Staffordshire County Council

2020 Flood Events:

Flood and Water Management Act

Section 19 - Investigation

Church Lane, Marchington

Flooding at Church Lane road bridge, Marchington

Staffordshire County Council

This report has been prepared by Staffordshire County Council as Lead Local Flood Authority for Staffordshire County, under Section 19 of the Flood and Water Management Act 2010, with the assistance of the Environment Agency and Severn Trent Water.

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.

Document Ref:			**2020 Flooding: Section 19 Flood Investigation for Church Lane, Marchington**		
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Executive Summary

When made aware of flooding, Staffordshire County Council, in its role as Lead Local Flood Authority, has a duty to investigate a flood to determine the causes of the flooding and identify appropriate actions that may be undertaken by the relevant Risk Management Authority (RMA).

Several storms occurred in 2020 across the Midlands region which impacted many areas. Storm Dennis, in February was a long duration, low-to-moderate intensity event, causing widespread flooding nationwide. The event led to a severe weather warning over much of Wales and the Midlands. As a result of these storms, a significant number of flooding incidents were reported to Staffordshire County Council, including Church Lane, Marchington.

Following the events, Staffordshire County Council worked closely with the various Risk Management Authorities (RMAs) and local residents to gather information and determine the impact of the flooding.

Staffordshire County Council, in partnership with the Environment Agency and Severn Trent Water, has undertaken an investigation in each of the areas where internal property flooding was reported, to determine the most likely cause of flooding (surface water flooding, flooding from rivers, flooding from sewer infrastructure and flooding from highway drainage).

This report focuses on Church Lane, Marchington. The investigation undertaken has been summarised, outlining the extent of flooding reported, the most likely cause of the flooding and the actions that have been completed, or are proposed to be completed in the future.

Introduction

Several storms occurred in the Midlands in 2020 resulting in flooding at several locations in Staffordshire. Storm Dennis arrived in Marchington on the 16th February 2020.

This storm caused widespread flooding to highways and properties across Staffordshire and as a result, Staffordshire County Council has undertaken investigations in the areas where flooding occurred.

This report will aim at providing a broad overview of the cause of the flooding at Church Lane, Marchington, resulting from the event in February 2020 and identifies the next steps, if any, that need to be taken by the relevant Risk Management Authorities (RMAs).

Although this report specifically focuses on Church Lane, Marchington, flooding associated with Storm Dennis resulted in more than 130 applications for grant support from residential and business properties across East Staffordshire. Many areas also experienced incidents in which five or more properties were internally flooded, reaching the criteria for a Section 19 investigation.

Lead Local Flood Authority

Following Royal Assent of the Flood and Water Management Act in 2010 (FWMA), Staffordshire County Council (SCC) became the Lead Local Flood Authority (LLFA) for Staffordshire. As such, SCC is responsible for the management of surface water food risk, groundwater flood risk and the flood risk from ordinary watercourses[1].

As LLFA, SCC is required to work in partnership with other agencies and authorities to manage flood risk. These agencies and authorities include, but not exclusively:

- Environment Agency, who hold responsibility for Main Rivers.
- Severn Trent Water, who hold responsibility for the public sewer network.
- Emergency service providers; and,
- Other public agencies and bodies.

Section 19 Requirements

The FWMA also places a duty on Lead Local Flood Authorities to investigate incidents of flooding. This is set out in Section 19 of the act and the investigations are therefore typically termed 'Section 19 Reports.' The Act states:

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.

[1]An ordinary watercourse is defined as any watercourse not designated as 'Main River,' i.e. watercourse that are not managed by the Environment Agency.

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.

It should be noted that not all flooding will require a formal investigation and report.
SCC has, set out in its *Local Flood Risk Management Strategy*[2], in *Appendix D* the process which will be used to determine to what extent it considers is 'necessary or appropriate' to investigate and what constitutes a significant flood event.

Stage 1 is an initial assessment, sufficient to ascertain with some confidence the extent of the flooding consequences. The second stage is to carry out a detailed investigation of the sites where it has been deemed necessary and appropriate. Reporting and publishing is the third, and final, stage. These stages may be described as: -

- Stage 1: Initial assessment
- Stage 2: S19 Investigation
- Stage 3: S19 Report and publish

It follows that there will be requirements for coordination and cooperation between Risk Management Authorities at each stage and, where required, following the outcome of a S19 Investigation. This will be undertaken via day to day officer communication, and through the LLFA's governance process for flood risk management.

Flood Investigation Methodology

SCC will undertake/coordinate a Flood Investigation in accordance with Section 19 of the Flood and Water Management Act (2010) when one or more of the following thresholds are exceeded.

Consequence Staffordshire Flood Investigation Thresholds:

- Five or more residential properties are reported to have been internally flooded during a single flood event in one location;
- 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

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.

This policy only relates to how flood investigations will be prioritised and does not guarantee that any flood risk mitigation works will be installed at the locations where investigations are undertaken.

This report has been based on the number of reported incidents of flooding; however, it is likely that the actual number of incidents of flooding was higher than that reported.

This data is the best currently available and is being verified and quality checked for accuracy.

[2] https://www.staffordshire.gov.uk/environment/Flood-Risk-Management/Local-Flood-Risk-Management-Strategy.aspx

Investigation into Flooded areas

Step 1: During the Flood Event

SCC received a high number of calls during the event, which reported flooding of properties, gardens and highways.

During the flood event, the LLFA coordinated with multiple Risk Management Authorities (RMAs) to ensure that flooding was managed effectively and the risk to people and properties was mitigated as far as reasonably practicable.

Step 2: Initial Investigations

Using call records, flooding investigation questionnaires and site visits, the LLFA identified the locations where flooding occurred.

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.

Following receipt of the Flood Survey responses, the LLFA identified areas where at least one property experienced internal flooding.

Step 3: Detailed Investigation and Analysis

The LLFA conducted detailed investigation and individual location analysis of each of the areas where a minimum of one property experienced internal flooding. It should be noted that SCC have defined internal property flooding as:

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

These investigations typically included a review of existing infrastructure and topography, identification of predominant flow paths, site visits and local knowledge gathering.

Through a detailed analysis, the LLFA have identified the types of flooding that occurred at each location during the event of February 2020.

The LLFA does not undertake detailed investigation of external flooding to garages, gardens and highways due to limited resources and funding. Indeed, gardens often act as flood storage areas and highways can be designed to convey flood waters reducing the extent/level of internal property flooding.

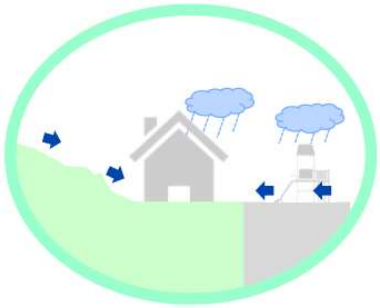
Step 4: Recommended Actions

Following the analysis of the affected areas, the LLFA have worked in collaboration with other RMAs 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.

Types of Flooding

Surface Water 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,

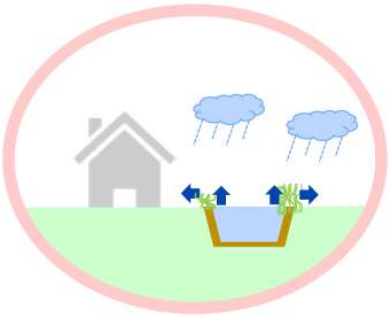
Hard surfaces, known as *impermeable surfaces*, do not allow any rainfall to soak into the ground and this rainfall will become (surface water) runoff. Runoff is usually very quick too. These are typically in the form of highways and roads, roofs, car parks and public squares.

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 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.

River 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 watercourse through their land.

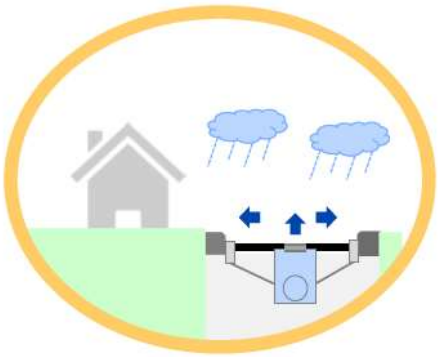
River flooding occurs under a number of circumstances, most commonly occurring when:

- 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 surfaces 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.

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 to watercourses.

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

Combined Sewer, drain both wastewater from properties along with runoff from highways, roofs, car parks and other sources. These systems were typically constructed up to the 1950s and hence are still found in historic areas of cities.

