

Appendix C

**Flood and Water Management Act
2010**

**Section 19 Flood Investigation
Report**

**Storm Dennis –
Flood Investigation Area RCT12**

January 2022

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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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EXECUTIVE SUMMARY

This report has been produced through the duties placed upon Rhondda Cynon Taf County Borough Council 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 the 15th and 16th of February 2020 within the Rhondda Cynon Taf County Borough Council area, focusing the investigation on the flooding that occurred within the area of Treforest adjacent to the western bank of the River Taf (Flood Investigation Area RCT 12, Figure 1).

This report was undertaken to identify the mechanisms of flooding, establish which Risk Management Authorities have relevant flood risk management functions under the Flood and Water Management Act 2010 and ascertain if those Risk Management Authorities have undertaken or are planning to undertake actions related to those functions to manage the risk of flooding.

The flooding that affected RCT on the 15 and 16th of February 2020 was a result of an extreme rainfall event, designated by the Met Office as ‘Storm Dennis’. The impact of the event at investigation area RCT12 resulted in internal flooding to at least 50 properties: including 43 residential properties and 7 non-residential properties. Significant flooding to the highway throughout the investigation area also occurred.

These impacts were identified through inspections made by RCT’s Flood Risk Management Team during the days following the storm event, as well as information collated by residents; RCT’s Public Health team and RCT’s Highway and Streetcare Depot; Natural Resources Wales and Dŵr Cymru Welsh Water.

It has been established from the evidence gathered within this report that the primary source of flooding at RCT12 in this incident was the overtopping of the main River Taf following persistent and heavy rainfall. River level gauge data from NRW’s Pontypridd monitoring station reveal that the River Taf was almost four times its typical level during Storm Dennis, reaching a peak level of 5.32 metres; the highest river level recorded at the station since its opening in 1970.

On review of NRW's FRAW maps, the impacted properties within RCT12 are identified at medium and low risk of flooding from the main river. Despite formal flood defences being in place at RCT12, they only provide protection from a 1 in 75 annual flood event and were overtopped during the Storm Dennis event.

The investigation also identified surface water accumulation on the highway to have contributed to the flooding of one non-residential property, as well as exacerbating existing fluvial flooding within RCT12. Flooding from the combined sewer network at James Street was also identified during the storm event.

NRW has been determined as the relevant Risk Management Authority responsible for managing the main river flooding that occurred during Storm Dennis. In response to the flooding at investigation area RCT12, NRW have;

- Carried out their own post event investigative analysis work to understand the mechanism of flooding from the River Taf at Treforest;
- Commissioned a Lower Taf Flood Modelling Project, the outcomes of which will include an initial assessment of the viability of potential flood risk management options; and
- Developed a series of recommendations and a detailed action plan to address areas of improvement for future storm events, including the performance of NRW's Flood Warning Service and incident management response.

RCT as the Lead Local Flood Authority, Land Drainage Authority and Highway Authority has been determined as the relevant Risk Management Authority responsible for managing the surface water flooding that occurred during Storm Dennis. In response to the flooding at investigation area RCT12, RCT has;

- Carried out survey, jetting and cleansing operations to highway drainage infrastructure.
- Led on the development of a central Control Room to compliment the Council's Contact Centre and CCTV Centre; and to provide a comprehensive and informed response to residents during storm events;
- Exercised its powers, under Section 13 of the Flood and Water Management Act 2010, to engage with NRW and DCWW in relation to their responsibilities as Risk Management Authorities; and
- Working in partnership with NRW, the LLFA have expanded their interim Property Flood Resistance project, offering expandable flood gates to those properties deemed at high risk of river flooding as per NRW's determination.

The event that occurred on 15 and 16th February was extreme, and it is unlikely flooding from a similar event could be prevented entirely. It is concluded that Risk Management Authorities satisfactorily carried out their flood risk management functions in response to the flood event at RCT12; however, further measures have been proposed by all RMAs to improve preparedness and response to future flood events.

ABBREVIATIONS

CaRR – Communities at Risk Register

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

Q – Return Period (1 in X chance of an event occurring in any given year)

RCT - Rhondda Cynon Taf

RCT12 – Flood Investigation Area RCT 12

RCTCBC – Rhondda Cynon Taf County Borough Council

RMA – Risk Management Authority

SAB – Sustainable Drainage Approval Body

SFRA – Strategic Flood Risk Assessment

SuDs – Sustainable Drainage Systems

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1. INTRODUCTION

1.1. PURPOSE OF INVESTIGATION

On the 15th and 16th of February 2020, RCT was impacted by an extreme weather event which was named ‘Storm Dennis’ by the Met Office. Due to the extent and impact of the event, the LLFA opted to undertake a formal investigation.

The storm resulted in widespread residential and commercial flooding within the Rhondda Cynon Taf County Borough Council area. This report will focus on Flood Investigation Area RCT12 which comprises of an area within the north-west of the Treforest Ward.

The reason behind RCT’s investigation is in response to the duties of the local authority regarding 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 (a) publish the results of its investigation, and (b) notify any relevant risk management authority”¹

The purpose of the investigation is to determine which RMAs have relevant flood risk management functions and which functions have been exercised in response to the flood event in question.

Specific details of Storm Dennis, such as rainfall analysis are covered within a separate overview report that covers the wider RCT area. The report is titled ‘Storm Dennis February 2020 – Overview Report’ and will be referred to as ‘FRM – Storm Dennis – Overview Report’².

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

² [Flood Investigation Reports | Rhondda Cynon Taf County Borough Council \(rctcbc.gov.uk\)](https://www.rctcbc.gov.uk/flood-investigation-reports)

1.2. SITE LOCATION

The area investigated within this report covers part of the Treforest ward that lies on the western side of the River Taf, located to the south-east of Pontypridd within the southern region of the county borough.

RCT12 is located within the River Taf catchment and is situated on the western floodplains of the main river which flows from north to south above the investigation area (Figure 1). The community is also situated immediately downstream of the confluence of the River Taf and the River Rhondda.

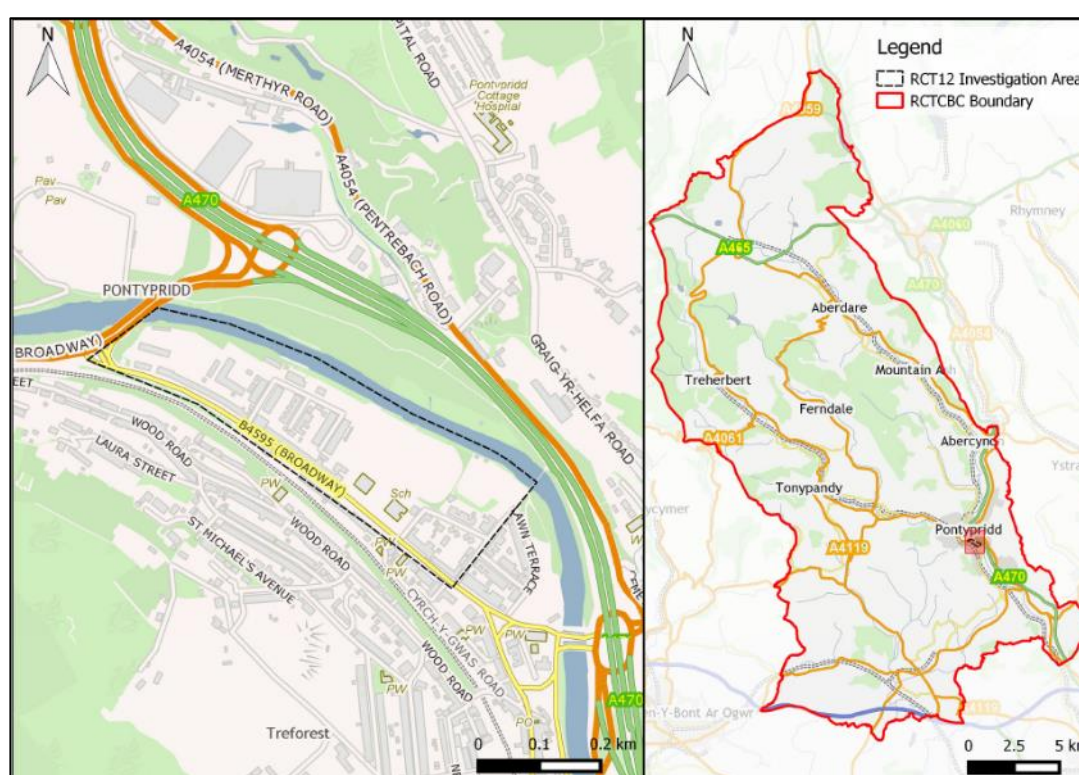


Figure 1: Flood Investigation Area RCT12 Location Plan

RCT12 falls within the community area of Glyntaff. According to the Welsh Government's CaRR, Glyntaff is ranked 91st for surface water flood risk and 129th for main river flooding in Wales.

