RHONDDA CYNON TAF COUNTY BOROUGH COUNCIL

Flood and Water Management Act 2010

Section 19 Flood Investigation Report

Storm Callum - Brook Street Aberaman

October 2019

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This report should be read in its entirety

This report has been prepared in accordance with the requirements of section 19 Flood and Water Management Act 2010. The Council assumes no responsibility or liability from any person in connection with its contents or findings.

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1 EXECUTIVE SUMMARY

This report has been produced through the duties placed upon Rhondda Cynon Taf County Borough Council (RCT) under Section 19 of the Flood and Water Management Act 2010. The Act states, "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".

This Section 19 investigation provides a factual report of the storm event that occurred on 12 and 13th of October 2018, within the Cynon and Rhondda Valley's, focusing investigation on the flooding at Brook Street Aberaman on the 13th October.

The flooding that affected RCT on 12 and 13th October 2018, was a result of an extreme rainfall event. The storm was preceded by 7 weather warnings being issued by the Met Office ranging from; Yellow to Amber warnings with rainfall predictions increasing closer to the 12th – 13th October. The Met Office designated the storm as 'Storm Callum',

The impact of the event at Brook Street Aberaman resulted in internal flooding to four properties and flooded the highway. These impacts were identified through inspections made by RCT's Flood Risk Management Team on the 13th October.

It has been established from local residents, first responders and officers within the Flood Risk Management team that the source of flooding originated from an unnamed ordinary watercourse located west of Brook Street (Culvert 3), which identified a 200mm rectangular inlet where the surcharging occurred.

A review of Culvert 3 following post event inspections identified an 'un-consented structure' within the culvert inlet, which appeared to be restricting the inlets efficiency to convey the flow of the watercourse into the Nant Gwawr watercourse. Due to the un-consented structure being erected by the riparian owner of Culvert 3. The Council as the Land Drainage authority issued a warning letter to the riparian owner requiring the un-consented structure to be removed. Following the issuing of the letter the riparian owner removed the structure.

To support the investigation into the flooding at Brook Street a review of the mechanism of flooding was undertaken utilising a hydraulic model; the model was

developed to investigate the capacity of the network and the effects of the local catchment including tributaries and outfall influences.

The model identified the standard of protection of Culvert 3 both with and without the unconsented structure. Following removal of the unconsented structure the culvert was shown to provide a standard of protection from flooding up to and including the Q100 +30% climate change event which represents current design standards for new culverts. With the unconsented structure the standard of protection of Culvert 3 was significantly reduced to Q30 + climate change.

The model further concluded that the Nant Gwawr watercourse had no influence on the flooding at Brook Street on the 13th October. The results of the model demonstrate that the likely cause of the internal flooding to the properties at Brook Street was a result of the un-consented structure being erected by the owner of Culvert 3; which reduced the standard of protection of Culvert 3 to Q30 + climate change. .

Following the results of the investigation into flooding at Brook Street and the subsequent removal of the unconsented structure, RCT acting as the LLFA and LDA do not intend to exercise any additional functions following the flooding event, however, RCT will continue to work with residents in managing the local flood risk.

ABBREVIATIONS

DCWW – Welsh Water

FRMP – Flood Risk Management Plan

FWMA – Flood and Water Management Act 2010

LDA – Land Drainage Authority

LFRMS – Local Flood Risk Management Strategy

LLFA – Lead Local Flood Authority

NRW – Natural Resources Wales

RCT - Rhondda Cynon Taff CBC

RMA – Risk Management Authority

SAB – Sustainable Drainage Approval Body

SuDs – Sustainable Drainage Systems

INTRODUCTION

1.1 PURPOSE OF INVESTIGATION

On the 12 and 13th October 2018 Rhondda Cynon Taf County Borough Council (RCT) was impacted by an extreme weather event which was designated by the 'Met Office' as 'Storm Callum' (Referred to in this report as the Storm).

The storm resulted in widespread residential and commercial flooding within the Cynon and Rhondda Valley's. This report will focus on the area of Brook Street Aberaman.

The reason behind RCT's investigation is in response to the duties of the local authority in regards to Section 19; of the Flood and Water Management Act 2010, which 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 the response to the flood."

2. "When an authority carries out an investigation under subsection (1) it must publish the results of its investigation, and notify any relevant risk management authority"[1]

1.2 SITE LOCATION

The area investigated within this report is 'Brook Street' Aberaman, which is situated within the Electoral Ward of 'Aberaman North' within the Cynon Valley. The Street is situated adjacent the 'Nant Gwawr' Watercourse.

The area in question is identified within RCTs Flood Risk Management Plan (FRMP) as an area of flood risk specifically identified within Flood Investigation area RCT0002 (Figure 1). The primary ordinary watercourse that conveys within the investigation area is the 'Nant Gwawr'; which is fed by a number of smaller unnamed tributaries that convey water through a series of culvert networks to their outfall within the Nant Gwawr.

[1] Flood and Water Management Act 2010 – Section 19 - https://www.legislation.gov.uk/ukpga/2010/29/section/19