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

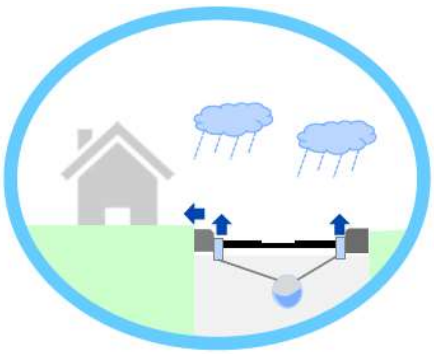
- There is a blockage, or the sewer itself collapses, which restricts or prevents flow within the sewer network. This causes water to back-up through the network and find its way to the surface, typically through a manhole or associated drainage structure.
- There is a period of heavy and/or prolonged 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 the Staffordshire area.

Surface water and foul water sewers are currently designed in accordance with Sewers for Adoption (8th Edition, published 2018). This guidance states that sewers should have to capacity to deal with all runoff from a storm with a 3.33% or greater probability of occurring in any given year and not cause any above ground flooding. This guidance is relatively recent having been brought into effect in the last 10 to 15 years. In addition, improvements in computer aided design and calculations also ensure designs are in agreement with the existing standards.

Therefore, at the time of construction of much of the sewer network across Staffordshire, the design standards may have been to accommodate a smaller storm event. The designs will likely have been done by hand and may have used “rules of thumb” to determine the required sizes. As a result, the drainage network is 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 be significantly overwhelmed.

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 which ultimately connects to the public sewer infrastructure.

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 across the East Staffordshire Borough. This work includes maintenance of the highway drainage including roadside gully pots.

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: https://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode

Figure 1: Example of Environment Agency updated Flood Map for Surface Water Flooding

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, considering 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://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode

Figure 2: Example of Environment Agency River Flood Zones mapping

Analysis of Flooding Location

Church Lane, Marchington, Uttoxeter

The following sections of this report describe the flooding event that occurred at Church Lane, Marchington on 16th February 2020. The event has been assessed through the review of anecdotal evidence from local residents and through consultation with the various Risk Management Authorities (RMAs).

Event Background

Several storms occurred in winter 2019-2020 across the UK and Midlands. The combined impacts of Storms Ciara, Dennis and Jorge led to exceptionally high rainfall totals across the UK, causing flooding in several areas.

Storm Dennis (15-16 February 2020) was the fourth named storm in the 2019/20 season, which arrived one week after Storm Ciara and brought with it heavy and persistent rainfall[3]. In the six to twelve months prior to Storm Dennis, Staffordshire had exceptionally high rainfall compared to the average (**Figure 3**). Rainfall in December and January was unremarkable. However, rainfall totals in February were exceptionally high, with February the wettest month in a series from 1862; the England figure was 258% of the long-term average (1981-2010). Crucially, soil moisture deficit from December 2019 through to February 2020 was generally practically zero/remained close to zero in Central England[3] (**Figure 4**). This means in the time running up to Storm Dennis there was generally little to no capacity within soils to drain or infiltrate rainfall. River flows in large rivers were also exceptionally high through February.

[3] Met Office – Winter 2019/2020 https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_monthly_climate_summary_winter_2020.pdf

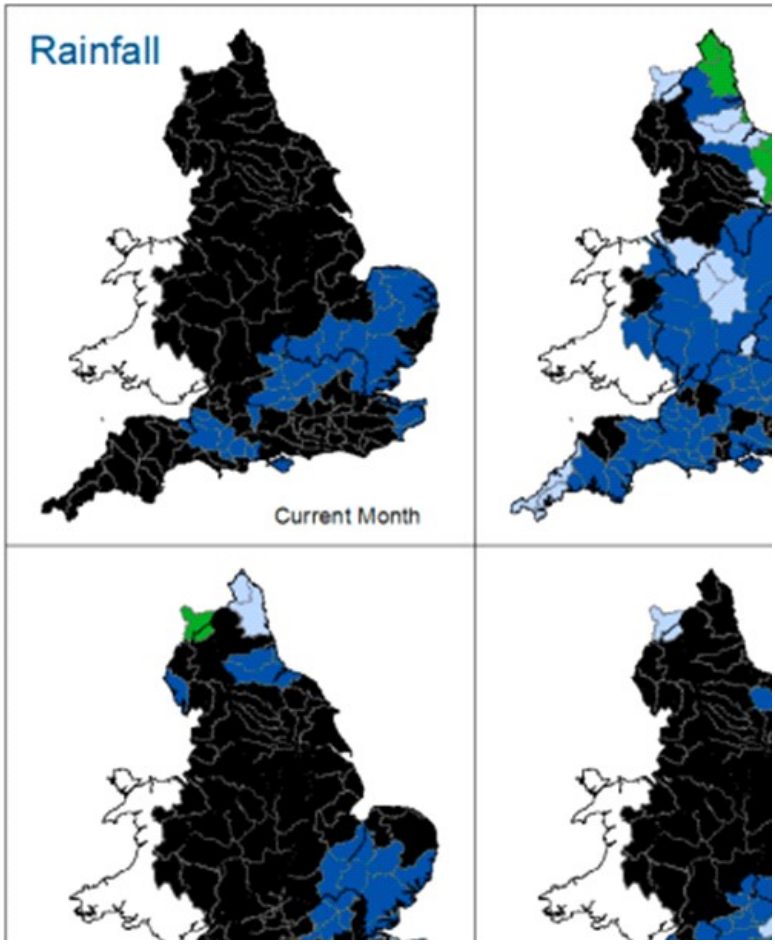


Figure 3: Total Rainfall Across England up to February 29 2020 (Source: Environment Agency[4])

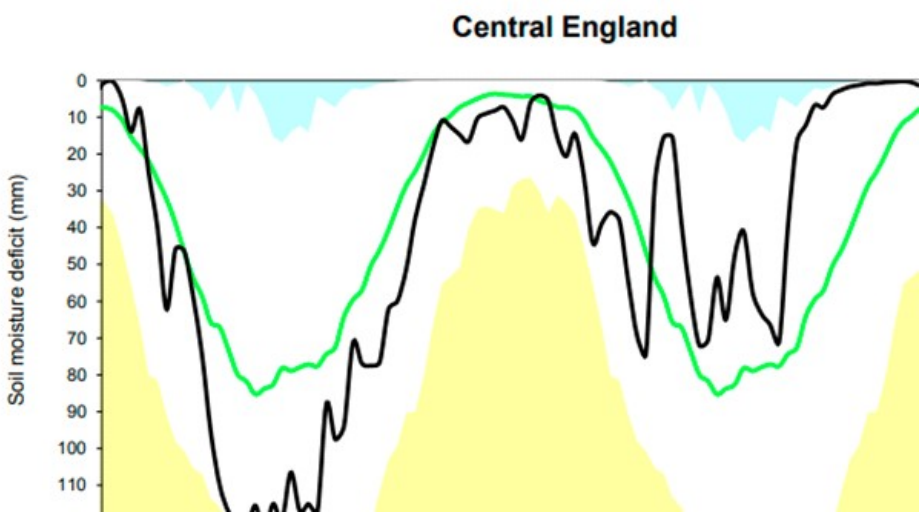


Figure 4: Central England Soil Moisture Deficit (Source: Environment Agency[4])

[4] Environment Agency – Monthly water situation report: England
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/871949/Water_situation_February_2020.pdf

On 14 February, Storm Dennis developed off the west coast of Ireland moving east and arriving in England by early afternoon. By mid-afternoon the front swept into Staffordshire and by late Friday night/early hours of Saturday morning this front had passed east out of Staffordshire. On Saturday 15 February a large front of rainfall developed in the morning and approached Staffordshire quickly, sustaining through to mid-day and continuing to remain over Staffordshire until early afternoon on Sunday 16 February. **Figure 5** shows radar-images of the rainfall across the UK. Through the rest of Sunday, the sustained/persistent rainfall moved over the rest of Europe, leaving scattered rainfall showers over Staffordshire through to Monday. For a more detailed account of Storm Dennis please refer to The Met Office[5] and Centre for Ecology and Hydrology[6].

