

## Flood and Waste Management Act 2010

### Section 19 Flood Investigation Report for Storm Water Flooding at Meadow Street and Railway Street, Llanhilleth

Report Date: June 2021



# Flood and Water Management Act 2010

## Section 19 Compliance: Flood Investigation Reports

### Introduction

In accordance with Section 19 of the Flood and Water Management Act 2010 (FWMA), all Lead Local Flood Authorities (LLFAs) have a duty to investigate all significant flood events that occur in their area to the extent they deem necessary. The LLFA must investigate which risk management authorities have relevant flood risk management functions and whether those flood risk management authorities have exercised those functions in response to the flood.

A significant flood event is defined as follows:

- 20 or more properties flooded internally from the same source of flooding, or
- Trunk roads, principal A roads or main distributor roads linking urban centres with the primary network are closed for 4 hours or more, or
- Secondary distributor roads (B and C roads) linking villages to the distributor network are closed for 10 hours or more, or
- There is risk to human life

Following the flood events in Llanhilleth during Storm Dennis (15<sup>th</sup> February – 17<sup>th</sup> February 2020), which affected 89 homes, Blaenau Gwent CBC, as Lead Local Flood Authority, must carry out a flood investigation and report on its findings.

### Contents for Flood Investigation Report:

1. **Executive Summary:** summarising the key points and findings of the investigation
2. **Site Location:** describe flooded area, provide site plan, OS grid reference and table identifying the location and designation of watercourses in the affected and surrounding areas.
3. **Site Location and Catchment Description:** describe topography, geology using available maps and surveys, watercourses and highway drainage.
4. **Flooding Incident**
5. **Flood Investigation**
6. **Conclusion**

## **1 Executive Summary**

Following extremely heavy rainfall during Storm Dennis between 15<sup>th</sup> and 16<sup>th</sup> February 2020, significant storm water flooding occurred throughout southern Blaenau Gwent. Between 9 am on Saturday 15<sup>th</sup> February and 9 am on Sunday 16<sup>th</sup> February 108 mm of rainfall fell, which is 95 per cent of the month's Long Term Average (LTA) rainfall. This Section 19 Report is focussed on Meadow Street and Railway Street, Llanhilleth, where 89 properties were flooded. Two residential streets were flooded by surface water during the storm event, causing disruption to many families and damage to homes and businesses.

Blaenau Gwent County Borough Council is the Lead Local Flood Authority for Blaenau Gwent, and under the Flood Water Management Act 2010 it has a duty to investigate any significant flooding that occurs within the county borough, particularly the cause of the flooding and Blaenau Gwent CBC's operational response.

The investigation found that the surface water flooding was caused by exceptionally heavy rainfall, high volumes of surface water run-off and blockages in the drainage infrastructure.

## **2. Report Scope**

The purpose of the report is to review the flooding incident that occurred at Meadow Street and Railway Street, Llanhilleth between 15<sup>th</sup> and 16<sup>th</sup> February 2020 and the operational response. The report will also investigate the causes of the surface water flooding, and will identify those responsible for flood risk in the study area and what actions are required in order to reduce the risk of flooding in the future.

The information used to inform this flood investigation report is as follows:

- Eyewitness statements
- Site photographs taken during the flood incident and immediately after
- Call logs recorded by BGCBC Neighbourhood Services
- A report on the Sewage Pumping Station (The Fields, Llanhilleth), produced by Dwr Cymru Welsh Water (March 2020)
- Assessment of needs spreadsheet for the affected houses recorded by BGCBC Revenues
- CCTV surveys of the existing drainage system after the event

All site photographs in relation to the report can be found in Appendix A of this report.

A copy of the Sewage Pumping Station (The Fields, Llanhilleth) (DCWW, 2020) can be found in Appendix B.

### **3. Site Location and Catchment Description**

The small village of Llanhilleth is located at the southern end of Blaenau Gwent in the South Wales valleys. In 2011, the Census recorded that population of Llanhilleth was just under 5000 people. There is a small high street, located on Commercial Road and High Street, within the village, which has a range of shops including a pharmacy and convenience store.

