Birmingham City Council

Preliminary Flood Risk Assessment

May 2011

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Document History

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Abbreviations

Term	Meaning / Definition
The Act	Flood and Water Management Act 2010
AStSWF	Areas Susceptible to Surface Water Flooding
BCC	Birmingham City Council
BGS	British Geological Society
BW	British Waterways
CFMP	Catchment Flood Management Plan
DAP	Drainage Area Plan
Defra	Department for Environment, Food and Rural Affairs
DG5	Director General Performance Measure 5
EA	Environment Agency
FMfSW	Flood Map for Surface Water
FRA	Flood Risk Assessment
LLFA	Lead Local Flood Authority
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPS 25	Planning Policy Statement 25 – Development and Flood Risk
The Regulations	The Flood Risk Regulations 2009
SFRA	Strategic Flood Risk Assessment
STW	Severn Trent Water
SWMP	Surface Water Management Plan

Executive Summary

This report has been prepared by Birmingham City Council to meet the requirements of the Flood Risk Regulations (2009). Under the regulations Lead Local Flood Authorities are responsible for undertaking a Preliminary Flood Risk Assessment (PFRA) for local sources of flood risk, primarily from surface water, groundwater and ordinary watercourses. The LLFA is not instructed to assess the risk from Main Rivers, the sea and large raised reservoirs as part of this review; this is the responsibility of the Environment Agency.

The PFRA is a high level screening exercise which entails collecting information on past (historic) and future (predicted) floods, assembling it into a PFRA report and using it to identify Flood Risk Areas which are areas where the risk of flooding is significant.

Flood risk data has been collected and mapped of historic flood events from surface water, watercourses, surface water sewers and canals. Based on the evidence collected no flood events were considered to have had 'significant harmful consequence' as defined by the guidance. However many of the floods are still viewed as notable at a local level but are not required to be reported to Europe.

Future flood risk data has also been mapped for predicted flooding from surface water, groundwater and ordinary watercourses, this has been undertaken using national datasets. Details of future surface water floods and their consequences in terms of the number of people, businesses and critical services affect are outlined.

The Environment Agency has used the criteria defined by Defra to determine indicative Flood Risk Areas across England. There are ten areas that have been identified nationally and Birmingham forms part of the indicative flood risk area which has been identified for the West Midlands. Birmingham City Council has reviewed this flood risk area and considers that this does provide an appropriate representation of the flood risk to Birmingham.

1. Introduction

1.1 Scope

Lead Local Flood Authorities (LLFA's) are required to produce and submit to the Environment Agency a Preliminary Flood Risk Assessment (PFRA) for their administrative area by 22nd June 2011.

The driver behind this work is the Flood Risk Regulations[1] (the Regulations) which came into force on 10th December 2009 and implements the requirements of the European Floods Directive[2], which aims to provide a consistent approach to managing flood risk across Europe. Under the regulations and in line with the Flood and Water Management Act[3] (the Act) which gained Royal Ascent in April 2010, LLFAs are responsible for undertaking a PFRA for local sources of flood risk, primarily from surface water, groundwater and ordinary watercourses. The LLFA is not responsible for assessing the risk from Main Rivers, the sea and large raised reservoirs; this is the responsibility of the Environment Agency. However the interaction of flooding from Main Rivers and reservoirs with local sources will need to be taken into account, this is particularly important in the highly urbanised catchment of Birmingham where flooding regularly occurs as a result of interaction from several sources.

The PFRA is a high level screening exercise which entails collecting information on past (historic) and future (predicted) floods, assembling it into a PFRA report and using it to identify Flood Risk Areas which are areas where the risk of flooding is significant. The PFRA will draw on historic information from a variety of sources, however of particular relevance are the Birmingham Level 1 Strategic Flood Risk Assessment[4] (SFRA) which was completed in January 2010 and the Birmingham Surface Water Management Plan (SWMP) which is currently being developed alongside the PFRA.

The PFRA forms part of a six year cycle of planning based on a four stage process as outlined in Table 1.1.

Stage	Requirement	Submission Date
1	Prepare **Preliminary Flood Risk Assessment**	22nd June 2011
2	Identify **Flood Risk Areas**	22nd June 2011
3	Prepare **Flood Hazard Maps** and **Flood Risk Maps** for each Flood Risk Area	22nd June 2013
4	Prepare **Flood Risk Management Plans** for Each Flood risk Area	22nd June 2015

Table 1.1 - Work Required under the Flood Risk Regulations 2009

[1] Statutory Instrument 2009 No. 3042, Environmental Protection, The Flood Risk Regulations 2009
[2] Directive 2007/60/EC of the European Parliament and the council of 23 October 2007 on the assessment and management of flood risks
[3] House of Lords and House of Commons, Flood and Water Management Act 2010
[4] Birmingham City Council (2010) Level 1 Strategic Flood Risk Assessment

1.2 The Study Area

The study area is defined by BCC's administrative boundary of nearly 270km^2 which is located in the centre of the West Midlands region. This is the largest local authority in both the United Kingdom and Europe with a population of over 1 million (2006 estimate). Against this background, it is not surprising that much of the study area is urbanised and is neighboured by several other large conurbations, including Solihull, Wolverhampton, Coventry and the towns of the Black Country.

The study area falls primarily into the Humber River Basin District, however 0.5% of the study to the south-west of the conurbation area drains to the Severn River Basin District. The Area is served by the Environment Agency Midlands Region and Severn Trent Water.

1.3 Aims and Objectives

The aim of this PFRA is to provide an assessment of the local flood risk for the Birmingham administrative area and to review the national assessment of Flood Risk Areas provided by the Environment Agency.

The objectives of the PFRA are:

- to identify relevant partner organisations involved in flood risk within Birmingham and develop partnerships;
- to develop arrangements for the ongoing collection, assessment and storage of LLFA flood risk data and information and to consider collaboration with other partners;
- to collate information on past and future floods and agree which information best represents the surface water flood risk;
- to record information on past and future flood events with significant consequence; and
- to review the indicative Flood Risk Areas provided by the Environment Agency using local information and provide justification for any proposed amendments.

2. Lead Local Flood Authority Responsibilities

2.1 Introduction

This section provides an overview of the governance and partnership arrangements in place within Birmingham. It also outlines the plans in place for stakeholder and public communication.

2.2 Governance and Partnership Arrangements

The Pitt Review[5], the subsequent Flood and Water Management Act 2010[3] and the Flood Risk Regulations 2009[2] identify that partnership working is essential in the management of local flood risk. To ensure the effective management of not only the PFRA process, but flood risk management as a whole, Birmingham City Council has developed partnerships with Severn Trent Water, the Environment Agency and other key stakeholders over a number of years.

Birmingham has worked with its partner organisations to develop a three tiered approach to managing flood risk. Figure 2.1 shows the three tiered structure.

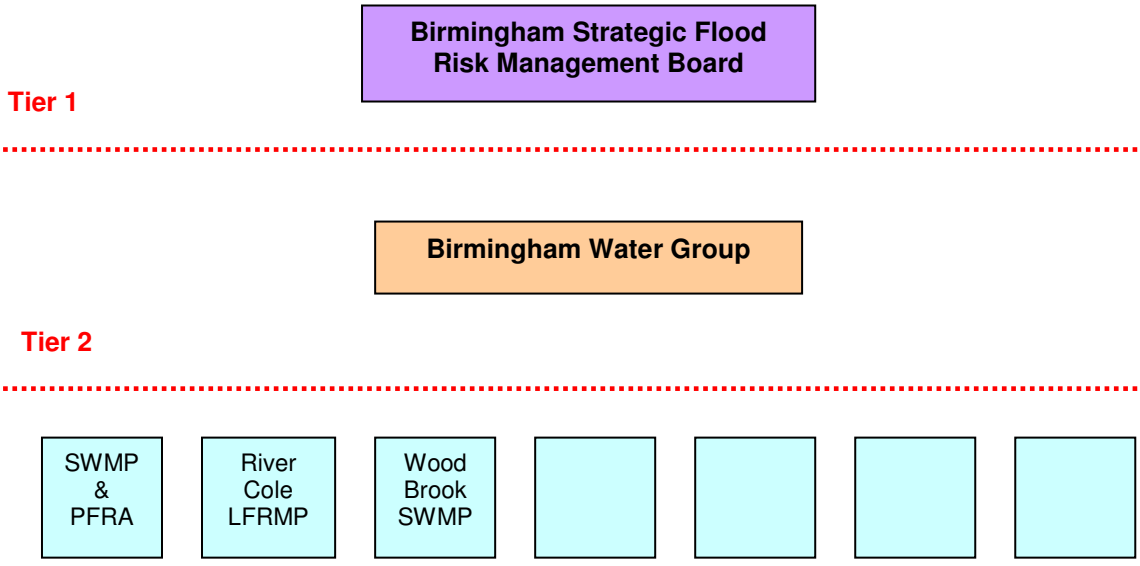

Figure 2.1 – Birmingham Three Tiered Flood Risk Management Structure

2.2.1 Upper Tier – Birmingham Strategic Flood Risk Management Board

The Strategic Flood Risk Management Board is a Member-led partnership with representatives from Birmingham City Council, Severn Trent Water and the Environment Agency. It aims to set

[5] Pitt, M. (2008) – *Learning Lessons From the 2007 Summer Floods*, Cabinet Office, London

the strategic policy and agree investment priorities and service targets for managing and mitigating flood risk in Birmingham.

