

Flood Investigation Report

Various Locations, Solihull

1st September 2015

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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.

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1 Introduction

- 1.1. On 1st September 2015 Solihull experienced a period of high intensity rainfall between approximately 1930 and 2330hrs. No prior weather warnings had been received for the event and 153 reports of flooding to property were received across Elmdon, Silhill and St. Alphege wards.
- 1.2. As the Lead Local Flood Authority (LLFA) for Solihull, the Council's Flood Risk Management Team has investigated the events of 1st September and has produced this report in accordance with Section 19 of the Flood and Water Management Act 2010.
- 1.3. This report outlines the flood event, provides details of actions that were taken during the event and provides details of actions that it may be possible to take in order to reduce flood risk in the future.

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.

- 1.4. 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 1st September 2015?

- 2.1 On 1st September 2015 a large weather system moved across the UK, with severe conditions being experienced across the West Midlands. An intense localised rainfall event occurred across parts of Elmdon, Silhill and St. Alphege within Solihull between approximately 1930 and 2330hrs. In total, 153 reports of flooding to property were received, mainly as a result of surface water flooding, which occurred as a result of rainwater not being able to drain away through the normal drainage systems or soak into the ground, but instead lying on or flowing over the ground.
- 2.2 Due to the localised nature of the rainfall, obtaining precise weather data for 1st September to confirm details of the flood event has proved difficult. The only weather station to record the flood event was a local amateur station at Monkspath, which recorded 28mm of rainfall over a 90 minute period, with a peak intensity of 60mm/hr. To provide some perspective, the average monthly rainfall recorded for September at another weather station at Babbs Lake is 59mm.
- 2.3 Whilst collecting reliable weather data relating to the flood event has proved difficult, the Flood Risk Management Team have been able to recreate the events of 1st September through indicative modelling work produced by the LLFA's partner consultants. The modelling work has been produced using photographs collected by the Flood Risk Management Team and affected property owners during and immediately after the flood event.
- 2.4 Given the difficulty in obtaining weather data after the flood event, it is recommended that consideration be given to the possibility of the installation of a Borough wide network of weather stations.

ACTION(S):

A1. LLFA to work with partners to investigate the installation of a Borough wide network of weather stations that could allow the collection of rainfall data.

3 How did the key Risk Management Authorities respond?

3.1 Before the event

3.1.1 Lead Local Flood Authority

Prior to an extreme weather event it is typical for a weather warning to be received by the LLFA from either the Meteorological Office or the Environment Agency. On receipt of a weather warning, it is then standard practice for the LLFA to alert its partners. Due to the extremely localised nature of the flood event on 1st September, no such warning was in place for the 1st September.

3.1.2 Local Highway Authority

Prior to an extreme weather event it is typical for a weather warning to be received from either the Meteorological Office or the Environment Agency. On receipt of a weather warning, it is then standard practice for the local Highway Authority to arrange for additional operatives from the Tanker Services Team to be placed on standby to supplement existing out of hours resources.

The resources available to the Tanker Services Team during an event include:

- 2 combination gully emptying/jetting vehicles
- 1 cesspool vehicle
- 1 pick-up vehicle
- 6 operatives
- Sand bags
- Flood warning signs
- Road closed signs and barriers

Unfortunately due to the extremely localised nature of the event there was no warning in place for the 1st September and no additional operatives were placed on standby.

3.1.3 Severn Trent Water

Severn Trent Water (STW) has a duty to operate and maintain public sewers so as to effectually drain the area in which they operate. This includes preventative inspections, monitoring and cleansing as well as responding to incidents of blockages and flooding. More information on what STW does to respond to sewer flooding can be found on their website and on their sewer flooding leaflet¹.

3.1.4 Environment Agency

The Environment Agency's core role during flood incident response is to warn and inform which is done by providing a daily assessment of all flood risks for emergency response partners through the Flood Forecasting Centre and through providing a free flood warning service to the public, professional partners and the media.

¹ Available from https://www.stwater.co.uk/content/dam/stw/my-water/document/YOUR_GUIDE_TO_SEWER_FLOODING_STW_WEB.pdf

Within Solihull, the Environment Agency monitors the Rivers Blythe and Cole and operates a flood warning service for the Main river sections of these watercourses. Flood Alerts and Warnings are sent to registered partners and customers when flooding is forecast. Information relating to potential impacts is relayed through these messages with advice on how to respond.

The Environment Agency also operates a 24hour telephone helpline through which the public can access up to date information about flooding in their area or talk to Floodline staff for more detailed enquiries and report new flooding emergencies. The flood event on 1st September was related to surface water and no flooding was reported from the River Blythe or River Cole.

3.1.5 Emergency Services

The emergency services are always on standby and able to respond to calls should there be a threat to life.

3.1.6 CSW Resilience

The Coventry, Solihull and Warwickshire Resilience Team (CSW) monitor alerts given by partners, such as the Meteorological Office and the EA, and pass any information they receive through to the relevant body to take action should it be required. CSW also scale the response of these bodies to suit the nature of the emergency.

3.2 During the event

3.2.1 Lead Local Flood Authority

The LLFA were not informed of the event until the 2nd September. It is therefore recommended that a local escalation process be drawn up and shared with the Contact Centre, the local Highway Authority, the Tanker Services Team and CSW to ensure that the LLFA are notified of such an event.

ACTION(S):

A2. All relevant parties to be made aware of the need to ensure that the LLFA are notified of such an event.

3.2.2 Local Highway Authority

During the flood event the Highway's out of hours service received 12 calls relating to flooding, predominantly from residents of Elmdon, but also extending into the Silhill and St. Alphege wards.

The Tanker Services Team was instructed to attend the affected properties and due to the volume of calls received, additional operatives were requested, with two volunteering to assist.

It is clear that an event of the magnitude of 1st September can result in competing demands from a number of customers and it is therefore recommended that consideration be given as to how a system could be implemented to prioritise calls according to likelihood and impact.

ACTION(S):

A3. Local Highway Authority and Tanker Services to consider implementation of a prioritisation system for calls.

3.2.3 Severn Trent Water

STW received calls regarding incidents from 23 locations around the Borough. In response to the calls received, STW attended and cleansed those sewer systems which were reported as blocked by residents.

3.2.4 Environment Agency

The EA did not formally respond to the event of 1st September 2015 as the event was related to surface water flooding and not associated with the River Blythe or River Cole.

However, the EA did receive several calls to its 24 hour Floodline service. Unfortunately, as the flood event was related to surface water flooding, the service was unable to offer any local information.

ACTION(S):

A4. LLFA to discuss the use of and information held by the Floodline service in relation to Solihull events.

3.2.5 Emergency Services

Whilst the West Midlands Fire Service does not have a statutory duty to respond to flooding events, they do have a statutory duty to assist with saving lives.