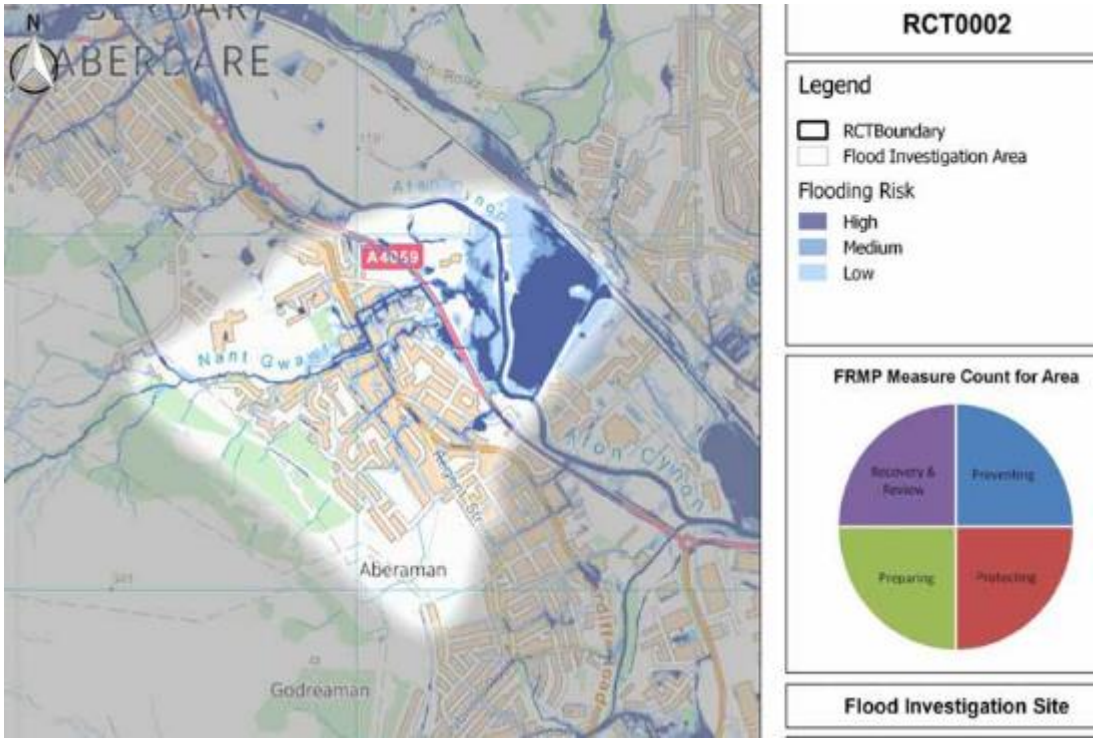

Figure 1: An excerpt of RCT's FRMP Identifying Investigation Area RCT0002.

1.3 Drainage System

The surface water drainage system that serves the Brook Street area is that of the highway drainage network designed to manage the surface water within the highway and a public surface water sewer and combined sewer operated by Welsh Water.

1.4 Investigation Evidence

To support the investigation a range of qualitative and quantitative evidence has been gathered from numerous sources, the summary of which is listed:

- Residents – Photos, Statements, Email correspondence
- Responders statements – Local Responders statements
- CCTV surveys – Internal surveys of the local culvert networks
- Technical Note 1 – Channel Condition Report
- Technical Note 2 – Hydraulic Performance Report
- Met Office Data – Weather Warning information
- Rain Gauges – Private and RCT operated gauge information
- Project Appraisal Reports
- RCT Flood Risk Management Plan
- Natural Resources Wales – River Level Data

FLOODING HISTORY

2.1 PREVIOUS FLOOD INCIDENTS

Information relating to flood history is limited, however, local residents interested in the flooding associated to Brook Street provided a range of dates that they state flooding has occurred within the Aberaman area (Table 1), however, details associated to each event were not available.

Date of Event	Areas Affected
March 1998	Hillcrest Avenue,
October 1998	Cardiff Road, Gwawr Street, Lord Street, Curre Street, King Street, Abergwawr Place, **Brook Street**, Tudor Place, Holford Street, Mount Hill Street and Club Street,.
September 1999	**Brook Street**, Gwawr Street and King Street,
December 1999	**Brook Street**, Curre Street and Gwawr Street,
September 2000	Curre Street,
October 2000	Rhos Nathan Wyn, Gwawr Street, **Brook Street** and Tanyard Place,
November 2000	Curre Street,
October 2001	Cardiff Road,
February 2002	Gwawr Street,
January 2004	**Brook Street,**
September 2004	**Brook Street**, Tanyard Place, Gwawr Street and Mount Hill Street.
January 2005	Cardiff Road,
October 2005	Cardiff Road,
November 2006	Cardiff Road and Gwawr Street,
December 2006	Cardiff Road, Gwawr Street, Hillcrest Avenue, Rhos Dyfed and **Brook Street,**
January 2007	Hillcrest Avenue and, Cardiff Road and Abergwawr Place,
July 2007	King Street, Hill Street, **Brook Street** and Mount Hill Street,
December 2007	Gwawr Street, Cardiff Road and Tudor Place,
September 2008	Holford Street, Cardiff Road, Belmont Terrace, Blaengwawr Close, Tanyard Place, Penderyn Place, Mount Hill Street, Abergwawr Street, Hill Street, Gwawr Street, Curre Street, Club Street, Sunnybank Street, **Brook Street** and Greenhill Drive,

Table 1: Summarises a list of historic flooding stated by a resident interested in local flooding events.

Table 1 outlines 19 individual events of flooding within the Aberaman area, where 9 events directly reference flooding to Brook Street. The information provided by the residents was limited regarding the extent of flooding, source or impact in terms of property, business, infrastructure or environmental flooding.

Following the flood event the local residents who were impacted met with Flood Risk Management staff and local councilors. One resident who had been flooded described that they had 'lived in the property for 40 years and that they had never experienced flooding before'.

It is of note that high levels of historical flooding within the Aberaman catchment is specifically associated with the 'Nant Gwawr' ordinary watercourse. In 2011, RCT commissioned a 'Project Appraisal' Report; which was produced by 'Capita Symonds' to appraise possible options to alleviation flooding from the Nant Gwawr.

As part of the report, a historical review of flooding incidents was undertaken the results of which identified 18 incidents of flooding between 1998 – 2008 which specifically related to Brook Street. On review of the flood history it revealed that the properties impacted on the 13th October flood event had not been previously flooded. The previous flooding incidents refer to highway flooding i.e. blocked drains, and overland flows from the Nant Gwawr. The results of the historical flooding review suggests that the properties flooded by the 13th October 2018 flood event had not previously been subject to internal flooding.

2.2 FLOOD INCIDENT

The flooding that occurred on the 12th and 13th October was a result of an extreme rainfall event that caused widespread flooding throughout the Cynon and Rhondda Valleys, the flooding that occurred at Brook Street was recorded on the 13th October 2018.