A Memorandum of Understanding has been developed to encourage the essential sharing of information amongst the Group members in an efficient and effective way, and to set the governance rules to ensure that no party's confidentiality, intellectual property rights or commercial interests would be compromised.

2.2.2 Middle Tier – Birmingham Water Group

The Birmingham Water Group is an operational level group with senior officers and specialists from Birmingham City Council, Severn Trent Water and the Environment Agency representing all relevant flood risk management work areas, including; drainage engineers, planners, emergency planners, development control, flood risk mapping, asset management, climate change adaptation and green infrastructure. The aim of the group is to ensure a joined up approach to all flood and water management activities within and across each organisation.

2.2.3 Lower Tier – Project Specific Partner Groups

Individual project specific groups meet to discuss local drainage and flooding issues and solutions. This approach ensures that issues and concerns are communicated to those who need to deal with them. Progress, news and events are shared at regular meetings.

A number of projects are already underway with their own project specific partner groups these include:

- Birmingham SWMP & PFRA
- River Cole Local Flood Risk Management Plan
- Wood Brook SWMP

2.3 Engagement and Communication

2.3.1 Partner Engagement

As outlined above a project specific partner group has been established to coordinate both the Birmingham Surface Water Management Plan (SWMP) and PFRA process. This approach has been taken as it was identified at an early stage that both areas of work required a similar approach to collecting and reviewing data and analysing flood risk.

Partner group membership was discussed at the first meeting where Birmingham City Council (BCC), the Environment Agency (EA) and Severn Trent Water (STW) were identified as key partners. The following departments from each of the partner organisations were identified to form part of the partnership:

Birmingham City Council

- Drainage
- Resilience Team
- Climate Change and Adaptation
- Planning Strategy
- Park and Nature Conservation
- Highways (delivered though Amey PFI Contract)

Environment Agency

- Development Control
- Flood Risk Mapping

Severn Trent Water

- Flooding
- Asset Management

2.3.2 Stakeholder and Public Engagement

As part of the PFRA process, the Birmingham SWMP & PFRA Group has engaged with stakeholders representing the following organisations:

- West Midlands Fire Service
- British Waterways

It is recognised that it may be beneficial to include other stakeholders and the public as the PFRA and SWMP progress. The main advantages to this engagement are identified as:

- Building trust
- Gaining access to additional local knowledge, and
- Increasing chances of stakeholder and public acceptance.

In order to ensure that this process is effective and the benefits are realised by partners it was agreed that an engagement plan would be drawn up to outline the following:

- Clarify what is to be achieved through engagement
- Identify the stakeholders and public to be reached and why they may need to be engaged
- Identify the levels of engagement the partnership wants from different stakeholders and the public, and
- At what stage of the process engagement with different stakeholders will take place.

At this stage of the PFRA process, it was agreed by project partners that stakeholders would be initially engaged to provide information on known flooding problems/locations. The partners agreed that greater engagement would occur when the group had a better understanding of local flood risk and when formulating Flood Risk Management Plans later in the PFRA cycle.

To this end the PFRA when agreed, will be published on the Birmingham City Council web based Be Heard Consultation Database and established Flood Action Groups will be encouraged to provide feedback.

3. Methodology and Data Review

3.1 Introduction

This PFRA has been produced in line with the Environment Agency's PFRA Final Guidance. As stated in the guidance the PFRA should be based on readily available or derivable data. The data collection, availability, limitations and methodology for sharing are outlined in this section.

3.2 Data Collection & Quality

The partners and stakeholders outlined in Section 2.3 were contacted and asked to share data for both the PFRA and Strategic SWMP. A data register was established to record the type of data, source, format and quality. The data register also provided a valuable tool for identifying gaps in the data.

The quality of the data was assessed using the data quality scoring system provided in the SWMP Technical Guidance[6] as outlined in Table 3.1. It is important to understand the quality of the data so that any uncertainty or perceived weakness is understood and available for consideration during the assessment stage.

Data Quality Score	Description	Explanations	Example
1	Best possible	No better available; not possible to improve in the near future	High resolution LiDAR River/sewer flow data Rain gauge data
2	Data with known deficiencies	Best replaced as soon as new data are available	Typical sewer or river model that is a few years old
3	Gross assumptions	Not invented but based on experience and judgement	Location, extent and depth of much surface water flooding Operation of un-modelled highway drainage 'future risk' inputs e.g. rainfall, population
4	Heroic assumptions	An educated guess	Ground roughness for 2d models

Table 3.1 – SWMP Data Quality Scoring System

The data that was collected is outlined in Table 3.2. Not all of the data listed in the table is directly relevant to the PFRA and has been used for the Strategic SWMP.

[6] Defra (2010) – Surface Water Management Plan Technical Guidance

3.3 Data Sharing, Security and Restrictions

The data from partner organisations was shared and used in accordance with the licensing and confidentiality agreements stipulated by the partners.

Source	Data Type	Description of Data	Data Provided	Media	Quality Score	Reason
Environment Agency	LiDAR Extents	Extent and Resolution of LiDAR data	LiDAR (Birmingham)	PDF/ Shapefile	1	Actual extent of LiDAR help by Environment Agency
	National Receptor Database	The National Receptor Database (NRD) is a dataset containing information on buildings, environment, heritage, transport and utilities . It is primarily intended for use in flood and coastal erosion risk management.	National Receptor Database	MapInfo TAB	1	No better data available
	Areas Susceptible to Surface Water Flooding	First Generation national mapping outlining areas susceptible to surface water flooding with three bandings (less, intermediate and more)	Less	MapInfo TAB	2	Limitations due to method used
			Intermediate	MapInfo TAB		
			More	MapInfo TAB		
	Flood Map for Surface Water	Second Generation national mapping outlining areas susceptible to surface water flooding with an allowance for buildings and the drainage network. Includes two events (1 in 30 and 1 in 100 year) and two depth bandings (greater than 0.1m and greater than 0.3m)	T30 Shallow	MapInfo TAB	2	Improvement on Areas Susceptible to Surface Water Flooding dataset as allowances made for buildings, infiltration and sewers, however still limitations with method used.
			T30 Deep	MapInfo TAB		
			T200 Shallow	MapInfo TAB		
			T200 Deep	MapInfo TAB		
	Rain gauge Locations	National Grid reference locations for Environment Agency Rain Gauges	England Indicative Flood Risk areas FINAL	MapInfo TAB	1	Confirmed grid references.
	Rainfall Data	Daily rainfall totals recorded at Environment Agency rain gauges.	Frankley	Excel	3	Actual rainfall totals recorded at maintained rain gauges, however insufficient coverage for Birmingham Catchment.
			Lea Marston	Excel		
			Lye	Excel		
			Saltley	Excel		
			Tudor Grange	Excel		
			Waseley	Excel		
			Willenhall	Excel		

Source	Data Type	Description of Data	Data Provided	Media	Quality Score	Reason
	Indicative Flood Risk Areas	Nationally identified flood risk areas, based on significance criteria identified by Defra.			1	No better data available
Birmingham City Council	Ordnance Survey Data	Digital mapping provided by Ordnance Survey	MasterMap 2009	MapInfo TAB	1	No better data available
			Street Gazetteer 2009	MapInfo TAB		
			1:10,000	MapInfo TAB		
			1:50,000	MapInfo TAB		
	BCC Boundary Data	Digital mapping of the Birmingham administrative boundary	Birmingham City Boundary	MapInfo TAB	1	Confirmed BCC administrative boundary
	Historic Flooding Records	Historic flooding records of flooding from surface water and ordinary watercourses	Surface Water	MapInfo TAB	2	Limitations as one point plotted at centre of postcode polygon, therefore do not accurately represent the actual location of flooding or the number of properties flooded.
			Watercourse	MapInfo TAB		
			Groundwater	MapInfo TAB		
			Other	MapInfo TAB		
	Water Features Layers	Digital mapping of water features within Birmingham administrative boundary	Ordinary Watercourse Open Channel	MapInfo TAB	2	Best data available at present time, however may be some missing data particularly in relation to small watercourses and pools. May also be errors in data particularly in relation to location of culverts.
			Ordinary Watercourse Culvert	MapInfo TAB		
			Canals	MapInfo TAB		
			Canal Tunnel	MapInfo TAB		
			Canal Feeder	MapInfo TAB		
			Canal Feeder Tunnel	MapInfo TAB		
			Reservoirs	MapInfo TAB		
			Covered Reservoirs	MapInfo TAB		
			Pools	MapInfo TAB		