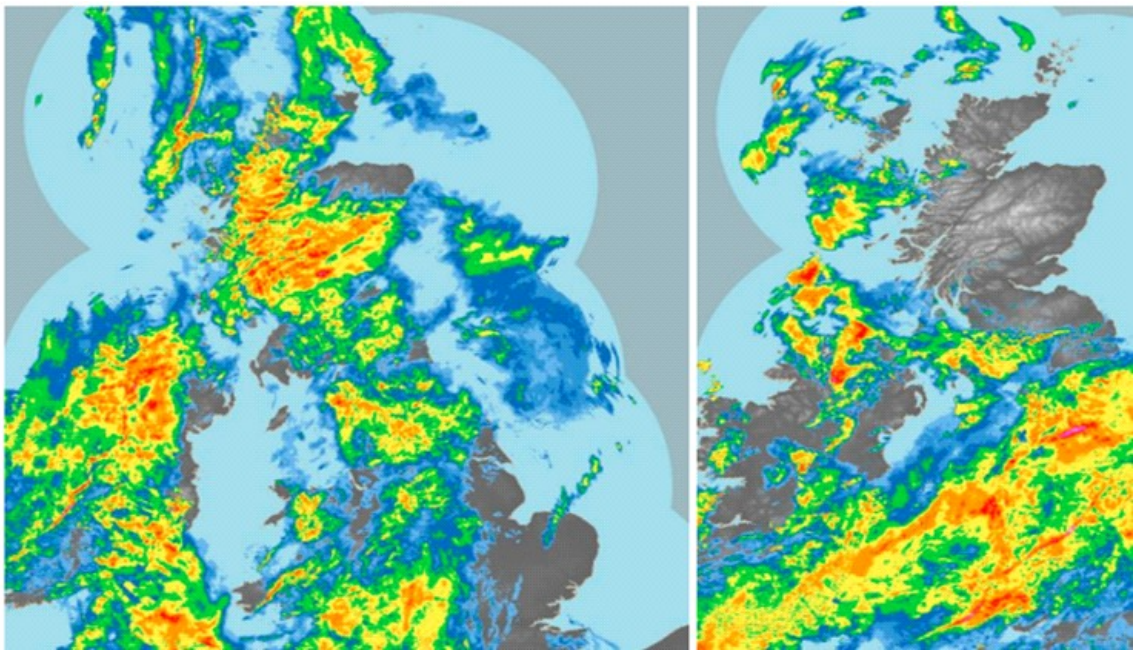


Figure 5: Rain-radar images at 12 UTC 15th and 00 UTC 16th February 2020 show the heavy and persistent rainfall from storm Dennis with the fronts sweeping across the UK (Source: The Met Office[5])

[5] Met Office – Storm Dennis https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2020/2020_03_storm_dennis.pdf

[6] Centre for Ecology and Hydrology – Briefing note: Severity of the February 2020 floods – preliminary analysis https://nrfa.ceh.ac.uk/sites/default/files/Briefing_Note_V6.pdf

Location Background:

Marchington is a small village in East Staffordshire, situated between the towns of Burton upon Trent and Uttoxeter. Church Lane is located at the south eastern edge of the village. Several residential properties are situated within the vicinity of Church Lane, along with a public house, an independently run village store and St Peter's Church. Figure 6 shows the location of Marchington within Staffordshire and highlights the area of the village affected by the flood event.

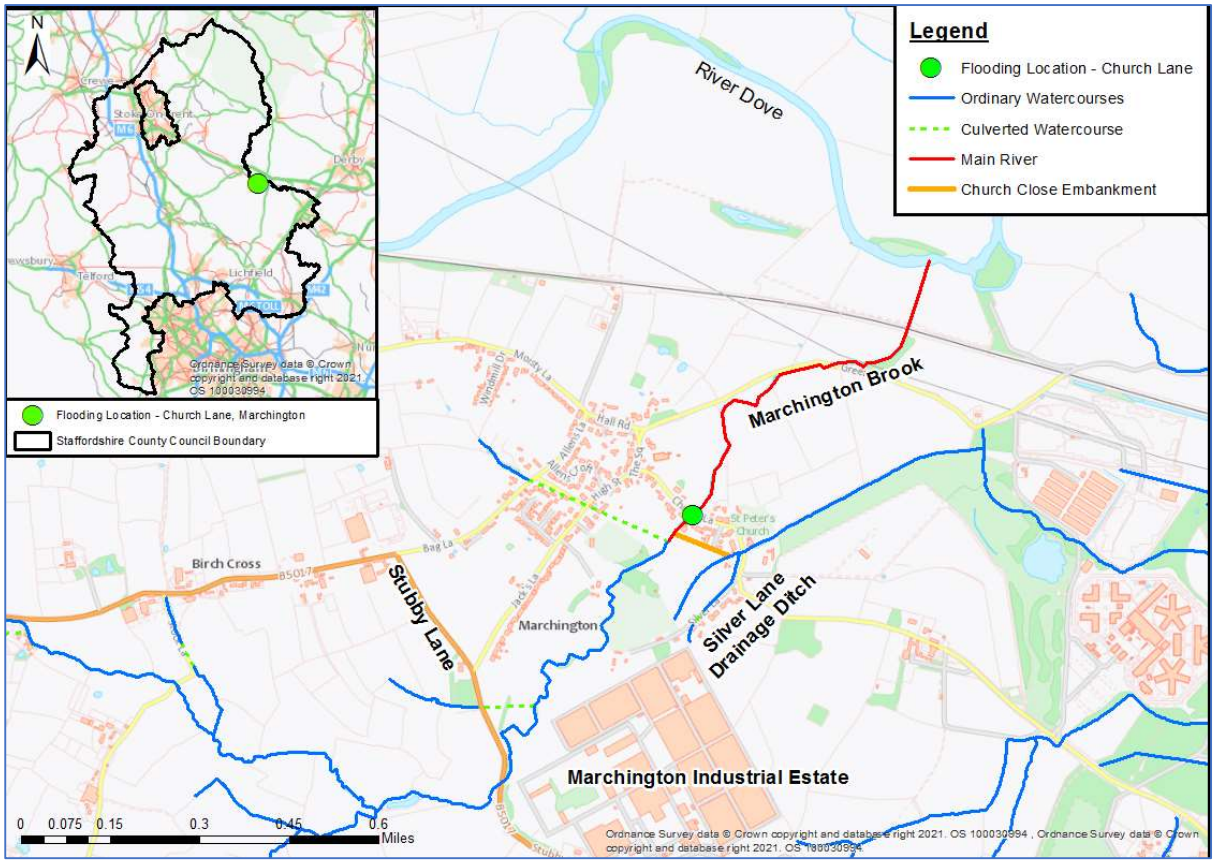


Figure 6: Location of Church Lane, Marchington

Local Watercourses

Marchington Brook, a tributary of the River Dove, flows in a predominantly north easterly direction through Marchington. The upper reaches of the watercourse are designated as ordinary watercourse and the responsibility of the riparian owner. From Church Lane road bridge to its confluence with the River Dove, Marchington Brook is designated main river and is the responsibility of the Environment Agency.

The watercourse rises to the south west of the village and is fed by two headwaters originating from Marchington Cliff, to the south west; and, low lying farmland to the west. The two headwaters combine approximately 400m upstream of Stubby Lane before continuing to meander through rural farmland towards the village. Upstream of Church Lane, a culverted watercourse discharges into the

Brook. The culvert takes flow from a ditch to the northwest and passes beneath Bag Lane and Jack's Lane.

At Church Lane, Marchington Brook is culverted beneath the road opposite the Dog and Partridge public house. This culvert is owned and maintained by Staffordshire County Council Highways department. Downstream of Church Lane, the watercourse continues to flow in a north easterly direction, being culverted beneath Green Lane, and through a railway embankment, before joining the River Dove approximately 240m downstream.