On the evening of the 1st September the Fire Service responded to calls where there was a risk to life, which included a lightning strike to a property and reports of internal flooding to the height of an electrical socket.

The LLFA are aware that a number of other residents made contact with the Fire Service over the course of the event but that it was judged that the situations were not life threatening. The Fire Service was not able to offer any local information on the flood event in Solihull to callers.

ACTION(S):

A5. LLFA to discuss communications during a flood event with West Midlands Fire Service to ensure consistent and accurate information is provided.

3.2.6 CSW Resilience

Due to the nature of the event, no prior weather warnings were issued by partner agencies. As such CSW Resilience was unaware of the event and could not initiate their escalation process.

It is recommended that staff from the out of hours Contact Centre service, the local Highway Authority standby service and the Tanker Services Team be provided with further information on how they should ensure that CSW are notified in real time of flood events that are occurring, particularly those where no prior weather warning had been received.

ACTION(S):

A6. Staff from the out of hours Contact Centre service, the local Highway Authority standby service and the Tanker Services Team to be provided with further information on how they should ensure that CSW are notified in real time of flood events.

3.3 After the event

3.3.1 Lead Local Flood Authority

Officers from the Flood Risk Management Team visited all affected properties and businesses following the event.

The purpose of such visits was to establish the severity to which people had been affected and to gather primary evidence. Each affected property was asked to complete a survey to assess how they were affected. The survey also gathered information regarding contact and response from the various partners on the night of the event.

Whilst the LLFA was quick to respond to the event and gather evidence, no prior processes or procedures had been put in place to deal with the aftermath of such large scale flood events. It is therefore recommended that the LLFA review its processes and procedures, particularly around information gathering and call handling in order to improve on its response should similar events occur in the future.

Communication after the event is clearly important. Whilst the LLFA was aware of several locations where flooding had occurred on 1st September 2015, it was apparent that many other locations would have been affected. Press releases were arranged asking for any affected property owners to make contact to provide further information about their individual experiences but unfortunately these were not run by the local newspapers.

Temporary signs were used at key locations on the Borough's road network requesting that any affected property owners make contact to provide further information about their individual experiences. Such signs proved invaluable in understanding all of those areas of the Borough that had been affected and it is recommended that they be used again should other similar events occur.

Over the course of the various visits to affected properties, some requests were made for financial assistance by those property owners without insurance to enable them to recover from the flood event. Whilst the LLFA does not have a fund in place to deal with such requests, it was clear that advice needs to be made available to those affected.

Communication with other parties is important after an event. Details of the impact of the 1st September flood event were given to relevant Cabinet Members and Ward Councillors after the event and representatives from the local MP's office attended a post event meeting of Risk Management Authorities. This helped the LLFA raise the profile of the flood event and assisted with the publication of a news article in a local paper.

There may also be occasions when it is necessary to promptly communicate with other partners as a result of a flood event. The 1st September flood event adversely affected housing stock under the control of Solihull Community Housing and the ability to effectively liaise and receive a prompt response was of particular importance in the recovery phase of the flood event. It is recommended that relationships be strengthened between the LLFA and SCH.

ACTION(S):

A7. LLFA to review its processes and procedures, particularly around information gathering, staffing during a large scale event and call handling.

A8. LLFA to determine sources of financial assistance for those affected by flooding and provide guidance to those requesting information.

A9. LLFA to review how it communicates post-flood event and to maintain a stock of temporary road signs that request that property owners who have experienced flooding make contact.

A10. Relationships to be strengthened between the LLFA and SCH.

3.3.2 Local Highway Authority

The Tanker Services Team attended each affected location to determine the condition and operational status of the highway drainage system. Investigations were logged using the Tanker Services Team in-cab asset management system and made available to the LLFA.

3.3.3 Severn Trent Water

STW investigated its sewer systems within the affected areas with CCTV equipment in order to determine whether any obvious blockages or collapses were present that could have contributed to the flooding. STW met with the LLFA on a regular basis in the initial stages of the investigation to share detailed information as appropriate and to co-ordinate activity. Further details are given where appropriate in the following sections of this report.

3.3.4 Environment Agency

The EA continued to monitor levels of parts of the River Blythe and the River Cole as standard. The EA offered assistance with regard to post event recovery in terms of sharing best practice and assisting with obtaining weather records.

3.3.5 Emergency Services

West Midlands Fire Service met with the LLFA after the flood event to discuss various matters including reporting and escalation processes. The availability of resources open to WMFS during a flood event and their effectiveness was outlined. It was noted that surface water flooding in an urbanised environment can present particular difficulties in terms of its disposal when existing sewer systems are at or are exceeding capacity.

Following a meeting with the LLFA, West Midlands Fire Service conducted a review of its call logs to ensure that the correct reporting and escalation processes were followed during the event.

3.3.6 CSW Resilience

The Emergency Planning team continued to monitor the alerts given by partners, such as the Met Office and the EA. Due to the short timescales associated with the flood event, the Emergency Planning team didn't become involved at a greater level but received regular updates from the LLFA during the recovery phase.

4 Who was affected?

4.1 Overview

153 properties were affected by surface water flooding on 1st September 2015, which happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. Table 1 details the number of affected properties and businesses by ward.

Ward	Number of affected properties - Residential	Number of affected Properties - Businesses	Total
Silhill	52	0	52
Elmdon	44	1	45
St Alphege	24	1	25
Other	31	0	31
Total	151	2	153

Table 1: Affected properties and businesses by ward

Six areas across Silhill, Elmdon and St. Alphege were heavily affected and each is discussed in more detail in the following sections of this report. A final section of the report details those individual properties that were affected outside these six areas.

For each of the six areas, the LLFA commissioned its partner consultants to recreate the highway and property flooding that occurred on 1st September 2015 by way of indicative hydraulic modelling. Although much more detailed work would need to be undertaken and then verified and approved by STW, the modelling work undertaken has helped the LLFA to broadly understand the nature of the flood event and also to identify on a preliminary basis any areas and the possible reasons for where the local Highway Authority highway drainage and any Severn Trent Water sewer networks may have been unable to deal with the volumes of rainfall experienced. The modelling work also allowed the Annual Exceedance Probability (AEP) of the flood event to be estimated by way of comparison with the recorded flood depth from 1st September.

With regard to sewer design, it is important to note that sewers on new development sites are constructed in accordance with Sewers for Adoption (7th Edition, 2013) and are designed to cope with all events up to and including the critical 3.33% AEP (1 in 30 year) storm event. However, the reality for the existing drainage system is that it will be made up of a range of different historic standards of protection, which will vary throughout the network on a pipe by pipe basis. It is important to note that design standards have changed over the years and some sewers would have been designed to a 1 in 5 or 1 in 10 year standard. It should therefore not be read that all sewers should have a capacity to deal with a 1 in 30 year storm event and that anything less must require capacity improvements.