Source	Data Type	Description of Data	Data Provided	Media	Quality Score	Reason
	Birmingham Level 1 Strategic Flood Risk Assessment	Report produced in accordance with Planning Policy Statement 25 to assess and map all known sources of flood risk, taking into account climate change to allow the council to use this as an evidance base to locate future development primarily in low flood risk areas.	Birmingham SFRA	PDF	2	Best data available at present time, however under review due to change in strategic housing allocations
	Core Strategy	Strategy setting out a clear spatial framework for the growth of Birmingham up to 2026. The strategy sets out how much new housing should be provided in the city, and identifies the general locations for the construction of new housing and flats. It also identifies the key locations for employment provision, and for other key activities, such as shopping, waste management, leisure and sport, education and health in order to support the city's growing population. The strategy also considers how transport and other infrastructure can be provided to enable this new development to take place in a sustainable way.	Sustainable Urban Neighbourhoods	MapInfo TAB	1	No better data available
			Core Employment Areas	MapInfo TAB		
			Strategic Allocations	MapInfo TAB		
			SHLAA 2010	MapInfo TAB	1	No better data available
	Gully maintenace records	All the locations where gullies have been cleaned within two working days of a daily gauged rainfall exceeding 25mm at Frankley and Saltley gauges	Gully Cleansing over 25mm Rainfall	MapInfo TAB	2	Data interpolated from rainfall records and highway maintenance records, therefore may be some deficiencies.
	New gully locations	All the locations where new gullies have been installed between 1999-2010, as a means of highlighting where surface water flooding is/has been problematic	New Gullies	MapInfo TAB	2	No better data available
	Road Classifications	Traffic sensitive roads within Birmingham: • Winter Gritting Route 07:00-19:00, 7 days a week; • Winter Gritting and Christmas Embargo Route 24 Hours a day 7 days; and • Tourist Route 24 Hours a Day, 7 days a week	Classifications	MapInfo TAB	1	No better data available

Source	Data Type	Description of Data	Data Provided	Media	Quality Score	Reason
Severn Trent Water	DG5 Register	Register of sewer flooding incidents. Defined as foul or surface water sewer flooding	Historic Flooding (DG5)	Excel	1	No better data available
	Drainage Area Plans	"x-x" diagrams – have been obtained or produced by re-running the respective models to produce GIS layers that highlight which lengths of pipe flood in storm events greater than a 1 in 10 year but less than a 1 in 50 year. With a buffer of 10m applied to the pipes, the data has been used to provide an indication of which receptors (e.g. residential properties) may be at risk from surface water flooding from the sewer system. Whilst this approach is rather coarse it has been deemed appropriate for the level of assessment at which it is being used.	X-X diagrams	PDF, IWT	1	Report and model formats respectively. Current data abtained, downloaded from STW's repository or obtained from their consultants as available.
British Waterways	Breach and Overtopping records	Historic flooding records of breach and overtopping of canals	Overtopping	Shapefile	1	No better data available
			Breaches	Shapefile		
	Canal Features	Digital mapping of canal features within Birmingham administrative boundary	Locks	Shapefile		
			Sluices	Shapefile		
			Weirs	Shapefile		
			BW_Waterways	Shapefile		
West Midlands Fire Service & Mett Office	Climate Change Report	Study undertaken to assess the current risk to WMFS due to the current weather and climate change, part of the focus of the study being flood risk	Climate Change Report	PDF	1	Recently completed study, no better data available.

Table 3.2 – Data Collected for PFRA and Strategic SWMP

4. Past Flood Risk

4.1 Introduction

This section summarises relevant information on all past floods including the date, location, source and where available consequence of the flooding. It also considers whether Birmingham has experienced floods which are considered to have 'significant harmful consequences'

4.2 Historic Flood Risk in Birmingham

A number of datasets have been collated to assess the local historic flood risk in Birmingham; this includes flooding from watercourses, surface water and groundwater. However due to the urbanised nature of the Birmingham catchment there are often significant interactions between sources of flooding and it is not always possible to ascertain the source of the flooding. As the PFRA should only consider local sources and exclude Main River this can often be difficult in Birmingham as Main River flooding is often combined with flooding from ordinary watercourses and localised surface water flooding. Therefore all historic incidents of flooding, including that which is considered to be primarily from Main River is included in the data, as there will inevitably have been interaction with surface water flooding.

To assess the historic flood risk in Birmingham the data sets outlined below have been used:

4.2.1 Historic Records

Historical flooding records provide a source of data that directly indicates both areas and sources of flooding. Recent years have seen a number of flooding events affecting Birmingham (September 1998, April 1999. June 1999, July 2000, June 2005, June 2007, July 2007 and September 2008), all historical flooding data has been collected from BCC, Severn Trent Water and British Waterways.

To protect the sensitivity of this data and to build up an understanding of the areas that are susceptible to flooding, this has been plotted using the centre of a postcode polygon whereby each point represents one or more properties. While this may not reflect if a particular property repeatedly experiences flooding or indeed how many unreported adjacent properties flooded, it does provide an understanding of the risks of flooding from all sources, as this data has been plotted using the recorded source of flooding (watercourse, surface water, sewer and groundwater). Where the source is not identified in the data set, the source of flooding has been recorded as “Source not Established”.

Watercourse Flooding

The historical locations of watercourse flooding have been provided by BCC and plotted in Figure 4.1, where flood surveys and investigations were undertaken to identify the numbers of properties affected and the flooding mechanism, details are included in Table 4.1.

Surface Water Flooding

The historical locations of surface water flooding have been provided by BCC and plotted in Figure 4.1, where flood surveys and investigations were undertaken to identify the numbers of properties affected and the flooding mechanism, details are included in Table 4.2.

Sewer flooding

Severn Trent Water maintain a database known as the “At Risk Flooding Register”, for sewer flooding within their area. Those properties affected by sewer flooding are reported to the Office

of Water Services (Ofwat) as part of Director General Performance Measure 5 (DG5). DG5 is the performance measure that Ofwat judges water companies by for sewer flooding. It covers two measures:

- The number of properties at risk of internal flooding from sewers due to hydraulic overloading within the last ten years (depending on the property type); and
- Properties which are internally flooded.

Sewer flooding can be caused by temporary problems, such as blockages or sewer collapses, or because of hydraulic overloading.

The historic locations of sewer flooding are protected under the Data Protection Act. The PFRA has been able to map out locations of surface water sewer flooding using the postcode polygon methodology outlined above and is included in Figure 4.1; however the details of the sewer flooding cannot be provided in this report.

Groundwater Flooding

Historical locations of groundwater flooding reported to BCC have been provided for the flood risk mapping in Figure 4.1, however as no formal investigation was undertaken at the time, specific details of this historic flooding have not been provided in this report.

Canal Breach and Overtopping

The historical locations of canal breach and overtopping have been provided by British Waterways, details of these incidents are included in Table 4.3 and Figure 4.1.

4.2.2 Indicators of Surface Water Flooding

Appreciating that the predicted risks of flooding will inevitably outweigh the actual locations where surface water flooding has occurred, it was decided that the following sets of data would be used to supplement the “the historic incidents of flooding”

New Gully Locations

All the locations where new gullies have been installed between 1999-2010, as a means of highlighting where surface water flooding is/has been problematic, as shown in Figure 4.2.

Gully Cleansing Locations

All the locations where gullies have been cleaned within two working days of a daily gauged rainfall exceeding 25mm at Frankley and Saltley gauges (rainfall data was provided by the Environment Agency), as shown in Figure 4.2.

4.3 Consequences of Historic Flood Risk

The Regulations require PFRAs to include information on past floods that had significant harmful consequences and which could occur again. This is separate from the identification of Flood Risk Areas which was based on Defra and WAG guidance providing a national perspective of significant (potential) flood risk.

The guidance states that only past floods with 'significant harmful consequences' of a level sufficient to justify reporting to Europe must be considered in the preliminary assessment report and recorded in the Annex 1 spreadsheet. However this does not preclude LLFAs making reference to the occurrence of less severe flooding in general terms in the report if this is considered relevant and useful for a more complete picture.

Guidance from the Environment Agency suggests that the following factors could be considered as defining a flood as having “significant harmful consequences”:

- The flooding registered on a national scale even if only occurring over a relatively small area. The aim being to avoid recording large numbers of historic floods where the consequences were moderate or low or unlikely to occur again due to risk reduction actions having been taken.
- The flooding event was memorable or notable (Summer 2007, Easter 1998)
- The flooding is considered considerable when taking into account the scale of flooding, its harmful consequences (for human health, economic activity and the environment) and the level of response (e.g. it involved the formation of the strategic co-ordinating group)
- The impact of the flooding was severe. For instance, internal flooding of a large number of properties is likely to be considered significant, but flooding to a large number of gardens is not.
- The quality of the historic information is sufficient to determine if there were 'significant harmful consequences.'

In reviewing the data provided in Section 4.2, no historic events have been considered to have had “significant harmful consequences” and therefore none will be recorded in Annex 1, the Preliminary Assessment Spreadsheet. However many of the floods listed in Table 4.1 and Table 4.2 are still viewed as notable at a local level but are not required to be recorded in Annex 1 or reported to Europe.

