



Kemerton

Worcestershire Surface Water Management Plan

June 2018

Find out more online:
www.worcestershire.gov.uk

Table of Contents

Glossary	3
Abbreviations	5
1. Executive Summary	7
2. Introduction	8
3. Preparation	9
3.1 Worcestershire general characteristics	9
3.2 Policy framework	9
3.3 Surface Water Management Plans	10
3.4 Partnership	11
4. Risk assessment - methodology	12
4.1 Countywide strategic risk assessment	12
4.2 Floodspots	12
4.3 Floodspot attribute data	12
4.4 Future potential floodspots	13
4.5 Floodspot prioritisation	13
4.6 Floodspot status	14
4.7 Floodspot allocation	15
4.8 Early / quick win schemes	15
4.9 Data management	15
5. Risk assessment – results	16
6. Options - management approaches	27
6.1 Floodspot response	27
6.2 Localised Flood Risk Management Plans	27
6.3 Future potential flood risk	27
6.4 Environmental impact criteria	27
6.5 Sustainable drainage systems (SuDS)	27
6.6 Property flood resilience	27
6.7 Funding	28
6.8 Early warning systems	28
6.9 Engagement, warning & informing	28
6.10 Weather event data	28
6.11 Rural SuDS and upstream catchment management	28
6.12 Environmental Considerations	29
6.13 Floodspot publication and gap filling	29
6.14 Flood event data recording	29
6.15 Asset management	29
6.16 Emergency planning	29
6.17 Spatial and infrastructure planning	29
6.18 Climate change	29
References	30
Appendix 1	31

Glossary

Term/Word	Definition
Act	A Bill approved by both the House of Commons and the House of Lords and formally agreed to by the reigning monarch (known as Royal Assent).
Catchments	An area that serves a river with rainwater. That is every part of land where the rainfall drains to a single watercourse is in the same catchment.
Catchment Flood Management Plan (CFMP)	A strategic planning tool through which the Environment Agency works with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.
Climate change	The change in average conditions of the atmosphere near the Earth's surface over a long period of time.
Defences	A structure that is used to reduce the probability of floodwater or coastal erosion affecting a particular area (for example a raised embankment).
Drainage authorities	Organisations involved in water level management, including IDBs, the Environment Agency, and RFDCs.
Flood	The temporary covering by water of land not normally covered with water.
Flood Risk Management	The introduction of mitigation measures (or options) to reduce the risk posed to property and life as a result of flooding. It is not just the application of physical flood defence measures.
Flood Risk Regulations	legislation which transposed the European Floods Directive in 2009.
Fluvial flooding	Flooding caused by the overtopping of river or stream banks.
Groundwater flooding	Occurs when water levels in the ground rise above the natural surface. Low-lying areas underlain by permeable strata are particularly susceptible.
IDB	Internal drainage board. An Internal Drainage Board is a statutory body that provides storm water management by operating and maintaining an artificial surface water drainage system.
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers.
Mitigation	The management (reduction) of flood risk.
Model	A computer generated representation of the possible outcomes of a simulated rainfall event
Ordinary watercourses	All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, IDBs.
RAG Sequence	The allocated status of a floodspot either red, amber or green; where red is not yet investigated, amber is being investigated or works are being carried out and green is works are complete and maintenance may be required.
Recovery	The process of rebuilding, restoring and rehabilitating the community following an emergency.

Term/Word	Definition
Reservoir	A natural or artificial lake where water is collected and stored until needed. Reservoirs can be used for irrigation, recreation, providing water supply for municipal needs, hydroelectric power or controlling water flow.
Resilience	The ability of the community, services, area or infrastructure to avoid being flooded or lost to erosion, or to withstand the consequences of flooding or erosion taking place.
Risk	Measures the significance of a potential event in terms of likelihood and impact. In the context of the Civil Contingencies Act 2004, the events in question are Emergencies.
Risk assessment	A structured and auditable process of identifying potentially significant events, assessing their likelihood and impacts, and then combining these to provide an overall assessment of risk, as a basis for further decisions and action.
Risk management authorities	Organisations that have a key role in flood and coastal erosion risk management as defined by the Flood and Water Management Act (2010). These are the Environment Agency, lead local flood authorities, district councils where there is no unitary authority, internal drainage boards, water companies, and highways authorities.
River flooding	Occurs when water levels in a channel overwhelms the capacity of the channel.
Sewer Flooding	Sewer flooding occurs when sewers are overwhelmed by heavy rainfall or when they become blocked. The likelihood of flooding depends on the capacity of the local sewerage system. Land, property and rivers can be flooded with water contaminated with raw sewage as a result.
SFRA	Strategic Flood Risk Assessment. The assessment of flood risk on a catchment-wide basis for proposed development in a District.
SuDS	Sustainable drainage systems. Current best practice for new development that seeks to minimise the impact upon the localised drainage regime, e.g. through the use of pervious areas within a development to reduce the quantity of runoff from the development.
Surface water flooding	Flooding from rainwater (including snow and other precipitation) which has not entered a watercourse, drainage system or public sewer.
SSSI	Wildlife and geological sites which are protected under the Wildlife and Countryside Act 1981, as amended by the CROW Act and NERC Act 2006.
Voluntary organisations groups	Self-governing organisations, some being registered charities, some incorporated non-profit organisations. They deliver work for the public benefit using volunteers.
Watercourse	A channel (natural or artificial) along which water flows.

Abbreviations

Abbreviation	Definition
AEP	Annual Exceedance Probability
AStSWF	Areas Susceptible to Surface Water Flooding (1st generation EA surface water mapping)
BHS	British Hydrological Society
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
Defra	Department for Environment, Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environment Agency
EU	European Union
FMfSW	Flood Map for Surface Water (2nd generation EA surface water mapping)
FRM	Flood Risk Management
FRMSCG	Flood Risk Management Strategic Co-ordinating Group
FWMA	Flood & Water Management Act 2010
GHG	Greenhouse Gas
GIS	Geographical Information System
IDB	Internal Drainage Board
IUD	Integrated Urban Drainage
LDF	Local Development Framework
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
LSDB	Lower Severn Drainage Board
NFU	National Farmers Union
NRD	National Receptor Database
NWWM	North Worcestershire Water Management
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
RAG	Red Amber Green (status sequence)
RBD	River Basin District
RFCC	Regional Flood & Coastal Committee
RFDC	Regional Flood Defence Committee

Abbreviation	Definition
RPE	Return Period Event
SAB	SuDS Approving Body
SEA	Strategic Environmental Assessment
SEP	Strategic Economic Plan
SFRA	Strategic Flood Risk Assessment
STW	Severn Trent Water
SuDS	Sustainable Drainage Systems
SWLDP	South Worcestershire Land Drainage Partnership
SWMP	Surface Water Management Plan
WCC	Worcestershire County Council
WLDG	Worcestershire Land Drainage Group

1. Executive Summary

Flooding has the ability to significantly impact upon property, businesses, infrastructure and the environment. As a result it affects fundamentally important strategic issues such as health, wellbeing, and the economy.

An extensive evidence base has been compiled comprising over 1,700 known floodspots across Worcestershire and a wealth of information about each of them.

For the first time this information, along with the EA modelled surface water mapping, allows us to see and articulate to others both the general scale and more specific details of flood risk in Worcestershire.

This data illustrates that the increasingly well-co-ordinated work of the RMAs and communities in Worcestershire has already achieved a great deal of flood risk reduction. It also shows that a great deal remains to be done.

Also for the first time, the detailed floodspot attribute data allows us to put the many locations which are at risk into consistent, criteria based priority order which will facilitate properly informed strategic decisions about the management of flood risk in the future.

Decisions which will be influenced by this evidence base include:

- the most effective and efficient deployment of existing resources
- the targeted procurement and allocation of additional funding and resources
- the targeted deployment of resources during flood events
- the location and design of new housing, business and infrastructure development

This evidence base and its influence on the Local Flood Risk Management Strategy and associated action plan, makes a significant contribution to the further reduction of flood risk in Worcestershire.

2. Introduction

The Flood & Water Management Act (2010) designated Worcestershire County Council (WCC) as Lead Local Flood Authority (LLFA) and gave it responsibilities including the management of surface water and groundwater. In order to help discharge this responsibility WCC decided to produce a Surface Water Management Plan (SWMP).

Early scoping exercises led to a decision to carry out a strategic, countywide assessment of flood risk from all sources, not just surface water, and to identify priority locations for further action based upon these findings. It was also decided to identify and undertake quick win projects in parallel with the longer term strategic exercise.

From the earliest stages the SWMP has been developed in partnership with the other Risk Management Authorities (RMAs) with particular emphasis on the six districts councils and the Highway Authority.

Production of the SWMP has been strongly informed by Defra's "SWMP Technical Guidance". In addition to its role guiding the future allocation of resources to local schemes, it also forms part of the evidence base for the Local Flood Risk Management Strategy (LFRMS).

This plan is intended for use principally by the RMAs operating in Worcestershire. It will also describe actions and an evidence base which will be of interest to others including the Local Planning Authorities (LPAs), infrastructure planners, developers and anyone impacted by surface water flooding.

3. Preparation

3.1 Worcestershire general characteristics

The county of Worcestershire covers 1741km² and has a population estimated at around 557,426 in six administration districts. In mid-2010, the population split was estimated at 70.4% in urban area and 29.6% in rural areas. The county benefits from a wide range of rural and urban landscapes which have differing effects on flood risk.

Worcestershire is a predominantly rural county with a population centred around the main urban areas of Worcester, Kidderminster, Bromsgrove, Redditch, Evesham, Droitwich Spa, Stourport-on-Severn, Upton-upon-Severn, Pershore and Great Malvern. There are also numerous other smaller towns, villages and scattered rural communities.

The county is drained almost entirely by the River Severn, which flows through the centre of Worcestershire from the north to the south. The majority of the county is of gentle topography, forming part of the broad River Severn basin, with the notable exceptions of the Malvern Hills, the Wyre Forest to the west of Kidderminster, the Clent Hills in the north-west of Bromsgrove and Bredon Hill in Wychavon.

