Flood Investigation Report

Various Locations, Solihull

27th May 2018

As Lead Local Flood Authority, Solihull Metropolitan Borough Council carries out investigations into flooding incidents.

During such investigations, the LLFA will:

- **Identify and explain the likely cause(s) of flooding;**
- **Identify which authorities, communities and individuals have relevant flood risk management powers and responsibilities;**
- **Provide recommendations for each of those authorities, communities and individuals; and**
- **Outline whether those authorities, communities or individuals have or will exercise their powers or responsibilities in response to the flooding incident.**

The LLFA cannot:

- **Resolve the flooding issues or provide designed solutions; or**
- **Force Authorities to undertake any of the recommended actions.**

1 Introduction

1.1. On 27 May 2018 Solihull experienced a period of high intensity rainfall with over 300 properties being affected by flooding.

1.2. As the Lead Local Flood Authority (LLFA) for Solihull, the Council's Flood Risk Management Team has investigated the events of 27 May 2018 and has produced this report in accordance with Section 19 of the Flood and Water Management Act 2010.

What is a Section 19 investigation?

In accordance with Section 19 of the Flood and Water Management Act 2010:

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate—

(a) which risk management authorities have relevant flood risk management functions, and

(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

(2) Where an authority carries out an investigation under subsection (1) it must—

(a) publish the results of its investigation, and

(b) notify any relevant risk management authorities.

1.3. Both Solihull Council's Preliminary Flood Risk Assessment (PFRA) and Local Flood Risk Management Strategy (LFRMS) define flood events considered to have 'Locally Significant Harmful Consequences' as:

- *Internal flooding to 5 or more residential properties, or;*
- *Flooding to 2 or more business properties, or;*
- *Flooding to 1 or more items of critical infrastructure, or a transport link impassable for in excess of 10 hours.*

2 What happened on 27 May 2018?

2.1. On the afternoon of Sunday 27 May 2018, parts of the West Midlands experienced high intensity rainfall, which in Solihull led to a rapid increase and volume of surface water and associated river flooding.

2.2. The rainfall that affected the West Midlands area developed 'in situ' locally during the afternoon, rather than following a normal tracked path. Once formed, the rain moved north-west, along a narrow corridor running through Stratford–on-Avon, Solihull, Bromsgrove and Birmingham. Rainfall Radar images from the Met Office that show the rainfall event are given in Appendix A.

2.3. Photos and videos shared at the time by those affected suggested that an extreme rainfall event had occurred. Common phrases such as "worse than 2007", "not in my lifetime" and "it all happened so quickly" were heard by officers when knocking on doors to check on people's health and welfare after the event.

2.4. Such anecdotal evidence was supported through data collated by the Environment Agency from their own rain gauges, that of private rain gauges and from the use of radar imagery.

2.5. Of all the data collected across the West Midlands, it was at a site in Tidbury Green, to the south west of Solihull, where the largest event was recorded. 89mm was measured in 2 hours and over 100mm for the day.

2.6. This was supported by recordings from another rain gauge located nearby in Hollywood where 75mm was measured in 2 hours. This is against a local average rainfall total for the May of just 53mm, measured over a period from 1981 to 2010.

2.7. Residents of 178 properties mainly across Blythe, Shirley West, Hockley Heath and Olton reported internal property flooding. In the worst cases, water crossed the threshold to such a depth that residents were forced to evacuate their homes. As the flood waters rose some residents were left to live upstairs or seek alternative accommodation.

2.8. A further 75 properties saw water entering their garages, destroying possessions, whilst an additional 63 properties experienced garden or external property flooding that required a clean-up.

2.9. In addition to the disruption to peoples' lives and properties, the flooding impacted the local road network. The main A3400 Stratford Road through Hockley Heath was impassable, as were key routes in and out of Cheswick Green, Dickens Heath and Shirley, restricting movement until the flood waters subsided.

2.10. In rural areas, water was seen to flow straight off surrounding fields and flood properties. Small watercourses that feed into the River Blythe and River Cole quickly became overwhelmed and broke their banks, with flood waters affecting one community before continuing further downstream to affect another.

2.11. In urban areas, such was the flow and depth of water that on occasion it was unable to enter the surface water sewer network. When it could, the networks quickly flooded or were unable to discharge into already flooded watercourses. Extreme flow paths were seen moving across streets, entering the front door of a row of properties before passing through and continuing out of the back doors before repeating the process on the next row.

2.12. Even the canal network was not immune to the event, with the feeder system at Earlswood Lakes being inundated with water from the River Blythe and becoming overwhelmed. This led to a surge of water passing along an unbroken stretch of the canal from Lapworth to Birmingham, overtopping at various points on its way and causing additional flooding to properties.

3 Our Investigation

3.1. When flood events, such as on the afternoon of the 27 May occur, it is the responsibility of the Lead Local Flood Authority for the area to carry out an investigation where it considers it necessary or appropriate. Within Solihull, the Council's Flood Risk Management team carries out the function of the Lead Local Flood Authority, under the Flood and Water Management Act 2010.

3.2. The Lead Local Flood Authority must investigate which authorities have relevant flood risk management functions and whether each of those authorities has exercised, or is proposing to exercise, those functions in response to the flood. When such an investigation is carried out, the Lead Local Flood Authority must publish the results of its investigation and notify any relevant risk management authorities, such as the Environment Agency or Severn Trent Water as the water authority.

3.3. Following the flooding that occurred on 27th May, the Council's Flood Risk Management Team have carried out investigations with partners such as the Environment Agency, Severn Trent Water and the Canal and River Trust at 11 locations across the Borough, as listed below. Reports for each location can be found in Appendices B – L.

Appendix B - Cheswick Green – Coppice Walk Area

Appendix C - Dickens Heath – Dickens Heath Road/Birchy Leasowes Lane/Beech Lane Area

Appendix D - Dickens Heath – Griffin Lane/Waterside/Cornwood House Area

Appendix E - Dickens Heath – Tythe Barn Lane Area

Appendix F - Earlswood – Wood Lane Area

Appendix G - Hockley Heath – Stratford Road Area

Appendix H - Olton – Swanswell Road/Langley Hall Road/Brook Lane Area

Appendix I - Shirley – Aqueduct Road/Corley Close/Green Lane/Millsoms Road Area

Appendix J - Shirley – Nethercote Gardens/Colebrook Road Area

Appendix K - Shirley – Yardley Wood Road/Pear Tree Crescent/Pear Tree Close Area

Appendix L - Tidbury Green – Fulford Hall Road/Norton Lane Area

4 Summary & Conclusions

4.1 As the LLFA, the Council's Flood Risk Management Team has investigated the events of 27 May 2018 and has produced this report in accordance with Section 19 of the Flood and Water Management Act 2010.

4.2 This investigation has determined that on 27 May 2018 Solihull experienced a period of high intensity rainfall, over a month's rain within an hour, as part of a wider event that affected the West Midlands area.

4.3 Data collated by the Environment Agency shows that at its peak, 89mm of rain fell in just two hours, against an average total for May of just 53mm. Statistically, parts of the Borough experienced an event with a 0.2% chance of occurrence in any given year.

4.4 Over 300 reports of flooding to property were received mainly across Blythe, Shirley West, Dorridge and Hockley Heath and Olton wards, with some residents being forced to leave their homes and live in alternative accommodation.

4.5 Many of the properties that were affected on 27 May are shown to be at risk from flooding on mapping produced by the Environment Agency. However, the vast majority had never previously experienced such an event.

4.6 11 locations have been investigated in more detail to identify the causes and mechanisms of the flooding. Work has included condition surveys of watercourses, culverts, attenuation features, surface water sewer and highway drainage systems, with follow up work being arranged on the occasions where it has been found necessary.

4.7 New and recent development sites have also been checked to ensure that they have been constructed in accordance with the approved plans.

4.8 Following the investigation work that has been undertaken at the 11 locations, work has already started to determine what, if anything, may be possible in the future to prevent such flooding from occurring again. An Action Plan is included in Appendix M.

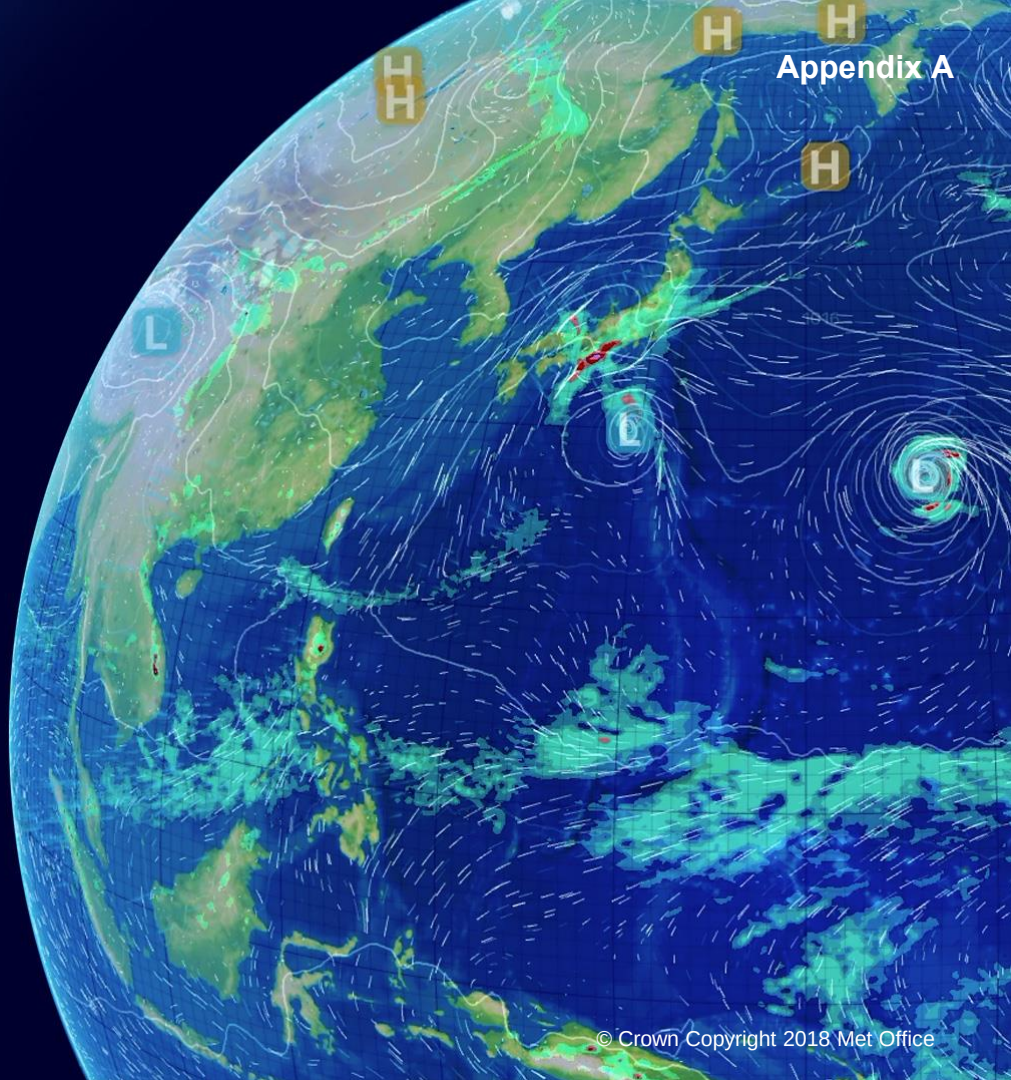
4.9 Appendix N details some potential future options to help reduce the risk of flooding to those who were affected on May 27th. Whilst the main focus in many instances may be for a community wide avoidance or defence scheme, there will also be a place for measures to be taken at an individual level by owners of properties to help make themselves more resilient or resistant to flooding.

Met Office

Appendix A

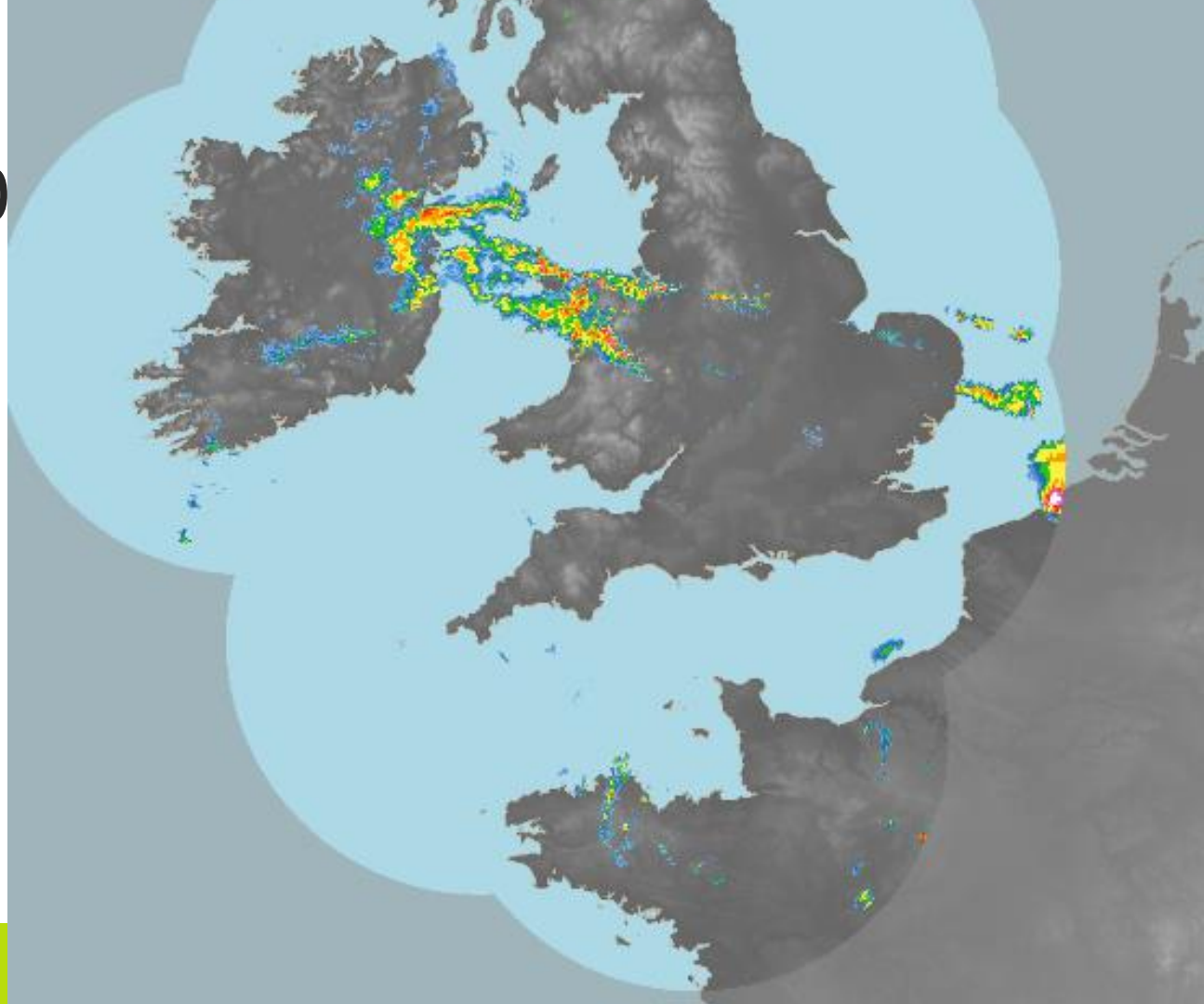
27th May 2018

Rainfall Radar Images



Met Office

27th May 15:00



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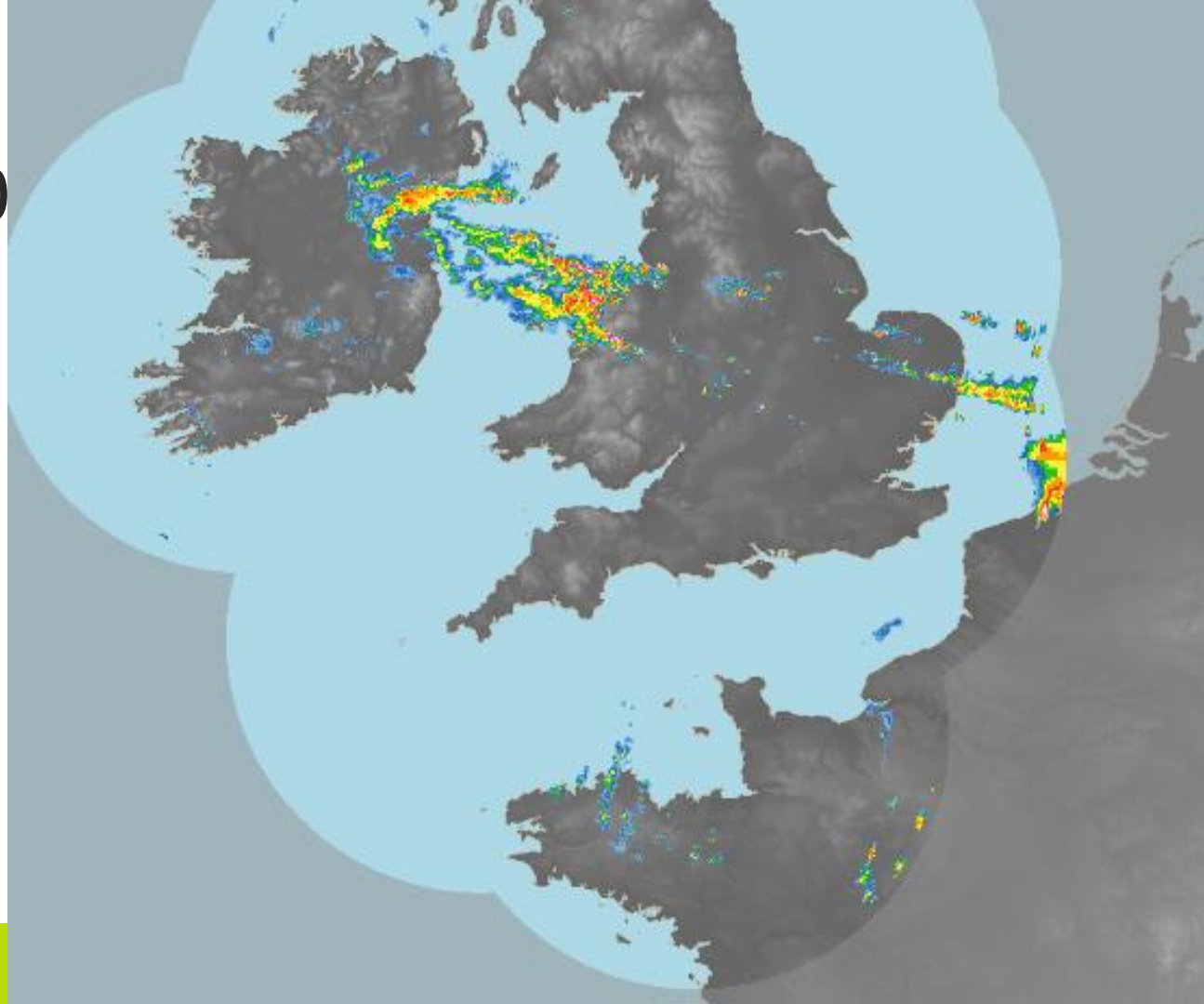

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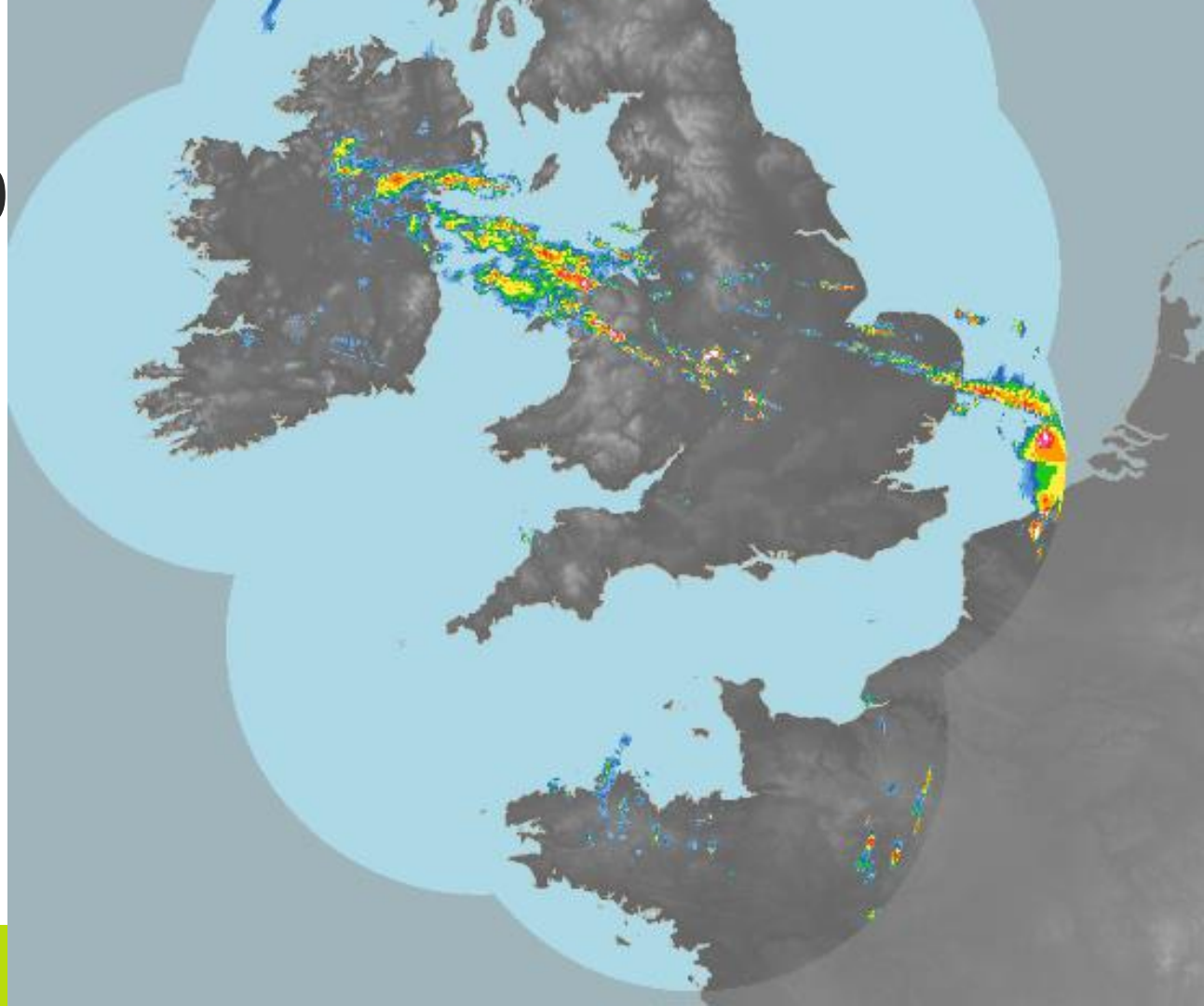