Flood Event	Area	Constituency	Watercourse	Main River	Roads with Properties Affected	No. of Properties with Internal Flooding
September 2008	Billesley	Selly Oak	Chinn Brook	No	Stoneyford Grove	0
September 2008	Weoley Castle	Northfield	Wood Brook	Yes	Bristol Road, Fox Hill, Witherford Way, Middle Park Road	4
September 2008	Selly Park	Selly Oak	River Rea	Yes	Cecil Road, Hobson Road, Kitchener Road, Fashoda Road, Moor Green Lane	25
September 2008	Selly Park	Selly Oak	Bourn Brook	Yes	Fourth Avenue, Pershore Avenue, Riverside Drive, Sir Johns Road, Mayfield Avenue, Pershore Road, Third, Avenue, First Avenue	17
September 2008	California	Edgbaston, Selly Oak	Bourn Brook	Yes	Elford Road, Swinford Road, Osmaston Road, Reservoir Rd	3
September 2008	Springfield	Hall Green	River Cole	No	Green Road, Sarehole Road	0
September 2008	California	Edgbaston	Stonehouse Brook	Yes	Stonebrook Way	2
September 2008	Bournville	Selly Oak	The Bourn	Yes	Bond Street, Oxford Street	1
September 2008	Frankley	Northfield	River Rea	No	Ringwood Drive. Wyre Close	6
September 2008	Weoley Castle	Northfield	Griffins Brook	No	Woodbrooke Grove, New House Farm Drive	8
July 2007	California	Edgbaston, Selly Oak	Bourn Brook	Yes	Elford Road	2
July 2007	Sparkhill	Hall Green	River Cole	Yes	Formans Road, Percy Road	20
July 2007	Hodge Hill	Hodge Hill	River Cole	Yes	Maryland Avenue	0
July 2007	Stirchley	Selly Oak	River Rea	Yes	Ripple Road	0
July 2007	Springfield	Hall Green	River Cole	No	Sarehole Road	2
June 2007	Four Oaks	Sutton Coldfield	Four Oaks Brook	No	Blackroot Road, Halloughton Road, Kenilworth Close	1
June 2007	Sutton	Sutton Coldfield	Plants Brook, Longmoor Brook	Yes	Clifton Road, Fawdry Close, Garrard Gardens, Ryton Close, Manor Road, Chichester Court	1
June 2007	Springfield	Hall Green	Coldbath Brook	No	Pensby Close	3
June 2007	Selly Oak	Selly Oak	Bourn Brook	Yes	Reservoir Road	1

Flood Event	Area	Constituency	Watercourse	Main River	Roads with Properties Affected	No. of Properties with Internal Flooding
June 2007	Billesley	Selly Oak	Haunch Brook (Trib)	No	Wheelers Lane, Birdwell Croft, Peacock Road	5
June 2007	Witton	Perry Barr	River Tame	Yes	Deykin Avenue, Tame Road, Electric Avenue, Brantley Road, Westwood Road	65
June 2005	Perry Barr	Perry Barr	Perry Brook	Yes	Church Road	5
June 2005	Harborne	Edgbaston	Harts Green Brook	No	Quinton Road, Ferncliffe Road, Beaumont Drive, Wheats Avenue, Mellors Close	2
June 2005	Northfield	Northfield	Gallows Brook	No	Heath Road South	0
June 2005	Harborne	Edgbaston	Chad Brook	No	Pereira Road	0
June 2005	Perry Common	Erdington	Hawthorn Brook	Yes	Witton Lodge Road	0
Sept 1998 - July 2000	Northfield	Northfield	River Rea	Yes	Station Road, Middlemore Road, Coleys Lane, West Heath Road, Abbeydale Road, Staple Hall Road	36
Sept 1998 - July 2000	Longbridge	Northfield	River Rea	Yes	Tessall Lane, Oak Grove, Appletree Close, Longbridge Lane	8
Sept 1998 - July 2000	Bournville	Selly Oak	Gallows Brook	No	Berberry Close	4
Sept 1998 - July 2000	Kings Norton	Northfield	River Rea	Yes	Westhill Road, Pershore Road South	3
Sept 1998 - July 2000	West Heath	Northfield	West Heath Brook	No	Pitclose Road	11
Sept 1998 - July 2000	Northfield	Northfield	Hanging Brook	No	Chelston Road, West Park Avenue, Hanging Lane, Josiah Road, Steel Road, Peters Avenue	11
Sept 1998 - July 2000	Turves Green	Northfield	Turves Green Brook	No	Parkdale Drive	0
Sept 1998 - July 2000	Billesley	Selly Oak	Haunch Brook	No	Hollybank Road, Chamberlain Road, Chessetts Grove	2
Sept 1998 - July 2000	Billesley	Selly Oak	Haunch Brook (Trib)	No	Wheelers Lane, Birdwell Croft	1
Sept 1998 - July 2000	Frankley	Northfield	Frankley Brook	No	Fisher Close, Boleyn Road	2
Sept 1998 - July 2000	Shenley Fields	Edgbaston	Merritts Brook	No	Merritts Brook Lane	1

Table 4.1 – Historic Watercourse Flooding Incidents

Flood Event	Area	Constituency	Roads with Properties Affected	No. of Properties with Internal Flooding
September 2008	Selly Oak	Selly Oak	Lodge Hill Road	5
September 2008	Kitwell	Edgbaston	Longford Close	3
September 2008	Weoley Castle	Northfield	Bushwood Road	4
September 2008	Lodge Hill	Selly Oak	Weoley Avenue, Corisande Road, Alwold Road	5
September 2008	Frankley	Northfield	Miranda Close, Oberon Close	21
July 2007	South Yardley	Yardley	Gilbertsone Avenue	1
July 2007	Bournville	Selly Oak	Selly Oak Road	1
July 2007	Harborne	Edgbaston	Wadhurst Road	1
July 2007	West Heath	Northfield	Wakeford Road	0
June 2007	Acock's Green	Yardley	Marie Drive	1
June 2005	Woodgate	Edgbaston	Bark Piece	1
June 2005	Longbridge	Northfield	Coombes Road	1
June 2005	Harborne	Edgbaston	Quinton Road, Ferncliffe Road, Beaumont Drive, Wheats Avenue, Mellors Close	6
June 2005	Handsworth	Ladywood	Ninevah Road	1
June 2005	Bartley Green	Edgbaston	Rush Green	1
June 2005	Northfield	Northfield	Station Road	0
June 2005	Woodgate	Edgbaston	The Hill	0
June 2005	Longbridge	Northfield	Thurlestone Road	1
Sept 1998 - July 2000	Northfield	Northfield	Bristol Road South, Newlyn Road, Frankley Beeches Road	10

Flood Event	Area	Constituency	Roads with Properties Affected	No. of Properties with Internal Flooding
Sept 1998 - July 2000	Northfield	Northfield	Bristol Road South	7
Sept 1998 - July 2000	Turves Green	Northfield	Coney Green Drive	1
Sept 1998 - July 2000	West Heath	Northfield	Exe Croft, The Fordrough, Aire Croft	4
Sept 1998 - July 2000	Frankley	Northfield	Crychan Close, Boleyn Road, Oberon Close, Miranda Close, Blackdown Close, Cotswold Close, Brightstone Road, Epping Close	26
Sept 1998 - July 2000	Northfield	Northfield	Staple Lodge Road	7
Sept 1998 - July 2000	West Heath	Northfield	Nesfield Close	4
Sept 1998 - July 2000	Cofton	Northfield	Longbridge Lane, Rea Close	2

Table 4.2 – Historic Surface Water Flooding Incidents

Date	Canal	Location	Cause
1872	Worcester & Birmingham Canal	Near Edgbaston Tunnel	Engineering works to adjacent railway
1894	Worcester & Birmingham Canal	Selly Oak	Cause unknown.
1938	Grand Union Canal	Between locks 5 to 4	Failed culvert, canal dewatered between locks 5 to 4, 0.45km in length
1940	Worcester & Birmingham Canal	Bourneville Lane Aqueduct	WW2 Bomb.
1952	Grand Union Canal Breach	Between locks 5 to 4	Failed canal wall, canal dewatered between locks 5 to 4, 0.45km in length.
1957	Grand Union Canal	Tysley	Erosion to the embankment by the River Cole bridges 88b to 88c.
1985	Birmingham & Fazeley Canal	Locks 1 to 2	Culvert collapse, minimal damage as canal was dewatered before major loss of water could took place
1989	Grand Union Canal	Not given	Pump shaft leak 1989. No third party damage.
1990	Grand Union Canal	Hay Mills	Third party works to the adjacent mill leat, bridges 88b to 88c.
2010	Birmingham and Fazeley Canal	Minworth	Vandalism

