### **Flood and Water Management Act 2010**

### **Section 19 Flood Investigation Report**

# Woodside, Usk

### February 2020



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### **Version Control**

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		(i toject Eligineer)	Highways and Flooding)	



### 1. Executive Summary

In accordance with Section 19 of the Flood and Water Management Act 2010 Monmouthshire County Council (MCC) has a duty as Lead Local Flood Authority to investigate flooding within its area, insofar as it considers it necessary or appropriate. This report has been prepared specifically for the purpose of meeting the requirements of Section 19 and provides a factual account of the flood event that occurred on 15<sup>th</sup> to 18<sup>th</sup> February 2020 at Woodside, Usk, Monmouthshire.

On the 15 and 16<sup>th</sup> February 2020, a period of heavy rain fell on already wet ground resulting in significant flooding in the town of Usk. This came from Storm Dennis and from Storm Ciara which hit the area just a week before. Some areas received 50 to 100mm or more of rain upon saturated ground, causing river levels to rise rapidly. The upper catchments of the River Usk in the Brecon Beacons responded to the rainfall, resulting in a rapid rise in levels in the river on Friday 15<sup>th</sup> and Saturday 16<sup>th</sup> February.

It has been established that the primary mechanisms of flooding were from the unnamed brook that crosses the Woodside area and normally discharges into the River Usk at the northern end of Usk Island. With the River Usk at a record level the brook could not discharge, known as flood locking. Flooding of the local area commenced around 5.30pm on Friday 15<sup>th</sup> February. Water from the brook built up on the A472 highway that runs adjacent to the River Usk and flowed down this road and then westerly through ground adjacent to the Glen Yr Afon Hotel. Here it joined with out of bank flows emanating from an upstream section of the ordinary watercourse flowing in a southerly direction towards and through Woodside Industrial Estate and on to residential properties adjacent to Usk bridge and the local rugby club. Some residential properties that lie between the River Usk and the A472 near the Usk bridge appear to have flooded from their outfalls to the river, which may have occurred due to their flap valves not closing properly. Flood water levels did not start to recede until the early hours of Monday the 17<sup>th</sup>, a period of some 29 hours. Twelve residential and eight commercial premises had internal and external flooding and a further five had flooding to gardens or working areas causing damage to properties and disruption to residents and businesses. These figures are based on reported data, it is possible that more properties and businesses were affected considering the extent and depth of the flooding.

Following the flood event Officers from MCC's Highways and Flood Risk Management Team visited the locations affected by flooding and collated information of the event from residents and landowners to gain an understanding of the nature of the flooding. Further detail has been gathered from historic reports from previous flood events at the same location, and information has been shared between MCC and Natural Resources Wales who are the Risk Management Authority for the River Usk, which is designated as a main river. The Risk Management Authority for the unnamed brook is MCC. Further invaluable information has been gathered from residents and business owners through a letter drop and the helpful responses.

The report has identified a number of recommendations and actions to avoid or minimise the impact of any future flood events. These recommendations and actions can be found on page 29.



### 2. Introduction

### 2.1 Purpose of Investigation

On 15<sup>th</sup>/16<sup>th</sup> February 2020 Monmouthshire was impacted by a significant weather event which resulted in heavy and prolonged rainfall in the northern parts of the county and upper catchments of many ordinary watercourses and main rivers, including the Rivers Usk, Monnow and Wye.

The heavy rainfall event resulted in significant flooding in many areas across Monmouthshire, notably Skenfrith, Abergavenny and Monmouth as well as the central part of the County, where the town of Usk was badly affected, particularly the western side of the town and River Usk known as Woodside. This report will focus on the flooding at Woodside, Usk.

The reason behind Monmouthshire County Council's (MCC) 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 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.



#### 2.2 Site Location

The historic town of Usk sits to the west of the County and takes its name from the River Usk which flows from north to south on the west side of the town. It is a busy and popular town with the A472 passing through west to east which then joins the A449 Trunk Road east of the town and further west joins the A4042 Trunk Road. Its population in the 2011 census was 2,193. Woodside is a narrow area of land located on the west side of the River Usk adjacent to Usk town.



### Figure 1: Location Plan Showing the Flood Area (Indicative) and the Ordinary Watercourse

The area of the investigation runs from the disused railway line in the north, to Kensington Cottage in the south. The topography is relatively flat with a shallow gradient to the south following the fall of the River Usk. To the west the ground rises quite steeply to Graig Foel and Coed-duon hill. The River Usk flows from north to south through Usk town and separates Woodside from the main town.

