SSSI	Sites of Special Scientific Interest
STWL	Severn Trent Water Limited
SWMP	Surface Water Management Plan
WAG	Welsh Assembly Government
WCS	Water Cycle Study



1 INTRODUCTION

1.1 General Overview

In November 2009 Royal Haskoning was appointed by Stafford Borough, Lichfield District, Tamworth Borough, South Staffordshire District and Cannock Chase District Councils (hereafter “the Councils”) to produce a Phase 1 and Phase 2 Surface Water Management Plan (SWMP) and a Phase 1 and Phase 2: Scoping and Outline Stage Water Cycle Study (WCS). The Phase 1 SWMP and WCS was finalised in July 2010 and the draft Phase 2 SWMP reports submitted in March 2011.

However, during the course of this project Staffordshire County Council has been assigned Lead Local Flood Authority (LLFA) status for Staffordshire and, as part of their new responsibilities, completed a Preliminary Flood Risk Assessment (PFRA) report for the County. As a result of the PFRA, some of the historical and future flooding information included within the Final Phase 1 SWMP has been superseded. This Addendum introduces the PFRA report and outlines the updated data and impact of this data upon the Phase 2 SWMP assessment.

1.2 Staffordshire County PFRA

The Flood Risk Regulations 2009 came into force on 10th December 2009 (the aim of which is to provide a consistent approach to managing flood risk across Europe) and the Floods and Water Management Act (FWMA) gained Royal Assent on the 8th April 2010. The Regulations implement the European Floods Directive in England and Wales and, inline with the FWMA, place responsibility upon all LLFAs² to manage local flood risk. The sources of flooding for which the LLFA responsibilities extend are outlined in **Table 1.1** below:

Table 1.1 - Sources of Flooding

Source of Flooding	Responsible Organisation	
	Lead Local Flood Authority	Environment Agency
Ordinary Watercourses	✓	
Surface Runoff (from rain or snowmelt)	✓	
Groundwater	✓	
Artificial Water Bearing Infrastructure*	✓	
Main Rivers	<i>Interactions with sources above only</i>	✓
The Sea	<i>Not applicable to Staffordshire</i>	✓
Reservoirs	<i>Interactions with sources above only</i>	✓

* includes canals, highways drains, water supply systems and sewers (where flooding is wholly or partially caused by rainwater or other precipitation entering or affecting the system)

One of the responsibilities which has been placed on LLFAs is the completion of a PFRA as part of a six year cycle of flood risk management, for the sources of flood risk for which they are responsible. The aim of the process is to provide an assessment of local flood risk (both historical and future) and the consequence of flooding across the

² Defined within England as the Unitary Authority or County Council

study area, enabling the identification of Flood Risk Areas. The objectives of the process are to:

- prompt LLFAs to act upon their legislative requirements;
- instigate partnership relationships;
- source flood risk information relevant to their area;
- formulate an action plan to enable completion of the flood risk management cycle (and its subsequent reviews); and
- develop an efficient method of recording future flood events and their impacts.

The PFRA for Staffordshire has been completed by Royal Haskoning and the draft report submitted in March 2011³. It is due for submission to the Environment Agency in June 2011.

1.3 Impact of PFRA on SWMP

A number of the PFRA objectives listed above overlap with the scope of the Southern Staffordshire SWMP, namely:

1. The instigation of partnership relationships (Phase 1 SWMP);
2. Sourcing of historical and future flood risk information (Phase 1 SWMP); and
3. Assessment of the potential impacts of future flood events (Phase 2 SWMP).

This addendum introduces the methodology utilised within the PFRA to meet these objectives, the new data sourced and the impacts of this data upon the existing SWMP reports.

³ Staffordshire Preliminary Flood Risk Assessment, Draft Report, Royal Haskoning, March 2011

2 ESTABLISHING A PARTNERSHIP

2.1 Phase 1 SWMP

At the start of the SWMP a partnership was identified and instigated between the following three groups of consultees:

1. Core Steering Group (Partners)

- Local Councils (Stafford Borough, Lichfield District, Tamworth Borough, South Staffordshire District and Cannock Chase District);
- Staffordshire County Council
- Royal Haskoning;
- The Environment Agency; and
- Water Companies (Severn Trent Water Limited and South Staffordshire Water).

2. Additional Data Providers / Key Consultees (mix of Partners and Stakeholders)

- Natural England
- British Waterways
- Environmental Groups
- Internal Drainage Boards
- Public Flood Risk Forums
- Lichfield and Hatherton Canal Restoration Trust

3. Other Stakeholders (Stakeholders)

- Public
- Riparian Owners
- Developers

Within the Phase 1 SWMP, the partners were identified as having responsibility for the decisions or actions, whereas stakeholders were identified as being affected by the problem or solution. The interconnections between these three groups is illustrated in **Figure 2.1** and their various roles and responsibilities are defined in **Table 2.1**.