The post event inspection undertaken on the 13th October 2018 by RCT's Flood Risk Management Team identified four properties as internally flooded with the conveyance of floodwater entering the properties from the rear of Brook Street. During the site visit, the inspecting office contacted the Fire and Rescue service who confirmed the source of the floodwater and indicated that a 'man rescue' from a flooded property was undertaken due to 'entrapment'.

The volume of floodwater within the property was identified during the post event surveys through the debris marks left within the properties that depicts the maximum water level during the event, image 1 and 2 identify flood marks identified within 2 of the properties and indicate a flood depth between 1m – 1.4m. It was noted that the severity of flood depth varied between the four houses as a result of the compartmentalised arrangement of the rear gardens.

Image 1: Post event flood Investigation Photos; this photo depicts the flood depth within the property during the event.

Image 2: Post event flood investigation Photo: This photo depicts the flood depth within a property on Brook Street.

During the initial event the flood water entered through the rear of the properties and released onto the Brook Street highway where the flood water conveyed into the adjacent highway drainage network. As a result of the volume of water the Brook Street highway experienced flooding for several hours during the incident and following the event when the rainfall had dissipated (Image 3).

Image 3: Event Photograph: This photo depicts the conveyance of flood water across Brook Street highway.

2.1 RAINFALL ANALYSIS

The storm was tracked by the Met Office who issued approximately 7 weather warnings 5 of which issued prior to the storm making land fall and 2 during the event. The nature of the weather warnings identified an unpredictability to the storm track with a range of likelihoods leading up to the storm event.

On Thursday 11th October the storm deepened over the Atlantic increasing the likelihood of strong winds and heavy rainfall[2]; this triggered an Amber warning being issued on the 11/10/18, which indicated a 'potential risk to life' (Met Office, 2019). Table 2 summaries the warnings issued by the Met Office, which shows an increasing likelihood between 09/10/19 – 11/10/19 where the rainfall range varied considerably with the amber outlining a significant range between the low lying areas and upland areas of South Wales.

Warning Level	Date of issue	Time	Likelihood	Impact	Range fall Rainfall
Yellow	09/10/2018	11:20	Very Low	Medium	50 - 120
Yellow	10/10/2018	11:04	Low	Medium	50 - 100
Yellow	10/10/2018	11:54	Low	Medium	50 – 80
Yellow	11/10/2018	10:23	Low	Medium	50 - 80
Amber	11/10/2018	10:25	Medium	Medium	40 - 160
Amber	13/10/2018	10:25	High	Medium	30 - 50
Yellow	13/10/2018	10:48	Low	Medium	20 - 40

Table 2: Summary table indicating the Met Office Warnings related to Storm Callum.

Rainfall during the event was recorded at four weather stations maintained by RCT and a station maintained by the Tower Regeneration Ltd (Table 3). Geographically the RCT stations are situated to the south and south east of the borough and identified a significant increase in rainfall readings the further north the stations were located. It was noted that RCT recorded approximately 86 reports of flooding within the borough, which were centered within the Aberdare, Treherbert and Rhigos areas that provides a linkage to the rainfall information provided.

[2] Met Office – Storm Callum - https://www.metoffice.gov.uk/weather/warnings-and-advice/uk-storm-centre/storm-callum

Rainfall Data Recorded	Coed Ely	Cwmaman	Cilfynydd	Rhigos	Rhydyfelin
Total Rainfall	51	136.6	60.4	160	20.8
Total Rainfall 12th	31.6	94.2	44.2	N/A	14.2
Peak Hourly Intensity 12th	8.2	12	8.2	N/A	1.4
Total Rainfall 13th	19.4	42.4	16.2	N/A	6.6
Peak Hourly Intensity 13th	4	9.2	4	N/A	0.4

Table 2: Outlines a summary of the rainfall recorded between 12 – 13/10/18.

Table 2 details the summary of the rainfall recorded for both the 12th and 13th of October (Storm Callum) and identified significant rainfall totals in the northern extent of the borough i.e. 160mm in Rhigos and 136.6mm in Cwmaman with peak hourly intensities identifying 12mm in Cwmaman. Compared to the southern extent of the borough i.e. Coed Ely and Rhydyfelin where the totals are significantly lower at 51mm and 20.8mm respectively.

Following the storm event, the Met Office reviewed the local Radar information and suggested that the rainfall was comparable to a Q50 event.

The impact of Storm Callum is evidenced by the rainfall levels and their impact on the local watercourses; information taken from NRW's River Monitoring Website identified the effect of the rainfall levels on the Main Rivers. Areas such as Hirwaun, Treherbert and Aberdare recorded the 'highest recorded readings' at the stations during both the 12th and 13th with the 13th October generally depicting a marginally lower level with a longer duration than on the 12th (Figure 2) which resulted in main river flooding at Aberdare, Ferndale and Mt Ash affecting Highway and Rail Infrastructure.