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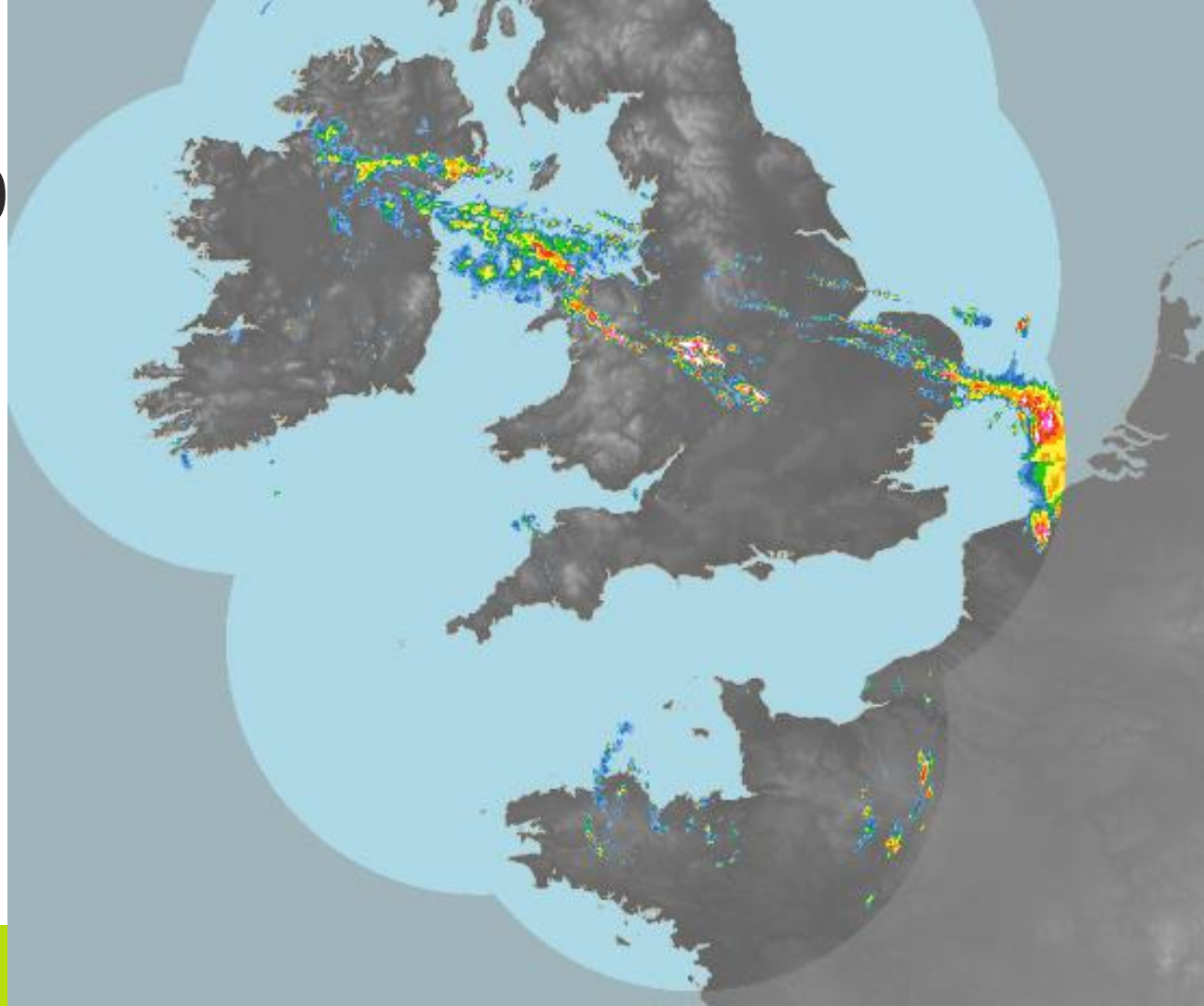

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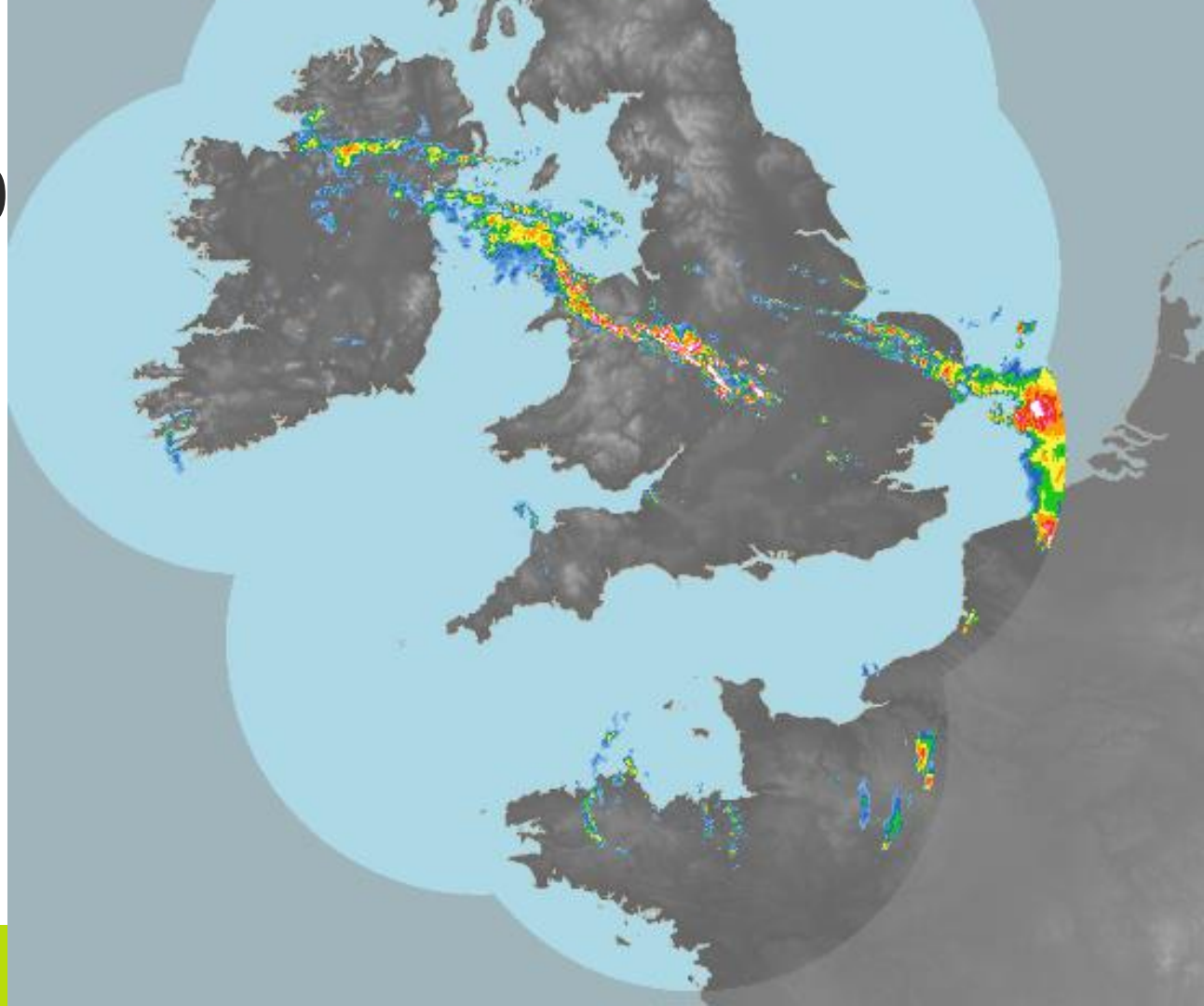

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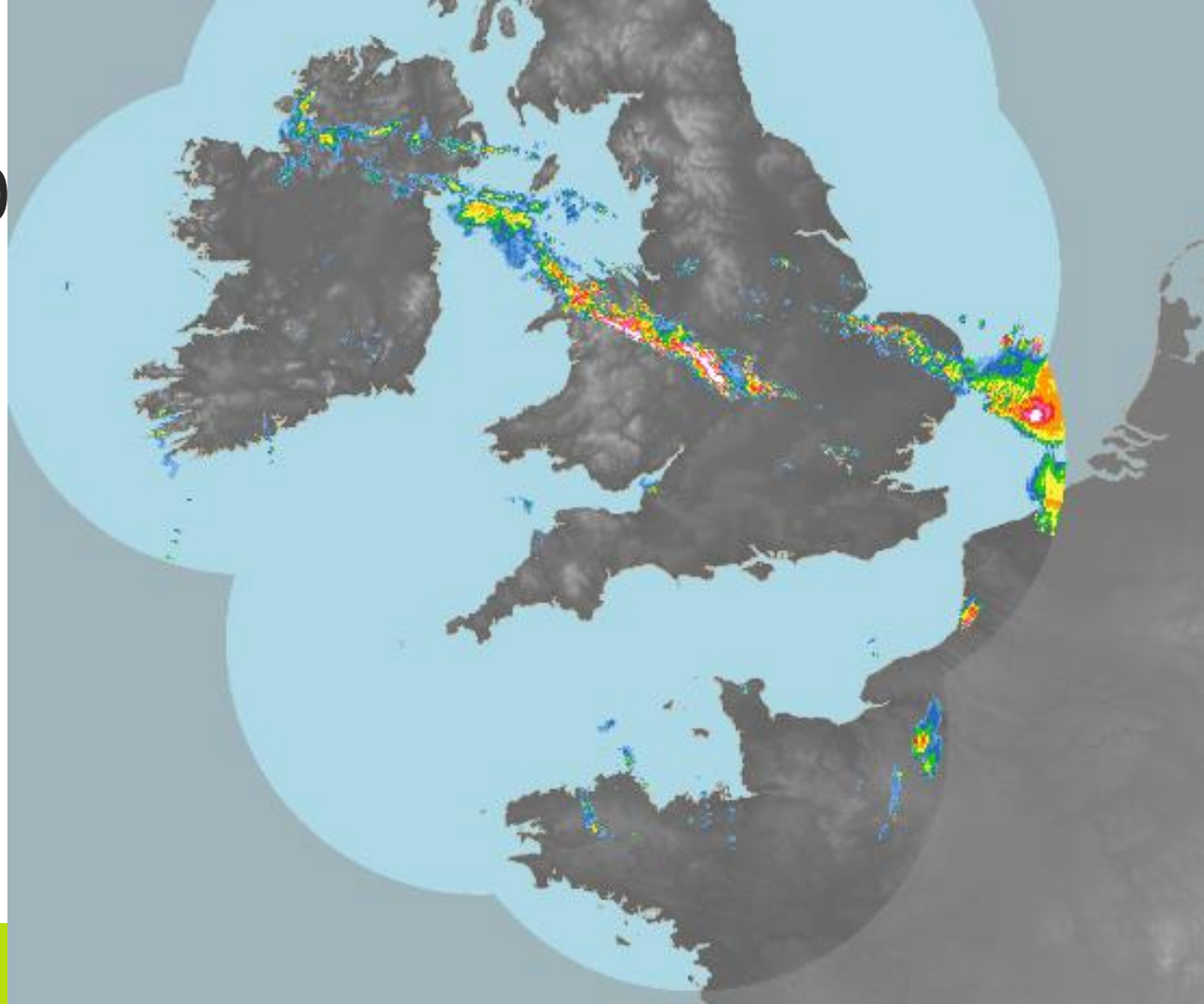

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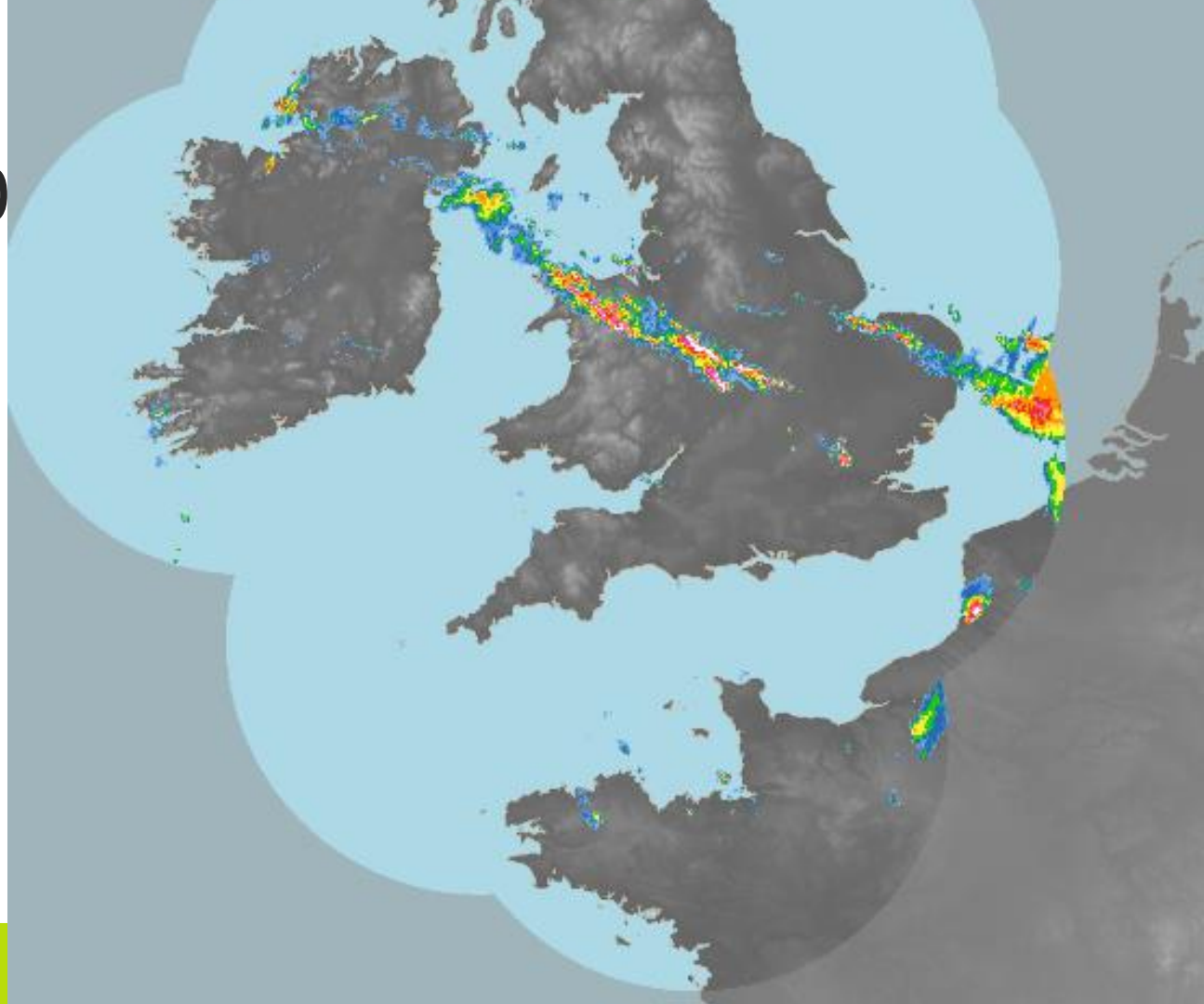

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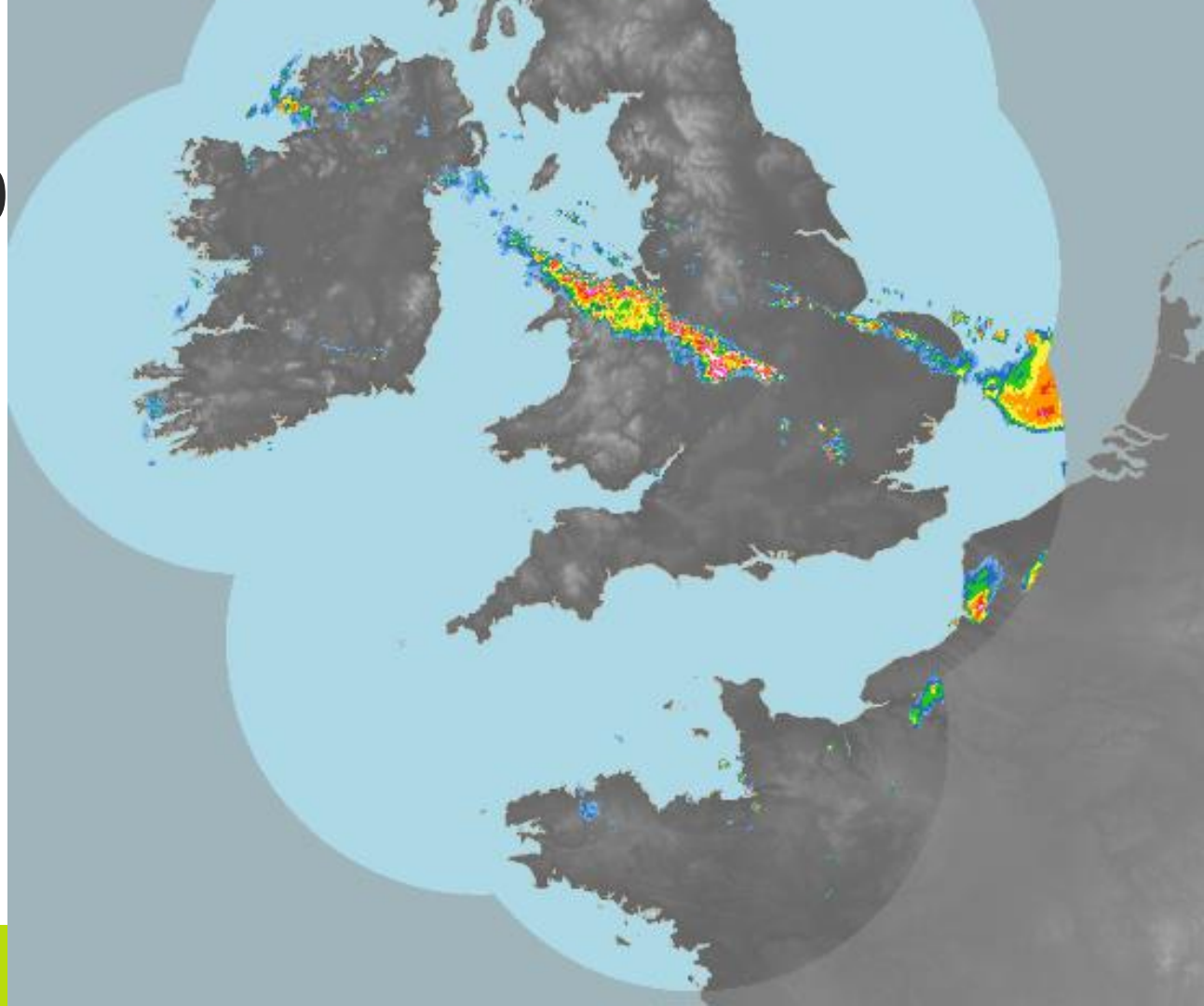

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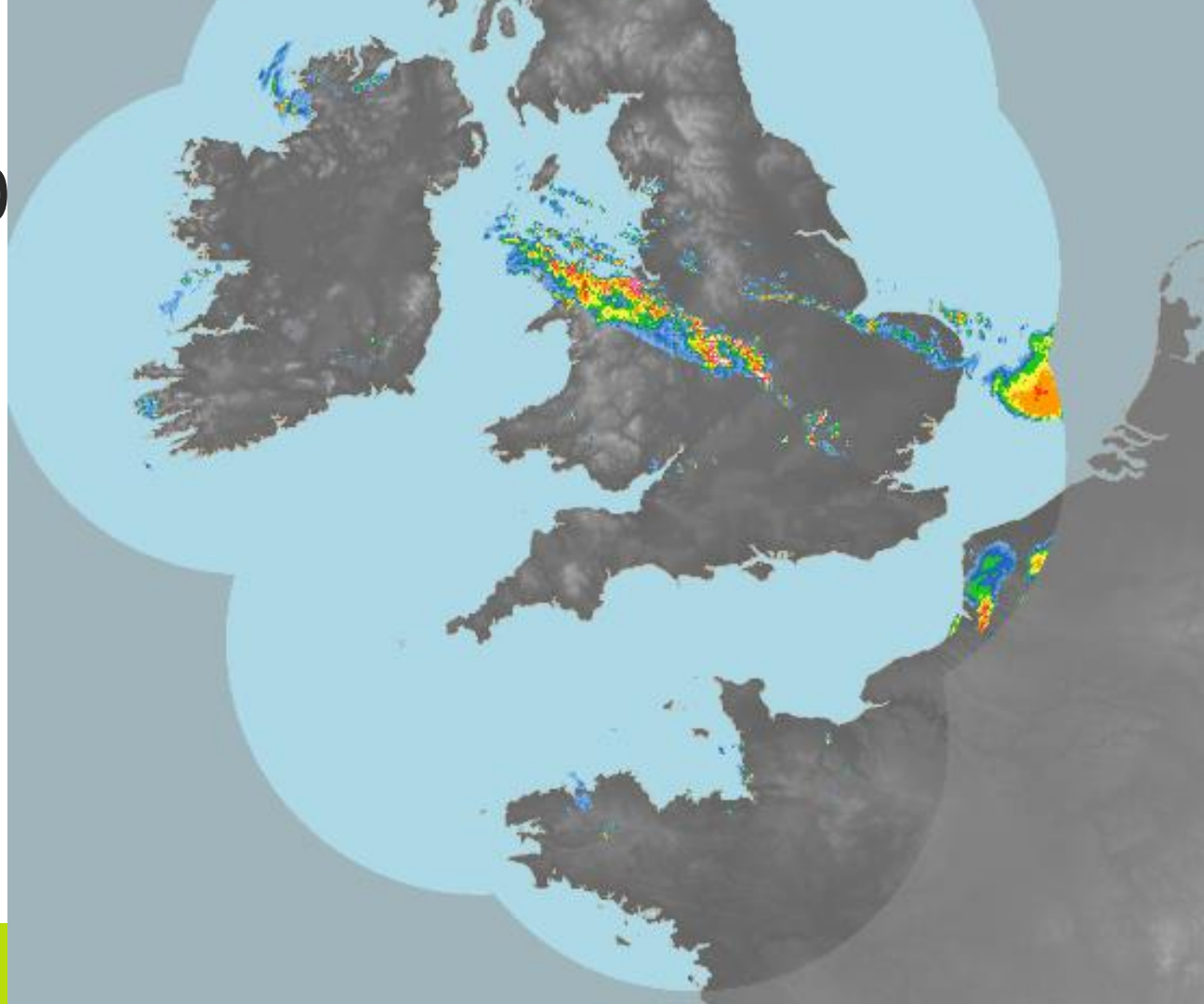

