

Investigation Report into Flooding Incident of 16th February 2020 Canal Side, Aberdulais



Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council Cyngor Bwrdeistref Sirol

Highways and Drainage Services
Environment and Regeneration Directorate
Neath Port Talbot County Borough Council

The Quays

Brunel Way

Briton Ferry

Neath

SA11 2GG

Revision Schedule

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1. Introduction

An investigation has been undertaken by Neath Port Talbot County Borough Council (from here referred to as the Authority) as Lead Local Flood Authority in response to the flooding that occurred at Canal Side, Aberdulais on the 16th February 2020. This report is a summary of the investigation and includes relevant information required to meet the statutory requirements placed on the authority by Section 19 of the Flood and Water Management Act 2010. Information regarding the duties and responsibilities placed on a Lead Local Flood Authority to investigate flooding can be found in Appendix A.

One of the requirements of Section 19 is that an investigation report must identify which Risk Management Authorities (RMAs) have relevant flood risk management functions. Appendix B provides a summary of the roles and responsibilities of the RMAs within Neath Port Talbot.

Through the investigation process, it was determined that the relevant RMA's for the flooding that occurred at Canal Side on 16th February 2020 are:

- NPTCBC - Coordinator as Lead Local Flood Authority
- NRW as Main River Authority
- DCWW as Sewerage Undertaker
- WG/Cadw as statutory body for the Tennant Canal Aqueduct

The flooding at Canal Side, Aberdulais occurred at approximately 01:00hrs on Sunday 16th February 2020 following a period of prolonged and intense rainfall that started on Saturday 15th February at approximately 03:00 hrs and ended Sunday 16th February at 14:00 hrs.

Emergency response actions were undertaken by NPTCBC to help reduce the flood risk and mitigate risk to life on the day.

2. Flood Incident

2.1. Location of flooding

Canal Side is located in the electoral ward of Aberdulais that is situated at the end of the Crynant valley where it meets the Neath Valley. The affected properties are situated alongside the Tennant canal and adjacent to the confluence of the river Neath and river Dulais, which is located in the centre of Neath Port Talbot County Borough. Figure 1 shows the site location.

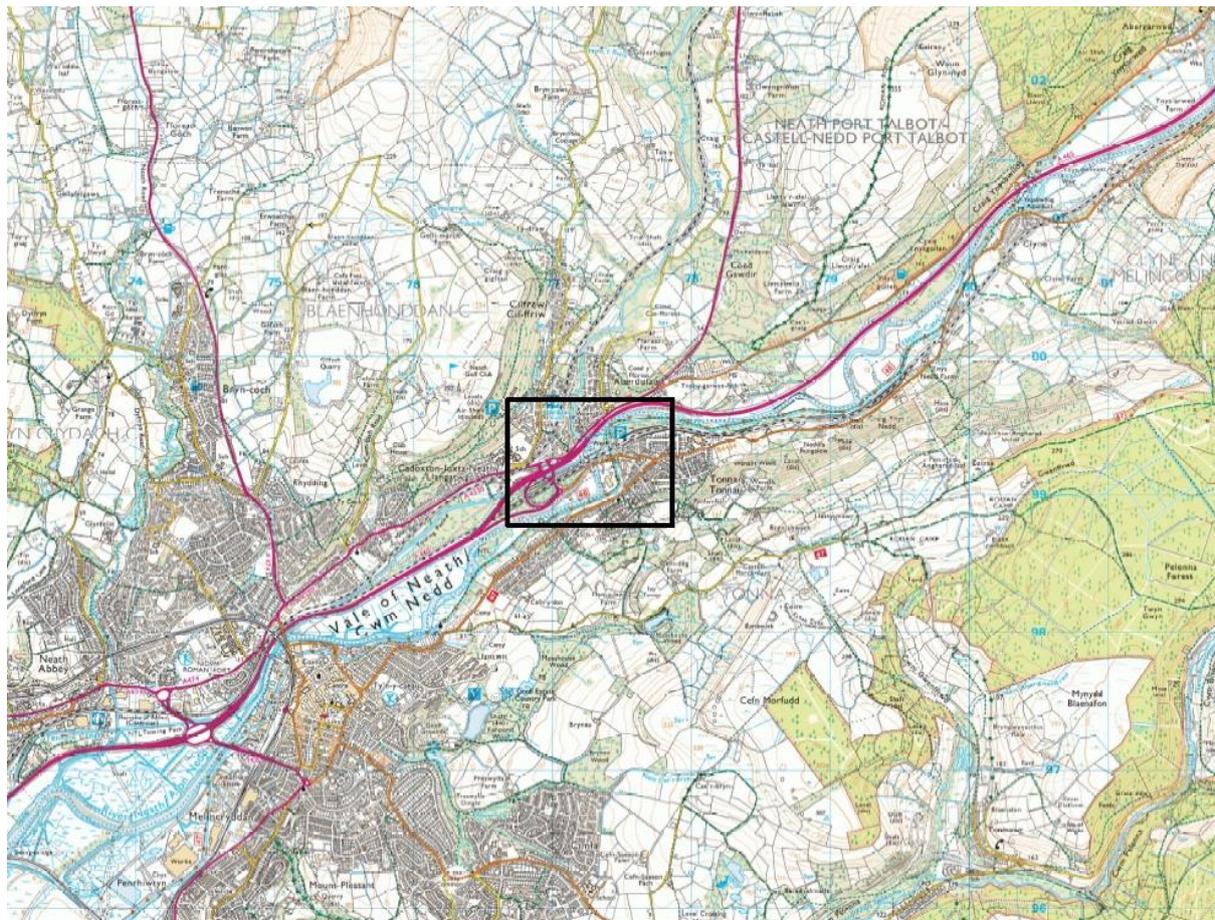


Figure 1 – Canal Side location plan.

2.2. Rainfall event and analysis

Between 03:00 hrs Saturday 15th February and 14:00 hrs Sunday 16th February continuous rainfall fell across the County Borough which lasted approximately 35 hours, peaking in intensity late Saturday night around 22:00 hrs. Canal Side sits in the river Neath catchment that along with the river Tawe catchment received the highest levels of rainfall over the 2 days. The river Neath catchment

is approximately 31,652ha in size and encompasses sections of the Brecon Beacons that are drained via a number of recognised watercourses on its southern slopes before converging on the river Neath near Pontneathvaughan. The river Neath and its largest tributary river Dulais will be discussed throughout this report as one of the main contributors to the flooding. Figure 2 below shows the catchment size with the location of Canal Side labelled.



