

Flood and Water Management Act 2010

Section 19 Flood Investigation Report

Skenfrith

October 2019

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Version Control

Title	Skenfrith October 2019
Purpose	Section 19 Flood Investigation Report
Owner	Highways and Flood Risk Management
Approved by	M.Hand (Head of Placemaking, Housing, Highways and Flooding)
Date	May 2020
Version Number	Final
Status	Issued
Review Frequency	-
Next review date	-
Consultation	MCC Emergency Planning – April 2020 Natural Resources Wales – April 2020

Version	Prepared by	Reviewed by	Approved by	Date
Draft	R.Price (Project Engineer)	P.Keeble (Group Engineer)		April 2020
Final	R.Price (Project Engineer)	P.Keeble (Group Engineer)	M.Hand (Head of Placemaking, Housing, Highways and Flooding)	May 2020

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 26th October 2019 at Skenfrith, Monmouthshire.

On the 25 and 26th October 2019, a period of heavy rain fell on already wet ground resulting in significant flooding in the village of Skenfrith. The flooding affected the entire village with significant internal flooding to eighteen residential properties as well as the local pub, village hall and church.

It has been established that the primary mechanisms of flooding were from the Norton Brook and River Monnow which overtopped following persistent and heavy rainfall the preceding day and during the morning of Saturday 26th October. The Norton Brook overtopped upstream of the village before flowing across adjacent fields and the local road, flooding properties at the northern end of the village. The River Monnow also overtopped shortly after and converged with out of bank flows from the Norton Brook in the centre of the village which resulted in significant flooding to adjacent land and property across the whole village.

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 land owners 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 main River Monnow and the Norton Brook where it falls within the Internal Drainage District. Additional supporting information of the weather patterns and rainfall at the time of the event have also been gathered from the Met Office.

2. Introduction

2.1 Purpose of Investigation

On 26th October 2019 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 Monnow and Wye.

The heavy rainfall event resulted in significant flooding in many areas across Monmouthshire, in particular the northern half of the county, where the village of Skenfrith and parts of Monmouth were badly affected. This report will focus on the flooding at Skenfrith.

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 village of Skenfrith is located in the north-east of the county where the Norton Brook and River Monnow converge immediately upstream of the village. The village itself is located on the western bank of the main River Monnow, approximately 16km upstream of the confluence with the River Wye at Monmouth. The village comprises of approximately 20 residential properties, a village hall, church, public house/hotel and the remains of an early 13th century castle. Many buildings date back several centuries with a comparatively more modern development of six houses from the 1950's at the northern end of the village.

The River Monnow upstream of Skenfrith has a catchment of approximately 395km² and is predominately rural in nature. The main tributaries of the River Monnow are the Norton Brook, Escley Brook, River Honddu and the River Dore. The River Monnow is crossed by a 3 arch stone bridge at the downstream end of the village. Remains of an old weir, which collapsed in 2001, are located immediately upstream of the bridge.

The River Monnow is a designated main river that falls within the Internal Drainage District (IDD) managed by Natural Resources Wales (NRW). The boundary of the IDD also covers approximately 1km of the Norton Brook upstream of its confluence with the River Monnow.

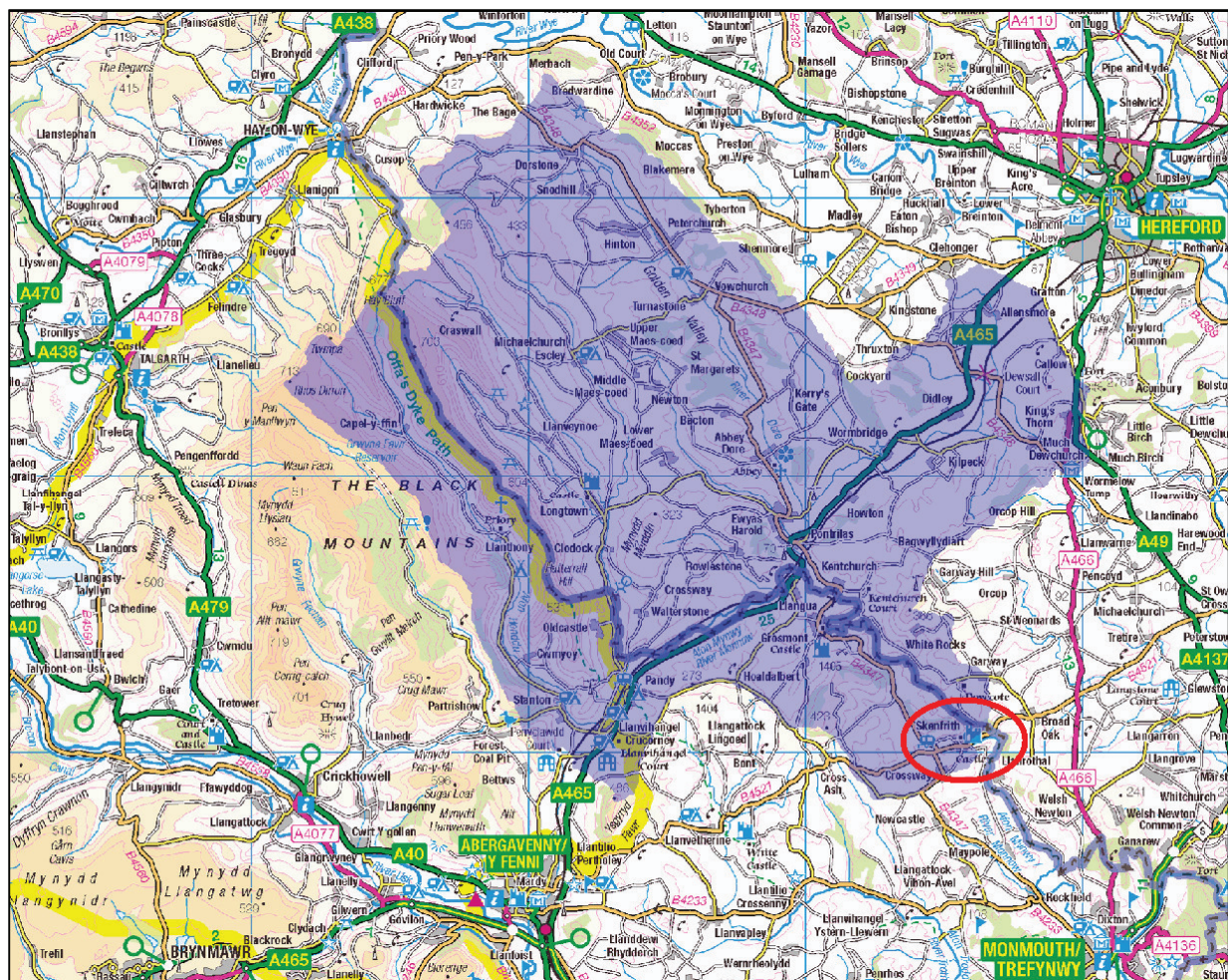


Figure 1: Location Plan (River Monnow Catchment shown in Blue)



Figure 2: Skenfrith and local rivers / road network

Natural Resources Wales (NRW) flood maps show Skenfrith as being at High risk of flooding from the River Monnow and Norton Brook, and Medium - High risk from surface water flooding as shown in Figures 2 and 3 below.

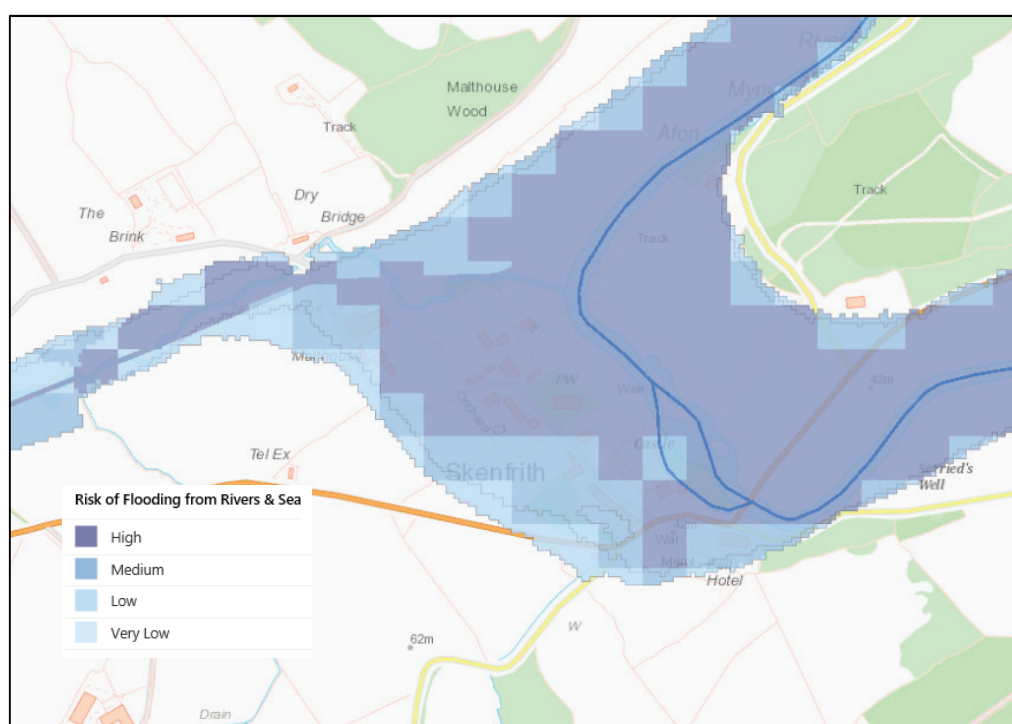


Figure 3: Extract from Natural Resources Wales Flood Map showing Risk of Flooding from Rivers