The south of the county is largely underlain by impermeable Lower Lias clay and Triassic mudstones. By contrast, the north of the county includes: a major aquifer due to the presence of Permian and Triassic sandstones beneath much of Wyre Forest, the west of Bromsgrove District and small parts of Wychavon and Malvern Hills and a minor aquifer due to the presence of Lower Old Red Sandstone beneath the western part of Malvern Hills. The majority of the main rivers corridors are underlain by drift geology (silts and gravels) with the associated risk of perched groundwater accumulations.

There are 109 Sites of Special Scientific Interest (SSSIs) in Worcestershire and two Special Areas of Conservation (SACs). In addition there are around 460 Local Wildlife Sites (areas of nature conservation interest which are of county importance). Elements of the county's historic environment are also designated and there are many listed buildings which are grades I and II.

There is a long history of flooding in Worcestershire and whilst media coverage focuses on the main river flooding in towns such as Bewdley, Worcester, Upton-upon-Severn and Evesham, the majority of flood risk is from surface water and the extensive network of smaller 'ordinary' watercourses. This was clearly illustrated during the severe summer flood events in 2007 when locally and nationally over two thirds of the impacted properties were flooded by surface water.

3.2 Policy framework

The SWMP is informed by and will contribute to the delivery of a number of other plans and policies including:

- Flood and Water Management Act (2010)
- Flood Risk Regulations (2009)
- National Flood Risk Management Strategy
- Local Flood Risk Management Strategy
- Preliminary Flood Risk Assessment
- Flood Risk Management Plan
- Strategic Flood Risk Assessments
- Water Cycle Studies
- Water Framework Directive

- National Planning Policy Framework
- Catchment Flood Management Plan
- River Basin Management Plan
- Multi-Agency Flood Plans
- Flood Response Frameworks
- Climate change adaptation plan
- Local Transport Plan

For more information about these plans and policies see the Worcestershire LFRMS.

3.3 Surface Water Management Plans

The Surface Water Management Plan Technical Guidance by Defra defines surface water flooding as:

- surface water runoff: runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing pluvial flooding
- flooding from groundwater where groundwater is defined as all water which is below the surface of the ground and in direct contact with the ground or subsoil
- sewer flooding: flooding which occurs when the capacity of underground systems is exceeded due to heavy rainfall, resulting in flooding inside and outside of buildings. Note that the normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters as a result of wet weather or tidal conditions
- flooding from open-channel and culverted watercourses which receive most of their flow from inside the urban area and perform an urban drainage function
- overland flows from the urban/rural fringe entering the built-up area
- overland flows resulting from groundwater sources

After the 2007 floods the Government commissioned Sir Michael Pitt to review the response to the flooding events. The Pitt Review was released to summarise the lessons that were to be learned from the 2007 floods and made several recommendations to the Government on changes to improve response in the future. The Flood and Water Management Act 2010 put into place many of these recommendations. One of the recommendations made was that a SWMP should be written especially in areas at high risk of flooding.

A SWMP is a study that is undertaken in consultation with partners who look after drainage and surface water in the area. It looks at surface water flooding in the area and the risk it causes. It assesses the money being spent on flood risk management and aims to make sure that the management carries on being performed in an economic way. The final output of an SWMP is a long term action plan detailing how to manage surface water flooding in the future. This plan will affect future spending, emergency planning, land-use planning, drainage maintenance and future developments. The SWMP can also be used as a tool to communicate risk to local residents and councillors.

The Defra guidance defines a standard process via which a SWMP should be undertaken and this is articulated in a wheel diagram (Fig 1). There are four steps involved in the process: Preparation, risk assessment, options, and implementation & review. The first three phases focus on the SWMP study and gathering the information. The final phase is producing the action plan from the evidence gathered, implementing the plan and then reviewing the response.

3.4 Partnership

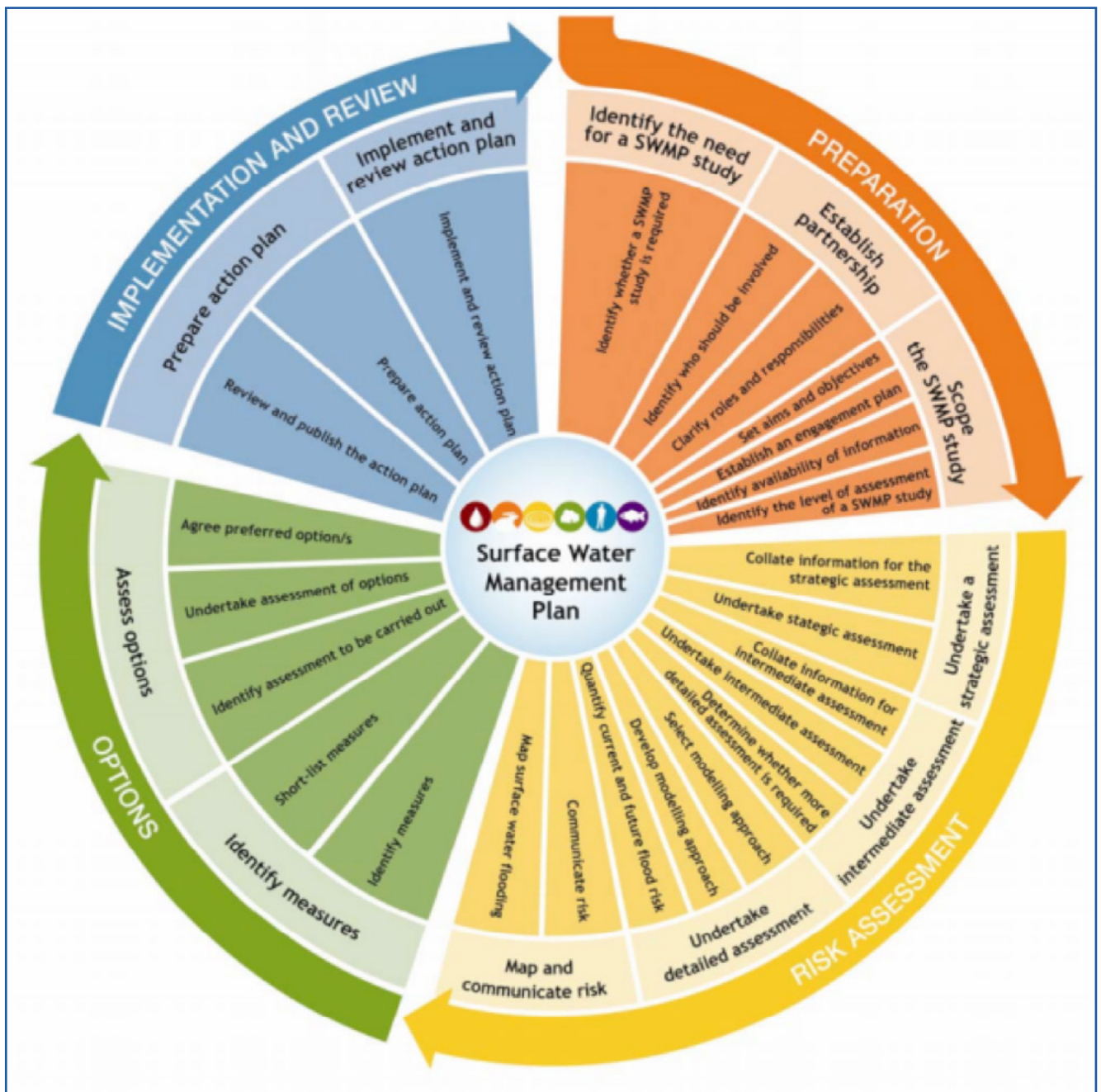
The SWMP has been produced by WCC working in close partnership with Bromsgrove District Council, Redditch Borough Council, Wyre Forest District Council, Worcester City Council, Malvern Hills District Council, Wychavon District Council, the Environment Agency, Severn Trent Water Limited and the Lower Severn Internal Drainage Board.

The land drainage officers from the three district councils in north Worcestershire work together as a joint service under the title of ‘North Worcestershire Water Management’ (NWWM). In south Worcestershire the three district authorities have a similar arrangement under the title of the ‘South Worcestershire Land Drainage Partnership’ (SWLDP).

Delivery of a number of Lead Local Flood Authority duties, including land drainage consenting and enforcement, are delegated to NWWM and the SWLDP via service level agreements.

Production of the SWMP has been guided by the multi-RMA Worcestershire Land Drainage Group and overseen by the multi-RMA Worcestershire Flood Risk Management Strategic Co-ordinating Group.

Figure 1 – The Surface Water Management Plan dial from the Defra SWMP Guidance



4. Risk assessment - methodology

4.1 Countywide strategic risk assessment

An early decision was made to carry out a top-down, countywide assessment of all past and future potential flooding, from all sources, in order to:

- Form a thorough and robust flood risk evidence base
- Identify locations which require attention
- Prioritise the locations which require attention
- Record locations which have already received attention

4.2 Floodspots

All locations which are known to have flooded in the county at some point in the past have been identified and mapped through:

- An extensive series of workshops with experienced and knowledgeable officers from a range of disciplines within the RMAs
- A thorough examination of flood reports and records including district council Strategic Flood Risk Assessments and reports produced after the severe 2007 flooding event

This exercise, with the addition of new locations emerging from flood events which occurred during the assessment period, has produced 1,700 floodspots.

4.3 Floodspot attribute data

Each floodspot represents a location where it is known there has been at least one flood event. However, the nature and scale of these flood events varies significantly.

Therefore, a large number and variety of workshops, interviews and desk top assessments has led to the collation of attribute data for almost every floodspot including:

- Flooding source
- Number of impacted properties
- Number of impacted businesses
- Number of impacted pieces of critical infrastructure
- Status of mitigation work
- Lead RMA

Where impact numbers weren't available, a 50m buffer was created around the centre of the floodspot and overlaid with the National Receptor Database (NRD). In many locations this method exaggerated the number of receptors at risk. Therefore, the resulting theoretical numbers of properties, businesses and pieces of critical infrastructure were passed to the relevant lead RMA to be truthed, to give a correct indication of risk in the floodspot location. At time of writing some RMAs are still truthing the data.