Figure 2 - River Neath fluvial and pluvial catchment plan.

The average levels of rainfall that fell on NPTCBC and South Wales across a 6-day period are displayed in Figure 3. It shows how consistent rainfall fell for 3 days leading up to the weekend before increasing in intensity for 2 days. It illustrates how high the average rainfall levels were across Saturday and Sunday.

Analysis of the rainfall identified that the intensity increased up until it peaked on Saturday. The highest average rainfall in a 24-hour period measured across a 1km grid square was 113mm on Mynnydd Marchywel. This location falls within the river Dulais catchment, which is the largest tributary of the river Neath with its confluence at Canal Side.

Over the 2 days of the storm it has been calculated that an average of 61.3mm of rainfall landed within the county boundary over a 48 hour period.

A summary of the rainfall analysis:

- Recorded data from Saturday 15th revealed the rainfall ranged from 113mm to 40mm in the 24hr period across the catchment, averaging out to 76.5mm.
- Recorded data from Sunday 16th revealed the rainfall ranged from 63mm to 29mm in the 24hr period across the catchment, averaging out to 46mm.

It is noted from the river Neath gauging station records at Resolven (6 miles upstream from Canal Side) that during the storm the river level peaked twice, once on Saturday 18:30 at 2.371m and then again on Sunday 05:15 at 3.29m.

Figure 4 & 5 illustrates the magnitude of the rainfall event with the river level exceeding the highest on record on Sunday morning. The rainfall hydrograph data from Resolven along with the river level records show how the river level reacted to the rainfall peak times.

- Rainfall peaked at 4.4mm per hour at 15:00 hrs on the Saturday with the river levels reacting 4.30 hrs after, peaking at 18:30 hrs.
- Rainfall again peaked at 9.8mm per hour at 23:00 hrs Saturday and again at 8.6mm per hour at 03:00 hrs on Sunday morning leading to the river level rising to the highest on record at 05:15 hrs.

Across Saturday and Sunday the authority responded to many calls across the borough regarding flooding which the emergency 'out of hours' staff responded to. However, at approximately 01:00 hrs Sunday 16th February the first floodwaters entered properties on Canal Side.

It is important to note that the floodwater continued to rise throughout a period of approximately five hours with the first property reporting flooding at 01:00 hrs and the last at 05:30 hrs. It is also understood the floodwaters did not recede until late morning at around 10am Sunday morning.

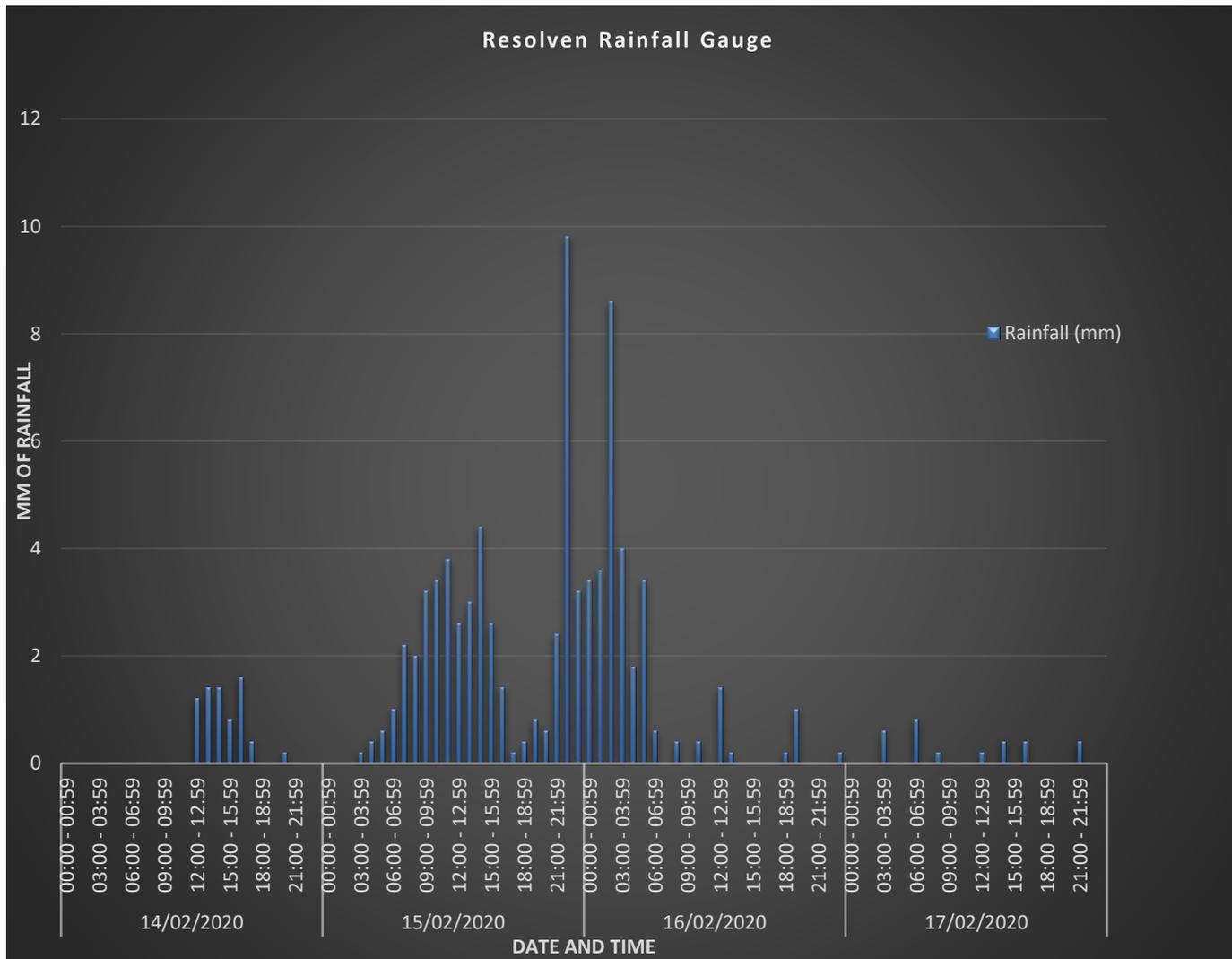


Figure 4 – Rainfall Hydrograph at Resolven, Shootill Gauge Map 2020.

