

# **Flood Investigation Report**

**MAIN STREET, LEIRE**

**31<sup>ST</sup> JULY 2019**

**Final Report**

**December 2021**

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# 1 EXECUTIVE SUMMARY

On the morning of the 31st July 2019, two residential properties in Leire village were internally flooded. A heavy<sup>1</sup> rainfall event occurred on 30th July 2019 which continued into the early hours of 31st July (approximately 29.8mm over a 28-hour period, source: Littlethorpe Rain Gauge<sup>2</sup> – located approximately 6km north of Leire). The heavy rainfall resulted in excess surface water falling onto and accumulating on the highway, with minimal highway gullies exacerbating the volume of water accumulating on the highway. The flood water followed the land levels and flowed towards the low point in the highway and pooled adjacent to the impacted residential properties on Main Street. The sheer volume of flood water therefore exceeded the front thresholds of the affected residential properties.

## 1.1 SUMMARY OF FLOOD SOURCES

Ordinary Watercourse	No
Public Sewer	No
Main River	No
Canal	No
Surface Water	Yes
Land Drainage	No
Groundwater	No
Highway Drainage	Yes

## 1.2 RECEPTORS IMPACTED (NUMBER)

Residential	2
Business	0
Other Buildings	0
Roads	0
Critical Infrastructure	0

<sup>1</sup>[https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/library-and-archive/library/publications/factsheets/factsheet\\_3-water-in-the-atmosphere.pdf](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/library-and-archive/library/publications/factsheets/factsheet_3-water-in-the-atmosphere.pdf)

<sup>2</sup> <https://www.gaugemap.co.uk/#!Map/Summary/8147/3490/2019-07-26/2019-08-02>

## 2 INTRODUCTION

### 2.1 SECTION 19 INVESTIGATIONS – DUTY TO INVESTIGATE

Section 19 of the Flood and Water Management Act (FWMA) states:

*(1) On becoming aware of a flood in its area, a Lead Local Flood Authority (LLFA) must, to the extent that it considers it necessary or appropriate, investigate:*

- a. which Risk Management Authorities (RMAs) have relevant flood risk management functions, and*
- b. whether each of those RMAs has exercised, or is proposing to exercise, those functions in response to a flood event.*

*(2) Where an authority carries out an investigation under section 1 (above) it must:*

- publish the results of its investigation, and*
- notify any relevant RMAs.”*

### 2.2 FORMAL FLOOD INVESTIGATIONS CRITERIA

Leicestershire County Council, from herein referred to as “*The Council*”, identified local thresholds for formally investigating flood incidents across Leicestershire within the Local Flood Risk Management Strategy published in August 2015. This policy advises when a formal flood investigation should be undertaken, including where one or more of the thresholds in table 1 occurs as a result of a flooding incident.

A formal investigation into the flood incident on Main Street, Leire, on the 31<sup>st</sup> July 2019 has been undertaken as the event triggered the locally agreed flooding characteristics or discretionary items as indicated below:

**Table 1: Locally Agreed Criteria for Formal Flood Investigations**

<b><u>Mandatory Investigation</u></b>	
Loss of life or serious injury	<b>No</b>
Critical infrastructure flooded or nearly flooded from unknown or multiple sources	<b>No</b>
Internal property flooding from unknown or multiple sources	<b>Yes</b>
<b><u>Discretionary Investigation</u></b>	
A number of properties have been flooded or nearly flooded	<b>No</b>
Other infrastructure flooded	<b>No</b>
Repeated instances	<b>No</b>
Investigation requested	<b>No</b>
Risk to health (foul water)	<b>No</b>
Environmental or ecologically important site affected	<b>No</b>
Depth/area/velocity of flooding a cause for concern	<b>No</b>

### 2.3 RISK MANAGEMENT AUTHORITIES (RMAS)

The following RMAs were identified as relevant to the flooding on Main Street, Leire:

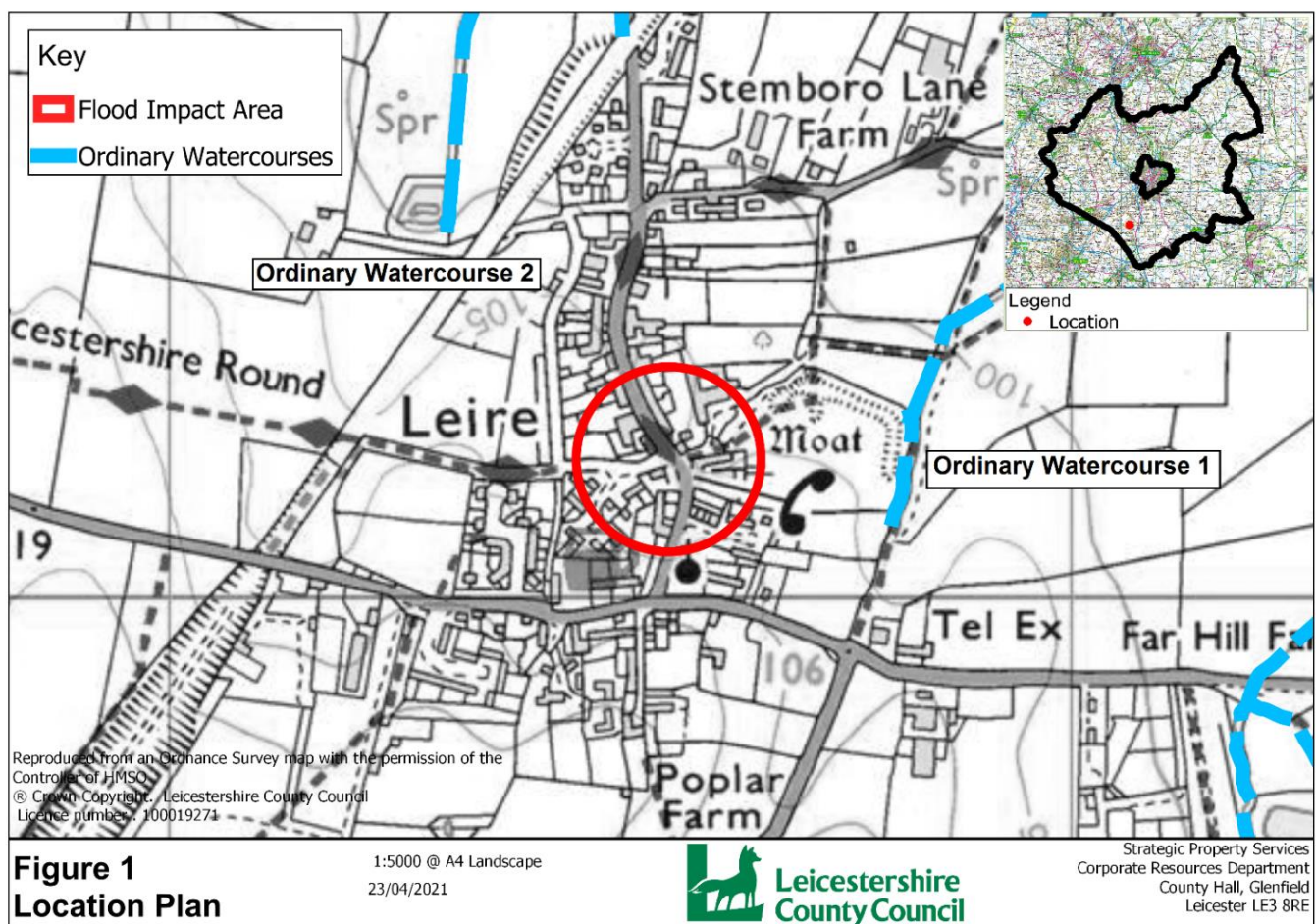
- Leicestershire County Council – Lead Local Flood Authority (LLFA)
- Leicestershire County Council – Local Highways Authority
- Severn Trent Water Ltd (STW) - Statutory undertaker for public wastewater and freshwater assets in Leire.