With regard to highway drainage design, on new developments it is the developer's responsibility to demonstrate and ensure that the number and positioning of gullies is adequate to drain the highway. Typically, a highway drainage system would now be designed to cope with a 1 in 2 year event and a maximum rainfall of 50mm per hour. However, the reality for the existing highway drainage system is that it will be made up of a range of different historic standards of capacity. In addition, replacement of front gardens with paving to provide parking has often been undertaken by a number of homeowners across the various catchments thereby increasing the impermeable area and surface water runoff to the highway. This would be over and above the volumes to which the infrastructure was designed.

For each location flood maps produced by the Environment Agency and held by Solihull MBC have been included for reference, showing the extent of potential surface water flooding for various occurrence probabilities including a 3.3% chance of occurrence in any given year in addition to flooding with a 1% chance of occurrence in any given year.

4.2 New Road & Park Avenue Area, St Alphege



Figure 1 – Surface water flood risk within the New Road & Park Avenue Area, St Alphege

4.2.1 Site History

The LLFA is not aware of any previous flooding events relating to the New Road and Park Avenue area. This is supported by evidence from local residents who when contacted have not reported any previous flooding events.

Mapping produced by the Environment Agency and held by Solihull MBC indicates a flood risk associated with surface water flooding. The extent of surface water flood risk is shown in Figure 1. As Figure 1 shows, flood risk can be found in the areas around Park Avenue and New Road, with extreme flow paths running through both areas and down to Malvern Park.

4.2.2 Impacts of the Flooding

Residents of New Road and Park Avenue reported water ingress into the ground floor of their properties as well as over both the front and rear gardens. Residents were affected to varying degrees, from complete internal flooding of the ground floor, to garage areas and side passages and front and back gardens. Depths and extents of the flooding varied but photographic evidence of the event showed flood waters reaching up to a metre in places.

4.2.3 Severn Trent Water Investigation

STW attended the New Road and Park Avenue area on multiple occasions during November 2015. On these occasions root cutting and cleansing was undertaken of the surface water sewer system between Park Avenue and Malvern Park to clear any blockages that were found and CCTV work was undertaken on New Road. The cause of flooding at the junction of Warwick Road with Hampton Lane and the reason for repeat issues associated with a nearby manhole chamber was unclear.

ACTION(S):

A11. LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Hampton Lane area.

4.2.4 LLFA Investigation

As set out previously, the LLFA commissioned its partner consultants to recreate the highway and property flooding that occurred on 1st September 2015 by way of indicative hydraulic modelling. Although much more detailed work would need to be undertaken and then verified and approved by STW, the modelling work undertaken has helped the LLFA to broadly understand the nature of the flood event and also to identify on a preliminary basis any areas and the possible reasons for where the local Highway Authority highway drainage and any Severn Trent Water sewer networks may have been unable to deal with the volumes of rainfall experienced.

4.2.5 Findings

- Analysis of the modelled storm event suggests that surface water is collected on Hampton Lane and then conveyed south to the junction with Warwick Road and Park Avenue. Surface water appears to collect on the northern side of the junction before crossing the centre of the carriageway and flowing down Park Avenue.
- Flow down Park Avenue appears to collect in the highway in front of No. 5 where three gullies are located. Flow from here then appears to follow the natural exceedance flow paths indicated on the Environment Agency surface water flood maps down driveways towards residential properties.
- The results of the model appear to suggest that during the storm the gully links and sewer within Park Avenue are at capacity and unable to accept surface water inflow.
- The AEP of the event that occurred in the New Road and Park Avenue area on 1st September 2015 is estimated to be at least 20% (1 in 5 years).

4.2.6 Recommendations

- The catchment extends to a large area north of the flooded properties and as such the primary exceedance route is down Park Avenue and through the affected properties. During the flood event the flow into Park Avenue appears to exceed the capacity of the sewer. The LLFA should discuss the possibility of a joint modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Hampton Lane and Park Avenue area.

- Extreme flows appear to be prevented from passing around properties due to minor infill development that has taken place historically. Property level protection may therefore need to be considered by the owners of those properties that are located in extreme flow paths. Ideally, this should be co-ordinated by the LLFA and undertaken on a street scale as opposed to individual level to ensure flood risk is not increased elsewhere. The impact of granting further such developments should also be discussed by the LLFA with the Local Planning Authority.

ACTION(S):

A12. LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Hampton Lane and Park Avenue area.

A13. Subject to the outcome of a joint detailed modeling exercise between the Local Highway Authority and STW, LLFA to investigate the feasibility of introducing a Property Level Protection (PLP) scheme for affected properties on Park Avenue.

A14. LLFA to monitor planning applications to ensure exceedance flow paths are not built over.