NRW's Flood Risk Assessment Wales (FRAW) maps indicate that there are areas of low to high flood risk from both fluvial and surface water and ordinary watercourse sources within the investigation area. This is illustrated in Figure 2, which is an excerpt from the FRAW maps.

The highest risk posed to people and properties within RCT12 is broadly associated with the River Taf, with low to high fluvial flood risk observed along the length of the watercourse. Flood risk from surface water and ordinary watercourse sources is also noted across parts of the investigation area, albeit less severe, as illustrated in Figure 2. Areas adjacent to the main river may be at risk of both surface water flooding and main river flooding, as illustrated within RCT's FRMP³.

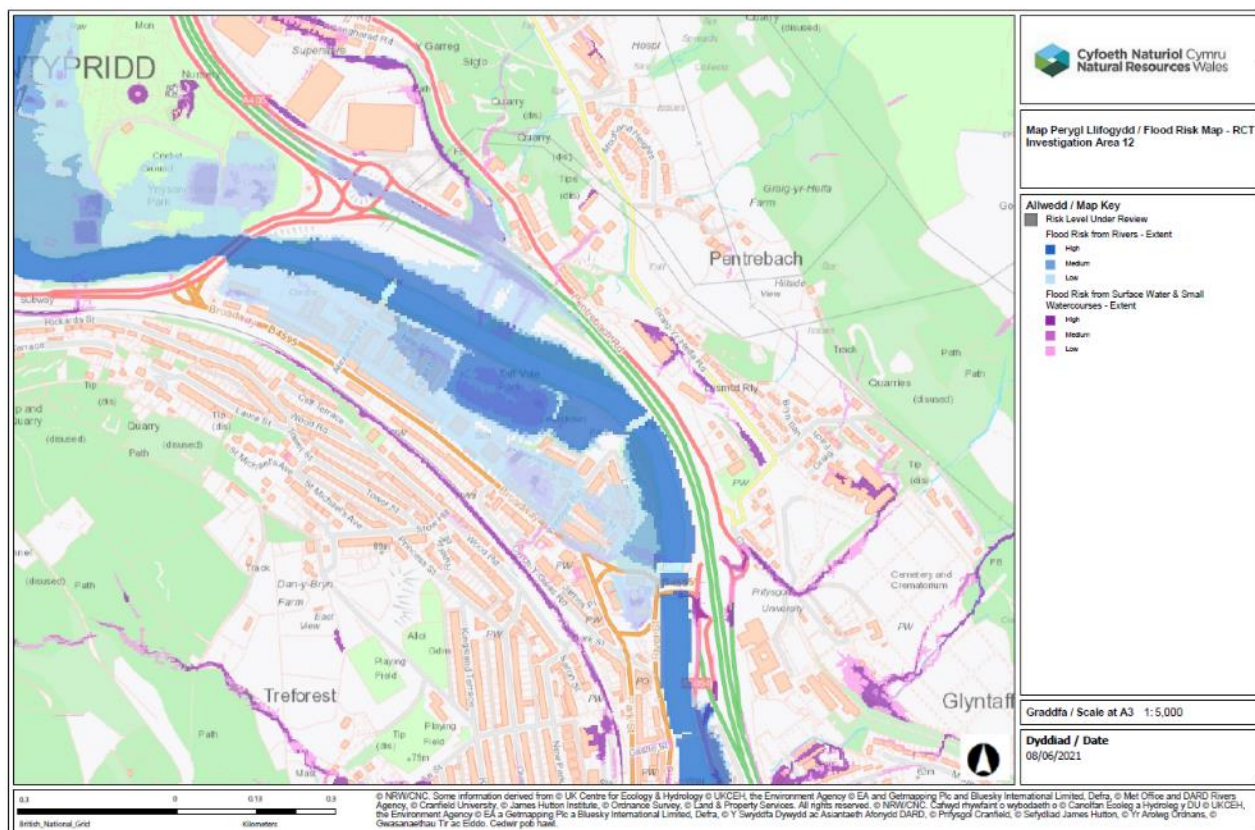


Figure 2: Natural Resources Wales' Flood Risk Assessment Water (FRAW) map for rivers and ordinary watercourse and surface water flood risk at RCT12. Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved

1.3. DRAINAGE SYSTEM

The surface water drainage systems that serve investigation area RCT12 are that of the highway drainage network designed to manage the surface water within the

³ [RCT'S Flood Risk Management Plan \(rctcbc.gov.uk\)](https://www.rctcbc.gov.uk)

highway and public surface water sewer and combined sewer networks operated by Dŵr Cymru 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 below within Table 1.

Table 1: Investigative evidence gathered in preparation of this Storm Dennis Section 19 report

Source	Data
Residents	Photos, videos, statements, email correspondence, public engagement survey responses
Responders' statements	Local responders' statements
CCTV Surveys	Internal surveys of the local drainage networks
Met Office Data	Weather Warning information (see FRM – Storm Dennis – Overview Report)
Rain Gauges	RCT and NRW operated rain gauge information (see FRM – Storm Dennis – Overview Report)
Natural Resources Wales	River Level and Flood Warning data
RCT Flood Risk Management Plan	Site specific information and data for each electoral ward in RCT
Communities at Risk Register	Flood risk ranking and scores for all flood types based on community data in Wales
Flood Investigation Report (Redstart's FIR)	A summary of the source-pathway-receptors, culvert capacity assessment and hydraulic modelling work undertaken by Redstart. The Flood Investigation Report was commissioned by RCT prior to writing the Section 19 report.

Evidence sourced from the 'Flood Investigation Report', commissioned by RCT, will be further referred to as 'Redstart's FIR' throughout this report.

1.5. PUBLIC ENGAGEMENT

Following the initial flooding event that occurred on the 15 and 16th of February during Storm Dennis, flood risk officers from RCT's Flood Risk Management department were deployed to areas across the borough to investigate reports of internal flooding by

residents. Residents engaged with the Flood Risk Management team to help determine the initial impacts caused by the flooding event and to investigate the potential source(s) and pathway(s) of flood water. Due to the volume of calls received by RCT's Out of Hours department, visits were prioritised to those areas experiencing significant internal flooding to residential properties.

To support the flood investigations, a public engagement exercise was undertaken between the 4th and 25th of January 2021 by Redstart, on behalf of RCT. The aim of this exercise was to engage with local residents who were affected by the flood event to capture details on how they were impacted, the source and movement of flood water within the area, how receptors were impacted as well as drawing on local knowledge to query how local conditions could have exacerbated the event. This data is useful to help the LLFA better understand and validate our assessment of the flood event to support the investigation under Section 19 of the FWMA.

2. FLOODING HISTORY

2.1. PREVIOUS FLOOD INCIDENTS

Historical flood records and residents accounts captured by RCT's Flood Risk Management officers following Storm Dennis indicate that the majority of properties within the investigation area had not experienced internal flooding prior to Storm Dennis.