Table 4.3– Historic Canal Breach Incidents

Birmingham City Council

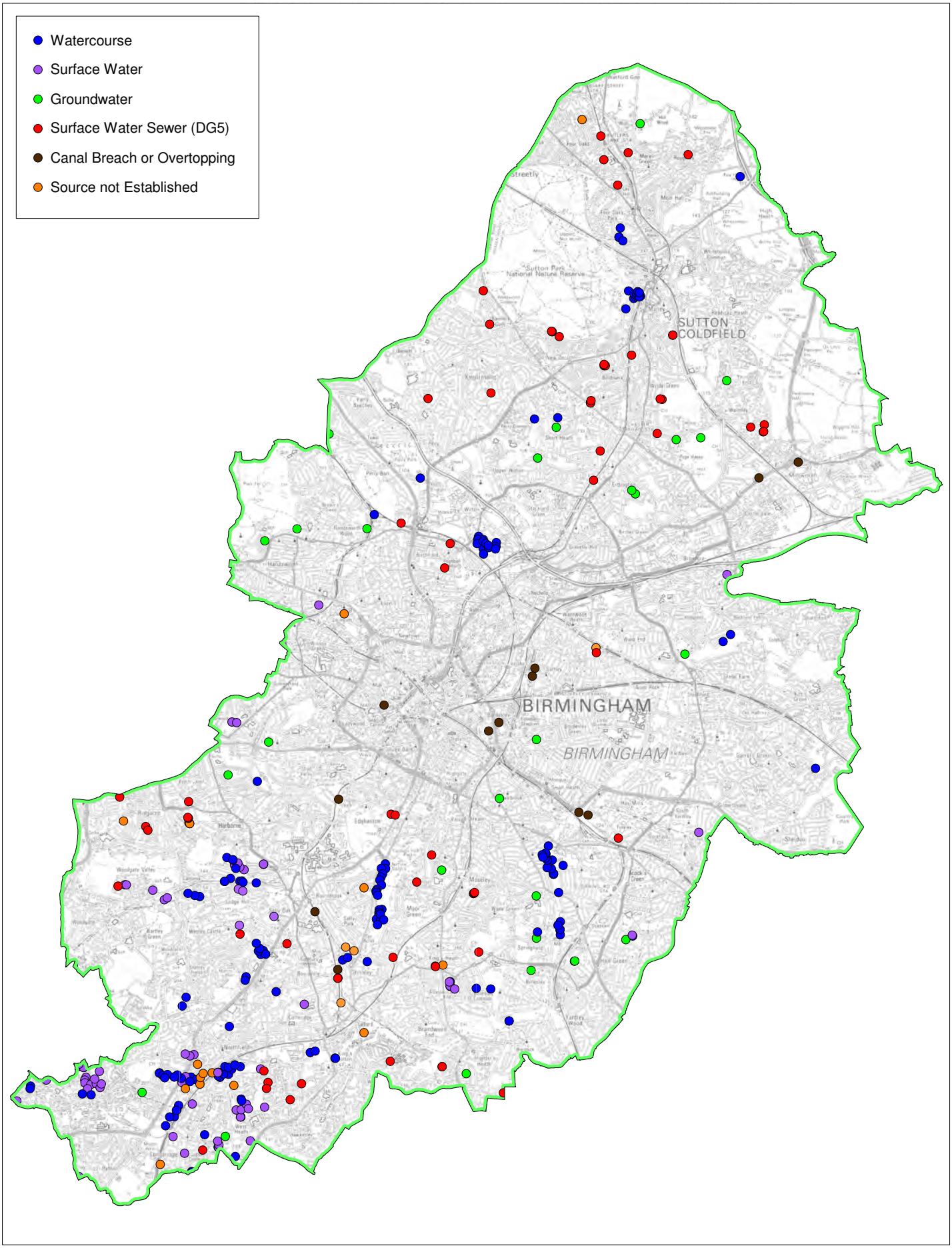

Figure 4.1 - Historic Flooding Locations

Birmingham City Council

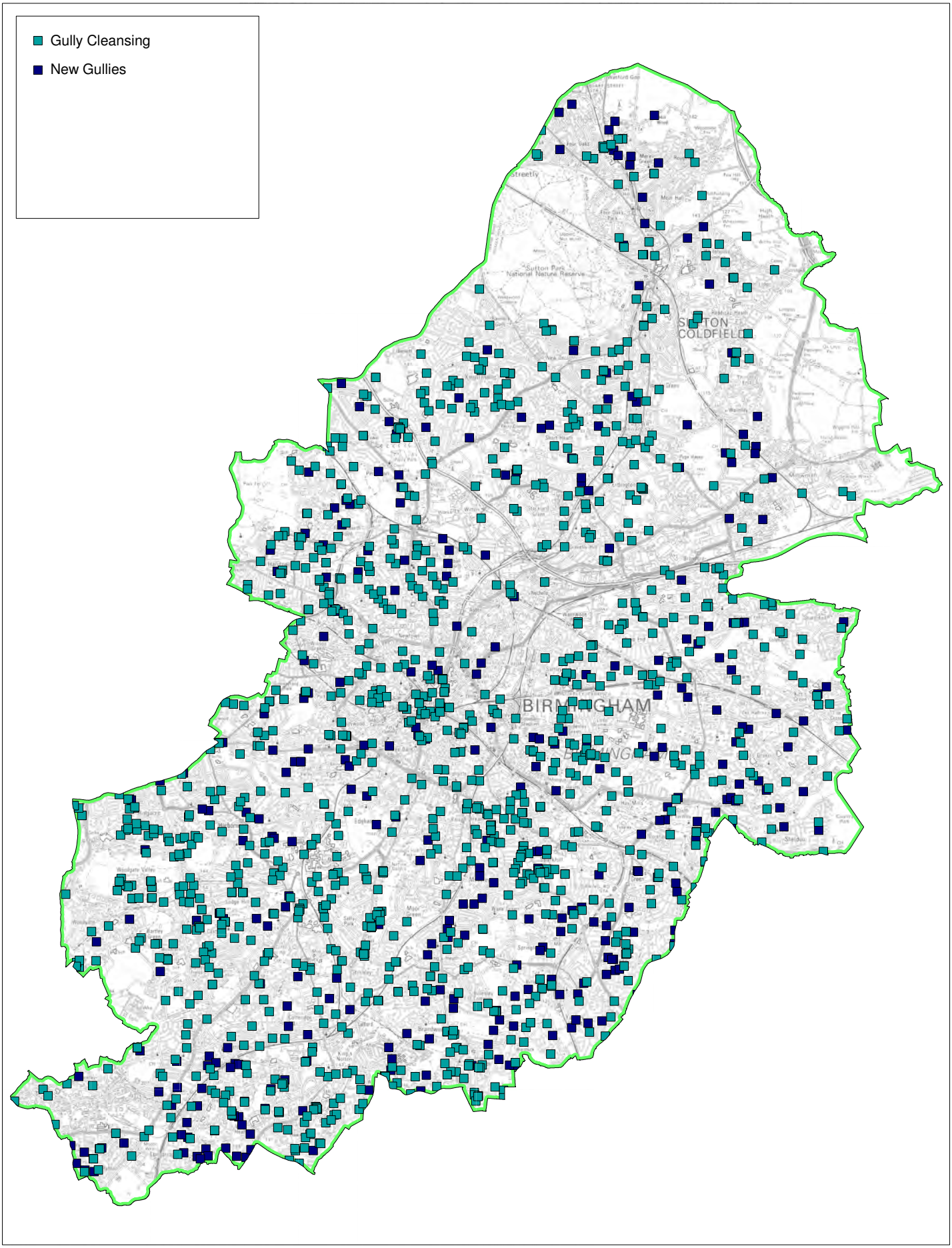

Figure 4.2 - Indicators of Surface Water Flooding

5. Future Flood Risk

5.1 Introduction

This section summarises all relevant information on future flood risk in Birmingham including climate change.

5.2 Surface Water Flood Risk

5.2.1 National Information on Surface Water Flood Risk

The Environment Agency has produced two national datasets showing predicted surface water flooding:

- Areas Susceptible to Surface Water Flooding (AStSWF)
- Flood Map for Surface Water (FMfSW)

Areas Susceptible to Surface Water Flooding

The map has been produced using a simplified method that excludes underground sewerage and drainage systems, and smaller over ground drainage systems, excludes buildings, and uses a single rainfall event of a 6.5 hour storm with a 0.5% average probability of being exceeded each year (1 in 200 annual probability) – therefore it only provides a general indication of areas which may be more likely to suffer from surface water flooding.

The maps do not show the susceptibility of individual properties to surface water flooding. The map provides three bandings from 'less' to 'more' susceptible to surface water flooding. The 'more' band will be useful to help identify areas which have a natural vulnerability to:

- flood first;
- flood deepest; and/or
- flood for relatively frequent, less extreme events (when compared to the other bands).

Flood Map for Surface Water

These maps are a development of the Environment Agency's Areas Susceptible to Surface Water Flooding (AStSWF), as they consider:

- More storm events;
- The influence of buildings; and
- The influence of the sewer system.

The Flood Map for Surface Water shows areas where surface water would be expected to flow or pond.

Two rainfall events, one with a 1 in 30 and the other with a 1 in 200 chance of occurring in any year, are modelled and mapped. However, users must note that this is the chance of this rainfall, and not of the resulting flood extent occurring. Consequently it only provides a general indication of areas which may be more likely to suffer from surface water flooding in these rainfall probabilities.

For each rainfall probability, the map provides two bandings which can be used individually to indicate:

- 'Surface Water Flooding' - flooding greater than 0.1m deep;

- 'Deeper Surface Water Flooding' - flooding greater than 0.3m deep;

The 0.3m threshold is chosen as it represents a typical value for the onset of significant property damages when property flooding may start (above doorstep level) and because it is at around this depth that moving through floodwater (driving or walking) may become more difficult; both of which may lead users to consider the need to close roads or evacuate areas.

5.2.2 Locally Agreed Surface Water Information

The Environment Agency guidance on surface water flood risk information recommends that LLFAs should review, discuss, agree and record with partners what surface water information best represents local conditions, this is known as 'locally agreed surface water information'.

There is currently no local surface water flood risk information for Birmingham; however a Surface Water Management Plan is currently underway for the City together with a more detailed integrated modelling study for the River Cole catchment. The results of these studies will be used to inform the second cycle of the PFRA process and the production of flood hazard and flood risk maps for the area.

It is however recognised that there is a significant surface water flooding issue in relation to agricultural land on the urban fringe, generally in other LLFAs jurisdiction, resulting in flooding in the Birmingham City Council area. Resolution of such problems will require cross boundary cooperation.

As there is no local information, the 'locally agreed surface water information' is considered to be the Flood Map for Surface Water, as shown in Figure 5.1. These maps are considered to be an improvement over the AStSWF maps, however they are not without their differences and limitations. One of the issues that is particularly relevant for Birmingham is the fact that they will be less representative over large flat landscapes where there will be locations at risk outside of the areas predicted. Although this does inevitably mean that these maps would need to be improved to make robust flood risk management decisions at a local level, it was agreed that they currently provide the best available surface water management information at a strategic level since:

- Their use would limit any additional modelling that may be just as coarse, or strategic, as the readily available data; and
- Through cross examination it was felt that the mapping did largely represent the incidents of flooding or indicators of flooding.