## 3 FLOOD INVESTIGATION

### 3.1 LOCATION AND SETTING

Leire is a village situated 6km north of Lutterworth in Harborough District (Figure 1). The village is within the River Soar catchment in the Humber River Basin District. The residential properties impacted during the 31<sup>st</sup> July 2019 flooding event are located in the centre of Leire along Main Street which is the main highway that runs through Leire (Figure 1).

### 3.2 LOCAL DRAINAGE



The flood impact area is approximately 2km south from the nearest Main River (River Soar) and is categorised as Flood Zone 1. Ordinary Watercourse 1 (illustrated on Figure 1) flows in a northerly direction parallel to Main Street approximately 250m to the east of the flood impact area before connecting with a tributary of the River Soar approximately 2km north of the village. Ordinary Watercourse 2 (illustrated on Figure 1) flows in a north westerly direction approximately 400m to the north west of the focus area.

In the agricultural fields surrounding Leire, there are two springs and approximately eleven ponds within a 500m radius of the flood impact area. The geology of the flood impact area and the adjacent fields is predominantly sandstone, which has relatively high porosity and permeability. These factors suggest that the area has a naturally high water-table.

Main Street is served by a traditional highway drainage system which uses a system of gullies and piped sewers. The village is served by foul and surface water sewer networks, owned and

maintained by STW. The surface water system consists of a 300mm diameter pipe which flows east along Back Lane, passing perpendicular through Main Street, before outfalling into Ordinary Watercourse 1 (Figure 1). A separate 150mm surface water system starts along Main Street within the flood impact area and flows in a northerly direction along Main Street before upsizing into a 225mm diameter system. There is also a 225mm diameter STW foul sewer system which flows in a northerly direction along Main Street.



## 4 FLOODING INCIDENT ON 31<sup>ST</sup> JULY 2019

The majority of the information supporting the description of the flooding incident is based on first-hand accounts and flood survey information provided by affected residents.

### 4.1 PRIOR TO THE EVENT

Early July 2019 was dominated by dry conditions but following the 25th July 2019, successive rainfall events were recorded for the remainder of the month resulting in heavily saturated catchments. The most significant rainfall event was on the 30th July which brought major disruption through surface water flooding to central and northern parts of Britain. This heavy rainfall event fell onto the already saturated catchment, resulting in high volumes of surface water present across Leire's catchment area.

There is a voluntary flood warden in Leire who supports with community engagement during flood events, however there is no flood action plan due to the flooding within the village being a localised issue.

In 2017, the Council undertook drainage improvement works along the highway drainage system on Main Street to increase the capacity of the system. A private drainage system was identified in the garden of one of the impacted residential properties which took highway surface water, however the system was cut off by an unknown infrastructure to the east of the flood impact area towards Eaglesfield. The Council, with the agreement of STW, therefore fitted a new manhole and a highway drainage system which connects into the STW surface water system along Eaglesfield to directing the highway surface water away from the severed private drainage system. The private system remains in situ however no longer takes highway surface water. Due to the system being located on private land, the Council was unable to conduct further investigations on the system's possible impact on the flood event. The riparian landowners were made aware of this at the time and their responsibilities to maintain the asset in the future.

As the internal flooding reported in July 2019 occurred following these improvement works, the flooding was believed to be due to an unknown source which reaches the threshold for the Council to conduct a formal flood investigation. The Council has therefore conducted this formal flood investigation to explore other possible flood sources which resulted in the internal flooding of two residential properties.

### 4.2 FLOOD EVENT

It was anecdotally reported that following the heavy rainfall event highway flood water was flowing east along Back Lane onto Main Street and towards the low point adjacent to the impacted residential properties. Flood water was also anecdotally reported flowing north along Frolesworth Road towards the flood impact area. The volume of highway flood water overwhelmed the local drainage network within the flood impact area (Figure 1), resulting in the flood water levels exceeding the highway kerb face. The flood water subsequently flowed onto the driveways of at least two residential properties on Main Street, where it then breached the thresholds of the residential properties and caused internal flooding (Photos 1 and 2).



