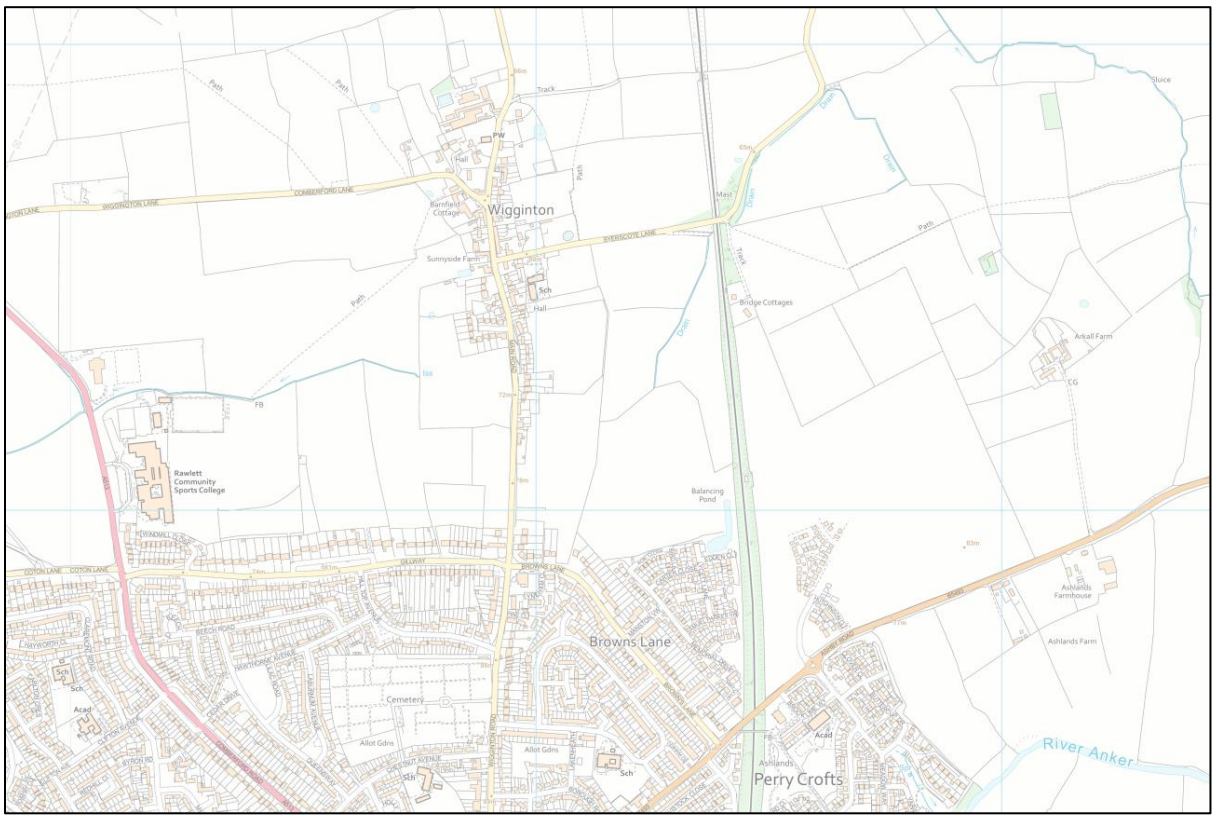
2nd January 2024 Flood Event

Floods and Water Management Act 2010 Section 19 - Investigation

Main Road/Sill Green Wigginton Lichfield District



This report has been prepared by Staffordshire County Council Flood Risk Management Team as the Lead Local Flood Authority, under Section 19 of the Flood and Water Management Act 2010.

This report is based on the information available at the time of preparation. Consequently, there is potential for further information to become available, which may lead to future alterations to the conclusions drawn in this report for which Staffordshire County Council cannot be held responsible.

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Executive Summary

Storm Henk, the eighth storm of the 2023-2024 storm season, brought damaging winds and heavy rain to southern and central parts of England and Wales on 2 January 2024. Heavy rain from Storm Henk contributed to significant flooding problems, following the wet weather during autumn and December 2023. Between 1 October 2023 and 4 January 2024, parts of the Midlands, north-east England and eastern Scotland received more than 150% of the 1991-2020 long term average rainfall for the four-month period October to January

One of the areas affected by this flood event was Main Road/Sill Green Wigginton, in Lichfield District of Staffordshire. 2 properties were internally flooded due to surface water.

As required by Section 19 of the Flood & Water Management Act 2010, the Lead Local Flood Authority (LLFA) has a duty to investigate flooding where the appropriate thresholds have been met. Our thresholds for investigation are outlined in our Local Flood Risk Management Strategy and have triggered the requirement for this report.

In the recovery phase that followed, Staffordshire County Council Flood Risk Management team worked with Staffordshire County Council (SCC) Highways to identify affected residents, provide help and guidance, and investigate the drainage infrastructure where required.

Introduction

The requirement to undertake this report

Section 19 of the Flood & Water Management Act 2010 (FWMA) requires that the Lead Local Flood Authority (LLFA) undertake an investigation (to the extent that it considers it necessary or appropriate) upon becoming aware of flooding in its area.

The flood investigation must also determine the risk management authorities (RMAs) that have relevant flood risk management functions and whether each of those authorities have exercised or is proposing to exercise those functions in response to the flood. See Appendix I for the responsibilities of the various RMAs involved in this flood event.

Staffordshire County Council(SCC) policies identifies the thresholds that will apply when determining whether an investigation under Section 19 of the FWMA is required. These thresholds are as follows:

- Five or more residential properties are reported to have been internally flooded during a single flood event in one location; or
- Two or more business properties are reported to have been internally flooded during a single flood event in one location; or
- One or more items of critical infrastructure are reported to have been adversely affected during a single flood event in one location; or
- One or more residential properties in the same location are reported to have been internally flooded more than once during a 5-year period.