5.3 Groundwater Flood Risk

5.3.1 National Information on Groundwater Flood Risk

In response to the need for more information on groundwater flooding, the British Geological Society (BGS) has produced the first national hazard or susceptibility data set of groundwater flooding. The data is based on geological and hydrogeological information and can be used to identify areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

Although this is not a risk data set in that it does not provide information about the likelihood of a groundwater flood occurring, it can be used to provide an understanding of groundwater flooding. The five susceptibility zones are shown in the Table 5.1.

This data is presented in Figure 5.2 and shows the areas at high or very high susceptibility to groundwater flooding are illustrated.

Geological Class	Susceptibility
1	Very High
2	High
3	Moderate
4	Low
5	Very Low
No data	No susceptibility

Table 5.1 –Groundwater Susceptibility Zones

5.3.2 Local Information on Groundwater Rebound

Local information on groundwater flood risk is based on the CIRIA Special Publication 92 (1993) Titled: Rising Groundwater Levels in Birmingham and the Engineering Implications[7].

The study found that the Triassic Sandstones that underlie much of the city of Birmingham are water bearing and were used for well over a century as a major source of supply for local industry and commerce, and originally also for local public water supply. Between about 1860 and 1930 many wells and boreholes were sunk to meet the needs of industrial development and urbanisation. Abstraction rates exceeded recharge, as a direct consequence groundwater levels in the sandstone aquifer fell.

During the last 40 years there has been an appreciable reduction in the amount of pumping in the area. Licensed abstractions within the Birmingham Groundwater Unit have fallen in total to less than a fifth of the peak, from an estimated maximum of over 75 Ml/d (megalitres per day) during the 1940s, to less than 15 Ml/d in 1993.[7]

The excess of natural recharge and leakage over abstraction from the aquifer has led to a rapid rise in groundwater levels. Ultimately the groundwater surface will return to historic levels, subject to the effects of changes in surface land use, drainage and continued abstractions.

The area affected by the rebounding of groundwater levels corresponds to the extent of water bearing sandstones under and around the city of Birmingham, an area of approximately 110 square kilometres. This area is approximately 6 to 8 kilometres wide, extending from the districts of Weoley Castle and Bourneville in the south, to Streetley in the north, a distance of 18 kilometres.

The groundwater modelling studies of the Birmingham Aquifer presented in the 1993 CIRIA were run for a number of future options in terms of abstraction rates and locations. The worst case modelling assumptions assumed a relatively low rate of abstraction from the Birmingham aquifer. The impacts predicted were for rising levels of between 10 and 12 m to the south of the River Tame between 1990 and 2020, and relatively little change north of the River Tame.[7]

[7] CIRIA Special Publication 92 (1993) Rising Groundwater Levels in Birmingham and the Engineering Implications

Rising levels in the main Birmingham aquifer units will cause water to overspill into superficial groundwater units over a wider area. This is particularly the case along the Birmingham Fault were levels were already over spilling into the superficial aquifers overlying the Mercia Mudstones west of the fault in places in the early 1990s.

In summary there is likely to be continuing widespread impacts as a result of groundwater level rebound in the Birmingham area. Localised management and dewatering operations to stabilise and protect buildings, buried structures and avoid flooding of basements and low lying areas are likely to be required unless substantial increases in groundwater abstraction rates have occurred in recent years.

5.4 Ordinary Watercourses

5.4.1 National Information on Ordinary Watercourse Flood Risk

There are no national datasets that deal solely with predicted fluvial flood risk from ordinary watercourses; however there are Environment Agency datasets which contain relevant information, these being:

- Areas Susceptible to Surface Water Flooding (AStSWF)
- Flood Map for Surface Water (FMfSW)
- Flood Map for Rivers and Sea

The surface water flooding datasets (AStSWF and FMfSW) can be used to make assumptions about the extent of flooding from surface water and small ordinary watercourses as in many cases this will be similar.

The Flood Map for Rivers and Seas whilst primarily showing flood risk to Main Rivers also shows flood risk to larger ordinary watercourses where the catchment is greater than 3km^2. The Flood Map for Rivers in Figure 5.3 has been edited to remove the flood outlines for Main Rivers and show only those for ordinary watercourses. Flood outlines are available for the following ordinary watercourses:

- River Cole
- Chinn Brook
- Hockley Brook
- Griffins Brook
- Chad Brook
- Perry Brook
- Plants Brook

The EA's Flood Map was first published and made freely available on the internet in October 2004. The sources of flood extent data sets presented on the Flood Map range from high quality information derived using detailed hydraulic models to lower quality data sets derived as part of the Flood Zone Project (a high level national mapping programme). Another variable which potentially affects the quality of the published Flood Map is the topographic data that is used to map the flood extent in conjunction with the water level information. The topographic data generally used for the purpose of producing the Flood Map includes LiDAR and NextMap data, 2m and 5m grid resolution respectively, which have different degrees of accuracy.

There have recently been a number of more detailed hydraulic models produced through partnership working between the Environment Agency and Birmingham City Council, for ordinary

watercourses within Birmingham which are now included in the Flood Maps, this is the case for the River Cole, Chinn Brook and Plants Brook.

5.4.2 Local Information on Ordinary Watercourse Flood Risk

There is currently no local ordinary watercourse flood risk information for Birmingham; however a Surface Water Management Plan is currently being developed for the City. A hydraulic modelling study for the Hockley Brook is also underway which will ultimately update the Environment Agency Flood Map, this study is being undertaken as there is general agreement that the existing outline is of a lower quality and is not representative of the actual flood risk. The results of both of these studies will be used to inform the second cycle of the PFRA process and the production of flood hazard and flood risk maps for the area.

5.5 Potential Consequences of Future Flooding.

The Environment Agency has used the Flood Map for Surface Water and the National Receptor Database to identify the potential consequences of future flooding from surface water, this information has been included in Annex 2 of the Preliminary Assessment Report Spreadsheet.

5.6 Climate Change and Long Term Developments

5.6.1 The Evidence

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

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

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

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

5.6.2 Key Projections for Humber River Basin District

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

- Winter precipitation increases of around 12% (very likely to be between 2 and 26%)
- Precipitation on the wettest day in winter up by around 12% (very unlikely to be more than 24%)
- Relative sea level at Grimsby very likely to be up between 10 and 41cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 8 and 14%

Implications for Flood Risk

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

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

Drainage systems in the district have been modified to manage water levels and could help in adapting locally to some impacts of future climate on flooding, but may also need to be managed differently. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. Even small rises in sea level could add to very high tides so as to affect places a long way inland.

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

5.6.3 Adapting to Change

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

Although the broad climate change picture is clear, we have to make local decisions 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.

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).