The source of River Usk lies in the west of the Brecon Beacons near Llanddeusant in Powys on the northern slopes of the Black Mountain and traverses east to Brecon then southeast to Abergavenny before heading south to discharge into the Severn Estuary at Newport. There are four potential sources of flooding to Woodside; these are from the River Usk, the Berthin Brook which lies to the northwest of Woodside, groundwater in the low lying areas and from a small unnamed stream that flows from west to east through Woodside. The River Usk and Berthin Brook are classed as main rivers and therefore Natural Resources Wales (previously Environment Agency Wales) has permissive powers to manage flood risk from these watercourses.





Figure 2: Catchment of the River Usk at Woodside, Usk

The unnamed ordinary watercourses are the responsibility of Riparian owners. As a Risk Management Authority, Monmouthshire County Council has permissive powers to undertake work for the purpose of managing flood risk if deemed necessary. Natural Resources Wales have previously carried out studies into flood risk from the local main rivers i.e. the River Usk and Berthin Brook. There have been no reports or evidence that flooding on the Berthin Brook affects Woodside. Road levels have a drop of around two metres in the area north of the old railway embankment and is therefore likely to deflect runoff to the east, rather than south along the road. The old railway embankment acts as a defence from flows from the north, apart for the gap where the A472 road passes through.

There are a variety of residential properties in Woodside ranging from large houses to small terrace houses; there is also a hotel, an office, a small industrial area known as the old goods yard adjacent to the disused railway. South of the River Usk bridge, there is an large industrial estate, a rugby ground and a garage, as well as a few residential properties. The A472 main road also runs parallel to the River Usk through Woodside and is the main route between Pontypool and Usk.





Photo 1: Flooding of Road Outside Nos 11-15 Woodside Taken 16<sup>th</sup> Feb 2020 Courtesy of a Local Resident.

Woodside is defended from flooding from the River Usk by raised defences which afford protection against a 1.0% (1 in 100) annual chance event and which were constructed in the late 1980s. The risk of flooding from the Berthin Brook is considered low. The threshold at which flooding from the Berthin Brook is initiated is at least the 2% (1 in 50) annual chance event and significant overland flow paths would have to be developed before Woodside is threatened from the Berthin Brook.



Photo 2: A view of the flooding in the low lying are to the rear of the Glen Yr Afon



The principal flood risk to Woodside is from the unnamed stream. Flood levels above the 50% (1 in 2) annual chance event in the River Usk prevent the discharge of the unnamed stream into the main river channel. Flood waters spill from the stream threatening the community. The flow from the unnamed watercourse discharges into the River Usk via a 900mm diameter culvert under the defences at the north end of the area known as the Island which has an invert level of 16.00 metres AOD. This equates to a water level of 3.685 metres on the Usk river gauge.

There are also potential issues with ground water flooding. A back-analysis of a previous flood event carried out by W S Atkins suggests that the volumes of floodwater emanating from the unnamed stream are insufficient to generate the recorded flood depths.

### 2.3 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:

- Residents photos, statements, written correspondence
- Surveys drainage surveys and site inspections
- Met Office Data Weather warnings and reviews
- Natural Resources Wales river gauge data
- Natural Resources Wales rain gauges
- Dwr Cymru Welsh Water (DCWW) records and information
- Monmouthshire County Council rain gauges, asset database & Flood Risk Management Plan
- Historic reports relating to flooding at Woodside, Usk, namely:
  - "Pre Feasibility Report, Woodside, Usk, MCC, 2004
  - "Flooding at Woodside" 2006, WS Atkins on behalf of MCC



## 3. Flooding History

#### **3.1 Previous Flood Incidents**

There is a long history of flooding at Usk including Woodside which occurred before the current flood defences were constructed in the late 1980s.

In December 1979, the River Usk broke its banks in many locations in Monmouthshire and caused significant flooding to both Usk town and Woodside. Following this event, a series of defences were constructed by Natural Resources Wales' predecessor organisations to improve the flood protection to the area. In Woodside, the defences comprise a raised embankment along the west bank of the River Usk and a section of wall north and south of the bridge, then a further section of embankment south to higher ground near Llanbadoc. Since these improvement works have been carried out, Woodside has not flooded directly from the River Usk.

On the east bank there are bunds running from Abergavenny Road to downstream of the Cricket club, with a wall immediately upstream of the river bridge, adjacent to the Police Station on the downstream side and then a wall at Llanthowell.

Since the 1980's there have been a number of flooding incidents in Woodside area, these include;

- October 1998,
- October 2000, and
- February 2002.



Photo 3: Flooding at the Glen Yr Afon Hotel in 2002, courtesy of John Tallet of Usk



The source of flooding during Storm Dennis was not from the River Usk but from the unnamed stream that discharges into the River Usk. The unnamed stream flows in an open channel from west to east through Woodside. The lower section is culverted under the A472 main road and from here flows through a short stretch of open channel before entering another culvert which cuts its way through and under the Usk flood defence embankment and beneath the Usk Island recreation ground before entering the River Usk. A substantial flap valve is housed on the outfall of the culvert in order to prevent ingress of the water from the Usk. However, when there is a storm on the Usk and the flood levels exceed the soffit level of the outfall this causes a "flood lock" situation preventing discharge into the Usk. As a result of this the water backs up the culvert and the unnamed stream and overtops its banks causing flooding to the area of Woodside.