Anecdotal information supplied by long-term residents of Niagara Street and Egypt Street suggest that areas of RCT12 flooded on multiple occasions between 1960 and 1998; however, flooding was largely external and confined to areas adjacent to the main River Taf.

2.2. FLOOD INCIDENT

The flooding that occurred on the 15th and 16th February 2020 was a result of an extreme rainfall event, designated by the Met Office as ‘Storm Dennis’. The rainfall event affected the majority of RCT and caused widespread flooding to communities.

Specific details of Storm Dennis, such as rainfall and river level analysis are covered within a separate overview report that covers the wider RCT area, referenced ‘FRM – Storm Dennis – Overview Report’².

Post event inspections undertaken on the days following the storm event by RCT’s Flood Risk Management team and RCT’s Public Health, Protection and Community team identified 43 residential properties and 7 non-residential properties as internally flooded within the investigation area.

A summary of the source(s) and pathway(s) of flooding within RCT12 during Storm Dennis have been outlined in Table 2 and further described throughout this section.

Table 2: Summary of the source(s), pathway(s) and receptor(s) affected during Storm Dennis within RCT 12

Source(s)	Pathway(s)	Receptor(s)
The primary source of flooding for this incident was the River Taf, which flows adjacent to the investigation area, overtopping its banks.	The primary flow path saw river flood water flow across Nile Street and onto Egypt Street and Niagara Street.	The overtopping of the River Taf resulted in the flooding of 42 receptors, including 24 residential properties at Egypt Street and a further 18 properties at Niagara Street. 6 non-residential properties were also flooded on Nile Street and Niagara Street.
Intense rainfall and subsequent surface water runoff from the surrounding area.	Flow pathways within the Treforest area were associated with the conveyance of surface water along Broadway.	A non-residential property on Broadway was internally flooded.
The surcharging of a combined sewer was identified as the source of flooding at James Street.	Surface water originating from the surcharged manhole conveyed to the rear of the impacted property at James Street. Surface water was	A residential property on James Street was internally flooded.

	contained within property's boundary as it's situated lower than the adjacent highway.	
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On review of Table 2, the primary source of the recorded flooding within the investigation area originated from the adjacent main river, the River Taf, overtopping its western embankment during the storm event.

During the early hours of Sunday 16th February, RCT received several calls from residents at Treforest reporting the overtopping of the River Taf which was causing water ingress into properties. The primary flow paths observed during the event saw fluvial flood water convey beyond the western riverbank of the River Taf (Figure 3) and onto Nile Street, following local topography. Flood water subsequently flowed onto Egypt Street and Niagara Street before subsiding at the rear of Broadway (B4595) (illustrated in Figure 7).



Figure 3: A view of the River Taf and southern riverbank, looking north-east (Redstart's Flood Investigation Report)

Significant flood depths of over 1.5 metres were reported by residents at Egypt, Niagara and Nile Streets, where at least 42 residential and 6 non-residential properties were internally impacted by the River Taf. Figure 4 depicts the damages caused to property at Treforest following the flood event.

Emergency rescue efforts by the Fire Service were in operation following the overtopping of the River Taf on the 16th February 2020 to evacuate residents from their homes (Figure 5).



Figure 4: Image capturing the damage to property and belongings at RCT12 following Storm Dennis
(Image: WalesOnline/Rob Browne)



Figure 5: Image capturing South Wales Fire and Rescue Service undertaking evacuations within Egypt Street on 16th February 2020, (Image: Huw Evans Picture Agency Ltd)

Post event inspections undertaken on the days following the storm event by RCT's Flood Risk Management team identified evidence of deposited riverine mud and silt along several streets within RCT12 following the receding flood water. The inspections suggest that surface water flooding resulting from intense rainfall and overwhelmed drainage infrastructure also impacted the aforementioned streets, exacerbating the flooding incident at RCT12.

Surface water was also identified as a primary source of flooding at an end of terrace property on Broadway (B4595), whereby pluvial flows from the highway network accumulated on the access road west of Parc Lewis Primary School (Nile Road), depicted in Figure 6, due to local topography.



Figure 6: A view of Nile Road from Broadway. (Redstart's Flood Investigation Report)

A further residential property located at James Street, to the west of RCT12, reported internal flooding during Storm Dennis. Upon a site inspection to the property by RCT's Flood Risk Management team in the days following the storm event, the source of flooding was identified as a surcharging DCWW combined sewer system. The DCWW system surcharged via a manhole to the rear of James Street, resulting in the internal flooding of one property.

The observed flow pathways that resulted in the internal flooding of properties within the investigation area are illustrated in Figure 7.

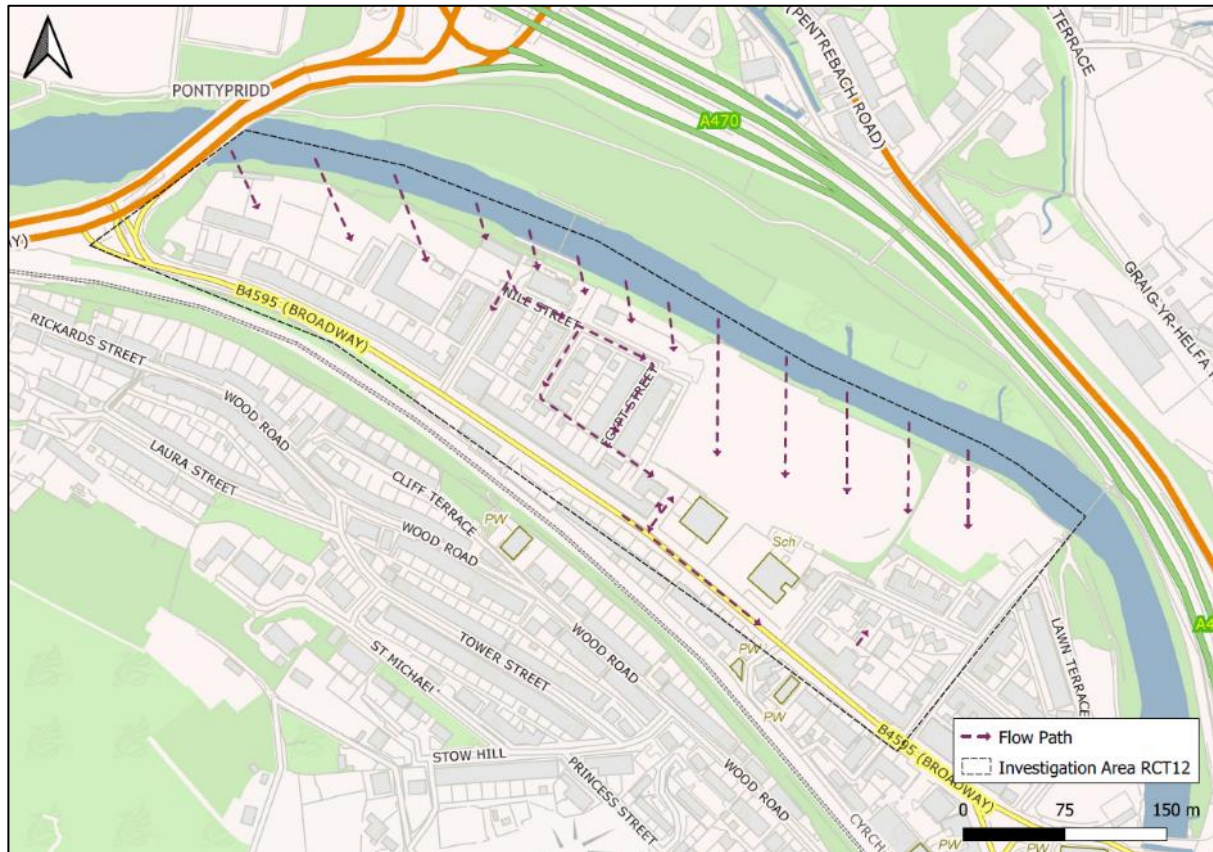


Figure 7: Observed flow paths that caused internal flooding within RCT12 during Storm Dennis

2.3. RAINFALL ANALYSIS

See RCT's 'Overview Report' of Storm Dennis, reference 'FRM – Storm Dennis – Overview Report'², for a detailed analysis of the rainfall and ordinary watercourse response.