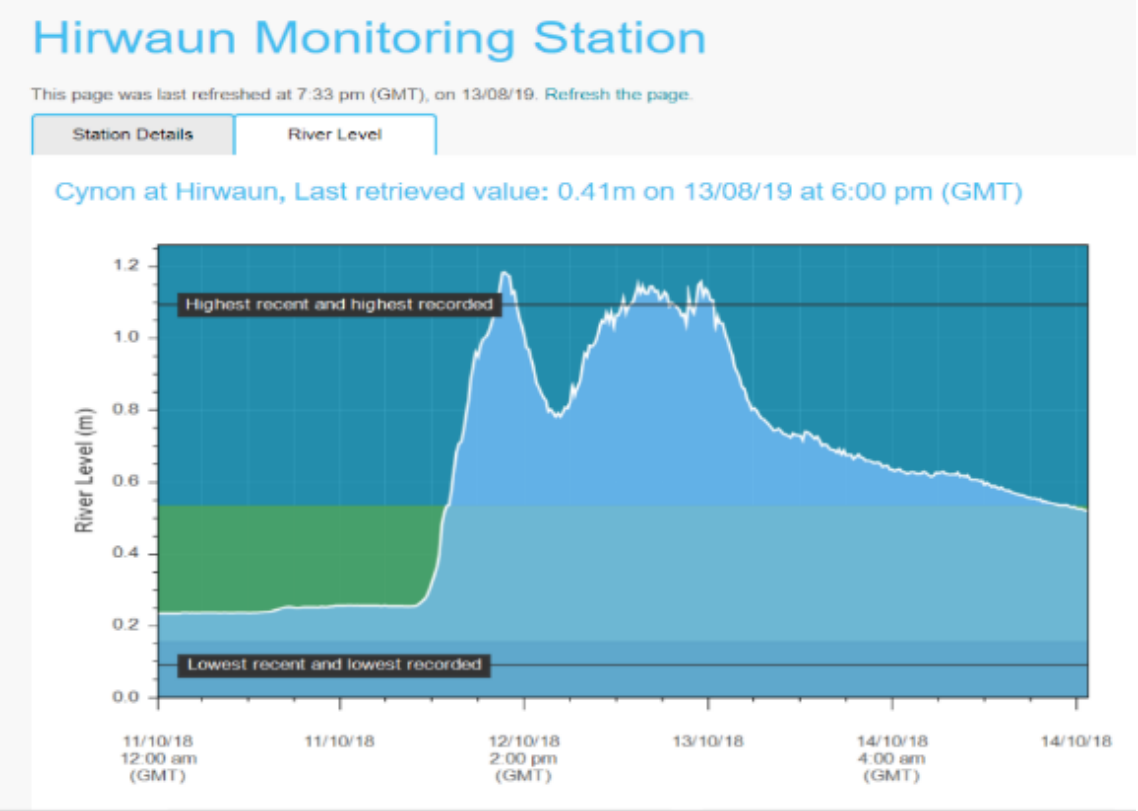

Figure 2: An excerpt from Natural Resources Wales River Monitoring Gauge at Hirwaun[3]

[3] NRW River Monitoring Website - https://rloi.naturalresources.wales/ViewDetails?station=4068

POSSIBLE CAUSES

3.1 CULVERT CONDITIONS

Within the vicinity of Brook Street there are 3 Ordinary Watercourse Culverts (Figure 3), the first of which identified as 'Culvert 1' is situated 91m east of Brook Street (downstream). The culvert inlet conveys the 'Nant Gwawr' ordinary watercourse beneath Cardiff Road and outfalls adjacent Holford Street. During the post event inspection, the culvert inlet was found to be clear from debris and did not identify evidence of surcharging. Culvert 1 is identified as a highway culvert and the responsibility of RCT.

Figure 3: Culvert Inlet Location Plan

The second culvert identified as 'Culvert 2' is located 98m south west from Brook Street. The culvert inlet conveys an unnamed ordinary watercourse beneath the 'Ross Nathan Wyn' highway where it outfalls into an open channel that conveys adjacent No 4 – 8 Gwawr Street which is situated behind Brook Street. Culvert 2 inlet has been identified as the responsibility of Newydd Housing Association.

During the post event inspection, the Culvert 2 inlet was found to be holding several tons of silt and debris that was retained by the debris screen, which was identified as damaged (Image 4). The watercourse evidenced signs of surcharging at the inlet due to the debris accumulation however, there was no evidence of conveyance from the inlet area and based on information gained from the South Wales Fire and Rescue Service was not considered to be flooding outside of its channel during the 13th October 2019.

Image 4: Post Event Flood Inspection: This photo depicts the accumulated debris and defective trash screen of Culvert 2 following Storm Callum.

The third culvert identified as 'Culvert 3' is located 46m south west from Brook Street. The culvert inlet conveys an unnamed ordinary watercourse beneath no 4 Gwawr Street before out falling into the Nant Gwawr Watercourse opposite number 4 Gwawr Street.

The source of the flooding was identified by local residents, first responder and officers within the FRM team during the event as originating from an unnamed ordinary watercourse that conveys behind Brook Street (Culvert 3). The surcharging occurred at the inlet structure where the open channel enters into the concrete culvert system through a 200mm rectangular inlet (Image 5); both the open channel and culvert network at this location falls within private land ownership and is the responsibility of riparian owners.

The inlet structure depicted by Image 5 identifies an 'Obstruction'[4] within the culvert inlet which appears to restrict the inlet structures efficiency to convey the flow of the watercourse.

Following the flood event the ripairan owner of Culvert 3 was approached in regards to the maintenance of the inlet. No maintenance information was provided at the time of the writing of this report. However, a statement that the channel is litter picked regularly was stated. Based on the condition of the channel following the event; maintenance is considered to be infrequent and does not form part of a routine program.

Image 5: Post Event Photo – Depicts Culvert 3's inlet structure provided by a local resident..

Images passed over to the LLFA by residents (Image 6 and 7) identified a pre and post view of the inlet area where the channel is surcharged and in flood and the post event condition which confirms the source of flooding recorded by the first responders residents and FRM officers.

[4] Land Drainage Act 1991 – Section 23 - https://www.legislation.gov.uk/ukpga/1991/59/section/23

Image 6: Post event Photo - Depicts Culvert 3's Inlet area following the flooding event on the 13th October 2019 provided by a local resident.

Image 7: Event Photo – Depicts the Culvert 3's Inlet area during the Flood event on the 13th October 2019 provided by a local resident.

Following identification of the obstruction within the watercourse the Land Drainage Authority reviewed its records associated to consent's under section 23 of the Land Drainage Act 1991 and identified that the modified structure did not have a consent. Following which, an enforcement warning was issued under section 24 Land Drainage Act that resulted in the owner removing the obstruction within the culvert inlet and reinstating a 670mm opening (Image 8).

Image 8: Post event photo: Depicts Culvert 3 Inlet area following remedial work undertaken by the riparian owner to reinstate an unobstructed flow.