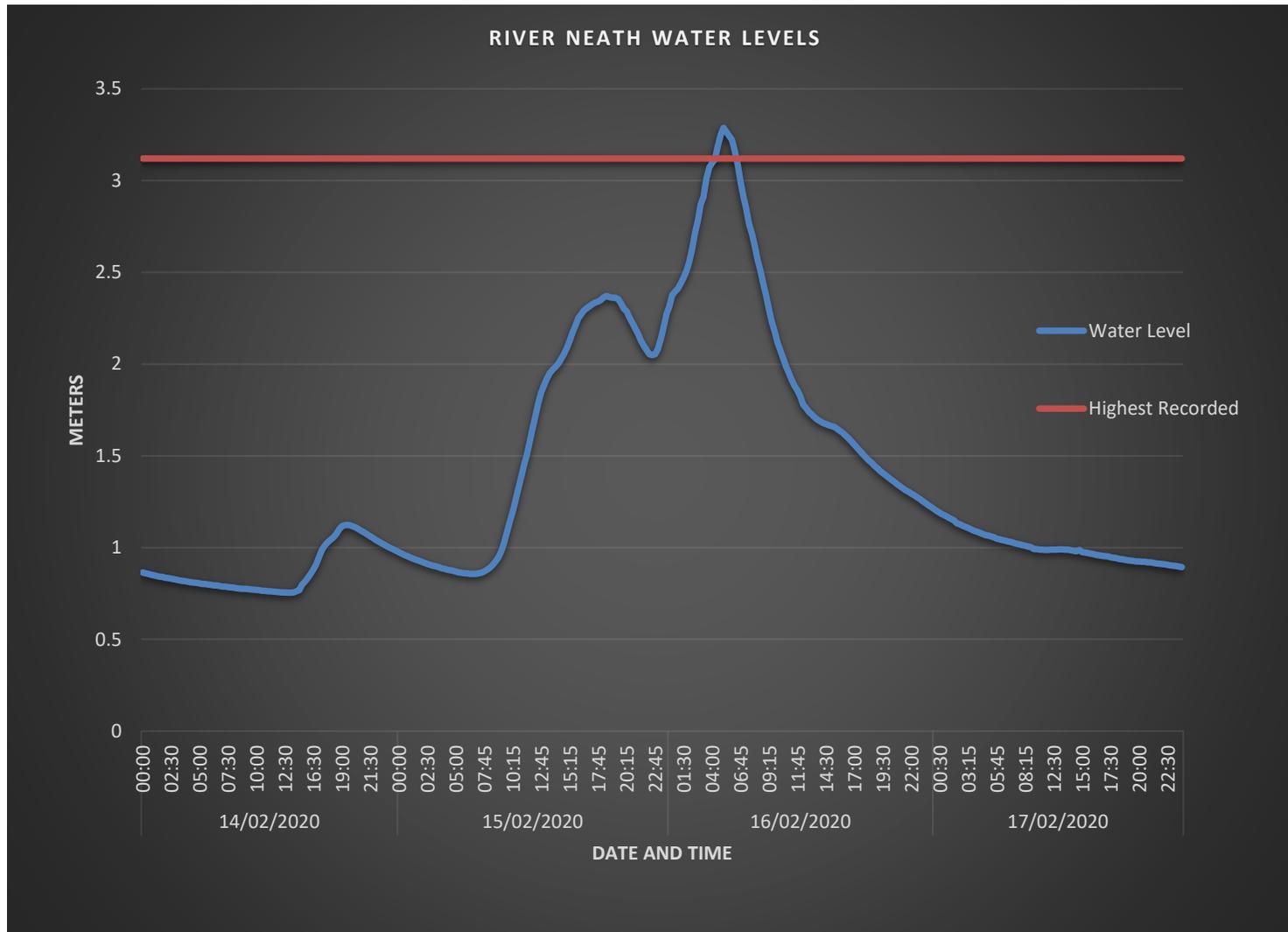


Figure 5 – River Level records at Resolven, Shootill Gauge Map 2020

2.3. Flood extent

A number of properties suffered internal flooding on Sunday 16th February at Canal Side; Figure 6 illustrates the general location of the properties that were affected.