Figure 2.1 - Phase 1 SWMP Partner Relationship Diagram

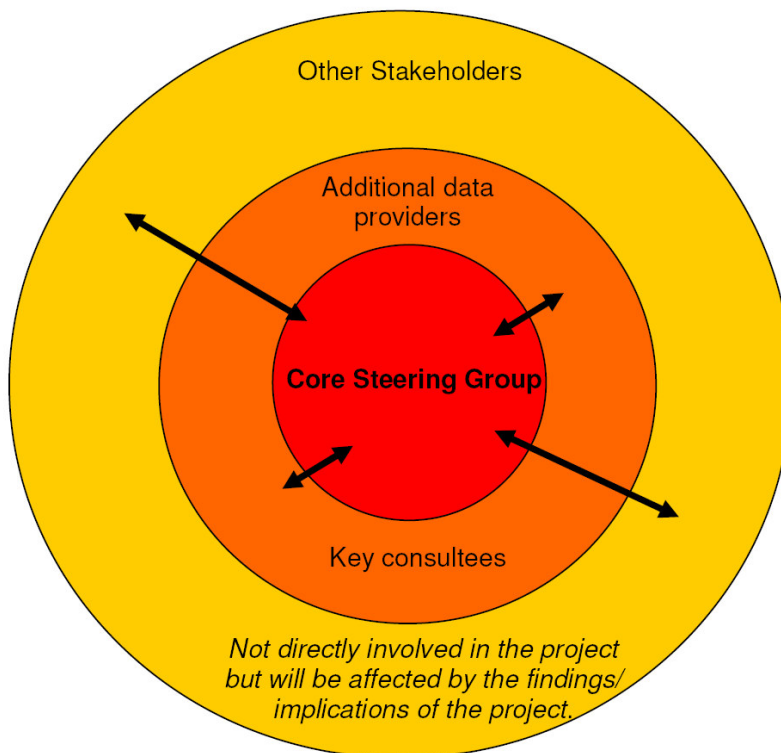


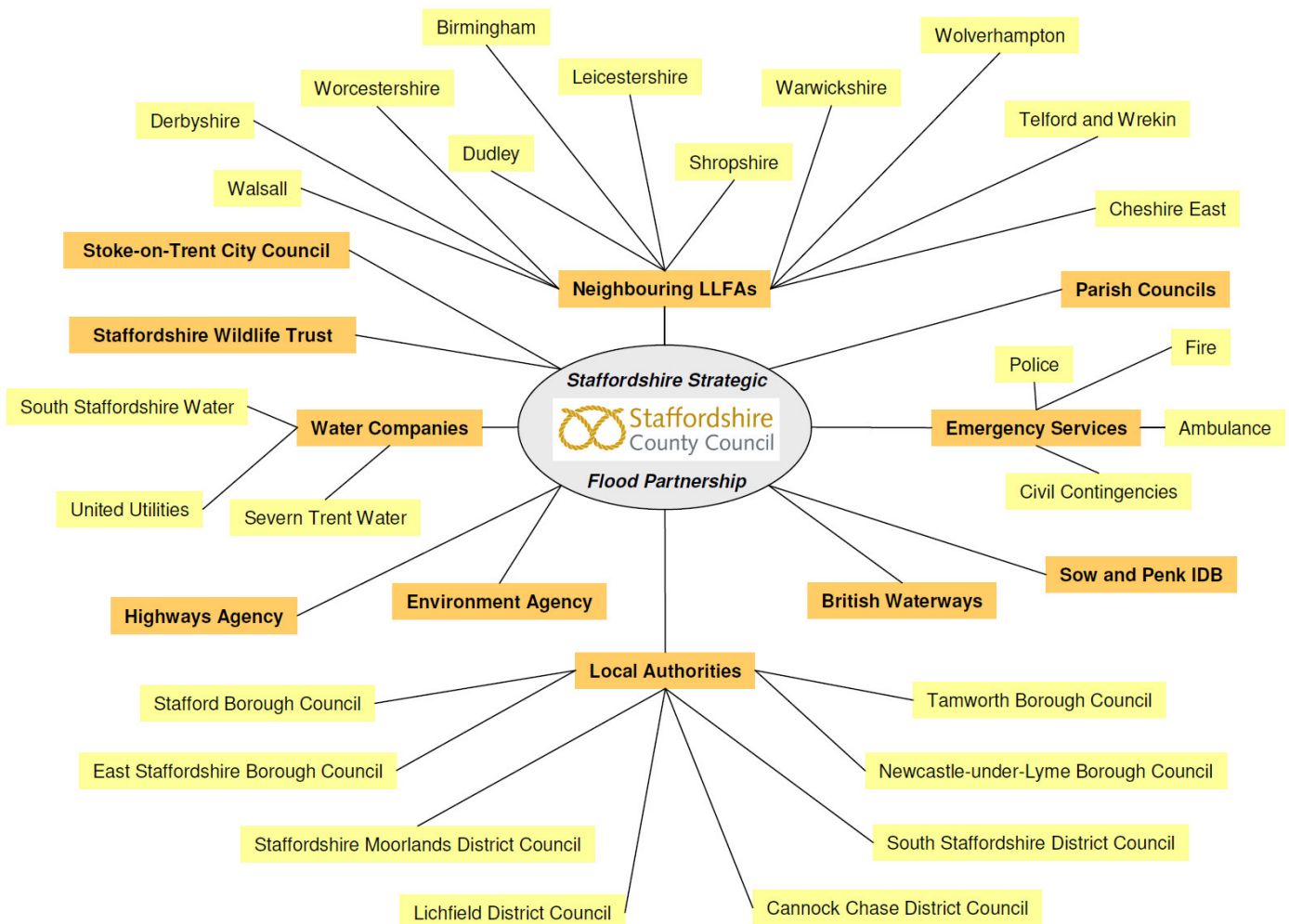
Table 2.1 - Phase 1 SWMP Roles and Responsibilities of Core Steering Group

Member	Engagement with....	Role/Method
Councils	Coordination of other Steering Group members	Throughout project life and beyond
	Additional data providers	Assisting RH with data collection
	Other Stakeholders	Meetings/Workshops/Presentations
		Day to day communication
Royal Haskoning	Rest of Steering Group	Implementation of development
		Data requests/queries Steering Group progress meetings Presentation
	Additional data providers	Telephone/Email/Meetings
Environment Agency	Steering Group	Provision of data
	Other Stakeholders	Either directly through day to day responsibilities or to assist the Council in dissemination of findings
Severn Trent Water	Steering Group	Provision of data
	Other Stakeholders	Either directly through day to day responsibilities or to assist the Council in dissemination of findings
South Staffordshire Water	Steering Group	Provision of data
	Other Stakeholders	Either directly through day to day responsibilities or to assist the Council in dissemination of findings

2.2 PFRA Update

As part of the PFRA, Staffordshire County Council was required to set up governance arrangements and develop partnerships for the management of flood risk on a local scale and to instigate the collection of historic flood risk information. To achieve this the County Council have strengthened existing links formed through the Staffordshire Strategic Flood Partnership and as part of the Phase 1 SWMP. However, they have also formed many new partnerships, most notably with the Parish Councils, which have extended the relationships utilised within the Phase 1 SWMP. The extent of Staffordshire County Council's new network is illustrated below:

Figure 2.2 - Staffordshire County Council Partnership Arrangements



3 COLLATE AND MAP INFORMATION

3.1 Data Collection and Quality

The PFRA report is a high level screening exercise that has been based solely on existing data available within the timeframe of the study. As such, Staffordshire County Council have researched and collected historic and future flood risk information from all the sources shown in **Figure 2.2**. Although this has included all the information presented within the Phase 1 and Phase 2 SWMPs, in some cases this has been superseded by, or updated with, new or more accurate information. This section introduces the data collected and where it replaces that included within the SWMP.

All information collected as part of the PFRA was assessed for quality using the same Multi Coloured Manual data quality assessment method introduced within Section 3.1 of the Phase 1 SWMP⁴.

3.2 Historic Flood Event Data

3.2.1 Data Collection

Existing datasets, reports and anecdotal information were collected from the partners shown in **Figure 2.2** to obtain as much information on past events as available. The data was collected in a variety of formats, including GIS shapefiles, hard copy documents and maps, as summarised in **Table 3.1** below.

Table 3.1 - Sources of Information on Past Floods used Within the PFRA

Source	Dataset	Description
Environment Agency	Historic Flood Map	GIS flood extent for historic floods, mainly Main River flooding.
	Catchment Flood Management Plans (CFMPs)	Reports to plan and agree management of future flood risk. Includes historic reports of flooding from all sources.
	Sandyford Brook Scoping Document	Part of a project to investigate potential options to reduce flooding from the Sandyford Brook - includes a summary of historical flood events.
	Rainfall Data	Rain gauge information for key flood events.
Staffordshire County Council	Historic Flooding Records	Historic flooding records from all sources.
	Anecdotal Information	Anecdotal information from Council officers for all sources of flooding (mainly related to more recent flood events)
	Highways Flooding Reports	Historic highways flooding records.
	Emergency Helpline Records	Records from telephone calls to the emergency helpline during flood events.

⁴ The Benefits of Flood and Coastal Risk Management: A Manual of Assessment Techniques, Flood Hazard Research Centre, 2005

Source	Dataset	Description
Staffordshire Civil Contingencies	Staffordshire Emergency Flood Plan Staffordshire Resilience Forum Report - Flood Events – June & July 2007	Multi agency strategy to prepare for, respond to and recover from the risk of flooding in Staffordshire.
Local Authorities (District and Borough Councils)	Strategic Flood Risk Assessments	Contain information on historical flooding from all sources.
	Historic Flooding Records	Records of flooding from all sources
	Flood Event Photographs	Photographs taken by Council officials or members of the public during flood events.
	Southern Staffordshire Surface Water Management Plan (SWMP)	Assessment of surface water flood risk and identification of key surface water hot spot areas.
	Anecdotal Information	Anecdotal information from Council officers for all sources of flooding (mainly related to more recent flood events)
	Flood Plan	Strategy to prepare for, respond to and recover from the risk of flooding in the District/Borough.
Parish Councils	Flood Survey Questionnaires	Questionnaires sent by Staffordshire County Council during the preparation of the PFRA.
British Waterways	Historic Breach Locations	GIS locations for historic canal breach locations, including date.
	Historic Overtopping Locations	GIS locations for historic canal overtopping locations, including date.
United Utilities and Severn Trent Water	DG5 Register	Register log of sewer flooding incidents in each area. Includes repeat occurrences and sewer type.
Highways Agency	Flooding Records	Records of highways flooding. No records available at time of request.
Internet	News Reports	Additional records of large flood events, often containing date, location and consequences.

To centralise the collation of data from numerous sources, Staffordshire County Council has developed a spreadsheet to capture the following key attributes regarding historic floods:

- Source of data;
- Location of flood;
- Time and date of flood;
- Duration of flood;
- General comments;
- Origin of floodwater;
- Details of flow pathway (if known);
- Location of photo records or event plan;
- Extent of flooding - properties;
- Extent of flooding - highway/rail; and
- Immediate actions and required actions

The data collected was then analysed using a combination of Excel data interrogation and GIS mapping. Much of the information was collected as part of the Phase 1 SWMP but has been updated as part of the PFRA process, which has also included a more thorough check for duplications.