The most recent event occurred on 16<sup>th</sup> February 2020 when the River Usk reached its highest ever recorded level of 18.112 metres Ordnance Datum (OD). This created a flood lock period of around 29 hours during which many residential and industrial properties were flooded internally and or externally. Flood locking commences at around 16.0 metres OD, equivalent to 3.685 metres on the River Usk gauge and full flooding comes into effect at 16.9 metres equivalent to a gauge level of 4.585 metres, which is the top of the culvert pipe at the outfall. The River Usk flood on the 16<sup>th</sup> February reached a peak of 5.8 metres gauge level equivalent to 18.112 OD. Section 3.2 below provides more details of the event covered by this report.



Photo 4: Flooding of the Playing Field at Usk in 2002, Courtesy of John Tallet of Usk



### 3.2 Flood Incident

On the morning of 15<sup>th</sup> February 2020 the Met Office issued a Yellow Warning for heavy rain for most of Wales with an Amber warning covering parts of south Wales and the western edge of Monmouthshire. Heavy and persistent rain fell across much of south Wales during Saturday 15<sup>th</sup> February and overnight into Sunday as part of Storm Dennis.

Following this persistent period of heavy rain, levels in the River Usk rose rapidly during Saturday and increased significantly overnight and during Sunday morning. The River Usk reached its peak around 2.00pm on the Sunday and then steadily fell back to a more normal level on Monday the 17<sup>th</sup>. Partial flood locking on the unnamed stream commenced around 8.30pm on Friday the 15<sup>th</sup> with full flood locking some four hours later. This continued through to around 2.30am on the 17<sup>th</sup> and then became fully open for discharge by 5am on Monday the 17<sup>th</sup>. This created a flood lock period of some 27 to 35 hours.



Figure 3: The Flood Levels in the River Usk 15th to 18th February 2020

As flows in the unnamed stream ceased to discharge to the river the A472 began to flood with some flows moving south down the road towards the Usk Bridge. Some flows went off to the west in a low area just north of the Glen Yr Afon Hotel. These flows then continued on to flood the lower lying areas west of the properties and then further south to the industrial area.

Residential properties at Woodside Court and Mayfield were flooded internally and two properties were surrounded by floodwater about 200mm deep. One of these properties avoided internal flooding by pumping via the Fire Service. Three properties had internal flooding in the Woodside Court area and three others had flooded gardens or were surrounded by flood water. Two commercial properties at the Old Goods Yard site were also surrounded by flood water around 300mm deep.





Figure 4: Plan Showing Indicative Flow Paths and Flood Extents

Natural Resources Wales issued a statement over the weekend of the flood as follows:

"The impact of two weekend of storms - Ciara and Dennis - on people and property has been felt across the whole of Wales, and our thoughts are with all those affected. Only a week on from Storm Ciara flooding communities across Wales, we saw exceptional rainfall and river levels during Storm Dennis over the weekend of 15-16 February. Many rivers have reached record levels, properties have been flooded and, in some communities, people were evacuated from their homes. The impacts have been significant, on people, property, businesses and livelihoods. These are the biggest floods for years in these areas, and communities will be affected for months to come".

The kitchen area of the Glen Yr Afon Hotel, which is at the rear of hotel the was reported to have been flooded from the lower lying land at the rear as were some of the terraced houses on the west side of the A472 north the Usk bridge. A number of residential properties on the east side of the A472 near the bridge were also affected and these may have been flooded from their outfalls to the river, possibly due to flap valves being lifted by flood waters in the River Usk, (See Photo 9 below). Water also flowed through the masonry wall at the south west side of the bridge where there are visible cracks in a short length of the wall here, (See Photo 6 below). It is possible these cracks were there prior to the flood, as these walls have been subject to traffic damage from large vehicles.





Photo 5: Flooding at the Rear of the Glen Yr Afon Hotel

Residents of the cottages just south of the bridge were badly affected by the water seeping through the bridge wall at the front to around 200mm and by much deeper water at the rear and commented that flooding commenced around 7am on the 16<sup>th</sup> and rose very quickly during the morning to around one metre deep internally.



Photo 6: Water Flowing through Usk Bridge Parapet Wall - West Side.





Photos 7 and 8: Showing Internal Flooding to Cottages South of the Bridge, Courtesy of Local Residents

Highway gullies were also notably full of debris and this would have delayed the flood waters clearing. It is unclear whether they were silted up from the flood or previously but the flood generated a great deal of debris.