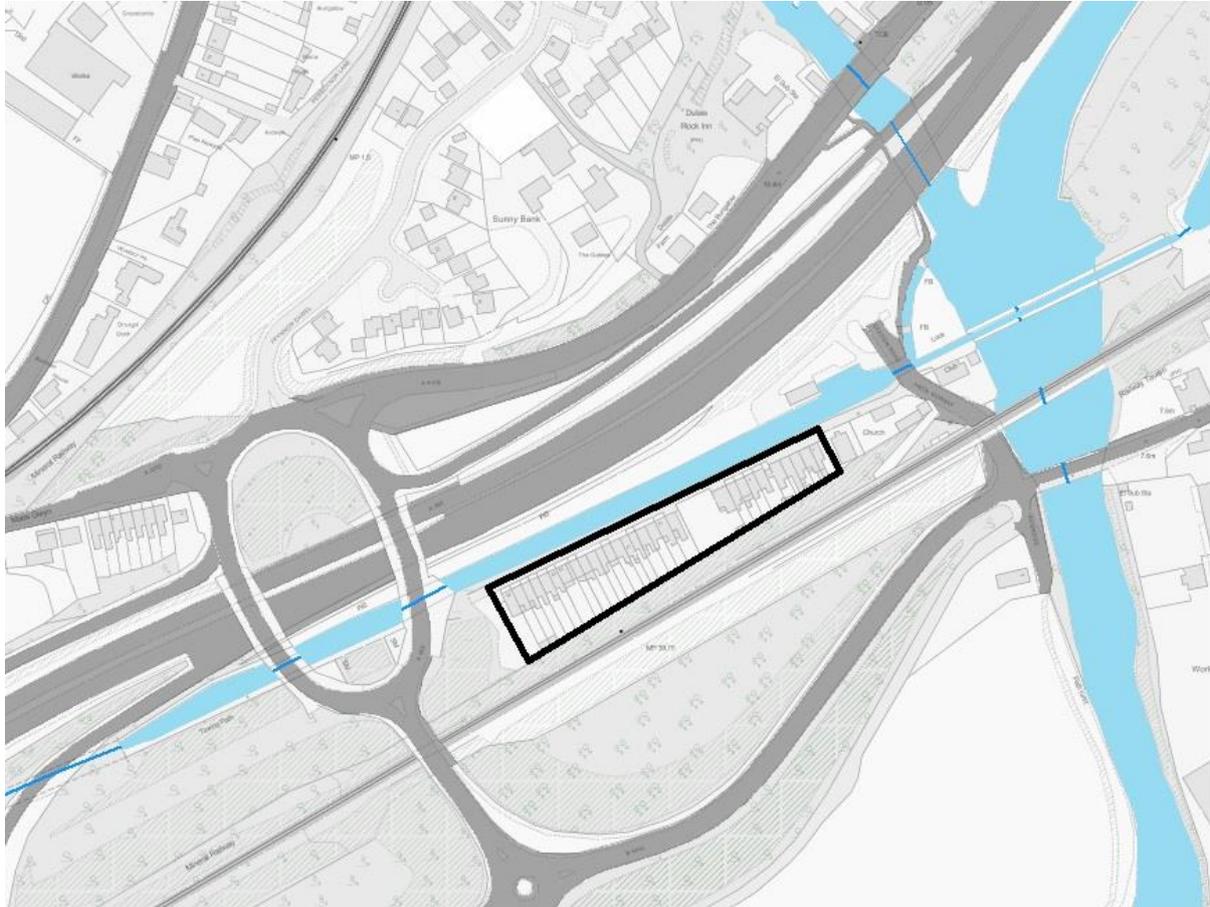


Figure 6 - Location of properties affected by the flood event on 16th February 2020

2.4. Site characteristics and structures

The properties on Canal Side are located alongside the Tennant canal in a low lying parcel of land that is sandwiched between the A465 to the north and west, the river Neath to the east and the Neath mineral railway line embankment to the south. The area is lower than all of the surrounding land with a difference of 3.76m between the lowest lying properties and the river level that was recorded on the day.

The area is characterised as a typical flood plain, with loamy/clayey floodplain soils and a naturally high water table due of its proximity to the river. The geology is predominantly carboniferous sandstone overlaid with superficial

deposits of alluvium clay, silt, sand and gravels deposited during the Quaternary period through to present day. The associated dynamics between the local soil characteristics and water levels in the river Neath have a major bearing on flood risk in the area.

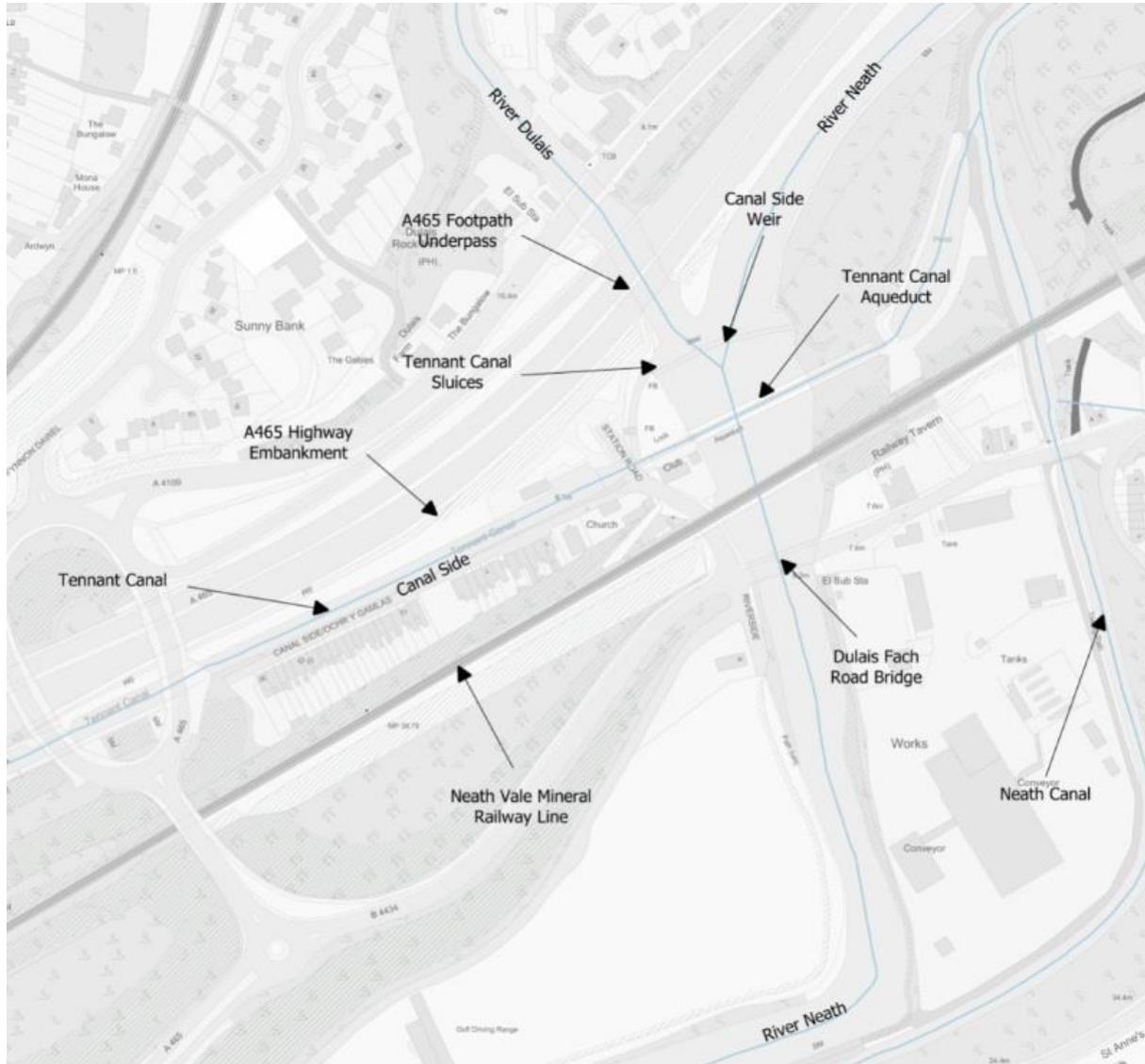


Figure 7 – Site characteristics and structures

2.4.1 Canal Side weir

This structure is a reminder of historical manmade alterations made to the river in order to harness its resource. Built in circa 1887, the weir is a low dam constructed across both the river Dulais and river Neath in order to regulate the flow of the river. It alters and diverts the natural current of the rivers to distribute the flow evenly through all of the aqueduct arches, though its primary

construction purpose was as a water management tool for the nearby tinplate factory and Tennant canal.