Within the PFRA the historic information was used to map the locations, frequency and property impact of historic flooding on a County-wide scale. It was also used to identify the key flood events that have affected Staffordshire, determining which have resulted in significant harmful consequences. The spreadsheet used as part of the process will be kept as a 'live' document (possibly in the form of a database or GIS application) that will be updated following every future flood event (another requirement of the LLFAs under the FWMA).

As a result of the recent date of collection, the number of partners approached and the level of information recorded, the historic flood risk data collected as part of the PFRA process and held by Staffordshire County Council supersedes that included within the Phase 1 SWMP and should be considered the most comprehensive historic dataset within Staffordshire.

3.2.2 Data Mapping

Similarly to the Phase 1 SWMP, the historic data collected as part of the PFRA has been mapped to illustrate its source and frequency, as well as the impact of the flooding upon residential properties. However, to avoid causing confusion between the source of flooding and receptors of flooding, source within the PFRA has been classified by source of data (i.e. the organisation providing the data record) rather than source of the water. Additional information regarding the source of the water is held in the database behind the GIS. **Table 3.2** below summarises the symbology used, which has also been carried forward into the Phase 2 SWMP mapping. The sewer postcode data, used in the Phase 1 SWMP, has been superseded by more recent information provided by Severn Trent Water Limited (STWL) and has now been removed from the mapping.

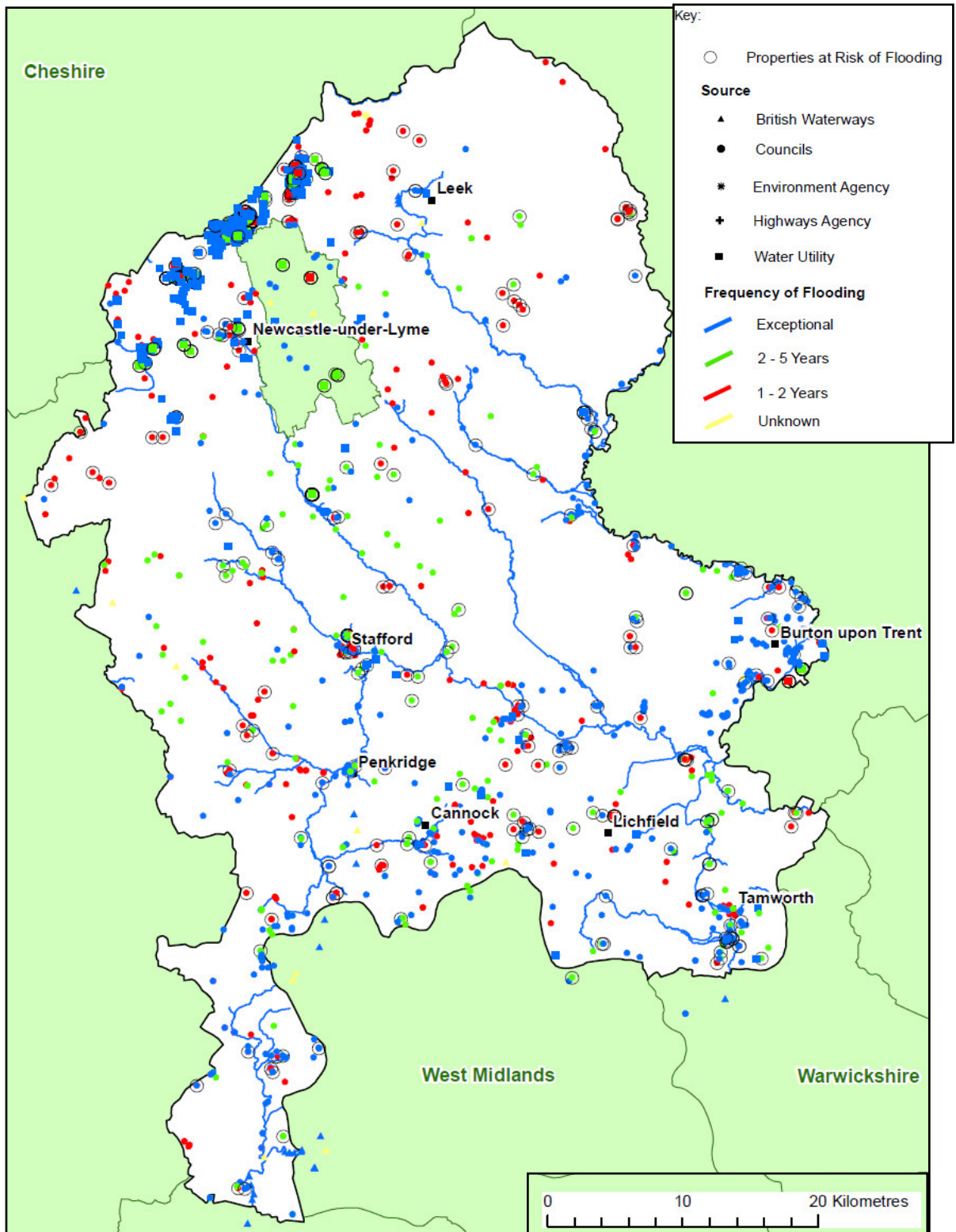
Table 3.2 - Symbology of Past Flooding

Source of Flood Record		
Organisation	Property Flooding	Symbol
Local Authority	Yes	⊙
	No/Not Recorded	○
Water Company	Yes	⊠
	No/ Not Recorded	□
British Waterways	Yes	△
	No/Not Recorded	△
Highways Agency	Yes	⊕
	No/Not Recorded	⊕
Environment Agency	Yes	⊗
	No/Not Recorded	⊗

Frequency of Flooding	
Regularity of Repeat Events	Colour
Unknown	○
Every 1 - 2 years	●
Every 2 - 5 years	●
Exceptional (> every 5 years)	●

A map showing the locations of historic flooding across Staffordshire (as presented in the Staffordshire PFRA) is included in **Figure 3.1** below, illustrating the updated symbology and distribution of the new historic flood locations across the study area, and beyond.

Figure 3.1 - Location, Source and Frequency of Past Flooding Records in Staffordshire⁵



⁵ Taken from Staffordshire PFRA, March 2011

3.3 Future Flood Risk Data

3.3.1 Surface Water Flood Map

The Phase 1 SWMP introduced three main sources of future flood risk information, one of which was the Environment Agency's 'Surface Water Flood Map'. The flood map utilised within that study was the Areas Susceptible to Surface Water Flooding (AStSWF), the Environment Agency's first edition mapping.

Following completion of the Phase 1 SWMP, the Environment Agency released their second edition mapping, Flood Map for Surface Water (FMfSW). Although still produced on a national scale, the FMfSW is more detailed than the AStSWF, containing more storm events, a representation of the influence of buildings and a representation of the influence of infiltration and the sewer system (simulated through a reduction in rainfall over urban areas).

As such, the FMfSW further defines the potential surface water flow routes than those illustrated within the AStSWF maps. Within the PFRA, it was considered to more suitably represent the risk of surface water flooding within Staffordshire than the AStSWF and has been designated as a major element of the County's 'Locally Agreed Surface Water Information'⁶. It has been produced for the 1 in 30 (3.33%) and 1 in 200 (0.5%) chance of occurring in any year and for two depths for each - greater than 0.1m and greater than 0.3m (deep).

3.3.2 Property and Infrastructure

Within the Phase 1 SWMP, the National Property Dataset (NPD) was used to determine the number of properties located within the future surface water flood extent. This dataset has now been replaced by the National Receptor Database (NRD), which is supplemented by critical infrastructure locations held by Staffordshire County Council. Due to the similarities between the datasets it was not considered necessary to re-calculate the property numbers used within the 'flag' classifications within the Phase 1 SWMP. However, the new datasets have been used in preference to the NPD in all new calculations, including the PFRA and Phase 2 SWMP. The final Lichfield Phase 2 SWMP and draft Penkrige Phase 2 SWMPs (both submitted prior to completion of the PFRA) have been updated and resubmitted accordingly.