3. POSSIBLE CAUSES

3.1. CULVERT CONDITIONS

There is no evidence from this investigation to suggest that culverted ordinary watercourses within investigation area RCT12 significantly contributed to the recorded flooding of properties in RCT12 during Storm Dennis.

As such, the condition of culverted ordinary watercourse infrastructure within the investigation area has not been investigated as part of this investigation.

3.2. ORDINARY WATERCOURSE CONDITIONS

There are no known ordinary watercourses within the investigation area. As such, ordinary watercourse conditions have not been investigated as part of this investigation.

3.3. MAIN RIVER

The designated main River Taf flows in a southeasterly direction through Treforest. The investigation area itself is situated on the western bank of the river (Figure 1).

3.3.1. MAIN RIVER LEVELS AND FLOOD WARNINGS

The hydrograph in Figure 8 illustrates the significant rise in the River Taf's levels in response to rainfall between the 14 – 17th February 2020. River level data was captured at NRW's Pontypridd river level gauge, located adjacent to Nile Street within the investigation area.

NRW issued a 'Flood Alert' (indicating possible flooding) for the entirety of the River Taf at approximately 13:30 on the 15th of February; at which point the main river was over 2 metres in depth and continuing to rise at Pontypridd station. At approximately midnight on the 16th February the River Taf began to rise again, reaching a peak river level of 5.32 metres at 04:45 on the 16th of February; the highest level recorded for the River Taf at Pontypridd since 1970.

The green bar displayed on the hydrograph shows the typical level of the River Taf at the Pontypridd station, ranging between 0.4 and 1.3 metres. The river level was above this green line for over 48 hours, highlighting the severity of the storm event and its unprecedented nature. At its peak, the River Taf at Pontypridd was almost four meters higher than its average level.

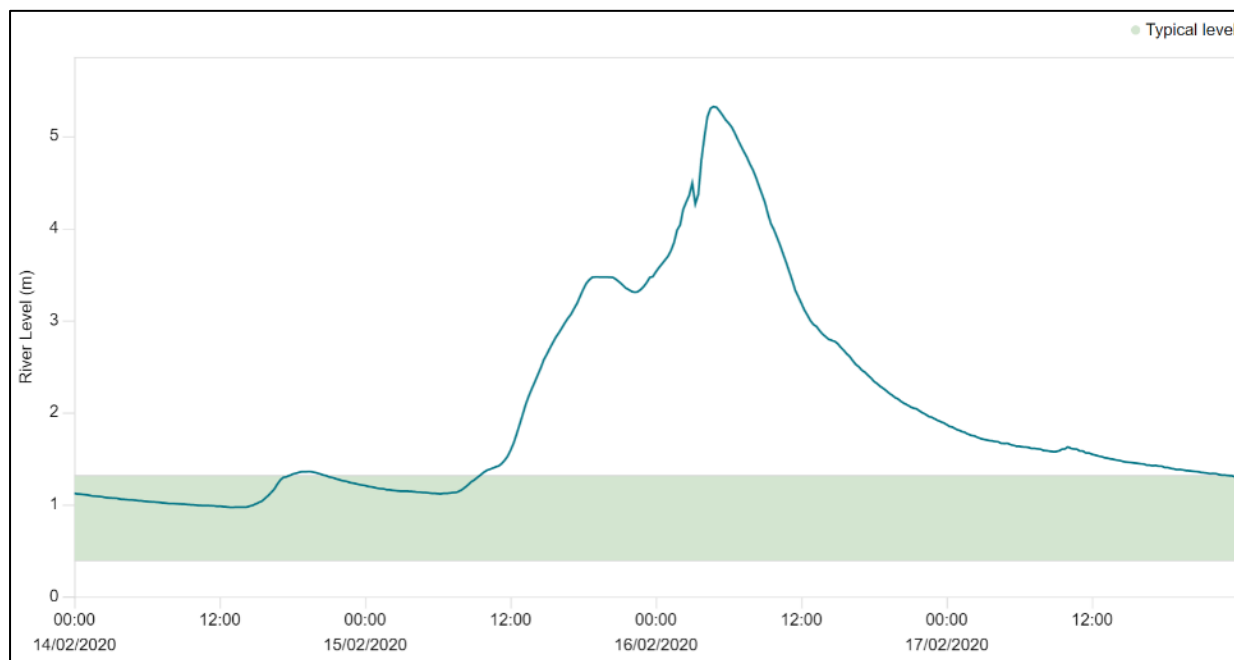


Figure 8: The River Taf levels at Pontypridd station between the 14th and 17th February 2020 (Natural Resources Wales)

With significantly high river levels being recorded upstream in both the River Taf and the River Rhondda, it is accepted that the River Taf reached record-high levels beyond the confluence of the two rivers at Pontypridd. As a result, the river overtopped its banks downstream of the confluence, resulting in significant flooding to Treforest.

Investigation area RCT12 falls within the Pontypridd NRW Flood Warning Area. The Flood Warnings issued by NRW, and associated river levels, for the River Taf at Pontypridd (nearest gauging station to RCT12) during Storm Dennis are shown in Table 3.

Table 3: Flood Warnings issued by NRW for the River Taf at Pontypridd during Storm Dennis

Flood Warning Type	Location	Start Time	River Level (m) at Pontypridd
Flood Alert	River Taf	13:27 15/02/2020	2.178
Flood Warning	River Taf at Pontypridd	20:48 15/02/2020	3.443
Severe Flood Warning	River Taf at Pontypridd	06:33 16/02/2020	5.039

NRW issued a 'Flood Warning' alert (indicating flooding is expected) for the River Taf at Pontypridd at 20:48 on the 15th February, prior to the overtopping of the main river. A 'Severe Flood Warning' alert (indicating Community-wide flooding and possible risk to life) for the River Taf at Pontypridd was issued by NRW nine hours later at 06:33 on the 16th February; at which point the River Taf was 5.039 metres in height; 0.285 metres lower than its peak level. According to residents however, significant main river flooding to properties had already commenced at several locations along the River Taf by this time, including at Treforest.

NRW have acknowledged within their 'Flood Incidence Response Review'⁴ that the operation of the Flood Warning service "came under significant pressure during February and at times became overwhelmed" resulting in flood warnings being issued late (after the onset of flooding) or not issued at all. At this location (RCT12), this is in reference to the 'Severe Flood Warning' alert issued at Pontypridd.

Improvements to their flood forecasting and warning services are being internally investigated by NRW and where feasible implemented to deliver the recommendations outlined within their Flood Incident Response Review⁴.

3.3.2. MAIN RIVER FLOOD RISK

As outlined in Section 2, the overtopping of the River Taf resulted in the internal flooding of 42 properties within the investigation area.

Figure 9 is an excerpt from NRW's Flood Risk Assessment Wales (FRAW) mapping exercise which depicts the main river flood extents for the 'Defended' scenario, i.e., with the presence of flood defence infrastructure. The darker shading identifies areas at higher risk of flooding (more frequent/less extreme rainfall events) and lighter shading showing the lower risk areas (less frequent/more extreme rainfall events).

The flooding that occurred within RCT12 during Storm Dennis is largely consistent with the modelled outputs of NRW's FRAW map (Figure 9), with the majority of the impacted areas within RCT12 falling within an area of medium and low risk of fluvial flooding.