4.3 Yew Tree Lane, Cornyx Lane and Wherretts Well Lane, Silhill

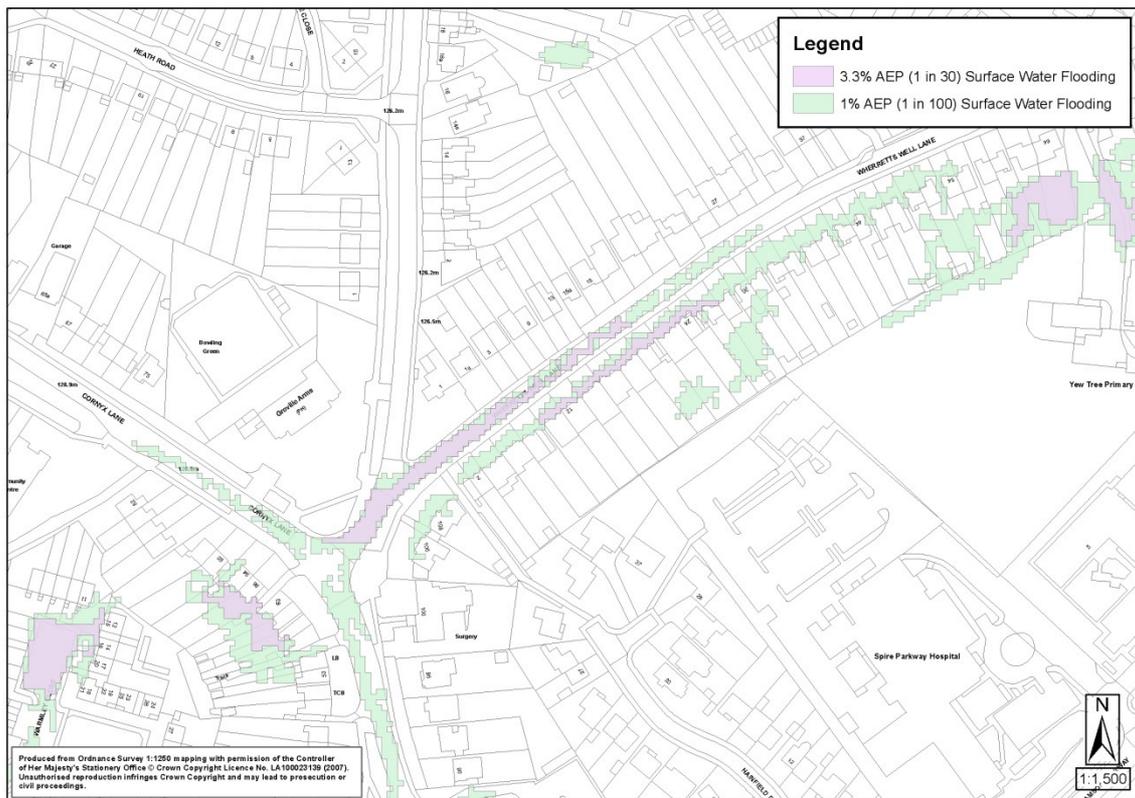


Figure 2 – Surface water flood risk within the Yew Tree Lane, Cornyx Lane and Wherretts Well Lane Area, Silhill.

4.3.1 Site History

The LLFA is not aware of any previous flooding events relating to the area. This is supported by evidence from local residents who when contacted have not reported any previous flooding events other than at Wherretts Well Lane where residents have reported that they flood at least once a year externally.

Mapping produced by the Environment Agency and held by Solihull MBC indicates a flood risk associated with surface water flooding. The extent of surface water flood risk is shown in Figure 2. As Figure 2 shows, flood risk can be found in front and rear gardens of Wherretts Well Lane, Cornyx Lane and Yew Tree Lane. Flow paths can also be seen spreading along the various carriageways from the junction of Wherretts Well Lane, Cornyx Lane and Yew Tree Lane.

4.3.2 Impacts of the Flooding

Residents of Yew Tree Lane reported that flood water affected the interior of their properties along with their drives and garage areas up to 30m² per property, and to a depth of 5cm. It was also reported that the footpath was flooded and became impassable for pedestrians. There was a single report of sewage entering the garden of one of the residents.

Residents of Cornyx Lane reported that flood water affected the road and gardens, as well as interiors through floorboards and airbricks to a depth of 20cm and across 20m² per property.

The residents of Wherretts Well Lane reported both internal and external flooding to a similar depth to that of Cornyx Lane, however flooding was much greater internally, at around 100m² per property.

4.3.3 Severn Trent Water Investigation

An extensive CCTV survey was undertaken of all surface water sewers at the junction of Yew Tree Lane, Cornyx Lane, Damson Lane and Wherretts Well Lane during November 2015, along with a survey of the sewer along Wherretts Well Lane.

At the junction of Yew Tree Lane, Cornyx Lane, Damson Lane and Wherretts Well Lane STW reported no problems with the network, with the exception of two intruding connections causing a restriction in one of the sewers for which follow up work was to be arranged. On Wherretts Well Lane STW found a mass of roots at the end of the system nearest Yew Tree Primary School which were cleared.

ACTION(S):

A15. STW to arrange the removal of the two intruding connections.

4.3.4 LLFA Investigation

As set out previously, the LLFA commissioned its partner consultants to recreate the highway and property flooding that occurred on 1st September 2015 by way of indicative hydraulic modelling.

Although much more detailed work would need to be undertaken and then verified and approved by STW, the modelling work undertaken has helped the LLFA to broadly understand the nature of the flood event and also to identify on a preliminary basis any areas and the possible reasons for where the local Highway Authority highway drainage and any Severn Trent Water sewer networks may have been unable to deal with the volumes of rainfall experienced.

4.3.5 Findings

- Affected properties on the south side of Wherretts Well Lane sit at a lower elevation than the highway and as a result any flow that spills over from the carriageway flows towards the affected properties.

- Replacement of front gardens with paving to provide parking appears to have been undertaken by a number of homeowners across the catchment thereby increasing the impermeable area and surface water runoff to the highway. This may be over and above the volumes to which the infrastructure was designed.
- The formalisation of access to the rear of their properties by construction of garages and doorways appears to prevent surface water runoff from flowing around the affected properties and could instead cause surface water to pond against them.
- The annual exceedance probability of the event that occurred on 1st September 2015 is estimated to be 2% (1 in 50 annual probability). The initial hydraulic model suggests surface water runoff collects at the junction of Cornyx Lane, Yew Tree Lane and Damson Lane. From there, surface water appears to flow northwards along Damson Lane to the junction with Wherretts Well Lane where flow is joined by additional surface water flowing southwards along Damson Lane. Surface water then appears to flow north-eastwards along Wherretts Well Lane.
- As the storm develops, additional surface water flow from the upstream catchment appears to flow around the properties within Warmley Close and appears to be directed towards the rear of the properties on Cornyx Lane. This flow, along with increasing surface water flow from Cornyx Lane and Yew Tree Lane appears to overwhelm the flow capacity within the highway channel and it is suggested that surface water flow spills out of the highway eastwards and down towards the affected properties.
- The subsurface drainage network in the vicinity of the Cornyx Lane/Damson Lane/Wherretts Well Lane junction is complex with a number of sewers joining beneath the junction. It is suggested that during the 3.33% AEP storm event the system may be approaching capacity and as a result of this, the model predicts a number of gullies and manholes may issue water.

4.3.6 Recommendations

- The LLFA should discuss the possibility of a joint modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Yew Tree Lane, Cornyx Lane, Damson Lane and Wherretts Well Lane area.
- Possible landscaping of the upstream catchment to provide some storage may reduce the incoming flow from Warmley Close. This could be supplemented with additional landscaping in Cornyx Lane and Yew Tree Lane to slow the flow within the road channels and direct water to the highway gullies. This could reduce the volume of water congregating at the junction of Cornyx Lane/Damson Lane and thereby reduce the volume of water flowing into Wherretts Well Lane.
- Consideration should be given to modifying the raised table at the junction of Cornyx Lane/Damson Lane/Yew Tree Lane to aid in keeping flow within the highway channel rather than letting surface water spill towards the affected properties.
- Property level protection and improved landscaping could be an alternative and easier to implement option to aid in reducing flood risk by redirecting flood flows around the affected properties.
- Any property level protection and improved landscaping should be undertaken on a street scale as opposed to individual level to ensure flood risk is not increased elsewhere and further analysis of the downstream flood risk should be undertaken prior to any flow routes being implemented.

ACTION(S):

A16. LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Cornyx Lane/Damson Lane/Wherretts Well Lane and Yew Tree Lane area

A17. Subject to the outcome of a joint detailed modelling exercise between the Local Highway Authority and STW, LLFA to investigate the feasibility of introducing a Property Level Protection (PLP) scheme for affected properties in the Cornyx Lane/Damson Lane/Wherretts Well Lane and Yew Tree Lane area.