3.3.3 Additional Surface Water Flood Risk Information

In addition to the FMfSW, the Environment Agency have provided the LLFAs with some high level surface water analysis maps, summarising surface water flood risk and the NRD, for use in the PFRA. Although only available at a large scale, some of this information is relevant to this SWMP and may be of use to the Local Authorities.

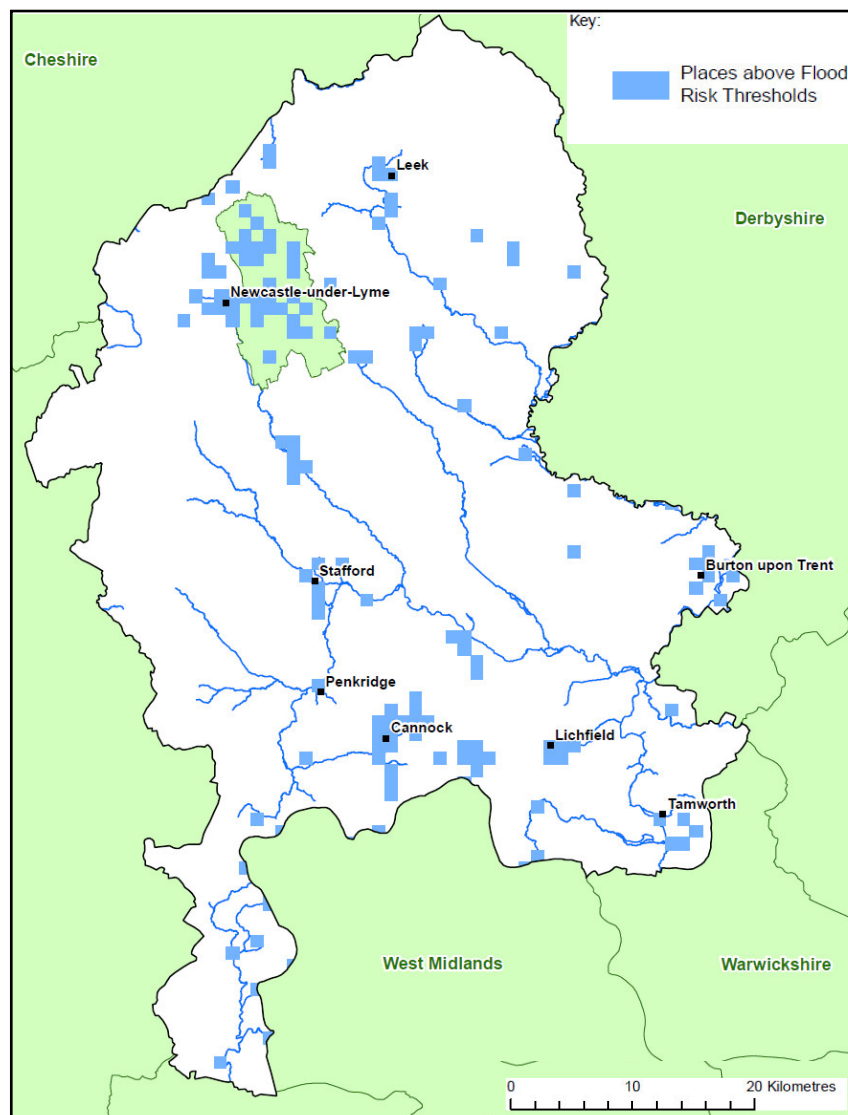
⁶ See Section 5.3 of the Staffordshire Preliminary Flood Risk Assessment, Draft Report, Royal Haskoning, March 2011.

The Environment Agency have used the FMfSW mapping (representing the 1 in 200 year rainfall event and water depths of greater than 0.3m)⁷ and the NRD⁷ to identify a number of 1km² national grid squares across the Country that exceed the following threshold:

1. 200 people at risk of flooding *or*
2. 20 businesses at risk of flooding *or*
3. 1 critical service at risk of flooding

The grid squares in Staffordshire that exceed this threshold are illustrated in **Figure 3.2** and are identified as the areas where flood risk, based upon the FMfSW, is considered to be the most severe across Staffordshire.

Figure 3.2 - Floods Over Threshold⁸

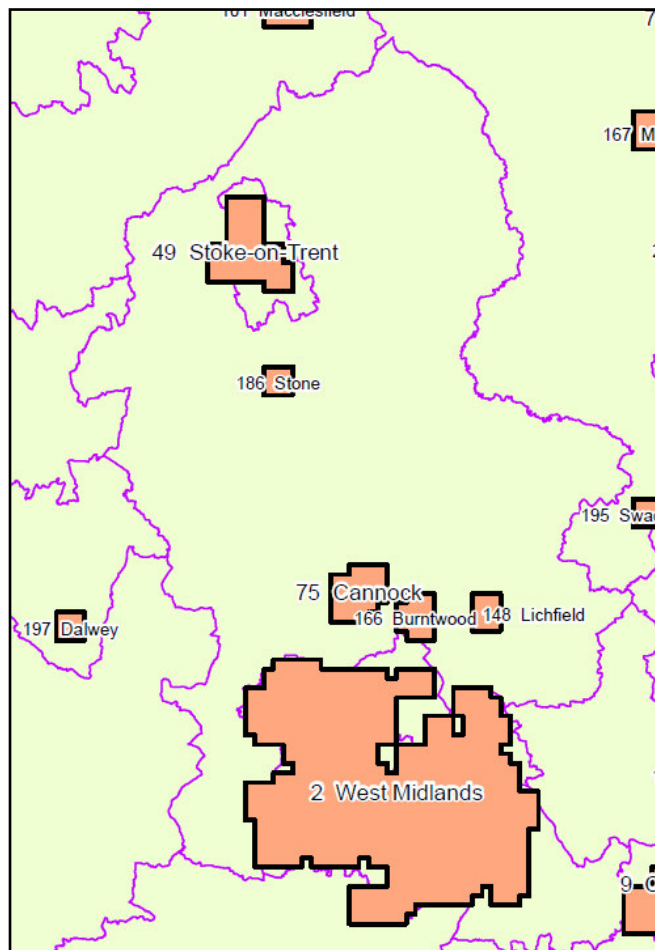


⁷ Version 1.0. Please note that this has since been updated and Version 1.1 utilised within the Phase 2 SWMP and the PFRA analysis carried out by Royal Haskoning.

⁸ Taken from Staffordshire PFRA, March 2011

Where the 1km blue squares have been identified as forming a 3km² cluster, the grouping has been identified and ranked, nationally, in terms of the number of people at risk (1 = highest number of people at risk; to 219 = the lowest number of people at risk), as illustrated in **Figure 3.3** below. Within southern Staffordshire these have been identified as the settlements of Stone, Cannock, Burntwood and Lichfield.

Figure 3.3 - Clusters of Places Above Flood Risk Thresholds⁹



In addition, the Environment Agency provided a list of key environmental and culturally significant sites at risk of flooding from surface water. The relevant sites within southern Staffordshire are summarised in Section 4 below.

⁹ Taken from Staffordshire PFRA, March 2011

3.4 Mapping and GIS

Due to the continuation of the PFRA process and requirement of the LLFA to constantly update their records of historic and future flood risk information, as new information becomes available, it has been agreed that the mapping produced within the Phase 1 SWMP would not be updated as part of this addendum, although summary screen shots are provided in Section 4 below. Instead the most recent data sets should be requested from the County Council when, and if, required.