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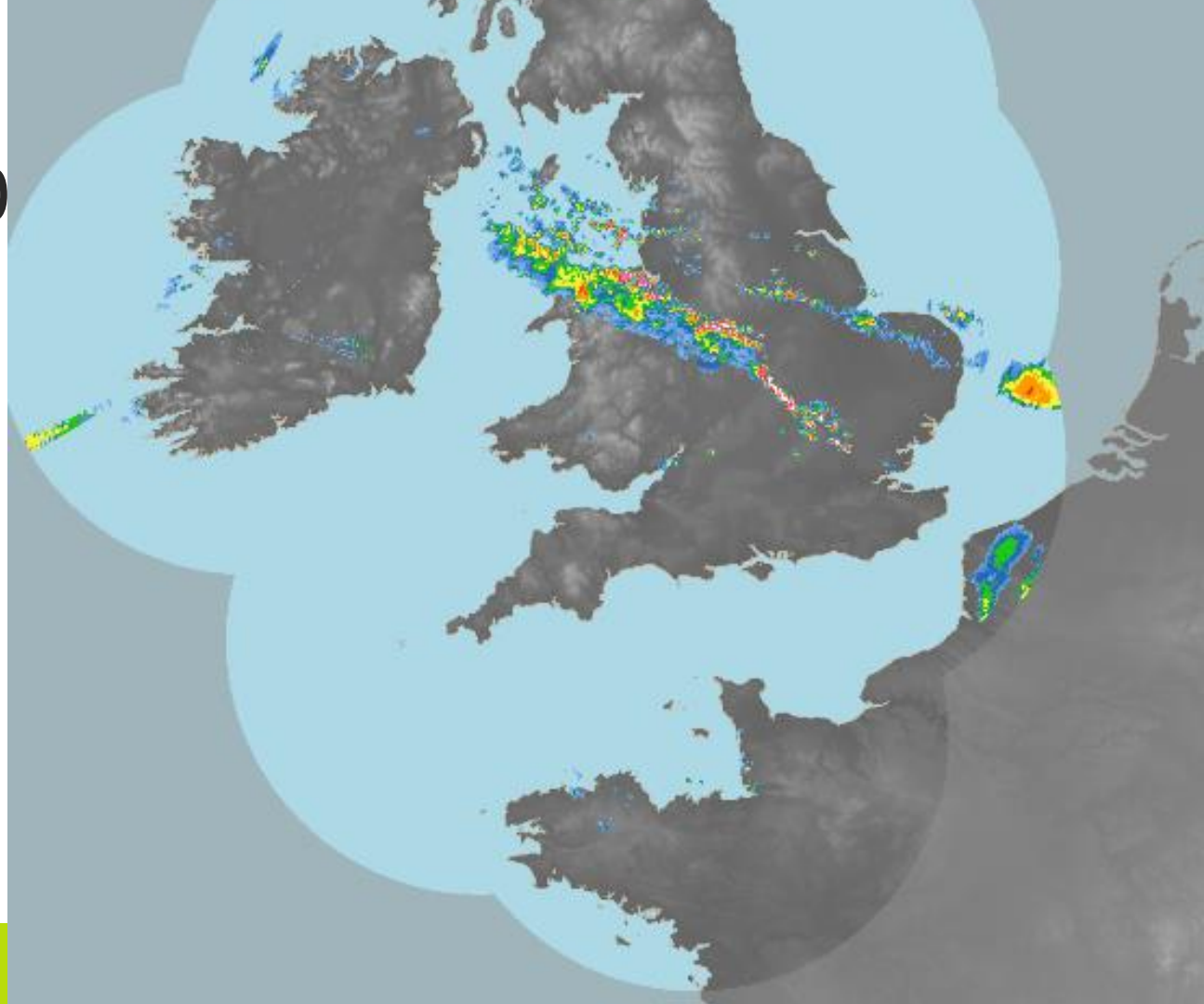

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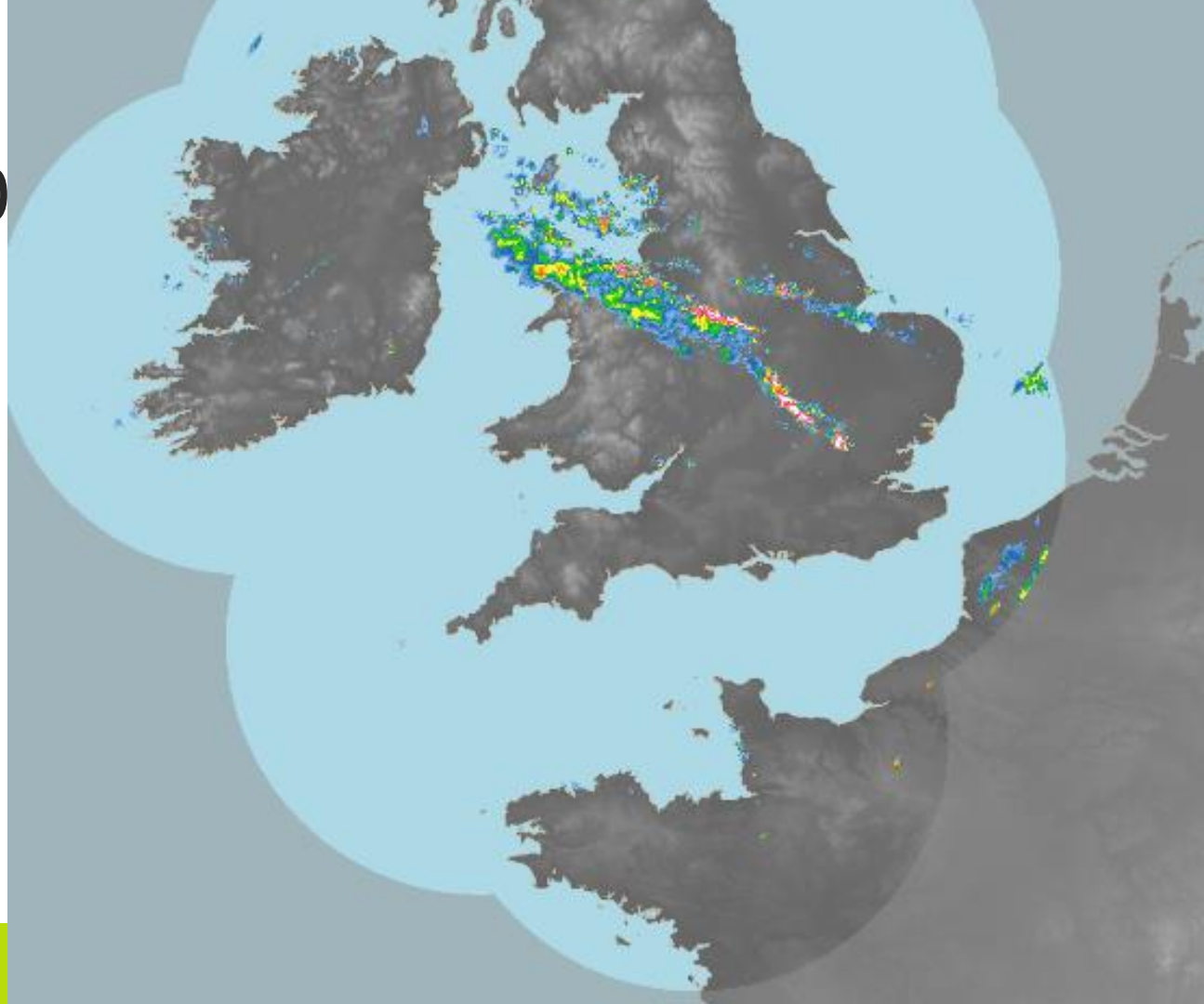

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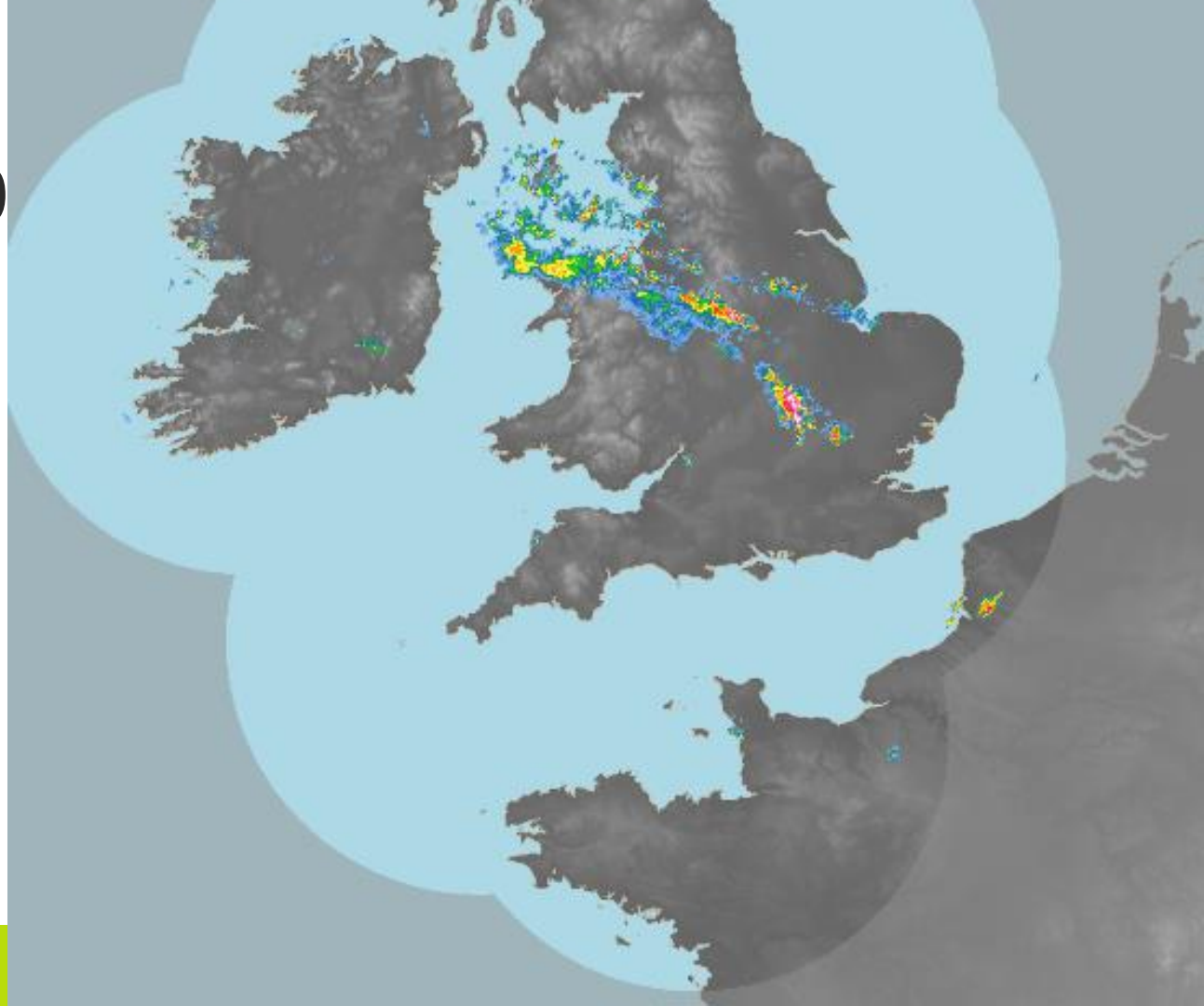

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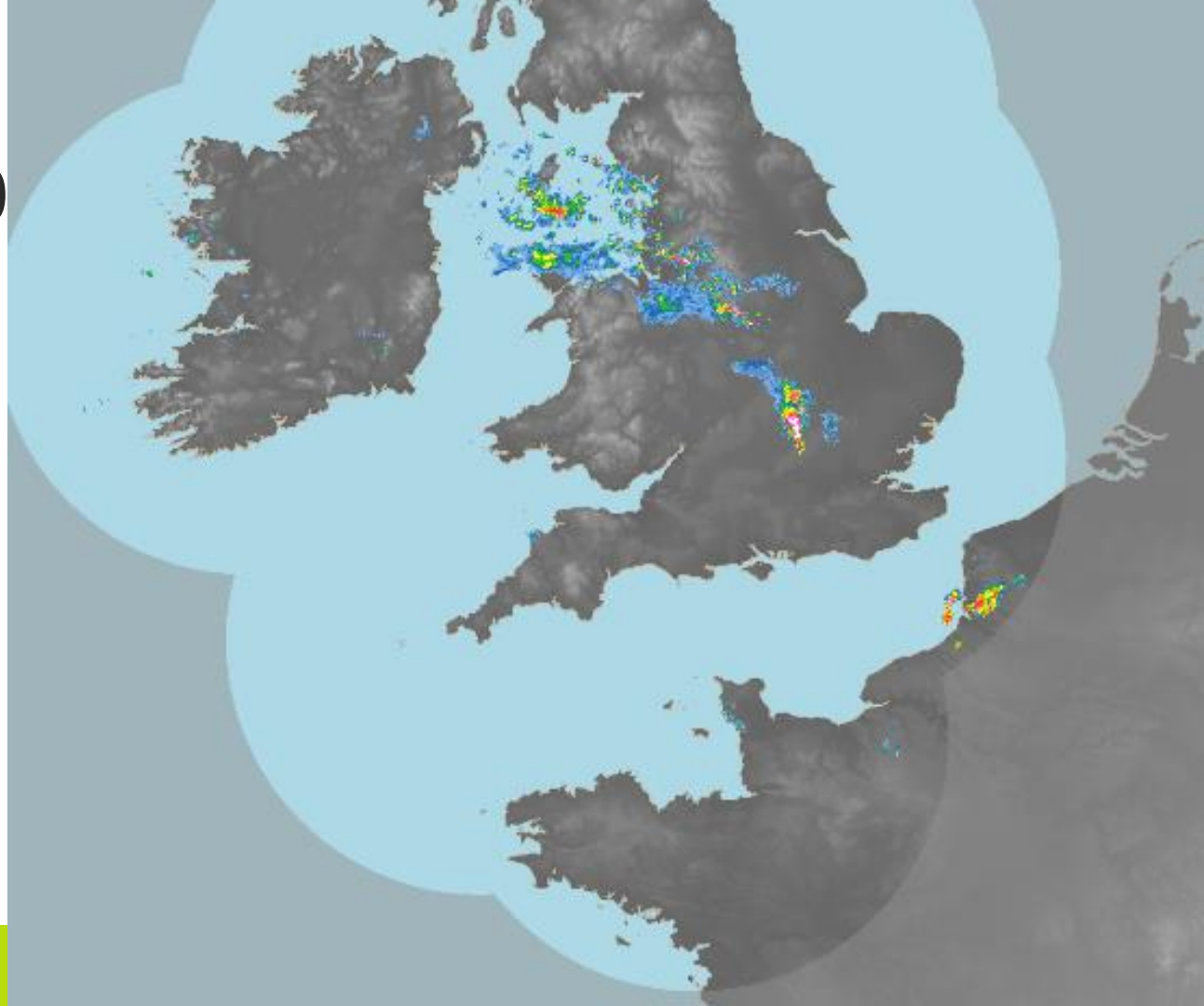


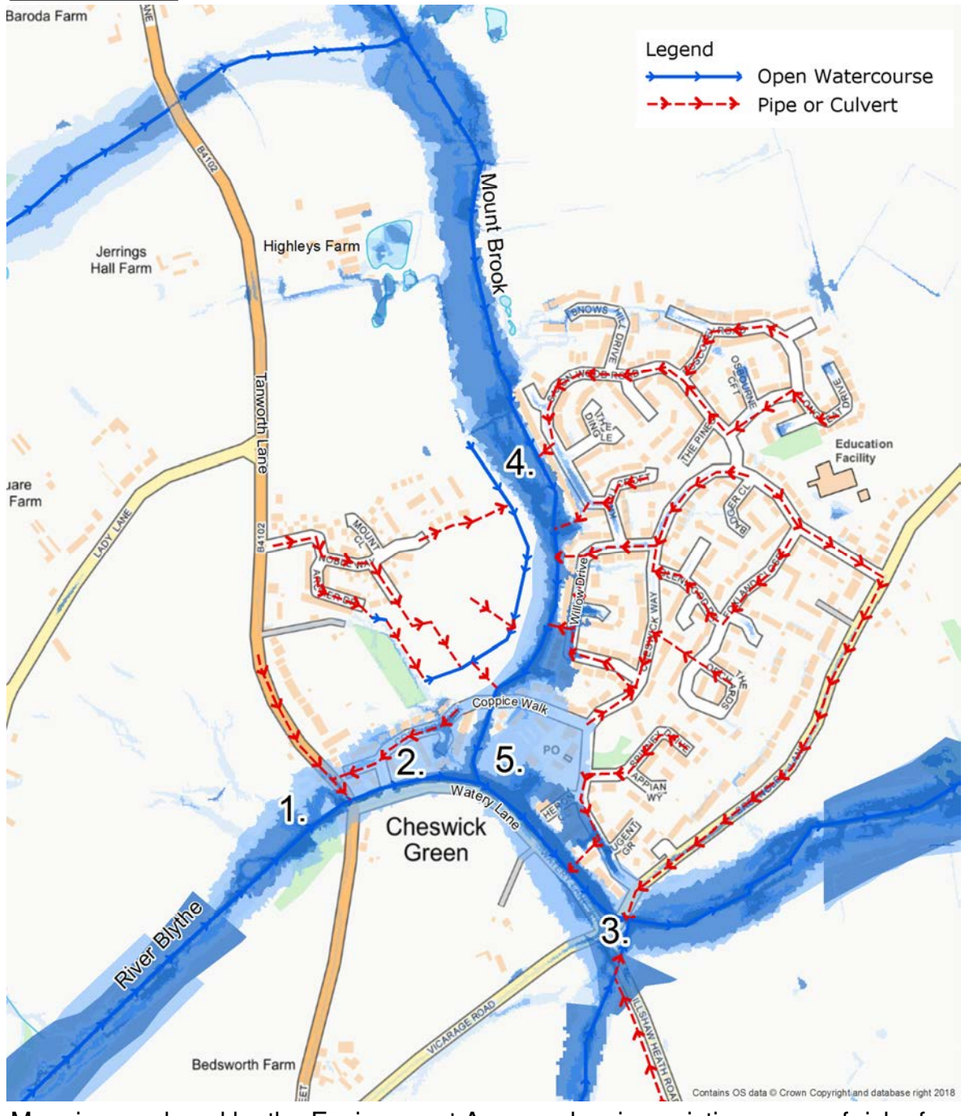
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Coppice Walk Area, Cheswick Green

Who or what was affected?

12 properties internally flooded	10 properties externally flooded	1 garage flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water in Cheswick Green. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✗	✓	✗	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	There was no sewer flooding in the area.	Main Rivers were unable to cope with the amount of water flowing into them.	There are no ordinary watercourses in the area.	No other source was identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

Cheswick Green is situated at the confluence of the River Blythe and the Mount Brook.

The River Blythe generally flows in a northerly direction from its source south of the M42, passing Earlswood Lakes towards Cheswick Green. The Blythe then flows in an easterly direction to the south of Cheswick Green along Watery Lane, before passing under the M42 south of Junction 4. The Mount Brook runs in a southerly direction towards Cheswick Green, bringing surface water from a sewer network in Shirley. The brook is joined north of Cheswick Green by an unnamed watercourse that carries flows from both Dickens Heath and Tidbury Green. The Mount Brook runs between the Cheswick Place development and Saxon Wood Road and Willow Drive, before passing under Coppice Walk to join the River Blythe at Watery Lane.

Surface water from the village flows into the River Blythe or the Mount Brook at various points by way of a Severn Trent Water surface water sewer network, as shown on the plan opposite. The operational ability of the sewer network becomes restricted as the outlets are submerged by flooding on the River Blythe or Mount Brook.

Description of area shown to be at risk	What happened on 27th May?
1. Flood risk associated with the River Blythe south west of Tanworth Lane	Significant flows were witnessed at this location with the River Blythe flooding out of its normal channel. A single property flooded to the south of Tanworth Lane before flows continued to Coppice Walk.
2. Flood risk associated with flooding from the River Blythe on Tanworth Lane, Coppice Walk and Watery Lane	Internal and external flooding of multiple properties was reported along Coppice Walk and Tanworth Lane due to flooding of the River Blythe. Residents reported a wave of water arriving after the initial rainfall had stopped. This may have been associated with flooding of the Stratford Upon Avon Canal at Lady Lane, which caused additional flows within the River Blythe.
3.Flood risk associated with the River Blythe from the crossroads of Watery Lane/ Creynolds Lane/ Vicarage Road/ Ilshaw Heath Road	No reports were received of internal or external flooding of properties at this location, although it is suspected that several back gardens would have been underwater as a result of the River Blythe flooding. It is understood that the highway was impassable at this point.
4. Flood risk associated with the Mount Brook from Highleys Farm to Coppice Walk	External flooding of the back gardens of properties on Saxon Wood Road and Willow Drive was reported, as a result of the Mount Brook flooding. Whilst properties are shown to be at risk on the mapping produced by the Environment Agency, no internal flooding of properties was reported on this occasion.
5. Flood risk associated with the Mount Brook from Coppice Walk to the River Blythe.	Internal property flooding was reported to the east of the Coppice Walk road bridge as a result of the Mount Brook flooding. It is understood that in extreme events water flows over and around the bridge flooding properties. The highway was also flooded at this location.

Location: Coppice Walk Area, Cheswick Green

What might be possible to reduce the risk from future flooding?

Can we store water coming out of Shirley in ponds and wetlands?

Can we store more water coming out of Dickens Heath in ponds and wetlands?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we increase the size of the Dickens Heath attenuation pond?

Can we store water coming out of Earlswood Lakes in ponds and wetlands?

Can we store more water coming out of Tidbury Green?