The NRD contains a list of infrastructure, which was edited to include only those seen as 'critical infrastructure'. For the purposes of the SWMP, this edited list was used, plus highways which are felt to be of particular importance e.g. key emergency service routes or those which have few or no alternative diversion possibilities.

The critical infrastructure included within the prioritisation criteria is listed in Appendix 1.

4.4 Future potential floodspots

The previous version of the EA surface water map, 'Flood Map for Surface Water', was overlaid with the NRD in order to identify potentially problematic future flood locations.

Any resulting locations which coincided with existing, known floodspots were discarded along with any which a selection of RMA representatives assessed as being extremely unlikely to flood.

A final list of 'future potential floodspots' resulted, ready for further investigation and potential mitigation.

However, now that the EA has produced and published a more recent and intelligent version of the surface water map, the 'updated Flood Map for Surface Water', this exercise needs to be repeated in order to produce more accurate results. These will be fed into the overall prioritisation list, allocated to appropriate lead RMAs and added to the SWMP action plan for more detailed investigation and possible mitigation.

4.5 Floodspot prioritisation

Both existing and future potential floodspots have been prioritised according to the extent of impact and grouped into bands, see table 1.

Table 1 – The bands used for floodspot prioritisation and the criteria

Band	Flood spot type	Criteria (and/or)	Title
1.	Floodspot	Life threatening	Hotspot
2.	Future potential floodspot	Life threatening	Hotspot
3.	Floodspot	10+ properties 1+ critical infrastructure 10+ businesses	Hotspot
4.	Future potential floodspot	10+ properties 1+ critical infrastructure 10+ businesses	Hotspot
5.	Floodspot	3-9 properties 3-9 businesses	
6.	Future potential floodspot	3-9 properties 3-9 businesses	
7.	Floodspot	1-2 properties 1-2 businesses	
8.	Future potential floodspot	1-2 properties 1-2 businesses	
9.	Floodspot	1+ property or business flooded externally	

Within each priority band, floodspots are ordered according to the number of properties followed by the number of pieces of critical infrastructure followed by the number of businesses.

Following recent discussions the impact on highways has been considered and prioritisation into the banding structure above has been produced. Table 2 shows the highways prioritisation for floodspots. As this is a very recent addition to the prioritisation criteria it has not yet been formally confirmed, implemented or integrated. These new highway criteria will be integrated into the overall prioritisation criteria in table 1.

Table 2 - Floodspot prioritisation criteria accounting for highway impact

Band	Floodspot type	Criteria (and/or)
1.	Floodspot	Wetspot Winter Wetspot
2.	Future potential floodspot	Wetspot Winter Wetspot
3.	Floodspot	Complete or lane closure of A or B road Closure of minor road with big impact
4.	Future potential floodspot	Complete or lane closure of A or B road Closure of minor road with big impact
5.	Floodspot	Closure of minor road Minor impact on A or B road
6.	Future potential floodspot	Closure of minor road Minor impact on A or B road
7.	Floodspot	Minor impact on minor road
8.	Future potential floodspot	Minor impact on minor road
9.	Floodspot	Incomplete attribute data or no known impact

A Wetspot can be defined as follows:

Where water is running across the road, to a significant degree, which would cause wash off of road salt where gritted, from whatever source. In addition, where there is a significant amount of water lying/standing across the road which may cause a significant hazard to vehicles travelling along the road.

Critical note:

1. Water running or present in a channel on the side of the road, is not defined as a Wetspot.
2. Where there is a major severe weather event and/or significant ground water saturation situation, it will not be practicable to sign all wet areas of the highway. In such situations, significant Wetspots as identified by the police, or reports from officers (including PEM reports that identify any significant issues, where inspected) will be signed as necessary where identified.

It is likely that some floodspots will be moved into a different band once initial investigation gets underway. For example if a floodspot is known to be impacted very frequently it might be moved to a higher band or if the critical infrastructure is discovered to be less important it might be moved to a lower band.

In addition, when a floodspot is being investigated it will be sensible to look at other floodspots in close proximity, regardless of their priority band, in order to establish if there is a relationship between them and/or an opportunity exists to address them together. This might be particularly relevant where a broad catchment based approach is appropriate.

The top four priority bands of floodspot are given the additional title of ‘hotspots’ as a quick and easy reflection of their importance in terms of actual or potential impact.

4.6 Floodspot status

Every floodspot has been given a simple mitigation status as follows:

Red - not yet investigated

Amber - being investigated or a scheme being developed/implemented

Green - mitigation work either completed or not viable/necessary

It should be noted that a 'Green' status does not necessarily mean that flooding will not re-occur. Rather it means that the likelihood and/or severity of any future potential flooding has been reduced. In addition, it is very likely that a 'Green' floodspot may have drainage infrastructure which needs to be regularly monitored and maintained.

The status of the floodspots will be dynamic and the attribute data will be regularly updated accordingly as 'Reds' become 'Ambers' and 'Ambers' become 'Greens'.

Floodspot allocation

Each floodspot has been provisionally allocated to a lead RMA who will be expected to carry out further investigation before confirming whether they are the lead RMA. Once the lead RMA and other relevant RMAs for each floodspot has been confirmed, the lead RMA will ensure that the floodspot is appropriately taken through the SWMP process and through the RAG status sequence. Many floodspots will involve more than one source of flooding and therefore require a multiple-RMA approach.

The EA and STWL have been provisionally assigned a number of the floodspots. As detailed in the LFRMS Action plan, the EA and STWL will carry out further investigations and analysis before the lead RMA and other relevant RMAs can be confirmed. Any confirmed EA or STWL lead floodspots will then be monitored and discussed in ongoing partnership fora. The GIS layer of these floodspots will be retained for future reference.

However, the remaining 1,400 floodspots i.e. those led by the local authorities will be retained as a live, regularly updated GIS layer.

4.7 Early / quick win schemes

A number of individual floodspots have been investigated and appropriate mitigation works carried out during the SWMP strategic assessment stage and schemes which have been either completed or started include:

- Tibberton
- Droitwich Town Flood Risk Management Plan
- Bromsgrove Flood Risk Management Plan
- Redditch Flood Risk Management Plan
- Green Lane, Catshill
- Callow Brook, Rubery
- Wolverley
- Lower Moor
- Bransford
- Harvington

4.8 Data management

Floodspots and their attribute data have been recorded in a GIS layer so that they can be used most effectively and made as appropriately and fully accessible as possible.

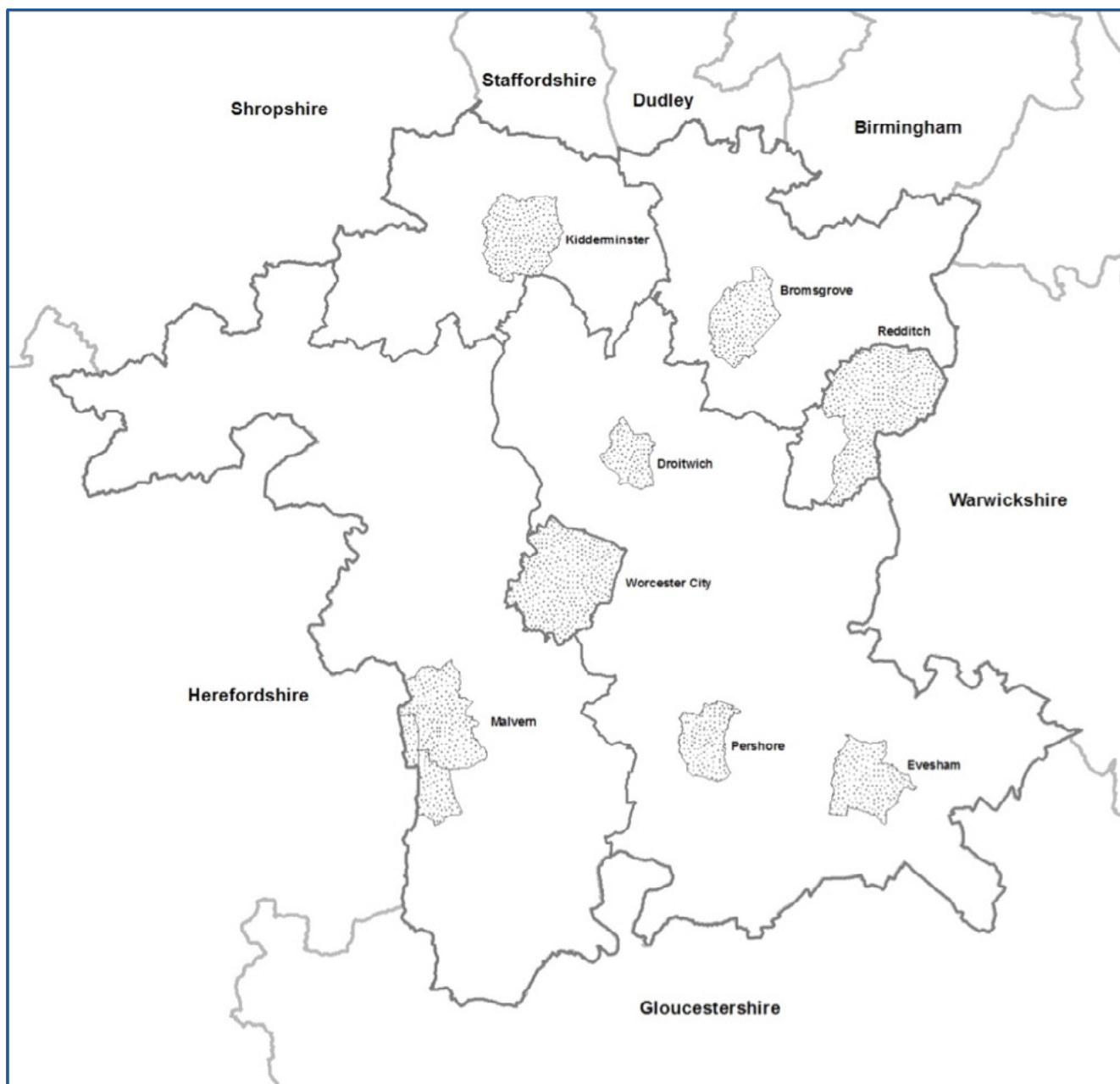
When appropriate this data will be made available on the WCC website. However, some of the information is more sensitive and, subject to data protection and access to this needs to be appropriately restricted.