SCC may investigate flooding outside these categories, but only when all outstanding issues with a higher priority have been considered. These guidelines set numerical thresholds, however, in recognition of the fact that all floods will be different; a certain amount of discretion will be required in order to implement this policy effectively.

Scope of this report

This report summarises the completed and ongoing investigations carried out into the flooding which occurred on 2nd January 2024 in Main Road/Sill Green Wigginton, Lichfield

This report does not obligate the LLFA or other risk management authorities into resolving the flooding issues investigated herein, nor is it possible for the LLFA to impose others to undertake any of the recommended actions.

Investigation Summary

Following the event of 2nd January 2024, Staffordshire County Council has undertaken the steps as outlined below:

Step 1: Initial Investigations

Using call records, social media sweeps, reports and direct testimonies from residents, the LLFA identified most of the locations where flooding occurred and then distributed 'Flood Questionnaire Surveys' to all property owners and residents affected by flooding. Officers also visited the location to gather evidence directly from those affected. Responses were received, providing personal accounts of the flood event including the estimated time, duration, extent and depth with any other information which was felt pertinent.

Step 2: Detailed Investigation and Analysis

The LLFA conducted detailed investigation of the location where properties experienced internal flooding. It should be noted that Staffordshire County Council have defined internal property flooding as:

> 'Flooding that occurs in a habitable room within a single property, excluding detached garages, porches and underfloor ingress of water.'

These investigations typically included a table-top review of known existing infrastructure and topography, identification of predominant flow paths, compared with the survey responses and photos, local-knowledge, and site visits with Individual face to face interviews with residents.

Through this detailed analysis, the LLFA identified the types of flooding that occurred on 2nd January 2024.

Step 3: Recommended Actions

Following the analysis of the affected areas, the LLFA have worked to identify opportunities and options to mitigate the potential that a similar rainfall event will result in similar outcomes. These have been summarised as 'Recommended Actions' and a lead RMA has been identified to undertake these actions.

The following sections of this report provides an overview of the different types of flooding, which is then followed by the summary of the findings from the works undertaken to date regarding the affected areas.

Standard definitions of types of flooding

The following section explores the various types of flooding that were experienced during 2nd January 2024.

Surface Water Flooding – Pluvial Flooding

Surface water is rainwater which is on the surface of the ground and has not soaked into the ground or entered a watercourse, drainage system or sewer. During a storm event, rainfall will land on the ground and depending on the characteristics of the ground it will behave in different ways.



Soft surfaces, known as *permeable surfaces*, allow water to soak (infiltrate) into the ground. These are typically in the form of gardens, parks, fields and green spaces,

Hard surfaces, known as *impermeable surfaces*, do not allow any rainfall to soak into the ground and this rainfall will become (surface water) runoff. Runoff is usually very quick too. These are typically in the form of highways and roads, roofs, car parks and public squares.

Surface water flooding occurs under a number of circumstances, most commonly occurring when:

- There has been a prolonged period of rainfall and the permeable surface becomes saturated therefore no more water can infiltrate into the ground;
- The rainfall intensity is very high, and the rain is falling faster than it can infiltrate into the ground;
- There has been a prolonged warm dry period, the permeable surface may be baked hard and effectively turn the permeable surface into hard impermeable surface;
- It rains on impermeable surfaces, and there is no formal means of managing the rainfall;
- There is heavy rainfall on impermeable surfaces and surface water cannot enter the drainage system provided to manage rainfall as the system is at capacity.

During most storm events, the rainfall rate is low enough to allow surface water to soak into the ground or drain into formal drainage systems (e.g. gully pots). However, during an extreme event, where the intensity of the rainfall is high, where catchments are saturated from previous rainfall events or rapid thaw or there is an excessive volume of water, it is unable to soak into the ground or enter formal drainage systems and as such it will flow across a surface in an uncontrolled manner.

Flooding from Highway Drainage



Highway drainage consists of gullies, drainage channels and other features which collect and drain rainfall away from the highway. These features are typically located on one, or both, side(s) of the highway where they connect to an underground highway drainage system. In a lot of cases these systems discharge into the public sewer infrastructure, but can sometimes connect directly to other pipes, drains, culverts or watercourses.

Where rainfall falls onto the highway, this will enter the highway drainage system or flow within the highway channel until a point where it enters the system or ponds on the surface.
In new development, it is common practice to use highways to contain and convey heavy rainfall events away from properties, however historically this practice has not happened.

Across Staffordshire, properties can be seen at or below the level of the adjacent road. This means that should a carriageway not be able to contain the water flowing within it, flow will overtop the kerbs on the highway and spill over adjacent land into properties.
Flooding from highway infrastructure occurs under a number of circumstances, most commonly occurring when:

- There is a blockage or build-up of surface debris in the vicinity of a gully, typically trash, leaves and twigs, which prevents, or restricts, the highway runoff from entering the gullies and subsequent highway infrastructure.
- There is a period of heavy and/or prolonged rainfall, whereby the volume of rainfall falling onto the highway overwhelms the highway drainage features and is unable to be captured. The resulting flows are then conveyed or contained within the highway, until such times as the water level overtops the kerbs and flows overland into properties.
- The sewer, culvert or watercourse to which the highway drainage is connected is at full capacity and therefore the highway run-off has no-where to drain to.

Staffordshire County Council, in their role as the local highway authority, is responsible for the highway drainage and gullies. This work includes maintenance of the adopted highway drainage infrastructure including roadside gully pots.

Flooding from Sewer Infrastructure

Where rainfall falls on an impermeable surface, it will typically be served by a formal drainage system, most commonly this is a sewer. There are different types of sewer, including:



Surface Water Sewers carry rainfall and surface water away from properties roofs and curtilages to watercourses.