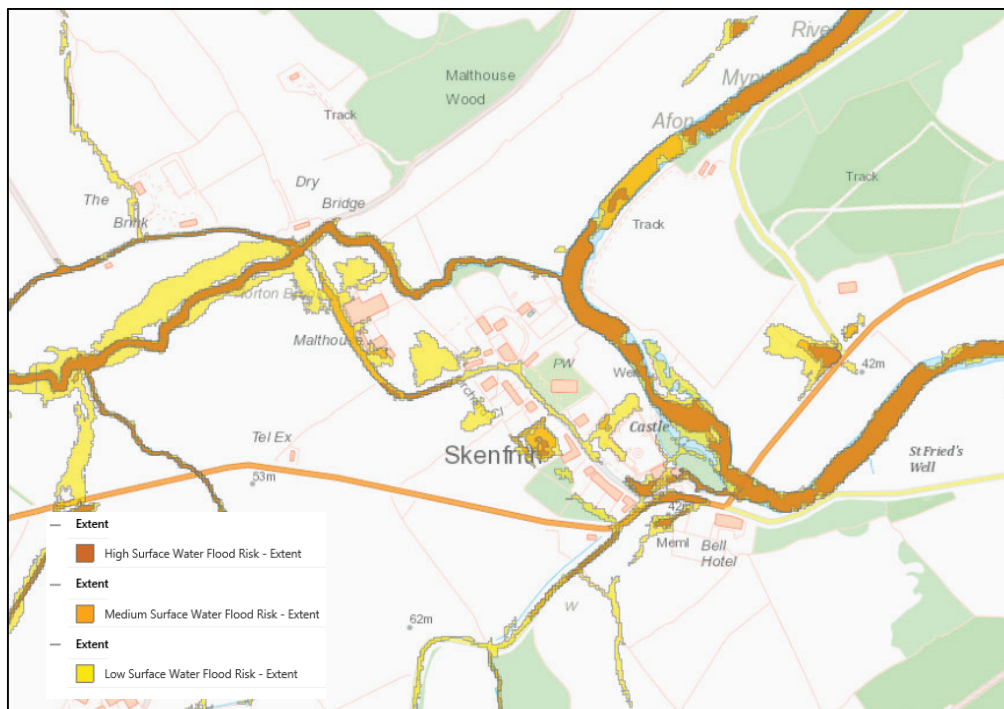


Figure 4: Extract from Natural Resources Wales Flood Map showing Risk of Flooding from Surface Water

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
- Monmouthshire County Council – rain gauges, asset database & Flood Risk Management Plan
- Historic reports relating to flooding at Skenfrith, namely:
 - “1998 Easter Floods”, Environment Agency
 - “Flooding At Skenfrith” 1999, WS Atkins on behalf of Environment Agency Wales February 1999
 - “Skenfrith Castle: Impact of the Weir Breach December 2001” April 2002, Haycock Associates on behalf of The National Trust
 - “Skenfrith Flood Alleviation Scheme Pre - Feasibility Study” 2006, Atkins (on behalf of Environment Agency Wales)

3. Flooding History

3.1 Previous Flood Incidents

There is a long history of flooding at Skenfrith which has previously been recorded in an Environment Agency Wales report of the Easter 1998 Floods and a subsequent report produced by WS Atkins in 1999 on behalf of the Environment Agency. The dates of these previous flood events were recorded as follows:

Flood Date	Properties Affected
1928	Unknown
1960	Unknown
1979	21
1990	3
1992	13
1998	21

Table 1: Recorded Historic Flood Events

The Hydrological summary of the Easter 1998 flood concluded: “*Therefore it is estimated that the Easter 1998 flood at Skenfrith had a return period of around 20 years and was only the second highest since 1949*”.

In December 2001 the weir that used to serve the old corn mill immediately above Skenfrith Bridge collapsed, resulting in a 1.5-1.7m drop in river level according to the 2002 Haycock Associates report which assessed the impact of the collapse.

In 2006, Atkins undertook a Pre-Feasibility Study on behalf of Environment Agency Wales to assess possible flood alleviation options at Skenfrith. The study included a review of the Hydrology and historic flood events using the Flood Estimation Handbook methodology and estimated the annual probability of the 1998 event to be 10% (10 year return period). The report concluded that the benefit cost ratio of a flood defence scheme was below unity and did not identify an economically viable scheme.

More recent notable flood events have been reported as having occurred in 2002, 2004 and 2008, all of which were of a lesser extent to the October 2019 event with no significant flooding to property. It has also been reported that flooding from the Norton Brook is more frequent than the larger flood events from the River Monnow and has led to flooding of the road through the village on numerous occasions in recent times. Property flooding was not reported during these lesser events, but residents do move cars to higher ground above the level of flood water along the road which runs through the village.

3.2 Flood Incident

On the morning of Friday 25th October 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 Friday and overnight into Saturday.

Following this persistent period of heavy rain, levels in the River Monnow and Norton Brook rose during Friday and increased significantly overnight and during Saturday morning. At 11.09am on Saturday 26th October NRW issued a Flood Warning for the River Monnow at Skenfrith. NRW river gauges recorded a peak level occurring between 5.30-6.30pm.

The channel capacity of both the Norton Brook and River Monnow was exceeded resulting in extensive flooding to land and property. The Norton Brook backed up due to high levels in the River Monnow and overtopped the right bank upstream of Dry Bridge to the north west of the village. Water flowed across fields and along the C12.13 Norton road, resulting in significant flooding to properties at the northern end of the village. These out of bank flows also affected agricultural buildings downstream of Dry Bridge before reaching the confluence with the River Monnow. The River Monnow then overtopped along the right bank directly flooding the village and merging with out of bank flows from the Norton Brook.

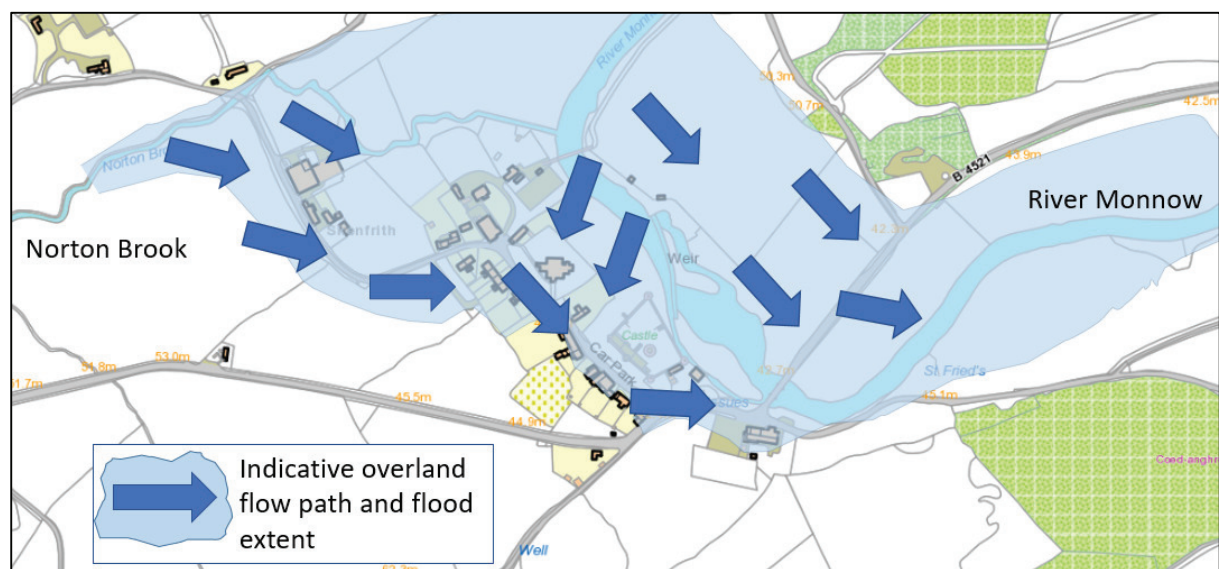


Figure 5: Plan showing indicative overland flow paths and flood extent from the Norton Brook and River Monnow

A post event inspection identified eighteen residential properties that were very badly affected with levels of internal flooding typically 300-600mm deep, but up to approximately 1.0m in some instances. The local pub, village hall and church also suffered significant flooding.