The rugby field and its pavilion buildings were badly affected with water up to the serving bars, several feet deep in the pavilion. It is noticeable that the A472 falls as it travels south from the Old Goods Yard to the bridge and continues on the minor road, R106, to the rugby pitch by some two metres which would have hampered clearing the flood water once the flood locking cleared. This also partly accounts for the deeper flood water at the southern part of the Woodside area.



Photo 9: Example of Outfall with Flap Valve, taken July 2020





Photos 10 & 11: Flooding at the Rugby Club, taken on Sunday 17th

In addition to providing support through the provision of sandbags during the event, Officers from MCC were on site to assist residents and record details of the flooding on Sunday 17<sup>th</sup> and again on Monday the 18<sup>th</sup> February.

Flood waters receded steadily on the Monday once the river levels had dropped and the unnamed brook could again discharge to the river. It left significant damage in its wake and much clearing of mud and silt was required along with the need to pump out some properties. One property that was not flooded internally but surrounded by floodwater has discovered problems related to the flooding some five months later with floor tiles lifting and other defects arising.

### **3.3 Rainfall Analysis**

A Met Office review of the wet period in January and February 2020 (Appendix A) reported a slow moving weather front that brought persistent rainfall across England and Wales on 15<sup>th</sup> and 16<sup>th</sup> February



Figure 5: Met Office Rainfall Data December 2019 to February 2020. This also shows daily rainfall totals through February 2020, with particularly wet days from Ciara (8th), Dennis (15th) and Jorge (28th).

#### Storm Ciara and the week preceding Storm Dennis

Storm Ciara (8<sup>th</sup> and 9<sup>th</sup> February) impacted the catchments of North Wales most severely. However, significant rainfall was also recorded in South Wales, particularly on the uplands of the Brecon Beacons and Black Mountains, both of which are within the catchment of the River Usk. The Tal y Maes rainfall gauge in the Black Mountains recorded 38 mm of rainfall between 20:00 on 8<sup>th</sup> February and 16:15 on 9<sup>th</sup> February. Further smaller rainfall events continued in the week preceding Storm Dennis, including a rainfall of 31 mm on 13<sup>th</sup> February. In the seven days prior to Storm Dennis the gauge at Tal y Maes recorded 93 mm of rain. A similar rainfall pattern was observed elsewhere in the upper catchment of the Usk but with even higher amounts of rainfall. The rainfall gauge at Crai Reservoir recorded 174 mm over the seven days prior to Storm Dennis.



#### Storm Dennis

Storm Dennis was the fourth named storm of the 2019/2020 season and occurred only a week after the heavy rainfall from Storm Ciara. Storm Dennis brought strong winds and heavy rain across the UK from 15th February to 17th February

Weather impacts from Storm Jorge were in general less severe than from storms Ciara and Dennis, but flooding problems continued in the aftermath of these earlier storms and as a result of further rain falling on already saturated ground. The railway line between Cardiff and Swansea was closed and there were reports of further localised flooding. The M4 in west Wales was closed due to strong winds. Flooding problems from the exceptionally wet February continued across all parts of the UK.



*Figure 6: Rainfall Isohyet Map showing rainfall over a 48-hour period during Storm Ciara (produced by NRW).* 



Date	Rainfall at Tal y Maes (mm)
8 <sup>th</sup> February (Storm Ciara)	6
9 <sup>th</sup> February (Storm Ciara)	33
10 <sup>th</sup> February	13
11 <sup>th</sup> February	1
12 <sup>th</sup> February	8
13 <sup>th</sup> February	31
14 <sup>th</sup> February	2
15 <sup>th</sup> February (Storm Dennis)	55
16 <sup>th</sup> February (Storm Dennis)	29
Total (8 <sup>th</sup> to 16 <sup>th</sup> February)	177

Table 1: Daily rainfall totals for the nine days up to and including 16<sup>th</sup> February 2020.



Figure 7: Rainfall Isohyet Map showing rainfall over a 48-hour period during Storm Dennis in South Wales (produced by NRW).

From a local rain gauge at Estavarney near Monkswood, the total rainfall in the Usk area was 97 mm in the 48-hour period up to 9am on Saturday the 16<sup>th</sup> February.





Figure 8: Rainfall Data for February 2020



## 4 Mechanisms of Flooding

#### **4.1 Fluvial Flooding**

The flooding mechanisms at Usk are well known with the main river defences protecting the town and Woodside from flooding from the River Usk which is understood to be defended to a 1:100 standard.