Image 1 – Weir structure at Canal Side.

It is important to note that the Canal Side weir also marks the point of furthest tidal influence on the river Neath. However, the structure is in a very poor state of repair with a 20m section demolished during a previous flood, therefore, it can be argued the tidal influence extends further upstream, especially during times of high sea levels.

This flood event on Sunday 16th February was found to coincide with a low spring tide at 05:11 hrs Sunday morning at a height of 2.02m, as seen in Figure 8. It can therefore be surmised the tide was not an impacting factor during this storm event.

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Data Area 1-4. Europe, Northern Waters & Mediterranean Updated to Week 07/20

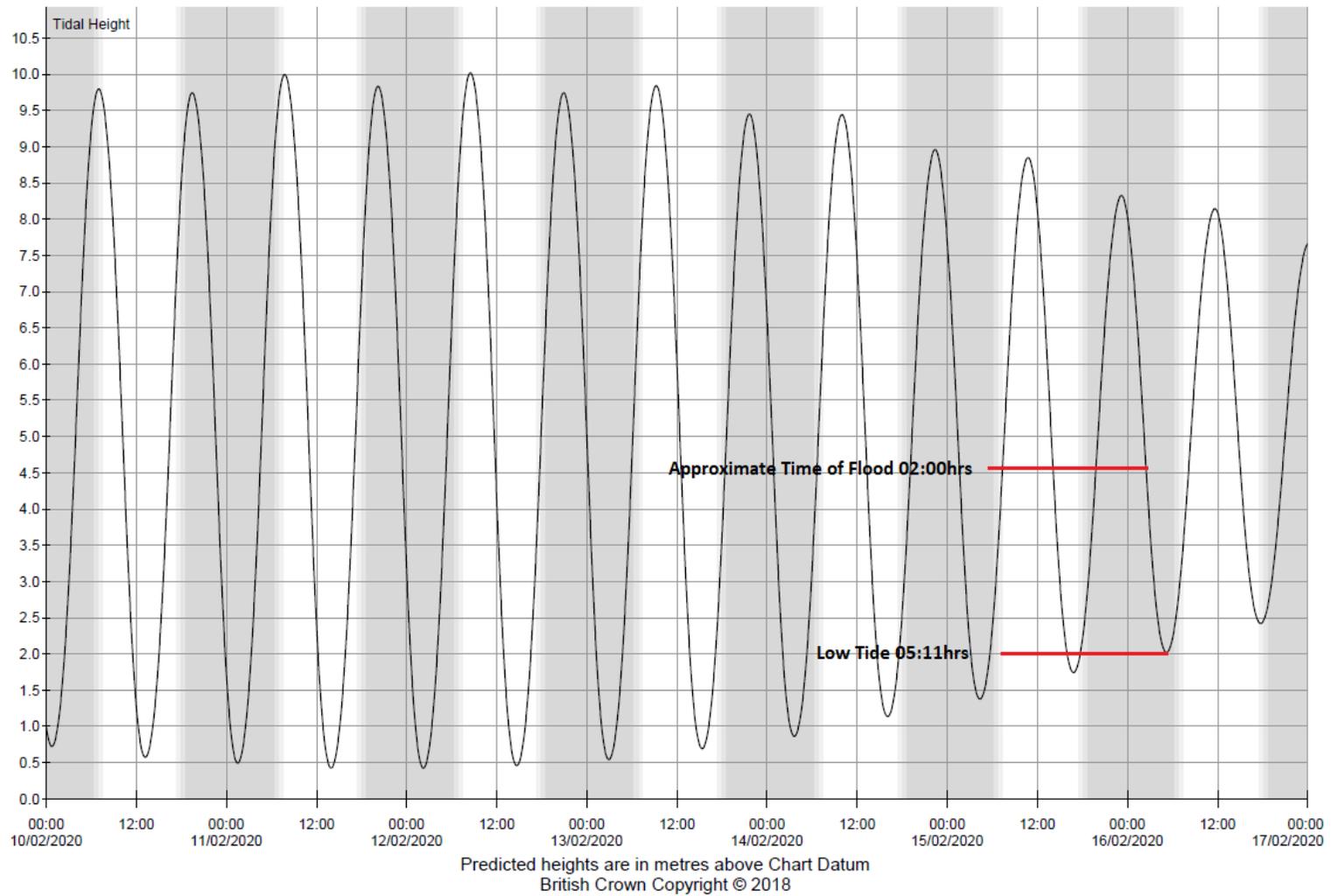


Figure 8 – Tide data showing time of low tide and the flood event at Canal Side.

2.4.2 Canal Side aqueduct

Immediately 30 meters downstream of the weir is the Tennant canal aqueduct that crosses the river Neath. The aqueduct is a 130m long ten arch masonry structure that was built in 1823 to link the Tennant and Neath canals. The structure imposes itself on the river as you can see in Image 2 and water is forced to channel between the arches. Downstream from here the river flows beneath the Vale of Neath railway line viaduct and the B4434 Dulais Fach Road Bridge that is often overtopped during high river levels. Although the aqueduct is understood to be privately owned, it has scheduled monument (SM) designated under the Ancient Monuments and Archaeological Areas Act 1979, as amended by the Historic Environment (Wales) Act 2016.

The structure is also in a very poor state of repair; however, it is protected and preserved in its current state by Cadw who are a division of Welsh Government. The structure, although protected has suffered from extensive damage following recent storms and Cadw should therefore appoint a qualified structural engineer with experience of historic structures to thoroughly inspect.



Image 2 – Tennant Canal Aqueduct

2.5. Drainage networks and flood paths

There are no public or private, surface water drainage networks or culverted watercourse on Canal Side. Rainwater that lands on hardstanding is known to drain into the Welsh Water combined sewerage network. The combined sewers are located to the rear of the properties and drain out into the main trunk sewer that runs in a south-westerly direction alongside the riverbank towards the pumping station on Riverside lane, as can be seen in figure 9. There is no positive drainage at the property frontages, only the downpipes from roofs discharge water directly on to the un-adopted track that is located between the canal and properties.