The study area, where the flooding occurred, comprises of two adjacent residential streets in the north of the village; Meadow Street and Railway Street. Meadow Street is located north of the River Ebbw, and Railway Street is located immediately north of Meadow Street. Both streets have two rows of terraced houses; Meadow Street has 72 properties and Railway Street has 70 properties. The central Ordnance Survey coordinates for the site are: 321588 E, 200719 N.

The streets lay on generally flat, low lying ground that is level with the top of the river bank. However, a topographic survey has shown that the streets have a gentle undulation, and the levels differ throughout the length of the street in an east to west direction, which means there are some low points, particularly in the middle of each street which creates a shallow bowl effect in an east to west direction. For example, manholes in the carriageway at each end of Meadow Street have a level of 139.74 AOD. A gulley outside No. 47 Meadow Street recorded a level of 139.08m AOD, which is a difference of 0.66 m. Similarly, a manhole at eastern end of Railway Street has a cover level of 141.27m AOD, and at the carriageway at the western end of the street has a ground level of 139.62 m AOD. A gulley outside No. 27 Railway Street, has a level of 139.12, which is lower than the eastern and western ends by 2.15m and 0.5m respectively.

Above these two streets are the railway line and the high street, which has a recorded level of 165.2 m AOD at its highest point. Blaen Cuffin Road, which is located off junction with High Street has a recorded level of 173.4 m. In a relatively short distance of 212 m, there is a change in level of almost 35m in a north to south direction.

A flood defence wall was built along this section of the River Ebbw in 1989 by the Environment Agency to prevent fluvial (river) flooding

To the east of the study area are the Llanhilleth Miners' Institute and St Illtyd's Primary School. To the north of the study area is a Llanhilleth Railway Station which forms part of the Ebbw Vale to Cardiff Central railway route. To the west of the study site are two more residential streets and to the south of the site is the River Ebbw.



Figure 1 below shows a map of Blaenau Gwent, its boundary indicated by a red line. Llanhilleth is shown at the southern end of the county borough. Figure 1 also shows the location of the NRW operated rain gauging stations within the county borough.



Figure 1 Map of Blaenau Gwent showing where Llanhilleth is located along with the two Rain Gauging Stations that are monitored by NRW – Ordnance Survey Maps

Figure 2 Below is a site location plan of Meadow Street and Railway Street in relation to the River Ebbw, the railway line and Commercial Road.



Figure 2 Site Location Plan of Meadow Street and Railway Street, Llanhilleth

### 3.1 Catchment Description

The River Ebbw source is the Mynydd Llangatwg and from this point travels through the north east region of the South Wales Valleys. It transcends two river management catchments; the Usk and South East Valleys catchments, which are both managed by Natural Resources Wales. The River Ebbw runs through terrain characterised by relatively steep, narrow channels and limited groundwater. As a result of these conditions, the river reacts quickly to intense rainfall, 'which limits the time available to issue flood warnings' (NRW, 2020: 14). Equally, once rainfall stops the river levels reduce quickly (NRW, 2020).

### 3.2 Ordinary Watercourses and Drainage

The Lead Local Flood Authority for the area is Blaenau Gwent County Borough Council, which has a duty to oversee and manage ordinary watercourses (smaller rivers, streams, surface water and groundwater). Blaenau Gwent CBC has set up regular inspection and maintenance routines of its assets as well as undertaking additional inspections as and when required.

Highway drainage is managed by the Blaenau Gwent Highway Authority, which is responsible for inspections and maintenance of drainage gullies and other highway drainage infrastructure, ensuring it is free of debris and other obstructions to allow surface water to drain away effectively from the highway.

The Nant Cuffin watercourse which takes water from the mountainside above Llanhilleth to the river, enters a large storm water culvert, approximately 800mm diameter where it

crosses under Blaencuffin Road, Llanhilleth, and continues in a southerly direction towards the River Ebbw. It travels underneath Commercial Road, the railway line and the link road between Meadow Street and Railway Street. The outfall of the culvert is located immediately west of the footbridge that crosses the river.

## 4.0 Flooding Incident February 2020

### 4.1 Weather Conditions

Prior to February 2020, the winter of 2019/2020 was one of the wettest on record since records began in 1862, therefore, the ground was already saturated before the February storms arrived. Storm Ciara was the first storm to hit Wales in February 2020, followed by Storm Dennis a week later.