Additional data, beyond that held in the core floodspot attribute spreadsheets, is held by the relevant RMAs in a range of formats. It is intended that this information will gradually be digitised and made accessible via a floodspot web mapping system.

5. Risk assessment – results

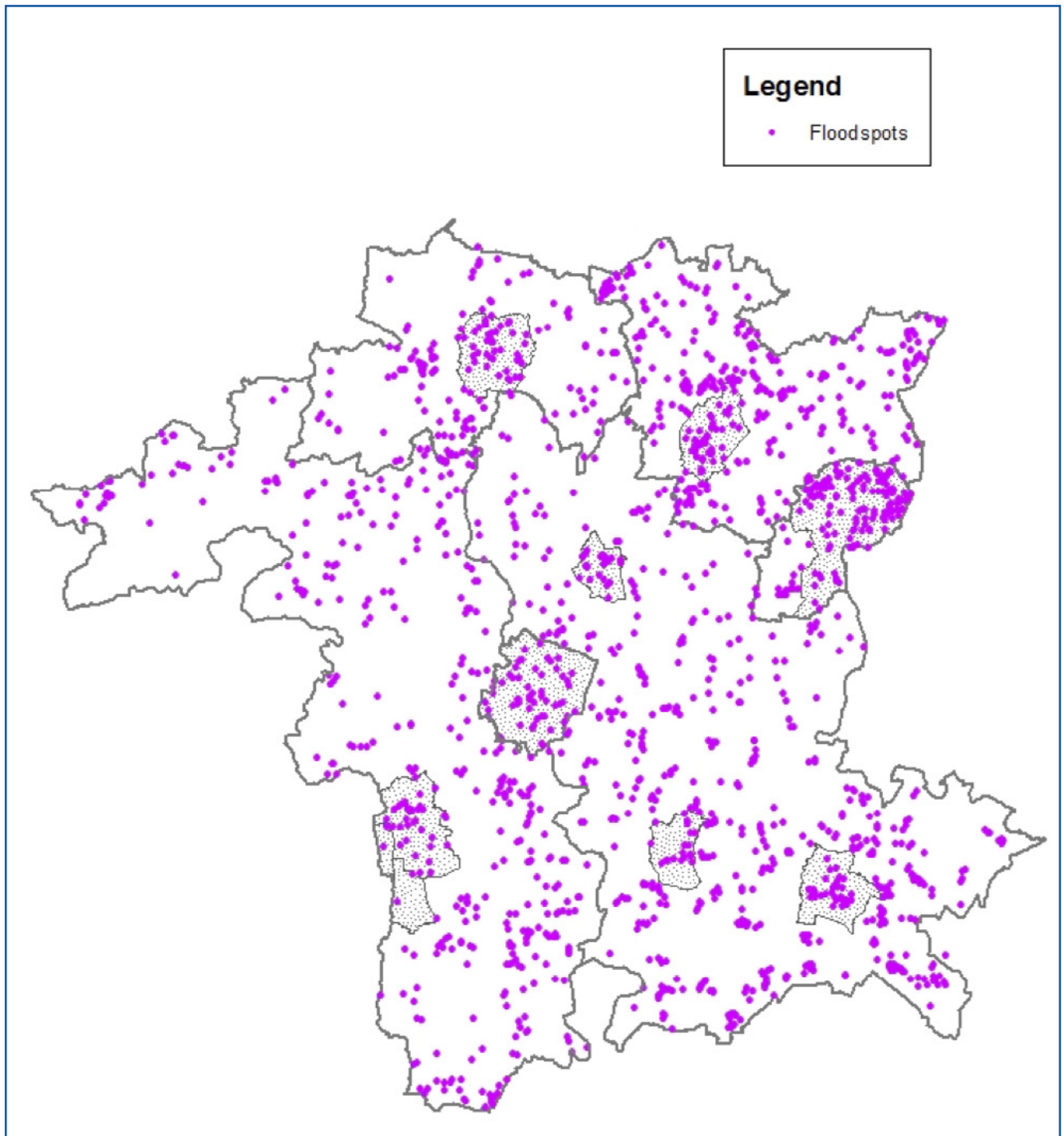
5.1 Worcestershire in context

Figure 2 – Neighbouring authorities and urban areas in Worcestershire



5.2 There are over 1,700 recorded floodspots across Worcestershire.

Figure 3 – Floodspots from all Risk Management Authorities



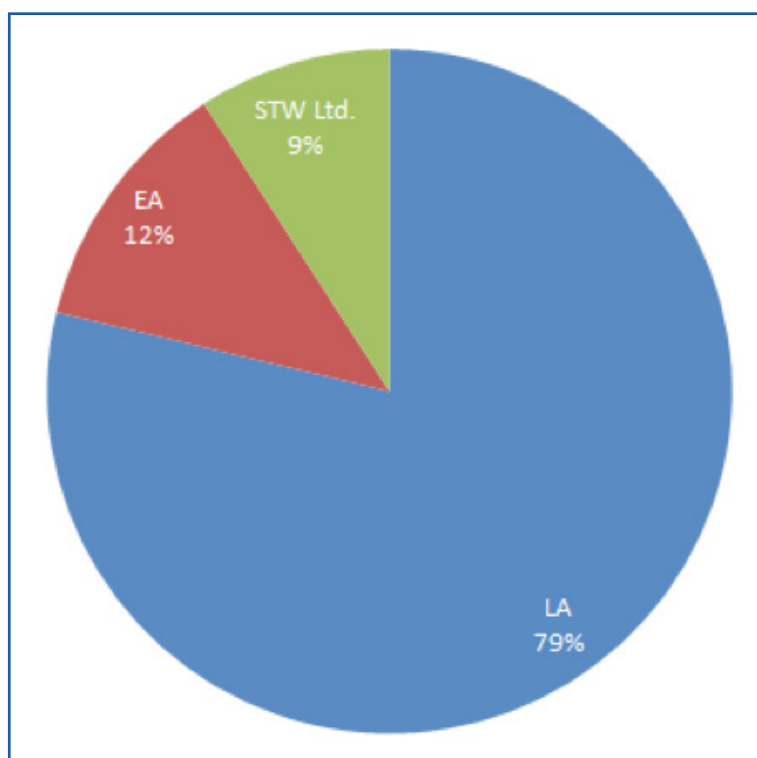
5.3 A range of data has been gathered about the floodspots which has allowed each of them to be allocated to a lead RMA, ranked in terms of its priority and given a status in terms of the extent to which the flood risk has been mitigated.

Table 3 – The numbers of floodspots for each RMA broken down into their priority band and mitigation RAG status

RMA	Total	Band 1			Band 3			Band 5			Band 7			Band 9							
		Red	Orange	Green	Red	Orange	Green	Red	Orange	Green	Red	Orange	Green	Red	Orange	Green					
LLFA	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Highways	656	0	0	2	0	0	9	41	57	0	24	54	83	0	86	161	125	0	0	11	3
NWWM	312	0	0	0	1	0	0	11	20	0	8	33	54	0	19	69	86	0	1	7	3
SWLDP	370	0	0	1	0	0	0	22	10	0	29	63	27	0	69	109	38	0	0	1	1
EA	207	0	0	0	0	26	9	18	21	10	3	3	4	43	21	7	8	16	13	0	5
STW Ltd.	155	0	0	0	0	12	31	46	12	2	8	14	2	2	6	7	5	2	1	4	1
Total		0	0	3	1	38	49	138	120	12	72	167	170	45	201	354	262	18	15	23	13
Total	1701	4			345			421			862			69							

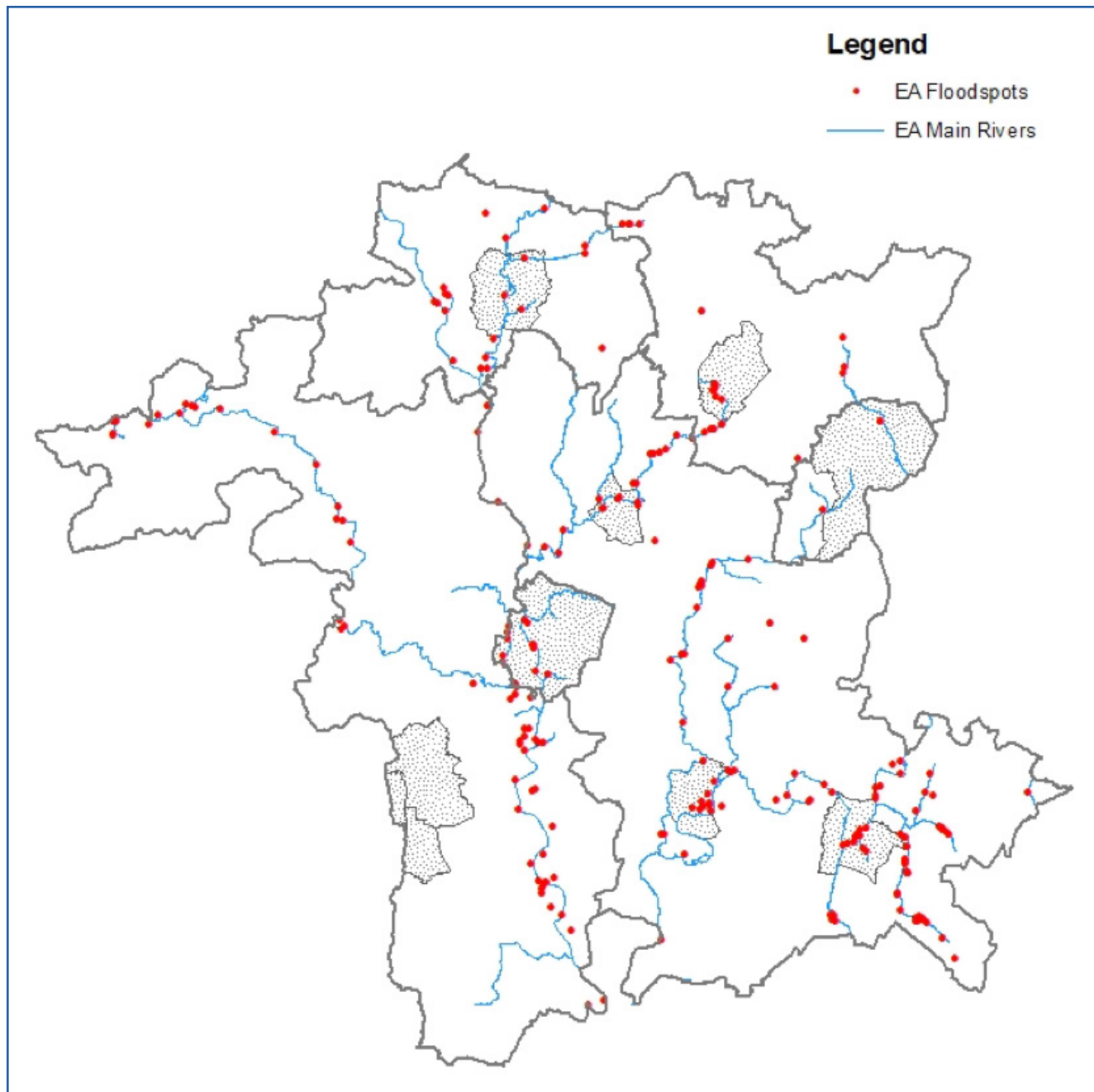
5.4 The majority of floodspots are related to surface water and ordinary watercourses, both of which fall under the responsibility of the local authorities, see figure 4.