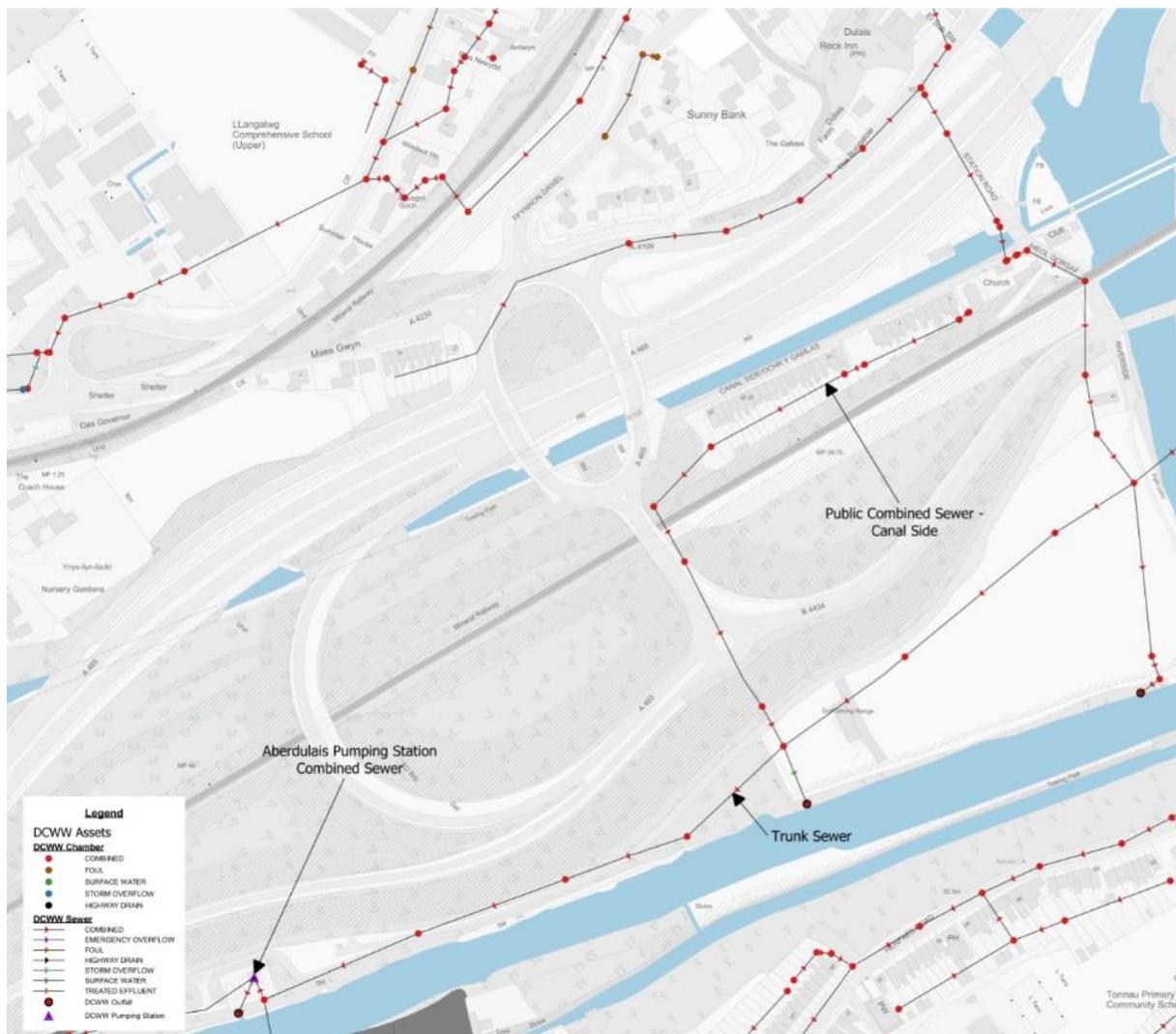


Figure 9 - Map showing the public combined sewer network at Canal Side

Reports from residents and indications on the ground during site investigations point toward flooding coming from two main sources, the river Dulais and the combined sewerage network. Figure 10 illustrates the likely flood paths.