Photo 1: Significant flooding in the centre of the village and church grounds

Record levels along the River Monnow were recorded at NRW's Grosmont and Skenfrith gauge stations. A peak level of 4.62m was recorded at Grosmont at 3.00pm on Saturday 26th October, with the peak reaching 4.84m at Skenfrith approximately 2 hours later between 5.30-6.30pm.

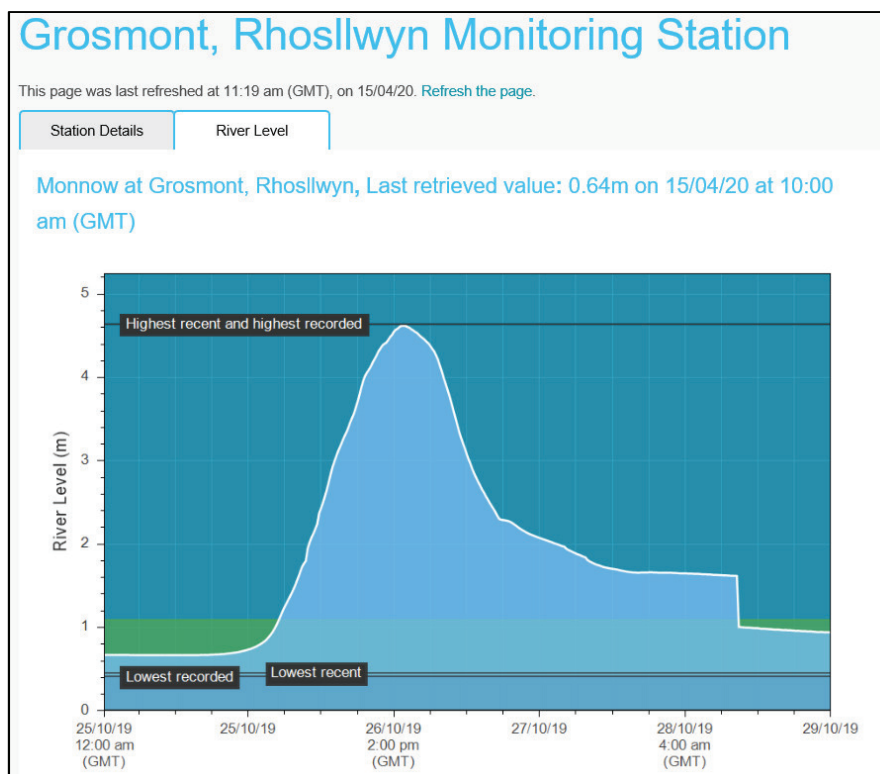


Figure 6: An extract from Natural Resources Wales' River Monitoring Gauge at Grosmont (4 day view)

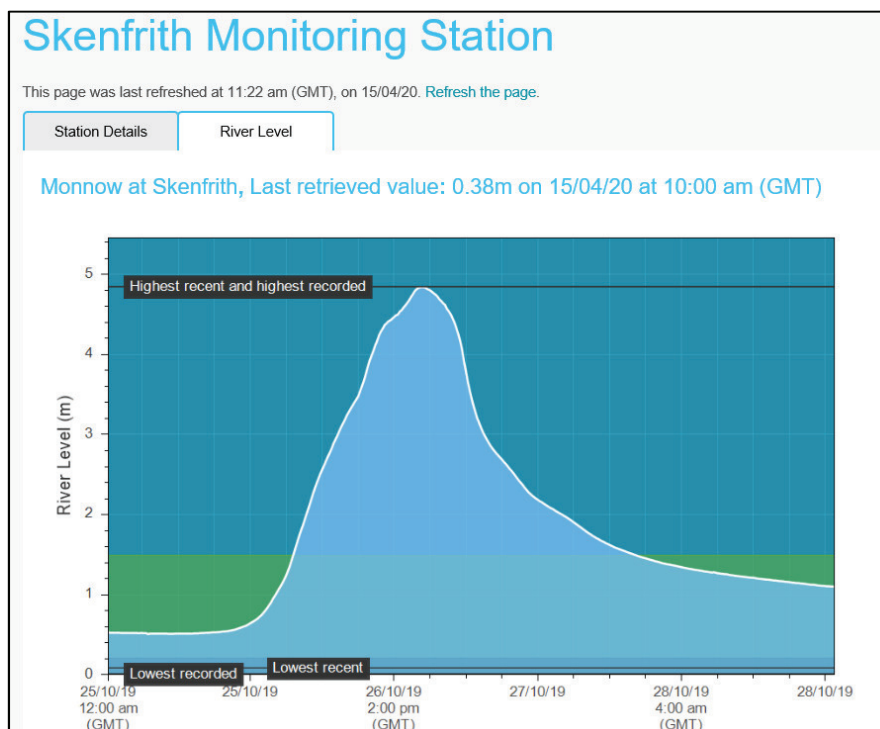


Figure 7: An extract from Natural Resources Wales' River Monitoring Gauge at Skenfrith (4 day view)

On Saturday 26th October MCC's out of hours Duty Officer began to receive requests for sandbags from late morning and throughout the afternoon. From 6.00pm onwards MCC received calls from Gwent Police and South Wales Fire and Rescue Service advising that they were at the scene and evacuation of properties was being considered. A Rest Centre at Abergavenny Leisure Centre was set up and MCC transport was sent to Skenfrith to transport those residents who had evacuated their homes. Later that evening when river levels had receded, most residents either returned to their homes or made their own travel & alternative accommodation arrangements with only two people transported to the Rest Centre by the Police. Later that evening those two residents were transported to relatives at an alternative location and the Rest Centre was stood down.

On Sunday 27th October following the flooding, assistance was requested from the residents of Skenfrith asking for advice and support on what to do next, there were also concerns around flood water mixed with sewage and oil. An MCC Recovery Group was convened via teleconference, led by the Chief Officer - Enterprise which involved all key service areas. An Officer was sent to Skenfrith to liaise with residents, provide advice and carry out impact assessments. Support was then provided by way of assisting the clear up operation and removal of damaged household goods.

Following the flood event a meeting was held between MCC Officers and residents at Hilston Park on 6th November 2019. The meeting was arranged to gather information about the flood event and to discuss the flood risk at Skenfrith in general. Comments from residents at that meeting included:

- Concerns over how rapidly river levels rose and how quickly the situation escalated into an emergency/rescue situation. Emergency services arrived just in time along with a boat (SARA) to evacuate people. There was a very real risk to life with some people wading through deep fast flowing water.
- Confusion over the flood warning service and messages received, some residents stated they have previously removed themselves from the service.
- Frustration with vehicles driving through flood water in village pushing waves of water into properties.
- There was a lack of sandbags available.
- Regular meetings with MCC, NRW and residents would be beneficial to consider options going forward.
- Concerns with strangers coming through the village whilst homes are left empty.
- Individual flood plans and a community flood plan would be of benefit.

It was agreed at the meeting that NRW involvement in future discussions with residents was essential and that a subsequent meeting would be arranged with them to discuss options.

3.3 Rainfall Analysis

A Met Office review of the wet period in October 2019 (Appendix A) reported a slow moving weather front brought persistent rainfall across England and Wales on 25th and 26th October. Over 100mm of rain fell across high ground in south Wales where some locations received 75% or more of the monthly average rainfall. This rain fell on already very wet ground causing river levels to rise rapidly.