The unnamed brook that crosses through Woodside draws its flows from the hills behind, then flows across the Woodside area, crosses under the A472 highway in a culvert, then into a short section of open channel and then is culverted through the NRW maintained river Usk defences. This section, with a 900mm diameter pipe, then discharges into the river. Generally, the River Usk levels rise from rainfall in its main catchment in the Brecon Beacons and by the time the peak flow reaches Usk town the local rainfall will have cleared. On this occasion as in 2002, with such a wet period and a second storm within a week, both the flood peak on the River Usk and local run off coincided and created significant flooding.

Once flood locking takes effect the highway and adjacent properties begin to flood, floodwater flows south along the A472 as both highway and ground levels fall in that direction. There is a low lying area just north of the Glen Yr Afon and flood water passes west through here to lower lying land along the base of the hills, knowns as Graig Yn Allt. From here water levels build up as well as flowing further south to flood the industrial area and the rugby field and pavilion. As all outfalls become flood locked, flood water rises and continues until the River Usk falls sufficiently to permit outfalls to clear the flood water. Photos 14-16 in Appendix B show the difference in water colour from the two flood sources, with the lighter colour being from the ordinary watercourse, the darker from the River Usk.

### 4.2 Land Drainage



Photo 12: The Open Ditch on the Industrial Estate taken July 2020



There is a very limited system of land drainage with the brook, and one notable open ditch in the centre of the industrial area. Parts of the unnamed brook were noted to have quite an amount of debris and silt when visited in June 2020, this may well be from the February floods. Land owners will be notified to clear their sections of the brook to maintain an unobstructed water course.

### 4.3 Surface Water Drainage

Within the Woodside area there is a system of highway drainage where individual or groups of highway gullies collect highway run off and discharge via outfalls that pass through the flood defences. Each of the outfalls have their own flap valves to prevent backflows during floods on the River Usk. Responsibility for the highway gullies rests with MCC Highways department. Similar to the unnamed brook these also become flood locked when the River Usk is in flood. There are also several private outfalls from some of the households that sit between the A472 and the River Usk and again these outfalls become flood locked in flood situations. There are also a number of private outfalls from the industrial area which again become flood locked at flood periods. It is understood that the flap valves on the outfalls are maintained by Natural Resources Wales as these were modified as part of the flood defence works in the late 1980s. Responsibility for the connecting pipework rests with the asset owners.

The detail of the land drainage and surface water systems was collected following the flood event through site investigations. This detail has been recorded on MCC's flood and drainage asset database in accordance with our duties as Lead Local Flood Authority. Additional surveys have been completed as some information was not collected at the time of the initial investigation due to water levels within the system.

### 4.4 Foul Water Drainage

Many properties at Woodside north of the bridge have their own sewage systems with septic tanks, cesspits or other forms of private sewage treatment systems.



Figure 9: Indicative locations of Foul Sewerage Systems at Woodside



West of the bridge there is a short sewerage system along the rear of the cottages at numbers 11 to 21 Woodside which was overwhelmed by the flood waters. This would have mixed foul sewage with flood water and some residents have reported that floodwater came up through their sinks and bathrooms. North of the bridge and east of the A472 there is also a short sewerage system for numbers 22, 24, 26, 28, 30 & 32 Woodside and both systems discharge to the River Usk.



## 5 Rights and Responsibilities of Risk Management Authorities

#### 5.1 Lead Local Flood Authority

Under the Flood and Water Management Act 2010, Monmouthshire County Council (MCC) 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, MCC 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:

- The preparation of local flood risk management strategies;
- A duty to comply with the National Strategy;
- To co-operate with other authorities, including sharing data;
- A duty to investigate all flooding within its area, insofar as a LLFA consider it necessary or appropriate;
- A duty to maintain a register of structures and features likely to affect flood risk;
- A duty to contribute to sustainable development; and
- 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:

- Powers to request information;
- Powers to designate certain structures or features that affect flood or coastal erosion risk;
- The expansion of powers to undertake works to include broader risk management actions; and
- The ability to cause flooding or coastal erosion under certain conditions.

LLFA's in Wales have also taken 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 are responsible for both approving the original design of the SuDS and adopting and maintaining the finished system in accordance with Welsh Government's National Standards for Sustainable Drainage.

The function of the LLFA during and after the flooding at Woodside 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 to the flooding with Emergency Services



• Asset information collected during the flood event has been incorporated into the LLFA Asset Register.

#### **5.2 Natural Resources Wales**

Under the Flood and Water Management Act 2010 and the Water Resources Act 1991, NRW has discretionary powers to manage the risk of flooding from main rivers and the sea. They are also recognised as a coastal erosion risk management authority under the Coastal Protection Act 1949.

Their strategic oversight role is about having a Wales-wide understanding of all sources of flooding, coastal erosion and the risks associated with them, on a consistent basis across Wales to help inform the RMAs and the public.