A low risk of flooding means that an area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%) each year; meanwhile, a medium risk of flooding signifies a yearly chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%).

⁴ [February 2020 Floods in Wales: Flood Incident Management Review \(cyfoethnaturiol.cymru\)](https://www.cymru.gov.uk/mediacentre/2020/february-2020-floods-in-wales-flood-incident-management-review)

Considering Storm Dennis has been estimated as a 1 in 200 annual probability (Q200) flood event, the area of flooding aligns with those depicted by the low main river flood risk extent (Figure 9).

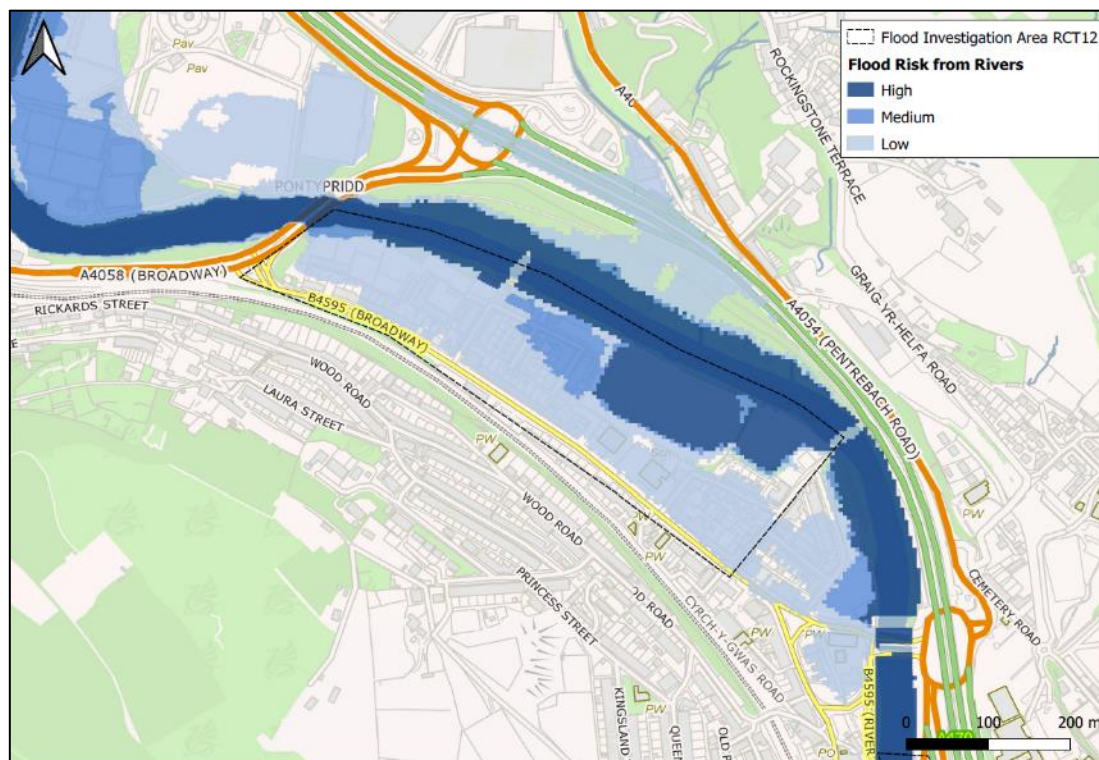


Figure 9: NRW's Flood Risk Assessment Wales (FRAW) map for River sources in RCT12. Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

Flooding up to 1.5 - 1.8 metres was observed across the worst affected streets at RCT12, including at Egypt, Niagara and Nile Streets. These observed flood depths also correlate well with NRW's Flood and Hazard map outputs for the low flood risk event (Figure 10).

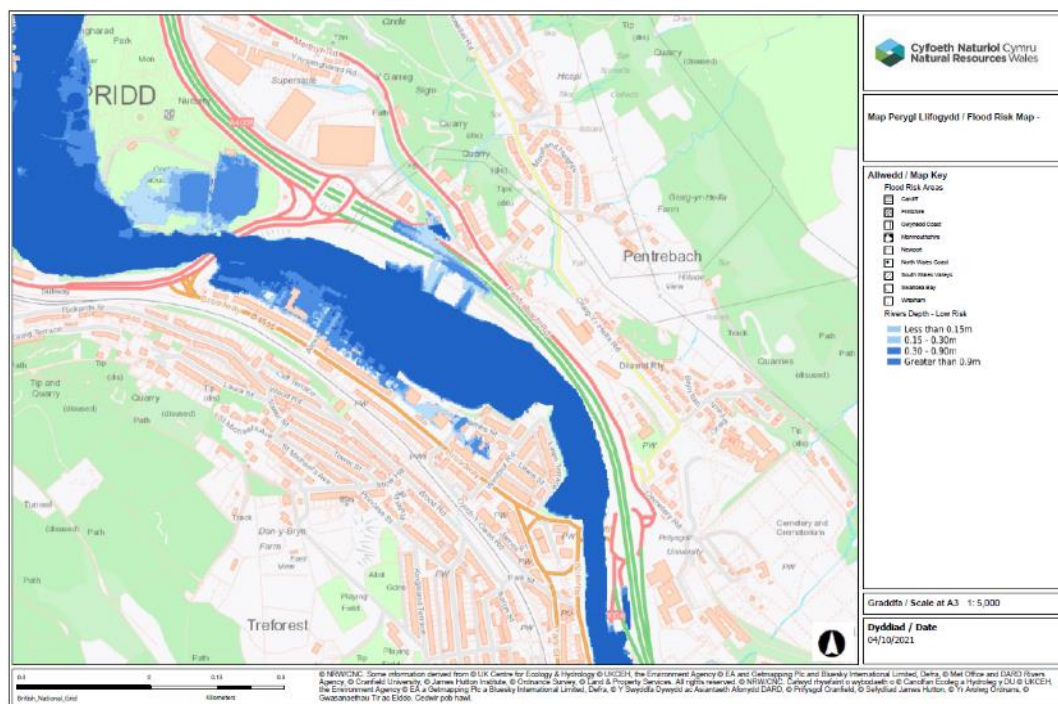


Figure 10: NRW’s National Hazard map for Low Risk River Flood Depth in RCT12. Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved.

3.3.3. MAIN RIVER FLOOD DEFENCES

As illustrated in Figure 11 (demarcated by a bold red line), there are approximately 150 metres of formally designated flood defence infrastructure along the western bank of the River Taf at RCT12. This infrastructure is operated and maintained by NRW.

According to NRW, this infrastructure provides a standard of protection up to 1 in 75 annual probability flood event (Q75) to several properties within the investigation area (black hatched area in Figure 11), including properties at Alexandra Road, Nile Street, Egypt Street and Niagara Street.