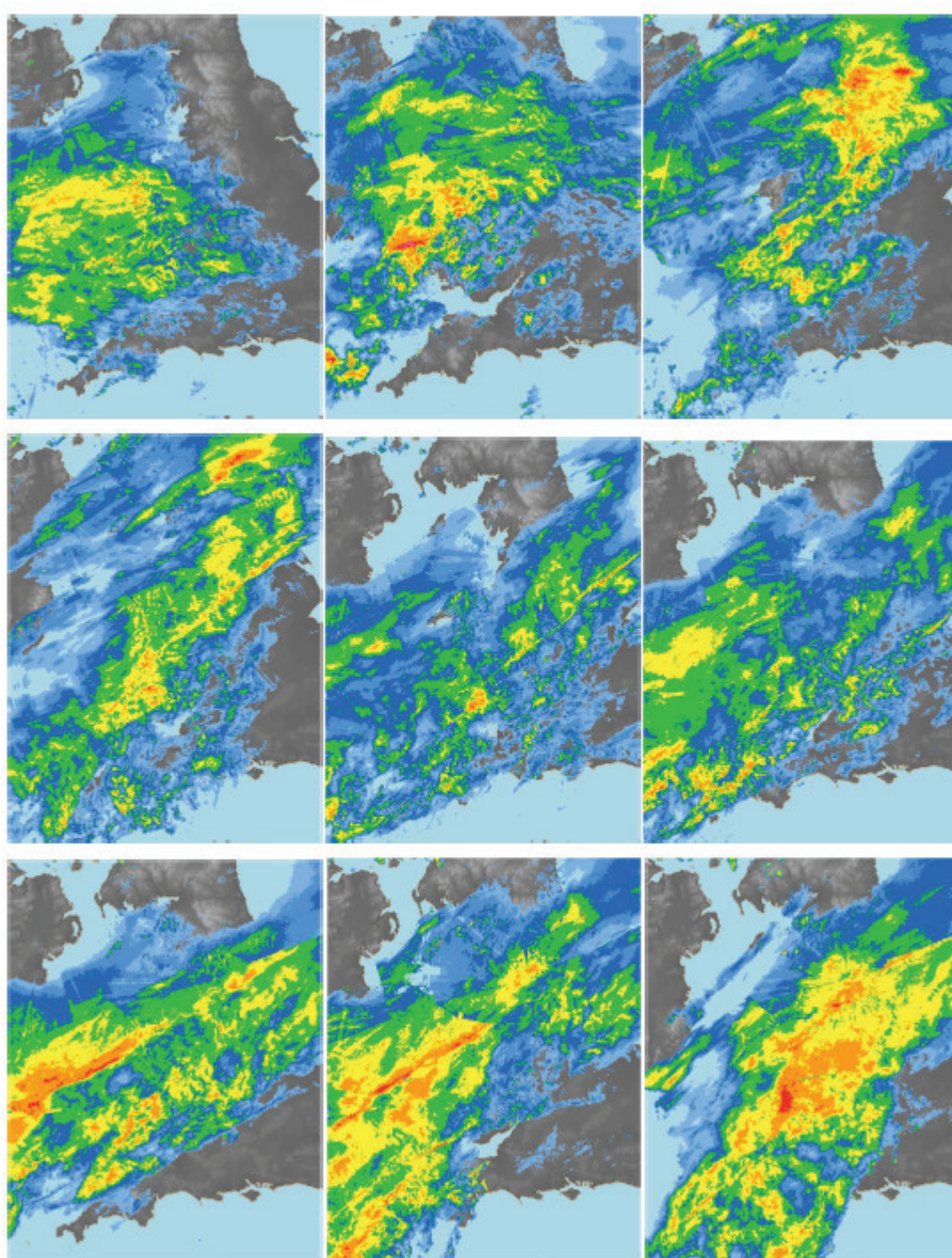


Figure 8: Panel of rain-radar images indicating the presence of persistent heavy rainfall over south Wales (3 hour intervals between 9.00am 25th October and 9.00am 26th October).

The map below shows rainfall totals for the 3 day period between 9.00am on 24th October and 9.00am on 27th October. Upland areas of Wales, particularly the Brecon Beacons, recorded over 100mm with totals in some locations exceeding 130mm. Most of this rain fell during a 24 hour period on 25th October.

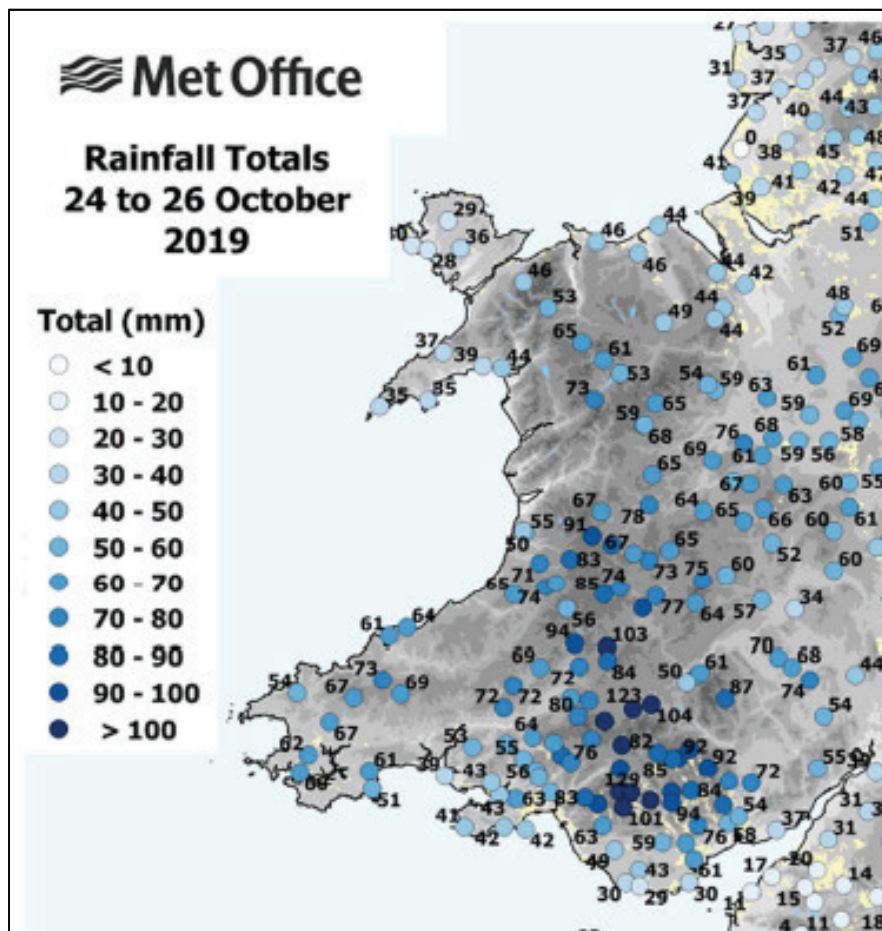


Figure 9: Rainfall totals between 24th & 27th October 2019

At the western edge of the River Monnow catchment a NRW rainfall gauge located at Tafalog, Llanthony, recorded a 24hr rainfall total of 84.4mm, which equated approximately to a 1 in 26 year return period. The peak rainfall was recorded on the morning of 26th October.

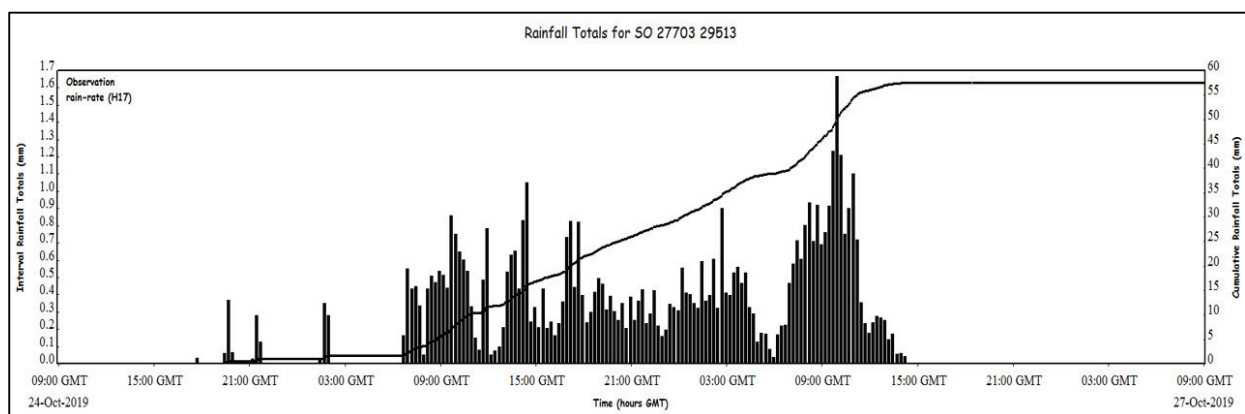


Figure 10: Tafalog Gauge Station, 85mm in two days peaking at 50mm in 12 hours on the 26th October.