Where present, NRW manage Internal Drainage Districts (IDDs) and are responsible for maintenance, improvement and operation of drainage systems and regulation of watercourses within the internal drainage district. Their main role is the close management of water levels in watercourses or underground (groundwater) for the purpose of reducing the risk from flooding and for sustaining all land uses and the environment.

### 5.3 Water / Sewerage Company

Sewerage Undertakers are responsible for maintaining the public sewerage systems, including adopted sewers carrying surface water run-off.

In flood conditions, the sewer systems can often become overloaded with a mixture of floodwater and sewage leading to overflow and flooding. Where applicable, Sewerage Undertakers are responsible for the removal of surface water from impermeable surfaces through their sewerage system. Where there is frequent and severe sewer flooding, Sewerage Undertakers are required to address this through their capital investment plans which are regulated by Ofwat. To prevent further flooding, water and sewer companies have a responsibility to: monitor the levels; prevent overloading sewer systems; maintain and repair drainage pipes as necessary. This investigation has not identified any assets or infrastructure belonging to a water or sewage company that may have contributed to the flood event

#### 5.4 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. This investigation has not identified any assets or infrastructure belonging to Network Rail that may have contributed to the flood event.

### 5.5 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 falls onto the highway.

Monmouthshire County Council is the Highway Authority for all highways in Monmouthshire apart from Trunk Roads which are managed by the Welsh Government. Highways Authorities



are also Risk Management Authorities in their own right according to the Flood and Water Management Act 2010 and must adhere to all the responsibilities of Risk Management Authorities.

Under the Highways Act 1980, the Highways Authority has a duty to maintain the highway. This includes ensuring that highway surface water drainage systems are clear and free from blockages.

### 5.6 Riparian Landowners

A riparian owner possesses rights over and responsibilities for the stretch of a watercourse that forms the boundary of their property. A riparian owner is anyone who owns a property where there is a watercourse within or adjacent to the boundaries of their property. A watercourse includes a river, stream or ditch. Riparian owners, (householders and businesses) are responsible for maintaining their rivers, streams, ditches, pipes, culverts and bridges.

Riparian Landowners are legally responsible under common law for the maintenance of the land generally up to the centreline 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).

Landowners are responsible for ditches and land drainage assets upon their land at Woodside, Usk, with permissive powers for those watercourses classified as Main Rivers falling to NRW and all other watercourses to MCC.

### 5.7 Residents and Property Owners

Residents and property owners are responsible for the maintenance and operation of drainage assets and connecting pipework falling within their ownership. They are also responsible for the protection of their own properties against flooding. Where safe to do so, they should take measures to protect themselves and their property from flooding. Residents and property owners have the right to defend their property as long as they do not subsequently increase the risk of flooding to other properties.



## 6 Permissive Powers of Risk Management Authorities

As Risk Management Authority for the main River Usk, Natural Resources Wales have permissive powers under the Flood and Water Management Act 2010 and Water Resources Act 1991. These discretionary powers include the ability to undertake works to clear watercourses, as well as promoting and implementing flood alleviation schemes when justifiable.

MCC also have similar permissive powers under the Land Drainage Act 1991 on ordinary watercourses and drainage features. Monmouthshire CC is also the Lead Local Flood Authority and the investigating and reporting body for flood events in the County. As Highway Authority, MCC arranged clearance of the highway drainage systems following the flood event and recorded the detail on their drainage asset database in accordance with their duties as Lead Local Flood Authority.



## 7 Flood Alleviation Scheme / Drainage Improvements

Following the flooding in 2002 W S Atkins were asked to produce a Project Appraisal that would identify possible options to reduce flood risk, identify those that could be progressed and recommend a solution. The following options were identified:

Option	Details
А	Do nothing – the base option
В	Do-Minimum
С	Weir structure, collecting channel and pumping station in the long meadow
D	Overflow and Pumping station adjacent to Island House and Pumping Station in Long Meadow
E	Overflow and pumping station adjacent to Mayfield bungalow and a pumping
	station in Long Meadow
F	Flood storage area in the field north of unnamed stream
G	Flood embankments
Н	Extend Culvert
	Flood warning & bring in temporary pumps
J	Managed retreat

Several of these were considered unacceptable or undeliverable and three options were taken forward, which were Options A, B and C. Following further work and financial assessments Option C was identified as the optimal choice. However, this came at a cost of approximately £2.5m and a positive benefit to cost ratio of 1.6. MCC were however unable to obtain support for the scheme and no scheme went forward.

A review of the above options now needs to be undertaken as well as considering a mix of the original options and any new approaches that may now be possible.