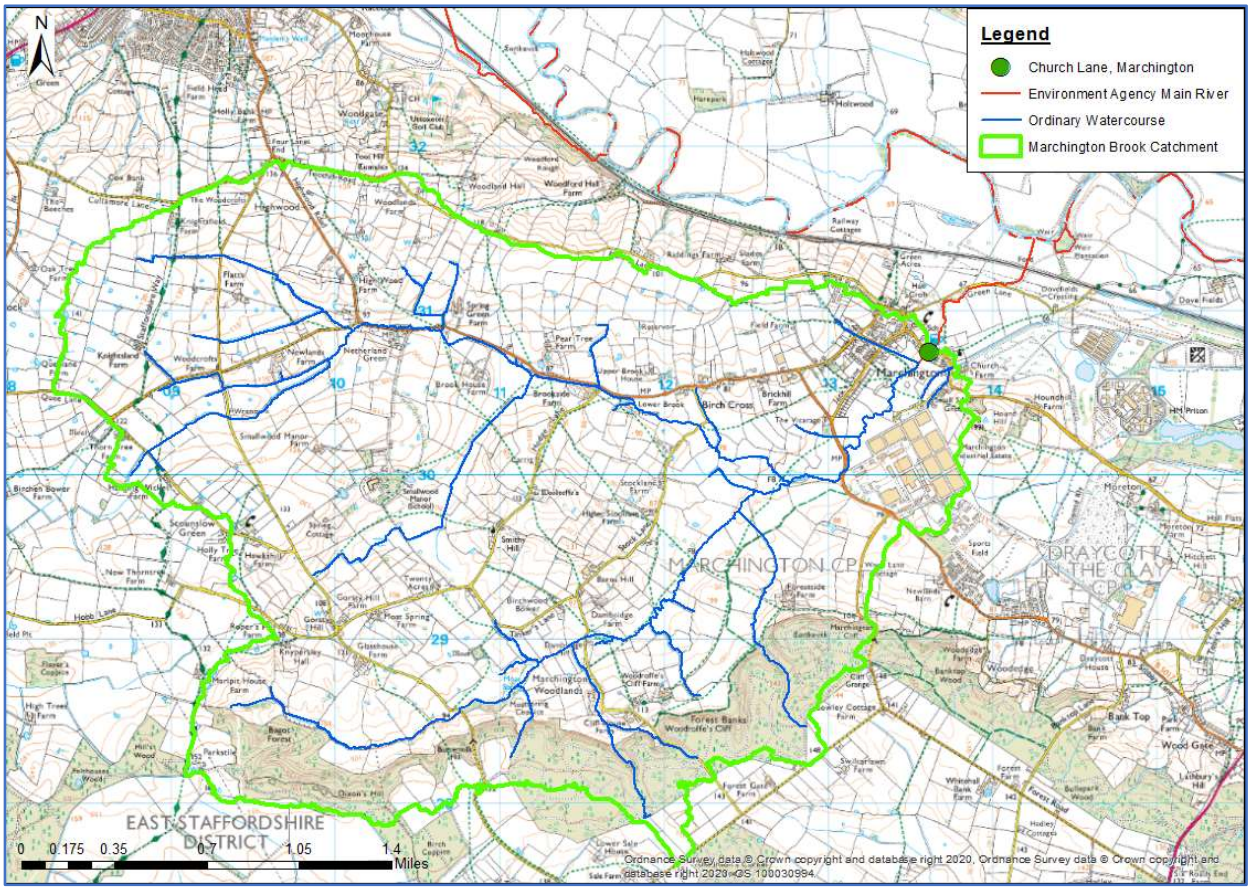


Figure 7: Marchington Brook Catchment

Marchington Brook drains a catchment area of approximately 16km^2 (Figure 7). The catchment is predominantly rural, with the surrounding area comprising arable and grassland with some woodland areas. The catchment is steep, particularly in its upper reaches at Marchington Cliffs, and responds quickly to heavy rainfall events. The underlying geology at the flood location is dominated by the Mercian Triassic Mudstone group, comprising moderately permeable clays and mudstones. Overlying superficial drift deposits are found adjacent to the watercourse and comprise mud, sand and gravels. Such deposits can exhibit high water tables, particularly in times of high flow and when the ground is saturated.

There are no formal flood defences along Marchington Brook, however, an earth embankment is located in the field behind Church Close (Figure 6). This is privately owned and was constructed to prevent water flowing down Church Close towards Church Lane.

An unnamed drainage ditch (referred to as Silver Lane ditch) is located to the south of the village. The ditch drains surface water from Marchington Industrial Estate with water entering the ditch from the Industrial Estate via a 900mm culvert pipe which flows under the garden of Rushey Lea Cottage. From here the drainage ditch flows in a north easterly direction, parallel to Silver Lane. The ditch is culverted beneath Church Lane/Silver Lane adjacent to Tithe Barn and flows in a north easterly direction towards the River Dove. The culvert is the responsibility of Staffordshire County Council Highways department.

Public Sewer Network:

The village of Marchington is served by a gravity fed foul sewer network which is owned and maintained by Severn Trent Water. The head of the foul sewer originates to the rear of Chestnut Corner and runs in a northerly direction to a manhole on Church Lane opposite the Dog and Partridge Public House. From here, the sewer takes a 90 degree turn, continuing down Church Lane and Silver Lane, and on towards Silver Lane pumping station, located to the south of the village. A series of storage tanks hold water at the pumping station until it can proceed to the pumping station. Flows are then pumped to a sewage treatment works situated approximately 2km to the east of Marchington.

There is an emergency overflow at the pumping station that discharges into an existing ditch to the north. There is also a rising main from a pumped combined sewer overflow (CSO) that pumps spill flows to a discharge point in the Marchington Brook, downstream of Church Lane.

Highway Drainage Network:

The local highway drainage network comprises traditional highway gullies and connections. To the west of Church Lane bridge, a series of highway gullies connect into two clay pipes that run down Church Lane. These both discharge into Marchington Brook under the road bridge. Highway drains from roads to the south of Marchington from the direction of Silver Lane also discharge to Marchington Brook. Staffordshire County Council Highways department are responsible for the maintenance of the highway drainage network and connections.

Historical Flooding at Church Lane, Marchington

The Marchington Brook has a long history of flooding and Church Lane is a documented flooding hotspot. Since the 1940s there have been numerous reports of flooding to the village centre and surrounding areas. Records indicate that there has been frequent flooding to the highway, gardens, outbuildings and internal flooding to property from a combination of river, surface water and sewer flooding. More recently, flood events in Marchington affecting properties have been recorded in November 2000, July 2012, November/December 2012, 2013, 2016, April 2018, 2019, February 2020 and January 2021.

Within the village, the brook is culverted beneath Church Lane opposite the Dog and Partridge public house. Videos of historical flooding show that when the water level in the brook exceeds the capacity of the culvert, flows back up until they spill onto Church Lane, leading to flooding of the highway and often to properties. During smaller events flooding to Church Lane does not always lead directly to flooding of property; however, reports from residents describe how bow waves from vehicles passing through the village push water into properties situated at a lower threshold than the highway.

Reports from residents describe how flooding from the Marchington Brook has also occurred from the watercourse upstream of Church Lane bridge. Flood water has been observed leaving the channel and flowing across the field towards the drainage ditch at Silver Lane opposite Tithe Barn.

River flooding has also been reported from Marchington Brook downstream of Church Lane. Flood water has been observed spilling from the right bank of Marchington Brook and flowing across the fields towards the gardens on the northern side of Church Lane.

In 2012, Church Lane suffered extreme flooding which left many of the properties underwater. Environment Agency flood surveys suggested that the flooding was due to a combination of water coming from the Marchington Brook, overland flow and road drainage issues. Records also suggest that the flooding in 2012 caused the toilets in many properties to back up.

Environment Agency Flood Risk Maps

Church Lane is at risk of flooding from multiple sources. Figures 8 and 9 below demonstrate the Environment Agency's Flood Zones from Rivers and Sea (RoFRS) and the Risk of Flooding from Surface Water (RoFSW) maps for Church Lane, Marchington.

The Environment Agency's Flood Zone map clearly shows the risk of flooding to Church Lane from Marchington Brook, with large parts of the road located within both Flood Zones 2 and 3 (Figure 8). Areas both upstream and downstream of Church Lane are also shown to be at risk.

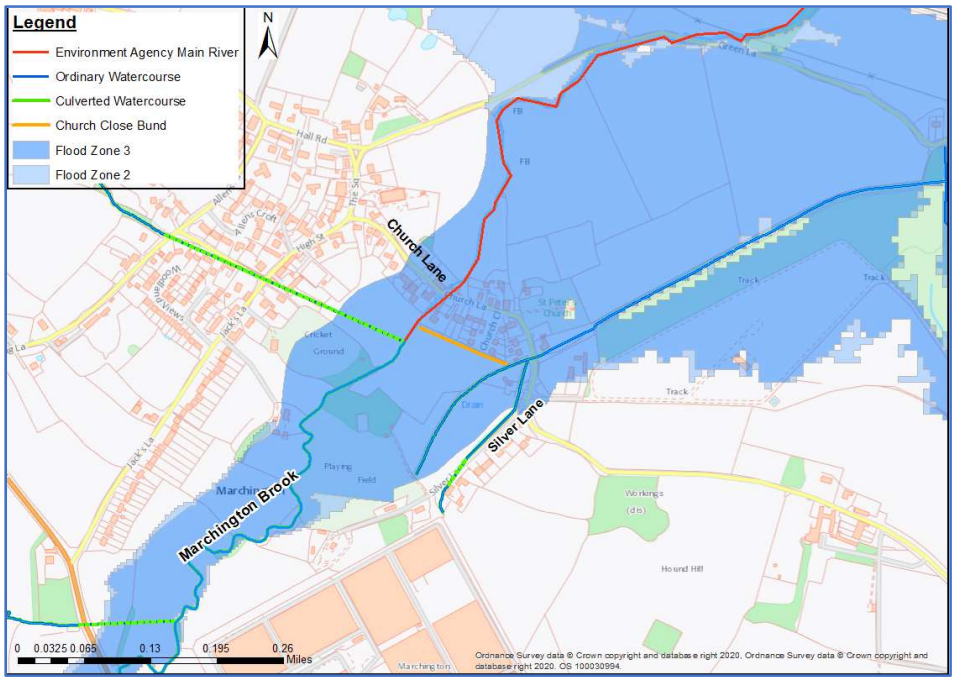


Figure 8: Environment Agency Risk of Flooding from Rivers and Sea (RoFRS) map demonstrating Flood Zones 2 and 3 at Church Lane, Marchington

Review of the RoFSW maps (Figure 9) also shows a risk of surface water flooding to properties at Church Lane. Church Lane is located within the 1 in 30 year RoFSW, 1 in 100 year RoFSW and the 1 in 1000 year RoFSW maps. Comparison of the maps to anecdotal records of past flood events show a similar extent of flooding, with flow paths along both Church Lane and Church Close clearly demonstrated.