However, the historic flood risk information and FMfSW outlines have been included with the Phase 2 SWMP mapping and the Local Authorities will be provided with the updated GIS files for their entire District/Borough by the County Council. The NRD, critical infrastructure and FMfSW have been used for the model analysis within the Phase 2 SWMPs. *Please note, due to the timings of the release of the Phase 2 SWMPs and the PFRA, both the Final Lichfield Phase 2 SWMP and the draft Penkridge Phase 2 SWMP were updated to incorporate the new flood risk information, thus bringing all Phase 2 SWMP reports inline with the PFRA.*

4 LOCAL AUTHORITY DATA COMPARISONS

4.1 Introduction

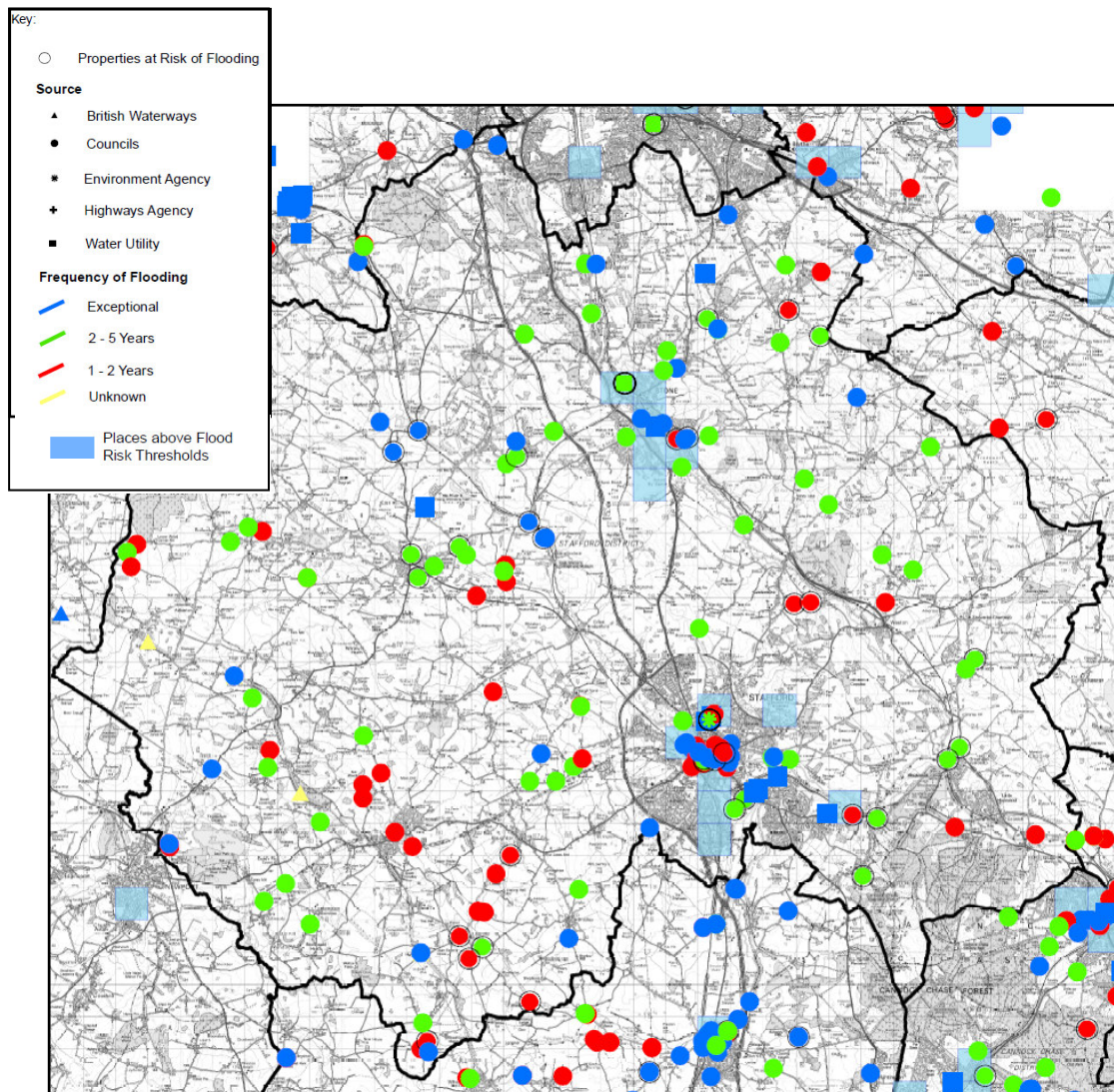
It was not considered appropriate as part of this addendum to recalculate the settlement specific summary sheets included within the Phase 1 SWMP to reflect the data updates introduced above. Although the changes to data sources will result in some differences to both the mapping and settlement specific conclusions, they are not considered to be significant enough to warrant re-evaluation. It must be noted, however, that if the summary sheets are used for any planning or decision making purposes, the results of the PFRA and Phase 2 SWMPs must be consulted. The Local Authorities are encouraged to update their GIS databases accordingly and maintain regular contact with the LLFA to provide any new flood risk information they hold and to receive the most up to date flood risk database.

Sections 4.2 - 4.6 below briefly summarise the impacts of the updated historical and future flooding information within each of the Local Authority areas. *Please note that all the conclusions and recommendations within Sections 4-8 of the Phase 1 SWMP are still considered valid and should not be rejected as a result of this addendum.*

4.2 Stafford Borough

Figure 4.1 summarises the current historic flood risk data points and the ‘flood risk over threshold’ information for Stafford Borough (please note that information collected regarding the impacts of the flood events on residential properties is very limited - refer to the PFRA for further information).

Figure 4.1 - Updated Historic and Future Surface Water Flood Information for Stafford Borough



4.2.1 Historic Flooding

As stated within the Phase 1 SWMP there are fairly large number of historic surface water flood occurrences across the Borough. Most of these have been obtained from Local Authority sources and have a recurrence of 2-5years. A number of water authority sewer flooding events are included within the record, as are two occurrences of canal overtopping. Clusters of historic flood events are most notable over the towns of

Stafford and Stone, including a number of high frequency events and those which have resulted in the flooding of residential properties. Eccleshall is also identified as having a high number of flood records within the vicinity and Gnosall, along with much of southeast Stafford Borough, as having a number of high frequency flood events (recurring every 1-2years).

4.2.2 Future Flooding

The results of the Environment Agency's Floods Above Threshold analysis identifies the towns of Stone and Stafford as having a number of 1km 'blue squares' (i.e. 200 people at risk of flooding *or* 20 businesses at risk of flooding *or* 1 critical service at risk of flooding). Stone has been identified within the national 'cluster analysis' with a rank of 186 out of 219. A summary of the information provided within the PFRA for this cluster is given below:

Table 4.1 - Summary of the Flood Risk Indicators for Stone

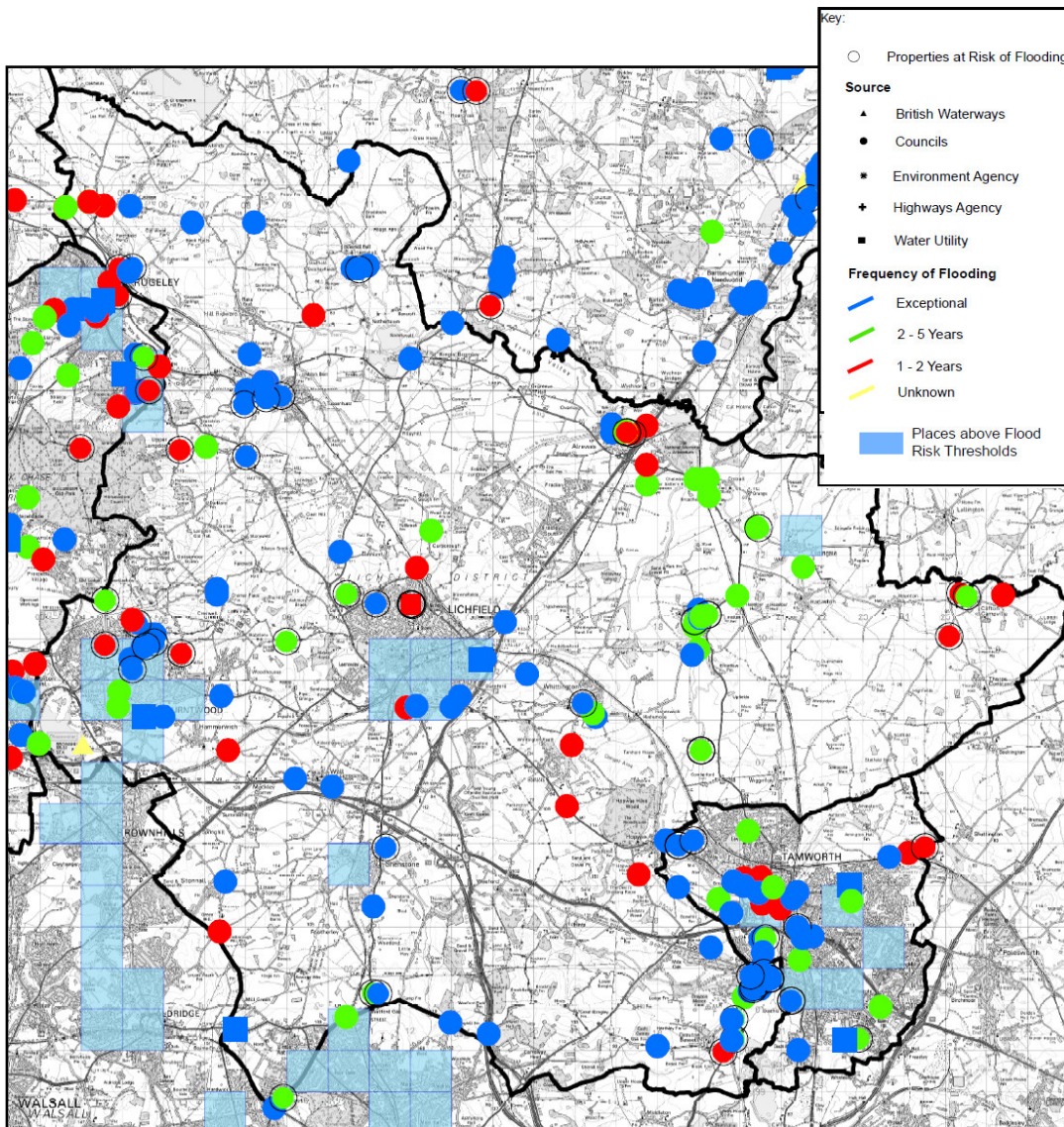
Flood Risk Indicator	Result
Rank (out of 219)	186
National Grid Reference	SJ9050033500
Area	900ha
Number of Residential Properties at Risk	<i>Not provided</i>
Number of People at Risk	<i>Not provided</i>
Number of Critical Services at Risk	<i>Not provided</i>
Number of Non Residential Properties at Risk	<i>Not provided</i>
Length of Road or Rail at Risk from Surface Runoff	4.9km
Area of Agricultural Land at Risk from Surface Runoff	22.8ha
Number of PPC sites potentially at risk from surface runoff.	0
Number of Listed Buildings (all grades) at risk from Surface Runoff	7
Number of Listed Buildings (Grades I and II*) at risk from Surface Runoff	0
Number of Scheduled Ancient Monuments at risk from Surface Runoff	0
Mean Potential for Groundwater Flooding over Cluster	45.8%
Area of Cluster with > 75% Ground-water Flooding Potential	200ha
Area of Cluster with > 50% Ground-water Flooding Potential	400ha
Area of Cluster with > 25% Ground-water Flooding Potential	600ha

In addition, the Environment Agency's assessment information, utilised within the PFRA, identified that the West Midlands Mosses SSSI and Pasturefields Salt Marsh SSSI are also at risk of surface water flooding.

4.3 Lichfield District

Figure 4.2 summarises the current historic flood risk data points and the ‘flood risk over threshold’ information for Lichfield District (please note that information collected regarding the impacts of the flood events on residential properties is very limited - refer to the PFRA for further information).

Figure 4.2 - Updated Historic and Future Surface Water Flood Information for Lichfield District



4.3.1 Historic Flooding

Historical surface water flooding occurrences are spread across Lichfield District, with most recorded from Local Authority sources. The more regularly occurring events are constrained within the middle swathe of the District, with a number impacting upon properties. Clusters of historic flooding points are notable within the settlements of

Burntwood, Lichfield, Armitage/Handsacre and Alrewas (although the latter is largely attributable to fluvial rather than surface water flooding). With the exception of Armitage/Handsacre all of these settlements have a number high frequency flood events (recurring every 1-2 years).

4.3.2 Future Flooding

The results of the Environment Agency's Floods Above Threshold analysis identifies the town of Burntwood and city of Lichfield as key risk areas, in addition to the villages of Edingale, Shenstone and Little Aston. Lichfield and Burntwood have been identified within the national 'cluster analysis' with ranks of 148 and 166 out of 219, respectively. The summary of the information provided for these clusters within the PFRA is given in **Table 4.2** below. Parts of the village of Little Aston form part of the Birmingham conurbation cluster, ranked as 2 out of 219 and therefore classed as a national 'Indicative Flood Risk Area'¹⁰.

Table 4.2 - Summary of the Flood Risk Indicators for Buntwood and Lichfield

Flood Risk Indicator	Burntwood	Lichfield
Rank (out of 219)	166	148
National Grid Reference	SK0516708500	SK1250009000
Area	1800ha	1200ha
Number of Residential Properties at Risk	<i>Not provided</i>	<i>Not provided</i>
Number of People at Risk	<i>Not provided</i>	<i>Not provided</i>
Number of Critical Services at Risk	<i>Not provided</i>	<i>Not provided</i>
Number of Non Residential Properties at Risk	<i>Not provided</i>	<i>Not provided</i>
Length of Road or Rail at Risk from Surface Runoff	5.5km	3.9km
Area of Agricultural Land at Risk from Surface Runoff	32.4ha	19.8ha
Number of PPC sites potentially at risk from surface runoff.	1	0
Number of Listed Buildings (all grades) at risk from Surface Runoff	0	19
Number of Listed Buildings (Grades I and II*) at risk from Surface Runoff	0	2
Number of Scheduled Ancient Monuments at risk from Surface Runoff	0	0
Mean Potential for Groundwater Flooding over Cluster	37.5%	125%
Area of Cluster with > 75% Ground-water Flooding Potential	300ha	0ha
Area of Cluster with > 50% Ground-water Flooding Potential	300ha	0ha
Area of Cluster with > 25% Ground-water Flooding Potential	300ha	300ha