### 8 Conclusion

The investigation has identified that the flooding that affected Woodside between the 15<sup>th</sup> and 18<sup>th</sup> February 2020 was the result of a prolonged and significant rainfall event. This event came from Storm Dennis and from Storm Ciara which hit the area just a week before. Some areas received 50 to 100mm or more of rain upon saturated ground, causing river levels to rise rapidly. The total rainfall in the Usk area was 97 mm in the 48-hour period up to 9am on Saturday the 16<sup>th</sup> February, based on the gauge at Estavarney near Monkswood the nearest to Usk. The upper catchments of the River Usk in the Brecon Beacons responded to the rainfall, resulting in a rapid rise in levels in the river on Friday 15<sup>th</sup> and Saturday 16<sup>th</sup> February.

Rainfall in the local area to Usk town also occurred at the same time and created high local run off. The local flows coincided with the peak flows on the River Usk and local flows became flood locked. These steadily built up over the flood locked period of some 29 hours. There is also evidence of some groundwater adding to the flooding and also that some outfalls / flaps may not have functioned correctly causing flooding to properties at No's 22 to 32 Woodside.

As the described flows built up on the highway, flooding of local properties occurred and flood water continued to flow south and west into lower lying areas and then continued further south to flood the industrial estate, local residences near the bridge and the pavilion and rugby field. 12 residential and 8 commercial premises had internal and external flooding and a further 5 had flooding to gardens or working areas causing damage to properties and disruption to residents and businesses. However, this is based on reported data and it is highly likely that many more properties and businesses were affected considering the extent and depth of the flooding.

In addition, water was noted to be flowing through the bridge wall at the south west corner of the River Usk bridge and cracks are evident. It is unclear whether these were there before the flooding, as these walls are subject to damage from traffic movements.

The multi-agency emergency response effort during the event was praised by local residents as was the assistance with the clear up operation immediately after the event. Concerns were raised with the level of risk residents face from future flood events and actions to address these concerns were requested by residents and property owners.

These actions have been considered further and a number of recommendations have been made in Section 9 of this report.



### 9 Recommendations

In accordance with Section 19 of the Flood and Water Management Act 2010, as Lead Local Flood Authority Monmouthshire County Council has investigated this flood event and identified which Risk Management Authorities have relevant flood risk management functions. As a result of the findings of this investigation and discussions with residents and other Authorities, the following recommendations have been made.

Reference	Recommendation	Responsible Risk Management Authority(s)
WD1	Notify all landowners adjacent to the unnamed brooks to clear and remove debris and silt as riparian owners.	MCC
WD2	Clarify which outfalls passing through the flood defences are maintained by NRW and check that all flap valves are working correctly.	NRW/MCC
WD3	MCC have now checked the stability of the bridge wall at the south west corner of Usk river bridge. Consideration should be given to the findings and recommendations of that report.	MCC
WD4	That MCC Highways teams ensure all gullies together with their connections and outfalls are cleared of silt and debris and ensure such features are maintained to the required standards.	MCC
WD5	MCC Flood Team to revisit the previous Project Appraisal Study undertaken in 2002 and consider re-evaluating the options to identify working solutions that can now be delivered but which may be subject to Welsh Government funding.	MCC
WD6	Identify foul sewage systems at Woodside and consider possible improvements to reduce the risk of flooding to adjacent properties.	DCWW/MCC
WD7	Consider the requirement and location of a local sandbag store (and other equipment).	MCC



### **10 Useful Links and Contacts**

- Monmouthshire County Council Flood Pages: <u>www.monmouthshire.gov.uk/flood-risk-management</u>
- Natural Resources Wales: <u>www.naturalresources.wales/flooding</u>
- Welsh Government:
  <u>www.gov.wales/flooding-coastal-erosion</u>
- Blue Pages
  <u>www.bluepages.org.uk</u>
- Flood Re (Insurance): www.floodre.co.uk





#### Met Office

#### **Storm Dennis**

Storm Dennis was the fourth named storm of the 2019/2020 season. Arriving one week after storm Ciara, Dennis brought heavy and persistent rain across much of the UK – especially Wales and western England. Western upland parts of the UK received 50 to 100mm or more of rain falling on saturated ground. The Met Office issued a Red Warning for rain across parts of south Wales and there was major and widespread flooding. Storm Dennis also brought very strong winds, but the worst of the impacts were from the rain.

#### Impacts

South Wales, Herefordshire, Worcestershire and Shropshire were worst affected by flooding and major incidents declared. The River Wye and River Severn which were reported to have reached their highest-ever levels. Areas of several towns including Hereford and Pontyprydd were inundated. The Environment Agency issued over 600 flood warnings and alerts including several severe flood warnings. A woman was swept away by floodwater in Worcestershire and over 1400 homes and businesses were flooded across several counties. The flooding also caused major travel disruption with roads blocked, damaged railway lines and hundreds of flights cancelled. Large areas of farmland were also underwater. Strong winds and large waves battered exposed coastlines, and in County Cork an abandoned 'ghost' cargo ship was washed ashore.