A18. LLFA to monitor planning applications to ensure exceedance flow paths are not built over.

4.4 Foredrove Lane, Damson Lane & Walsgrave Close, Elmdon



Figure 3 – Surface water flood risk within the Foredrove Lane, Damson Lane and Walsgrave Close area, Elmdon.

4.4.1 Drainage History

The LLFA is not aware of any previous flooding events relating to the Foredrove Lane, Damson Lane and Walsgrave Close area. This is supported by evidence from local residents who when contacted have not reported any previous flooding events. The only on-going issue is with highway drainage near to the canal bridge on Damson Lane.

Mapping produced by the Environment Agency and held by Solihull MBC details flood risk associated with surface water flooding. The extent of surface water flood risk is shown in Figure 3. As can be seen, flood risk to the area is very low and non-existent in certain areas that flooded.

4.4.2 Impacts of the Flooding

12 properties experienced internal flooding on Foredrove Lane. According to reports from residents, storm water flooded the road and rose above the height of the kerbs, moving onto the footway and into the housing, internally flooding ground floors.

Residents of 4 properties on Damson Lane reported storm water flooding the road and moving across onto private properties.

In the Draycote Close and Walsgrave Close area, residents of 6 properties reported internal flooding associated with runoff from adjacent garage areas, the public highway and in some cases from domestic toilet facilities.

4.4.3 Severn Trent Water Investigation

Foredrove Lane

STW carried out a survey of its assets in the Foredrove Lane area near to Nos. 5-31 during October and November 2015. Whilst no blockages were found in the network, a collapsed pipe was identified on a side branch of a lateral drain to the rear of 14 Walsgrave Drive that was previously under private ownership but was transferred to STW in 2011.

Walsgrave Drive

STW surveyed its assets on Walsgrave Drive during October 2015 but no issues were found.

58 / 60 Damson Lane

STW attended two manholes on different lines of a public sewer in response to flooding reports in the area, which were blocked by fats, oils & greases leading to a surcharge. STW contractor Amey attended and cleansed the sewers.

STW have since inspected the local mains surface water sewers and foul water sewers on the highway and found no evidence of continuing blockage issues.

STW have arranged for a follow-up visit to the food premises responsible for the build-up of FOGs in the sewers to advise them to stop putting fats, oils and greases into the sewer.

55 Damson Lane

The local surface water drainage system was inspected by STW and a root blockage was located and cleared.

112 Damson Lane

STW have inspected the surface water drainage system and found several sections where roots have been able to mass, causing restrictions to the flow of water. STW arranged for these roots to be cut out and the pipe inspected again to ensure the whole length is clear.

ACTION(S):

A19. STW to raise repair for lateral drain to the rear of 14 Walsgrave Drive

A20. STW to arrange follow up visit to food premises responsible for the build-up of FOGs

4.4.4 LLFA Investigation

As set out previously, the LLFA commissioned its partner consultants to recreate the highway and property flooding that occurred on Foredrove Lane on 1st September 2015 by way of indicative hydraulic modelling.

Although much more detailed work would need to be undertaken and then verified and approved by STW, the modelling work undertaken has helped the LLFA to broadly understand the nature of the flood event and also to identify on a preliminary basis any areas and the possible reasons for where the local Highway Authority highway drainage and any Severn Trent Water sewer networks may have been unable to deal with the volumes of rainfall experienced.

4.4.5 Findings

- The high point of the road is to the north of the affected properties in front of No. 59 Foredrove Lane. From there, the road falls in a northerly and southerly direction.
- A number of properties (including the affected properties) were observed to sit at a slightly lower elevation to the existing footway with minimal threshold. This has the effect that should the carriageway not contain all the surface water then the excess water will preferentially flow down towards the properties.
- Replacement of front gardens with paving to provide parking appears to have been undertaken by some home owners to the north of Foredrove Lane thereby increasing the impermeable area and surface water runoff to the highway. This may be over and above the volumes to which the infrastructure was designed. In some locations driveways slope toward the highway without drainage measures to intercept runoff at the property boundary which is in contravention of the Highway Act 1980 and associated best practice.
- The modelling work shows that in ideal conditions surface water runoff will flow down the footpaths in front of the affected properties to the gully pots where it will drain through the grate and down into the sewer beneath Foredrove Lane.
- In an extreme event the modelling appears to show that surface water runoff will flow down the footpaths in front of the affected properties. Upon reaching a gully pot some water appears to drain through the grate and into the sewer, however some surface water will flow over or around the gully pot, passing forward to the next one and not entering the sewer. Although much more detailed work would need to be undertaken and then verified and approved by STW, the sewer beneath Foredrove Lane appears to reach capacity and is unable to accept any further inflow of surface water. In extreme circumstances, water may flow out of the sewer either at manholes or gullies.
- During the 1st September flood event the modelling appears to show surface water flows along the footway in front of the affected properties. At the low points of the footway there are twin gullies to allow runoff to drain into the sewer which runs southwards along Foredrove Lane. As the storm progresses, surface water runoff from the footway appears to flow down towards No. 21 and upon reaching this property appears to spread laterally along the low points in front of the flooded properties.
- Further work is necessary to define the exact AEP storm event, but the model suggests a probability of between 20% and below 1% (between 1 in 5 and greater than 1 in 100 annual probability).

4.4.6 Recommendations

- Property level protection could be considered by the owners of those properties that are located in extreme flow paths. Ideally, this should be co-ordinated by the LLFA and undertaken on a street scale as opposed to individual level to ensure flood risk is not increased elsewhere.
- The grassed area in front of the properties could be used for some form of Sustainable Drainage System (SuDS) feature to attenuate surface water runoff in times of extreme weather.
- The footways in the immediate area of the affected properties on Foredrove Lane could be considered for re-profiling where necessary to ensure that water is directed away from properties towards the grassed area, rather than towards them.
- In conjunction with the above point, consideration could be given to increasing the height of the kerb line at key sections on Foredrove Lane along with edging kerbs at the back of the various footways.
- The LLFA should discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Foredrove Lane area.

ACTION(S):

A21. Subject to the outcome of a joint detailed modelling exercise between the Local Highway Authority and STW, LLFA to investigate the feasibility of introducing a Property Level Protection (PLP) scheme for affected properties on Foredrove Lane.

A22. The local Highway Authority and others to consider whether the grassed area in front of the properties (No's 11-31) could be used for a form of SuDS feature

A23. The local Highway Authority and others to consider whether the footways in the immediate area of the affected properties could be re-profiled and kerb heights increased.

A24. LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Foredrove Lane area.

4.5 Warmley Close, Silhill



Figure 4 – Surface water flood risk within the Warmley Close area, Silhill.