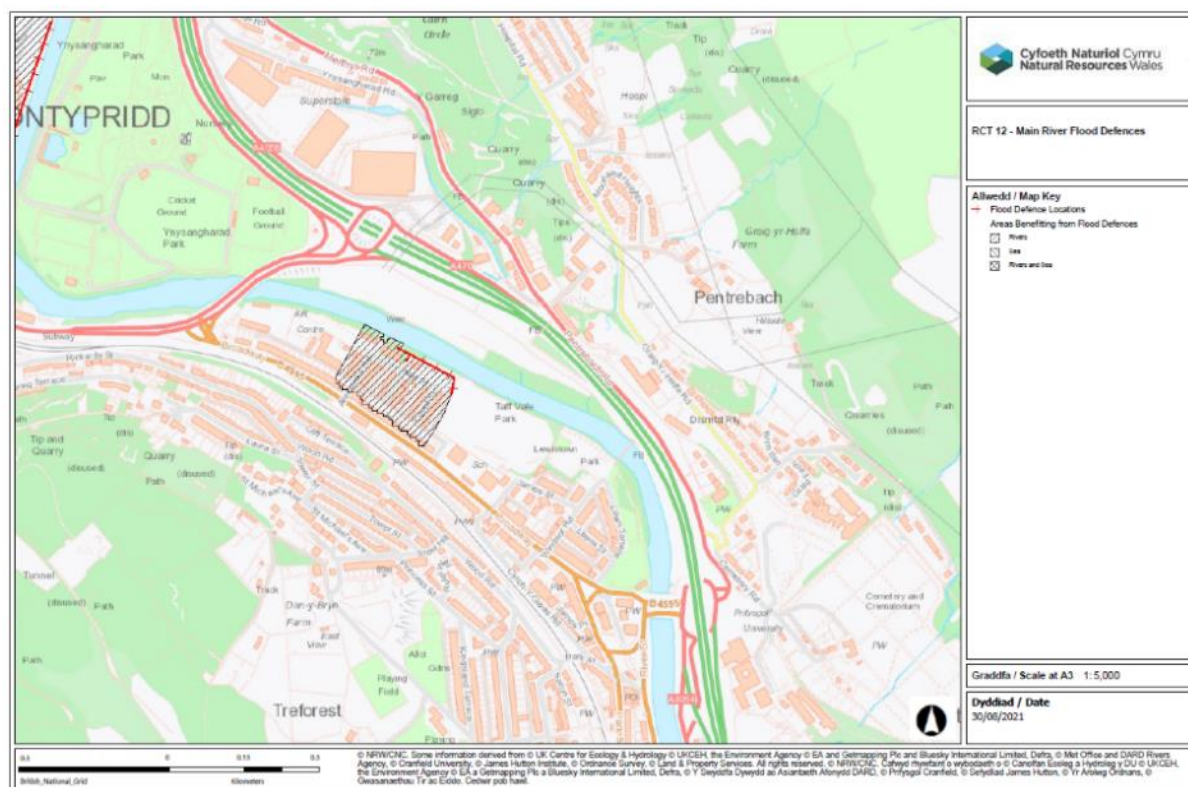


Figure 11: Natural Resources Wales’ map for Main River Flood Defences and areas benefiting at RCT12. Contains Natural Resources Wales information © Natural Resources Wales and database right. All rights reserved

The current indicative design standard of protection for flood defences on a main river is 1 in 100 annual probability (Q100) flood event plus, for new defences, an allowance for climate change. This is stated within the Welsh Government’s National Strategy for Flood and Coastal Erosion Risk Management which encourages main river flood alleviation schemes to provide a Standard of Protection (SOP) up to Q100⁵. It is thereby inferred that the current SOP of flood defence infrastructure at RCT12 is below current indicative standards.

Whilst the flood defences identified at RCT12 are below the current indicative standard, the unprecedented rise of river levels in the Taf during Storm Dennis resulted in the overtopping of assets up to Q100 SOP. NRW’s ‘Flood Incidence Response Review’⁴ does in fact outline that no flood defences failed in the lower Taf region and that the flooding was the result of river flows exceeding the construction design standard.

⁵ [National Strategy for Flood and Coastal Erosion Risk Management in Wales \(English\) \(gov.wales\)](https://www.gov.wales/national-strategy-for-flood-and-coastal-erosion-risk-management-in-wales)

3.4. HIGHWAY DRAINAGE CONDITIONS

Several streets, including Nile Street, Egypt Street and Niagara Street, were observed to be flooded by the overtopping of the River Taf during Storm Dennis. These fluvial flows deposited mud, silt and debris across the investigation area which are assumed to have entered the highway drainage system, leading to blockages and a reduction in the hydraulic capacity of the surface water network.

Surface water conveyance along the highway network at Broadway (B4595) was also noted by residents during the storm event. Given the intensity of rain falling on a largely impermeable catchment, it is considered that the highway drainage infrastructure in the affected regions of RCT12 became overwhelmed during the storm event, resulting in exceedance surface water flows along the highway.

Highway drainage is not designed to manage overland flows from private areas, parks or open space, nor is it designed to accommodate fluvial flows that may arise during storm events. In this instance, the capacity of the highway drainage in RCT12 was exceeded as a result of a both main river and surface water flows entering the network. The maintenance condition of the highway drainage infrastructure is not considered to have significantly impacted the flooding experienced.

3.5. DCWW APPARATUS CONDITIONS

In addition to the highway drainage infrastructure within RCT12, the overtopping of the River Taf and the intensity of rainfall during Storm Dennis is considered to have overwhelmed parts of DCWW's combined drainage infrastructure during the storm event. This is evidenced by the surcharging of a DCWW combined sewer manhole on James Street (illustrated in Figure 12), resulting in the internal flooding of a nearby residential property which is also situated at a localised low point.

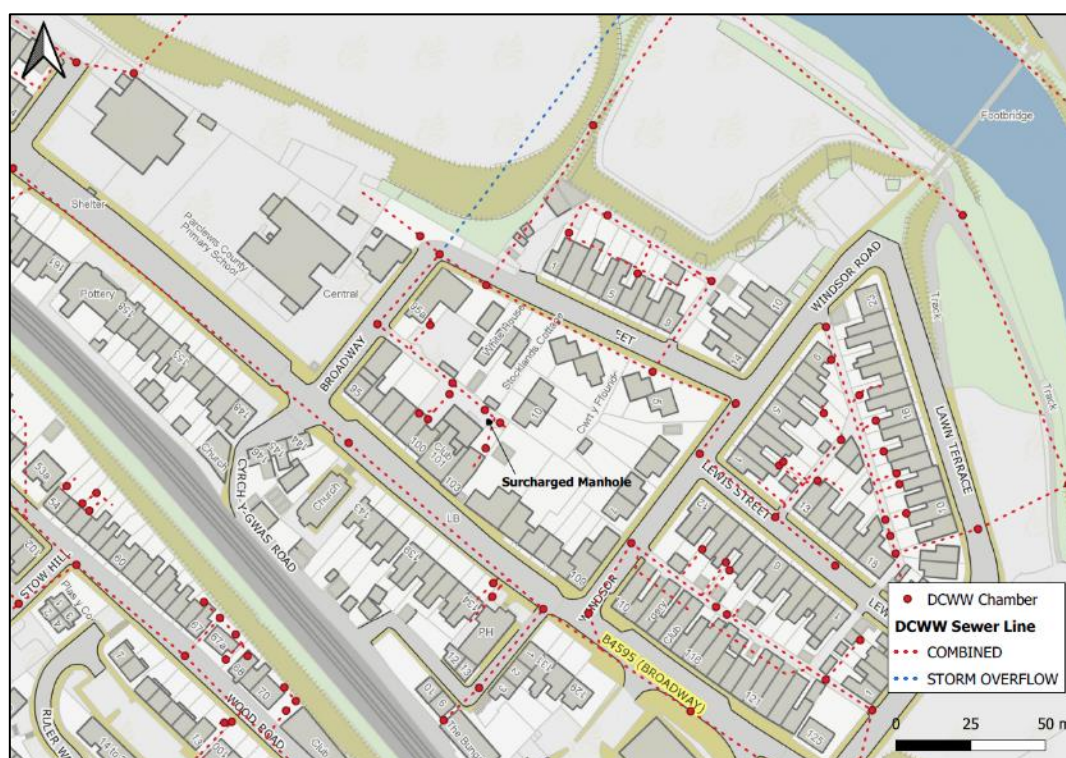


Figure 12: Location of surcharging manhole on DCWW's Combined Sewer network

Furthermore, reports from properties on Niagara Street during the flood event also refer to being impacted by sewage. Surcharging from the combined sewer network in this area may have occurred during the storm event, however, this cannot be confirmed due to the dominant impact of fluvial flooding sourced by the River Taf during the event. The unprecedented height of main river levels within the River Taf may have also impacted the ability of DCWW's infrastructure to manage the discharge of water during the storm event.