Foul Water Sewer, carries wastewater away from properties to be treated; and,

Combined Sewer, drain both wastewater from properties along with surface water from properties roofs and curtilages. In addition these can also accept runoff from highways, roofs, car parks and other sources, subject to agreement. These systems are not constructed anymore but they are still found in certain areas of villages, towns, and cities.

Flooding from sewer infrastructure occurs under a number of circumstances, most commonly occurring when:

- There is a blockage, or the sewer itself collapses, which restricts or prevents flow within the sewer network. This causes water to back-up through the network and find its way to the surface, typically through a manhole or associated drainage structure.
- There is a period of heavy and/or prolonged rainfall, which results in significant flows that exceed the capacity of the sewer network. This prevents water from entering the sewer network and may result in surface flooding.

Severn Trent Water, as the sewerage company, is responsible for the operation and maintenance of the public sewers within Staffordshire. New surface water and foul water sewers are currently designed in accordance with the Design and Construction Guidance approved documents published by Water UK. This guidance is typically for new development sites. Though these design standards are not necessarily used when determining designs for reduce flood risk to achieve higher standards of protection.

At the time of construction of much of the sewer network across Staffordshire, the guidance may have been to accommodate smaller storm event magnitudes. Any designs will likely have been calculated and modelled to determine the appropriate sizes of the network for the catchment at that period of time, with some marginal tolerances to allow for expansion of the network. As a result, overall drainage network are complex with some sewers able to accommodate storms well above current design standards and other sewers much lower. Thus, when a large storm event occurs, the existing drainage network (combined or surface water sewers) may become significantly overwhelmed.

River Flooding – Fluvial Flooding



River flooding occurs when the amount of water in a river channel exceeds its capacity. This causes the water level in the river channel to rise above the riverbanks, where water flows from the channel into the surrounding area.
In terms of flood risk management there are two classifications of rivers/watercourses:

Main River and Ordinary Watercourse

The Environment Agency holds responsibility for the management of flood risk on Main Rivers. All other watercourses, which are not specified as Main Rivers are termed Ordinary Watercourses. Flood risk management of these watercourses is the responsibility of the LLFA.

However, in both cases, the riparian owner, that is anyone who owns land or property next to, or over, a watercourse, is responsible for maintenance of watercourses through their land.

River flooding occurs under a number of circumstances, most commonly occurring when:

- There has been a prolonged period of rainfall and the river levels have risen due to surface water runoff and inflow from sewer infrastructure;
- There has been a prolonged period of rainfall whereby permeable surface become saturated and the rate of surface water runoff increases thereby reaching the river faster;
- There is heavy rainfall on impermeable surfaces and the provided drainage system conveys water to the river quickly;
- There are high flows within the river which become restricted by structures (e.g. bridges and culverts) which results in water levels upstream rising and spilling from the banks;
- Sediment and debris building up in the river channel and reduces the capacity of the river channel causing flows to spill from the banks.

During most storm events, rivers are capable of conveying flows within their channels however, during an extreme event where the volume of water may be significant, flows may exceed the channel capacity and spill from the river in an uncontrolled manner.

Background to Flood Risk Mapping

Flooding is traditionally very difficult to predict, and while there are many local factors that influence flooding, there are a number of publicly available, national information tools which can enhance our understanding of the potential flood risks within a local area, more specifically risk of flooding from surface water and from rivers.

Surface Water Flood risk

In 2013, the Environment Agency, working with LLFAs, produced the Risk of Flooding from Surface Water map.

This is the third national surface water map produced by the Environment Agency under their Strategic Overview role and is the first publicly available surface water flood risk map.

Storms are usually given with an annual probability or the chance of occurring in any given year. Typically, smaller storms have a higher probability of occurring in any given year and larger storms have a lower probability of occurring. However, the probability only describes the chance a storm will occur and not when.

This means that if a large, low probability storm occurs, it can happen again soon after or can happen a long time after.

This mapping assesses surface water flood risk as a result of the chance of rainfall occurring in any given year, and is categorised into the following three scenarios:

High Risk: Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year or 3.3% chance that the storm will occur in a single year

Medium Risk : Flooding occurring as a result of rainfall between 1 in 100 and 1 in 30 chance in any given year or between 1% and 3.3% chance that the storm will occur in a single year

Low Risk: Flooding occurring as a result of rainfall between 1 in 1000 and 1 in 100 chance in any given year or between 0.1% and 1% chance that the storm will occur in a single year

Very Low Risk: Flooding occurring as a result of rainfall with less than 1 in 1000 chance in any given year or less than 0.1% chance that the storm will occur in a single year.

It should be noted that this mapping has been produced at national scale with a number of assumptions and therefore there are some limitations at a local scale and is not appropriate for identifying individual property level flood risk. This mapping is publicly available for use and is available online.

https://check-for-flooding.service.gov.uk/



Figure 1 Extent of Surface Water Flooding, Source Environment Agency

River flood risk

With regards to river flooding the Environment Agency publish the Flood Risk from Rivers or the Sea map. This shows the flood risk from Environment Agency Main Rivers and from the sea, taking into account any flood defences that may be present.

Storms are usually given with an annual probability or the chance of occurring in any given year. Typically, smaller storms have a higher probability of occurring in any given year and larger storms have a lower probability of occurring. However, the probability only describes the chance a storm will occur and not when. This means that if a large, low probability storm occurs, it can happen again soon after or can happen a long time after.

This mapping assesses flood risk from rivers or the sea as a result of the chance of rainfall occurring in any given year, and is categorised into the following four scenarios:

High Risk: Flooding occurring as a result of rainfall with a greater than 1 in 30 chance in any given year or 3.3% chance that the storm will occur in a single year

Medium Risk: Flooding occurring as a result of rainfall between 1 in 100 and 1 in 30 chance in any given year or between 1% and 3.3% chance that the storm will occur in a single year

Low Risk: Flooding occurring as a result of rainfall between 1 in 1000 and 1 in 100 chance in any given year or between 0.1% and 1% chance that the storm will occur in a single year

Very Low Risk: Flooding occurring as a result of rainfall with less than 1 in 1000 chance in any given year or less than 0.1% chance that the storm will occur in a single year.