3.2 Open Watercourse Conditions

On review of the open watercourse sections identified within the Aberaman area two distinct networks were identified, the first is the Nant Gwawr watercourse that conveys in a west to east orientation adjacent Gwawr Street (Culvert 1). This section of watercourse was reviewed following the identification of movement in the adjacent highway retaining wall.

A general inspection was undertaken, which recommended a more detailed analysis of the structural integrity of the wall as a result of the number of structural defects identified along the length of the watercourse. The Highway Authority commissioned Redstart consultants to undertake an assessment of the highway retaining wall and to design the necessary remedial works.

The work undertaken by Redstart included a review of the base level of the bed of the Nant Gwawr at its current level and its effect on the structural integrity of the retaining wall structure. The results of the investigation concluded that the current condition and level of the bed of the Nant Gwawr should be retained to ensure the structural performance of the retaining wall. The evidence suggested that lowering (dredging) of the watercourse would be detrimental to the structural integrity of the retaining wall and would serve no benefit to the conveyance of flow through the watercourse as it would facilitate rapid siltation of natural riverine material.

The second open watercourse network is that of the unnamed watercourse that conveys to the rear of Brook Street (Culvert 3) and continues from Culvert 2 Ross Nathan Wyn towards the cycle path to the West of Brook Street where the network conveys through a culvert structure from the upper catchment above.

The open watercourse channel was inspected following the Storm to ascertain whether the channel conditions contributed to the flooding within Brook Street. The inspection identified 5 sub sections within the channel depicted within Figure 4.

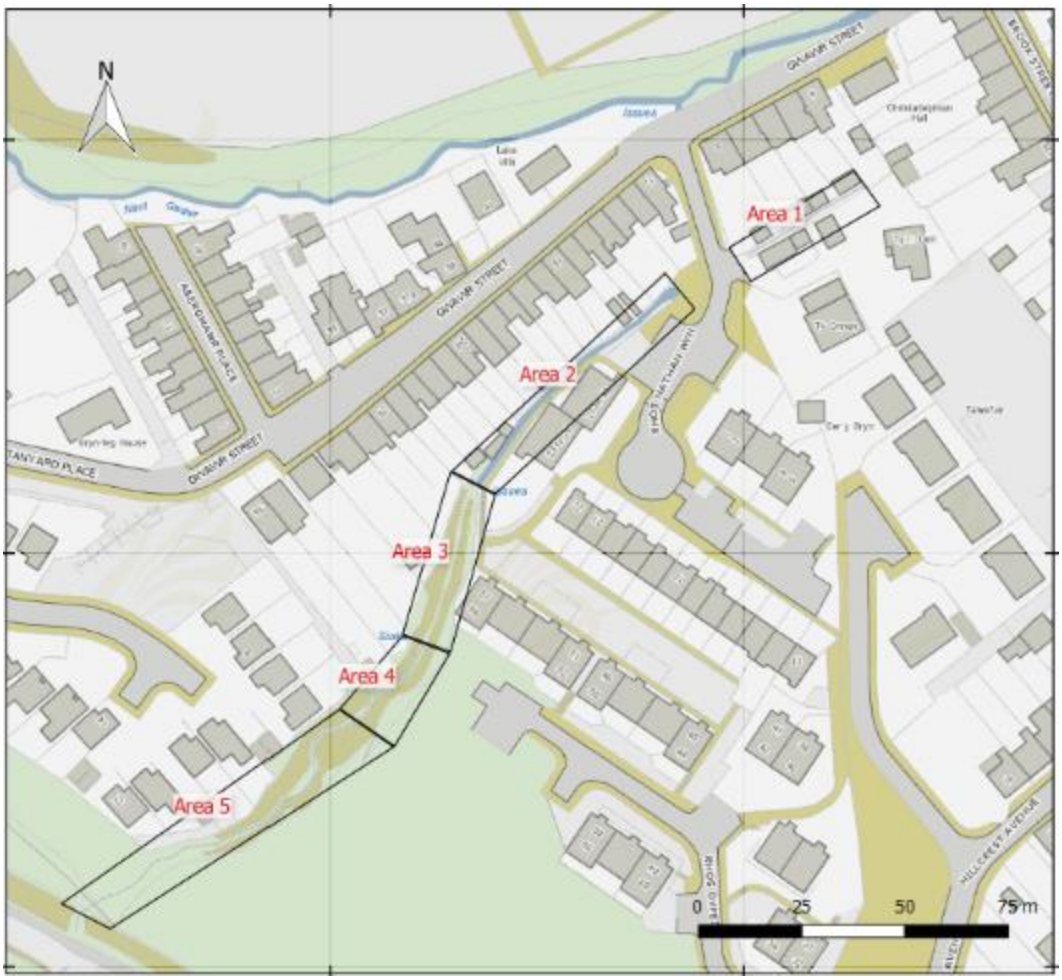

Figure 4: Channel Inspection Location Plan (Technical Note 1)

The summary within 'technical note 1' identified several sections between Area 2 – 4 where the channel and embankments have evidence of scour which is the likely cause of the material deposited against the inlet of Culvert 2. It is of note that Area 1 and 3 show signs of fly tipped material, which is more pronounced within Area 3, which is likely to become mobilised during future high flow events.

Based on the level of debris in Area 2 compared to Area 1 it is considered that Culvert 2 acted as barrier to the conveyance of sediment to the downstream network, debris blockage as a result of upper channel scour is considered to be an unlikely factor related to the flooding on the 13th October.

3.3 Access Structures

No access structures were identified during the asset investigations within the area, as such 'access structures' have not been considered within this report.

3.4 System at Capacity

The evidence gathered post event has identified the source of flooding located at Culvert 3. Following identification of the culvert inlet the network was surveyed to ascertain the internal condition of the network (Figure 5), the result of which fed into a review of the hydraulic performance of the network to ascertain the likely cause of flooding.