Location: Coppice Walk Area, Cheswick Green

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
That the flooding was caused by drains that weren't clean.	Solihull Council cleans highway gullies (drains) once a year as standard practice. Since the flooding in May, the Council has been back out to Tidbury Green to cleanse the system again and has undertaken CCTV surveys of assets that it owns on Coppice Walk and Tanworth Lane.	Local Highway Authority	Complete
Why weren't the gullies on the entrance to the Bloor Homes development in use?	The gullies were in use but gully guards were installed in the drains on the entrance to the development site. This was to safeguard against pollution entering the River Blythe, which is a Site of Special Scientific Interest.	Bloor Homes	Complete
How does the attenuation feature on the Mount Dairy Farm development work? Have the works been completed? Water is stored on land higher than the surrounding ground. The new landscaping alongside Coppice Walk has lifted the land which has reduced space for water	The drainage and attenuation systems for Cheswick Place were completed as part of the first phase of works on the site. Water from the site is collected in a series of swales and then slowly released into the Mount Brook. The attenuation basins are filled when water levels rise in the Mount Brook. Water flows through the basins to drain back to the Brook.	Bloor Homes	Complete
What is being done to address the problem with the attenuation at the point where water returns to Mount Brook as this returning water now floods houses in Coppice Walk.	In rainfall events prior to the 27th May the basins filled and then overtopped back into the Mount Brook rather than draining slowly through the pipe. This is believed to be because of the hay bales that were placed across the pipe during construction to protect water quality down stream. These bales have since been removed and the outfall will be monitored.	Bloor Homes / Lead Local Flood Authority	Complete
What is being done to improve the bridge on Tanworth Lane and the banks of the River Blythe along Watery Lane to reduce flooding?	The River Blythe is a Main River, managed by the Environment Agency. The Environment Agency regularly inspect watercourses and arrange for works to be carried out, but they need to be mindful that the River Blythe is a Site of Special Scientific Interest. We are discussing the potential for a joint scheme at Cheswick Green with the Environment Agency.	Environment Agency/ Local Landowners	In Progress
Are there any plans to clear silt and debris at Creynolds Lane bridge? Watercourses in the area are in need of maintenance.			
What happened at Earlswood Lakes that caused the wave of water in Coppice Walk, were any sluice gates opened? Why did water from the river overflow the bridge some 40 minutes after rain had ceased? Did the reservoir top the embankment, why has so much work had to be done to the reservoir embankments?	The Canal and River Trust have indicated that whilst there was no breach at Earlswood Lakes, intense rainfall across part of the Blythe catchment caused the feeder system to the lakes to become overwhelmed. This water then passed into the main canal south of Lady Lane and caused overtopping of the canal at a low point in the southern canal bank adjacent to the River Blythe Culvert. This water then entered the River Blythe. The Canal and River Trust have informed us that the lakes did not flood. However, the embankment was damaged by water flowing down Malt House Lane and spilling down the slope to Valley Road. Two land slips occurred and these were covered in tarpaulin to avoid further damage risking the integrity of the dam.	Canal and River Trust	Complete
Have the Canals and River Trust been asked to alter the water management of the lakes and canal network to reduce the risk of flooding	The Canal and River Trust have told us that it is not feasible to use the canal network in this manner as it is not so simple to respond to extreme flows and control levels accordingly. Day to day, the level of the canal is maintained within a small tolerance only to ensure that water can flow over weirs to avoid becoming stagnant.	Canal and River Trust	Complete
Future development within the area will increase flood risk. How is the Council going to modify its plans for housing since any more development in the Mount Brook catchment upstream of Cheswick Green Village will only make the potential flooding problem worse.	New development is located away from land that are considered to be at high risk of flooding and to ensure that it does not cause additional risk to those living downstream. Whilst the Council's Local Plan is currently being reviewed, there is a specific policy relating to water management, which developers are required to follow. This includes limiting discharge rates and providing on site storage. New development can offer an opportunity to achieve some betterment, be it through the provision of greater storage areas for flood waters, or the potential funding of flood risk management schemes through contributions to the Community Infrastructure Levy.	Lead Local Flood Authority/ Local Planning Authority	In Progress
How is runoff controlled in exceedance events? What measures have been taken to reduce flood risk in new developments?	Exceedance occurs when the rate of surface water runoff is greater than the capacity of the surrounding sewer or drainage network. Where exceedance events are not controlled, indiscriminate flooding of properties can occur. New developments are required to consider extreme rainfall in their designs.	[redacted]	
Concerns that such flood events are now happening on a more regular basis (2007, 2018)	The Environment Agency has previously warned that intense bouts of flooding are set to become more frequent. "This follows a pattern of severe flooding over the past 10 years linked to an increase in extreme weather events as the country's climate changes. Met Office records show that since 1910 there have been 17 record breaking rainfall months or seasons – with 9 of them since 2000. As intense storms are becoming more frequent, sea levels are also rising because of climate change" (EA, 2018)		

Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Beech Lane and Rumbush Lane Area, Dickens Heath

Who or what was affected?

9 properties internally flooded	0 properties externally flooded	4 garages flooded

Location Plan

Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water in Dickens Heath. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them	No other source identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

The Beech Lane and Rumbush Lane area of Dickens Heath is naturally made up of a single drainage catchment that drains land between the east of Tidbury Green and the west of Dickens Heath. Through a network of watercourses, water flows towards Cleobury Lane before passing under Rumbush Lane and out towards Cheswick Green, under the Stratford Upon Avon Canal.

The drainage network from Birchy Leasowes Lane joins the low point of a surface water sewer network that runs along Dickens Heath Road, before flowing down Cleobury Lane for a short distance and outfalling into the watercourse that runs through the Beech Lane development. A ditch network that commence at the southern extent of Cleobury Lane travels in a north westerly manner to join the watercourse at this point.

The pumping station at the junction of Cleobury Lane and Dickens Heath Road ensures that foul water from this part of Dickens Heath can overcome gravity on its journey along Birchy Leasowes Lane to the sewage treatment works.

Surface water from the Beech Lane development drains via an internal network of sewers to an online attenuation pond that is present at the south eastern extent of the watercourse through the site. The development site provides attenuation storage for flows from on and off the site for the 1 in 100 year plus climate change event.

Description of area shown to be at risk	What happened on 27th May?
1. A surface water flow path is shown across the junction of Cleobury Lane and Dickens Heath Road, before joining the watercourse that flows through the Dickens Manor development.	Reports were received of flooding from the front of properties overlooking Dickens Heath Road and of the highway being flooded.
2. Flood risk associated with a watercourse that flows from the Dickens Manor development under Rumbush Lane.	Reports were received of flooding to the front of properties on Rumbush Lane and of the highway being flooded.
3. Flood risk associated with the watercourse through The Paddocks development.	The balancing ponds were observed to be at or near capacity but with no flooding to properties on The Paddocks development.
4. Flood risk associated with the watercourse that crosses Braggs Farm Lane before joining a watercourse that flows under Rumbush Lane.	No reports of flooding were received for this area.

Location: Beech Lane and Rumbush Lane Area, Dickens Heath

What might be possible to reduce the risk from future flooding?

Can we store more water upstream of the junction of Dickens Heath Road with Birchy Leasowes Lane? Can we provide any protection at Beech Lane?

Can we stop water flooding Rumbush Lane?

Can we improve the screens at the Rumbush Lane Culvert to help in times of extreme flows?

Location: Beech Lane and Rumbush Lane Area, Dickens Heath

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains.	Solihull Council as the local highway authority is responsible for the cleansing of the highway drainage system across the Borough and aims to cleanse each gully (drain) once a year. Since the flooding in May, the Council has carried out work to cleanse and CCTV highway drainage assets that it owns on Birchy Leasowes Lane, Dickens Heath Road, Cleobury Lane and Rumbush Lane. Mapping of assets has also been updated at the same time where necessary.	Local Highway Authority	Complete
	Severn Trent Water are responsible for the cleansing of the main sewer network in Dickens Heath. Severn Trent have undertaken various visits to the area to cleanse, CCTV and map their assets where necessary. Work to repair the manhole cover and frame at the junction of Cleobury Lane and Dickens Heath Road has been completed.	Severn Trent Water	Complete
Condition of the attenuation feature on The Paddocks development site, in particular the current vegetated state.	Maintenance of watercourses is the responsibility of the relevant landowner, which in this case still remains David Wilson homes. Work has recently been undertaken to adjust the side slopes on the watercourse that runs through the site to ensure compliance with approved plans. It should be noted that there has been no change in storage volumes. Following the flooding in May, as Lead Local Flood Authority, Solihull Council commissioned the inspection of approximately 10km of watercourses across the Borough by independent and accredited consultants. This included the attenuation feature on The Paddocks development site, but no further maintenance works were identified to manage the vegetation that is present.	Lead Local Flood Authority/ David Wilson Homes	Complete
That the Dickens Manor development has not been constructed in accordance with the approved plans	Officers from the Flood Risk Management Team have surveyed the site and are content that the development has been constructed in accordance with the approved drainage plans.	Lead Local Flood Authority	Complete
Maintenance of ditches and watercourses in the surrounding area.	Following the flooding in May, as Lead Local Flood Authority, Solihull Council commissioned the inspection of approximately 10km of watercourses across the Borough by independent and accredited consultants. Any actions that were identified as a result of the work are now being followed up with local landowners, Ditching work has been completed by Bellway Homes on the north eastern side of Cleobury Lane and similar work has been requested from the relevant landowner on the south western side.	Lead Local Flood Authority/ Bellway Homes/ Local Landowners	In progress
The capacity of the existing system at the junction with Birchy Leasowes Lane/Dickens Heath Road and what the potential solutions may be.	Options are being considered as to how the and impact of such an event could be reduced in the future, but it is important to note that it is unrealistic to simply upsize all of the drainage network in the area. In response to the flooding, detailed modelling work of the drainage catchment has been commissioned by the Lead Local Flood Authority, with the purpose of determining the feasibility of potential options and informing the necessary business cases that would need to be developed to secure sources of funding.	Lead Local Flood Authority	In progress
Construction of the attenuation feature on the Dickens Manor development site.	Suggestions from local residents as to how the attenuation feature could be adapted to increase storage and how the channel between the attenuation feature and the culvert under Rumbush Lane could be adapted are being considered as part of a wider piece of modelling work of the drainage catchment.	Lead Local Flood Authority	In progress
Rumbush Lane Culvert Security/Trash Screens.	Revised security/trash screen arrangements have been discussed with the Dickens Manor developer to reduce the likelihood and impact of any future blockage of the culvert.	Lead Local Flood Authority/ Bellway Homes	In progress

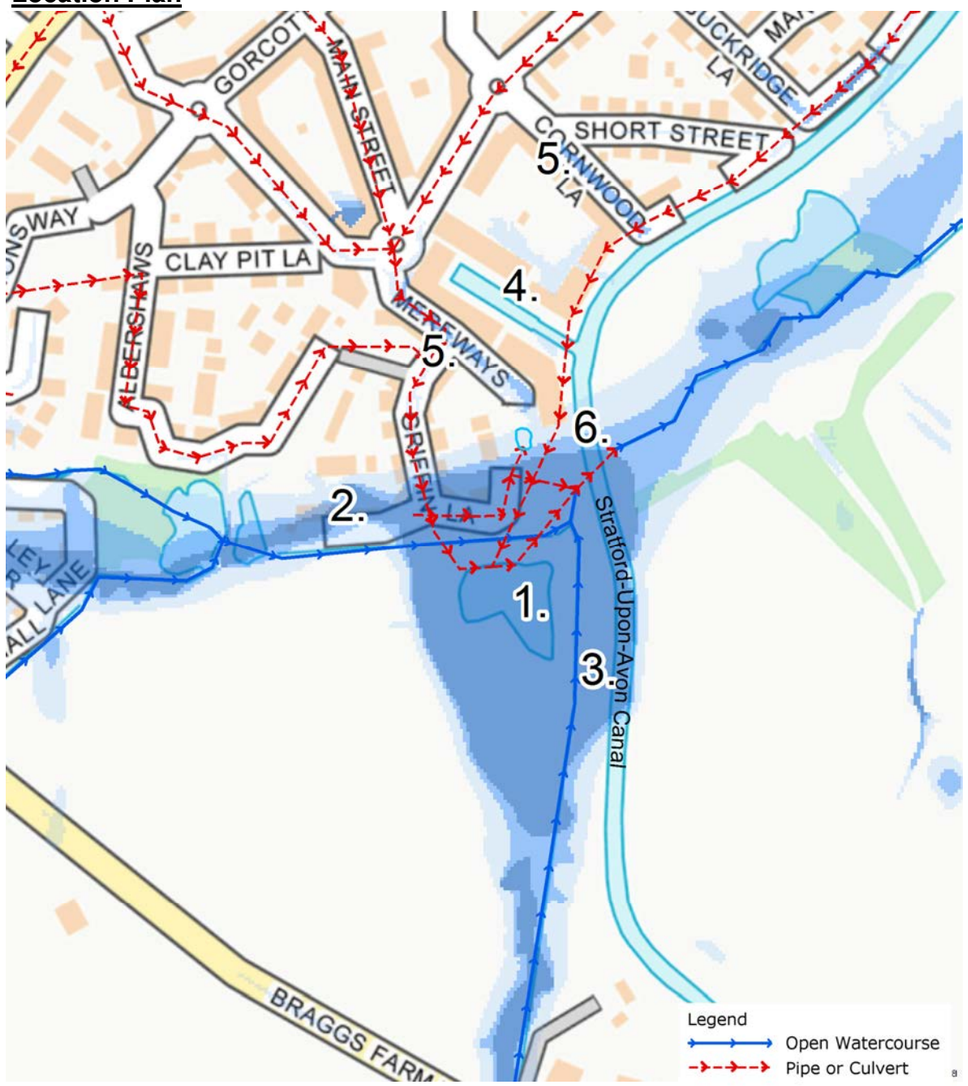
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Griffin Lane, Waterside and Cornwood House Area, Dickens Heath

Who or what was affected?

13 properties internally flooded	4 properties externally flooded	1 garage flooded

Location Plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water in Dickens Heath. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✓
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them	Flooding of the canal.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

Two watercourses meet at a point on land to the east of Griffin Lane, before passing through a culvert under the Stratford Upon Avon Canal and continuing in a north easterly direction to the Mount Brook and then onto the River Blythe at Cheswick Green.

The Stratford Upon Avon Canal runs to the east and north of Dickens Heath and is unbroken in terms of level between Lapworth to the south and Birmingham City Centre to the north (via the Worcester and Birmingham Canal). The level of the canal is maintained within 50 to 70mm to ensure that water can flow over weirs to avoid the water becoming stagnant.

Surface water from the majority of the central and southern parts of Dickens Heath village (with the exception of the recent developments at Griffin Lane, Dickens Manor and The Paddocks) passes through a surface water sewer system and is held in an attenuation feature in the country park to the south of Griffin Lane, before being released via a piped network into the culvert under the Stratford Upon Avon Canal.

Description of area shown to be at risk	What happened on 27th May?
1. Flood risk associated with the existing attenuation feature that sits within the Dickens Heath Country Park and that serves the surface water sewer system for the village.	No reports were received of the attenuation feature flooding.
2. Flood risk associated with a watercourse that flows from the direction of Rumbush Lane across the bottom of Griffin Lane.	Reports were received of internal property flooding to properties on Griffin Lane and of the highway being flooded as a result of the watercourse flooding.
3. Flood risk associated with the watercourse that flows from the south of Griffin Lane along the eastern edge of the existing attenuation feature that sits within the Dickens Heath Country Park.	Reports were received of the watercourse being out of bank as a result of flood water flowing through from Tidbury Green.
4. Flood risk alongside Waters Edge, Waterside Heights and Cornwood House	Reports were received of flooding to the front of properties on Waters Edge, Waterside Heights and to the basement and car park of Cornwood House. 100 properties in Cornwood House lost their clean water supply after basement pumps became flooded.
5. Surface water flood risk in the carriageway on Mereways and Cornwood Lane	Reports were received of flooding in the highway.
6. Flooding associated with the Stratford Upon Avon Canal	Reports were received of the canal flooding outside Waters Edge and Waterside causing internal flooding to multiple properties. This may have been associated with flooding of the Stratford Upon Avon Canal at Lady Lane, which caused additional flows within the River Blythe.

Location: Griffin Lane, Waterside and Cornwood House Area, Dickens Heath

What potential flood risk management schemes have been identified?

Location: Griffin Lane, Waterside and Cornwood House Area, Dickens Heath

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains.	Solihull Council as the local highway authority is responsible for the cleansing of the highway drainage system across the Borough and aims to cleanse each gully (drain) once a year. Since the flooding in May, the Council has carried out work to cleanse and CCTV highway drainage assets that it owns on in the area. Mapping of assets has also been updated at the same time where necessary.	Local Highway Authority	Complete
	Severn Trent Water are responsible for the cleansing of the main sewer network in Dickens Heath. Severn Trent have undertaken various visits to the area to cleanse, CCTV and map their assets where necessary.	Severn Trent Water	Complete
That construction of the attenuation feature on the Griffin Lane development is incorrect.	Officers from the Flood Risk Management Team have surveyed the site and are content that the development has been constructed in accordance with the approved drainage plans.	Lead Local Flood Authority	Complete
That the canal flooded outside Waterside.	The Canal and River Trust have indicated that whilst there was no breach at Earlswood Lakes, intense rainfall across part of the Blythe catchment caused the feeder system to the lakes to become overwhelmed. This extreme flow of water exited the feeder system at Lady Lane and entered the Stratford-Upon-Avon Canal, causing a surge through the system of up to1m. An inspection of the canal by the Canal and River Trust identified a section of bank adjacent to Waterside Heights where the available freeboard (difference between the water level and the top of the bank) is lower than would be normally recommended. It is not clear whether water was flowing into or out of the canal at this point.	Canal and River Trust	Complete
That the culvert under the Stratford Upon Avon Canal does not provide sufficient capacity and is blocked.	In response to the flooding, detailed modelling work of the area has been commissioned by the Lead Local Flood Authority, with the purpose of determining the feasibility of potential options and informing the necessary business cases that would need to be developed to secure sources of funding. Detailed survey work has been completed of the attenuation pond within the Country Park and of the sewer network and control chamber that regulates flows to the culvert under the Stratford Upon Avon Canal. The Canal and River Trust have been requested to provide maintenance records associated with their culvert.	Lead Local Flood Authority/ Canal and River Trust	In Progress
That flow is restricted through the open space to the east of the Stratford Upon Avon Canal.	Following the flooding in May, as Lead Local Flood Authority, Solihull Council commissioned the inspection of approximately 10km of watercourses across the Borough by independent and accredited consultants. Any actions that were identified as a result of the work are now being followed up with local landowners, including Dickens Heath Management Company who are responsible for the maintenance of this piece of open space.	Lead Local Flood Authority/ Dickens Heath Management Company	In Progress
That the basement and car park of Cornwood House flooded from the sewer network.	The managing agents of Cornwood House have been liaising with Severn Trent Water to determine the cause of this flooding. It is unclear at this time as to how flood water entered the basement area and further investigation is needed.	Managing Agents/ Severn Trent Water	In Progress
That Dickens Heath and the surrounding area has not been designated as a Critical Drainage Area.	Areas with Critical Drainage Problems can be designated through partnership between the Lead Local Flood Authority and the Environment Agency. In such designated areas, LLFAs and the Environment Agency work with the Local Planning Authority to ensure that adequate surface water management measures are incorporated in development to mitigate fluvial flood risk. Discussions are currently being held with the Environment Agency as to whether designation would be beneficial.	Lead Local Flood Authority/ Environment Agency	In Progress
That more attenuation of flood water is required. Only one attenuation feature is insufficient and that the use of the canal should be considered in extreme events.	In response to the flooding, detailed modelling work of the area has been commissioned by the Lead Local Flood Authority, with the purpose of determining the feasibility of potential options which may include additional attenuation and with the intention of informing the necessary business cases that would need to be developed to secure sources of funding. From conversations with the Canal and River Trust, it would not be feasible to use the canal network as additional storage due to lack of current capacity and insufficient measures to easily control and adjust flows.	Lead Local Flood Authority	In Progress
That the area does not naturally drain well due to the presence of clay soils.	The underlying soil type across the Borough is generally clay, but pockets of free draining soil and areas of slightly impeded drainage exist east of the M42. Where infiltration is not possible it is necessary to use other means to dispose of surface water, e.g. sewers or watercourses.		

Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Tythe Barn Lane Area, Dickens Heath

Who or what was affected?

		
5 properties internally flooded	0 properties externally flooded	1 garage flooded

Location plan

Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water in Dickens Heath. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✓
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them.	Another source has been identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

Tythe Barn Lane is situated to the north of Dickens Heath and forms a link out of the village towards Whitlock's End railway station and Shirley.

At the western end of Tythe Barn Lane, water drains to a watercourse that begins towards Betteridges Farm on Tilehouse Lane and which flows in a northerly manner through culverts under Tythe Barn Lane and the Stratford Upon Avon Canal towards Shirley before joining the River Cole at Aqueduct Road.

At the eastern end of Tythe Barn Lane, water outfalls via a highway drainage and sewer network into the Stratford Upon Avon Canal at the rear of Nos. 120-130 Tythe Barn Lane.

Description of area shown to be at risk	What happened on 27th May?
1. At the western end of Tythe Barn Lane risk from surface water flooding is shown in the carriageway from the junction with Tilehouse Lane to a point outside of No.298.	Reports were received of internal flooding to multiple properties on Tythe Barn Lane at this point and of the highway being impassable as a result of water flowing off surrounding land and the watercourse being flooded.
2. Flood risk associated with a watercourse that flows in a northerly direction from Whitlocks End to the Stratford-Upon-Avon Canal. There is some localised flooding on land between Tythe Barn Lane and the canal.	It is understood that surrounding land was flooded in this area and that the watercourse was out of bank.
3. At the eastern end of Tythe Barn Lane risk from surface water flooding is concentrated mainly in the carriageway immediately before the canal bridge but also exists from Whitchurch Lane to the canal bridge on a line behind Nos. 120-130 Tythe Barn Lane.	Reports were received of internal flooding to multiple properties on Tythe Barn Lane at this point as a result of the highway drainage and sewer network being overloaded. It is understood that the water level on the canal may have been higher than normal at the time, which may have caused the flooding as the outfall from the sewer network became restricted.

Location: Tythe Barn Lane Area, Dickens Heath

What potential flood risk management schemes have been identified?

Can we improve the culvert under Tythe Barn Lane to allow more water through?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we store more water south of Tythe Barn Lane?

Do we need to improve the road drainage on Tythe Barn Lane?

Can the foul sewer be made more resilient during a flood?