This modelling is publicly available as the Environment Agency's Flood Risk from Rivers or the Sea map and is available online.

https://check-for-flooding.service.gov.uk/



Figure 2 Extent of River Flooding , Source Environment Agency

What actually happened? Weather and flood warnings

In the weeks preceding the flood event in question, the Met Office issued several national Yellow and Amber warnings, in addition to Yellow Rain warnings. Specifically, a prolonged spell of wet weather led to average daily totals of 10mm of rain falling across the UK for more than 5 days between the 26th December 2023 to 4th January 2024. Warnings issued on 2nd January 2024 listed the West Midlands Authorities and neighbouring authorities as potential areas that may be affected.

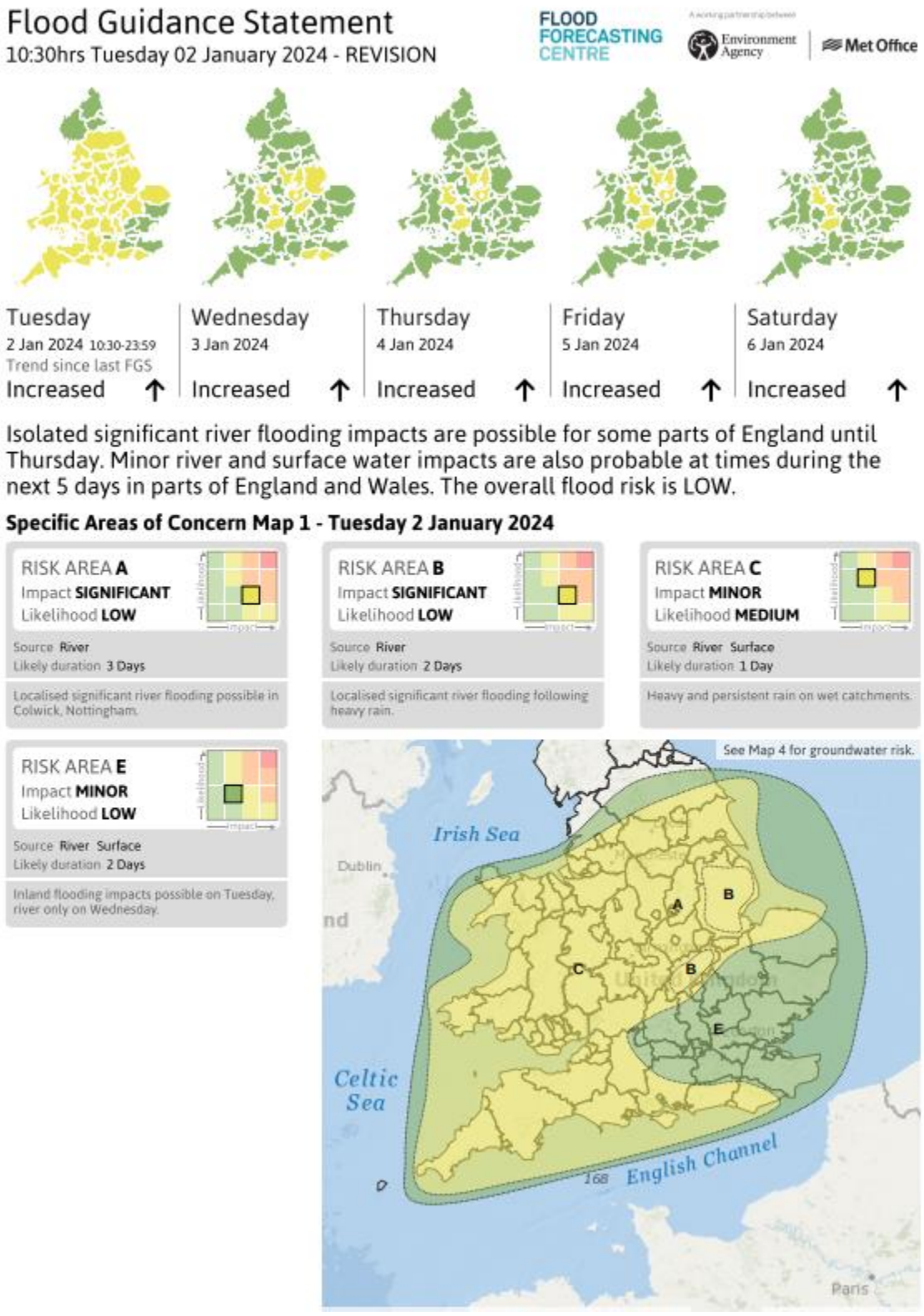


Figure 3 Extract from Flood Guidance Statement 2nd January 2024

From rainfall radar data obtained through Hydromaster, precipitation software that SCC utilises that provides real time and historic rainfall data from the Met Office, an evident belt of prolonged rainfall can be seen holding across the entire West Midlands Region between 08:00am - 20:00hrs on 2nd January 2024. With reference to the images below taken from Hydromaster, the higher rainfall intensities are denoted through shades of green. Lower intensities are represented through colours of blue.