4.5.1 Drainage History

Officers are not aware of any previous flooding events relating to the Warmley Close area. This is supported by evidence from local residents who when contacted have not reported any previous flooding events.

Mapping produced by the Environment Agency and held by Solihull MBC indicates a flood risk associated with surface water flooding. The extent of surface water flood risk is shown in Figure 4. As Figure 3 shows, flood risk can be found in the areas of Warmley Close, Redlands Road and Elms Close. As can be seen, flood waters flow from Elms Close and Redlands Road into Warmley Close, with water accumulating at the bottom of the Close.

4.5.2 Impacts of the Flooding

Residents of Warmley Close experienced significant internal flooding due to surface water runoff, with external flooding also being reported in garages and landscaped areas. Flooding was reported to be approximately 60cm deep in an area around 20m² per property. Residents have reported that the entire carriageway of Warmley Close was flooded as a result of water collecting along the highway and overtopping the kerb line. As the properties are sited below the road level the flood waters then entered the various properties through front walls, airbricks, doors and windows.

4.5.3 Severn Trent Water Investigation

STW attended Warmley Close during November 2015 to inspect and CCTV their assets. Whilst the surface water sewer on Warmley Close was found to have small root ingress and to be partially restricted due to silt this was not considered significant and didn't explain the flood route observed by local residents.

4.5.4 LLFA Investigation

As set out previously, the LLFA commissioned its partner consultants to recreate the highway and property flooding that occurred in Warmley Close on 1st September 2015 by way of indicative hydraulic modelling.

Although much more detailed work would need to be undertaken and then verified and approved by STW, the modelling work undertaken has helped the LLFA to broadly understand the nature of the flood event and also to identify on a preliminary basis any areas and the possible reasons for where the local Highway Authority highway drainage and any Severn Trent Water sewer networks may have been unable to deal with the volumes of rainfall experienced.

4.5.5 Findings

- Warmley Close rises approximately 150mm at its mouth, then falls at a gentle gradient northwards towards Nos. 7-11.
- A number of properties (including the affected properties) were observed to sit at a lower elevation than the carriageway. This has the effect that should the carriageway not contain all the surface water then the excess water will preferentially flow down towards the properties.
- Across the catchment, a considerable number of front gardens appear to have been paved over to provide increased room for car parking. As a result, this increases the impermeable area from which rainfall can runoff, usually into the highway area. Where this is undertaken without drainage measures to intercept runoff at the property boundary, this is in contravention of the Highway Act 1980 and associated best practice. The design of the highway drainage network is that no surface water runoff is discharged to the highway from adjacent properties and land.

- The modelling work undertaken appears to show surface water flowing eastwards down Redlands Road and northwards down Elms Close and collecting in a depression at the junction with Warmley Close. This depression is formed by a slight rise in ground levels, approximately 150mm, at the entrance to Warmley Close. There are three highway gullies located in this area to allow runoff to drain into the 150mm diameter surface water sewer. As the storm progresses, the depth of water in the depression appears to exceed the 150mm rise and flow is able to continue down into Warmley Close towards the flooded properties.
- In ideal conditions, surface water runoff will flow down the sides of the highway to a gully pot where it will drain through the grate and down into the sewer beneath Warmley Close. From there, it will flow northwards within the sewer network, ultimately discharging into the Grand Union Canal.
- In an extreme event the modelling shows that surface water runoff will flow down the sides of the highway. Upon reaching a gully pot some water appears to drain through the grate and into the sewer, however some surface water will flow over or around the gully pot, passing forward to the next one and not entering the sewer. Although much more detailed work would need to be undertaken and then verified and approved by STW, the sewer beneath Warmley Close appears to reach capacity and is unable to accept any further inflow of surface water. In extreme circumstances, water may flow out of the sewer either at manholes or gullies.
- Further work is necessary to define the exact AEP storm event, but the model suggests a probability of between 10% and 20% (between 1 in 5 and 1 in 10 annual probability).

4.5.6 Recommendations

- Consideration could be given to increasing the number of gullies, particularly in Redlands Road and Elms Close to allow more surface runoff to drain into the network before reaching Warmley Close, however discussion would be required with Severn Trent Water to determine whether sufficient capacity exists within the area to facilitate the provision of such extra gullies.
- Consideration could be given to slowing the flow of water within the road channels on Redlands Road and Elms Close to direct water to gullies within these roads and reduce the volume of water congregating at the junction with Warmley Close.
- Property level protection could be considered by the owners of those properties that are located in extreme flow paths. Ideally, this should be co-ordinated by the LLFA and undertaken on a street scale as opposed to individual level to ensure flood risk is not increased elsewhere.

ACTION(S):

A25. LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Warmley Close area.

A26. Local Highway Authority to consider measures to reduce the volume of water congregating at the junction with Warmley Close.

A27. LLFA to investigate the feasibility of introducing a Property Level Protection (PLP) scheme for affected properties.

4.6 Coppice Road, Elmdon



Figure 5 - Surface water flood map within the Coppice Road area, Elmdon

4.6.1 Drainage History

Residents have reported that within the last 5-10 years there has only been one flood event, which affected them externally. Officers are not aware of any previous flooding events relating to the Coppice Road area.

Mapping produced by the Environment Agency and held by Solihull MBC indicates a flood risk associated with surface water flooding. As Figure 5 shows, is contained within the turning head of the Road.

4.6.2 Impacts of the Flooding

Residents of Coppice Road reported that during the flood event water collected within the turning head of Coppice Road, ultimately overtopping the kerb line and moving towards and through the residential properties due north. 3 properties reported internal flooding as a result.

Photographs taken by residents during the flood event on the 1st September 2015 indicate internal flood depths of approximately 130mm to 150mm. Photos also show surface water flowing through one of the properties from the front to the rear.

4.6.3 Severn Trent Water Investigation

STW attended the site during the event and no blockages were found. However, a subsequent investigation has since found a blockage in a nearby lateral drain.

4.6.4 LLFA Investigation

As set out previously, the LLFA commissioned its partner consultants to recreate the highway and property flooding that occurred on 1st September 2015 by way of indicative hydraulic modelling.

Although much more detailed work would need to be undertaken and then verified and approved by STW, the modelling work undertaken has helped the LLFA to broadly understand the nature of the flood event and also to identify on a preliminary basis any areas and the possible reasons for where the local Highway Authority highway drainage and any Severn Trent Water sewer networks may have been unable to deal with the volumes of rainfall experienced.