Location: Tythe Barn Lane Area, Dickens Heath

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains.	Solihull Council cleans highway gullies (drains) once a year as standard practice. Since the flooding in May, the Council has been back out to Tythe Barn Lane to cleanse the system again and has undertaken CCTV surveys of assets.	Local Highway Authority	Complete
Surchage of foul sewers caused by the failure of the foul pumping station at Broom Lane	Severn Trent Water own and maintain the pumping station. They have attended and undertaken the necessary repairs.	Severn Trent Water	Complete
Maintenance of ditches and watercourses in the surrounding area.	It is the responsibility of the relevant landowner to maintain the stretch of watercourse that runs on or under their land, or that is on the boundary of their land, up to its centre. Since the flooding we have had over 10km of watercourses across the Borough inspected by independent and accredited surveyors. No emergency work has been identified, but we have been following up some other points with local landowners.	Lead Local Flood Authority/ Local Landowners	In progress
Discharge of surface water at the eastern end of Tythe Barn Lane into the Stratford Upon Avon Canal.	It is understood that the outfall to the canal may have become submerged during the flood due to increased water levels on the canal. Further work is required to understand if and how the risk of this occurring again in the future can be reduced.	Local Highway Authority/ Canal and River Trust	In progress
Culvert capacity under Tythe Barn Lane.	The need to assess the culvert capacity under Tythe Barn Lane has been identified to ensure that it remains fit for purpose. However care needs to be taken to not increase flood risk downstream should any changes be made.	Local Highway Authority	In progress

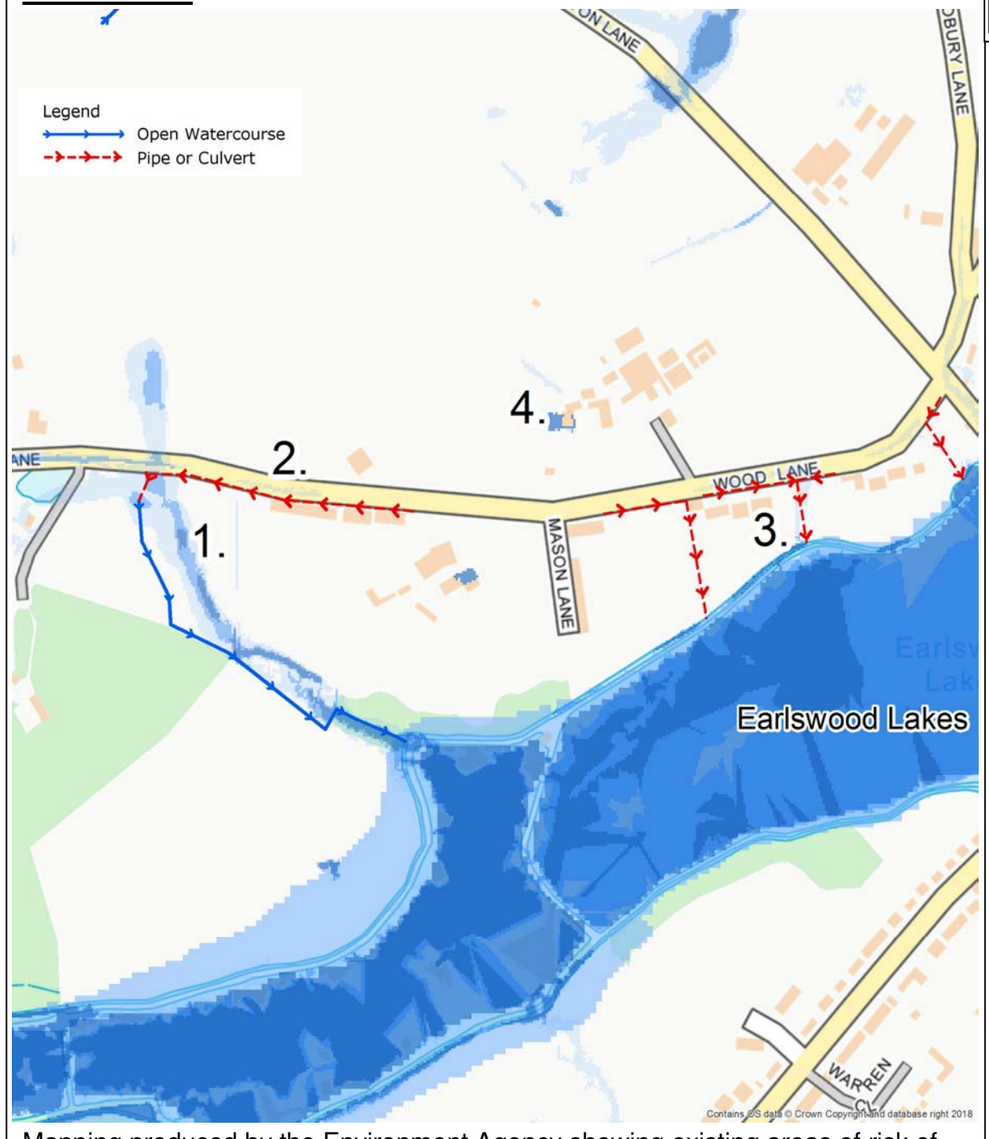
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Wood Lane Area, Earlswood

Who or what was affected?

9 properties internally flooded	1 property externally flooded	8 garages flooded

Location Plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water on Wood Lane. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✗	✗	✗	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	No sewer flooding has been identified.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them	No other source identified.

What does existing mapping show us and what happened on 27th May?

The land between Wood Lane and Norton Lane drains towards the River Blythe, entering the feeder channel to Earlswood Lakes to the rear of Mason Lane.

The highway drainage system on Wood Lane is comprised of a system of gullies and pipework, along with various ditches. At the western end (No.167 to The Rosery), the system runs in a westerly direction before discharging to a watercourse that runs to the rear of the properties, which then enters the canal feeder. At the eastern end, (Engine House to No.147) the system runs to a ditch and a culvert that then outfalls to the canal feeder.

A foul water sewer system runs under land to the rear of the properties on Wood Lane and Earlswood Lakes, which is pumped back towards Tidbury Green and further afield.

It is suspected that surface water from properties in this location is disposed of by way of the foul sewer system.

Description of area shown to be at risk	What happened on 27th May?
1. Flood risk is shown on a flow route that is primarily associated with a watercourse that runs from land adjacent to Willow Tree Farm through to Earlswood Lakes.	Photo and video evidence of the event suggests that the cause of the flooding was overland flow from the surrounding area across fields and through properties on either side of Wood Lane. Whilst the flow of water would have tried to enter the highway drainage system, the system would have quickly become overwhelmed, before the water continued on a path towards the canal feeder.
2. Minor patches of surface water flood risk are identified within the carriageway on Wood Lane.	
3. A surface water flow path is shown running between Wood Lane and Earlswood Lakes between Nos.65 and 101.	
4. A small area of surface water flood risk is shown to the rear of Earlswood Lakes Craft Centre	

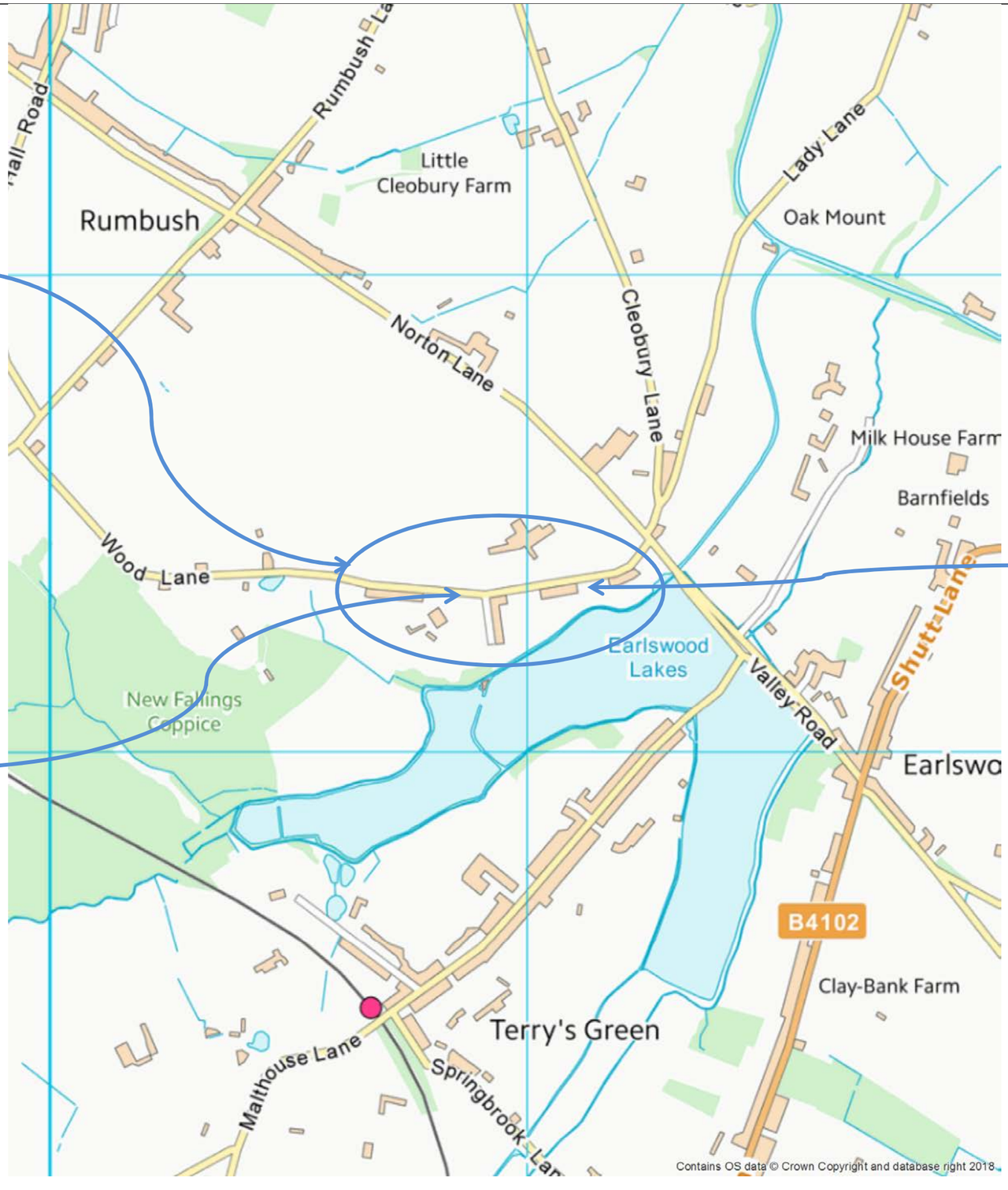
Location: Wood Lane Area, Earlswood

What might be possible to reduce the risk from future flooding?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we improve the highway drainage to drain the roads better?

Can we keep more water on the roads to stop houses flooding?



Location: Wood Lane Area, Earlswood

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains.	Solihull Council as the local highway authority is responsible for the cleansing of the highway drainage system across the Borough and aims to cleanse each gully (drain) once a year. Since the flooding in May, the Council has carried out work to cleanse and CCTV highway drainage assets that it owns on Wood Lane. Mapping of assets has also been updated at the same time where necessary.	Local Highway Authority	Complete
Condition of culverts within the area	CCTV inspection and of the culvert to the side of No. 65 Wood Lane	Local Highway Authority	Complete
Maintenance of ditches and watercourses in the surrounding area.	Following the flooding in May, as Lead Local Flood Authority, Solihull Council commissioned the inspection of approximately 10km of watercourses across the Borough by independent and accredited consultants. Any actions that were identified as a result of the work are now being followed up with local landowners.	Lead Local Flood Authority/ Local Landowners	In progress
Capacity of the local drainage system	Further modelling work to understand the capacity of the system (including the culvert) and to confirm understanding of the event and determine possible solutions	Lead Local Flood Authority/	In progress

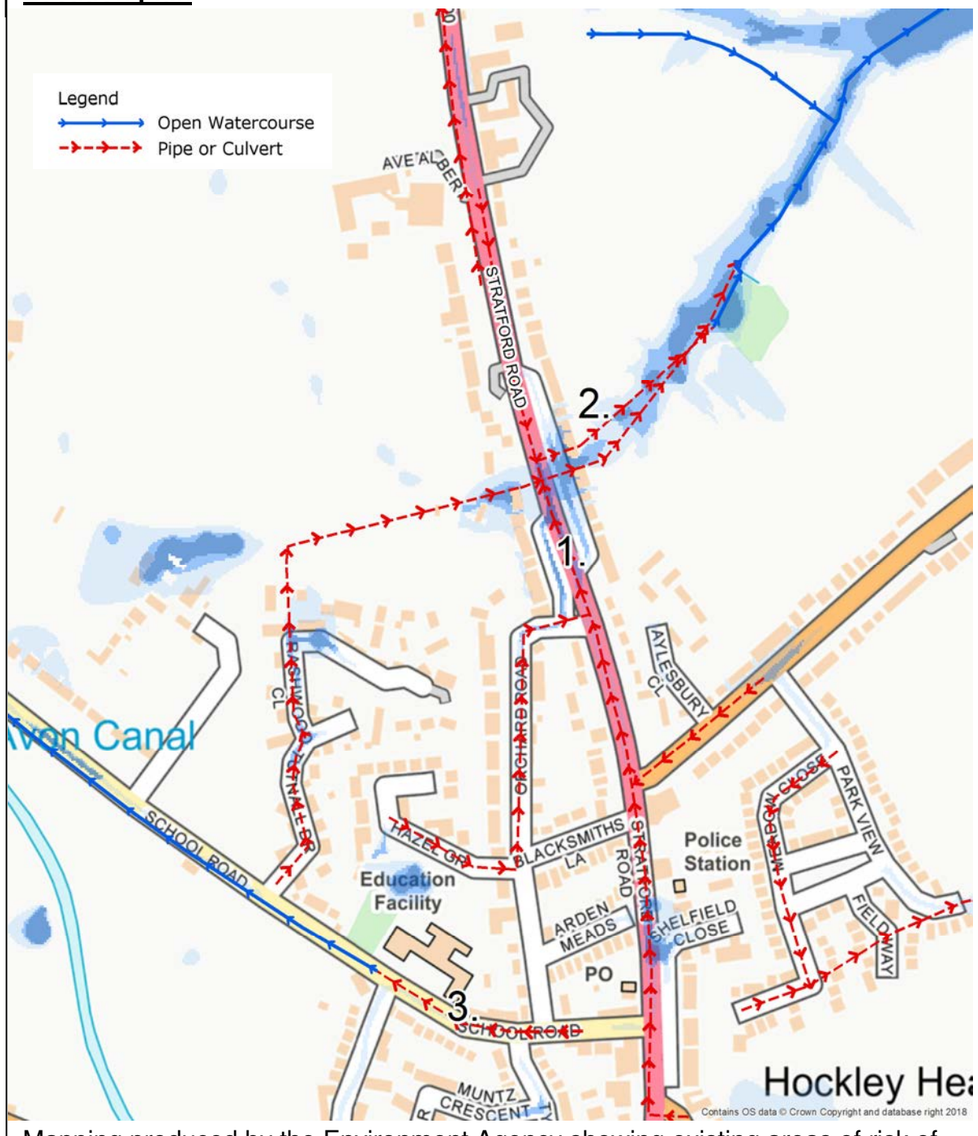
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Stratford Road Area, Hockley Heath

Who or what was affected?

3 properties internally flooded	0 properties externally flooded	3 garages flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water in Hockley Heath. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✗	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them.	No other source identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

There is a sewer network under the roads in Hockley Heath that is provided to take away surface water (rainwater) from properties with water from the highway draining via this same network. Used water from properties is kept separate and taken away by a foul water sewer system.

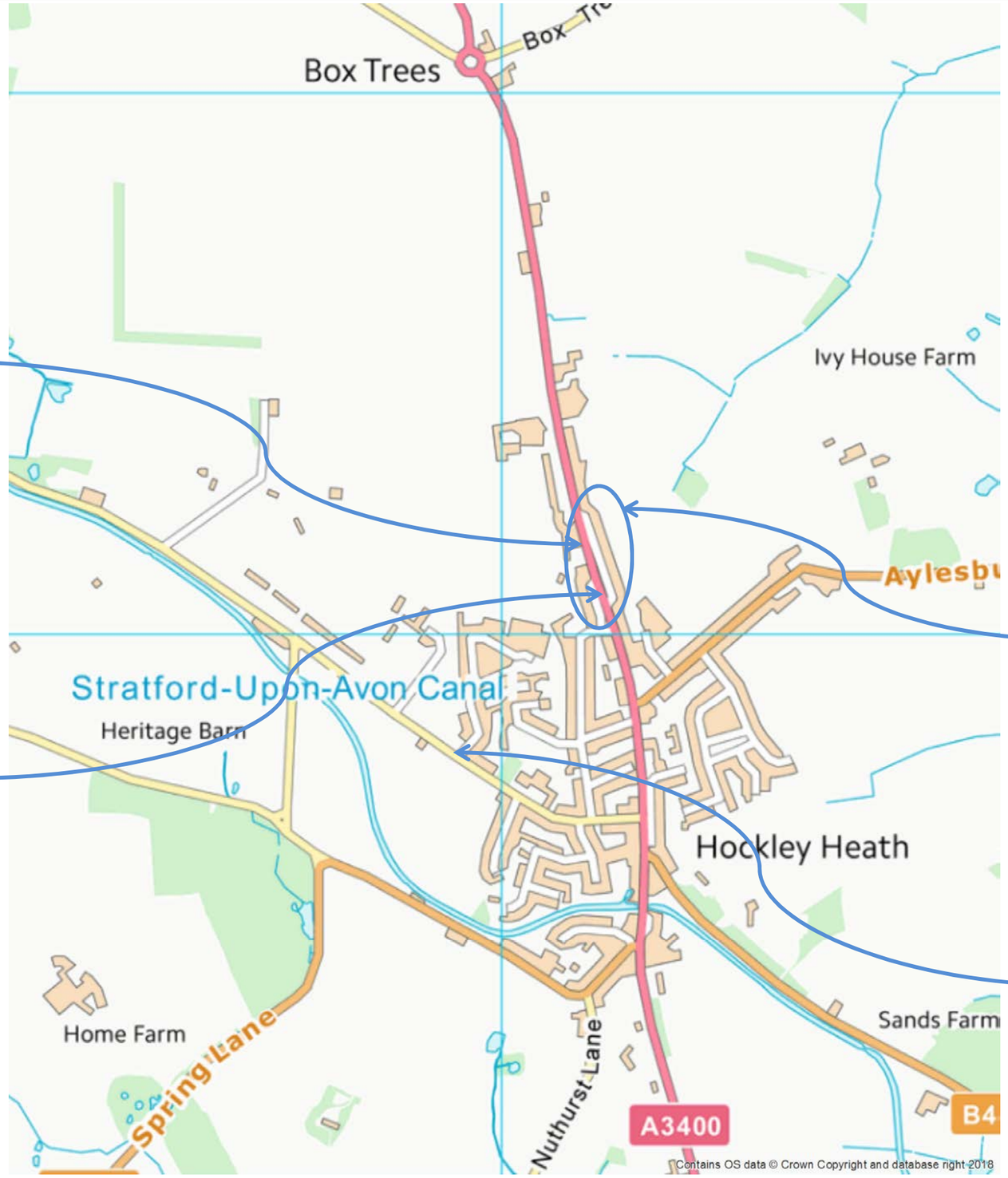
With the exception of the south west corner of Hockley Heath and from the part of the Stratford Road that is north of The Barn Public House, the surface water sewer network for the village heads to the vicinity of No.2505 Stratford Road. This network then outfalls into a watercourse that runs through land to the rear of the service road fronting Nos. 2491-2525 before continuing downstream to join the River Blythe.

Description of area shown to be at risk	What happened on 27th May?
1. Stratford Road from the junction of Orchard Road in a northerly direction to its northern most junction of the Service Road fronting Nos. 2491-2525.	Reports were received of internal flooding to multiple properties and garages along the service road and of the highway being impassable either as a result of surface water being unable to enter the sewer network or the sewer network flooding.
2. Flood risk associated with the watercourse that runs in a north easterly direction from the rear of the Service Road fronting Nos. 2491-2525 Stratford Road	No reports were received of flooding to the watercourse, although it is suspected that it would have been out of bank.
3. Flood risk associated with surface water on School Road between the Stratford Road and Tutnall Drive.	Reports were received of external flooding of properties on School Road and the highway being impassable either as a result of surface water being unable to enter the sewer network or the sewer network flooding.

Location: Stratford Road Area, Hockley Heath

What potential flood risk management schemes have been identified?

Do we need to improve capacity in the drains and sewers?



Can we improve the maintenance of the drains and sewers most at risk?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Do we need to improve the maintenance of the ditches and watercourses on School Road?

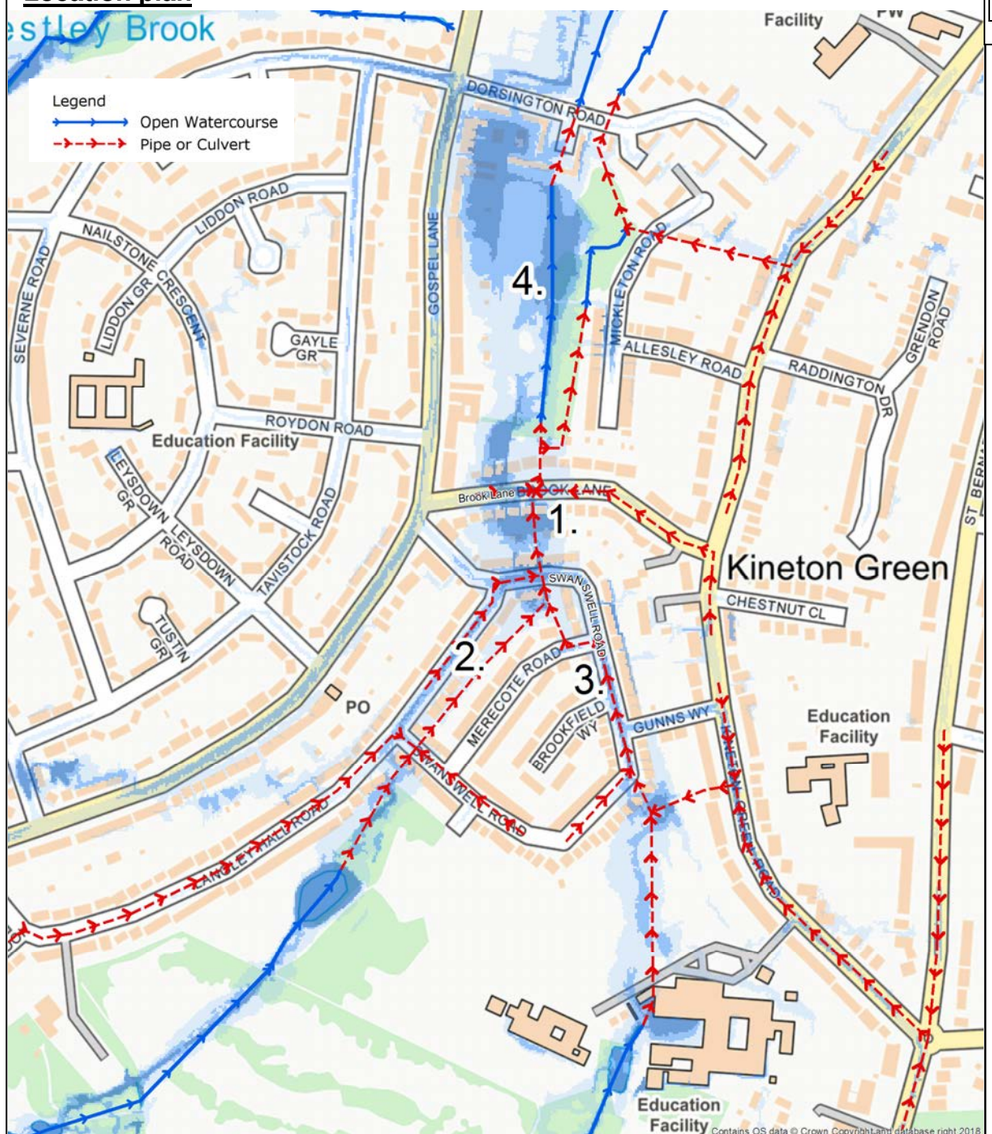
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Brook Lane, Langley Hall Road and Swanswell Road Area, Olton

Who or what was affected?

16 properties internally flooded	8 property externally flooded	5 garages flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Culverted watercourses were unable to cope with the amount of water flowing into them.	No other source identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

A surface water sewer system exists under Brook Lane, Langley Hall Road and Swanswell Road which serves the properties and highway in the area, covering an area south of Langley Hall Park and across to Kineton Green Road. The sewer system discharges into a culverted watercourse that runs through the area before crossing through open space to the rear of Mickleton Road. Flows then enter the Westerley Brook and Kingshurst Brook before joining the River Cole.