4 Mechanisms of Flooding

4.1 Fluvial Flooding

The flooding mechanisms at Skenfrith are well known and have been well documented following previous flood events. The primary source of flooding is from the River Monnow and Norton Brook. Increased levels in the River Monnow result in the Norton Brook backing up and over topping upstream of Dry Bridge. This resulted in overland flow across fields and along the local Norton road into the village. Secondly, as was the case in this event, the River Monnow continued to rise and overtopped along the right bank resulting in the village being inundated from both watercourses.

During the flood event, no major blockages or impediments to flow were reported within the watercourses or at Skenfrith Bridge, which carries the B4521 over the River Monnow at the downstream end of the village. Significant overland flows were reported across fields to the east of the village which then overtopped the B4521. After the event, debris accumulations were visible along the top of fences and gates suggesting the depth of water at this location was in excess of 1m.

The Easter 1998 flood report suggests this section of the B4521 carriageway, which crosses the flood plain to the east of the village, was raised in 1960 in order to improve access over Skenfrith Bridge for larger vehicles. The carriageway was overtopped in places during this event causing damage to hedges and fencing. The raised section has been described as a “causeway” type structure that has created a barrier to overland flow during extreme flood events. There is a twin masonry arch relief structure at the far end of the “causeway” adjacent to the B4521/R23 junction, which is of insufficient capacity to convey the overland flow beneath the B4521. Photos of this structure and other key drainage features can be found in Appendix B. Further investigation and hydraulic modelling would be required to ascertain what affect this section of raised carriageway has on overland flow and if it is significant enough to affect flood levels within the village.



Photo 2: Skenfrith Bridge with a small accumulation of woody debris on the far cutwater post event



Photo 3: Flood relief aches at the B4521/R23 Junction

4.2 Land Drainage

There is a network of land drainage ditches running along the western perimeter of the village which convey runoff from higher ground towards the centre of the Skenfrith, before entering culverted systems that outfall to the River Monnow. These systems are rapidly overwhelmed during large flood events and are not designed to manage additional out of bank flows from the larger watercourses.

There was no evidence or reports of significant overland flows from higher ground to the south or west of the village which contributed to the flooding of property during this event.

4.3 Surface Water Drainage

Within the centre of the village there is a limited highway surface water drainage system which drains the C12.13 carriageway that runs through the centre of Skenfrith. This drainage system also conveys flow from the land drainage ditches outlined above, to numerous outfalls to the River Monnow. The systems typically consist of small pipes and culverts which quickly become overwhelmed during larger flood events as they are not designed to accommodate additional volume from larger watercourses. Details of this drainage network can be seen in Appendix C and Figure 9 below.

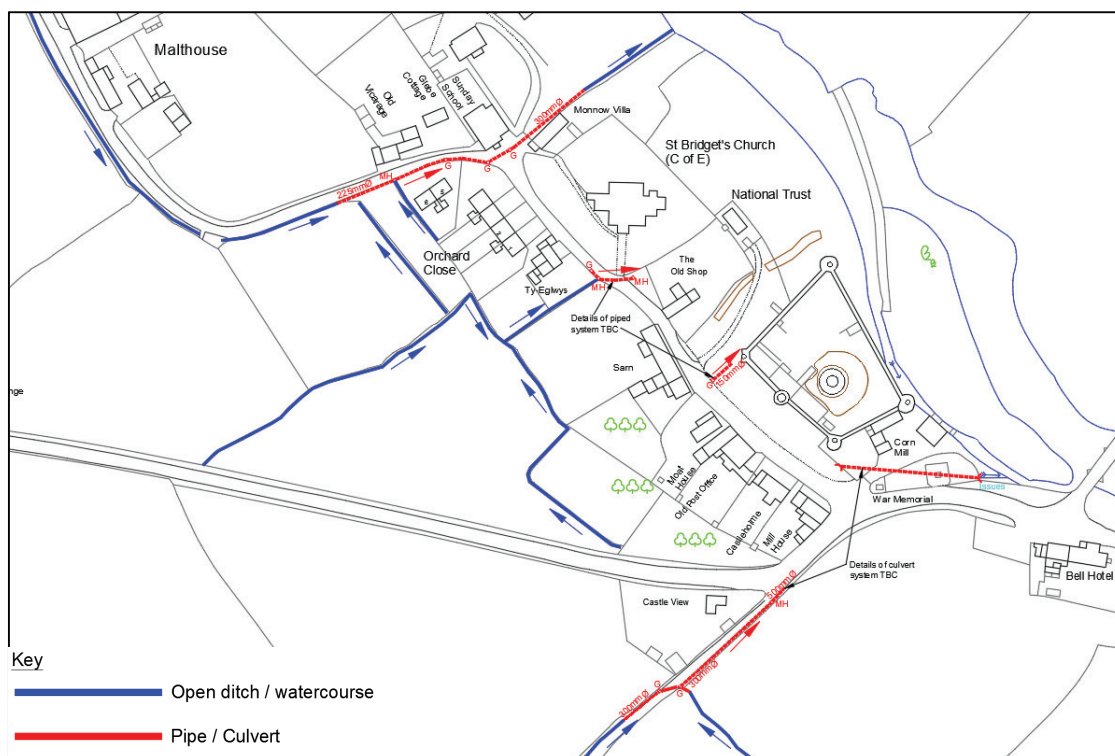


Figure 11: Land and Surface Water Drainage Features

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 duties as Lead Local Flood Authority. Additional surveys will be required as some information was not collected at the time of the initial investigation due to water levels within the system.

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 Skenfrith 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, NRW is responsible for managing flood risk from main rivers, reservoirs 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.

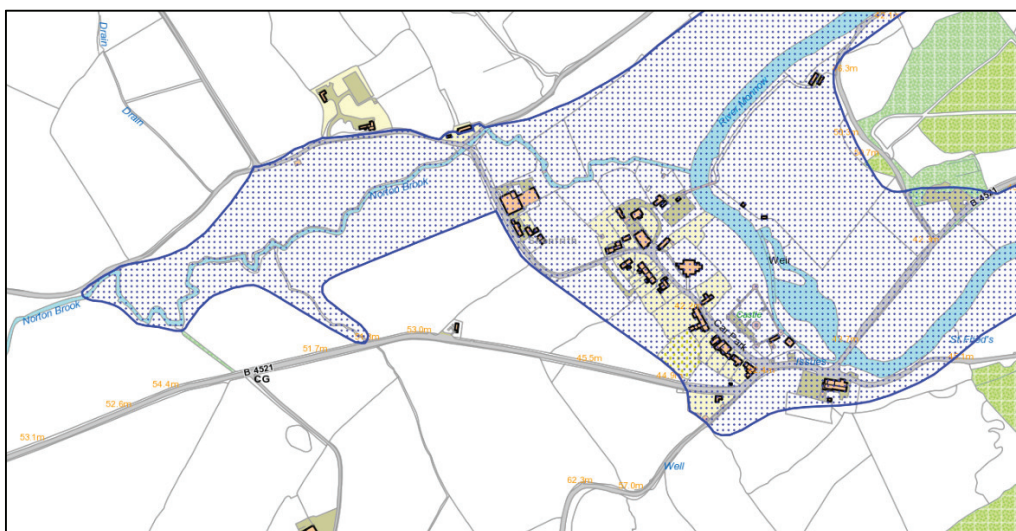


Figure 12: Internal Drainage District boundary hatched blue

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 Highways 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 that blockages.

5.6 Riparian Landowners

Riparian owners, householders and business owners are responsible for maintaining private drainage assets and these are usually minor drains, ditches, watercourses, 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).

Land owners are responsible for ditches and land drainage assets upon their land at Skenfrith, with permissive powers and responsibility for those watercourses within the Internal Drainage District falling to NRW.

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 Monnow and Norton Brook (Internal Drainage District), Natural Resources Wales have permissive powers under the Flood and Water Management Act 2010 and Land Drainage Act 1991. These powers include the right to undertake works to ensure watercourses are kept clear and free from impediments to flow, as well as promoting and implementing flood alleviation schemes.

Following the flood event and a request from MCC, the River Monnow and Norton Brook were inspected by NRW who found no blockage issues of immediate concern.