Birmingham City Council

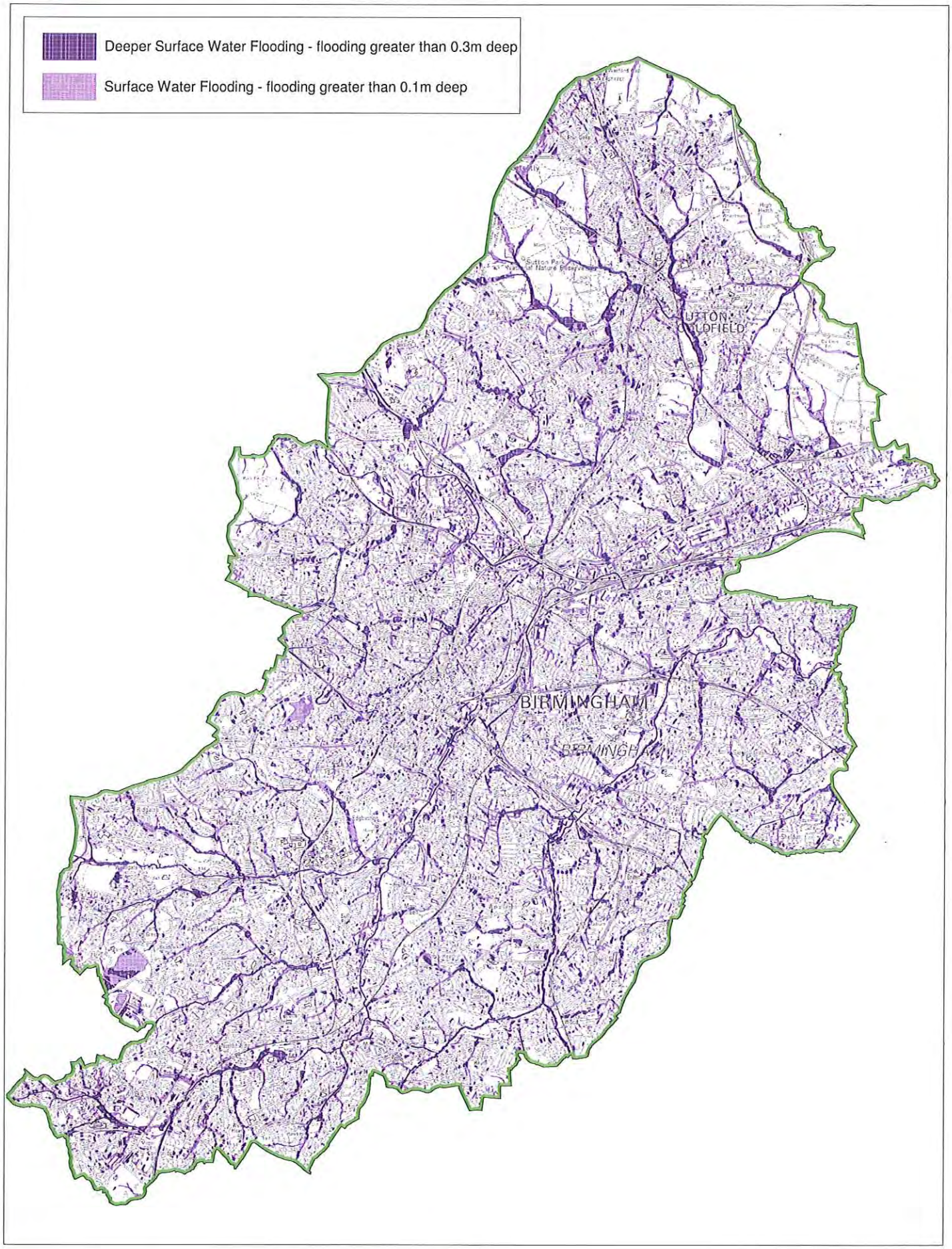

Figure 5.1 - Areas Susceptible to Surface Water Flooding

Birmingham City Council

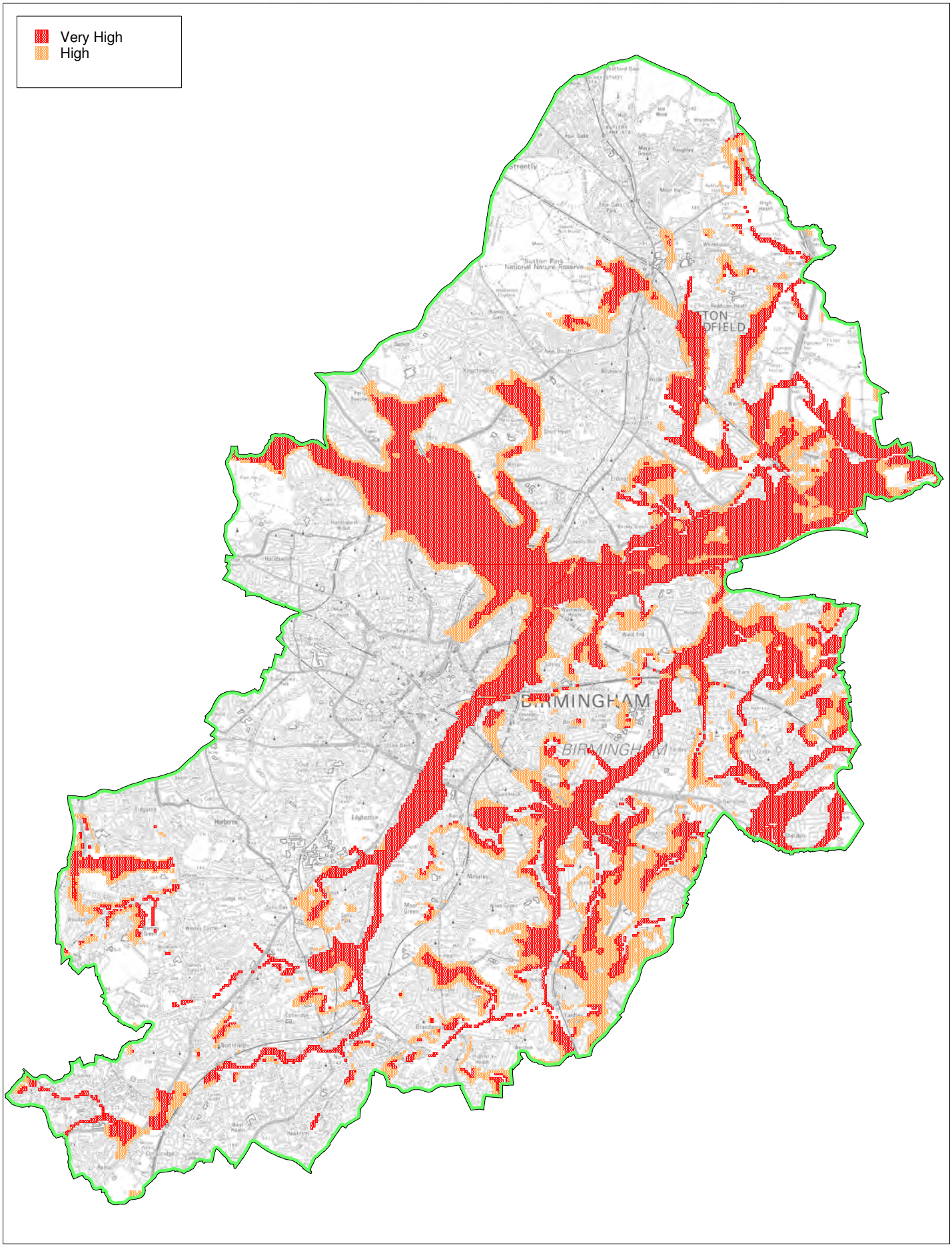

Figure 5.2 - Areas Susceptible to Groundwater Flooding

Birmingham City Council

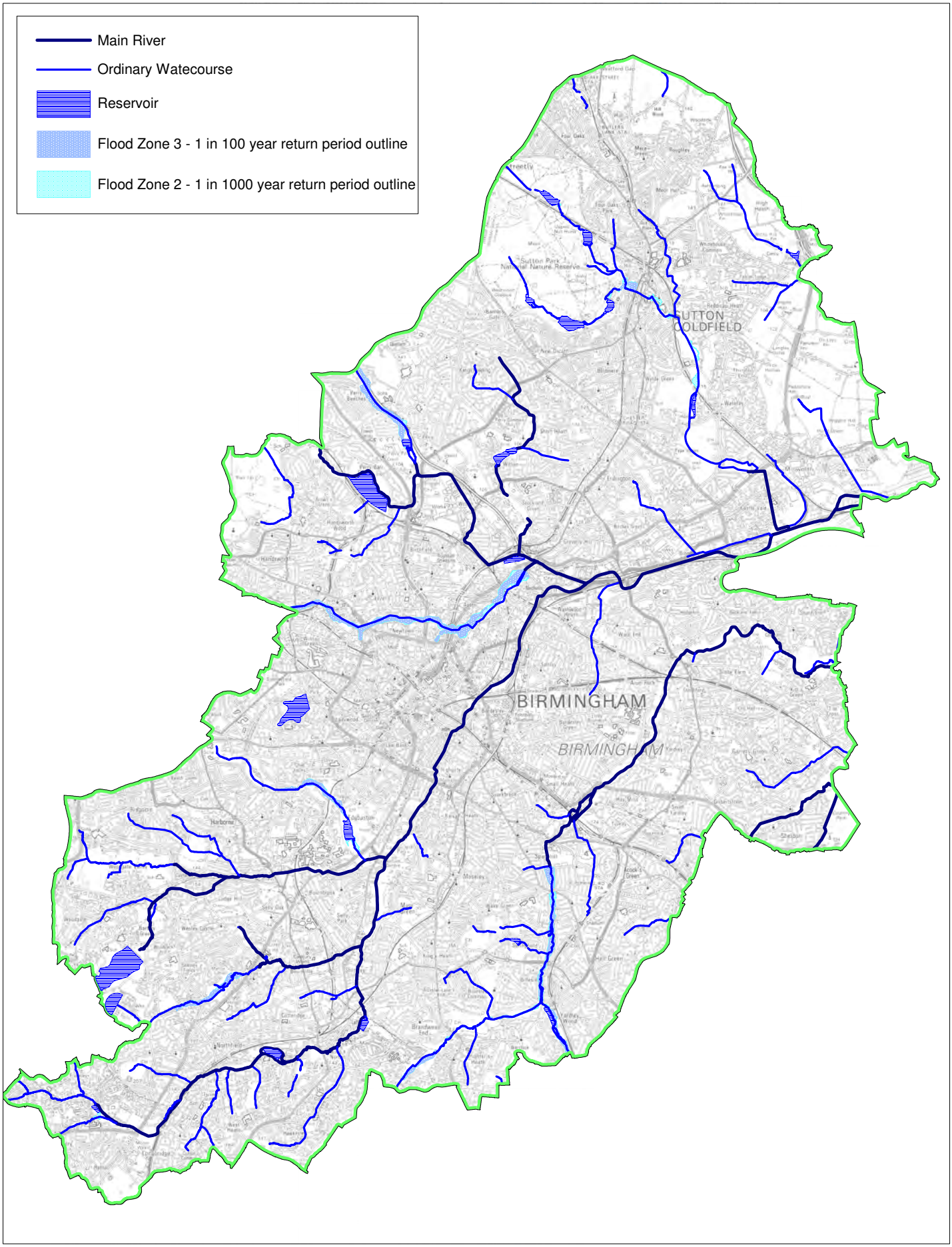

Figure 5.3 - Flood Map for Ordinance Watercourses

6. Flood Risk Areas

6.1 Introduction

This section summarises the process used to identify Indicative Flood Risk Areas and reviews the Indicative Flood Risk area for the West Midlands.