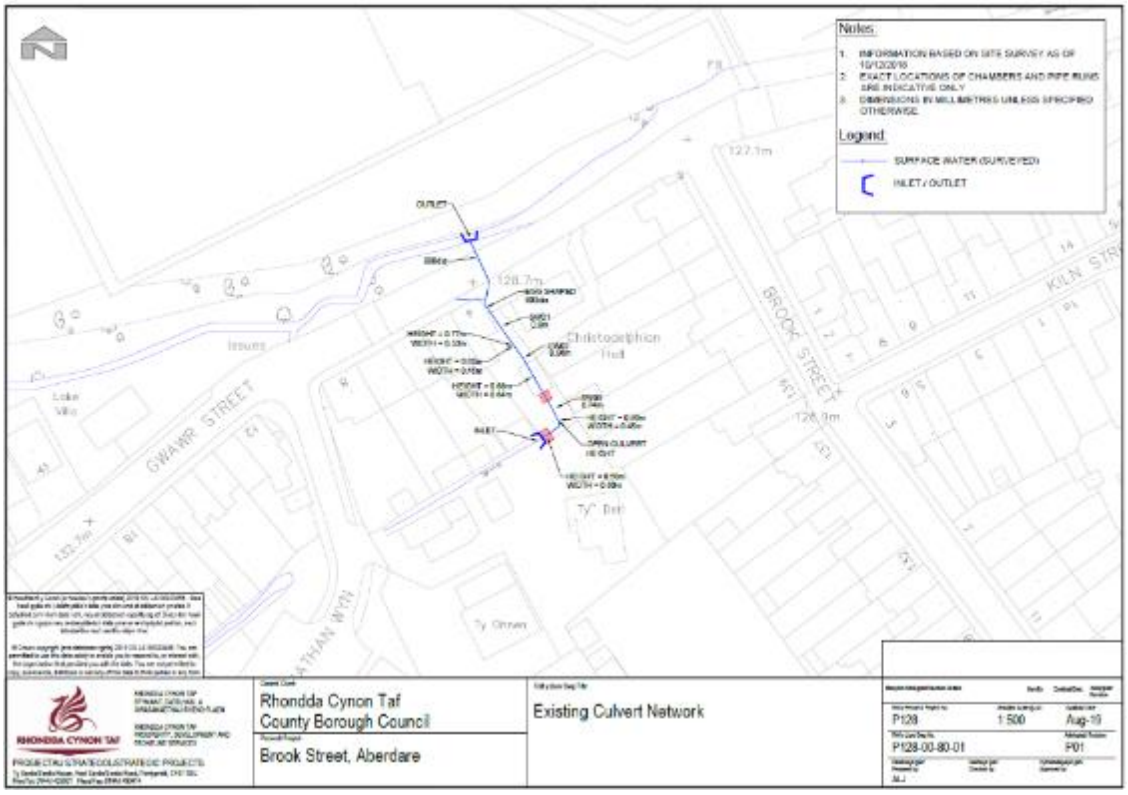

Figure 5: Depicts the summary results of the Culvert Survey undertaken by the LLFA

'Technical Note 2' detailed the results of a 'hydraulic model' using 'Micro drainage'[5] software which represented the open channel section above Culvert 3 (Area 1) and represented the structural condition of the network as it conveys through No 4 Gwawr Street and enters into the Nant Gwawr.

The results from the hydraulic model identified that flooding would occur during a Q30 +30 climate change event with the obstructed inlet of the culvert 3 (assuming no sediment accumulation within the network) (Image 5). 'Technical note 2' further reviewed the interaction between the culvert network and the relative level of the Nant Gwawr i.e. outlet control. The results identified that the culvert network was unaffected by the bed level within the Nant Gwawr in its current condition (current bed level).

The model was also run with the post event condition of Culvert 3 inlet structure following works undertaken by the resident to remove the obstruction within the watercourse (Image 7). The results identified that the inlet and culvert network was free from flooding up to and including the Q100 + 30% climate change event.

The results of the hydraulic model suggest that the flooding was a result of a structural blockage erected within the inlet of Culvert 3 and that the Nant Gwawr had no contribution to the flooding at Brook Street on the 13th October 2019. It further identified that the works undertaken by the resident i.e. obstruction removal has improved the standard of protection to Q100 +30% climate change.

[5] Mico Drainage Software - https://www.innovyze.com/en-us/products/microdrainage

RIGHTS AND RESPONSIBILITIES OF RISK MANAGEMENT AUTHORITIES

4.1 LEAD LOCAL FLOOD AUTHORITY

Within the Flood and Water Management Act 2010, Rhondda Cynon Taf County Borough Council has been established as the Lead Local Flood Risk Authority (LLFA) for its administrative area.

As defined in the Flood and Water Management Act 2010, RCT is responsible for 'Managing' what is termed, its 'local flood risk'. This includes the risk of flooding from ordinary watercourses, surface runoff and groundwater.

Local Authorities have always had certain responsibilities in relation to ordinary watercourses, and in practice most Local Authorities took the lead in dealing with surface water flooding incidents prior to the changes contained within the Flood and Water Management 2010.

The Flood and Water Management Act 2010 places a number of statutory duties on Local Authorities in their new role as LLFAs including:

1 - The preparation of local flood risk management strategies[6]
2 - A duty to comply with the National Strategy[7]
3 - To co-operate with other authorities, including sharing data
4 - **A duty to investigate all flooding within its area, insofar as a LLFA consider it necessary or appropriate**
5 - A duty to maintain a register of structures and features likely to affect flood risk;
6 - A duty to contribute to sustainable development; and
7 - Consenting powers on ordinary watercourses.

In addition to these each LLFA has a number of what are called permissive powers. These are powers that allow them to do something, but do not compel them to and include:

1 - Powers to request information;
2 - Powers to designate certain structures or features that affect flood or coastal erosion risk;
3 - The expansion of powers to undertake works to include broader risk management actions; and

[6] RCT Local Flood Risk Management Strategy - https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/LocalFloodRiskManagementStrategy.aspx
[7] WG National Strategy for Flood and Coastal Erosion Risk Management - https://gov.wales/flood-and-coastal-erosion-risk-management-strategy

4 - The ability to cause flooding or coastal erosion under certain conditions.