Figure 4 – The percentage of the 1,700 floodspots which are allocated to the Environment Agency, Severn Trent Water Ltd and the Local Authorities



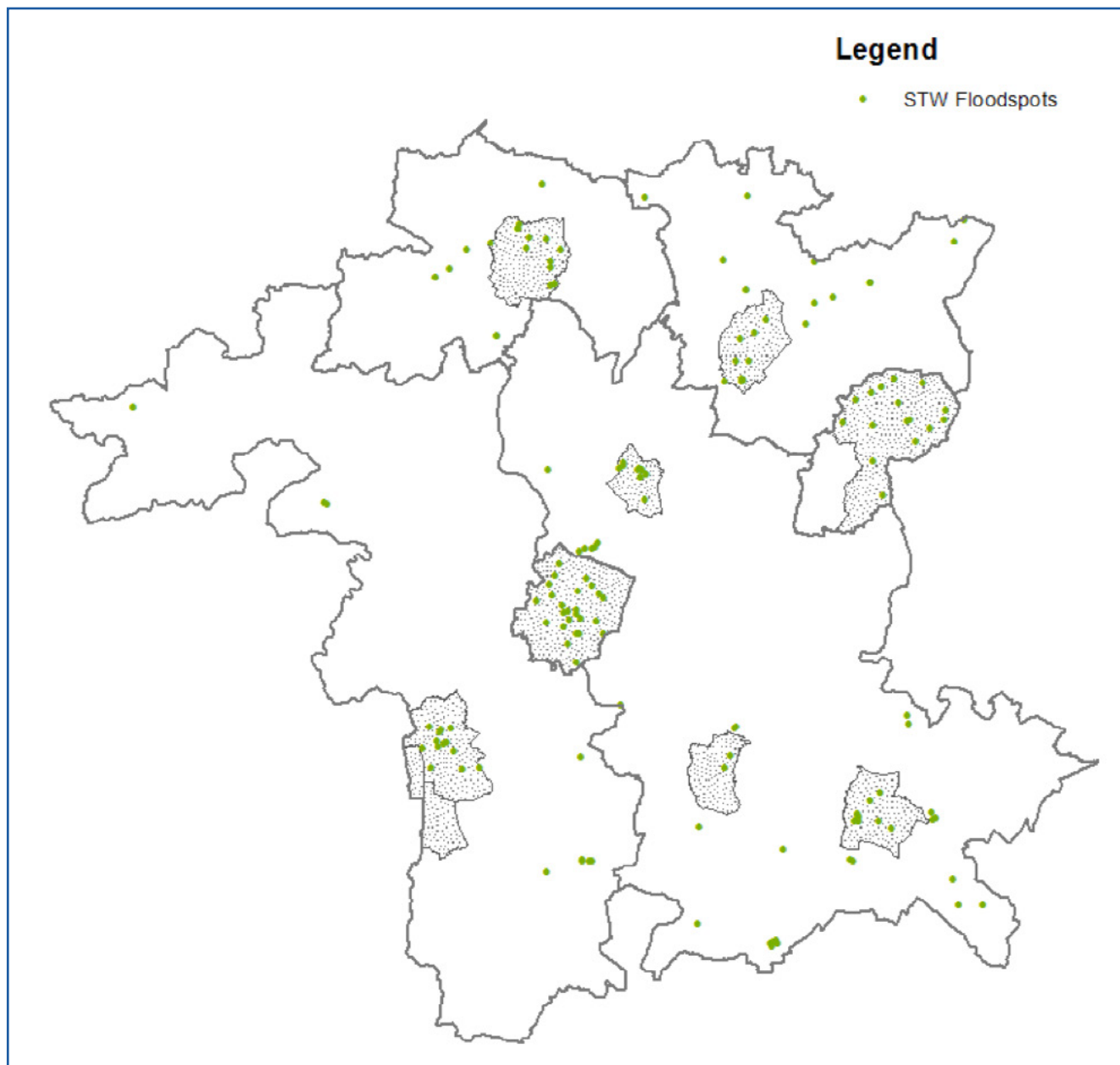
5.5 Just over 200 floodspots have provisionally been assigned to the Environment Agency as the lead RMA for further review. See Sections 4.3 and 4.7 for details of how a lead RMA has been provisionally assigned for each flood spot, and the process for the lead RMA to confirm that they are the lead. These floodspots can be seen to follow the Main River.

Figure 5 – Environment Agency floodspots and Main Rivers



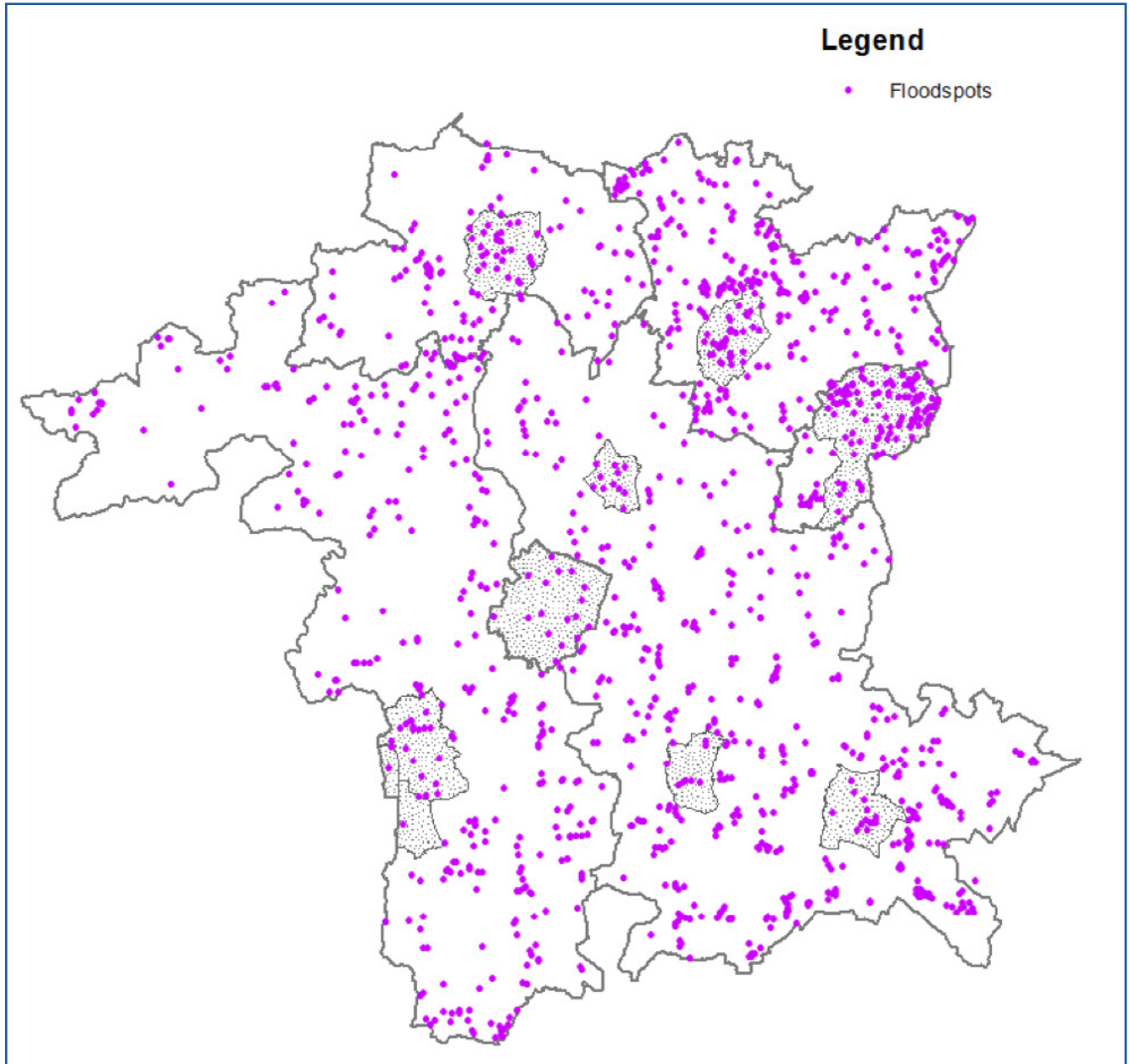
5.6 Around 150 flood spots have provisionally been assigned to Severn Trent Water Ltd as the lead RMA for further review. See Sections 4.3 and 4.7 for details of how a lead RMA has been provisionally assigned for each flood spot, and the process for the lead RMA to confirm that they are the lead.