#### 4.1.1 Rainfall

During Storm Dennis, which took place between 15<sup>th</sup> – 16<sup>th</sup> February 2020, a rainfall gauge based at Carno Reservoir, Ebbw Vale, which is located 8 miles north of Llanhilleth, recorded the equivalent of half a month's rainfall in 12 hours - 68mm of rain - and the equivalent of an entire month's rainfall in 36 hours - 128 mm of rain. In Cwmtillery, located 4 miles north of Llanhilleth, a rain gauge received 95% of February's Long Term Average rainfall within 24 hours. Table 4 below shows the rainfall received in a 24-hour period between 9:00 GMT on 15/02/20.

Table 4.1.1 Rainfall recordings in 24-hour period on 15/02/20

Name of Rain Gauge	National Grid Reference	Total Rainfall from 9:00 GMT on 15/02/20 to 9:00 GMT on 16/02/20 (mm)
Carno	SO1621313036	115
Cwmtillery	SO2209906893	108.2

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Figure 3 is a Rainfall Isohyet Map showing rainfall over a 48-hour period during Storm Dennis in South Wales. The colours on the map show the intensity of the rainfall over the South Wales Valleys during Storm Dennis. The lighter shaded areas are where the most intense rainfall was observed during this period. One area was located over Cwm, Blaenau Gwent, which is upstream of Llanhilleth.