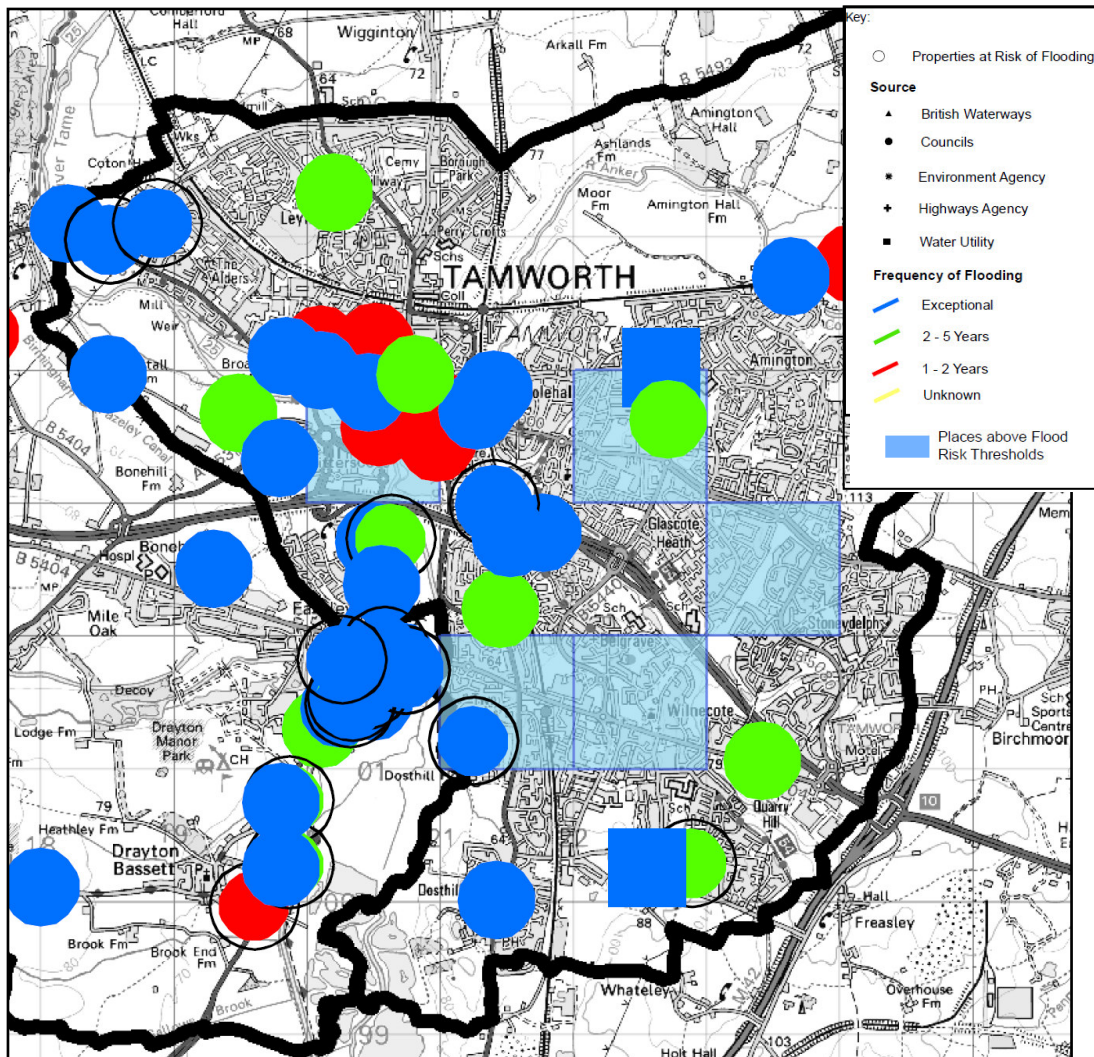
In addition, the Environment Agency's assessment information, utilised within the PFRA, identified that the River Mease SSSI is also at risk of surface water flooding.

¹⁰ Please see Section 6 of the Staffordshire Preliminary Flood Risk Assessment, draft report, March 2011, for further information.

4.4 Tamworth Borough

Figure 4.3 summarises the current historic flood risk data points and the ‘flood risk over threshold’ information for Tamworth Borough (please note that information collected regarding the impacts of the flood events on residential properties is very limited - refer to the PFRA for further information).

Figure 4.3 - Updated Historic and Future Surface Water Flood Information for Tamworth Borough



4.4.1 Historic Flooding

Tamworth has a high number of historic flooding points. However, due to the nature of classification with the PFRA, a high number of these are attributable to fluvial flooding rather than purely surface water. Many of the events have been sourced from Local Authorities, although there are also a number of sewer flooding points. A number of events are high frequency, especially in the centre of the town and a number in the Fazeley area have resulted in the flooding of properties.

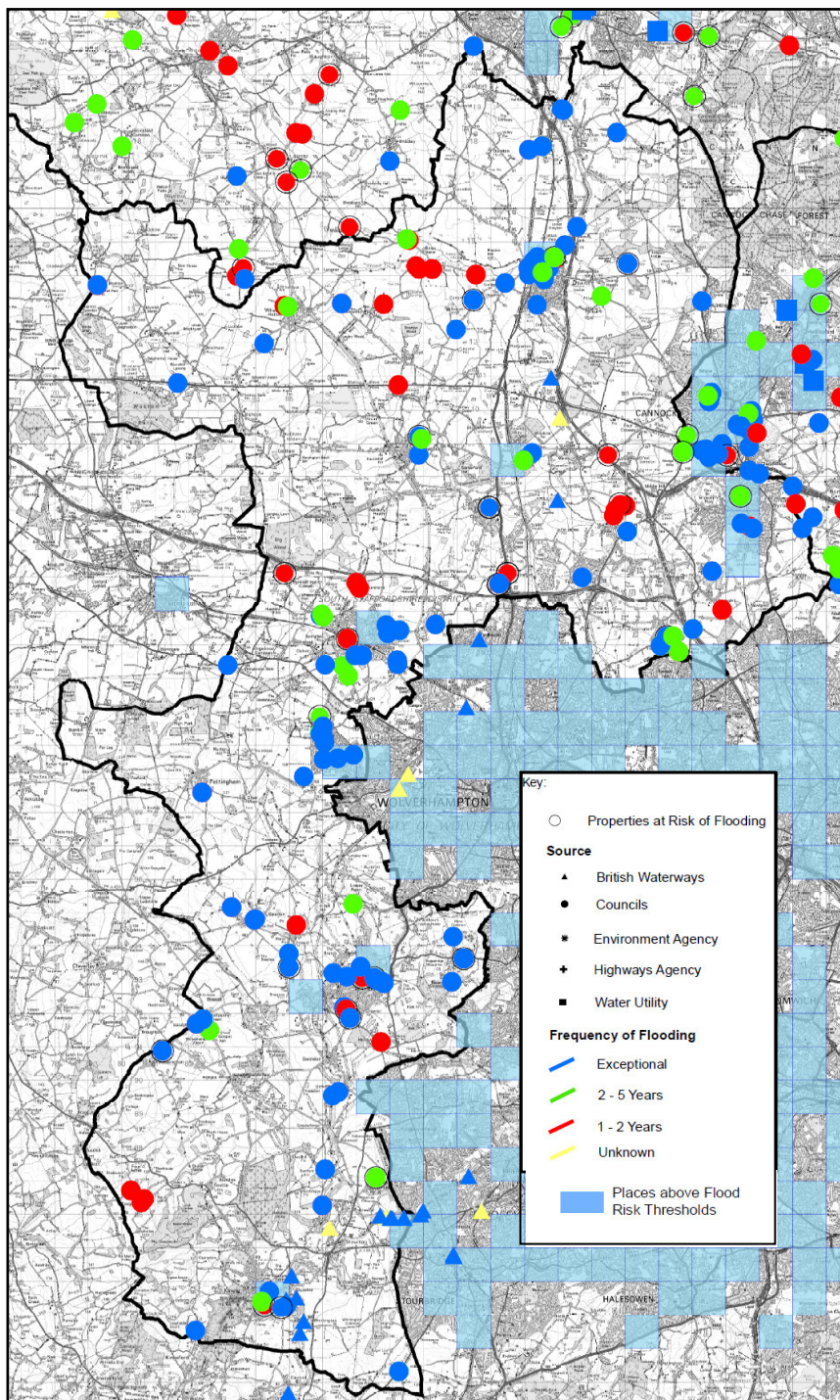
4.4.2 Future Flooding

Five 1km Floods Above Threshold squares (from the Environment Agency's analysis) are located within Tamworth in the central and western areas of the town. These have not, however, resulted in the designation of a 3km² cluster.

4.5 South Staffordshire District

Figure 4.4 summarises the current historic flood risk data points and the ‘flood risk over threshold’ information for South Staffordshire District (please note that information collected regarding the impacts of the flood events on residential properties is very limited - refer to the PFRA for further information).

Figure 4.4 - Updated Historic and Future Surface Water Flood Information for South Staffordshire District



4.5.1 Historic Flooding

There are a high number of historic flood events scattered across South Staffordshire District stemming from a number of sources. Of particular note is the high number of canal overtopping/breach events as compared to the rest of the study area. The more frequent events occur in clusters scattered across the District. As stated within the Phase 1 SWMP, the settlements of Penkridge, Wombourne, Codsall and Perton are particularly identified within the historic flood risk clusters. In addition Kinver is now also highlighted, although this may be related to the inclusion of the interaction between fluvial and surface water flood risk.