As outlined in 'FRM – Storm Dennis – Overview Report'², DCWW sewers have a current design standard of Q30, as per the 'Sewers for Adoption 7th Edition'⁶ guidance document. Given that the design standard was markedly exceeded during Storm Dennis, the maintenance condition of DCWW apparatus is not considered to have significantly impacted the flooding experienced.

⁶ WRC., 2012. Sewers for Adoption: 7th edition

3.6. SURFACE WATER

To estimate the area of land that would be expected to drain from the hillsides surrounding RCT12 towards the investigation area, a rolling ball assessment (a Geographical Information System (GIS) technique used to delineate a watershed using topographical data) was undertaken as part of Redstart's FIR. Figure 13 illustrates the estimated topographic watershed.

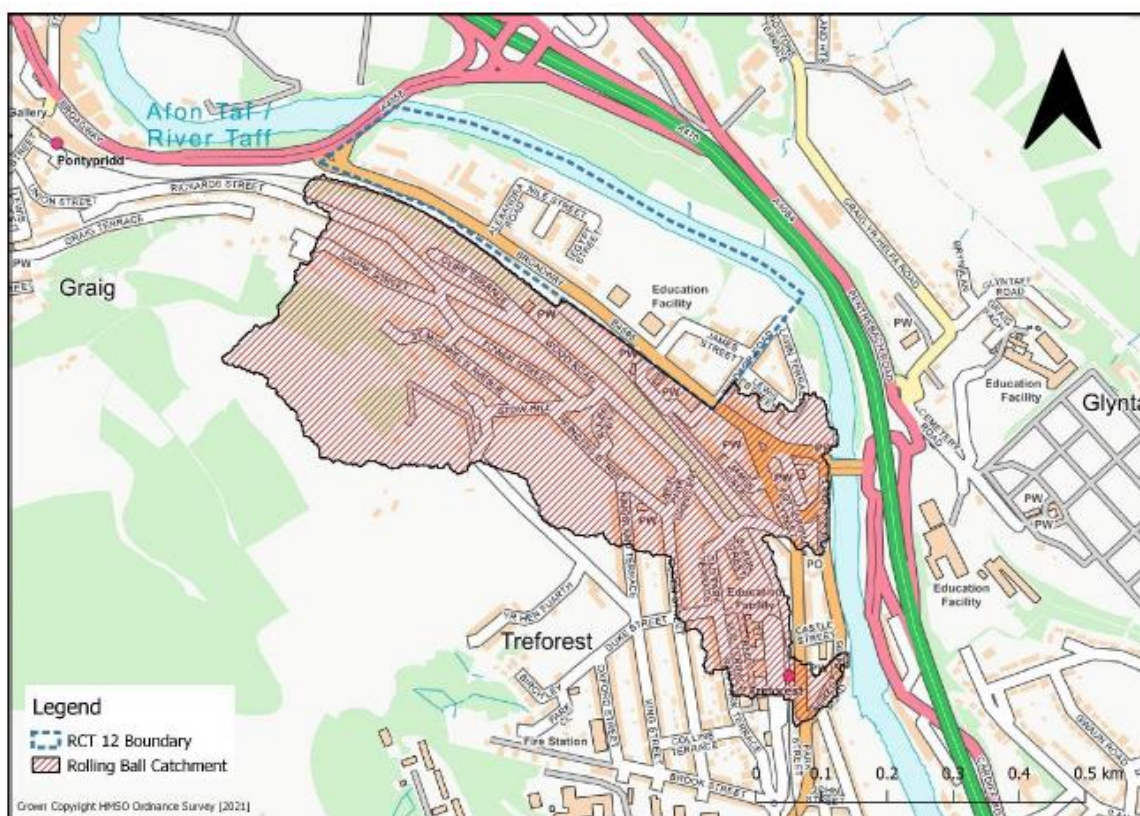


Figure 13: Topographic Watershed above RCT12

Figure 13 shows that surface water runoff originating from the hillsides to the south and southwest of Treforest are separated from the investigation area by the railway embankment running alongside Broadway. This suggests that whilst overland flows may have contributed to the pluvial flooding that occurred at Broadway, it is considered that surface water flooding within RCT12 was predominantly localised and not a consequence of the dominant valley gradient.

Surface water flows generated by intense rainfall and conveying via local topography and the highway network has been identified as the primary cause of flooding to one property at Broadway (B4595). Surface water is also considered to have contributed

to and exacerbated the main river and sewer flooding observed across the investigation area.

3.7. SUMMARY OF POSSIBLE CAUSES

The above sections have identified and described the possible causes of flooding within RCT12 during Storm Dennis which occurred on the 15th and 16th of February 2020. A summary of the identified source(s) and possible cause(s) of flooding (issue) has been outlined below in Table 4.

Table 4: Summary of source(s) and possible cause(s) of flooding in RCT12 during Storm Dennis (15-16th February 2020)

Ref No	Asset (Source)	Issue	Asset Owner	Type of Flooding
1	River Taf	Unprecedentedly high river levels within the River Taf resulted in the main river overtopping its banks at several locations and conveying into several properties.	Mixed Ownership	Main River
2	Surface water drainage network across RCT12	Intense rainfall across RCT combined with the overtopping of the River Taf severely overwhelmed highway drainage infrastructure, resulting in the accumulation of surface water on several streets throughout the investigation area.	Rhondda Cynon Taf CBC Highway Authority	Surface Water
3	Surcharging combined sewer infrastructure	A surcharging manhole on DCWW's combined sewer network caused internal flooding to one property.	DCWW	Sewer Flooding

4. RISK MANAGEMENT AUTHORITY ACTIONS

A Welsh Risk Management Authority is defined in Section 6 of the Flood and Water Management Act 2010 as NRW; a LLFA, a district council for an area where there is no unitary authority, or a highway authority wholly in Wales; an internal drainage board for an internal drainage district that is wholly or mainly in Wales; a water company that exercises functions in relation to an area in Wales. As the LLFA, RCT has the responsibility to coordinate the management of flood risk and the interaction of Risk Management Authorities across Rhondda Cynon Taf.

An overview of the relevant Risk Management Authority in relation to flood type is provided in Table 5. For further details of the roles and responsibilities of individual Risk Management Authorities in managing flooding, refer to the Welsh Government's National Strategy for Flood and Coastal Erosion Risk Management, Section 4 'Roles and Responsibilities'⁵, and RCT's 'FRM – Storm Dennis - Overview Report'².

Table 5: Risk Management Authority with relevant functions to manage the risk for different flood types

Type of Flooding	Risk Management Authority
Flooding from Main River, reservoirs and the sea (including coastal erosion).	Natural Resources Wales
Flooding from ordinary watercourses, surface water and groundwater	Lead Local Flood Authority
Flooding from water and sewage systems	Water Companies (Dŵr Cymru Welsh Water)
Flooding from the highway	Highway Authority
Flooding from the highway (motorways and major trunk roads)	Welsh Government Trunk Road Agency

Risk Management Authorities have direct flood risk management functions under the Flood and Water Management Act 2010, as well as the Water Resources Act 1991, Land Drainage Act 1991 and the Highways Act 1980. Through analysis of the flooding that impacted RCT12, the flood risk management functions exercised or proposed to be exercised by relevant RMAs were recorded pursuant to Section 19 of the Flood and Water Management Act 2010, which 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 the response to the flood.”

Through the investigation process, the source(s) and possible cause(s) of flooding in RCT12 during Storm Dennis have been previously identified and summarised within Table 4. The Risk Management Authorities responsible for managing that flooding have been listed in Table 6 below, along with a series of recommendations put forward by the LLFA.

Table 6: Recommendations provided by the LLFA to be considered by the relevant Risk Management Authority identified in response to the source(s) of flooding in RCT12 (as per Table 4).