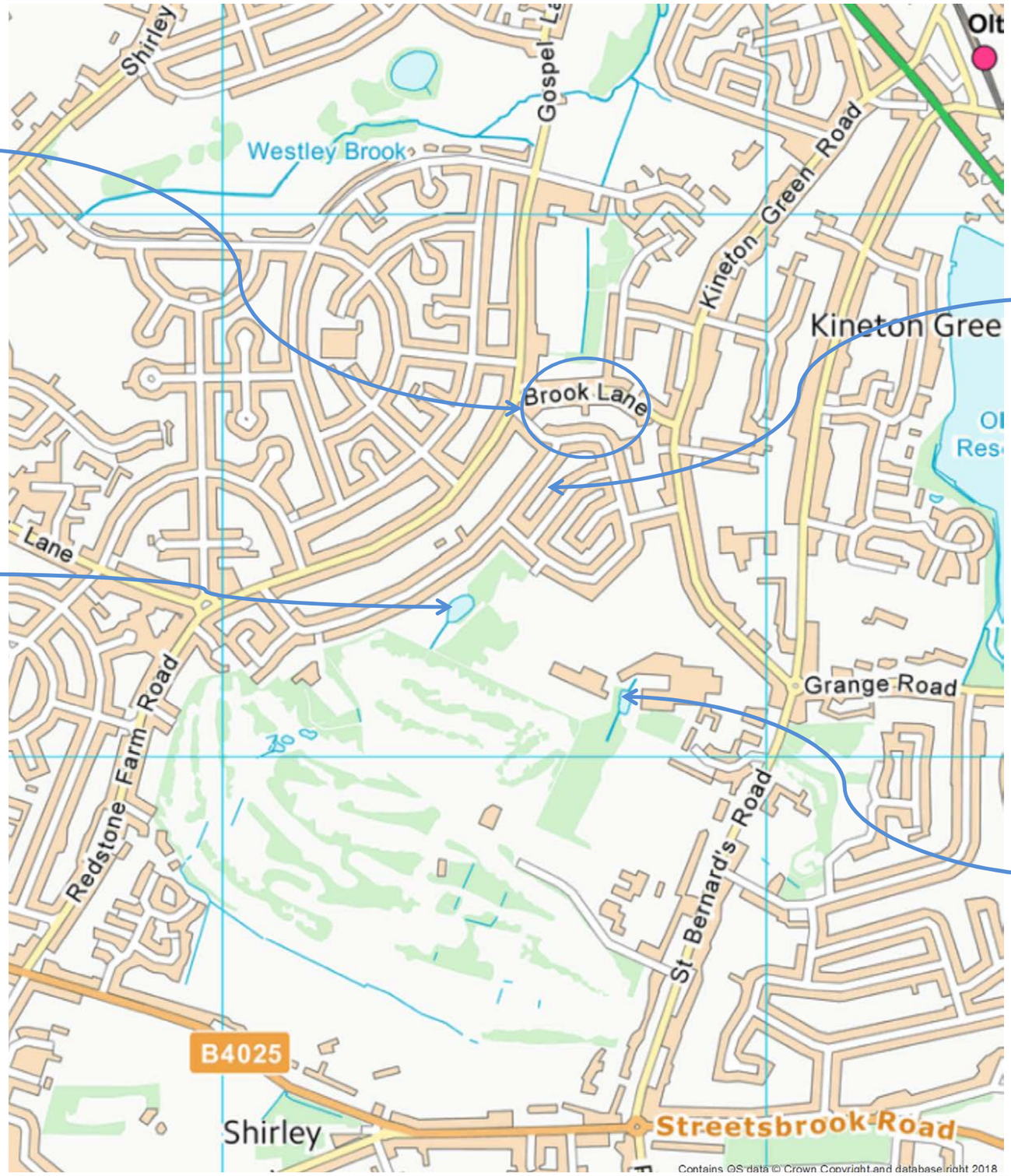
Description of area shown to be at risk	What happened on 27th May?
1. Surface water flood risk is shown for almost the entirety of Brook Lane, from its junction with Gospel Lane through to Kineton Green Road. The greatest risk is shown at the lowest point of Brook Lane, in the vicinity of Nos. 37-65.	7 properties reported internal flooding on Brook Lane, 3 garages were flooded and 8 properties reported external flooding as a result of surface water either being unable to enter the sewer network or the sewer network/culverted watercourse flooding.
2. On Langley Hall Road surface water flood risk is shown in the carriageway and to the front and rear of properties, in particular those on the eastern side of the road where the level is lowest.	1 property reported garage flooding on Langley Hall Road, near to the junction with Swanswell Road as a result of surface water either being unable to enter the sewer network or the sewer network/culverted watercourse flooding
3. Surface water flood risk is shown in the carriageway on Swanswell Road from Gospel Lane and on past the junction with Gunns Way. A further amount of flood risk is shown in the carriageway from near to the junction with Merecote Road through to the junction with Langley Hall Road. Flood risk is generally shown to the front and rear of properties on Swanswell Road from Gunns Way to Langley Hall Road.	9 properties reported internal flooding and a further property reported garage flooding on Swanswell Road as a result of surface water either being unable to enter the sewer network or the sewer network/culverted watercourse flooding
4. Flood risk is shown in the open space to the rear of Mickleton Road.	No reports were received of flooding within the open space to the rear of Mickleton Road.

Location: Brook Lane, Langley Hall Road and Swanswell Road Area, Olton

What potential flood risk management schemes have been identified?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we store more water in Langley Hall Park?



Do the culverts under roads and gardens need to be maintained?

Can we store more water at Langley School?

Location: Brook Lane, Langley Hall Road and Swanswell Road Area, Olton

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains	Solihull Council as the local highway authority is responsible for the cleansing of the highway drainage system across the Borough and aims to cleanse each gully (drain) once a year. Since the flooding in May, the Council has carried out work to cleanse and CCTV highway drainage assets that it owns on Brook Lane, Langley Hall Road and Swanswell Road.	Local Highway Authority	Complete
Condition of the main Severn Trent Water system	Severn Trent Water are responsible for the cleansing of the main sewer network in the Olton area. Severn Trent have undertaken various visits to the area to cleanse, CCTV and map their assets where necessary.	Severn Trent Water	Complete
Condition of the culverted watercourse between Langley Hall Park and Mickleton Road	A first CCTV inspection was abandoned of the culverted watercourse. A follow up attempt is now being planned.	Lead Local Flood Authority	In Progress
Condition of the drainage measures in place on Langley Playing Fields	It is the responsibility of the relevant landowner to maintain the stretch of watercourse that runs on or under their land, or that is on the boundary of their land, up to its centre. Since the flooding we have had over 10km of watercourses across the Borough inspected by independent and accredited surveyors. No emergency work has been identified, but we have been following up some other points with local landowners.	Lead Local Flood Authority	In Progress
What the Council's plan is to stop this from happening again	In response to the flooding, detailed modelling work of the area has been commissioned by the Lead Local Flood Authority, with the purpose of determining the feasibility of potential options and informing the necessary business cases that would need to be developed to secure sources of funding. An initial outline project proposal has been submitted by the Lead Local Flood Authority for a potential project covering Brook Lane, Langley Hall Road and Swanswell Road.	Lead Local Flood Authority	In Progress

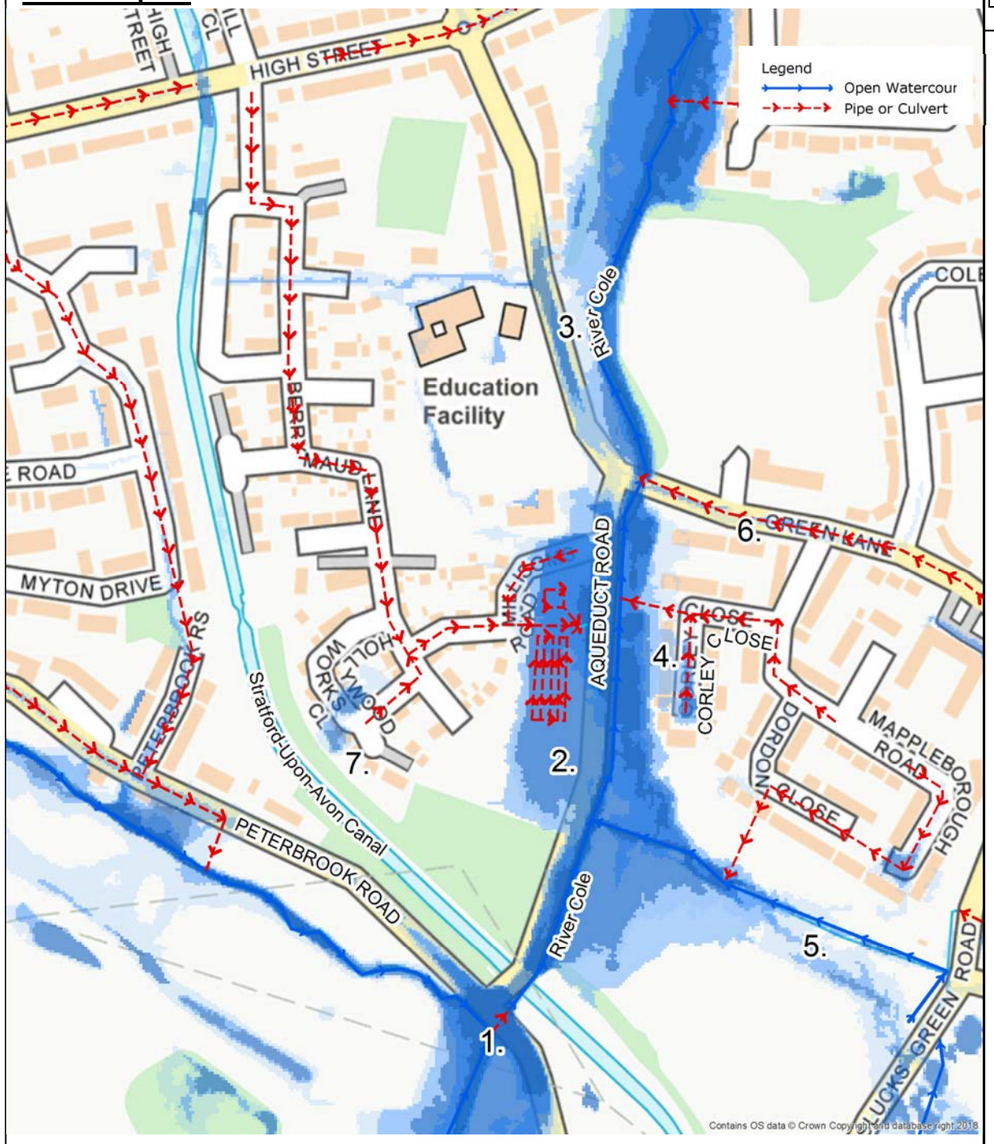
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Aqueduct Road, Corley Close and Green Lane Area, Shirley

Who or what was affected?

19 properties internally flooded	7 properties externally flooded	7 garages flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✓
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them	Flooding of the canal.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

Aqueduct Road, Corley Close and Green Lane all form part of a wider catchment area of the River Cole that extends from north Worcestershire and includes a large part of Shirley between the rail line and the A34 Stratford Road. The River Cole is joined by the Peter Brook at the junction of Aqueduct Road and Peterbrook Road, which serves a large part of north Worcestershire. A further tributary enters the River Cole north of the aqueduct which serves an area to the north and west of Dickens Heath.

Rainwater from properties and the highway is collected by way of a Severn Trent Water surface water sewer system before discharging into the River Cole at the rear of Corley Close, opposite Mill Lodge Primary School, at Colebrook Road and Priory Road, to the rear of Wiseacre Croft and at three points in Nethercote Gardens.

Surface water from the Berry Maud Lane site is stored in two underground tanks and in oversized pipes under the estate roads. Surface water from the site discharges to the foul sewer system rather than into the River Cole. The depression in the open space purely accommodates water from the River Cole once it floods over Aqueduct Road.

Description of area shown to be at risk	What happened on 27th May?
1. Flood risk associated with the River Cole is shown at the junction of Aqueduct Road and Peterbrook Road. Previous work has shown this area to have a 50% chance of flooding each year with the aqueduct itself acting as the major constraint to flow within the area.	Reports were received of flooding at the junction with the road becoming impassable. 2 properties across the border in north Worcestershire reported internal flooding.
2. Flood risk associated with the River Cole is shown on the section of Aqueduct Road from Peterbrook Road to Green Lane. Flood risk is constrained by the aqueduct itself, before spreading out across open space to the east and west.	Reports were received of flooding to the open space area in front of the Berry Maud development and of Aqueduct Road being impassable.
3. Flood risk from the River Cole and additionally from surface water flood risk is shown on the section between Green Lane and High Street Solihull Lodge, covering an area from Aqueduct Road to Wiseacre Croft.	3 properties reported internal flooding within this area. A further two properties reported flooding to their garages.
4. Flood risk from the River Cole and from surface water is shown on the highway and to properties on the northern and western sides of Corley Close.	12 reports of internal property flooding were received in Corley Close from the front and rear of the properties, along with two instances of garage flooding.
5. Flood risk is shown associated with a tributary of the River Cole that runs from the vicinity of Snowford Close behind properties on Dordon Close towards Aqueduct Road.	No reports have been received of flooding to properties in this area although it is understood that the watercourse would have been out of bank.
6. Surface water flood risk is shown on Green Lane from the junction with Cole Green to the River Cole, affecting the highway and properties near to the junction with Aqueduct Road.	Residents fronting this part of Green Lane reported internal flooding of their properties.
7. An area of surface water flood risk is shown in the area that is now known as Hollywood Works Close.	Residents reported internal flooding from the rear of their properties associated with flooding from the Stratford Upon Avon Canal.

Location: Location: Aqueduct Road, Corley Close and Green Lane Area, Shirley

What potential flood risk management schemes have been identified?

Can we get more water to pass under Green Lane?

Does the canal side need improving?

Can we store more water in the open space at Millisoms Road?

Can we store more water south of Peterbrook Road?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we store more water between Haslucks Green Road and Aqueduct Road?

Location: Aqueduct Road, Corley Close and Green Lane Area, Shirley

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains.	Solihull Council cleans highway gullies (drains) once a year as standard practice. Since the flooding in May, the Council has been back to Aqueduct Road, Corley Close and Green Lane to cleanse the system again and has undertaken CCTV surveys of assets that it owns.	Local Highway Authority	Complete
	Severn Trent Water are responsible for the cleansing of the main sewer network in Shirley. Severn Trent have undertaken various visits to the area to cleanse, CCTV and map their assets where necessary.	Severn Trent Water	Complete
That water was released from Earlswood Lakes.	The Canal and River Trust have indicated that whilst there was no breach at Earlswood Lakes, intense rainfall across part of the Blythe catchment caused the feeder system to the lakes to become overwhelmed. This water then passed into the main canal south of Lady Lane and caused overtopping of the canal at a low point in the southern canal bank adjacent to the River Blythe Culvert. This water then entered the River Blythe (not the River Cole). Further reports of overtopping along the side of the canal have been reported within Solihull. The Canal and River Trust have informed us that the lakes did not flood. However, the embankment was damaged by water flowing down Malt House Lane and spilling down the slope to Valley Road. Two land slips occurred and these were covered in tarpaulin to avoid further damage risking the integrity of the dam.	Canal and River Trust	Complete
That construction of the drainage features on the Berry Maud Lane development is incorrect.	Officers from the Flood Risk Management Team have surveyed the site and are content that the main drainage layout for the site is as per the approved plans. Surface water from the Berry Maud Lane site is stored in two underground tanks and in oversized pipes under the estate roads. Surface water from the site discharges to the foul sewer system rather than into the River Cole. The depression in the open space purely accommodates water from the River Cole once it floods over Aqueduct Road.	Lead Local Flood Authority	Complete
That a low spot along the Stratford Upon Avon Canal caused flooding to properties in Hollywood Works Close	Officers from the Flood Risk Management Team have verified the flooding to these properties and have requested that the Canal and River Trust undertake an inspection of their assets in the area.	Canal and River Trust	In Progress
Condition of the River Cole and other ordinary watercourses in the surrounding area	Following the flooding in May, as Lead Local Flood Authority, Solihull Council commissioned the inspection of approximately 10km of watercourses across the Borough by independent and accredited consultants. Any actions that were identified as a result of the work are now being followed up with local landowners.	Lead Local Flood Authority	In Progress
What measures are going to be put in place to stop this happening again?	In response to the flooding, detailed modelling work of the area has been commissioned by the Lead Local Flood Authority, with the purpose of determining the feasibility of potential options and informing the necessary business cases that would need to be developed to secure sources of funding. An initial outline project proposal has been submitted by the Lead Local Flood Authority for a potential project covering Aqueduct Road, Corley Close and Green Lane.	Lead Local Flood Authority	In Progress

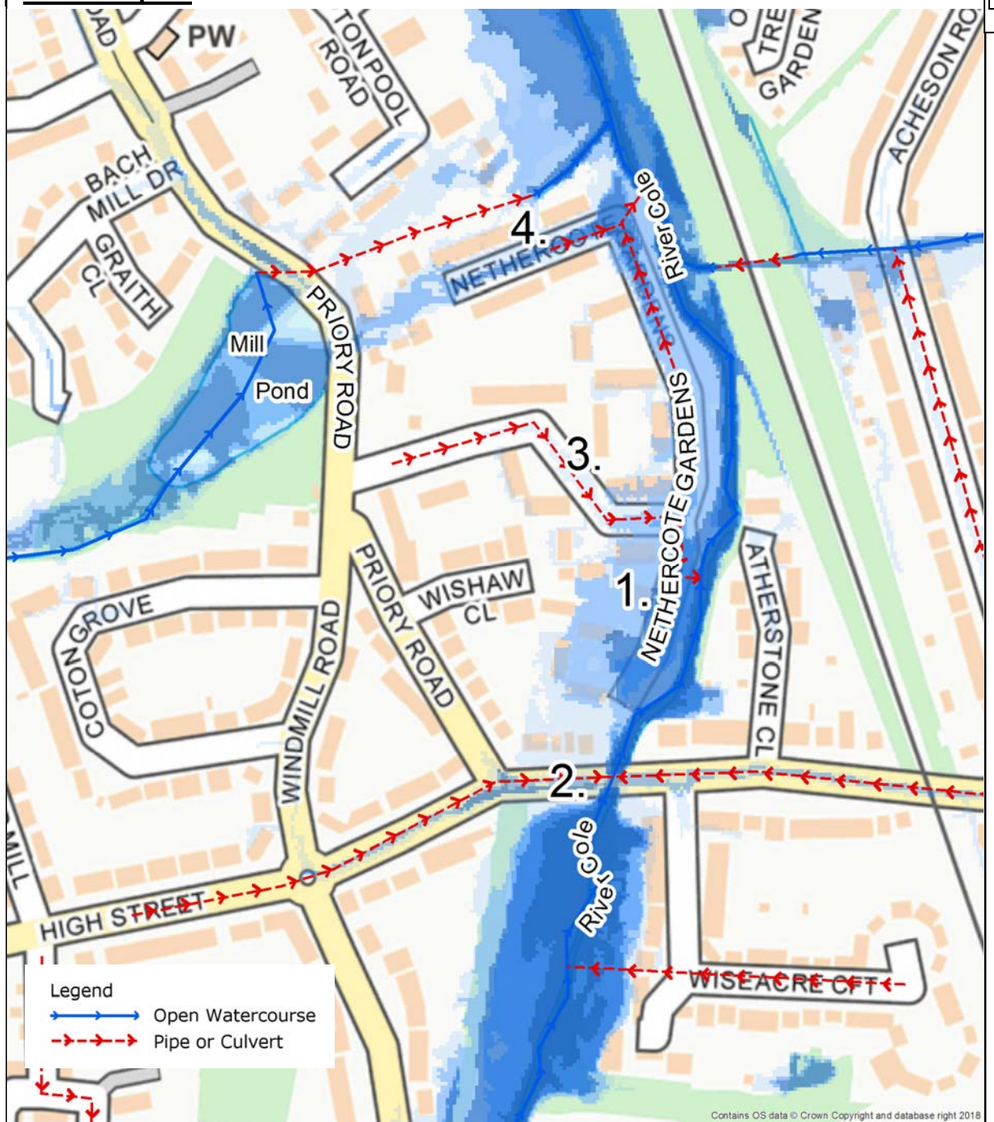
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Colebrook Road and Nethercote Gardens Area, Shirley

Who or what was affected?

42 properties internally flooded	1 property externally flooded	2 garages flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them.	No other sources have been identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

Colebrook Road and Nethercote Gardens are situated next to the River Cole and are shown to be at risk of flooding from the river and also from surface water. The Cole flows in a northerly direction under Colebrook Road before passing over the borough boundary into Birmingham. Two other watercourses join the River Cole towards the boundary with Birmingham and several surface water sewer systems from the surrounding area discharge at various points along this stretch of the river.

Rainwater from properties and the highway is collected by way of a Severn Trent Water surface water sewer system before discharging into the River Cole either side of the bridge at Colebrook Road and at three points along Nethercote Gardens.

Surface water from the Berry Maud Lane site is stored in two underground tanks and in oversized pipes under the estate roads. Surface water from the site discharges to the foul sewer system rather than into the River Cole. The depression in the open space purely accommodates water from the River Cole once it floods over Aqueduct Road.

Description of area shown to be at risk	What happened on 27th May?
1. High and medium flood risk is shown associated with the River Cole in Nethercote Gardens, affecting the highway and properties along the western bank. Due to a level change, the eastern bank is not shown to have the same risk.	29 properties flooded within the area that is shown to be at risk from fluvial flooding from the River Cole, with supporting photographic and video evidence.
2. Surface water flood risk is shown on Colebrook Road from its junction with Haslucks Green Road through to Windmill Road, with higher risk areas to properties shown in the vicinity of the road bridge where the road reaches its lowest level.	4 properties on the northern side of Colebrook Road experienced internal property flooding at this location. Whilst mapping shows the area to be at risk from surface water flooding, photographic and video evidence shows flooding from the River Cole.
3. Additional surface water flood risk is shown to the front and rear of properties in Nethercote Gardens, along with flooding of the highway.	Flooding of the highway was reported in this area.
4. A considerable surface water flow path is shown entering Nethercote Gardens from the direction of Priory Road, associated with the Mill Pond. This flow path predominately affects the highway and front of Nos. 177-223 before converging with the fluvial flow path associated with the River Cole.	8 properties experienced internal property flooding in this area. Residents reported water flowing down the walkway between Priory Road and Nethercote Gardens.