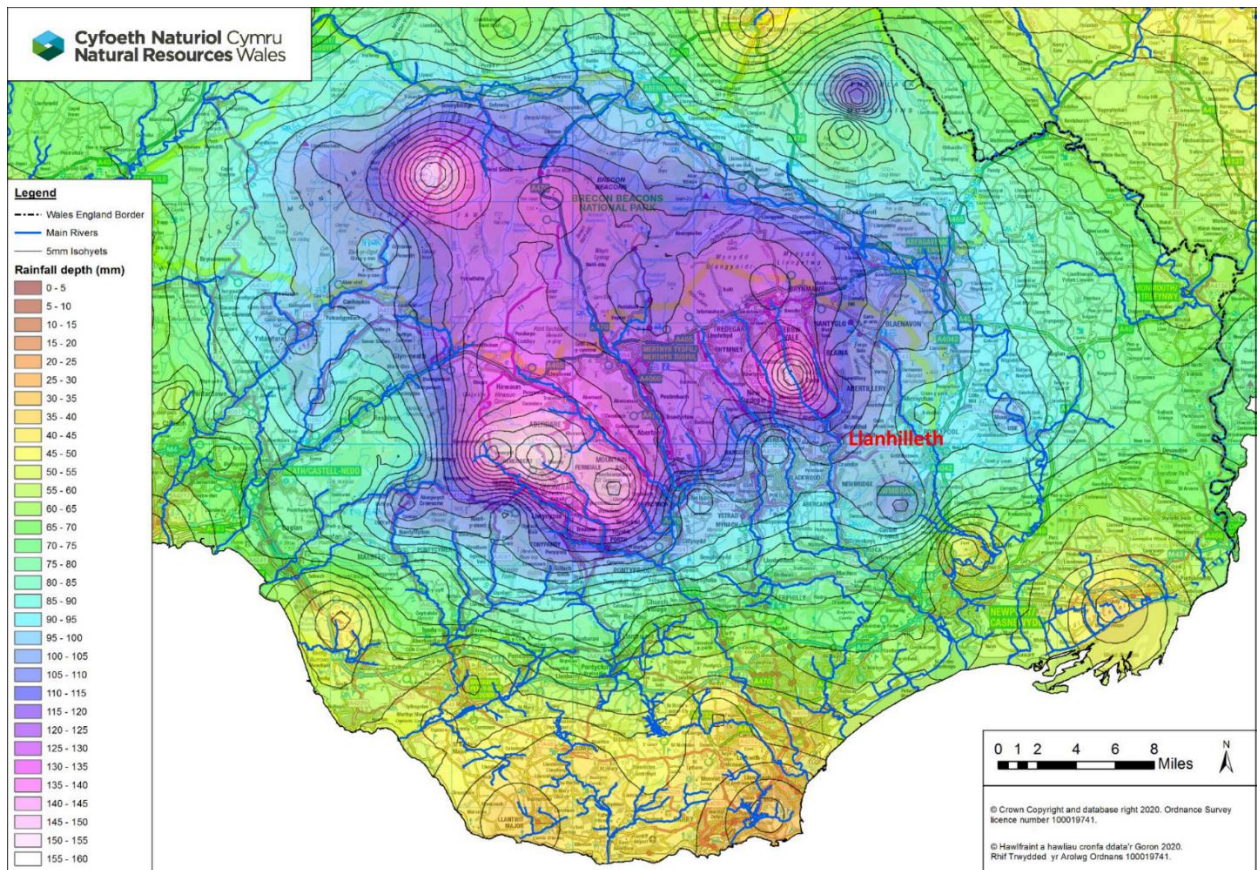


Figure 3 Isohyet Map of Rainfall across South Wales during Storm Dennis (NRW, 2020)

#### 4.1.2 River Flows

The high intensity rainfall received during Storm Dennis had a big impact on the River Ebbw's levels. The table below shows the peak stage each river station recorded during Storm Dennis (each station is located upstream of Llanhilleth). For comparison purposes, the average river flow recorded at Aberbeeg is 0.8 m and the lowest recorded is 0.38 m.

Table 4.1.2 Peak River Stage recordings along the River Ebbw during Storm Dennis

Gauging Station	Date and Time of Peak	Peak Stage (m)
Aberbeeg	16/02/2020 04:00	1.819
Cwm	16/02/2020 02:45	1.235

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#### 4.2 Flood Alerts and Weather Warnings

Before Storm Dennis arrived, 65 flood alerts, 89 flood warnings and 4 severe flood warnings were issued throughout South Wales.

On 15<sup>th</sup> February 2020 at 11:15 am the MET Office issued an Amber Warning for heavy rain for South East Wales. The warning advised that the heavy rain could lead to fast flowing or

deep floodwaters that could endanger life, cause flooding to homes and businesses and flood waters could completely cut off communities for days.

Blaenau Gwent CBC's Civil Contingencies Team received flood alert data from NRW for three of its river stations within Blaenau Gwent on 15<sup>th</sup> February 2021 at 13:34. The flood alert stated flooding was possible for the River Ebbw and River Sirhowy, which is also located in Blaenau Gwent but travels along a different valley and is completely within the South East Valleys River Catchment.

Despite the record breaking high river levels recorded by the river stations, witness reports state there was no fluvial (river) flooding at Llanhilleth. The existing flood protection wall located along the river protected the area from river flooding.

## **5.0 Flood Investigation**

This Section 19 focuses on the cause of the localised surface water and ordinary watercourse flooding that occurred between the 15<sup>th</sup> and 16<sup>th</sup> February 2021 and watercourse maintenance carried out following the incident.

### **5.1 Incident Response**

Blaenau Gwent CBC is the Lead Local Flood Authority for Blaenau Gwent and its Community Services Section were part of conference calls held by NRW on Friday 14<sup>th</sup> February 2020 to discuss preparations to be made for any potential flooding. Actions from the conference call to be completed by BGCBC were as follows:

- Additional response teams put on standby for the weekend.
- Sand bags prepared (Filled).
- All culverts on inspection regimes checked again and monitored overnight.
- Critical gullies checked.

On the 15<sup>th</sup> February 2020, three more calls were made with NRW at 12:00 hours, 18:00 hours and 22:00 hours to ensure measures were in place to help monitor river levels and respond to flooding calls from residents. There were further conference calls at 04:00 hours and 10:30 on the 16<sup>th</sup> February 2020.

South Wales Fire & Rescue Service and Blaenau Gwent CBC first attended site on the 15<sup>th</sup> February 2020 following emergency calls and reports of flooding made by residents.

Blaenau Gwent CBC attended Meadow Street and Railway Street in response to reports of flooding and blocked gullies made by residents. Sandbags were provided at properties to stem and divert the flow of the flood water away from properties.

At 03:55 am on 16<sup>th</sup> February 2020 BGCBC Community Services contacted Dwr Cymru/Welsh Water (DCWW) to report a suspected pump failure at a pumping station located on the river bank east of Meadow Street.

A gully outside No.34 Railway Street was jetted to dislodge a blockage in an inspection chamber in the rear lane between Meadow Street and Railway Street. Once the blockage was removed the water quickly drained away.