4.6.5 Findings

- A number of properties (including the affected properties) were observed to sit at a lower elevation than the carriageway. This has the effect that should the carriageway not contain all the surface water then the excess water will preferentially flow down towards the properties.
- Across the catchment, a considerable number of front gardens have been paved over to provide increased room for car parking. As a result, this increases the impermeable area from which rainfall can runoff, usually into the highway area. Where this is undertaken without drainage measures to intercept runoff at the property boundary, this is in contravention of the Highway Act 1980 and associated best practice. The design of the highway drainage network is that no surface water runoff is discharged to the highway from adjacent properties and land.
- The hydraulic models suggest surface water runoff collects at the low point of Coppice Road at the head of the turning circle; where a gully pot is located. However, as the storm develops the depth of water in the turning head appears to exceed the level at the back of the pavement and once this level is exceeded, surface water appears to run down the driveway towards the affected properties.
- In principle, the modelling indicates that additional gullies within Coppice Road may allow more surface runoff to drain into the subsurface network during the early part of a storm. These additional gullies could be located both along the highway but particularly at the low point of the road in the turning head. However, whilst subject to more detailed modelling and verification by STW, capacity within the receiving sewer appears to be reached during the 3.33% AEP storm event.
- The annual exceedance probability of the event that occurred on 1st September 2015 is estimated to be between 10% (1 in 10 annual probability) and 2.5% (1 in 40 annual probability).

4.6.6 Recommendations

- Consideration could be given to using the alleyway between No. 47 and No. 34 to provide an additional surface water flow route towards Inchford Road and ultimately towards the park to the north-east of Inchford Road, where water can be attenuated.
- Consideration should be given to installing additional gullies within Coppice Road to allow more surface runoff to drain into the subsurface network during the early part of a storm.
- In conjunction with the above point, consideration could be given to increasing the height of the kerb line at key sections on Coppice Road along with edging kerbs at the back of the various footways.
- Property level protection could be considered by the owners of those properties that are located in extreme flow paths. Ideally, this should be co-ordinated by the LLFA and undertaken on a street scale as opposed to individual level to ensure flood risk is not increased elsewhere.

ACTION(S):

A28. Subject to the outcome of a joint detailed modelling exercise between the Local Highway Authority and STW, LLFA to investigate the feasibility of introducing a Property Level Protection (PLP) scheme for affected properties on Coppice Road.

A29. The local Highway Authority to consider whether the footways in the immediate area of the affected properties could be re-profiled and kerb heights increased.

A30. LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Coppice Road area.

4.7 Other recorded incidents

Table 2 details other properties affected across the Borough on 1st September 2015.

Location	No. of households affected	No. of businesses affected	Internal or External Flooding	Cause	Required Action
De Moram Grove	1	0	Internal	Runoff from private parking area	Owner to investigate installing appropriate drainage.
George Road	0	1	Internal	Runoff from private goods yard area	Owner to investigate installing appropriate drainage.
Kendal Grove	4	0	Internal	Runoff from private area	Owner to investigate installing appropriate drainage.
Lode Lane	0	1	External	Manhole surcharge	Owner to investigate
Lugtrout Lane	2	0	External	Runoff from adjacent land	Owner to investigate installing appropriate drainage.
Oakfields Way	1	0	Internal	Flooding from adjacent watercourse	LLFA to contact riparian owner of watercourse
Waldeve Grove	3	0	Internal & External	Runoff from highway and private parking area	LLFA to discuss with Local Highway Authority and Solihull Community Housing
Warwick Road	1	1	Internal & External	Runoff from private parking area	Owner to investigate installing appropriate drainage.

Table 2: Other properties affected across the Borough on 1st September 2015.

5 Summary & Conclusions

As the LLFA, the Council's Flood Risk Management Team has investigated the events of 1st September 2015 and has produced this report in accordance with Section 19 of the Flood and Water Management Act 2010.

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.

5.1 What has this investigation found?

This investigation has determined that on 1st September 2015 Solihull experienced a period of high intensity rainfall between approximately 1930 and 2330hrs. No prior weather warnings had been received for the event and 153 reports of flooding to property were received predominately across Elmdon, Silhill and St. Alphege wards, 152 of which were as a result of surface water flooding. Many of the properties are shown to be at risk from surface water flooding on mapping produced by the Environment Agency but the vast majority have never previously experienced such an event.

Establishing the exact nature of the rainfall that was experienced on 1st September 2015, including its volume and intensity, has proved difficult. This has mainly been due to the highly localised nature of the event and the resulting lack of available weather data. However, using primary data collected by property owners and Officers during and in the immediate aftermath of the event it has been possible to recreate the events of 1st September through modelling work to help understand how and why the flooding occurred.

Whilst the results of the modelling work undertaken on behalf of the LLFA should be treated with caution it does indicate that the storm that was experienced on 1st September 2015 had an annual exceedance probability of between less than 1% and 20% dependent on location. Such probabilities indicate that an extreme event beyond the capacity of the local surface water systems may have been experienced.

5.2 What actions are proposed and/or what recommendations have been made?

This investigation has highlighted a number of actions that can be taken to mitigate the risk associated with flood events within Solihull, particularly those areas affected by flooding on 1st September 2015. Such actions are detailed in an appropriate Action Plan as an appendix at the end of this report. However, it should be remembered that flooding is a natural process. Stopping it altogether is impossible.

The actions identified in the plan are themed around 'knowing where and when it will flood', 'being rescued and cared for during an emergency' and 'providing better advice and help for people to protect their families and homes'. Delivery of the actions is the responsibility of the relevant Risk Management Authority and in some cases those who own affected properties.

It is unrealistic to expect any drainage system to deal with any amount of rainfall. Simply increasing capacity may not be feasible when assessed technically or when prioritised against other locations that have experienced flood events in the past and there will never be a guarantee that such work would prevent future flood occurrences.

Joint consideration therefore also needs to be given to how properties known to be at risk from flooding can be made more resilient. Whilst it is the responsibility of each property owner to defend their individual property interests, there may be benefit in adopting a community-wide approach when investigating the potential for property level resilience measures in order to lever funding from other sources and to achieve value for money.

Appendices

Action Plan

Action Plan

September 2015 Flood Event

LLFA – Lead Local Flood Authority
LHA – Local Highway Authority

STW – Severn Trent Water
WMFS – West Midlands Fire Service

SCH – Solihull Community Housing
EA – Environment Agency

<u>Action No</u>	<u>Highlighted Issues</u>	<u>Recommendation</u>	<u>Status</u>	<u>Notes</u>	<u>Owner</u>
Knowing when and where it will flood					
A1	Collecting reliable weather data relating to the event has proven difficult.	Work with partners to investigate the installation of a Borough wide network of weather stations that could allow the collection of rainfall data.	In progress	Officers have received quotations. Funding to be sought.	LLFA
Being rescued and cared for during an emergency					
A2	The LLFA were not informed of the flood event until the following morning.	All relevant parties to be made aware of the need to ensure that the LLFA are notified of such an event.	Complete	Escalation process has been shared.	LLFA LHA
A6	No prior weather warnings were issued by partner agencies. As such CSW Resilience were unaware of the event and could not initiate their escalation process.	Staff from the out of hours Contact Centre service, the local Highway Authority standby service and the Tanker Services Team to be provided with further information on how they should ensure that CSW are notified in real time of flood events.	Complete	Escalation process has been shared.	LLFA LHA
A7	No prior information gathering, staffing or call handling procedures for large scale events.	LLFA to review its processes and procedures, particularly around information gathering, staffing during a large scale event and call handling.	Complete	Processes and procedures including surveys, webpages and template documents have been put in place and call scripts reviewed.	LLFA