MCC also have permissive powers under the Land Drainage Act 1991 on ordinary watercourses and drainage features that fall outside of the Internal Drainage District. 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

There are currently no formal flood defences in Skenfrith or planned schemes to implement such measures. A number of individual properties have forms of flood barriers but these are largely ineffective in protecting against large flood events and many residents have experienced water rising through floors within the properties themselves.

The 2006 Atkins Pre-Feasibility Study considered a number of engineering options to reduce flood risk. These included:

- Do nothing (baseline case)
- Do minimum (localised land drainage improvements)
- Attenuation storage within the flood plan upstream of Skenfrith
- River channel conveyance improvements
- Upstream attenuation
- Replace Bridge (River Monnow)
- Installation of raised defences and significant land drainage improvements
- Improvements to local land drainage alone
- Flood Warning system
- Individual Property Protection
-

The preferred option was a combination of raised defences along the right bank of the River Monnow and Norton Brook and improvements to local land drainage systems. The defences typically consisted of raised earth embankments and stone faced reinforced concrete walls. Proposed land drainage improvements included the construction of new ditches to intercept runoff from higher ground, enlarging existing ditches, laying new pipework and a small pumping station to discharge to the River Monnow.

An economic assessment of the preferred option concluded that the benefit cost ratio was below unity and therefore a flood alleviation scheme was not economically viable at that time.

The Pre-Feasibility Study also concluded there were issues with the accuracy of the hydraulic modelling which would need to be resolved to undertake a full assessment of possible flood alleviation options, including the consideration of conveyance improvements over the raised section of the B4521 to the south of the village.

Given the advancement in hydraulic modelling techniques and changes to the methodology used to assess potential flood schemes in Wales since the 2006 Pre-Feasibility Study, it is recommend that a new study be undertaken using current Welsh Government guidance. Such a study and initial assessment of options would be promoted by Natural Resources Wales as Risk Management Authority.

8 Conclusion

The investigation has identified the flooding that affected Skenfrith on 26th October 2019 was the result of a prolonged and significant rainfall event, with the largest accumulations of rain falling on already wet ground predominately during 25th and 26th October. More than 75% of the monthly average rainfall was recorded in some areas in south wales with 84mm recorded in a 24hr period in parts of the River Monnow catchment. The rainfall fell across the upper catchments of the Norton Brook and River Monnow resulting in a rapid rise in levels in the two watercourses during Friday 25th October and Saturday 26th October.

Both watercourses overtopped on 26th October resulting significant flooding to land and property, including eighteen residential properties as well as the local pub, village hall and church. Local land drainage systems were quickly overwhelmed and the C12.13 Norton road was flooded, channelling water through the centre of the village and adjacent properties. Many residents reported water entering their properties from the front and rear elevations as well as through the floors of the buildings.

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 during individual meetings with residents and at the village meeting as described in this report. These actions have been considered further and relative 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)
SK01 (Flood Risk)	Undertake an Initial Assessment of options to reduce flood risk from all sources using current Welsh Government FCERM Business Case Guidance and updated hydraulic modelling. The assessment should include a review of all previous historic studies and consider natural flood management options.	NRW
SK02 (Land Drainage)	Record detail, ownership and maintenance responsibility of all land drainage features and ensure such features are maintained to the required standards.	NRW/MCC
SK03 (Surface Water)	Record detail, ownership and maintenance responsibility of all highway surface water drainage features and ensure such features are maintained to the required standards.	MCC
SK04 (Community Flood Plan)	Consider the requirement for a multi-agency Community Flood Plan to inform and aid the emergency response to future flood events.	NRW/MCC
SK05 (Local Protection)	Consider the requirement and location of a local sandbag store (and other equipment) which could be easily accessed by local residents.	MCC/NRW
SK05 (Norton Brook Telemetry)	Consider the addition of a gauge station on the Norton Brook to aid forecasting and monitoring of water levels.	NRW/MCC
SK06 (Flood Warning Service)	Raise awareness and understanding of the flood warning service "Floodline" and review take up within the village.	NRW

10 Useful Links and Contacts

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

Appendix A – Met Office Report

Persistent wet weather October 2019

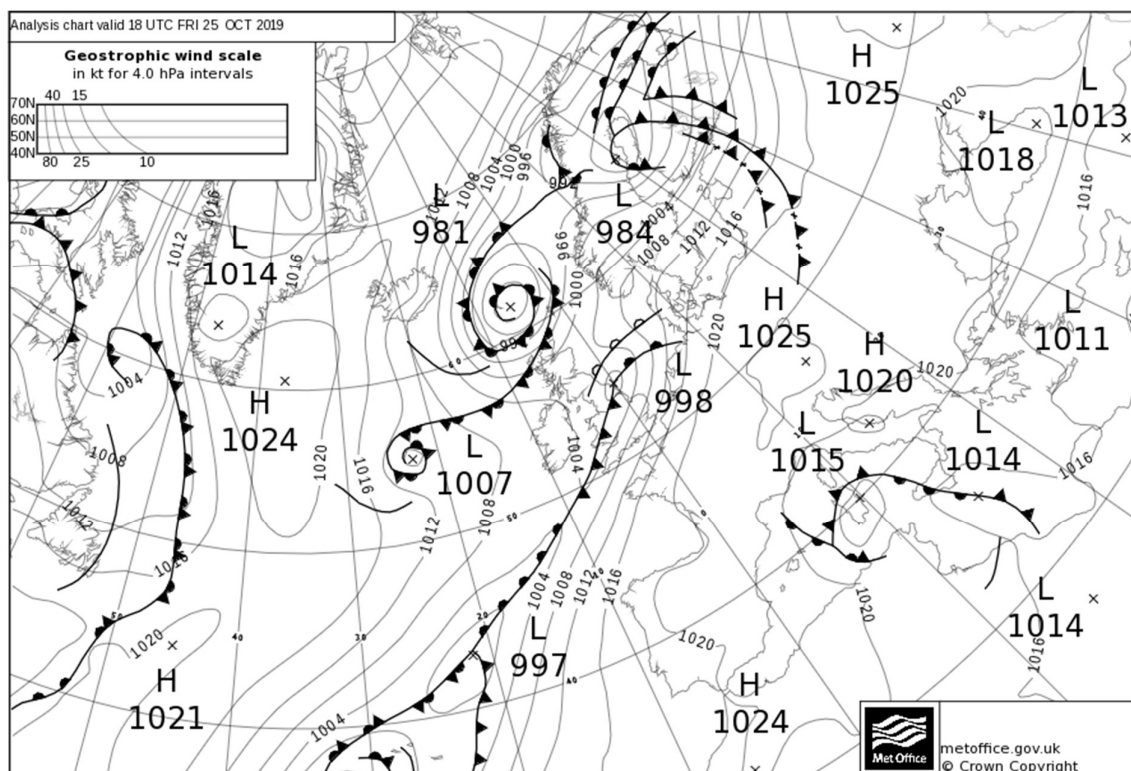
A slow moving front brought persistent heavy rainfall across England and Wales on 25 to 26 October 2019. The wettest area was across south Wales where over 100mm of rain fell across the high ground. Some locations across Wales and northern England received 75% or more of the monthly average rainfall.