Figure 6 – Severn Trent Water Ltd floodspots



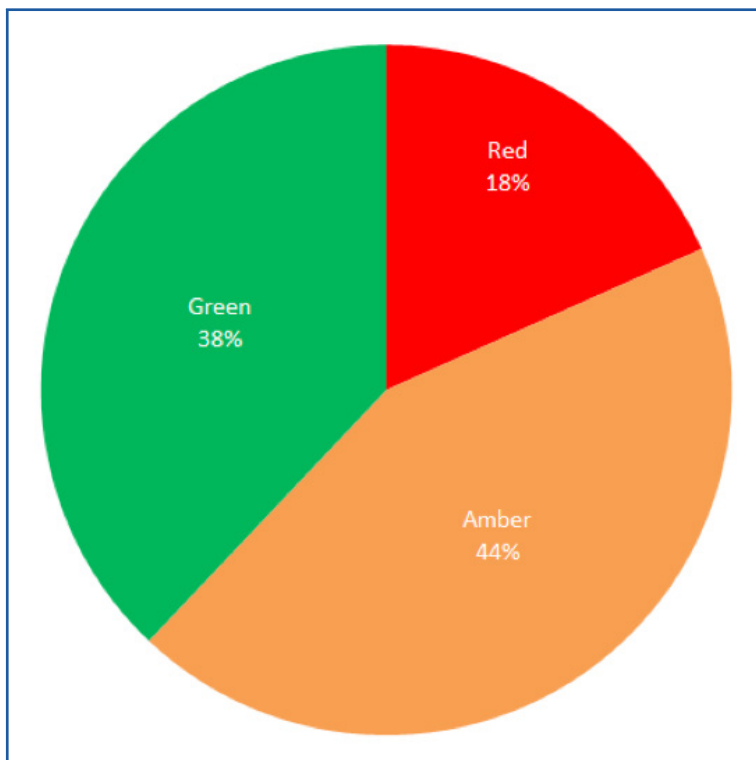
5.7 5.7. There are over 1,400 floodspots for which either Worcestershire County Council, as the LLFA and the Highway Authority, or the district council land drainage partnership is the lead RMA, figure 7.

Figure 7 – Local Authority floodspots



5.8 Figure 8 shows the percentage of 'Green' status floodspots of which significant progress has already been made with reducing flood risk in Worcestershire.

Figure 8 – The percentage of local authority floodspots in each mitigation status

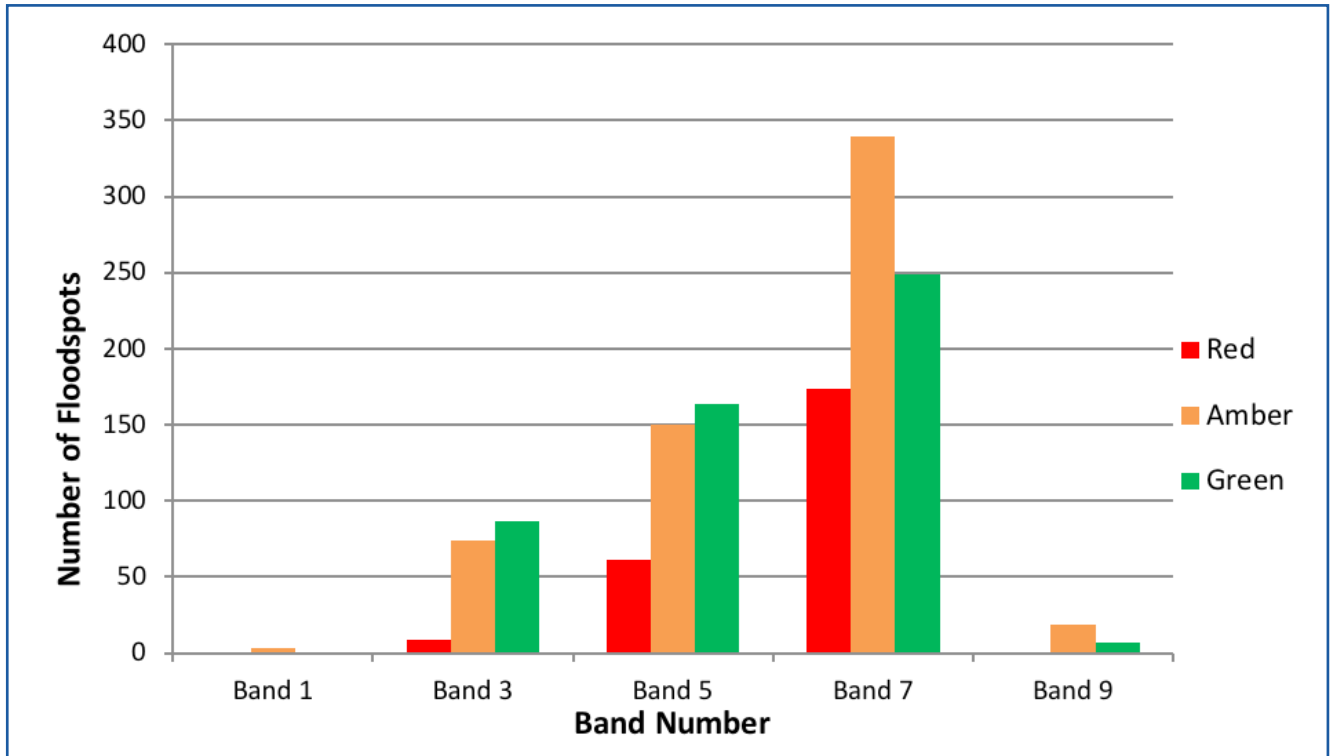


5.9 Just 18% of local authority high priority floodspots (hotspots) have a 'Red' status which shows that mitigation work is either already underway or complete.

However, drainage and flood alleviation infrastructure at 'Green' status floodspots needs to be maintained, therefore continued capacity and revenue funding is needed.

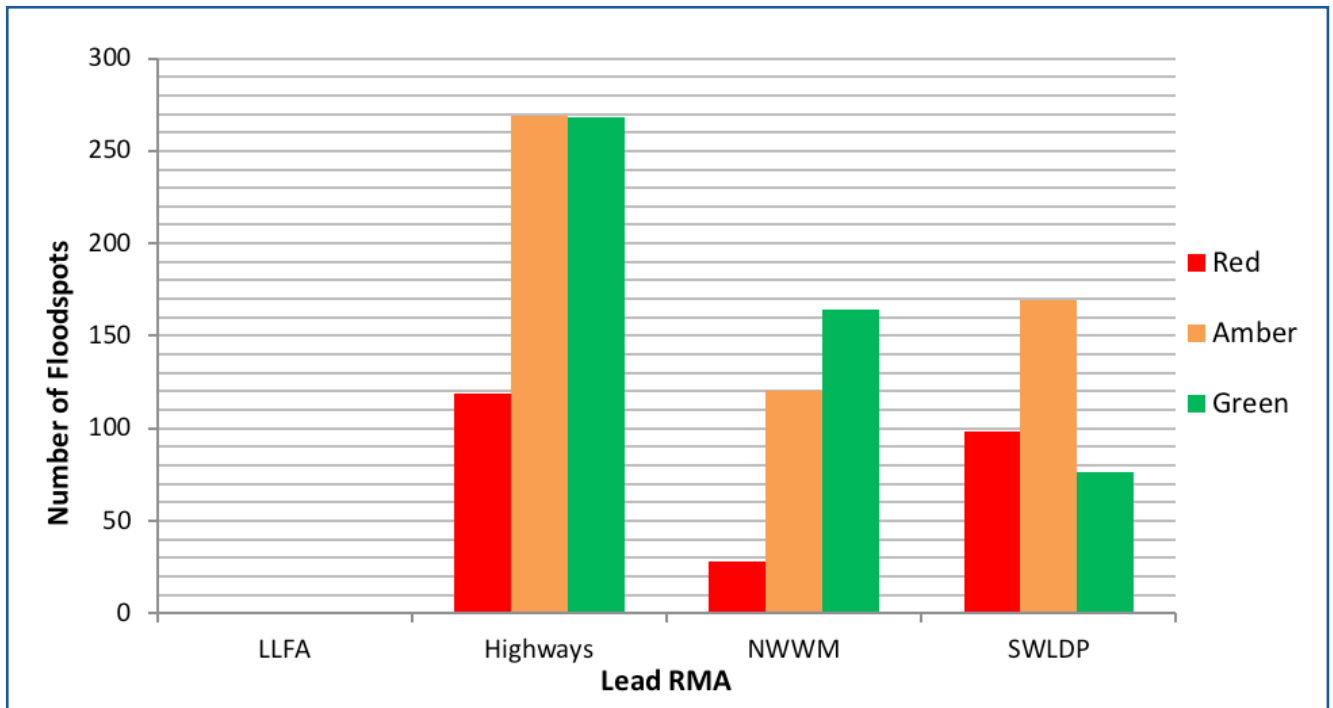
Also, as 'Amber' status floodspots are turned 'Green', more revenue capacity and funding will be needed for maintenance.

Figure 9 – Number of floodspots by status of mitigation work in each priority band



5.10 There remains a significant number of 'Amber' and 'Red' status floodspots so there is still a lot of work to be done and a clear need for capacity and capital funding for investigation and scheme development.

Figure 10 – Number of floodspots for each lead RMA broken down by status of mitigation works



5.11 Each of the RMAs has already contributed to the reduction in flood risk in Worcestershire and each has a significant role to play in its further reduction.