Blaenau Gwent CBC made arrangements for the disposal of all flood damaged house contents, including carpets and floor coverings, furniture, white goods, kitchen units and electrical appliances.

## **5.2 Recovery and Investigation**

A total of 86 homes were affected by surface water flooding within Railway Street and Meadow Street, Llanhilleth, which is 60 per cent of the homes within the two streets. The cause of the flooding was a combination of high intensity rainfall over a prolonged period, saturated ground from one of the wettest winters on record and blockages in the storm drainage infrastructure. The flood waters had subsided by 17<sup>th</sup> February 2020, clearly showing the damage that had been caused to residents' homes.

The recovery of the flood was coordinated and led by Blaenau Gwent CBC's Civil Contingencies Team. A temporary refuge centre was set up in Llanhilleth Miner's Institute for residents displaced from their homes by the flood waters. A door knocking exercise commenced on 16<sup>th</sup> February 2021 to check on residents and ask whether they required any assistance. Vulnerable residents were offered temporary accommodation at the Miner's Institute or at homes managed by United Welsh Housing Authority (UWHA). Residents whose furniture and white goods had been damaged were offered replacements in joint partnership between Blaenau Gwent CBC and United Welsh Housing Authority.

Electrical testing of flood damaged homes was arranged by Blaenau Gwent CBC.

### **5.2.1 Dwr Cymru/Welsh Water (DCWW)**

Following the call from BGCBC, DCWW attended site on the 16<sup>th</sup> February 2020 to investigate the pumping station. DCWW led their own enquiry into the suspected pumping station failure and produced a report that states the telemetry panel showed the pumps to be working during the time the River Ebbw reached its highest peak of 1.82m at 04:00 on 16<sup>th</sup> February 2020 therefore, it is unlikely any failure contributed to the flooding at Meadow Street and Railway Street.

The report also notes that the culvert flowing into the pumping station was full of debris, which built up in the outfall, prohibiting the free flow of water away from the pumping station. The site photographs taken of the culvert outfall show a mass of silt and small stones in the culvert, which led to loss of capacity. A copy of the report can be found in Appendix B of this report.

### **5.2.2 Blaenau Gwent CBC**

Blaenau Gwent CBC investigated the blocked culvert, manholes and gullies reported by residents. Investigations by BGCBC revealed the following:

#### **a) Partial Blockage of Inspection Chamber at Link Road Between Meadow Street and Railway Street:**

A large piece of composite board was found in the main storm water culvert underneath eastern link road between Meadow Street and Railway Street. The board caused a partial blockage in the culvert and the force of the water surcharging from the inspection chamber 'blew the cover off' according to one eye witness. The surcharging water discharged from the inspection chamber, which has a ground level of 140.48m AOD, and quickly flowed towards the low points in the rear lane and Meadow Street, which has a low point of 139.08 m



AOD further adding to the high volume of surface water caused by the exceptional rainfall. For the purposes of the report, this inspection chamber is referred to as IC A.

The blockage was removed by a member of BGCBC's drainage team once the flow of water in the chamber had subsided enough to enable it to be safely extracted.

It is considered unlikely, based on topographical levels, that the surcharging water from this manhole added to flood water at Railway Street. This assessment is made on the basis that the levels at the eastern side of Railway Street is 141.02 m AOD, which is some 500mm higher than the cover level of the surcharging manhole. However, it is probable that flood water from Railway Street contributed to the flooding in Meadow Street, because of the topography of the streets.

**b) Railway Street Blockage:**

A surcharging inspection chamber in the highway outside 34 Railway Street was reported by a resident on 15<sup>th</sup> February 2020. This was investigated by the BGCBC workforce and a blockage was located in the drain between the inspection chamber in Railway Street and the rear lane causing a surcharge of storm water from the inspection chamber. The inspection chamber, referred to as IC B for the purposes of the report, has a cover level of 139.26m AOD. The lowest point in the carriageway of Railway Street recorded in the topographical survey is outside No. 37, with a level of 139.12m AOD, which is approximately the middle of the street. Due to the shallow bowl effect of Railway Street, it is considered probable that the surcharging water from this manhole pooled in this area of Railway Street causing flooding to properties.