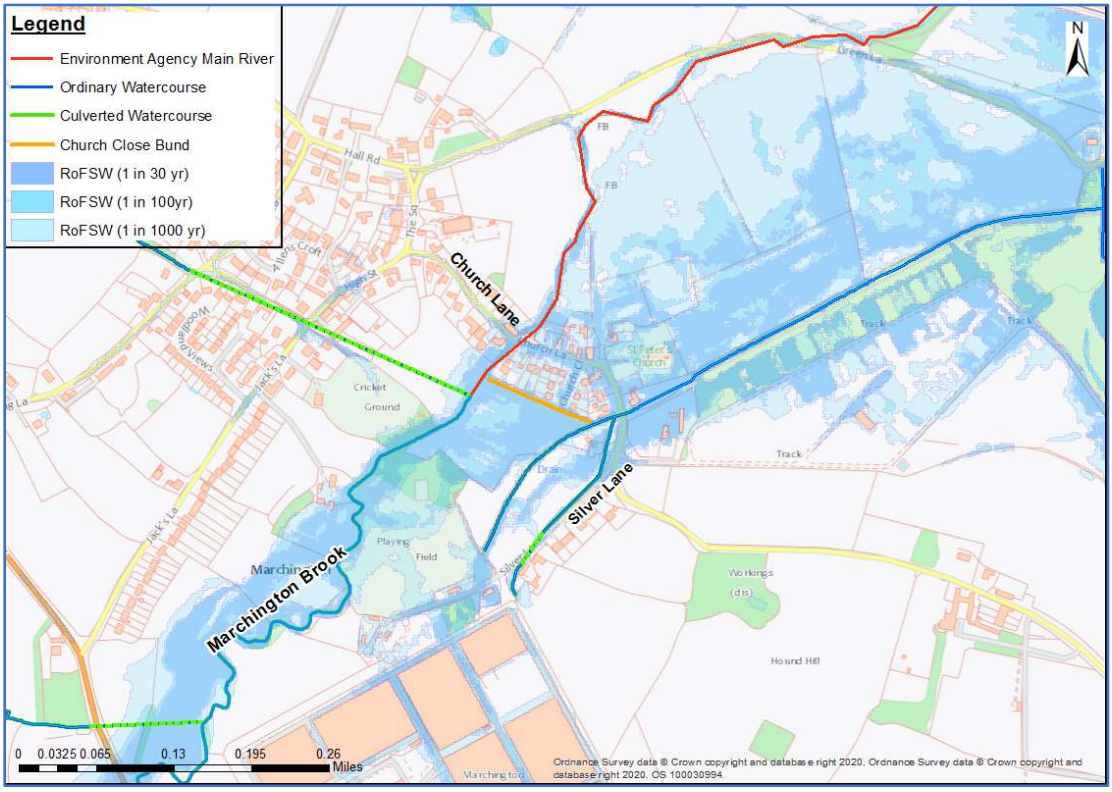


Figure 9: Environment Agency Risk of Flooding from Surface Water Maps for Church Lane, Marchington

February 2020 Flood Event

On the 16th February 2020, multiple properties in Marchington reported flooding. Accounts from residents describe flood water entering properties in the early hours of Sunday 16th February 2020. Details provided suggest that the source of flooding was from a combination of river flooding, surface water flooding, overwhelmed sewer infrastructure and overwhelmed highway drainage.

Identified Flooding Type(s)			
River	**Surface Water**	**Highway Drainage**	**Sewer**
			

Records received from East Staffordshire Borough Council (ESBC) and the Environment Agency indicate that 11 residential properties and 2 commercial properties including the Dog and Partridge public house and the village shop experienced internal flooding. Property owners described flood depths within their dwellings ranging from 1 to 9 inches with significant damage to interior decoration, carpets, flooring, furniture, and irreplaceable personal items that were beyond salvage. Flooding to outbuildings, gardens, garages, sheds, and driveways was also experienced. In addition, records indicate that several roads leading into the village were flooded, which led to some residents becoming cut off and unable to leave their properties for several hours.

Exceptionally high levels within Marchington Brook were recorded with Environment Agency records showing that at 04:00 on the 16th February, the river gauge at Marchington recorded the third highest level since the installation of the river gauge in 2000, peaking at a level 1.75m. Anecdotal reports of the flooding have described how Marchington Brook exceeded its capacity at several points, both upstream and downstream of Church Lane. This combined with the accumulation of surface water resulted in flooding to properties along Church Lane. In addition, given the high water levels in the brook, the local surface water drainage system was unable to discharge into the river, resulting in surcharging of drains and surface water flooding to the highway.

Records received by ESBC describe water spilling from the right bank of Marchington Brook downstream of Church Lane bridge. Water was observed flowing across the fields towards the Dog and Partridge public house into the gardens behind properties on Church Lane. Some residents also reported flood water coming up through their floors.

In addition to the river flooding that was reported, records indicate that there was an ingress of water into the sewer network which became overwhelmed. Discussions with Severn Trent Water indicate that they had no flooding reported directly to their organisation. However, residents

reported issues related to the pumping station located on Silver Lane. This was investigated by the relevant organisations at the time of reporting as detailed below.

Flood Incident Response:

Marchington is covered by the Lower Dove Brooks Flood Alert and has two Flood Warning Areas which cover Church Lane and Church Close and a separate one that covers Green Lane. The flood alert for Marchington was not issued during Storm Dennis as the trigger level was reached overnight. Consultation with the Environment Agency indicates that a flood warning for Church Lane/Close was issued at 02:54 on February 16th ahead of the peak flow at 04:00.

On Sunday 16th February, Environment Agency project officers liaised with Marchington Parish Council to determine the extent and impact of the flood event. Communication between Marchington Parish Council, the Environment Agency and Staffordshire County Council indicates that in response to flooding, Church Lane was closed to vehicles to help minimise the possibility of bow waves flooding properties.

Discussions with Severn Trent Water indicate that residents reported issues related to the pumping station located on Silver Lane. This is thought to have been caused by a local power outage, and Western Power re-set the power once aware of the issue. It is also understood that Severn Trent Water also sent one of their electricians out to re-set the power at the pumping station and confirm that it was working correctly.

Once the road flooding had subsided and it was deemed safe to do so, Environment Agency officers visited the flood location to assist residents and assess the impact of the flood event. These included:

- Tuesday 18th February – Environment Agency officers met with a representative of Marchington Parish Council to obtain an overview of the situation and record the level that the flood waters had reached at multiple locations in the village.
- Friday 21st February – Environment Agency officers visited all properties that had experienced internal flooding to offer advice and support, and to obtain information on observed flow routes, flood depths, extents and timings. Where residents were unavailable, details were left so that residents could contact the Environment Agency as required.

East Staffordshire Borough Council also collected information from residents that had flooded and received more than 130 applications for grant support from residential and business properties across East Staffordshire. By the end of the scheme, the DEFRA Property Flood Resilience grant scheme and ESBC will have provided grants to approximately 86 properties that equals an approximate value of £370,840 across the Borough.

Investigation

Flooding at Church Lane, Marchington is an ongoing issue and several investigations have been undertaken in recent years to obtain a better understanding of the flooding mechanisms and identify potential solutions to reduce the risk of flooding within the village. Following the flood event in February 2020, SCC LLFA have worked in conjunction with the relevant Risk Management Authorities (RMAs) to obtain data to help understand what happened on 16th February 2020.

Rainfall Analysis:

Rainfall data has been obtained from various sources to obtain a better understanding of the February 2020 event. On the 15th and 16th of February 2020, Storm Dennis generated a severe weather warning over much of the Midlands. The Storm Dennis event has been characterised as a long duration, low to moderate intensity rainfall event that spread over large catchments, which is typical with winter rainfall storm events.

Figure 10 shows the recorded 5-minute HydroMaster rainfall data for Marchington. A total of 37.5mm of rainfall was recorded over the 24 hour time period 15th February 2020 to 16th February 2020. There were several shorter periods of rainfall prior to a more significant period of rainfall which started around 21:10 on the 15th February. Of the total rainfall recorded during the event, 22.5mm was recorded during a 17-hour period between 21:10 on February 15th and 07:00 on 16th February 2020 demonstrating that the storm was intense with rainfall falling continuously throughout the duration of the storm.