<u>Action No</u>	<u>Highlighted Issues</u>	<u>Recommendation</u>	<u>Status</u>	<u>Notes</u>	<u>Owner</u>
Reducing the risk of flooding and its impact					
A11	It is unclear why there is repeated flooding at the junction of Warwick Road and Hampton Lane.	LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Hampton Lane area.	In progress	Further discussions to be held.	STW
A12	Increased understanding of the drainage and sewer systems in the Hampton Lane and Park Avenue area.	LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Hampton Lane and Park Avenue area.	In progress	Further discussions to be held.	LLFA LHA STW
A14, A18	Extreme flows are prevented from passing around properties due to minor infill development that has taken place historically.	LLFA to monitor planning applications to ensure exceedance flow paths are not built over.	On-going	LLFA are monitoring all planning applications.	LLFA
A15	Two intruding connections were found to be causing a restriction in one of the sewers at the junction of Yew Tree Lane, Cornyx Lane, Damson Lane and Wherretts Well Lane.	STW to arrange the removal of the two intruding connections.	Complete	Intruding connections have been removed.	STW

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
A16	Increased understanding of the drainage and sewer systems in the Cornyx Lane, Damson Lane, Wherretts Well Lane and Yew Tree Lane area.	LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Cornyx Lane/Damson Lane/Wherretts Well Lane and Yew Tree Lane area.	In progress	Further discussions to be held.	LLFA LHA STW
A19	A small collapse of a lateral drain was located to the rear of 14 Walsgrave Drive.	STW to raise repair for lateral drain to the rear of 14 Walsgrave Drive.	Complete	STW have repaired the lateral drain.	STW
A20	A build-up of fats, oils & greases (FOGs) caused a blockage on Damson Lane.	STW to arrange follow up visit to food premises responsible for the build-up of FOGs.	Complete	Follow up visit conducted and premises placed on future inspection list.	STW
A22	Areas of public open space on Foredrove Lane could be used for some form of Sustainable Drainage System (SuDS) feature to attenuate surface water runoff in times of extreme weather.	The local Highway Authority and others to consider whether the grassed area in front of the properties (No's 11-31) could be used for a form of SuDS feature.	In progress	Initial options appraisal and preliminary design underway.	LHA
A23	The footways in the immediate area of the affected properties on Foredrove Lane could be considered for re-profiling where necessary to ensure that water is directed away from properties.	The local Highway Authority and others to consider whether the footways in the immediate area of the affected properties could be re-profiled and kerb heights increased.	In progress	Preliminary design underway.	LHA
A24	Increased understanding of the drainage and sewer systems in the Foredrove Lane area.	LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Foredrove Lane area.	In progress	Further discussions to be held.	LLFA LHA STW

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
A25	Increased understanding of the drainage and sewer systems in the Warmley Close area.	LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Warmley Close area.	In progress	Further discussions to be held.	LLFA LHA STW
A26	Consideration could be given to slowing the flow of water within the road channels on Redlands Road and Elms Close to direct water to gullies within these roads and reduce the volume of water congregating at the junction with Warmley Close.	Local Highway Authority to consider measures to reduce the volume of water congregating at the junction with Warmley Close.	In progress	Preliminary design underway.	LHA
A13, A17, A21, A27, A28	Properties are located in extreme flow paths.	Property level protection should be considered by the owners of those properties that are located in extreme flow paths. This should be co-ordinated by the LLFA and undertaken on a street scale as opposed to individual level to ensure flood risk is not increased elsewhere.	Not started.	Awaiting outcome of modelling discussions with STW.	LLFA
A29	Consideration could be given to increasing the height of the kerb line at key sections on Coppice Road along with edging kerbs at the back of the various footways.	The local Highway Authority to consider whether the footways in the immediate area of the affected properties could be re-profiled and kerb heights increased.	In progress	Preliminary design underway.	LHA

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
A30	Increased understanding of the drainage and sewer systems in the Coppice Road area.	LLFA to discuss the possibility of a joint detailed modelling exercise being undertaken between the Local Highway Authority and STW to formally assess the capacity of the highway drainage and sewer systems in the Coppice Road area.	In progress	Further discussions to be held.	LLFA LHA STW
Better advice and helping people to protect their families and homes					
A3	Competing demands from a number of customers.	Local Highway Authority and Tanker Services to consider implementation of a prioritisation system for calls.	Complete	Prioritisation system has been issued by the LHA.	LHA
A4	The EA received several calls to its 24 hour Floodline service. Unfortunately, as the flood event was related to surface water flooding, the service was unable to offer any local information.	LLFA to discuss the use of and information held by the Floodline service in relation to Solihull events.	Complete	Solihull MBC has registered for the Extended Floodline Service (EFS) and has submitted frequently asked questions about what Solihull can do before, during or after a flood. Floodline staff can use this information when speaking to callers. If necessary, the caller can then be transferred to Solihull for further assistance.	LLFA EA

Action No	Highlighted Issues	Recommendation	Status	Notes	Owner
A5	The Fire Service responded to calls where there was a risk to life. The LLFA are aware that a number of other residents made contact with the Fire Service over the course of the event but that it was judged that the situations were not life threatening.	LLFA to discuss communications during a flood event with West Midlands Fire Service to ensure consistent and accurate information is provided.	Complete	WMFS have reviewed their logs relating to the incident. WMFS have made changes to their flooding scripts for Solihull.	LLFA WMFS
A9	It was difficult to contact those affected by flooding, therefore temporary signs were used at key locations on the Borough's road network requesting that any affected property owners make contact to provide further information about their individual experiences.	LLFA to review how it communicates post-flood event and to maintain a stock of temporary road signs that request that property owners who have experienced flooding make contact.	Complete	Temporary road signs have been stored.	LLFA
Recovery					
A8	Requests were made for financial assistance by those property owners without insurance to enable them to recover from the flood event.	LLFA to determine sources of financial assistance for those affected by flooding and provide guidance to those requesting information.	Complete	Sources of financial assistance have been shared with those requesting information.	LLFA
A10	The flood event adversely affected housing stock under the control of Solihull Community Housing and the ability to effectively liaise and receive a prompt response was of particular importance in the recovery phase of the flood event.	Relationships to continue to be strengthened between the LLFA and SCH.	On-going	SCH to be invited to all future FRMG meetings.	LLFA SCH