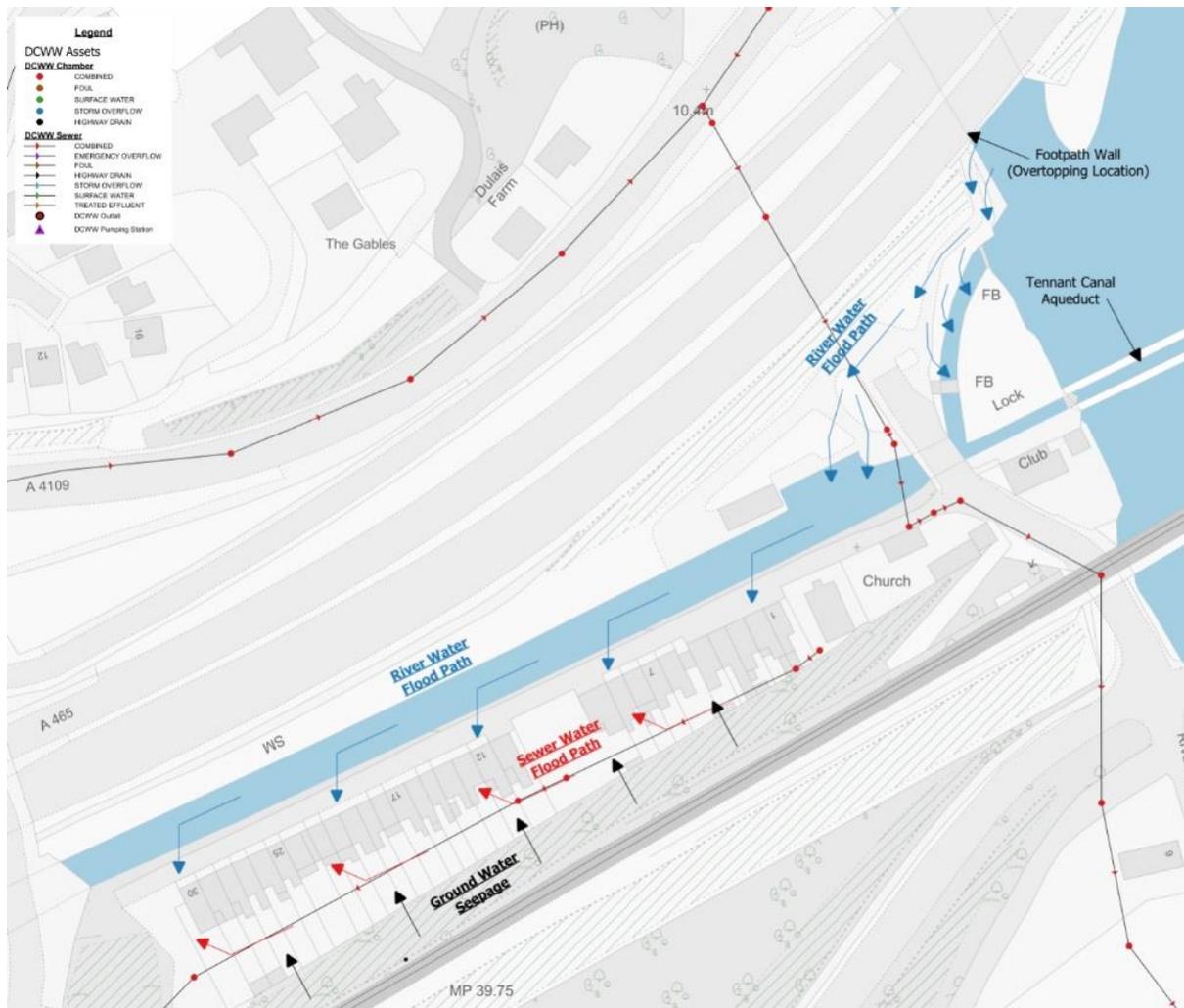


Figure 10– Flood water paths

It is understood the river Dulais overtopped the wall that is adjacent to the A465 underpass footpath (Image 3 and 4), the resultant floodwater then flowed down the footpath towards Canal Side entering the canal at various points. Around the same time, it is reported the drains and sewer chambers at the rear of the properties started to surcharge. It is also noted that residents reported ground water seeping through the railway embankment that backs onto the properties, although this would not have been critical on its own, it would have contributed to the floodwater. The volumes of water at the front and back of properties increased and eventually overcame the sandbag defences the residents erected in their doorways, flooding internally up to a depth of 1m.



Image 3 – Footpath wall where the river Dulais overtopped, downstream.



Image 4 – Footpath wall where the river Dulais overtopped, upstream.

2.6. Detailed investigation findings

On 16th February 2020, the river Dulais broke out of its channel and the combined sewer network exceeded its hydraulic capacity. Floodwater from the river caused the canal water level to rise considerably that then entered through the front doors flooding the ground floors of 27 properties. At the same time, water surcharging out of sewer drains positioned in the rear gardens led to wastewater entering the rear of the properties.

There has been a number of floods in previous years at Canal Side due to the river level and it has been known to flood from the sewerage system on at least one previous occasion. On October 12th 2018 Canal Side properties suffered from sewer flooding. The authority produced a section 19 report that can be found in the link <https://www.npt.gov.uk/8057>

2.6.1 DCWW sewer flooding

Welsh Waters investigations have determined that due to the river Neath breaching the flood defences and entering the public system, it resulted in a contributing factor the system was not designed to accommodate. Prior to the river Neath flooding, the public combined sewerage network and pumping station conveyed foul and rainwater effectively without detriment to those connected.

Discussions with Welsh Water have also confirmed the pumping station that serves the trunk sewer at Riverside (Figure 9) suffered from flooding from the river Neath, as it overtopped the bank and inundating the station.

Welsh Water, acting as the sewerage undertakers, have completed investigations and concluded the river Neath entered the public sewerage system and overwhelmed it beyond its design capacity. A large-scale CCTV survey has been undertaken and sewer's cleansed of the material that entered the combined sewer during the event.

2.6.2 River Dulais flooding

The authority's investigations have determined the river Dulais overtopped a wall adjacent to the footpath that passes beneath the A465. Please see image 3 and 4. The floodwater then entered into the Tennant canal rising the water levels before inundating the properties as depicted in figure 10.

As previously stated, the river levels of the Neath were the highest on record and would have been carrying a large amount of silt and tree debris down from the catchment. When this debris reached the Tennant canal aqueduct it is known to have become trapped in front and beneath the bridge structure creating a dam.

The aqueduct is a key factor in flood risk at the location. The aqueduct likely increases flood risk with the structure seen to act like a dam for both sediment and large trees/branches washed down from both the Neath and Dulais catchments. The effect this structure has on the river can be seen during heavy rainfall, slowing flows and creating a dangerously high backwater. This effect can stimulate the river to react by dropping sediment out of the water column that further worsens the situation by rising bed levels that in turn decreases the volume in which water can flow within its channel. Prior to the overtopping event, the backwater would have extended upstream over time until it reached the location of the breakout on the Dulais approximately 80m upstream from the aqueduct. The impact the weir had during the flood event is unknown but its potential effect cannot be discounted.

By removing these structures, it would re-instate the rivers natural unimpeded flow. Their removal will increase sediment transport and prevent shoaling immediately upstream that can be seen on both rivers, which if left un-managed also contributes to flood risk. By taking away these structures, it would also free up resources, as the trapped debris needs to be mechanically removed after prolonged or intense rainfall. NRW are the responsible party tasked with removing the detritus that builds up and should be consulted on the matter.

2.7. Emergency Response

On Thursday 13th February 2020 at 11:30am the emergency planning team received a flood guidance statement from the flood forecasting centre, and due to the risk level forecasted for the Neath Port Talbot area (medium risk) as per NPTCBC's local authority flood response plan, the team arranged an NPTCBC incident management team meeting in preparation for the storm.

The emergency planning team held and received a number of teleconferences with NRW and other professional partners across the days running up to the storm event where arrangements such as, preparations for evacuation, resources and culvert clearing were discussed.

The emergency planning team received the first flood alert for the river Neath at 11:44am on 15th February 2020 due to rising river levels, resulting in discussions with the council's highways duty officer. A flood warning for the river Neath at Aberdulais was then received by the emergency planning team at 16:21pm on 15th February as river levels continued to rise, requiring the team to contact Natural Resources Wales for an update on the situation, and for the team to contact other NPTCBC services to place them on standby or request specific actions be carried out as per protocols.

The emergency planning team attended a further two flood advisory service teleconference hosted by Natural Resources Wales at 18:00pm and 22:00pm on 15th February 2020 as conditions across the South Wales area worsened.