Figure 11 – North Worcestershire Water Management floodspots shown by mitigation status

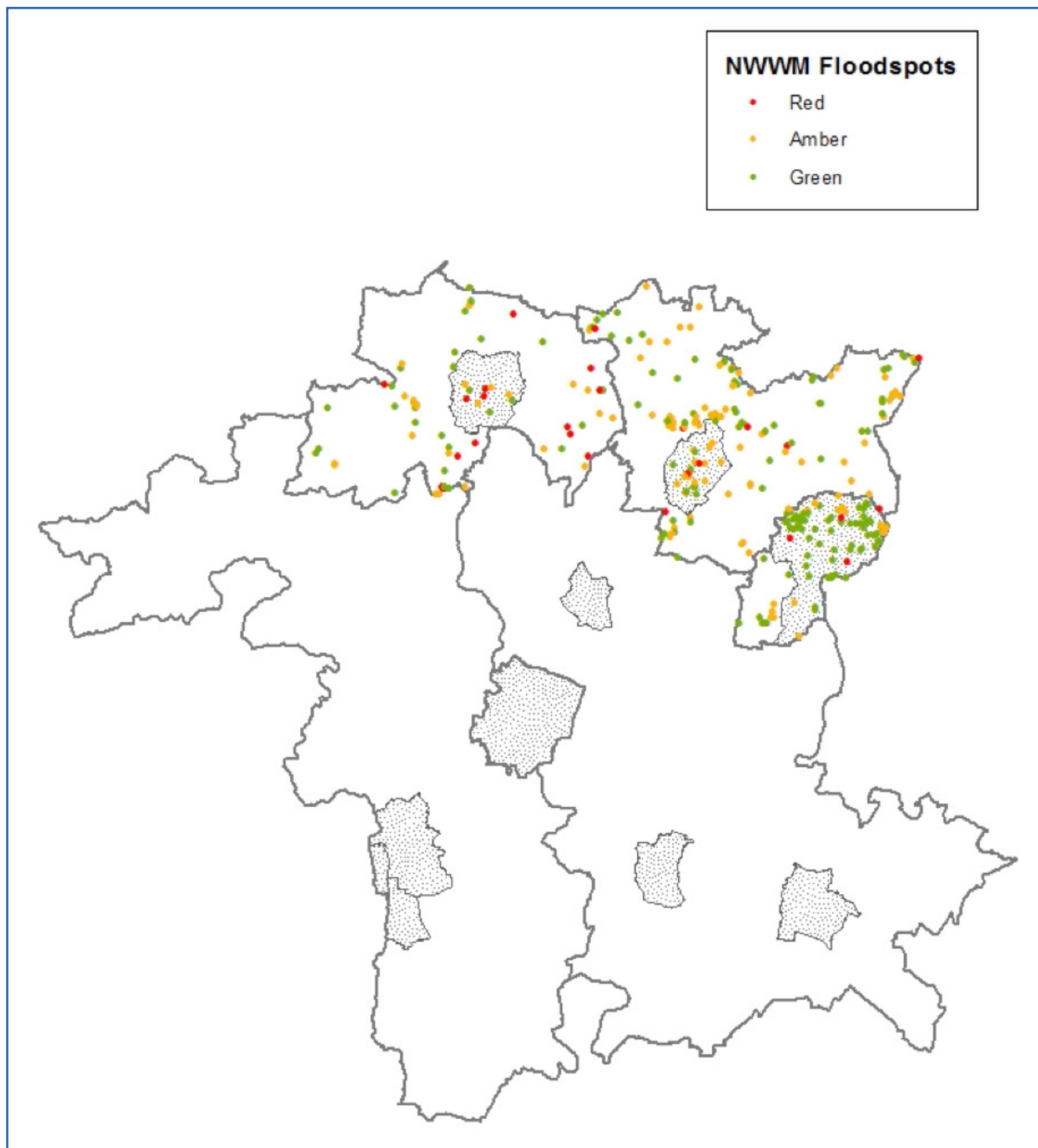


Figure 12 – South Worcestershire Land Drainage Partnership floodspots shown by mitigation status

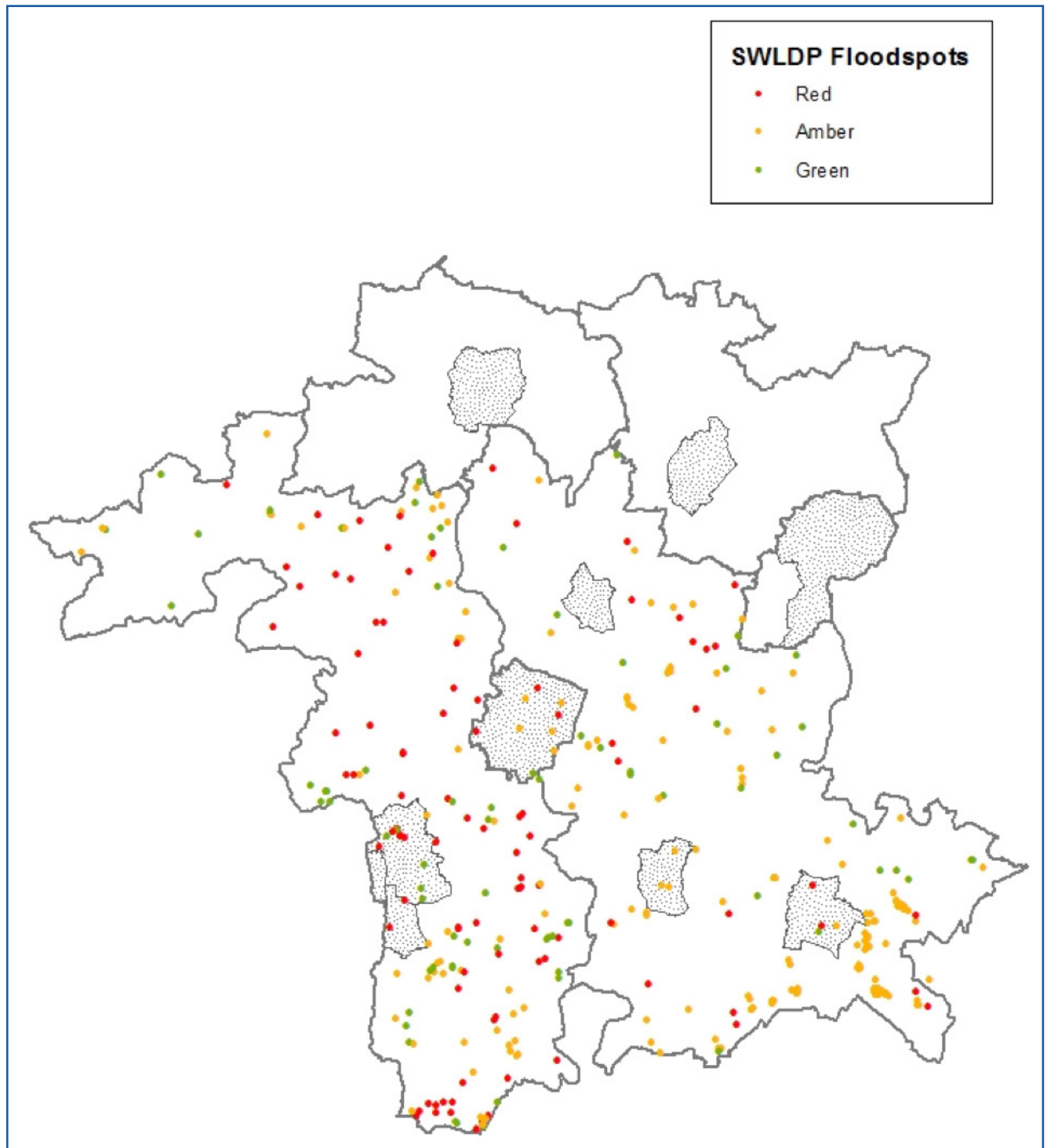
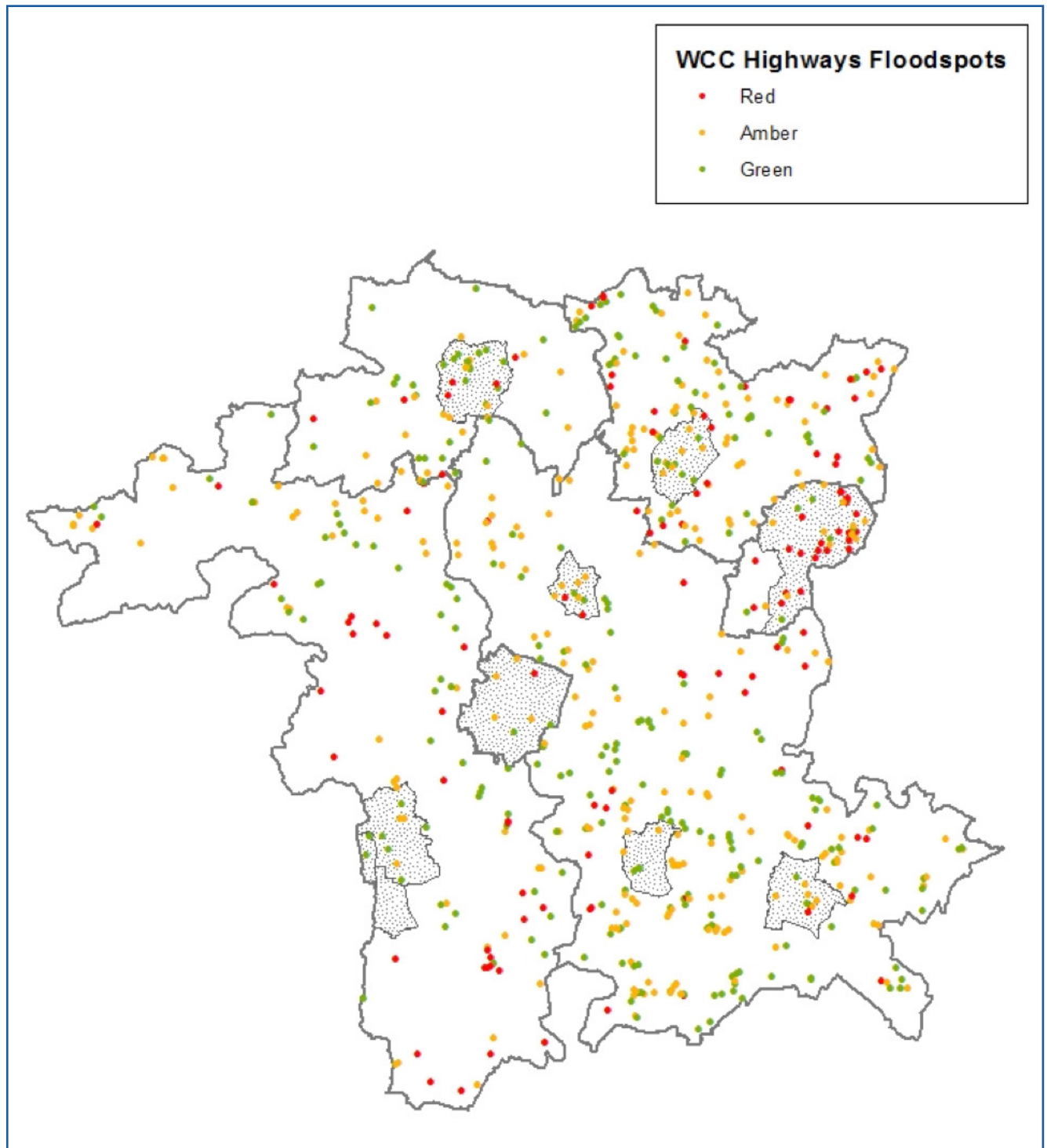