Location: Location: Colebrook Road and Nethercote Gardens Area, Shirley

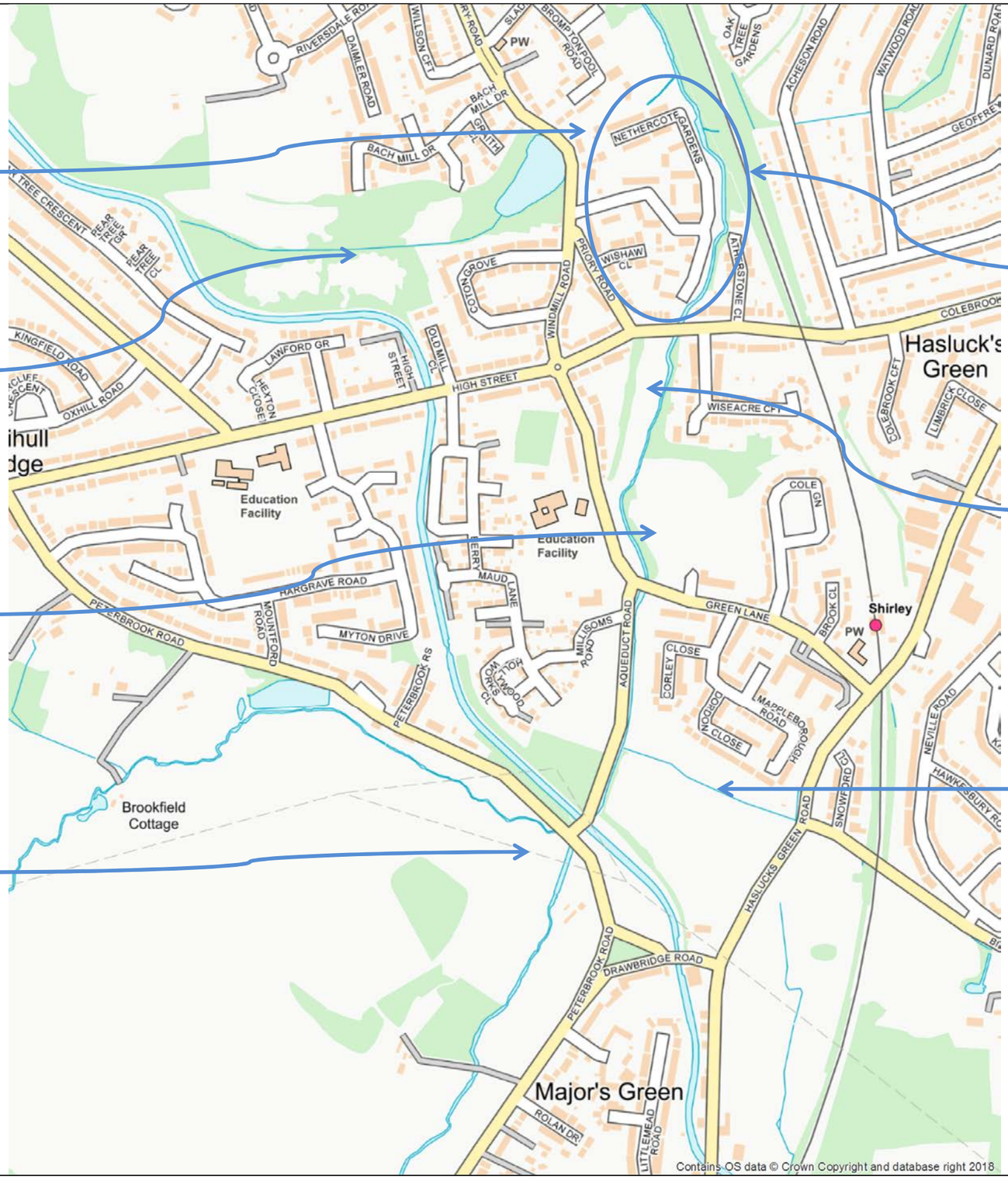
What potential flood risk management schemes have been identified?

Can we get more water through the culvert from the Mill Pond?

Can we store more water in the Mill Pond and Priory Fields Nature Reserve?

Can we store more water in Mill Lodge Park?

Can we store more water south of Peterbrook Road?



Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we store more water in Colebrook Recreation Ground?

Can we store more water between Haslucks Green Road and Aqueduct Road?

Location: Colebrook Road and Nethercote Gardens Area, Shirley

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains.	Solihull Council cleans highway gullies (drains) once a year as standard practice. Since the flooding in May, the Council has been back to Colebrook Road and Nethercote Gardens to cleanse the system again and has undertaken CCTV surveys of assets that it owns.	Local Highway Authority	Complete
	Severn Trent Water are responsible for the cleansing of the main sewer network in Shirley. Severn Trent have undertaken various visits to the area to cleanse, CCTV and map their assets where necessary.	Severn Trent Water	Complete
The Earlswood landslide and gates being opened on the canal network. Is this what caused the waves of water we saw.	The Canal and River Trust have indicated that whilst there was no breach at Earlswood Lakes, intense rainfall across part of the Blythe catchment caused the feeder system to the lakes to become overwhelmed. This water then passed into the main canal south of Lady Lane in Earlswood and caused overtopping of the canal at a low point in the southern canal bank adjacent to the River Blythe Culvert. This water then entered the River Blythe (not the River Cole). Further reports of overtopping along the side of the canal have been reported within Solihull. The Canal and River Trust have informed us that the lakes did not flood. However, the embankment was damaged by water flowing down Malt House Lane and spilling down the slope to Valley Road. Two land slips occurred and these were covered in tarpaulin to avoid further damage risking the integrity of the dam. In all likelihood, the waves of water were perhaps caused by water entering the River Cole from its various tributaries.	Canal and River Trust	Complete
That the new development is exacerbating problems.	Flood Risk Management is taken into account as part of the planning system to ensure that new development is located away from areas that are considered to be at high risk of flooding and to ensure that it does not cause additional risk to those living elsewhere. The development off Aqueduct Road has been built in accordance with national policies and requirements regarding flood risk. Officers have visited the site to check that the drainage element of the development has been built in accordance with approved plans.	Lead Local Flood Authority	Complete
Whilst the river level was not as high as previously experienced, many properties flooded for the first time.	River level information from the gauging station at Majors Green shows a peak of 1.86m during the event in May, second only to a peak of 1.93m in 2007. Whilst detailed modelling work is being undertaken to better understand the interaction between the overland and surface water flooding that was witnessed and the fluvial flooding that was experienced from the River Cole, care should be taken when comparing rainfall events due to differences in intensity and duration. It should also be noted that the station at Majors Green does not include flows into the River Cole from the Peter Brook, which joins at Aqueduct Road, or from an unnamed tributary that enters the River Cole north of the aqueduct from the direction of Dickens Heath, both of which received significant rainfall over a short period of time.	[redacted]	[redacted]
Flood defences are needed. What property level protection or resilience measures can residents put in place?	An initial outline project proposal has been submitted by the Lead Local Flood Authority for a potential project covering Colebrook Road and Nethercote Gardens. Members of the Nethercote Gardens Flood Group met with Officers at a community engagement event in Warwickshire in September to better understand property level protection and resilience.	Lead Local Flood Authority	In Progress
That waste is being dumped in the River Cole and that the river needs to be dredged.	It is the responsibility of the relevant landowner to maintain the stretch of watercourse that runs on or under their land, or that is on the boundary of their land, up to its centre. Since the flooding we have had over 10km of watercourses across the Borough inspected by independent and accredited surveyors. No emergency work has been identified, but we have been following up some other points with local landowners.	Lead Local Flood Authority	In Progress
That additional sandbins are needed in the area. Revised access arrangements should be made for the existing sandbins and pre-filled sandbags should be provided.	Additional sandbins have been ordered and revised access arrangements are being made for existing units. Residents who experienced internal property flooding are in the process of being issued with a personal supply of floodsax.	Lead Local Flood Authority	In Progress

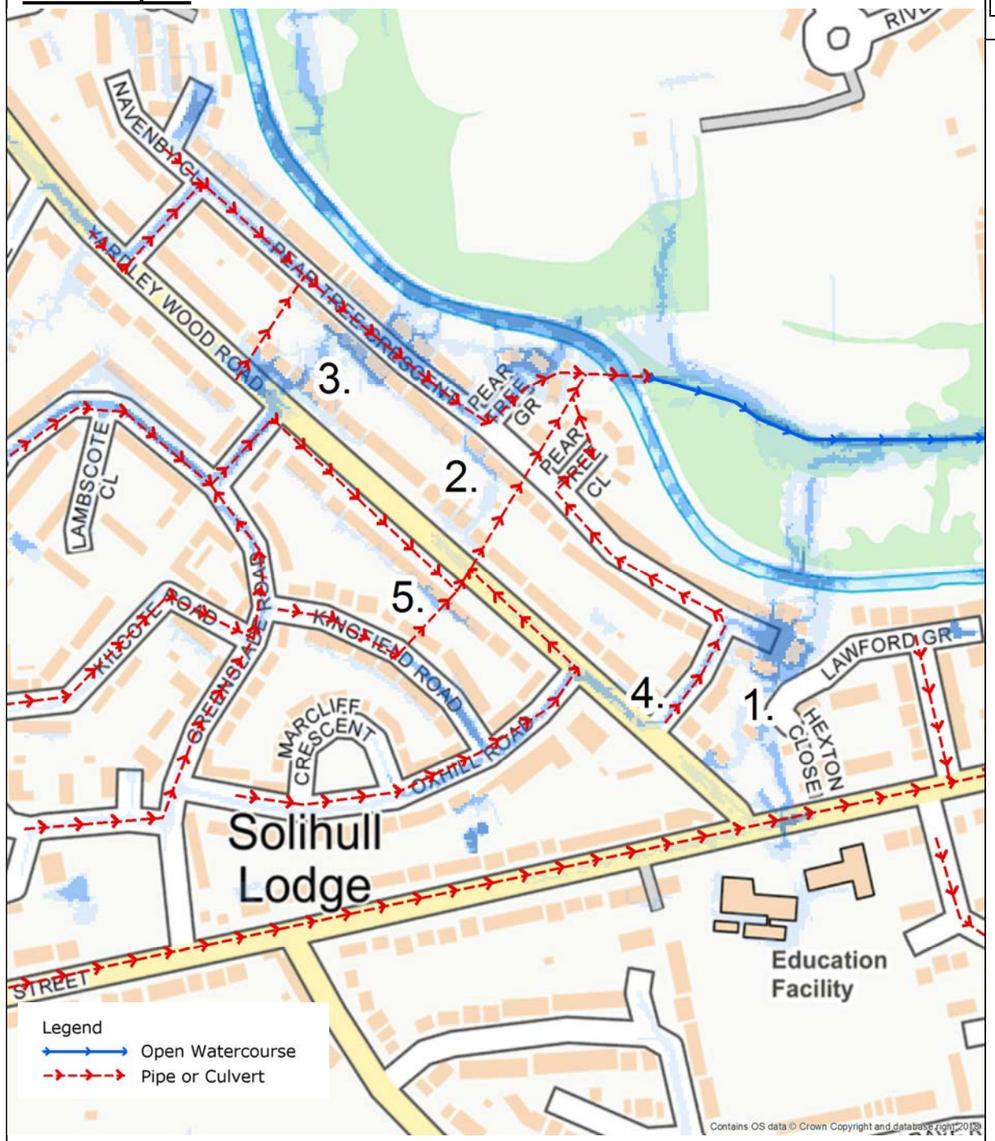
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Yardley Wood Road and Pear Tree Crescent Area, Shirley

Who or what was affected?

24 properties internally flooded	4 property externally flooded	2 garages flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✗	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them.	No other source identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

A surface water sewer network exists in the Solihull Lodge area to dispose of rainwater from properties as well as water from the highway. Used water from properties is kept separate and taken away by a foul water sewer system.

The entire surface water network for the area around Yardley Wood Road, Pear Tree Crescent and Greenslade Road heads in a north easterly direction towards a culvert that runs under the Stratford Upon Avon Canal. On the other side of the canal, flows then continue along a watercourse within Priory Fields Nature Reserve before joining the River Cole at Nethercote Gardens.

Description of area shown to be at risk	What happened on 27th May?
1. A surface water flow path is shown from High Street, Solihull Lodge and from Yardley Wood Road through Lawford Grove and Hexton Close to Pear Tree Crescent (Nos. 12-24) and on towards the Stratford Upon Avon canal.	Multiple properties were internally flooded from the front and rear on Hexton Close and Pear Tree Crescent associated with surface water being unable to enter the sewer network.
2. A surface water flow path is shown in the vicinity of Nos. 1254-1266 Yardley Wood Road and running through to the rear of Nos. 47-57 Pear Tree Crescent before joining a further flow path and heading in a north easterly direction towards Pear Tree Grove and then on towards the Stratford Upon Avon canal.	Internal property flooding was experienced to the front of multiple properties on Pear Tree Grove as a result of surface water being unable to enter the sewer network.
3. A surface water flow path is shown running from Greenslade Road across Yardley Wood Road fronting Nos.1208-1234 before continuing through Nos.82-94 Pear Tree Crescent.	Internal property flooding was experienced by multiple properties directly opposite Greenslade Road, with concerns that the water included sewage. The flood water continued through the front and back of properties on Pear Tree Crescent before reaching the Stratford Upon Avon canal.
4. Flood risk associated with surface water in the carriageway on Yardley Wood Road between Nos. 1258 and 1300.	Flooding of the highway was reported in this location.
5. Flood risk associated with surface water to the rear of Nos. 1215-1257 Yardley Wood Road.	Multiple properties on the southern side of Yardley Wood Road reported internal flooding from the rear associated with surface water being unable to enter the sewer network.

Location: Yardley Wood Road and Pear Tree Crescent Area, Shirley

What potential flood risk management schemes have been identified?

Can Severn Trent Water increase the capacity of the storage tanks at Yardley Wood Road?

Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Can we get more water to flow under the canal?

Can we change levels to push flood water away from houses?

Location: Yardley Wood Road and Pear Tree Crescent Area, Shirley

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Blocked drains	Solihull Council cleans highway gullies (drains) once a year as standard practice. Since the flooding in May, the Council has been back out to Solihull Lodge to cleanse the system again and has undertaken CCTV surveys of assets that it owns in the Yardley Wood Road and Pear Tree Crescent Area.	Local Highway Authority	Complete
Condition of the main Severn Trent Water system	Severn Trent Water are responsible for the cleansing of the main sewer network in the Solihull Lodge area. Severn Trent have undertaken various visits to the area to cleanse and CCTV their assets.	Severn Trent Water	Complete
Failure of the Severn Trent Water attenuation tank at the junction of Yardley Wood Road and Greenslade Road	It is understood that there was some overland flooding from the tank during the May event, but that Severn Trent Water have since lifted the pumps to ensure that the tank is operating as they would expect it to and they have fitted a system to notify them as and when there are issues.	Severn Trent Water	Complete

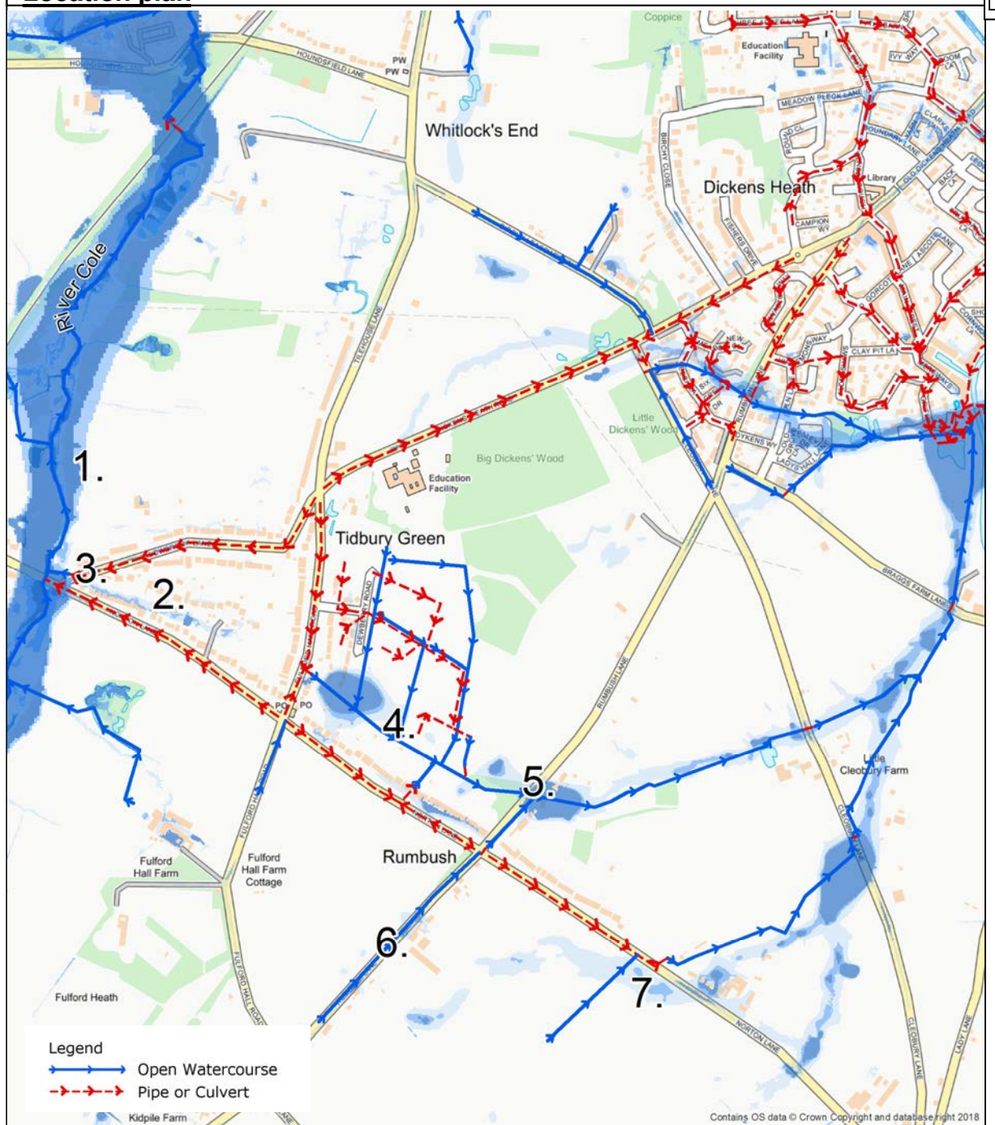
Investigation under Section 19 of the Flood and Water Management Act 2010

Location: Fulford Hall Road, Norton Lane and Rumbush Lane Area, Tidbury Green

Who or what was affected?

26 properties internally flooded	1 property externally flooded	10 garages flooded

Location plan



Mapping produced by the Environment Agency showing existing areas of risk of flooding from rivers and watercourses and also from surface water. The mapping is based on computer models to assess long term risk and does not take into account factors such as blocked drains or burst pipes.

What flooding mechanisms have been identified?

Surface Water/ Overland Flow	Sewers	Main Rivers	Ordinary Watercourses	Other
✓	✓	✗	✓	✗
Water flowed across the ground and was unable to enter watercourses or sewers.	The local sewer network became blocked or overloaded.	There are no main rivers in the area.	Watercourses were unable to cope with the amount of water flowing into them.	No other source identified.

How does the existing system work, what does existing mapping show us and what happened on 27th May?

The drainage system within Tidbury Green is generally split across two natural catchments, with water from the east of the village flowing towards the River Blythe and water from the west of the village towards the River Cole.

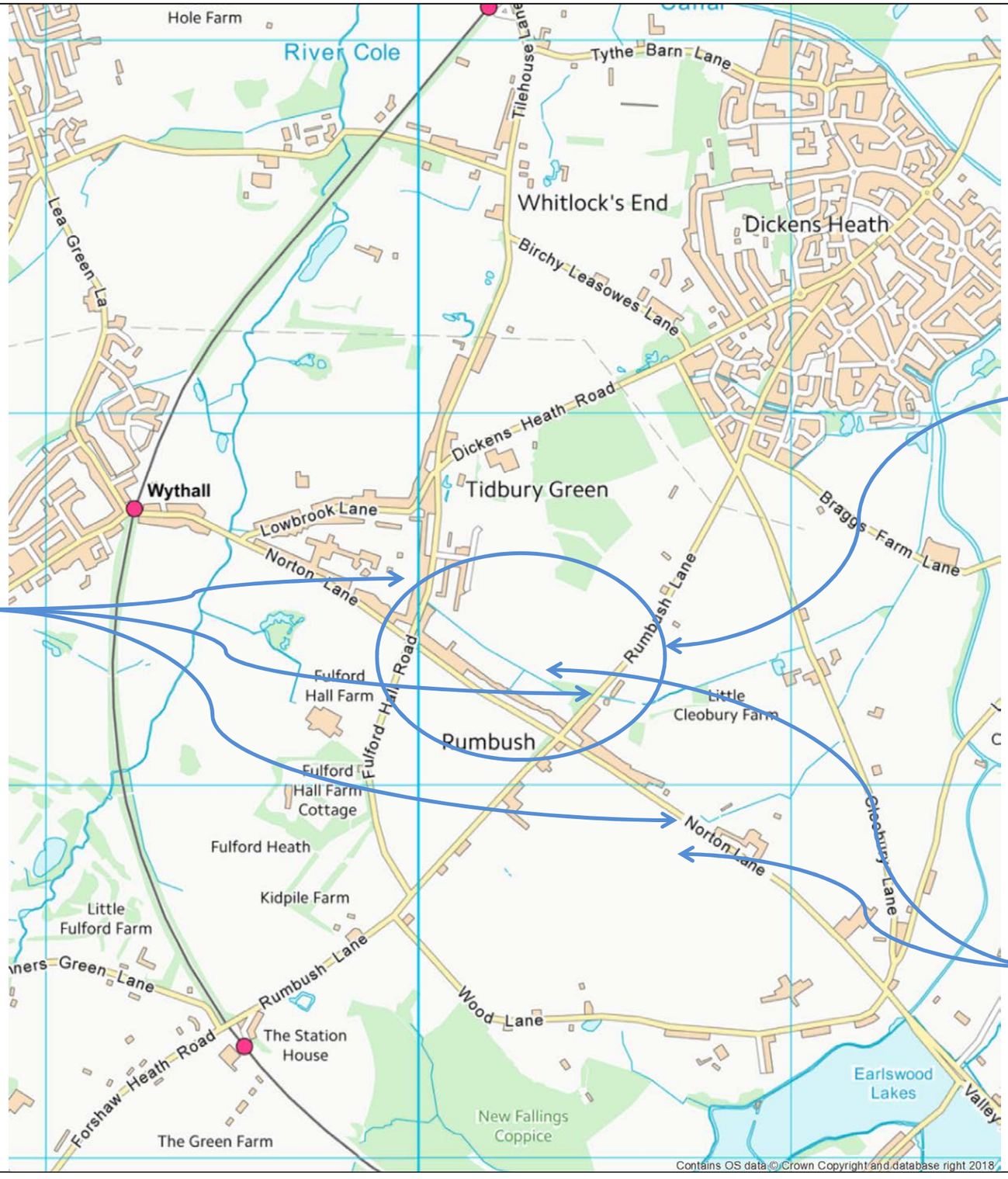
A surface water sewer network exists in most parts of Tidbury Green, which disposes of rainwater from properties and also from the highway, which is drained through gullies, pipes and ditches. Surface water then outfalls into local ordinary watercourses which typically flow to the rear of properties on Norton Lane, before heading in a northerly manner towards Dickens Heath.

Surface water from the Tidbury Heights development drains via a system of existing ditches and a new arrangement of swales and a surface water sewer system to the watercourse to the south of the site. Water from the site is stored in an attenuation feature in the south east corner of the site.