**c) Railway Street & Meadow Street Drainage Infrastructure:**

The investigation found that two 150mm diameter storm water pipes run along Railway Street, from easterly and westerly directions, meeting at an inspection chamber at a central point in the street. At this inspection chamber, the size and direction of the outlet pipe changes so that water flows in a 300mm diameter pipe in a southerly direction, beneath a Railway Street property, to an inspection chamber in the rear lane between Railway St. and Meadow St.

At this inspection chamber, observations show that a 150mm diameter pipe has been inserted inside a 300mm diameter pipe throughout its length between the inspection chambers at the rear lane and Meadow Street. This section runs underneath a property in Meadow Street. This reduction in pipe diameter means that there is only a 25% capacity of the original 300mm inlet pipe through this section. This may have led to a build-up of storm water in the smaller pipe causing a discharge from the upstream chamber in Railway Street.

From the chamber in Meadow St. The 150 mm diameter pipe then connects into a chamber, which carries a 675mm diameter storm water culvert that flows underneath Meadow Street in an easterly direction before eventually discharging into the river.

Figure 4 below shows the drainage infrastructure of Meadow Street and Railway Street

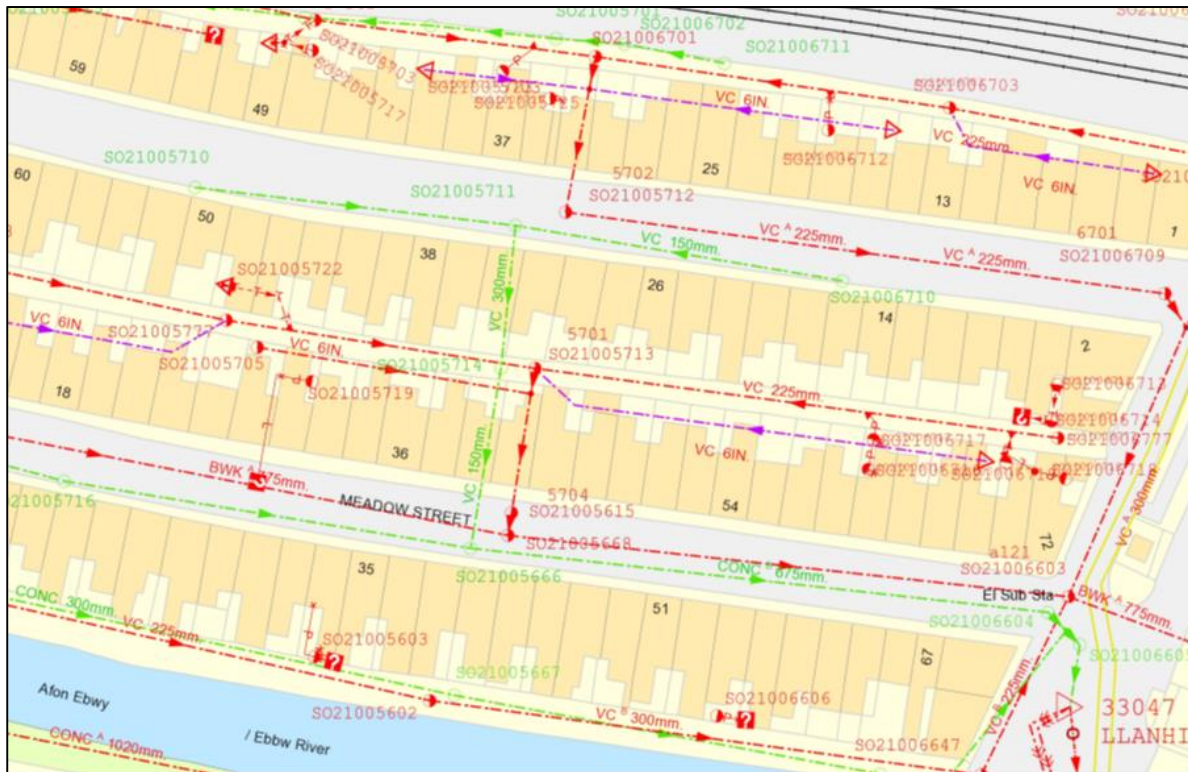


Figure 4: Plan showing the drainage infrastructure of Meadow Street and Railway Street (DCWW, 2020)

In addition to the reduced capacity along a section of drainage network, a CCTV survey undertaken in March 2020 showed a large amount of debris on an outlet pipe within this drainage infrastructure. It is probable that the build-up of debris in the pipe could have caused a reduction in flow capacity and lead to blockages.