4.5.2 Future Flooding

All the places mentioned in the historic flood risk assessment above (Penkridge, Wombourne, Codsall, Perton and Kinver) have been assigned at least 1 blue square within the Environment Agency's Floods Above Threshold analysis. In addition, the villages of Great Wyrley and Four Ashes have been identified, as have the edges of South Staffordshire bordering Wolverhampton, Dudley and Cannock. No individual 3km² clusters have been identified within South Staffordshire, although the edge of the Birmingham conurbation cluster, ranked as 2 out of 219, overlaps with the perimeters of the District. This area is classed as a national 'Indicative Flood Risk Area'¹¹.

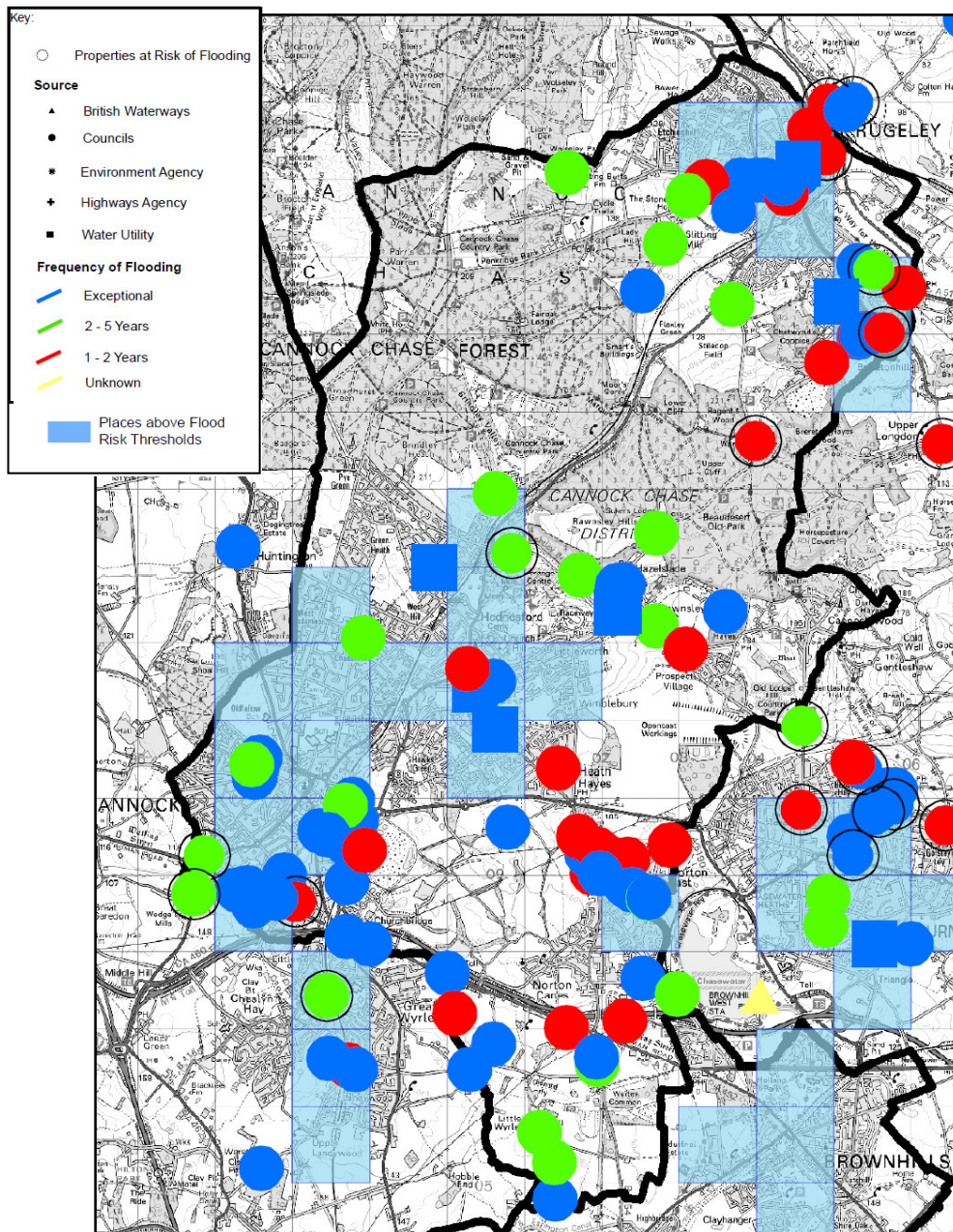
In addition, the Environment Agency's assessment information, utilised within the PFRA, also identified that the Motte Meadows SSSI is also at risk of surface water flooding, as is Patshull Hall. The latter has a total area of 7.8% at risk of surface water flooding, placing it 11th on a ranked list of parks and gardens in the Country.

¹¹ Please see Section 6 of the Staffordshire Preliminary Flood Risk Assessment, draft report, March 2011, for further information.

4.6 Cannock Chase District

Figure 4.5 summarises the current historic flood risk data points and the ‘flood risk over threshold’ information for Cannock Chase District (please note that information collected regarding the impacts of the flood events on residential properties is very limited - refer to the PFRA for further information).

Figure 4.5 - Updated Historic and Future Surface Water Flood Information for Cannock Chase District



4.6.1 Historic Flooding

The main sources of historic flooding data with Cannock Chase District have been derived from Local Authority and Water Company datasets. All three main settlements - Cannock, Norton Canes and Rugeley - are identified with clusters of points (although a number within Rugeley will include an high element of fluvial flooding). A relatively high number of flooding points are identified as high frequency and/or have affected properties.

4.6.2 Future Flooding

Compared with the other Local Authority areas within this SWMP, Cannock Chase has a high number of the Environment Agency's Flood Above Threshold 'blue squares' located within its boundaries. The largest group is located over Cannock, which also forms a cluster ranked 75 out of 219 nationally. The summary of the information provided for Cannock within the PFRA is given in **Table 4.3** below. A smaller group of blue squares is located over Rugeley and one is located over Norton Canes.

Table 4.3 - Summary of the Flood Risk Indicators for Cannock

Flood Risk Indicator	Cannock
Rank (out of 219)	75
National Grid Reference	SJ9891911048
Area	3100ha
Number of Residential Properties at Risk	<i>Not provided</i>
Number of People at Risk	<i>Not provided</i>
Number of Critical Services at Risk	<i>Not provided</i>
Number of Non Residential Properties at Risk	<i>Not provided</i>
Length of Road or Rail at Risk from Surface Runoff	13.4km
Area of Agricultural Land at Risk from Surface Runoff	39.1ha
Number of PPC sites potentially at risk from surface runoff.	0
Number of Listed Buildings (all grades) at risk from Surface Runoff	3
Number of Listed Buildings (Grades I and II*) at risk from Surface Runoff	0
Number of Scheduled Ancient Monuments at risk from Surface Runoff	0
Mean Potential for Groundwater Flooding over Cluster	38.5%
Area of Cluster with > 75% Ground-water Flooding Potential	200ha
Area of Cluster with > 50% Ground-water Flooding Potential	800ha
Area of Cluster with > 25% Ground-water Flooding Potential	1500ha

In addition, the Environment Agency's assessment information, utilised within the PFRA, also identified that the Cannock Extension Canal and Cannock Chase SSSIs are at risk of surface water flooding.

5 CONCLUSION

5.1 Summary

This Addendum has been produced as an update to the southern Staffordshire Phase 1 SWMP, published in July 2010, to reflect the updated historic flood point data, Environment Agency surface water flood map and property information, all of which has been made available between finalisation of the Phase 1 SWMP and completion of the Phase 2 SWMPs. This new data has been introduced and utilised within the Phase 2 SWMPs to bring the analysis in-line with the Staffordshire County Preliminary Flood Risk Assessment. As such, the impacts of the new data upon the existing Phase 1 SWMP for each Local Authority area have been briefly reviewed within this addendum. This is not a comprehensive assessment, however, and the two documents should be referred to in parallel.