Figure 13 – Worcestershire County Council Highways floodspots shown by mitigation status



6. Options - management approaches

6.1 Floodspot response

Each RMA is encouraged to allocate resources to floodspot investigation and development of subsequent schemes in the order suggested by the prioritisation bands.

However, parallel to this, the RMAs will also be encouraged to carry out basic investigation of all red status floodspots as soon as possible in order that their attribute data and priority band can be confirmed. This is detailed in the LFRMS action plan.

When planning the allocation of their resources, the RMAs will take into account the need to collaborate on floodspots for which they might not be the lead RMA but nevertheless have a major role to play.

6.2 Localised Flood Risk Management Plans

Following the identification of a cluster of high priority floodspots in Droitwich and Bromsgrove towns, and Redditch urban area, intermediate SWMP processes have been commenced in each location, and the production of local Flood Risk Management Plans have been commenced.

The potential to commence other intermediate SWMP processes should be considered in other locations where there is a particularly significant cluster of floodspots.

The LFRMS action plan includes actions relating to town specific FRMPs and the RMA who is leading on their production.

6.3 Future potential flood risk

The exercise described in section 3.4 should be repeated using the more recent uFMfSW. Any future potential floodspots which emerge from this process should then be allocated to the most appropriate RMA and fed into the overall floodspot priority list and action plan.

6.4 Environmental impact criteria

The floodspot prioritisation process should be updated to include criteria which reflect the impact of flooding on the natural and historic environment.

A draft methodology for this has been produced and this should be confirmed with appropriate RMA colleagues and introduced to the strategic SWMP process.

6.5 Sustainable drainage systems (SuDS)

The use of SuDS has enormous potential to minimise the risk of surface water flooding. Therefore, implementing the Government's proposed approach as effectively as possible must be an extremely high priority including the development of relevant processes, policies and standing advice.

Consideration should also be given to the potential to retrofit SuDS, particularly where it is possible to take advantage of infrastructure re-development opportunities.

6.6 Property flood resilience

Property flood resilience (PFR) involves making practical adaptations to an individual property in order to make it more resistant and / or more resilient to flooding.

In many locations this will be the only possible or cost effective way to minimise the impact of flooding.

The potential to cluster together floodspots where PFR is the chosen solution in order to produce a district or countywide scheme and funding bid should be explored.

6.7 Funding

The prioritisation of floodspots will influence resource allocation and target fundraising efforts.

Potential schemes will be appropriately introduced to the RFCC and its six year programme in order that potential Local Levy and FDGiA contributions can be maximised.

However, it will be essential to secure other local match funding such as contributions from local authorities, local beneficiaries and funding streams such as the SEP Local Growth Fund, New Homes Bonus, CIL and s106.

In addition to funding for scheme development it is essential that resources continue to be secured for the capacity necessary to implement it and to carry out such essential tasks as asset maintenance and land drainage enforcement.

As an action in the LFRMS, this will all be captured within a 'FRM Fundraising Strategy'.

6.8 Early warning systems

The success of automated early warning systems introduced on some Ordinary Watercourses by Wychavon District Council and North Worcestershire Water Management should be replicated elsewhere in Worcestershire. The potential for this to be achieved via countywide or north and south Worcestershire wide projects and funding packages should be explored.

6.9 Engagement, warning & informing

Methods of improving the awareness and preparedness of those at risk of flooding have been explored within the 'FRM Communications Plan'. This includes media presence, social media, further development of relevant web sites and better links between weather forecasts and likely flood events.

Informing those who are identified as being at risk of future flooding in locations which haven't previously experienced flooding will be particularly important though very challenging.

6.10 Weather event data

It is highly desirable to be able to more accurately predict flood events as far as possible in advance. This requires more established and understood links between weather events and resulting flooding.

In order to establish this, the potential to establish more rain gauge stations, in key locations, should be explored and a cohesive strategy produced for their monitoring, maintenance and interpretation.

6.11 Rural SuDS and upstream catchment management

Holding back and slowing down water in upper catchments before it reaches potential receptors downstream needs to become a more widely employed method of flood risk reduction.

However, this will require a greater and more widespread understanding of relevant techniques, engagement with and co-operation from landowners and co-ordination of RMA efforts and those of other relevant organisations.

A project has been initiated which will ensure that lessons learned from elsewhere in the country are translated into local plans, strategies and actions. This project, among other actions, will include:

- production and maintenance of an overview of existing/forthcoming relevant projects in Worcestershire
- production of practical ideas of potential techniques for land managers
- liaison with and promotion to landowners
- liaison and partnership with landowner organisations
- establishment of potentially viable locations
- establishment of a pilot project location
- maximisation of other related benefits e.g. biodiversity and landscape enhancement
- minimisation of potential negative impacts
- clarification of potential enforcement tools related to deposition of water, sand and gravel onto the Highway

6.12 Environmental Considerations

All flood risk management schemes should be put through an appropriate environmental considerations process.

A standardised environmental considerations process and checklist should be established and rolled out to the RMAs via the Worcestershire Land Drainage Group and follow-up familiarisation sessions.

6.13 Floodspot publication and gap filling

The map of floodspots will be published on the WCC website accompanied by a clear caveat that the nature of the floodspots means that they cannot be used to identify individual receptors at risk.

The development of these online systems is currently being discussed with relevant partners before being made publicly available.

6.14 Flood event data recording

It is important that data surrounding future flood events is gathered and recorded thoroughly and consistently. Any new floodspots will be added to the SWMP web mapping and any existing floodspots updated.

6.15 Asset management

It is important that structures and features which have a significant role to play in managing flood risk are identified, recorded, monitored, maintained and safeguarded.

This will be achieved by:

- Implementation of the LLFA's relevant duties and powers within the Flood & Water Management Act (2010)
- Maintenance and development of highway drainage assets
- Maintenance of Ordinary Watercourses and related assets
- Application of the Land Drainage Act (1991)
- Maintenance and development of the sewerage system

More information on the Register and Record of Structures and Features and Designation of Structures and Features can be found in the Worcestershire Local Flood Risk Management Strategy.

6.16 Emergency planning

The SWMP database should play an important role in identifying locations which are vulnerable and potentially in need of resources in flood events.

The database should be cross-checked with the Multi-Agency Flood Plans (MAFPs) in order to confirm that all particularly vulnerable locations are appropriately covered. Worcestershire districts have recently started producing Flood Response Frameworks which supersede the MAFPs; these will also be informed by the SWMP.

The database will also provide a useful guide for deployment of resources during a flood event.

6.17 Spatial and infrastructure planning

The SWMP database, alongside the EA uFMfSW, is already being used to inform the development of and response to planning applications, infrastructure plans and related policies and strategies.

New developments have very significant potential to impact negatively or positively on surface water flooding and every effort should be made to ensure that appropriate drainage plans are submitted and implemented.

6.18 Climate change

Surface water flood risk assessment and mitigation should properly take climate change projections into account. Similarly the SWMP data should be appropriately referenced to inform climate change and adaptation plans and strategies.

References

Defra (2011) *Surface Water Management Plan Technical Guidance* [online]. London: Defra.

Available from: <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>

Flood and Water Management Act 2010 [online]. Chapter 29. (2010)

Available from: <https://www.legislation.gov.uk/ukpga/2010/29/contents>

Flood Risk Regulations 2009 [online]. (2009)

Available from: <http://www.legislation.gov.uk/uksi/2009/3042/contents/made>

Worcestershire County Council (no date) *Flood Risk Management – Roles and Responsibilities*.

Available from: http://www.worcestershire.gov.uk/info/20236/flood_risk_management/1040/roles_and_responsibilities

Worcestershire County Council (2016) *Local Flood Risk Management Strategy* [online]. Worcester: Worcestershire County Council. Available from:

http://www.worcestershire.gov.uk/info/20236/flood_risk_management/1046/plans_policies_and_strategies/2

Appendix 1

Critical Infrastructure

Aqueduct
Burial ground
Cemetery
Clinic
Electricity sub station
Health centre
Hospice
Mortuary
Nursing home
Police services
Pump house
Pumping
Sewage pumping
Surgery
Telecommunications
Telephone exchange
Water filtration
Water regulating

National Receptor Database categories

Please contact us if you need this document in another format, or if you have any questions.

Phone: **01905 844463**

Email: **DevControlTeam@Worcestershire.gov.uk**

Write to: **Worcestershire County Council,
Development Management,
Directorate of Economy and Infrastructure,
County Hall,
Spetchley Road,
Worcester,
WR5 2NP**