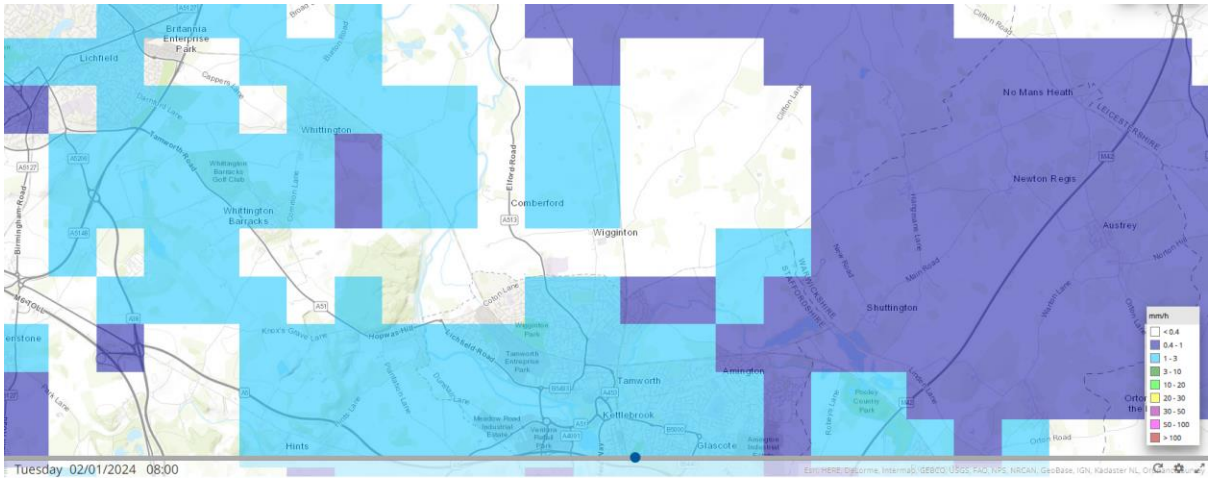


Figure 4 2nd January 2024 at 08.00am

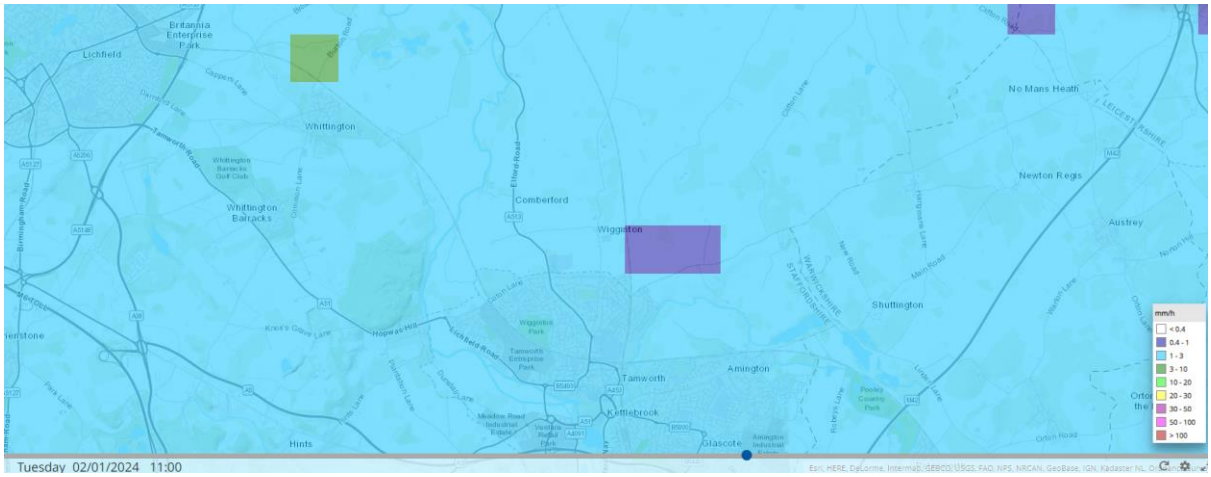


Figure 5 2nd January 2024 at 11.00am

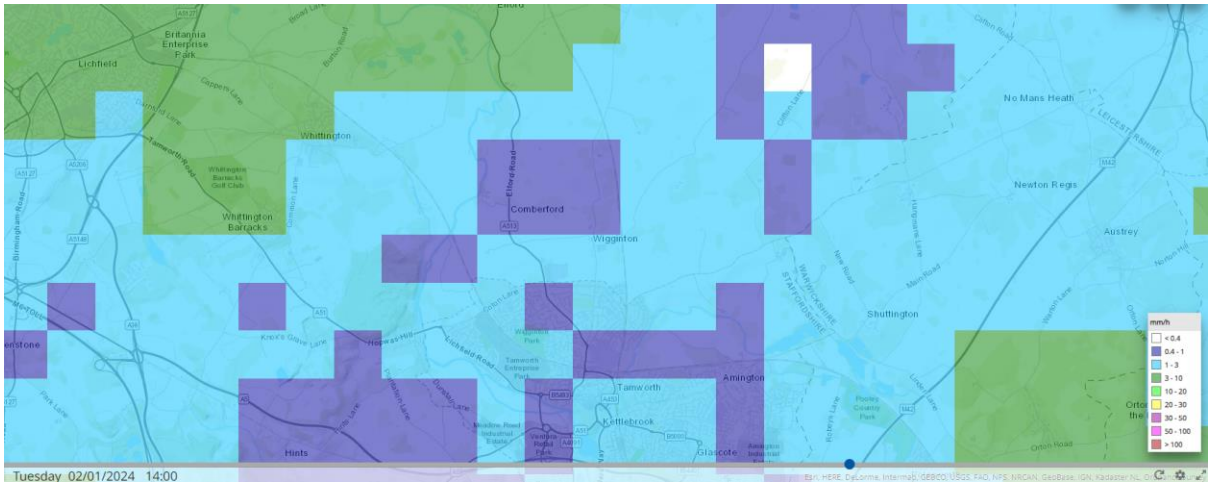


Figure 6 2nd January 2024 at 14.00pm



Figure 7 2nd January 2024 at 15.00pm

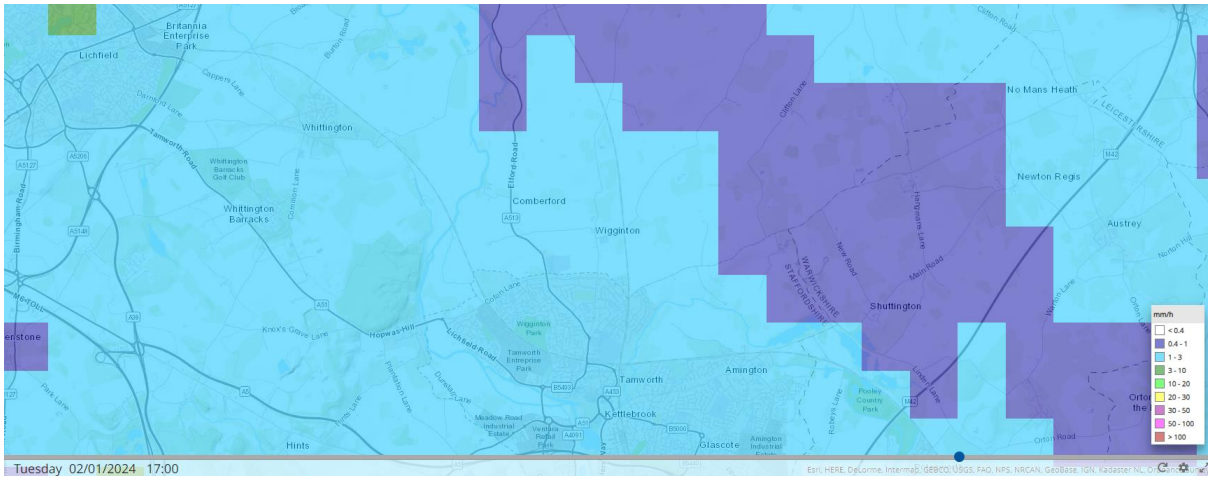


Figure 8 2nd January 2024 at 17.00pm

By using Hydromaster, rainfall data of both real time and historical can also be analysed at a localised catchment