Impacts

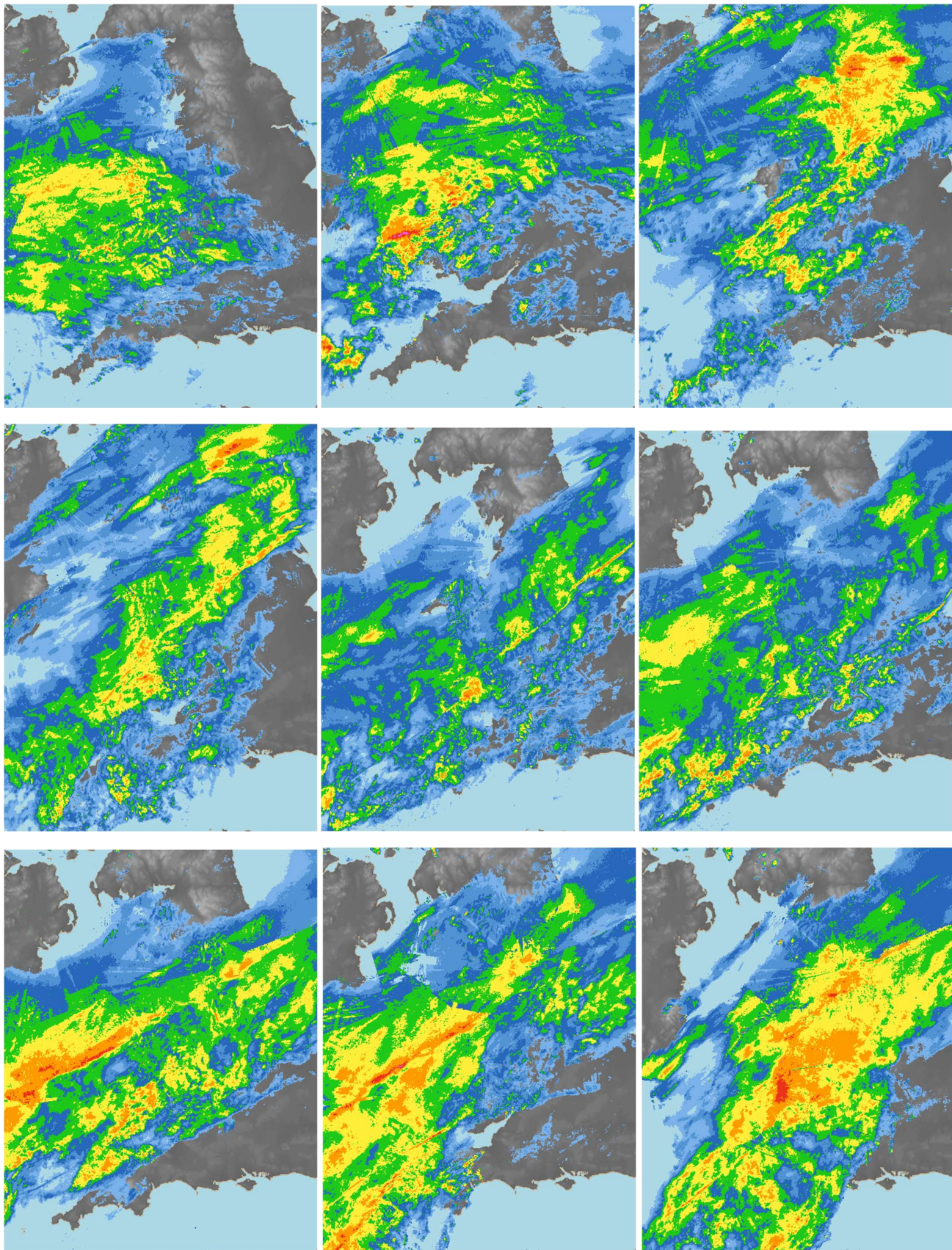
The heavy rain, falling on already very wet ground, led to flooding disruption across Wales, Shropshire, Staffordshire and Manchester. A number of roads were blocked by flooding – including the A555 Manchester Airport relief road. Rail services were also affected. Residents were evacuated from 25 homes in Skenfrith, Monmouthshire.

Weather data

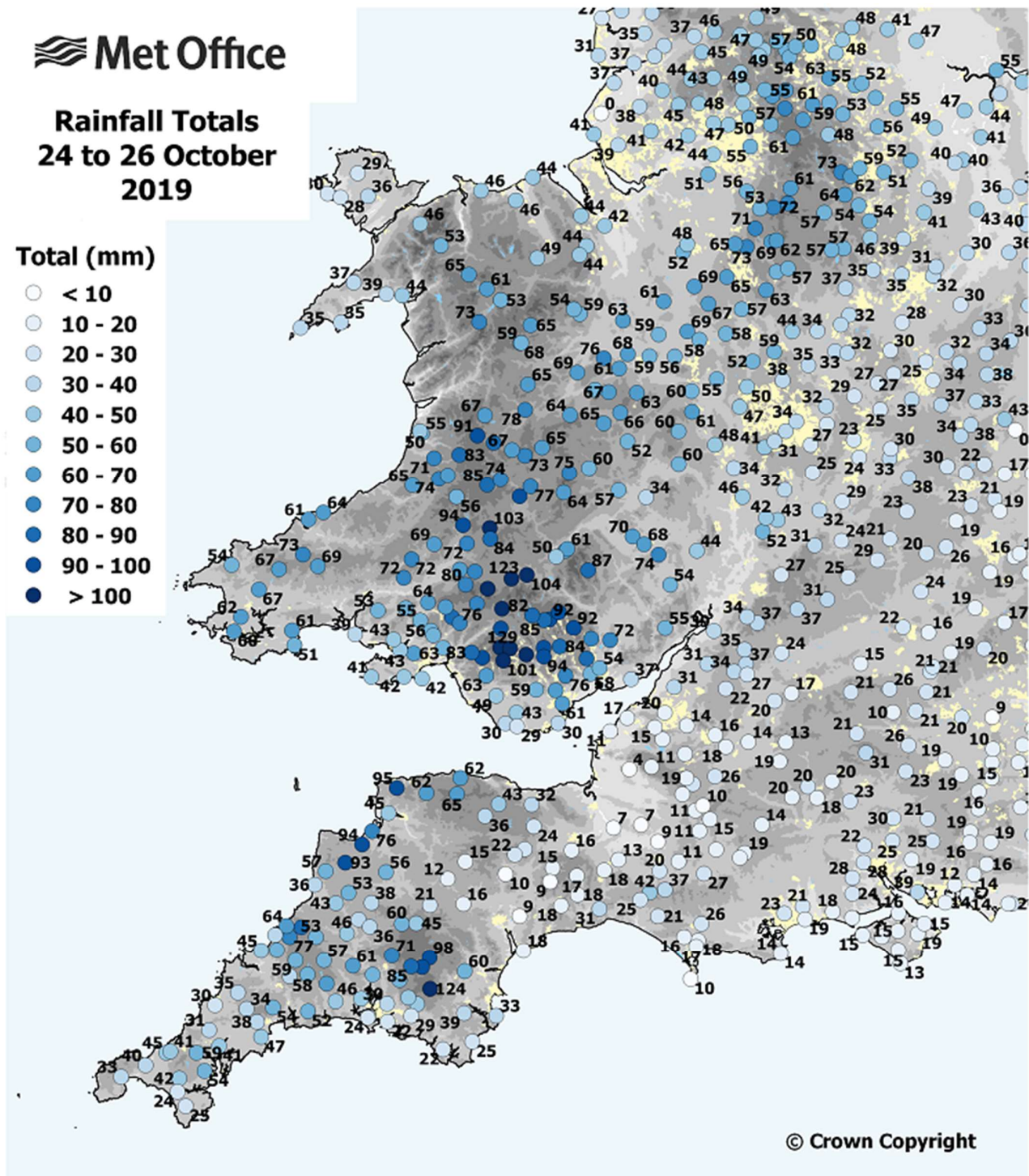
The analysis chart at 1800 UTC 25 October 2019 shows the slow moving front stretching from South Wales to Lincolnshire. The front was associated with a large temperature gradient; on 26 October the daily maximum temperature was around 7 °C in Birmingham and 17 °C in London.