Ref No	Asset (Source)	Asset Owner	Type of Flooding	Relevant Risk Management Authority	Recommendations
1	River Taf	Mixed Ownership	Main River	Natural Resources Wales	R1A NRW to “complete detailed investigative analysis work to understand the mechanisms of flooding in areas known to have flooded from main rivers”, including the River Taf at Treforest. Aligns with recommendation ‘Action FD2’ within NRW’s Flood Incident Management Review.

					R1B	<p>NRW to investigate the standard of protection provided by flood defences at RCT12 and “consider improvements to NRW flood alleviation schemes and structures on a prioritised basis”. Aligns with recommendation ‘Action FD3’ within NRW’s Flood Incident Management Review.</p>
					R1C	<p>NRW to review its flood warning service provision, especially for extreme events. This will form part of NRW’s Flood Warning Service Review Implementation Programme and aligns with the recommendations set out in their ‘Flood Incidence Management Review’.</p>
2	Surface water drainage network across RCT12	Rhondda Cynon Taf CBC Highway Authority	Surface Water	Highway Authority and Lead Local Flood Authority	R2A	<p>The Highways Authority to jet and cleanse the highway drainage network and action repairs accordingly.</p>

					R2B	The LLFA and Highway Authority to evaluate surface water management options to alleviate pluvial flooding at locations across the investigation area.
3	DCWW combined sewer and associated manhole	DCWW	Sewer	DCWW	R3A	DCWW to evaluate the standard of service and the condition of the combined sewer network servicing RCT12.

4.1. LEAD LOCAL FLOOD AUTHORITY

In review of Ref 2 in Table 6, the LLFA has been determined as a relevant Risk Management Authority in relation to the surface water flooding which occurred in Treforest during Storm Dennis.

The LLFA exercised the following functions in response to the flooding at investigation area RCT12:

- Officers investigated the initial flooding and have produced this report in line with Section 19 of the Flood and Water Management Act 2010.
- Officers contacted residents affected by flooding to offer support and advice to assist in the recovery following the event.
- A public engagement exercise carried out by Redstart, on behalf of RCT as the LLFA, was undertaken in order to gain further local insight and anecdotal evidence to support the flood investigation.
- The LLFA has exercised its powers, under Section 13 of the FWMA, to request information and co-operation from the relevant risk management authorities (NRW and DCWW) in relation to their responsibilities as RMAs in response to Storm Dennis.
- The LLFA has set up a central Control Room, to compliment the Council's Contact Centre and CCTV centre which is based at the Council's offices, to provide a comprehensive and informed response to the residents of RCT as appropriate during storm events.
- The LLFA, working in partnership with NRW, have expanded their interim Property Flood Resistance project offering expandable flood gates to those properties deemed at high risk of flooding from the main river, as per NRW's determination.

The LLFA also propose to exercise the following functions in response to the flooding at RCT12:

- The LLFA and LDA intend to clarify drainage asset owners and management responsibilities to make them aware of their personal risk. To ensure landowners manage the risk in compliance with the relevant legislation, a team of Flood Enforcement Officers including legal support is to be appointed.

- The LLFA and LDA will work with landowners and property owners to manage their personal flood risk through local measures, such as property resilience and resistance measures.
- As part of RCT's comprehensive review of the County Borough's most at risk communities, the LLFA are proposing to undertake a formal SFRA of the Lower Taf catchment area to better understand the overall risk from ordinary watercourse and surface water flooding in order to target investment to areas of highest risk. The SFRA also aim to encourage whole catchment measures, including working with natural processes, to alleviate flood risk in those areas of highest risk. **(R2B)**
- The LLFA will cooperate and collaborate with NRW to ensure a detailed study of the investigation area is completed and that appropriate actions to mitigate the impacts of river flooding are undertaken in accordance with NRW's Flood Incident Management Review.

4.2. NATURAL RESOURCES WALES

In review of Ref 1 in Table 6, NRW has been identified as the relevant Risk Management Authority in relation to the main river flooding from the River Taf during Storm Dennis.

NRW have exercised the following functions in response to the flooding at RCT12:

- NRW have carried out post event data collection including an assessment of the properties impacted by main river flooding and a survey of wrack marks, i.e. the marked high-water level.
- Following Storm Dennis NRW undertook an inspection of the River Taf at Treforest to ensure it was clear of blockages.
- NRW specifically outline within their ‘Flood Incident Management Review’⁴ that “more Severe Flood Warnings should have been issued based on the flooding impacts experienced” in the Lower Taf region. Utilising post event data and information, NRW have reviewed the Resultant Thresholds for the River Taf at Pontypridd Flood Warning Area. This is critical for assessing the performance, timeliness and accuracy of the warning service after a flood. **(R1C)**.
- NRW has introduced improved digital services to provide comprehensive flood risk, river level and rainfall information to households, businesses and communities across Wales. The improved service was launched in September 2020 on the NRW website and will improve how live flood warning and water level data is shared before and during flood events. **(R1C)**
- NRW have commissioned a Lower Taf Flood Modelling Project which is currently ongoing. **(R1A)**
- Following the flooding events of February 2020, NRW published a review of its incident response to Storm Ciara and Dennis in October 2020⁷. This review contains several recommendations for improvements to their ways of working and services which NRW are in the process of implementing through an internal delivery programme.
- NRW have developed a detailed Implementation Programme to address the areas of improvement work required to deliver the recommendations of the Flood Warning Service Review carried out by NRW in 2018. Several of the recommendations directly link to the recommendations set out by NRW within their Flood Incident Management Review **(R1C)**.

⁷ [Natural Resources Wales / Our response to Storm Ciara and Storm Dennis](#)

NRW propose to exercise the following functions in response to the flooding at investigation area RCT12:

- NRW to undertake minor repairs to Egypt Street flood wall.
- Following the completion of NRW's Lower Taf Flood Modelling Project, NRW propose to undertake an initial assessment of the viability of potential flood risk management options. Consideration should be given to areas at high risk of flooding from rivers on a prioritised basis. **(R1A, R1B)**
- Following the completion of NRW's Lower Taf Flood Modelling Project, NRW propose further threshold work and flood warning area amendments. **(R1A, R1C)**
- NRW will undertake a review of the modelled outputs and adopt changes to their maintenance program within the investigation area if required. **(R1A)**

4.3. WATER COMPANY

In review of Ref 3 in Table 6, DCWW has been identified as the relevant Risk Management Authority in relation to the sewer flooding associated with a surcharging manhole within the combined sewer network.

DCWW have exercised the following functions in response to the flooding at RCT12;

- DCWW have carried out their own investigations in response to the incidence of flooding that was reported by residents to RCT during the storm event.
- DCWW have investigated the performance of their network and telemetry systems during the storm event to ensure their assets were operating with no issues.

4.4. HIGHWAY AUTHORITY

During the investigation into the flooding at investigation area RCT12 during Storm Dennis, the Highway was identified as flooding from a combination of sources, notably as a result of surface water runoff and main river flooding from the River Taf.

Ref 2 of Table 6 identified the Highway Authority as a relevant Risk Management Authority in relation to the surface water flooding that occurred along the highway across RCT12.

RCT as the Highway Authority have exercised the following functions in response to the flooding at investigation area RCT12:

- The Highway Authority assisted with the emergency response during the event by supplying equipment and sandbags, some to individual properties and using sandbags to redirect flood water away from properties.
- The Highway Authority exercised their functions, under Section 100 of the Highways Act 1980, to arrange for all gullies and open drains in the highway to be inspected and cleansed following the influx of fluvial flood water to ensure the safety of the highway post event. **(R2A)**

RCT as the Highway Authority propose to undertake the following function in relation to the storm event at investigation area RCT12:

- The Highway Authority intend to increase their resource capacity by establishing a dedicated 'Pluvial Drainage Team' to focus entirely on the refurbishment and maintenance of RCT's existing and enhanced highway drainage infrastructure.

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>