level. The graph below shows the estimated capture of rainfall data for the 24-hour period of 2nd January 2024. This shows prolonged moderate intensity rainfall from 8.00am, with a noticeable spike of higher intensity rainfall between 14.00pm and 17.00pm

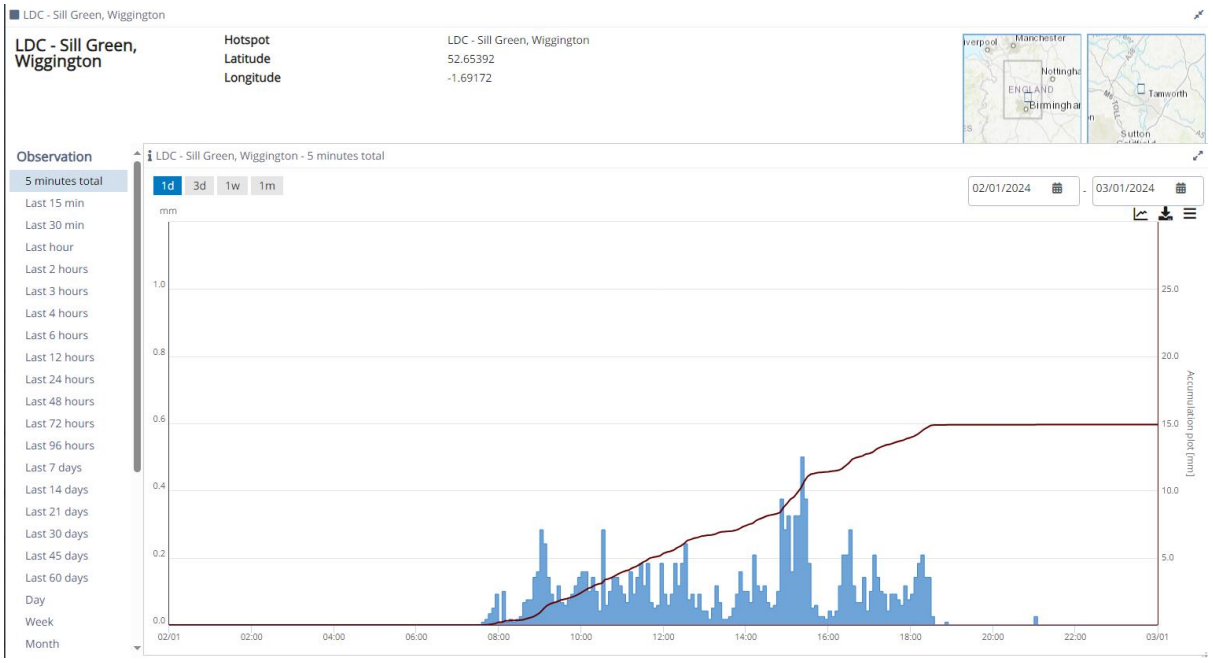


Figure 9 Graph showing 5 minute rainfall totals

The graph below shows the accumulated rainfall recorded at the nearest monitoring station for the 24-hour period of 2nd January 2024.