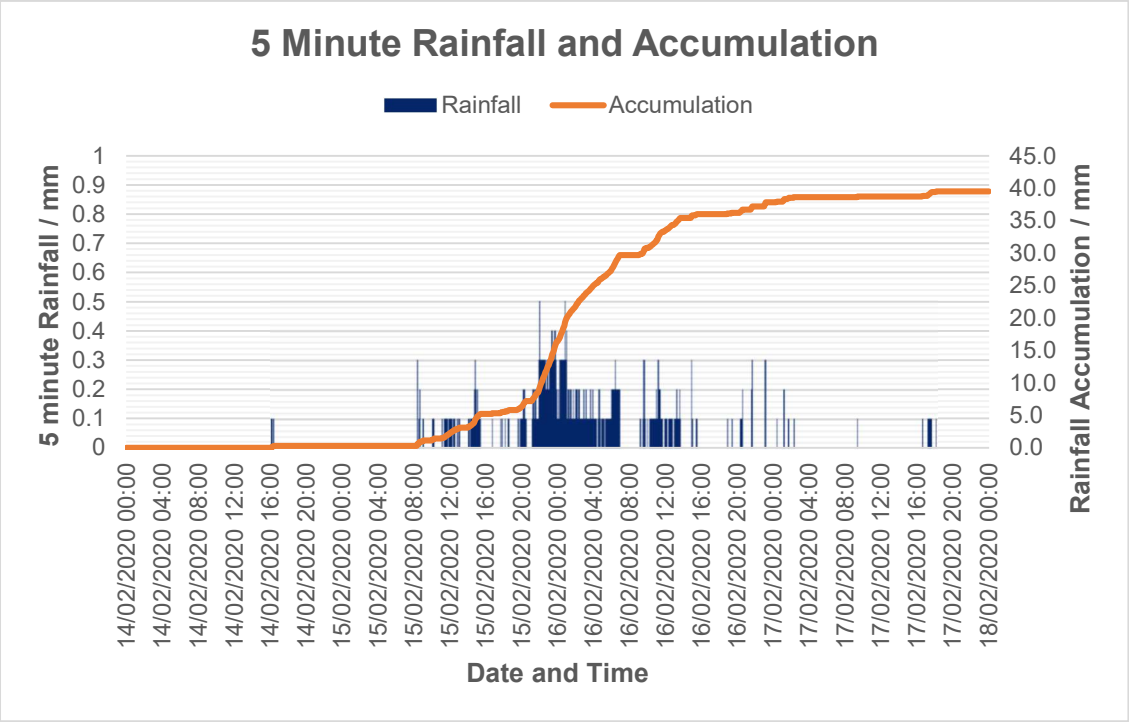


Figure 10: 5-minute Rainfall data for Church Lane, Marchington, from February 14th 2020 to February 18th 2020 (Source: Hydromaster)

The intense period of rainfall prior to the flooding incidents that occurred across the County resulted in significant volumes of surface water flowing over what was already saturated ground.

Analysis of rainfall data in HydroMaster has estimated the rainfall return period of the February 2020 event to be between a 1 and 2 year event (Table 1) and calculations undertaken by the Environment Agency have suggested that the rainfall event equates to a 3 year rainfall event. Whilst this appears relatively insignificant, historic average annual rainfall data from the MET Office shows that for the nearest rain gauge to Marchington (Denstone), the average annual rainfall for the month of February is 62.05mm (based on the baseline climate period 1981 to 2010). Therefore, more than 50% of the monthly rainfall fell over the Marchington area in the two day period between 15th February 2020 to 16th February 2020, making it significant to the area.

Table 1: Rainfall event return periods for Storm Dennis on February 16th and 17th 2020

Event duration	Event occurrence (date / time)	Total rainfall (mm)	Rainfall Intensity (mm/hr)	Event return period
6-hour	15/02/2020 21:10 – 16/02/2020 03:10	16.7	2.8	< 1 year
12-hour	15/02/2020 19:00 – 16/02/2020 07:00	24.0	2.0	> 1 year & < 2 year
24-hour	15/02/2020 13:45 – 16/02/2020 13:45	32.4	1.4	> 1 year & < 2 year
48-hour	15/02/2020 02:25 – 17/02/2020 05:25	38.4	0.8	> 1 year & < 2 year

Similar rainfall totals as presented in the hydroMaster data were recorded by DEFRA Environment Agency rain gauges within the area for the same time period. The closest gauge to Church Lane, Blithfield raingauge, recorded daily (24 hour) rainfall totals as 13.8mm on 15th February and 25.2mm on 16th February, with a total recorded rainfall of 39mm over the two days. Comparable rainfall values were also recorded at Uttoxeter (35.8mm) and Byrkley rain gauge (40.6mm) which are equal distances from the flood location. This demonstrates that close to 40mm of rainfall fell over the wider area prior to the event on February 16th, whilst the ground was already saturated and river levels were high from Storm Ciara the previous week.

Flooding Mechanisms:

The flooding experienced at Church Lane in February 2020 has been identified as river, surface water, highway and sewer flooding. In response to the February 2020 event the Environment Agency published a 'Flood Briefing Note' summarising the flood mechanisms in Marchington, their response to the February 2020 event and details of the works undertaken as part of their ongoing investigation into flooding issues at Marchington. The findings of this investigation demonstrate the complexity of the flooding issues, with multiple flow paths within the village identified containing water from several sources.

Flooding at Church Lane is complicated as the area is low lying and flood water can surround properties from several directions. Flood water also struggles to drain down quickly when levels in the Marchington Brook and River Dove remain high. During the February 2020 event, the catchment was already saturated and river levels were elevated following a sustained period of prolonged rainfall leading up to the event. Flood water was therefore unable to infiltrate into the ground and overwhelmed watercourses and the local drainage network.

Figure 11 demonstrates the main observed flow routes at Church Lane with the following sections describing these in more detail.

Figure 11: Observed flow routes at Church Lane, Marchington

Watercourses:

The Storm Dennis event and associated rainfall impacted watercourse levels and flows within many watercourses in Staffordshire. The predominant flood risk to the village is from the Marchington Brook, with the main flow route from the low spot at Church Lane road bridge (Figure 11, blue Arrows). When the brook reaches a level of 1.4m, the capacity of the culvert beneath the road is exceeded and water spills onto Church Lane. Whilst this does not always result in internal flooding to property, bow waves from passing vehicles can push water into properties that are situated at a lower threshold than the road. This problem can sometimes be exacerbated if surrounding roads such as Jack's Lane and Green Lane are flooded, resulting in more traffic passing through the village and onto Church Lane.

Figure 12 overleaf shows that there were two 15 minute periods of exceptionally intense rainfall on 15th February at 20:00 and 01:45 on 16th February. The Environment Agency has a continuous water level gauge on the Marchington Brook located directly upstream of Church Lane. Environment

Agency recorded river level data show that these two intense periods of rainfall triggered a rise in Marchington Brook levels, and at 04:00 on the 16th February, the river gauge at Marchington recorded the third highest level since the installation of the river gauge in 2000, peaking at a level 1.75m (Figure 12). The water from the brook, combined with the accumulation of surface water resulted in flooding to properties along Church Lane. In addition, given the high water levels in the brook, the local surface water drainage system was unable to discharge into the river, resulting in surcharging of drains and surface water flooding to the highway.