**Photo 1: the debris left behind in one of the impacted residential properties following the flood event**



**Photo 2: external flood levels witnessed from one of the impacted residential properties**

### **4.3 POST FLOOD EVENT**

Following the flooding, the Council conducted a range of site visits, meetings, investigations and analysed all available data. The Council also distributed questionnaires and spoke directly with the affected residents to help understand the flooding mechanisms.

The Risk of Flooding from Surface Water Map (Figure 2) has been produced by the Environment Agency (EA) and created using high-level modelling which represents where water would fall during certain rainfall events<sup>3</sup>. The arrows in Photos 3,4,5 in Figure 2 indicate the flow directions of the surface water which was anecdotally reported following the flood event and witnessed during a site visit conducted by the Council during a rainfall event in February 2020.

<sup>3 3</sup> <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>





**Figure 2:**  
**Risk of Flooding from Surface Water**

1:2000 @ A4 Landscape  
27/05/2021

Figure 2 indicates a highway surface water flow route from Frolesworth Road along Main Street in a northerly direction towards the flood impact area (Photo 3 in Figure 2). During the site visit, it was noted that there was a limited number of highway gullies located along Frolesworth Road and the south of Main Street. As Leire is a historic village, there are relatively less highway gullies than newer highway developments. There is therefore little interception of water flowing on the surface of the highway.

Figure 2 also illustrates a medium risk surface water flow path from Oak Avenue in a northerly direction (Photo 4 in Figure 2), and onto Back Lane where it flows in an easterly direction towards the flood impact area (Photo 5 in Figure 2). It was also noted that there are few highway gullies along Oak Avenue and Back Lane which would have further contributed towards the volume of highway flood water accumulating near the residential properties that were impacted as there was little surface interception of the flow.

Figure 2 highlights that the flood impact area is categorised as high risk from surface water flooding, indicating it is situated in a relatively low topographic point. The site visit conducted by the Council also found a natural dip in the highway along the front of the impacted residential properties. This supports the data in Figure 2 and the anecdotal reports of highway flood water accumulating outside the front of the impacted residential properties during the flood event.

The prolonged rainfall prior to the event, discussed in Section 4.2, and the geology of the sub-catchment indicates that the water table would have been relatively high prior to the event. This would have decreased the infiltration capacity of the catchment area and subsequently increased the volume of overland surface water flows within the catchment. Land height data available to the Council indicates that agricultural land to the south of the flood impact area has a relatively higher topography and falls in a northerly direction towards the flood impact area which is at a low point within the catchment. This would have added to the volume of highway flood water. Although this wasn't anecdotally reported, land height data does support this analysis.

The site visit indicated that the land to the north of the flood impact area falls away from the impacted residential properties. This indicates that any highway flood water to the north of the flood impact area would have flowed away from the impacted residential properties.

During the site visit, flood water from the roofs of adjacent residential properties (that were not impacted during the flood event) was witnessed to be flowing towards the impacted residential properties along a small concrete concave channel to the front of the residential properties (Photo 6). This would have added to the volume of flood water flowing onto the private driveways of the two impacted residential properties.





**Photo 6: Small concrete concave channel which runs along the front of the impacted residential properties (main photo taken from Google Maps in July 2011 and small photo taken in May 2021).**

Investigation work conducted by the Council following the flood event concluded that the highway drainage system, upgraded in 2017, was fully functioning. An unmarked drainage system (not available on any mapping available to the Council) was also found within close proximity to the flood impact area. Root ingress was identified and removed within the section of the storm water system, which was then reconnected into the STW surface water network approximately 35m south of the flood impact area. The Council's investigation has identified some anomalies within the STW mapped assets which are in close proximity to the flood impact area.