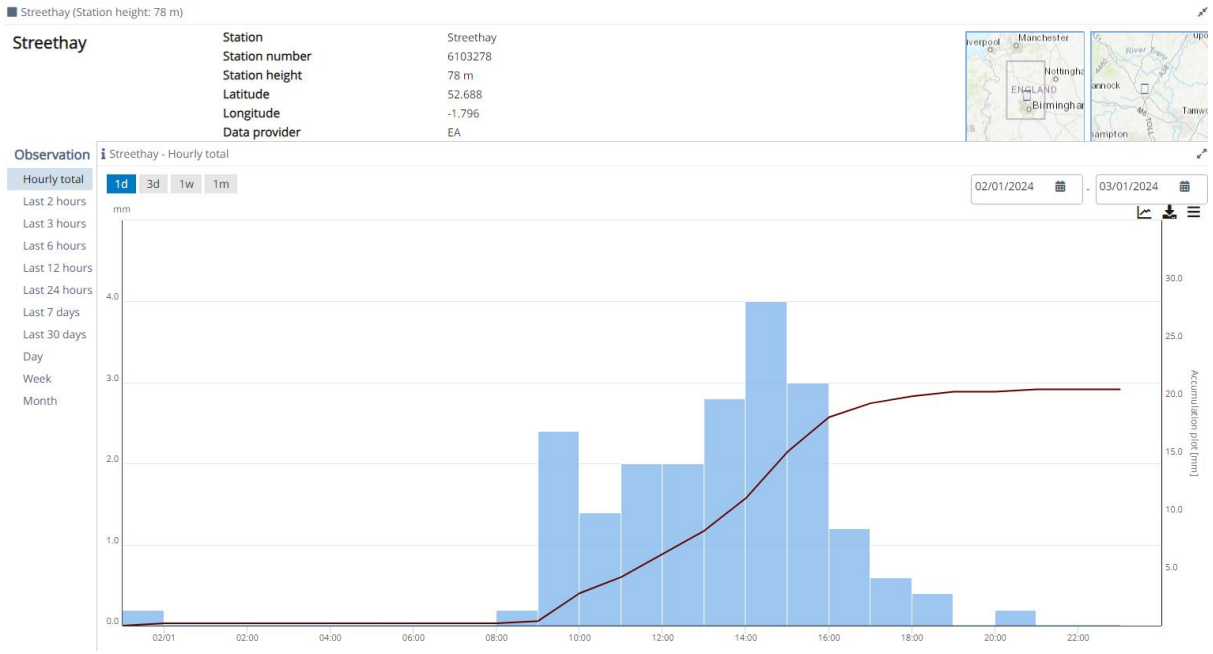


Figure 10 Graph showing 24hour rainfall totals for 2nd January 2024

Even though these volumes are sizable but not extreme, these amounts are one of the reasons for the flooding that has occurred on 2nd January 2024.

In Figure 11, the extract from Scalgo uses Lidar and mapping to show where surface water flows to when rainfall totals accumulate and shows where it wants to flow to. This shows that the affected properties are situated in a clearly defined depression, but also that surface water runs towards the affected properties. The threshold levels of each property or localised subterrain drainage infrastructure are not defined, so this is depicting the effect of the storm pictorially, so is subjective.

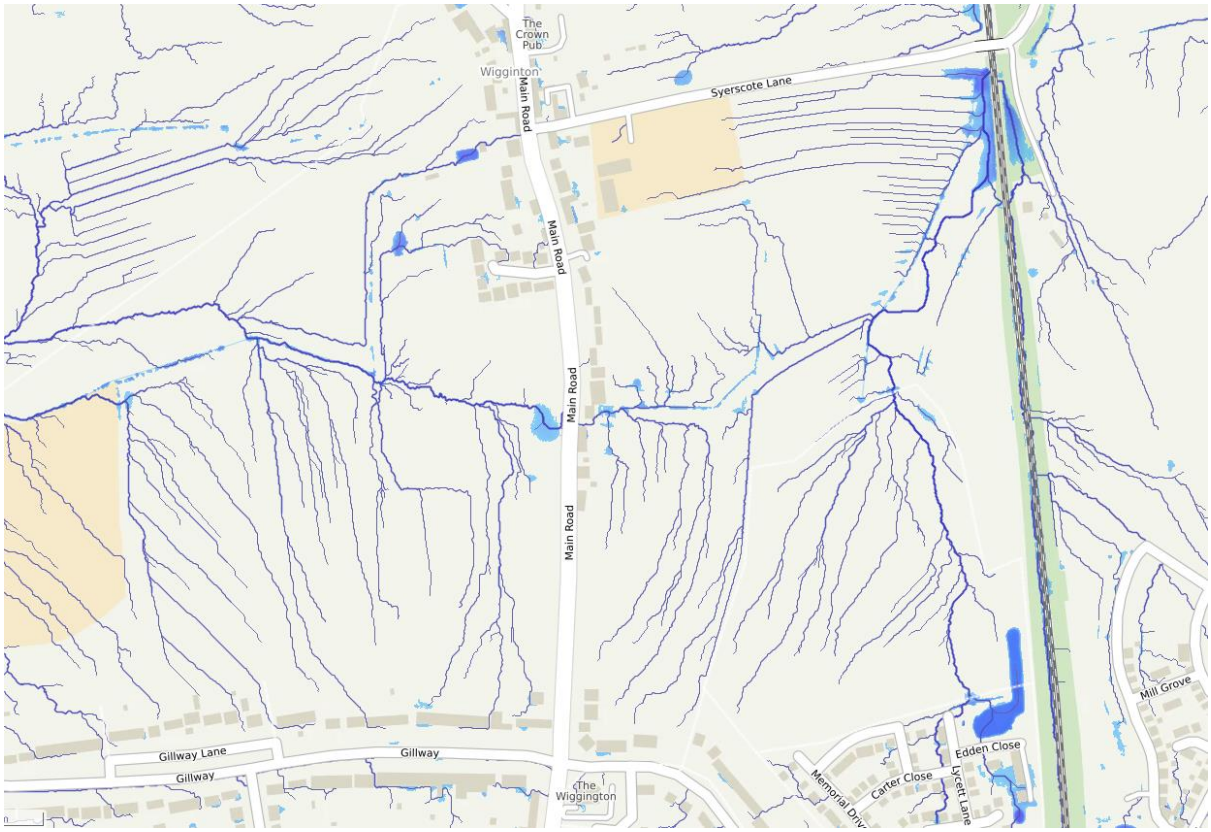


Figure 11 Extract from Scalgo using rainfall totals

Summary - Flooding Location on 2nd January 2024

Main Road/Sill Green Wigginton Staffordshire

Event Background

On the 2nd January 2024, Main Road/Sill Green was affected by surface water flooding, affecting the, Highway Drainage Infrastructure, driveways and residential properties.