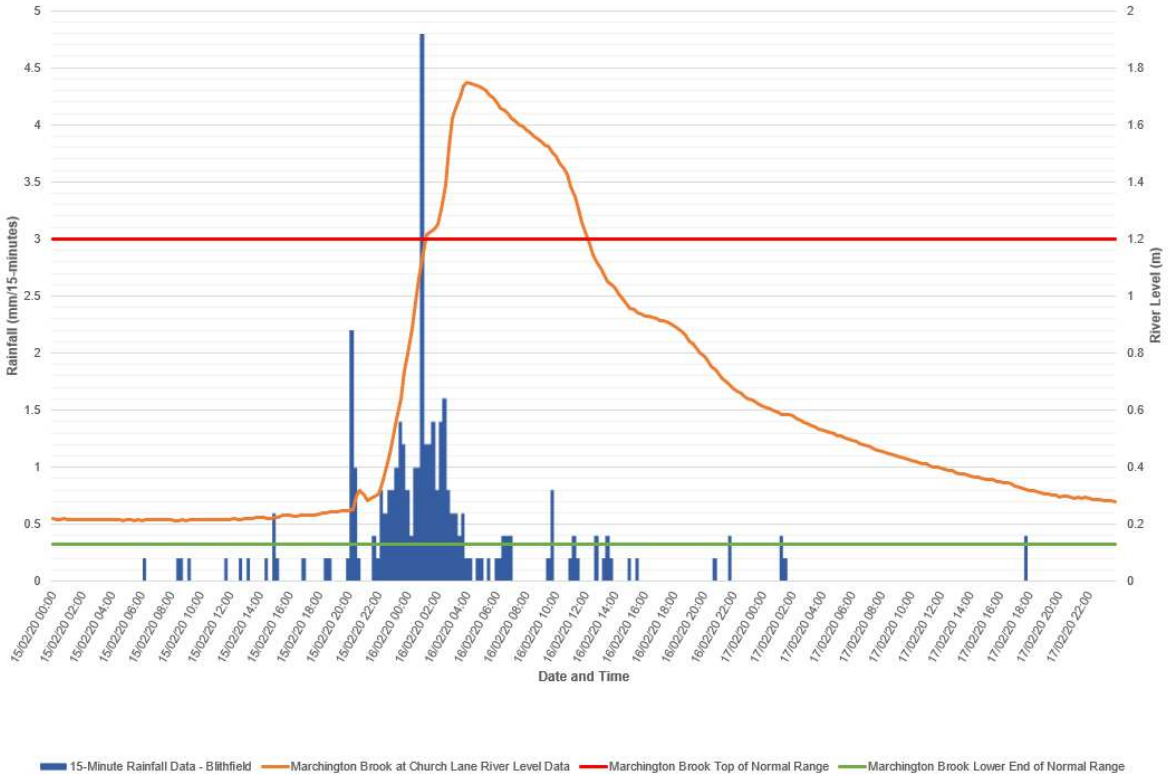


Figure 12: Recorded river level data for the Marchington Brook during the Storm Dennis event on 15th and 16th February 2020 (Data Source: Environment Agency)

Discussions with representatives from the Environment Agency indicate that modelling work undertaken following the storm has estimated that the event corresponded to an event with a 3.33% Annual Exceedance Probability (AEP), or a 1 in 30 year chance of occurring.

The second major flow route occurs as a result of water backing up at Church Lane road bridge. Records indicate that flood water from the Marchington Brook spilled from the right bank into the field upstream of Church Lane bridge (Figure 11, green arrow). This water flows across the field towards the drainage ditch at Silver Lane. Ordinarily the bund at Church Close would direct this water towards Silver Lane ditch to the east. However, during the February 2020 event, the bund behind Church Close was overtopped and by-passed creating an additional flow route down Church Close to Church Lane (Figure 11, pink arrow). As part of their investigation, the Environment Agency undertook hydraulic modelling which suggested that although this increased flood depths along Church Lane, this did not lead to additional properties being flooded.

During the February 2020 event, flooding to property situated towards the eastern edge of the village was also reported. Floodwater was observed spilling from the left bank of Silver Lane ditch onto the road, flowing down the road towards the village (Figure 11, yellow arrow). The ditch receives surface water flows from Marchington Industrial Estate, situated to the south. Flows from the Industrial Estate enter the ditch via a 900mm culvert pipe and then flow parallel to Silver Lane. The ditch is then culverted through two 900mm circular culverts beneath Silver Lane/Church Lane. Flooding to properties at this location occurred as a result of the high volume of water in the channel that backed up behind the culverts, spilling onto adjacent land and following the prevailing topography down Church Lane towards the lowest point in the village at the Post Office. Past site investigations have shown that the ditch course is unmaintained and open to livestock through its length, leading to some parts of the bank collapsing.

Residents have previously raised concerns as to the volume of water entering the ditch from the Industrial Estate. Internal flooding has been experienced at the Industrial estate with flooding from surcharging manholes also observed. However, recent Environment Agency hydraulic modelling has demonstrated that the estate represents only a small area of the total catchment size, contributing only around 5% of the volume of water that flows to the village.

A further identified flow route is downstream of Church Lane road bridge. Anecdotal reports from residents also describe water spilling from the right bank of Marchington Brook downstream of Church Lane bridge. Water was observed flowing across the fields towards the Dog and Partridge public house into the gardens behind properties on Church Lane (Figure 11, orange arrow). The prevailing topography directs flood water from the brook towards the gardens of properties on Church Lane and onto the road itself.

It is known from previous flood events that when Marchington Brook floods, this does not always result in internal flooding to property and bow waves from passing vehicles can push water into properties that are situated at a lower threshold than the road. This problem can sometimes be exacerbated if surrounding roads such as Jack's Lane and Green Lane are flooded, resulting in more traffic passing through the village and onto Church Lane. Staffordshire County Council and emergency response partners have worked with Marchington Flood Action Group to develop a community road closure scheme in response to this problem. This will allow volunteers from the local community to legally close the road on behalf of SCC when the Marchington Brook floods.

The Environment Agency have indicated that their processes for issuing Flood Alerts and Flood warnings have been amended to ensure there is adequate time for the scheme to be implemented.

Highway Drainage & Sewer Network:

Flooding at Church Lane is complicated further by interactions between surface water and river flooding on both the highway drainage and sewer networks. A series of highway gullies connect into two clay pipes that run down Church Lane. These both discharge into Marchington Brook under the road bridge. However, when levels in the brook are elevated, the pipes cannot discharge, and the system becomes overwhelmed. Previous CCTV investigations by Staffordshire County Council have

indicated that the highway drains appear to be in a reasonable condition, however, silt does get deposited at their downstream end which is likely to be caused when water from Marchington Brook backs up into the pipes. There are no outfall flaps on the pipes, however, regular cleansing of the gullies is undertaken, most recently being 18th March 2021.

There have been several reports of combined sewer and surface water flooding from the Severn Trent Water sewer network along Church Lane. At a manhole located outside Brookside House, the sewer network takes a 90 degree turn and observations from residents indicate that the manhole often discharges a number of hours before the brook has reacted. The most likely cause of this flooding is ingress of river and surface water into the sewer network and deposits of silt within the pipes reducing their capacity. It is not clear whether this was an issue during the February 2020 event as Severn Trent Water have now sealed all manholes along the part of the network at Church Lane to help prevent future ingress of river and surface water into the foul sewer network. Further investigation is currently being undertaken by STW to determine the full impact of this work on the sewer network.

Several residents reported issues with Silver Lane pumping station During the February 2020 event. Investigation by STW determined that a power outage had occurred which resulted in the pumping station not operating correctly. Residents reported that once the issue was resolved, water levels receded. Discussions with STW have indicated that they currently have a project in their programme of works to undertake investigation and feasibility work at Silver Lane Pumping station. The purpose of this work is to scope upgrades to the pumping station to improve performance and increase resilience. This will include reviewing the current arrangements at the prison which currently discharge downstream of Silver Lane pumping station.

Groundwater:

It has been noted that some residents described flood water entering their properties through their floors during the February 2020 event. Similar reports have been made during previous flood events, suggesting that groundwater flooding can be an issue, particularly in large events when the ground is saturated and the water table is high.

Conclusion

The flooding event in Marchington during Storm Dennis in February 2020 was the result of an exceedance event, with flooding experienced from a variety of sources including river, surface water, and overwhelmed sewers and highway drainage. A sustained period of prolonged rainfall leading up to the event resulted in the catchment becoming saturated, flood water was therefore unable to infiltrate into the ground and overwhelmed the local drainage network. With river levels already high, the Marchington Brook was unable to convey the volume of water draining to it from the surrounding catchment and water levels rose to exceptionally high levels, resulting in flooding to the surrounding land, several residential and commercial properties in Marchington.

Marchington Brook Flood Alleviation Scheme

Several investigations into the flood risk associated with the Marchington Brook have been undertaken. In 2014, Staffordshire County Council commenced work on a flood risk management project for Marchington to determine the mechanisms of flooding and investigate options to alleviate the flooding. As part of the study, it was determined that the main source of flooding in the village is from the Marchington Brook where the watercourse is classified as 'Main River,' and therefore under the responsibility of the Environment Agency.

In 2018, the Environment Agency took the lead to further investigate the options to reduce flood risk and increase community resilience. This project is named the Marchington Brook Flood Alleviation Scheme (FAS) and is being led by the Environment Agency who are working in collaboration with the various Risk Management Authorities (RMAs) and riparian owners within the catchment.

In March 2020, the Environment Agency completed an Initial Assessment to consolidate information on flood risk issues in the catchment and work on analysis of potential solutions. As part of the work, a business case was developed to justify further financial spend on the project and deliver a scheme. In April 2021, work on the Strategic Outline Case (SOC) was completed and a bid for Local Levy funding was presented to the Trent Regional Flood and Coastal Committee (RFCC) which was accepted. A final business case was developed and approved in May 2022.