LLFA's in Wales also take on the role of the SuDS Adopting and Approving Body in relation to sustainable drainage systems as of the 7th January 2019. In this role they will be responsible for both approving the original design of the SuDS and adopting and maintaining the finished system in accordance with the Welsh Governments National Standards for Sustainable Drainage.

The function of the LLFA during and after the flooding at Brook Street included a range of Response and Recovery functions:

- Officers investigated the initial flooding and have produced this report in line with section 19 FWMA 2010.
- Officers contacted residents affected by flooding to offer support and advice to assist in the recovery following the event.
- Officers coordinated the response of the flooding with the South Wales Fire and Rescue Service.
- Asset information collected during the flood event has been incorporated into the LLFA Asset Register.

Following the results into the investigation of flooding at Brook Street both the LLFA and LDA do not intend to exercise any additional functions following the flooding event, however, the LLFA and LDA will continue to work with residents in managing the local flood risk.

4.1 Natural Resources Wales

Historically the Environment Agency (precursor to Natural Resources Wales) led on the management of the risks of flooding from main rivers and the sea. However, as a consequence of the Flood and Water Management Act 2010 certain changes have been made to their role and remit. In addition to flooding from rivers and the sea, Natural Resources Wales has new operational responsibilities in relation to coastal erosion and a wider oversight role for all flood and coastal erosion risk management in Wales.

This change means that Natural Resources Wales has a dual role: -

1. Operational responsibilities for flooding from main rivers, the sea and coastal erosion.

2. Oversight responsibilities in relation to all flood and coastal erosion risk management in Wales.

The oversight change is integral to the delivery of national policy on flooding and coastal erosion risk management and has been taken forward to ensure that Natural Resources Wales has the remit to support the Welsh Government across the full range of flood and coastal erosion risks affecting Wales.

As part of their oversight role, Natural Resources Wales will lead on the provision of technical advice and support to other Risk Management Authorities. They will also lead on national initiatives such as Flood Awareness Wales, the national raising awareness program, and be the single point of contact for enquiries and information on flood risk, currently being piloted via their new Flood Line warning service[8].

The Flood and Water Management Act 2010 places a number of statutory duties on Natural Resources Wales including:

a) Co-operating with other authorities, including sharing data;

b) Reporting to the Minister on flood and coastal erosion risk in Wales including the application of the National Strategy; and

c) The establishment of Regional Flood and Coastal Committees.

[8] NRW Flood line Warning - https://naturalresources.wales/flooding/sign-up-to-receive-flood-warnings/?lang=en

In addition to their statutory duties, Natural Resources Wales has a number of permissive powers. These are powers that allow them to do something, but do not compel them to and include:

a. Powers to request information

b. The ability to raise levies for local flood risk management works, via the Regional Flood and Coastal Committees

c. Powers to designate certain structures or features that affect flood or coastal erosion risk

d. The expansion of powers to undertake works to include broader risk management actions; and

e. The ability to cause flooding or coastal erosion under certain conditions.

This new allocation of responsibilities is also consistent with Natural Resources Wales' role; in relation to the Flood Risk Regulations 2009. Which allocates specific responsibility for conducting assessments in relation to mapping and planning the risks of flooding from main rivers, the sea and reservoirs to Natural Resources Wales, as well as providing guidance to Local Authorities on these matters for flooding from other sources.

Under the Regulations, Natural Resources Wales also takes on an assessment and coordination role at a national level, ensuring the correct information is passed back to the European Commission.

Natural Resources Wales were not identified as a responsible authority in relation to the flooding at Brook Street on the 13th October 2019. Furthermore, the authority does not propose to undertake any functions in relation to the event.

4.2 WATER COMPANY

Water companies, when exercising their flood or coastal erosion risk management functions in relation to an area within Wales, must have regard to the relevant Local Strategies and any associated guidance.

Water and sewerage companies are responsible not only for the provision of water, but also for making appropriate arrangements for the drainage of foul water, the treatment of waste, surface water sewers and combined sewers. They have primary responsibility for floods from water and sewerage systems, which can include sewer flooding, burst pipes or water mains or floods caused by system failures.

No changes have been made to the operational arrangements for water and sewerage companies in respect of flood risk.

The Flood and Water Management Act 2010 places a number of statutory duties on Water and Sewerage Companies including:

1 - A duty to act consistently with the National Strategy;
2 - A duty to have regard to the content of the relevant Local Strategy; and
3 - Co-operation with other Authorities, including sharing data.

Water and sewerage companies often hold valuable information, which could greatly aid the understanding of flood risks faced by communities across Wales.

Welsh Water were not identified as a responsible authority in relation to the flooding at Brook Street on the 13th October 2019. Furthermore, the authority does not propose to undertake any functions in relation to the event.

5 ROLE OF OTHER AUTHORITIES

5.1 NETWORK RAIL

Network Rail has an operational responsibility as a riparian owner and is required to undertake regular maintenance of all assets that pose a risk to flooding. Regarding this investigation, no infrastructure within the responsibility of network rail was identified to cause or contribute to the residential flooding at Brook Street.

5.2 HIGHWAY AUTHORITY

The highway authority is responsible for ensuring the highway is clear of obstructions and has a drainage system that controls the surface water that enters onto the highway.

During the Investigation into the Flood at Brook Street the Highway was identified as flooding as a result of the influx of flood waters through the properties and onto the Highway resulting in Highway Flooding, however, the highway drainage apparatus eventually managed the additional overland flows once the rainfall had subsided.

Following the initial flooding event the Highway Authority arranged for the highway drainage gullies to be inspected and cleansed following the influx of flood waters to ensure the safety of the highway post event.

5.3 RIPARIAN LANDOWNERS

Riparian Landowners are legally responsible under common law for the maintenance of the land generally up to the centerline of any watercourse adjacent to their property. This includes the maintenance of the bed, banks and any boundary features e.g. vegetated strips such as hedging, with routine clearance of debris and/or blockages.