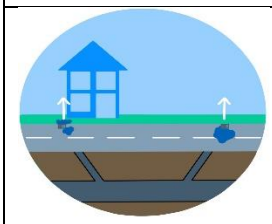
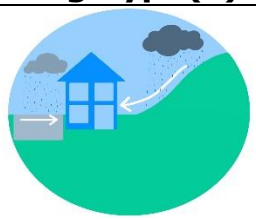
Identified Flooding Type(s)	
 Highway Flooding	 Surface Water/Pluvial Flooding
	 Watercourse Flooding/Fluvial Flooding



Figure 22 Location depicting flow routes

Investigations

Following reports by residents, flood questionnaires were issued to the properties directly affected at the location to help understand the extent of the flooding impacts. When the questionnaire responses were returned, the extent of the impacts were then fully realized. Officers representing the LLFA carried out visits to residents to obtain testimonies in person.

From the collation of information supplied as well as the in-person testimonies, it was identified that 2 residential properties were affected by internal flooding. The properties affected were a detached and semi-detached dwellings. The affects and damage meant that the properties needed renovations lasting some time.

During this time, SCC (LLFA) collaborated with SCC Highways to check that all infrastructure assets were inspected, and any findings be shared.

Information was later presented by SCC Highways, which described all actions and activities undertaken to date.

SCC Highways undertook numerous inspections and cleansing operations to establish the condition of both the highway drainage infrastructure, and the culverted watercourse crossing under the public highway. After some exploration including excavations, it was found that a watercourse culvert pipe crossing under Main Road/Sill Green had been severely damaged by a third party installing unrelated infrastructure. The damage meant that all surface water flows could not be conveyed efficiently heading west across farmland towards tributaries of the River Tame. This damage meant that the culvert pipe did not operate, largely leading to the flooding of the carriageway outside but also causing a build upstream of the affected properties. The volumes then spilled over the rear garden boundaries behind the affected properties and flowed over land towards the rear of the properties. Flood water entered the thresholds from both the front and rear.

In addition, the condition of the watercourse behind the properties was referred to the riparian landowners. The headwall arrangement is not deemed suitable as materials can accumulate and block the entrance to the culverted section. The arrangement is not easily cleaned, so needs further intervention by the riparian landowner to ensure that regular maintenance is undertaken and can be done so effectively.

Conclusion of Analysis

During the storm event on 2nd January 2024, surface water runoff was prevented from flowing efficiently via a culverted watercourse beneath Main Road/Sill Green, because it was severely compromised. The accumulated volumes of surface water flowed overland and through thresholds at the rear, whilst accumulations on the carriageway entered the property thresholds at the front. This was further exacerbated by vehicle movements through the flood water, leading to wash over.

Three types of flooding have been identified as causes for the instances of reported flooding. These include surface water flooding, flooding of highway drainage and river/watercourse flooding.

Recommendations and Actions

The following table briefly outlines what actions have been undertaken so far and lists any further actions that need to be undertaken by the appropriately identified RMA.

Recommended Actions	Identified Party/ RMA	What has happened so far and what will happen next?
Staffordshire County Council Highways to ensure gullies are maintained and kept clear. Important to ensure existing gully infrastructure is regularly maintained.	SCC Highways	This is ongoing in line with policy parameters
Staffordshire County Council Highways to ensure that the third party damage to the culverted watercourse is repaired sufficiently to allow flows to be conveyed downstream towards the River Tame tributaries	SCC Highways	The third-party damage has been already been referred to those responsible and steps are being taken to ensure this work is completed satisfactorily.
Staffordshire County Council Lead Local Flood Authority have approached riparian land owners to the rear of the affected properties to undertake an inspection of the watercourse in their ownership	SCC LLFA	The riparian owners have been instructed to undertake an inspection of the watercourse within their ownership, especially the entrance to the culverted section to assess its suitability to convey flow without obstruction. Regular maintenance inspections need to be undertaken thereafter.

Next Steps – Looking Ahead

During the compilation of this report, the relevant Risk Management Authorities have been identified and have already undertaken many of the actions needed, plus other additional works have been carried out, namely:-

- Staffordshire County Council Highways has undertaken operations to identify the condition of highway drainage infrastructure and discovered that third party damage has compromised the only flow route for the local catchment.
- Staffordshire County Council Highways has referred the damage to those responsible and will ensure that the repair is satisfactorily completed
- Staffordshire County Council Lead Local Flood Authority will continue to pursue the riparians landowner of the watercourse upstream of the affected properties to ensure that the watercourse conveys flow effectively without obstruction, and that regular inspections are undertaken.

APPENDIX 1 – Definitions of Risk Management Authorities and Other Parties

A summary of each of the RMAs, with regard to their role in flood risk management, is provided below:

Staffordshire County Council (LLFA)
LLFAs are county councils or unitary authorities which are required to prepare and maintain a strategy for local flood risk management in their areas, investigate significant local flooding incidents and publish the results of such investigations and play a lead role in emergency planning and recovery after a flood event.

Staffordshire County Council (SCC Highways)
Highway's authorities have the lead responsibility for providing and managing highway drainage.

Riparian Owners
https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities
A riparian owner is any party or individual who has a watercourse within or adjacent to any boundary of their property. They are responsible for maintaining the riverbed and banks within their section of the watercourse to preventing obstruction to the water flow and mitigate flood risk.

APPENDIX 2 – References

List of legislation and evidence to which reference is made

Flood and Water Management Act 2010 -
https://www.legislation.gov.uk/ukpga/2010/29/contents

Land Drainage Act 1991 –
https://www.legislation.gov.uk/ukpga/1991/59/contents

Photos, Videos, and questionnaires forwarded from the affected residents which demonstrated the event, and the damage suffered. The information shared by the affected residents is not inserted in the report to protect privacy.