6.2 Identification of Flood Risk Areas

To ensure a consistent and proportionate approach Defra and WAG have identified significance criteria and thresholds for defining Flood Risk Areas, these being significant harmful consequences on human health, economic activity and environment. Separate groups of indicators and thresholds have been selected for each of these consequences as outlined below:

Human Health

Two indicators can be used to identify the consequences of flooding on human health:

- Number of people
- Number of critical services

Economic Activity

The guidance identifies three factors for identifying the consequences of flooding on economic activity:

- Number of non-residential properties
- Infrastructure network
- Area of agricultural land

Environment

Several factors need to be considered when identifying the consequences of flooding on the environment:

- The consequences of pollution
- The impact on internationally and nationally designated environmental sites:
    - Special Areas of Conservation (SAC)
    - Special Protection Areas (SPA)
    - Ramsar sites
    - Sites of Special Scientific Interest (SSSI)
- The impact on internationally and nationally designated heritage assets
    - World Heritage Sites
    - Scheduled Monuments (SMs)
    - Listed Buildings
    - Registered parks and gardens

6.2.1 National Selection of Flood Risk Areas

Where the impact on an indicator can be derived from national data, the Environment Agency has used this information to inform its selection of indicative Flood Risk Areas. The indicative areas were identified by drawing on national flood risk information to identify 1 kilometre grid squares ('blue squares') where:

- 200 people are at risk or
- 1 critical service is a risk or
- 20 non-residential properties are at risk.

A cluster analysis was then undertaken to identify where 5 or more 'blue squares' are touching within a 3km by 3km square, these are then identified and joined to form a 'cluster'. Where a 'cluster' identifies more than 30,000 people at risk of flooding, it is then defined as an Indicative Flood Risk Area. There are ten indicative Flood Risk Areas across England.

6.2.2 Lead Local Flood Authority Review of Flood Risk Areas

Lead Local Flood Authorities are able to propose a new or expanded Flood Risk Area by reviewing the national assessment indictors using local information or by considering those indictors not covered in the national assessment, these being:

- Infrastructure network
- Area of agricultural land
- The consequences of pollution
- The impact on internationally and nationally designated environmental sites, and,
- The impact on internationally and nationally designated heritage assets

6.3 Review of Indicative Flood Risk Areas

The geographical extent of the Flood Risk Area for the West Midlands is shown in Figure 6.1. The proposed Flood Risk Area also covers many neighbouring LLFAs including, Solihull, Sandwell, Walsall, Dudley and Wolverhampton. Small parts of Worcestershire, Staffordshire and Warwickshire also fall within the Flood Risk Area.

Birmingham City Council does not propose to make any amendments to the Flood Risk Area for the West Midlands as it is based on the FMfSW which is considered to be the 'locally agreed surface water information' as outlined in Section 5.2.2 which best represents the surface water flood risk.

As the majority of the Birmingham City Council administrative area is covered by the Flood Risk Area, with the exception of three small areas of predominantly rural land the consequences of flooding from other sources, including groundwater and surface water are unlikely to bring these areas into the Flood Risk Area.

In summary, based on our current knowledge of flood risk which has been gained from the Level 1 Strategic Flood Risk Assessment[4], and our ongoing work on the Surface Water Management Plan and River Cole Local Flood Risk Management Plan it is felt that the extent of the Flood Risk Area is appropriate for Birmingham.

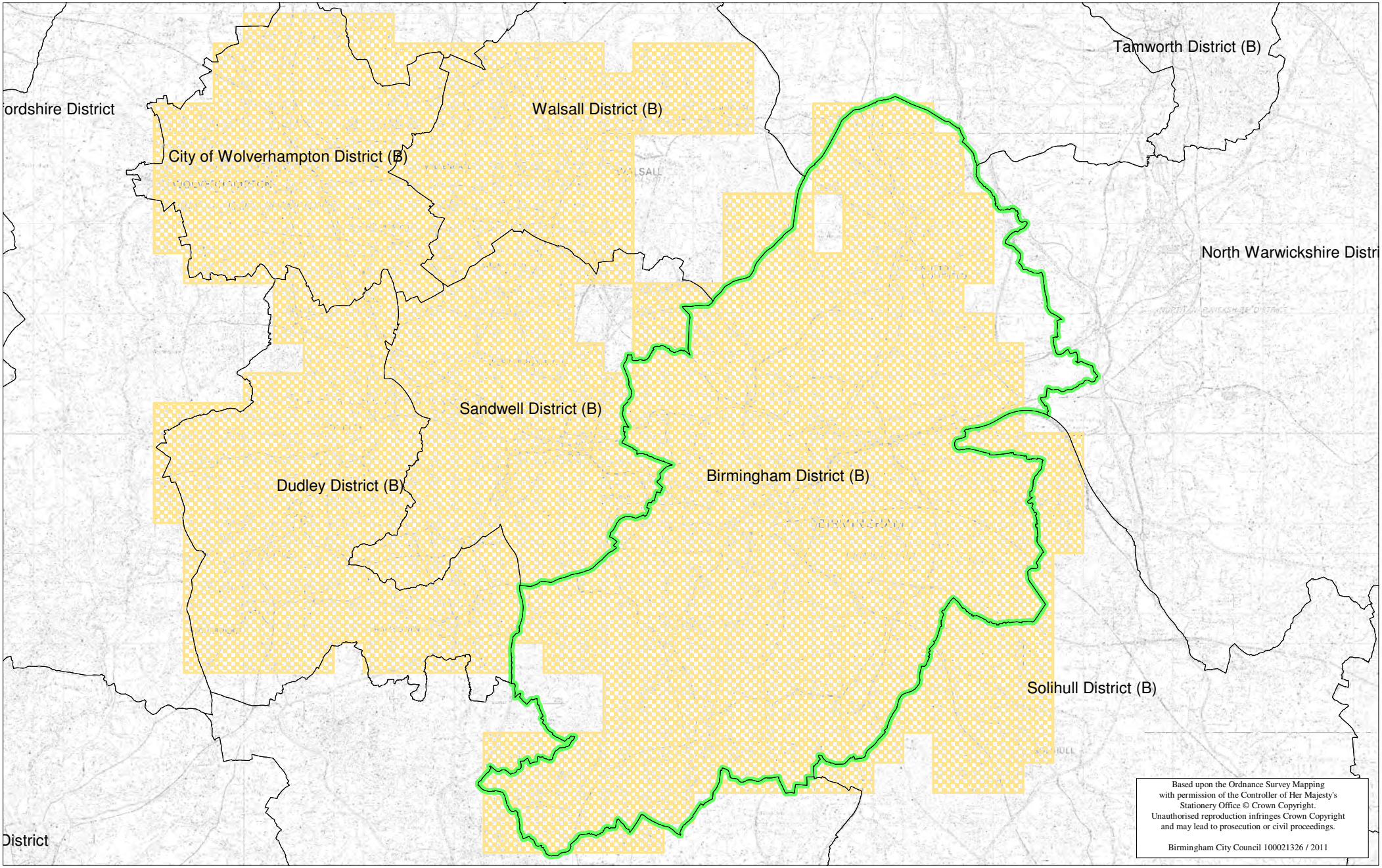

Figure 6.1 - West Midlands Indicative Flood Risk Area

7. Next Steps

7.1 Introduction

This section outlines the measures proposed by Birmingham City Council to support the review of the PFRA every 6 years, including the collection of the information.

7.2 PFRA Process

This report has been prepared by Birmingham City Council and reviewed by the City councils Transportation, Environment and Regeneration Overview and Scrutiny Committee in accordance with the guidance to meet the submission deadline of 22nd June 2011.

In order to continue to work towards the next stages in the cycle, discussions are currently underway with neighbouring LLFAs covered by the West Midlands Flood Risk Area on how to work together, share data and support each other in the production of Flood Hazard Maps and Flood Risk Maps by June 2013 and ultimately for the production of the Flood Risk Management Plan by June 2015.

7.3 Future Arrangements

Birmingham City Council recognises that as part of their Role as Lead Local Flood Authority they are required to investigate future flood events and ensure that flood risk data and information is collected, assessed and stored in an appropriate manner and passed to the appropriate responsible organisation for further investigation.

In order to achieve this it is recognised that all records of flood events will need to be documented consistently and in accordance INSPIRE Directive.

The general principles of INSPIRE are:

- Data should be collected only once and kept where it can be maintained most effectively.
- It should be possible to combine seamless spatial information from different sources across Europe and share it with many users and applications.
- It should be possible for information collected at one level/scale to be shared with all levels/scales.
- Geographic information needed for good governance at all levels should be readily and transparently available.
- It should be easy to find what geographic information is available, how it can be used to meet a particular need, and under which conditions it can be acquired and used.

Birmingham City Council already collects data on all reported flood events within its administrative area, the method of collection and storage will be reviewed and where necessary altered to meet the requirements of the Directive and to ensure that data is available in an appropriate format for the next phase of the PFRA process.

Annex 1- Records of Past Floods and their Significant Consequences

(Preliminary Assessment Report Spreadsheet – Electronic Copy Available)

Annex 2- Records of Future Floods and their Consequences

(Preliminary Assessment Report Spreadsheet – Electronic Copy Available)

Annex 3- Records of Flood Risk Areas and their Rationale

(Preliminary Assessment Report Spreadsheet – Electronic Copy Available)

Annex 4- Review Checklist (Electronic Copy Available)