This does not mean that the owner must remove all debris from the watercourse, but it does require the owner to maintain as far as it does not pose a risk or ‘nuisance’ to a neighbour. Any works to modify the watercourse by the landowner must first be passed through the relevant Risk Management Authority, Lead Local Flood Authority (LLFA) or Natural Resources Wales (NRW).

The evidence gathered in support of this report suggests that the flooding attributed to Brook Street originating from the ownership of a riparian owned watercourse, which does not benefit from a defined maintenance program undertaken by the riparian owners. Under common law, Riparian Owners have rights and responsibilities relating

to any watercourse that passes through or adjacent to the boundaries of their land. This means that the landowner must:

- Pass on flow without obstruction, pollution or diversion affecting the rights of others.
- Accept natural flood flows through their land, even if caused by inadequate capacity downstream, as there is no common law duty to improve a watercourse.
- Maintain the bed and banks of the watercourse (including trees and shrubs growing on the banks) and clear any debris, natural or otherwise
- Not cause any obstructions to the free passage of fish.
- Keep the bed and banks clear from any matter that could cause an obstruction either on their land, or by being washed away by high flow to obstruct a structure downstream.
- Take responsibility for protecting their property from seepage through natural or constructed banks.
- Keep clear any structure that they own such as culverts, trash screens, weirs etc.

Under the FWMA 2010, a landowner needs consent from the Land Drainage Authority if they want to construct a culvert or flood relief control structure on any ordinary watercourse.

5.4 RESIDENTS

Residents and property owners are responsible for the protection of their own properties against flooding. Residents have the right to defend their property as long as they do not subsequently increase the risk of flooding to other properties.

PERMISSIVE POWERS OF RISK MANAGEMENT AUTHORITIES

Risk Management Authorities have direct permissive powers under the Flood and Water Management Act 2010, as well as the Land Drainage Act 1991. Through the investigation of the flooding, that impacted Brook Street the use of Permissive powers of risk management authorities was recorded.

The Results identified that the Land Drainage Authority (RCTCBC), on being made aware of an Obstruction (Culvert 3); reviewed the Consenting records and found no consent was issued for the structure within the Inlet of Culvert 3. Following which a warning letter was issued to the Riparian Land owner of the culvert inlet on 25th October 2018 requiring the nuisance to be abated within 14 days.

Following receipt of the warning letter the resident undertook works to remove the obstruction from the channel of the watercourse complying with the warning on the 29th October 2018.

CONCLUSION

This report has detailed the investigation into the Flooding at Brook Street, Aberaman during Storm Callum; 13th October 2018. The investigation has reviewed evidence provided by Responders, Residents and Investigating officers and has been supported through the production of technical notes.

The impact of the storm resulted in widespread internal property and commercial flooding throughout RCT with transport links being affected by both Pluvial and Fluvial sources.

The storm was identified as 'Storm Callum' by the 'Met Office' and represented an un-predictable storm cell that resulted in 7 weather warnings being issued by the Met Office ranging from Yellow to Amber warnings with rainfall predictions increasing closer to the 12th – 13th October. Local rainfall gauges operated within RCT identified high total rainfall levels 136.6mm and 160mm in the Northern half of the borough with peak intensities reaching 12mm per hour. The result of which identified highest recorded readings at three NRW river monitoring stations.

The event reports identified that the source of the flooding originated from Culvert 3 located west of Brook Street which identified a 200mm rectangular inlet (Image 5). The flow path of the flood water entered the rear gardens of Brook Street and internally flooded 4 properties and flooded the Highway of Brook Street.

The review of the Culvert 3 identified an 'Un-consented structure' within the culvert inlet. On becoming aware of the 'un-consented structure' the Land Drainage Authority issued a warning to the riparian owner requiring the 'Nuisance' to be removed; which was complied with by the riparian owner within 4 days of issuing the warning.

In review of the flooding event the hydraulic performance of Culvert 3's network was undertaken. The results identified that Culvert 3 with the obstruction present (Image 5) would flood during a Q30 + 30% Climate Change event. When compared to Culvert 3 as with the obstruction removed (Image 8) the inlet was found to flood above Q100 + 30% which represents current design standards for new culverts.

The Culvert network was further tested to verify the interconnectivity of Culvert 3 and that of the Nant Gwawr. The result of which suggest that the Nant Gwawr watercourse (Including bed level) had no influence on the performance of the Culvert 3.

The evidence gathered within this report demonstrates that the cause of the internal flooding at Brook Street on the 13th October 2019 was a result of an un-consented structure being erected by the riparian owner of Culvert 3.

The investigation has noted however, that the un-consented structure was removed; by the riparian owner following a warning letter issued by the Land Drainage Authority (RCT).

USEFUL LINKS/CONTACTS

Blue Pages – property Resilience - http://bluepages.org.uk/

Flood Re – Flooded Property Insurance Scheme - https://www.floodre.co.uk/

Natural Resources Wales – Check Flood Warnings - https://naturalresources.wales/flooding/check-flood-warnings/?lang=en

Natural Resources Wales - Long Term Flood Risk - https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en

Rhondda Cynon Taf CBC - Local Flood Risk Management Plan - https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/Floodriskregulations2009.aspx

Rhondda Cynon Taf CBC - Local Flood Risk Management Strategy - https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/FloodAlleviation/LocalFloodRiskManagementStrategy.aspx

Rhondda Cynon Taf CBC – Sustainable Drainage – https://www.rctcbc.gov.uk/EN/Resident/ParkingRoadsandTravel/Roadspavementsandpaths/SustainableDrainage/SustainableDrainage.aspx

Welsh Government - National Strategy for Flood and Coastal Erosion Risk Management - https://gov.wales/sites/default/files/publications/2019-03/national-strategy-for-flood-and-coastal-erosion-risk-management-in-wales.pdf

Welsh Water – How to Contact Us – https://www.welshwater.com/en/Contact-Us.aspx