A second flood event was reported on 29<sup>th</sup> September 2019 resulting in the internal flooding of at least one residential property (Photos 7 and 8). This event was similar in nature to the 31<sup>st</sup> July 2019 flood event with highway flood water flowing towards the residential properties and pooling on the highway. The Council conducted further investigation works and completed maintenance works on the highway gullies along Main Street to remove siltation. Following this investigation, STW conducted further investigation works along their surface water assets on Main Street to the system's outfall at approximately OSNGR Easting: 452829, Northing: 290205. No restrictions or issues were found within the STW surface water system during this investigation. As the investigation works were completed several months following the initial flood event, it is not definitive that there was no obstruction within the system during the flood event which may have exacerbated the volume of highway flood water.



**Photo 7: highway surface water exceeding the thresholds of the highway onto private property on 29<sup>th</sup> September 2019.**



**Photo 8: surface water flooding to residential property threshold on 29<sup>th</sup> September 2019.**

#### **4.4 SUMMARY OF IMPACTS AND FINDINGS**

The result of the combination of factors described below resulted in the ingress of storm flood water to two residential properties on Main Street in Leire on 31<sup>st</sup> July 2019:

- The catchment area had experienced higher than average rainfall in the preceding days to the flood event resulting in the catchment being heavily saturated.
- The intense rainfall event prior to the flood event resulted in a high volume of rainwater falling over a short period of time which quickly overwhelmed the already saturated catchment and caused significant overland surface water flows.
- The steep gradient of the highways to the south of the flood impact area, along with the relatively few number of highway gullies, meant that there was little interception to the flow of highway flood water flowing south along the village highways towards the flood impact area.
- The natural low topography of the highway adjacent to the impacted residential properties resulted in highway flood water accumulating outside the residential properties and overwhelming the adjacent highway gullies.
- The volume of flood water on the highway breached the highway threshold and flowed onto the private driveways and subsequently into the impacted residential properties.

There are also factors that may have influenced the severity of the event; however, at the time of writing this report there is no firm evidence that these factors would have prevented any of the internal flooding experienced by this event. These factors include:

- The naturally high water-table would have further decreased the infiltration rates of the catchment, and subsequently increased overland surface water run-off from agricultural land onto the highway.
- Agricultural land to the south of the flood impact area falls in a northerly direction towards the flood impact area, therefore overland surface water flows would have flowed towards the flood impact area and added to the volume of highway flood water.
- The roof and driveway drainage from adjacent residential properties into the small concrete concave channel located to the front of the affected residential properties would have resulted in additional flood water following the topography of the land and flowing towards the impacted residential properties.



## **5 RESPONSIBILITIES**

### **5.1 LEAD LOCAL FLOOD AUTHORITY (LCC)**

As the LLFA, the Council has the responsibility to co-ordinate the management of flood risk and the interaction of RMAs across Leicestershire. For more information please refer to the Local Flood Risk Management Strategy.

### **5.2 BOROUGH/DISTRICT COUNCIL**

Borough/District Councils have powers under Section 14 of the Land Drainage Act 1991 (LDA) to undertake flood risk management works on ordinary watercourses (excluding Main Rivers), where deemed necessary. Under Section 20 of the LDA, Borough/District Councils have the power (by agreement of any person and at their expense) to undertake drainage work which that person is entitled to carry out and maintain.

### **5.3 HIGHWAY AUTHORITY (LCC)**

The Local Highway Authority has a duty to maintain the Highway under Section 41 of the Highways Act (1980). Section 100 states that the Council also has the responsibility and power to prevent water running onto the highway from adjoining land.

### **5.4 SEVERN TRENT WATER**

Water and sewerage companies are responsible for managing flood risk related to surface water, foul water and combined sewer systems. Public sewers are designed to protect properties from flood risk in normal wet weather conditions. In extreme weather conditions however, there is a risk of these public sewers being overwhelmed resulting in sewer flooding.

### **5.5 RIPARIAN LANDOWNERS OF WATERCOURSES AND HOMEOWNERS**

Riparian landowners have certain rights and responsibilities including:

- They must maintain the bed and banks of their watercourse, including the trees and shrubs growing on the banks;
- They must clear any debris, even if it did not originate from their land. This debris may be natural or man-made;
- They must keep any structures that they own clear of debris. These structures include (but are not limited to) culverts, trash screens, weirs and mill gates.