Description of area shown to be at risk	What happened on 27th May?
1. Risk associated with the River Cole itself, which flows from the south west along the western edge of Tidbury Green towards Shirley.	Whilst no reports of flooding were received for this area it is known that the River Cole breached its banks further downstream.
2. A surface water flowpath is shown from the rear of properties on the western side of Fulford Hall Road, before running across the back gardens of Nos. 88 - 142 Norton Lane to the River Cole.	Reports were received of multiple properties on Fulford Hall Road being flooded from the front and rear and of the highway being flooded.
3. Surface water flowpaths are shown on Lowbrook Lane and Norton Lane, before joining near the River Cole.	No reports of flooding were received for this area.
4. Risk associated with a watercourse to the rear of Nos. 176-276 Norton Lane. An additional watercourse joins at the rear of Nos. 230-232, before all of the flow passes under Rumbush Lane and heads in a north easterly direction towards Dickens Heath. The mapping also shows flood risk to be present at the front of Nos. 216-276 Norton Lane.	Reports were received of flooding to multiple properties on Norton Lane, from the front due to run off from surrounding land and from the rear of properties due to flooding from the watercourse.
5. A surface water flow path is shown along Rumbush Lane, from its junction with Norton Lane in a north easterly manner towards a watercourse that flows to the side of No.261. Flood risk associated with the watercourse that runs to the side of No. 261 Rumbush Lane is shown at this point.	Multiple properties on Rumbush Lane were flooded from the adjacent watercourse. The highway was impassable at this location.
6. A surface water flowpath is shown on Rumbush Lane in an area between Woodbourne Sports Club and No.343 Rumbush Lane and then again outside of Rumbush Farm. A flow path exists across fields to the rear of the sports club, to a point where a number of surface water systems outfall before forming a watercourse.	Reports were received of flooding through the front of properties on Rumbush Lane, associated with runoff from surrounding land and of the highway being flooded.
7. Flood risk is shown associated with a watercourse that starts on land to the south west of Norton Lane and which continues in a generally north easterly manner, before passing under Norton Lane to the west of No. 412, before continuing towards Dickens Heath.	Multiple properties on Norton Lane were flooded from the front, along with the highway. The watercourse in this area breached its banks.

Location: Fulford Hall Road, Norton Lane and Rumbush Lane Area, Tidbury Green

What potential flood risk management schemes have been identified?



Can we use Property Level Resilience to stop flood water entering houses at risk of flooding?

Do we need to improve the culverts in the area?

Can we store more water in fields before it causes flooding to houses?

Location: Fulford Hall Road, Norton Lane and Rumbush Lane Area, Tidbury Green

Your concerns and our actions

Concerns have been raised about	What has been done in response	Who is responsible	Status
Poor drainage 1.Blocked drains 2.Generally poorly maintained drains 3.Drainage system not adequate for the demand	Solihull Council cleans highway gullies (drains) once a year as standard practice. Since the flooding in May, the Council has been back out to Tidbury Green to cleanse the system again and has undertaken CCTV surveys of assets that it owns on Fulford Hall Road, Norton Lane, Rumbush Lane and Tilehouse Lane.	Local Highway Authority	Complete
	Severn Trent Water are responsible for the cleansing of the main sewer network in Tidbury Green and have undertaken various visits to the area to cleanse, CCTV and map their assets where necessary.	Severn Trent Water	In progress
	It is unrealistic to simply upsize all of the drainage network in the area, but we will be looking at what options might exist to store water in appropriate locations and whether it may be beneficial for properties to be fitted with property level resilience measures (e.g flood doors). In order to better understand what may be possible in the future, we are putting together some detailed flood modelling of the area which will allow us to look at different scenarios. If anything is possible then we will then need to make a bid for the necessary funds to allow us to carry out the work.	Lead Local Flood Authority	In progress
Development 4. Insufficient drainage and water management infrastructure to cope. We believe that this should have been resolved prior to the approval being granted. However action now needs to be taken for the future. 5.Excess water from the site being diverted to the brook, which is unable to cope.	The drainage system on the Tidbury Heights development has been designed in accordance with national standards. Wherever possible, surface water (rainwater) that falls on the site is conveyed by the original network of ditches and swales. The water passes through a storage feature in the south east corner of the site, before being released into the watercourse that runs along the southern boundary, as it would have done pre-development. The development does not use the existing surface water sewer network in Tidbury Green. Foul water (used water) from Tidbury Heights is taken away via a piped system that runs across land to the west, to a pumping station that exists on Rumbush Lane. The pumping station helps the foul water from Tidbury Green overcome gravity on its journey to the sewage treatment works.	[redacted]	
Maintenance 6.Poor Maintenance at the Tidbury Heights site – e.g. Silt from site entering the local brook, ditches not maintained etc. 7.Ditches and brooks are not maintained. They are not cleared out on a regular basis.	It is the responsibility of the relevant landowner to maintain the stretch of watercourse that runs on or under their land, or that is on the boundary of their land, up to its centre. Since the flooding we have had over 10km of watercourses across the Borough inspected by independent and accredited surveyors. No emergency work has been identified, but we have been following up some other points with local landowners. This has included contacting Bellway Homes to undertake some routine maintenance on the watercourse to the south of the site. The Environment Agency has given Bellway Homes a permit to discharge, which requires them to adhere to certain conditions, particularly in terms of water quality.	Lead Local Flood Authority/ Bellway Homes/ Local Landowners	In progress
Culvert 8. The culvert that runs under gardens, garages and drives of houses along Norton Lane is not capable of coping with the amount of water that travelled through it.	We are currently undertaking survey work to better understand where the culvert runs and also what condition it is in. It would technically be for those who own land over the culvert to fund and arrange any necessary works.	Lead Local Flood Authority (on behalf of local landowners)	In progress

Action Plan

Appendix M

May 2018 Flood Event

LLFA – Lead Local Flood Authority
LHA – Local Highway Authority
CSW – Emergency Planning
STW – Severn Trent Water
WMFS – West Midlands Fire Service
SCH – Solihull Community Housing
EA – Environment Agency

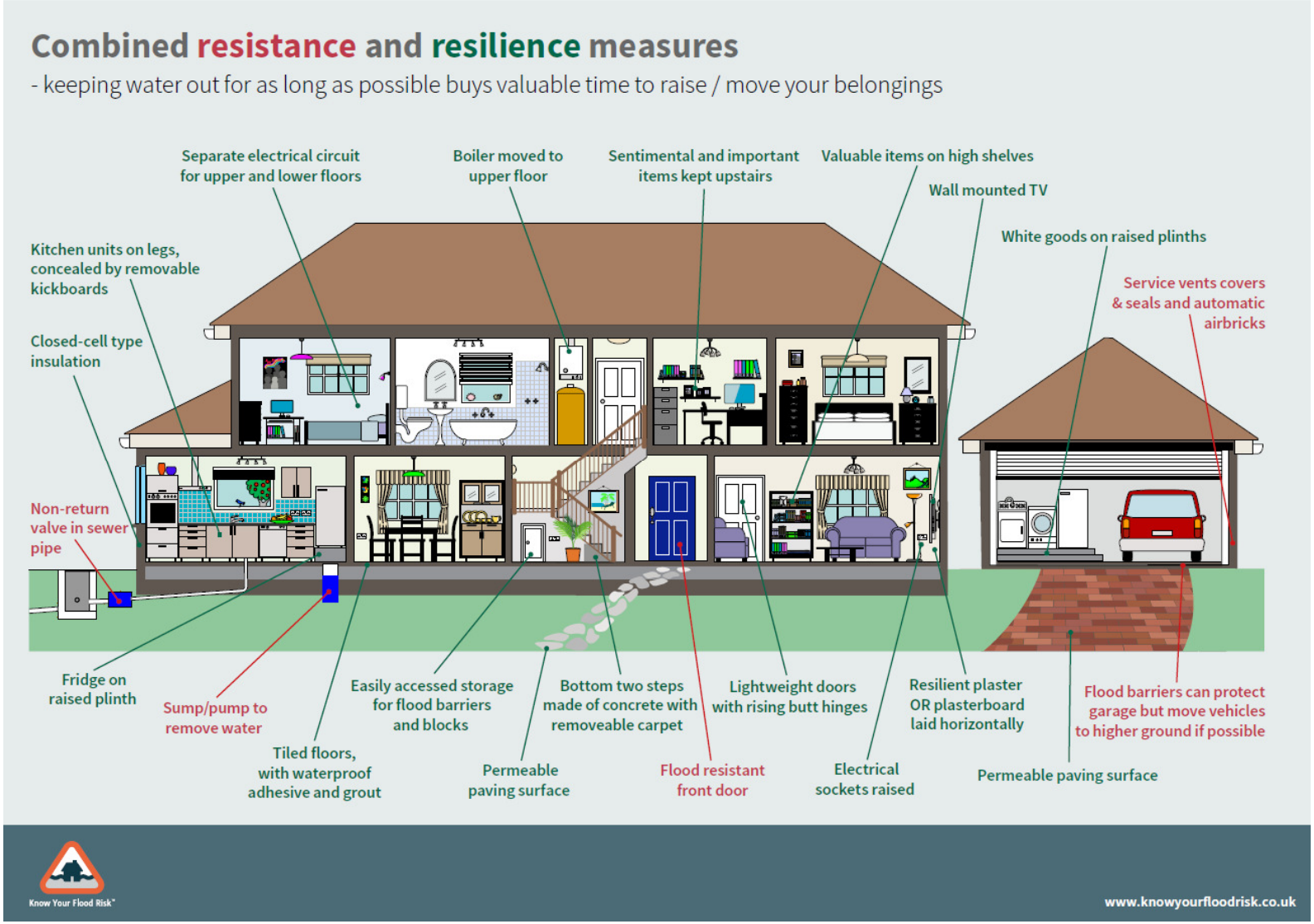
Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
Knowing when and where it will flood					
1	There is a need to obtain better information relating to how the River Blythe and River Cole catchments respond during extreme weather.	Work with partners to investigate the installation of a network of gauges that could provide better data and facilitate a warning process to those at risk.	In Progress	Officers have agreed the installation of two gauges on the River Blythe and its tributaries. Work to install such devices on the River Cole and its tributaries is in progress.	LLFA/EA
2	There is a need to update and obtain more detailed flood risk mapping of across areas that were affected by the flooding in May.	LLFA to commission detailed modelling of various tributaries of the River Blythe and River Cole to better understand flood risk and in order to inform future options appraisals. LLFA to commission surface water models of various locations to better understand flood risk and in order to inform future options appraisals.	In Progress	Officers have commissioned detailed modelling of the River Blythe and the River Cole, along with their tributaries. Officers have commissioned detailed surface water flood modelling for areas that were affected by flooding in Hockley Heath, Olton and Solihull Lodge.	LLFA
3	Accuracy of forecasting	The nature and intensity of the event could not be predicted. Consideration could be given to putting a 'Thunderstorm Plan' in place.	In Progress	The Environment Agency is looking at whether a plan could be adopted for the West Midlands.	EA

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
Being rescued and cared for during an emergency					
4	Communication and information sharing between partners on the ground at the time of the event could be improved.	Revision of the West Midlands Local Resilience Forum internal procedures.	In Progress		LRF
Reducing the risk of flooding and its impact					
5	Condition of Ordinary Watercourses in areas that experienced flooding.	Inspections of Ordinary Watercourses to be undertaken.	Complete	The Council commissioned RAB Consulting to undertake formal inspections of approximately 10km of ordinary watercourses and have since written to those landowners where any consenting or enforcement work has been identified.	LLFA
6	Condition of Main Rivers in areas that experienced flooding.	Inspections of Main Rivers to be undertaken.	Complete	The Environment Agency inspected the River Blythe and those parts of the Mount Brook that have Main River status.	Environment Agency
7	Condition of highway drainage assets.	Inspections and cleansing of highway drainage assets across affected areas to be undertaken.	Complete	Tanker Services have undertaken an additional XXXX gully cleanses across affected areas. Officers have also inspected associated pipework and have raised works orders for defect repairs where necessary.	LHA
8	Condition and performance of flood risk attenuation features on new and existing housing sites.	Inspections of flood risk attenuation features to be undertaken on new and existing housing sites.	Complete	Officers have inspected and surveyed attenuation features on development sites in areas that experienced flooding.	LLFA

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
9	Unknown condition of culverted watercourses or other assets.	LLFA to commission detailed CCTV inspections and mapping of culverted watercourses or other assets or obtain records from third parties such as the Canal and River Trust.	In Progress	The majority of CCTV inspections have been undertaken of key assets and records obtained from partner agencies where appropriate. The remaining assets have been scheduled for inspection.	LLFA
10	Funding needs to be obtained to install measures that can reduce the risk of future flooding at locations that were affected in May 2018.	Officers to submit proposals for project funding to DEFRA, through the Environment Agency.	In Progress	Officers have submitted preliminary proposals for funding for five potential schemes.	LLFA
11	Options need to be considered for measures that can reduce the risk of future flooding at locations that were affected in May 2018.	Officers to obtain initial assessments of potential future schemes through the Environment Agency.	In Progress	Officers have requested initial assessments be undertaken to determine economic and technical feasibility of various options at each location.	LLFA
12	To review policies and plans to ensure that they offer as much protection and support to those communities at risk of flooding.	Officers to review existing policies in Solihull's Local Plan to ensure that new development can play its part in helping to reduce the risk of flooding and its impact. Officers to consider the designation of Critical Drainage Areas where relevant across the Borough.	In Progress	Officers have previously undertaken work with the Council's Planning Policy Team and supported by the Environment Agency to ensure that appropriate policies are in place for the next Local Plan period. Officers are currently discussing the designation of Critical Drainage Areas with the Environment Agency.	LLFA LLFA/EA

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
Better advice and helping people to protect their families and homes					
13	Properties were affected by vehicles driving through roads causing bow waves.	Consideration should be given to how communities can safely help themselves, e.g. through the provision of road closure signage and equipment.	In Progress		LHA/CSW
14	Opportunity to co-ordinate local residents so that they can help themselves	Creation of local flood action groups	In Progress		LLFA/CSW/ EA/STW
Recovery					
15	Need to provide on-going support to those affected by the flooding over a longer period of time. For example, residents were unaware of the questions that they would have in the future.	Clear signposting to the various forms of support and advice that can be obtained after an event. Use of follow up community events to give an opportunity for those affected to seek help.	In Progress		LLFA/CSW/ EA/STW

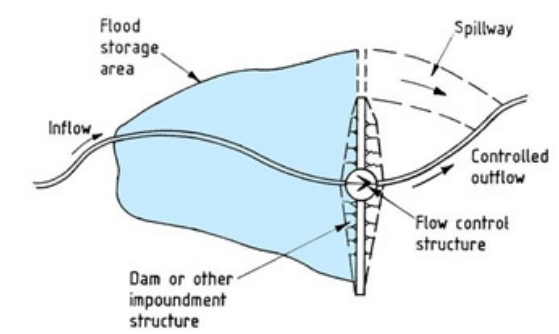
Property Level Resistance and Resilience



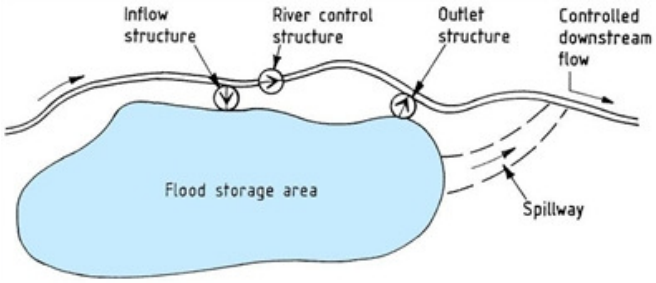
Avoidance

One example of avoidance is through the construction of upstream storage. Such storage helps to attenuate incoming flows so that they can be accommodated within the downstream channel and helps to delay the timing of a flood, with volume discharged over a longer time period. The storage is either usually online or offline, as shown below.

Example of an online storage feature



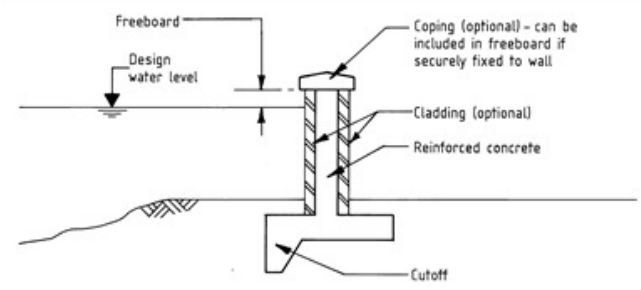
Example of an offline storage feature



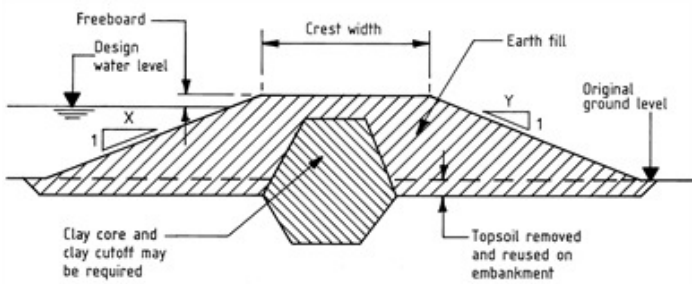
Flood Defences

Examples of flood defences would be a flood wall or earth embankment.

Example of a flood wall



Example of a flood embankment



Where would the money come from for any future project?

Examples of sources of funding for the delivery of projects that reduce the risk of flooding to properties are set out in the sections below. With each, there are various criteria that need to be met, typically around the cost and benefit of the work.

National Funding

Flood and Coastal Erosion Risk Management Grant in Aid Partnership Funding

Flood and Coastal Erosion Risk Management Grant in Aid (FCERM GiA) is the main capital budget set aside by central government for flood defence projects across England.

FCERM GiA can be applied for by the Environment Agency, Local Authorities, Internal Drainage Boards (IDBs), Highway Authorities and Water Companies, to deliver projects that they are managing. Local communities and flood action groups can work with any of these organisations to develop a scheme and put in an application for funding on their behalf. Funding can be made available for a variety of projects ranging from substantial defences to individual property protection.

In order for schemes to be eligible they have to be buildable, environmentally acceptable and cost beneficial. Schemes need to reduce the risk of flooding to homes from either surface water, ground water, fluvial or coastal sources. In the cases of schemes from Highway or Water Companies, only the costs associated with reducing flood risk for which they are not responsible are eligible for funding.

All viable and cost beneficial projects are able to secure some FCERM GiA funding, however not all projects will be able to secure 100% funding from this source. The amount of the project funding available from FCERM GiA is dependent on three factors:

- The value of benefits for householders as a result of the project, simply expressed as the number of homes which are moved from a high level of flood risk to a lower level of flood risk;
- The value of other benefits of the project such as: the benefits to business, agricultural productivity and protection for critical infrastructure;
- The environmental benefits of the project.

Where GIA does not cover all of the costs of a potential project then we may need to apply for extra money through partnership funding.

Anyone who will benefit from a project can be a partner, such as:

- local communities
- businesses
- developers
- local authorities

As the lead organisation we develop and fund the initial business case if we want to apply for partnership funding.

Regional Funding

Local Levy

Local Levy is an additional, locally sources, form of income raised by the Regional Flood and Coastal Committee. It is raised by way of a levy (precept) on County and Metropolitan Councils, Unitary Authorities and London Boroughs, shared on the basis of Band D equivalents between all contributing bodies within the area of each RFCC. Money raised through Local Levy counts as a local contribution in terms of the FCERM GiA process, even though the levy is supported by funding through the Department of Communities and Local Government. Subject to committee approval, Local Levy is used for flood risk management projects that are not considered to be national priorities and which do not attract full funding through either FCERM GiA.

Annually, each RFCC sets the level of Local Levy funding that LLFAs will contribute in the following year. Local Levy funds can be carried over from one year to the next. Solihull Council contributes approximately £83,000 annually to the Severn and Trent committees combined. Whilst not a direct match, the Council receives income from central government via the formula grant to cover this contribution.

Local and Other Funding Sources

Depending on the shortfall from FCERM GiA and the number of schemes competing for the RFCC's allocation, it is possible that the Local Levy will not solely provide all the required funding for a scheme and therefore other measures could be explored in the future if necessary. The following are examples of such measures:

Section 106 agreements

Under Section 106 of the Town and Country Planning Act 1990 Local Authorities can set Planning Obligations for developers. These are legally binding obligations that are attached to a piece of land and are registered as local land charges against that piece of land. These obligations enable a Local Authority to secure contributions to services, infrastructure and amenities in order to support and facilitate a proposed development.

'Making Space for Water' was produced by Defra in 2005 and identifies the Governments strategy to tackling flood risk over the lifetime of the strategy (20 years), One of the recommendations of 'Making Space for Water' was that local planning authorities should make more use of Section 106 agreements to ensure that there is a strong planning policy to manage flood risk. This means that any flood risk which is caused by, or increased by, new development should be resolved and funded by the developer.

Section 106 agreements can also be put in place to ensure new SuDS features will be maintained in the future. Funding for such maintenance will be provided in the form of a commuted sum, which will be paid to the adopting authority.

Community Infrastructure Levy (CIL)

CIL was introduced in 2010 to enable Local Authorities to raise funds to provide infrastructure and enable development. Money collected can be used for infrastructure transport, flood defences and green spaces. The CIL takes over from part of the Section 106 process. It is intended to collect funds to deliver strategic infrastructure that is not specifically related to the development site.

Solihull Council has recently implemented a CIL. It is intended that this will be available to fund projects that are part of the Council's flood risk management works and Green Infrastructure.

Private Contributions

Landowners and local residents in some circumstances may be willing to contribute funds to flood risk management where they can see a direct benefit to reducing their flood risk or improving their land drainage.

What is the approval process for any future project?

1. Project Proposal

The first step in delivering any project to reduce the risk of flooding is to submit a project proposal through the Environment Agency so that it can be included in the programme of flood and coastal management schemes.

In order to submit a proposal, we need to know some key bits of information, such as how many households will benefit from a project and about the area that will benefit. We also need to understand any environmental and financial benefits.

Outline project proposals have been submitted by the Lead Local Flood Authority for Flood and Coastal Erosion Risk Management Grant in Aid Partnership Funding for future potential projects covering those areas affected by the flooding on 27th May.

2. Develop a business case

This stage identifies the preferred approach to reduce the risk of flood or coastal erosion. The outcome of the appraisal process is a business case for the project being developed.

HM Treasury provides the funding for FCERM. This means that all projects to be funded from public money have to include a project appraisal in line with the requirements of the Treasury.

The appraisal is intended to identify the most cost beneficial solution to the problem and the justification for the most appropriate and preferred option. It is important to note that funding and affordability should not unduly influence this process to avoid early compromise in options identification. Affordability and different sources of funding may however influence the final options choice and investment decision.

3. Application

An application is made at this stage to undertake an FCERM scheme.

4. Getting technical approval

Applications are reviewed by the Environment Agency at this stage. The review provides assurance that the project:

- is good value for money
- can be completed within the budget and time stated in the business case

5. Get financial approval

When the project has been assured the Environment Agency will submit the application and the assurance review record for financial approval.

Once approved, we can apply for interim and final capital grant payments.