As part of the work, the Environment Agency worked with consultants to test a mechanism that could help reduce flood risk at Marchington. Discussions with the Environment Agency in May 2022 outlined that the Capital Scheme is now being progressed and will involve the following works:

- Closing of the gap by Church Lane road bridge to reduce the risk of flooding during lower order events (1 in 2 year event).
- Repairs / enhancements to the Church Close embankment.
- Clearing of culverts on Church Lane to improve the flow of water.
- Property Flood Resilience (PFR)

In addition, the Environment Agency are working closely with Staffordshire Wildlife Trust (SWT), landowners and residents to look at the potential for Natural Floodplain Management (NFM) work across the wider catchment. This project was previously under a Staffordshire wide project but has now been integrated with the Marchington Brook FAS. The aim of this project is to slow and store more water in the upper catchment and improve water quality. A pilot study has been undertaken to install a series of wooden debris dams to slow water. SWT are developing a Small Grants Scheme which is being trialled at Marchington allowing farmers to apply for funds to deliver NFM techniques on their land, with SWT providing advice, information and support. Further details of the scheme are outlined at Natural Flood Management | Staffordshire Wildlife Trust (staffs-wildlife.org.uk).

RECOMMENDED ACTIONS

As part of the ongoing investigation into flood risk at Marchington, an 'Action Log' has been compiled by the relevant RMAs and partners detailing the flood risk issues, recommendations for further investigation and actions associated with those recommendations. Whilst many relate specifically to Church Lane, others are relevant to flood risk across the wider catchment.

Since the storm Dennis flood incident in February 2020, several actions have already been completed. Table 2 below presents the key recommendations and actions and has been updated in conjunction with the relevant RMA responsible for each action to reflect its current status at the time of publishing this Section 19 investigation.

Table 2: Recommendations and Actions

Lead RMA	Actions to Date	Future Actions
Environment Agency (EA)	Development of Marchington Brook Flood Alleviation Scheme (FAS) in partnership with relevant RMAs. Assessment of potential flood alleviation options including option modelling and development of Strategic Outline Case for Local Levy funding (completed April 2021). Final business case approved May 2022.	Capital Scheme is ongoing with Capital build due to start in Nov 2022. Works include closing the gap option on Church Lane, embankment works in field to south of Church Close and clearing of culvert on Church Lane.
Environment Agency (EA)	Opportunities to provide Property Flood Resilience (PFR) measures to homeowners have been explored and initial property surveys undertaken with recommendations put forward to residents. Initial business case approved with project expected to go to contract in May 2022.	Continue to progress PFR options and further consultation with residents with view to complete works by end of 2022.
Environment Agency (EA) & Staffordshire Wildlife Trust (SWT)	Natural Flood Management (NFM) project in progress. Whole Farm Appraisals completed and EA working with landowners to deliver priority measures. Initial measures successfully installed by EA and plans to create additional storage in place.	The NFM project that is currently in progress and likely to run until March 2024. Next update expected in November 2022.

Lead RMA	Actions to Date	Future Actions
Severn Trent Water (STW)	Sewer cleansing work and sealing of manholes along Church Lane completed. Commenced assessment into the condition and capacity of the sewer network and investigations into feasibility work at Silver Lane pumping station to consider upgrades to pumping station, improve performance and increase resilience.	Continue to progress investigative works including monitoring of existing sewer network. Review existing maintenance schedules and explore opportunities to increase frequency of maintenance and/or incorporation of additional maintenance tasks.
SCC Highways & Staffordshire Civil Contingencies Unit (CCU)	Development of a community led road scheme to prevent vehicles driving along Church Lane during a flood event has been developed.	This scheme has now been signed off and is ready for implementation when required.
Staffordshire County Council (SCC) / SCC Highways	Assess the condition and capacity of the highway drainage network and investigate effectiveness of gullies / possibility of re-routing to a more appropriate discharge location.	Review maintenance schedules and explore opportunities to increase frequency of maintenance and/or incorporation of additional maintenance tasks (Timescale: on-going).
EA & SCC	Provision of support for Marchington Parish Council (MPC) in the formation of a Flood Action Group and in the development of a Flood Action Plan to help residents be prepared for future flood events. EA meeting held with the Parish Council to discuss their flood action plan.	EA continued liaison with the Parish Council to provide support with their flood action plan.
ESBC Planning Department	Consideration of the impact of future development on flood risk through the planning application process.	Flood risk challenges within the catchment should be communicated to ESBC planners and Councillor to ensure it has been appropriately considered when assessing future development within Marchington. Timescale: On-going.

In line with the Local Flood Risk Management Strategy for Staffordshire, information on flooding that has happened will also be used to inform, where appropriate:

- Our understanding of the level of flood risk around the County and how we take a risk based approach to prioritising our resources,

- Our understanding of where watercourses and assets, such as culverts and trash screens have caused particular issues and future maintenance needs. We will work to achieve these with land and asset owners,

- Where we can support communities to understand flood risk and become more resilient to flooding,

- Responses to major planning applications to ensure new development does not exacerbate existing flood risk issues and where possible, carefully planned Sustainable Drainage Systems on new developments reduce flood risk elsewhere,

- Partnership working with other flood risk organisations to take a joined up approach to flood risk management,

- Work undertaken by the Staffordshire Local Resilience Forum to be more prepared for future flood events, and

- The future programme for flood alleviation schemes across the County.

RISK MANAGEMENT AUTHORITIES & OTHER PARTIES

In addition to the recommended actions, a Risk Management Authority (RMA) or alternative party has been identified to undertake these actions. The Marchington Flood Alleviation Scheme is being led by the Environment Agency in collaboration with the various RMAs, identified partner organisations and riparian owners within the catchment, each of whom will ensure the action is completed in a timely manner.

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

Environment Agency
https://www.gov.uk/government/organisations/environment-agency

The Environment Agency has a strategic overview of all sources of flooding and hold responsibility for flood risk management activities on Main Rivers. The Environment Agency are the lead organisation for Marchington Brook Flood Alleviation Scheme.

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 (Highways)
Highways authorities have the lead responsibility for providing and managing highway drainage.

East Staffordshire Borough Council (ESBC)
As the Local Planning Authority, ESBC are responsible for determining planning applications within the Marchington Catchment in accordance with local and national policies.

Severn Trent Water (STW)
https://www.stwater.co.uk/my-supply/pipes-and-drains/help-with-pipes/sewer-flooding/

As a water and sewerage company, Severn Trent Water manage the risk of flooding to water supply and sewerage facilities and the risk to others from the failure of their infrastructure. They ensure their systems have the appropriate level of resilience to flooding, and maintain essential services during emergencies, maintain and manage their water supply and sewerage systems to manage the impact and reduce the risk of flooding and pollution to the environment and they provide advice to LLFAs on how water and sewerage company assets impact on local flood risk.

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.

Other Partners

Other Partnerships identified as part of the Marchington Brook FAS include:

- *Staffordshire Wildlife Trust (SWT)*

  Marchington Brook flows into the River Dove and is within the Staffs WT catchment. SWT are the delivery partner for any NFM works and are an important partner in helping to reduce the wider flood risk in Marchington.

- *Marchington Parish Council (MPC)*
  Marchington Parish Council are responsible for the flood action plan and community road closure scheme. They form an important link between the various RMAs and the local community.

- *Property owners*
  The various RMAs have liaised directly with local residents throughout the investigation process to obtain local knowledge of previous flooding and gain a better understanding of the flooding mechanisms. Community events have been held with residents to update them with progress and discuss the potential options for reducing flood risk. Local residents and tenants who are aware that they are at risk from flooding should take action to ensure that they and their properties are protected.

Conclusions

Several storms occurred in 2020 across the Midlands region which impacted many areas. Storm Dennis, in February was a long duration, low-to-moderate intensity event, causing widespread flooding nationwide. Following the February 2020 storm event, incidents of flooding were reported to Staffordshire Council, including Church Lane, Marchington.

The flooding at Church Lane had a significant impact on the community, with records indicating that 11 residential properties and 2 commercial properties including the Dog and Partridge public house and the village shop experienced internal flooding on 16th February 2020. In addition, flooding to outbuildings, gardens, garages, sheds and driveways was also reported. Flooding was also experienced on several roads leading into the village which resulted in some residents becoming cut off and unable to leave their properties.

Four types of flooding have been identified as causes for the instances of reported flooding. These include flooding from rivers, surface water flooding, flooding from sewer infrastructure and flooding from highway drainage.

The multiple and complex sources of flood risk have resulted in several studies to investigate the mechanisms of flooding at Church Lane and to further investigate options to reduce flood risk and increase community resilience. The most recent study, The Marchington Brook Flood Alleviation Scheme, is being led by the Environment Agency in their capacity as lead RMA for the Marchington Brook. This work is ongoing and is being undertaken in conjunction with the various RMAs and identified partners.

Staffordshire County Council in its role as LLFA will continue to work with the Environment Agency and other identified RMAs to try and reduce the flood risk to properties and infrastructure, as well as assisting the local community to ensure that is resilient and prepared for flood events should they occur in the future.