Prior to the issue of a severe flood warning for the river Neath at Aberdulais at 03:35am on 16th February 2020, discussions were held in the early hours of the 16th February 2020 between and NPTCBC and professional partners to discuss the need for an evacuation at Canal Side, and made the decision at 02:45 to evacuate Canal Side based on current and forecasted river levels and on the specific protocol for Canal Side, with council services being activated at 02:50am. As a result the rest centre was open from 03:01am on 16th February 2020, and transport was sent to Canal Side with confirmed attendance at 03:42. The evacuation became hampered by the fast, unprecedented onset of flooding at Canal Side and due to multiple severe flooding incidents occurring across the

South Wales area, resulting in a strain on the resources of professional partner agencies.

River levels reached the highest on record for the area at around 05:00am. Evacuation of residents finally commenced and was confirmed by South Wales Police at 05:51am. In total, 29 residents evacuated, sheltered and received welfare provision (e.g. a warm meal) at the designated rest centre.

2.8. Investigation summary

The conclusion from the authority's investigation is that properties along Canal Side were flooded from both hydraulic over capacity of the sewerage network, and overtopping of the river Dulais as a direct result of impeded flows beneath the Tennant canal aqueduct. Heavy prolonged rainfall over a 35 hour period which was concentrated around the river Neath catchment contributed to the river Neath reaching its highest recorded level that had a significant bearing on the flooding. The river levels affected both the sewer infrastructure serving Canal Side and the canal water level that led to internal flooding from both the front and back of the terrace properties.

3. Recommended Actions

The actions contained within Table 1 are recommended actions to be taken forward by the relevant RMA or property/landowner.

No.	Action by	Action	How it will be achieved
1.	NPTCBC	Review Flood Incident Response	Meeting to take place with Emergency Planning to review procedure and recommend/implement and changes to the incident response.
2.	NPTCBC	Future Flood Mitigation Measures	A meeting with all responsible stakeholders to discuss future flood mitigation options. Those required to attend, NPTCBC, NRW, Welsh Water, WG/Cadw, The Canal & River Trust, identified land owners & Local Councillor.
3.	Welsh Water (DCWW)	Undertake Flood Investigation	DCWW to consider following the outcome of action 2 and implement any agreed recommendations.
4.	NRW	River Neath & Dulais confluence - Flood Study Report	NRW to consider following the outcome of action 2 and implement any agreed recommendations.
5.	WG/Cadw	Consider flood risk impact of Aqueduct.	WG/Cadw to consider following the outcome of action 2 and implement any agreed recommendations.

Table 1 - Recommended actions

The recommended actions that have been identified to be undertaken by RMA's will be monitored for progress by NPTCBC as the LLFA. Given their nature, it is assumed the responsible RMAs will deal directly with affected residents and as such, NPTCBC will not be acting as an intermediary.

4. Appendices

4.1. Appendix A - Duty to Investigate

The Flood Risk Regulations 2009 and the Flood and Water Management Act 2010 identify NPTCBC as the Lead Local Flood Authority (LLFA) for the area. This has placed a number of flood risk management duties and responsibilities on the Council. In particular, Section 19 of the Flood and Water Management Act 2010 places a duty upon NPTCBC to undertake investigations into flood events to the extent that it considers necessary.

A 'Risk Management Authority' (RMA) means:

Flood and Water Management Act: Section 19 - Local authorities: investigations

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate—

(a) which risk management authorities have relevant flood risk management functions, and

(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

(2) Where an authority carries out an investigation under subsection (1) it must—

(a) publish the results of its investigation, and

(b) notify any relevant risk management authorities.

Flood and Water Management Act (2010), S.19, c.29, London: HMSO

- A. Natural Resources Wales (NRW)
- B. a lead local flood Authority,
- C. a district council for an area for which there is no unitary authority,
- D. an internal drainage board,
- E. a water company, and

F. a highway Authority.

When considering if it is necessary or appropriate to investigate a flood event within its area, NPTCBC will review the severity of the incident along with the number of properties affected and the frequency of such an occurrence. The Council’s Local Flood Risk Management Strategy sets out the criteria to be used when considering a Flood Investigation Report.

4.2. Appendix B - Risk Management Authorities Responsibilities

RMA in Neath Port Talbot have responsibilities in relation to flood risk management. Table 2 below identifies numerous sources of flooding and the RMA that has responsibility and flood risk management functions relating to a particular source of flooding.

Table 2, Responsibilities of Risk Management Authorities

Flood Source	Natural Resources Wales	Lead Local Flood Authority	Water Company	Highway Authority
Main River	✓			
Ordinary Watercourse		✓		
Surface Water		✓		
Surface Water Originating on the Highway				✓
Sewer Flooding			✓	
The Sea	✓			
Ground Water		✓		

The general responsibilities placed upon RMAs in relation to flood risk management are outlined below.

Natural Resources Wales

Natural Resources Wales (NRW) is responsible for managing the risk of flooding from main rivers and the sea. NPTCBC works closely with NRW, especially when managing flood risk from combined sources and in the event of a large

flood incident. NRW also provide a flood warning service throughout Wales in areas at risk of flooding from rivers or the sea.

Neath Port Talbot County Borough Council as LLFA

NPTCBC is responsible for managing the flood risk related to ordinary watercourses, groundwater and surface water. NPTCBC has produced a Flood Risk Management Plan in line with the Flood Risk Regulations 2009 which sets out how the Authority proposes to undertake this function. In addition to this and as previously stated, the Authority also has a Local Flood Risk Management Strategy which was produced to meet the requirements of the Flood and Water Management Act 2010. There are a number of duties and responsibilities placed upon the Authority as the LLFA for the area by these two legislative documents. The Authority is also responsible for consenting works on ordinary watercourses and enforcing the removal of any unlawful structure or obstruction within the watercourse.

Neath Port Talbot County Borough Council as Highway Authority

The Authority undertakes routine maintenance on the water conveyance infrastructure contained within the highway including culvert and gully cleansing operations. These operations, together with visual inspections of the condition of such assets are undertaken to reduce the risk of flooding on the adopted highway network and adjacent land.

Dwr Cymru Welsh Water

Dwr Cymru Welsh Water (DCWW) is responsible for the supply of drinking water and for taking away, treating and properly disposing of the wastewater that is produced throughout Wales. Any flooding that occurs from the overload of public sewers or burst water mains is the responsibility of DCWW.

South Wales Trunk Road Agency

The South Wales Trunk Roads Agency (SWTRA) is responsible for maintaining and managing the trunk road network throughout South Wales, including any associated drainage and flood risk assets.

Land/Property Owners

Under common law, land or property 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, including litter and animal carcasses, even if it did not originate from their land.
- 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 Council if they want to construct a culvert or flood relief control structure on any ordinary watercourse.