Figure 5 below shows CCTV survey footage of the 150mm pipe inserted into the 300mm pipe between Meadow Street and the rear lane.



Figure 5 CCTV Survey footage of the outlet pipe covered with debris



Figure 6 below shows the three areas within the study area where drainage issues were recorded during Storm Dennis

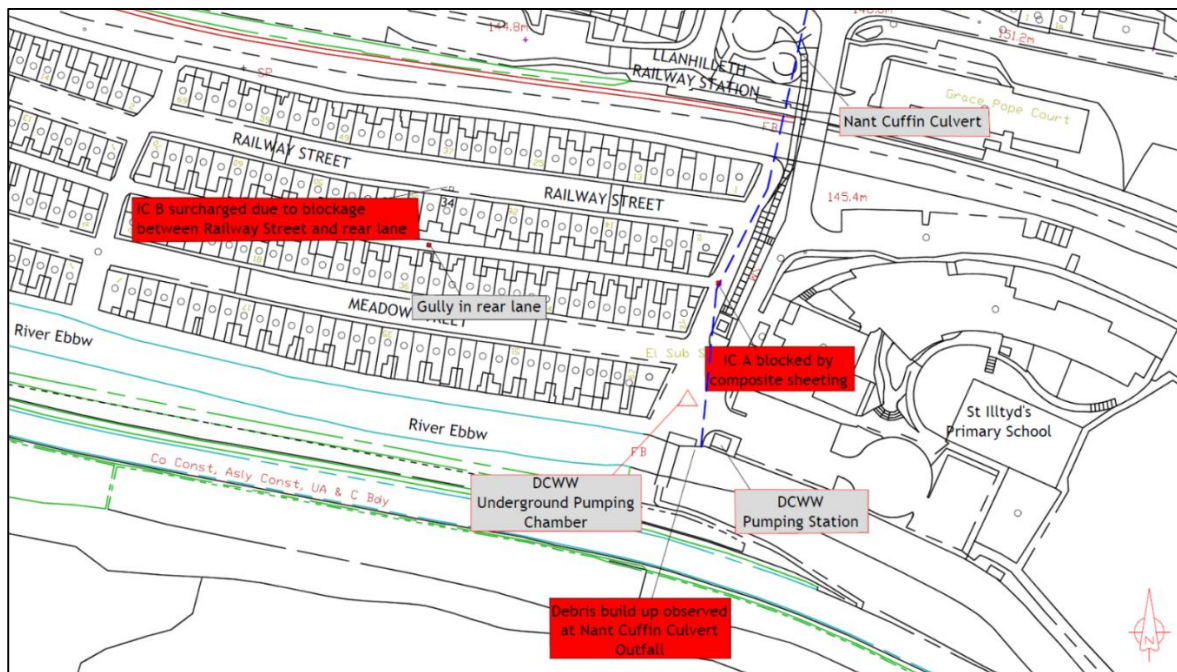


Figure 6 Site of recorded drainage issues within study site

Figure 7 below shows the likely flow paths of the surcharging water during Storm Dennis based on the topography of the streets.



Figure 7 Likely directional flow of surcharging storm water



### **5.3 Actions**

The cover of the manhole chamber, located to the east of the rear lane, which was dislodged by the sheer force of the surcharging water caused by a blockage, was replaced by Blaenau Gwent CBC soon after the storm event had passed.

A CCTV survey was carried out in March 2020 to inspect the drainage system beneath Meadow Street and Railway Street.

Blaenau Gwent CBC has secured Welsh Government funding to upgrade the existing drainage network. Investigations are ongoing as to how drainage capacity can be improved.

Blaenau Gwent CBC will continue to maintain its regular inspection regimes and maintain and repair its drainage infrastructure as necessary. In addition, as part of its flood prevention strategy, it will continue its critical culvert inspections prior to heavy rain and storm events.

The Nant Cuffin Culvert inlets and trash screens will continue to be regularly inspected to check for debris build up. Any visible debris will need to be removed to help ensure the full capacity of the culvert is maintained and to avoid any blockages and surcharges further downstream.