A full explanation of the rights and responsibilities of riparian ownership are given on the 'Owning a Watercourse' government webpage found at <https://www.gov.uk/guidance/owning-a-watercourse>

Local residents and tenants who are aware that they are at risk of flooding should take action to ensure that they and their properties are protected.

Community resilience is important in providing information and support to each other if flooding is anticipated. Actions taken can include; signing up to Flood Warning Direct (if available), nominating a community flood warden, producing a community flood plan, implementing property level protection and moving valuable items to higher ground. More permanent measures are also possible such as installing floodgates, raising electrical sockets, and fitting non-return valves on pipes.

## 6 RECOMMENDATIONS/ACTIONS

### 6.1 LEICESTERSHIRE COUNTY COUNCIL

The County Council (LLFA) has agreed / completed the following actions:

<b>ACTION</b>	<b>PROPOSED TIMESCALE</b>
To continue to coordinate the actions of the RMAs in relation to the flooding incident and feedback to the community as appropriate.	<b>Ongoing</b>
To support the affected residents in providing guidance and information to help them become more resilient to flooding.	<b>Ongoing</b>
Engaged with the riparian landowners of the discussed private drainage system to ensure they are aware of their riparian responsibilities.	<b>Completed</b>
To investigate all available sources of funding for installing PLR in collaboration with all partners.	<b>12 months from publication date</b>

The County Council (Local Highways Authority) has agreed/completed the following actions:

<b>ACTION</b>	<b>PROPOSED TIMESCALE</b>
In 2017, the Council undertook drainage improvement works along the highway drainage system on Main Street to increase the capacity of the system.	<b>Completed</b>
Completed maintenance works on the highway drainage system to remove siltation from the highway gullies and undertook a CCTV survey of their assets on Main Street.	<b>Completed</b>
Installed a new manhole and highway drainage system to redirect the highway surface water away from the severed private drainage system and into the STW surface water system.	<b>Completed</b>

To review the appropriateness of conducting a modelling survey of the existing public highway drainage infrastructure to ensure that the volume of the current system and network is appropriate for the volume of water from the highway.

**9 months from publication date**

To work with the LLFA to investigate all available sources of funding for installing PLR.

**12 months from publication date**

## **6.2 SEVERN TRENT WATER**

Severn Trent Water (STW) has agreed/completed the following actions:

<b>ACTION</b>	<b>PROPOSED TIMESCALE</b>
Completed a CCTV survey of the surface water system which serves Main Street to its outfall. No restrictions or issues were found within the system.	<b>Completed</b>
Collaborated with the Council to support the installation of a new manhole and highway drainage system which redirects highway surface water away from the severed private drainage system into the STW surface water system.	<b>Completed</b>
To work with the Council on updating their mapped assets to include the systems found during the highway drainage systems investigation works to support the possible modelling survey of the existing public highway drainage infrastructure.	<b>12 months from publication date</b>
To work with the LLFA to investigate all available sources of funding for installing PLR.	<b>12 months from publication date</b>

### **6.3 COMMUNITY MEMBERS / INDIVIDUAL HOMEOWNERS**

Local residents and tenants who are aware that they are at risk of flooding should take action to ensure that they and their properties are protected. Community resilience is important in providing information and support to each other if flooding is anticipated. Actions taken can include: signing up to Flood Warning Direct (if available), nominating a community flood warden, producing a community flood plan, implementing property level protection and moving valuable items to higher ground. More permanent measures are also possible such as installing floodgates, raising electrical sockets, and fitting non-return valves on pipes.

### **6.4 STATUS OF REPORT AND DISCLAIMER**

This report has been prepared as part of the Council's responsibilities under the FWMA.

The findings of the report are based on a subjective assessment of the information available by those undertaking the investigation and therefore may not include all relevant information. As such it should not be considered as a definitive assessment of all factors that may have triggered or contributed to the flood event.

The opinions, conclusions and any recommendations in this report are based on assumptions made by the Council when preparing this report, including, but not limited to those key assumptions noted in the report, including reliance on information provided by others.

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