#### Weather data

The analysis chart at 06 UTC 15 February 2020 shows storm Dennis as the deepening area of low pressure to the north-west of the UK, driven by a powerful Atlantic jet stream.



The analysis chart at 06 UTC 16 February 2020 (24 hours later) shows storm Dennis as the large area of low pressure still dominating the north Atlantic with rain-bearing fronts and strong winds sweeping across the UK.



The map below shows maximum gust speeds from storm Dennis. Winds were comparable to storm Ciara, gusting at over 50 Kt (58 mph) across the UK and over 60 Kt (69 mph) around exposed coastlines. In total over 20 stations recorded gusts exceeding 60 Kt. The highest gusts were 79 Kt (91 mph) at Aberdaron, Lleyn Peninsula, 78 Kt (90 mph) at Capel Curig, Conwy, 72 Kt (83 mph) at Pembrey Sands, Dyfed and 70 Kt (81 mph) at Weybourne, Norfolk. Wind speeds reached around 100 mph across the tops of the Pennines and Scottish mountains.



In terms of wind speeds, this was a notable although not exceptional storm for the time of year. However, one feature of storm Dennis was the persistence of the strong winds across the UK for several days, with the low pressure centre to the north-west slow to clear. The strongest winds on 15th to 16th were across England and Wales, transferring to Scotland on the 17th as the low's centre finally pulled away east toward Norway. The chart below shows hourly maximum gust speeds for three stations in Wales – Aberdaron, Capel Curig and Pembrey Sands – all three being exposed locations. Hourly maximum gust speeds reached 50 Kt during the morning of the 15th and remained mostly above 50 Kt until the morning of the 17th – being sustained at this level for around two days.



The rain-radar images at 12 UTC 15th and 00 UTC 16th February 2020 show the heavy and persistent rainfall from storm Dennis with the fronts sweeping across the UK.



The map below shows rainfall totals for a) storm Ciara and b) storm Dennis, as actuals and % of 1981-2010 February long-term average. Storm Dennis brought 50 to 100mm or more of rain across the high ground of Dartmoor, parts of Wales, the Lake District and Highlands. 100 to 150mm of rain fell across parts of the Brecon Beacons and south Wales valleys. More than the February whole-month average rain fell for the rain-days 15-16 February (09 UTC 15<sup>th</sup> to 09 UTC 17<sup>th</sup>) across parts of the west and north Midlands.

Storm Ciara one week earlier brought 100mm+ of rain across the high ground of Snowdonia, the Lake District and parts of the Pennines. More than the February whole-month average rain fell for the rain-days 8 to 9 February (09 UTC 8<sup>th</sup> to 09 UTC 10<sup>th</sup>) across parts of the south Pennines

a) - storm Ciara rainfall





130

- 120 - 120 - 110 - 10 - 70 - 70 - 70 - 70

50 30

#### b) - storm Dennis rainfall



The maps below show how much rain fell across the UK overall for the 9-day period from 8th to 16th February, including both storms Ciara and Dennis. Over 100mm of rain fell across many western parts of the UK through this period with 150 to 250mm or more across the high ground of Dartmoor, Wales, northern England, Southern Uplands, West Highlands and parts of Northern Ireland. Most of the UK received the February whole-month average rainfall over this 9-day period, with around 150% fairly widely across east Wales, the West Midlands and a swathe of the Pennines through to Edinburgh and over 200% locally in the Pennines and parts of Gloucestershire and Herefordshire.



The chart below shows UK areal-average rainfall totals for each day of winter 2020 so far (1 December 2019 to 18 February 2020), with the exceptionally wet days of 8 and 15 February associated with storms Ciara and Dennis.



The map below shows rainfall totals at individual stations for storms Ciara and Dennis combined as % of 1981-2010 February long term average.



Author: Mike Kendon, Met Office National Climate Information Centre Last updated 20/02/2020





Appendix B – Land Drainage General Arrangement





# Appendix C – Additional Photos of Flooding



Photo 13: River Usk looking upstream. Surcharged ordinary watercourse is located in top left of photo



**Photo 14:** Usk Town Bridge, note flooding to carriageway adjacent to Woodside Cottages and flooding to industrial estate at top of photo. Difference in colour of water indicates flooding from 2 difference sources (ordinary watercourse light colour, River Usk brown darker colour)





**Photo 15**: Flooding from ordinary watercourse running right to left in top of photo, through Woodside Industrial Est. and on to Usk Rugby Club



Photo 16: Extensive flooding to Woodside Industrial Est. and rugby club on right





Photo 17: Usk Town Bridge upstream elevation



Photo 18: Usk Town Bridge downstream elevation





Photo 19: Usk Island Football Pitch