## 6.0 Conclusion

The Flood Investigation Report set out to investigate the flooding that occurred in Meadow Street and Railway Street, Llanhilleth, during Storm Dennis between 15<sup>th</sup> and 16<sup>th</sup> February 2021, causing flood damage to almost 90 homes and disrupting a large part of the Llanhilleth community. The investigation used eye witness statements, rainfall and river level data from NRW, call logs, site photographs and a report made by DCWW.

Storm Dennis was preceded by one of the wettest winters on record, which meant that the ground was already saturated prior to the February 2020 storms. During Storm Dennis, the second storm to hit Wales in February 2020, an exceptional amount of rainfall was experienced in large parts of South Wales, which led to high volumes of surface water. Record breaking data was recorded at rain gauge stations within Blaenau Gwent. Almost a month's worth of rainfall was received within a 24-hour period which fell on saturated ground, causing high volumes of surface water run-off. River levels were also the highest ever recorded, with Aberbeeg River Station recording River Ebbw's river level at 1.8 m during the storm, over a meter higher than its average level. River flooding did not occur at Llanhilleth because of the flood defence wall that is located along the top of the river bank.

Although the drainage systems upstream accommodated the exceptional volumes of runoff, it is probable the blockages in parts of the drainage system contributed to the flooding of Meadow Street and Railway Street. These issues were exacerbated by the topography of Meadow Street and Railway Street, where level differences between the ends and middle of each street create a bowl effect, meaning the middle of each street is at a lower level than the ends. This bowl effect means that surface water runoff gathers at the low points. Due to the exceptional high volume of rainfall and blockages in the system, the surface water built up and caused flooding to properties along each street.

The recovery of the flood was coordinated by Blaenau Gwent CBC's Civil Contingencies Team. The recovery included visiting the affected homes and offering residents temporary accommodation whilst their homes were assessed for damage and electrical testing carried out.

Blaenau Gwent CBC are in the process of investigating the ways in which drainage capacity can be improved for the area.

## References

1. February 2020 Floods in Wales: Flood Event Data Summary; Natural Resources Wales, 2020
2. Usk Management Catchment Summary; Natural Resources Wales, 2016
3. South East Valleys Management Catchment Summary; Natural Resources Wales, 2016
4. Llanhilleth SPS (The fields) Asset No 33047 – Investigation Report; Dwr Cymru Welsh Water, 2020

## Appendix A: Site Photographs



*Photograph 1 Blocked inspection chamber of the Nant Cuffin Culvert, located to the east of the rear lane between Meadow Street and Railway Street. The blockage can be seen inside the chamber, with fragments of it on the surrounding road. Attempts to remove the blockage could only be made once it was safe enough to do so. Arrow shows direction of flow-south towards River Ebbw (February 2020)*





*Photograph 2 Damaged contents outside homes along Meadow Street, Llanhilleth following Storm Dennis. View East. (February 2020).*



*Photograph 3 Flood damaged living room of property in Meadow Street. Damaged carpets have been removed and the water mark left by the flood waters can clearly be seen. (February 2020).*



*Photograph 4 View of inside inspection chamber that was blocked during Storm Dennis. Arrow shows direction of flow of water. Water is flowing freely and unobstructed. (June 2021)*





*Photograph 5 Rear Lane between Meadow Street and Railway Street. Manhole that was blocked by composite board during Storm Dennis at forefront of photograph. View West. (June 2021)*





*Photograph 6 Photograph Railway Street view West.*



*Photograph 7 Meadow Street, View West. (June 2021)*





*Photograph 8 Rear of Meadow Street along the bank of the River Ebbw. NRW's flood defence wall protected the street from fluvial flooding. View West. (June 2021).*



*Photograph 9 The River Ebbw flowing in a south easterly direction. At the bottom lh side of the picture is the outfall of the Nant Cuffin Culvert and pumping station inlet. Above the outlet is DCWW's pumping Station building. In the distance is the car park for St Illtyd's Primary School and Llanhilleth's Recreation Ground. (June 2021).*





*Photograph 10 Llanhilleth Railway Station located immediately to the rear of Railway Street. (June 2021)*

## Appendix B



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