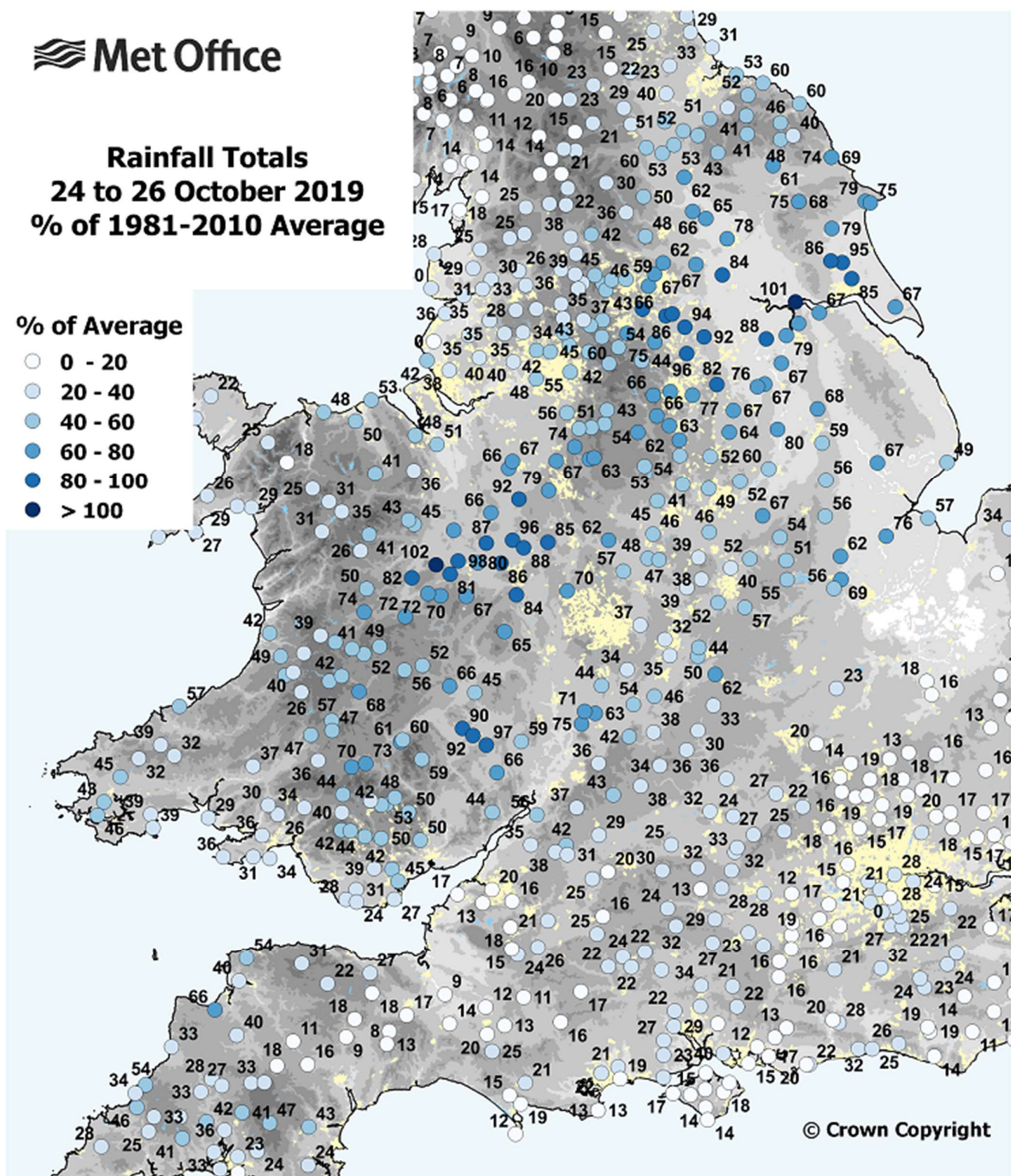
The panel of rain-radar images below indicate the persistence of the heavy rainfall (3-hour intervals from 0900 UTC 25 October to 0900 UTC 26 October 2019



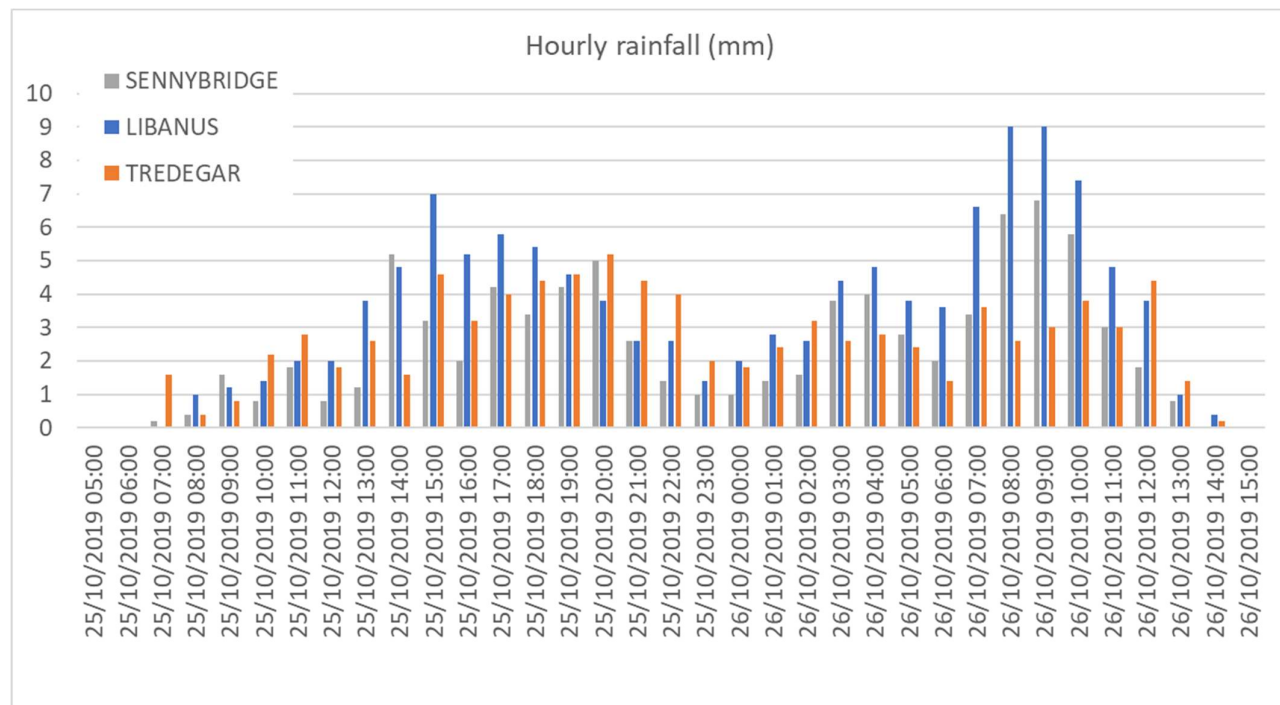
The map below shows rainfall totals for the 3-day period 0900 UTC 24 October to 0900 UTC 27 October 2019. 50 to 80mm fell across a swathe from north Devon through Wales to the Peak District. Upland areas of South Wales (particularly the Brecon Beacons) and Dartmoor recorded over 100mm with totals in some locations exceeding 130mm. Most of this rain during a 24-hour period on 25 October.



The map below shows rainfall totals for the 3-day period 0900 UTC 24 October to 0900 UTC 27 October 2019 as a % of the 1981-2010 October long-term average. Around 50 to 75% of the monthly average rain fell across a swathe from east Wales through Shropshire and the Peak District to Lincolnshire and Yorkshire, with some locations recording 75 to 100% of the monthly average.



The chart below shows hourly rainfall totals at three locations in Wales – Libanus and Sennybridge (both Powys) and Tredegar (Blaenau Gwent). Although the rainfall was not particularly intense, the chart indicates the persistence of the rainfall: in a 32-hour period Libanus recorded 120.6mm, and Tredegar and Sennybridge both over 80mm. This area had already experienced some very wet weather in late September and during the first half of October.



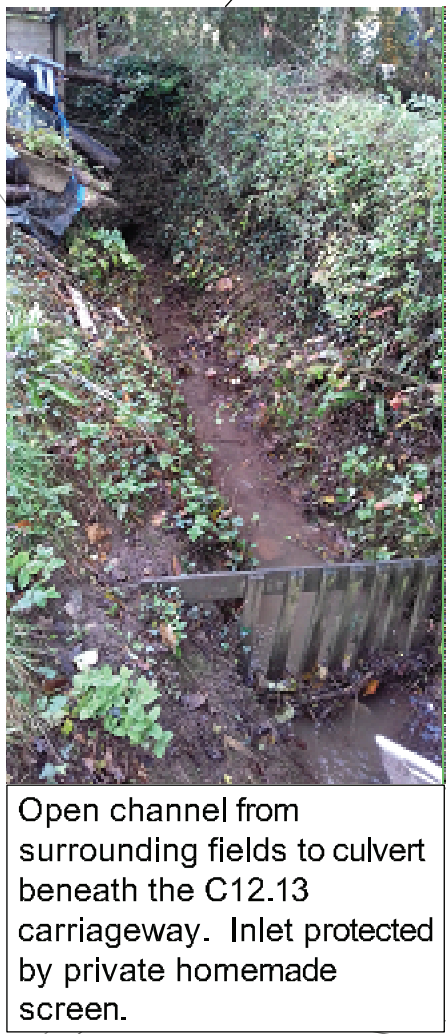
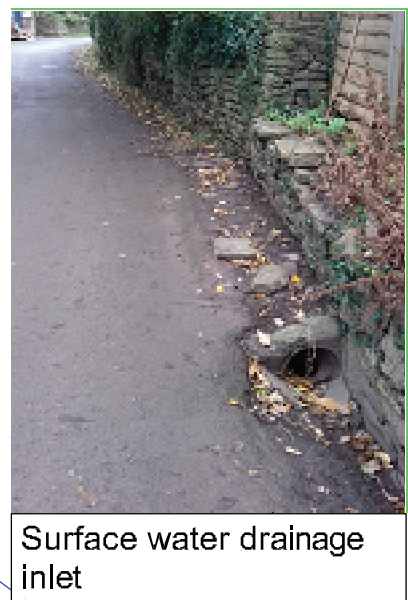
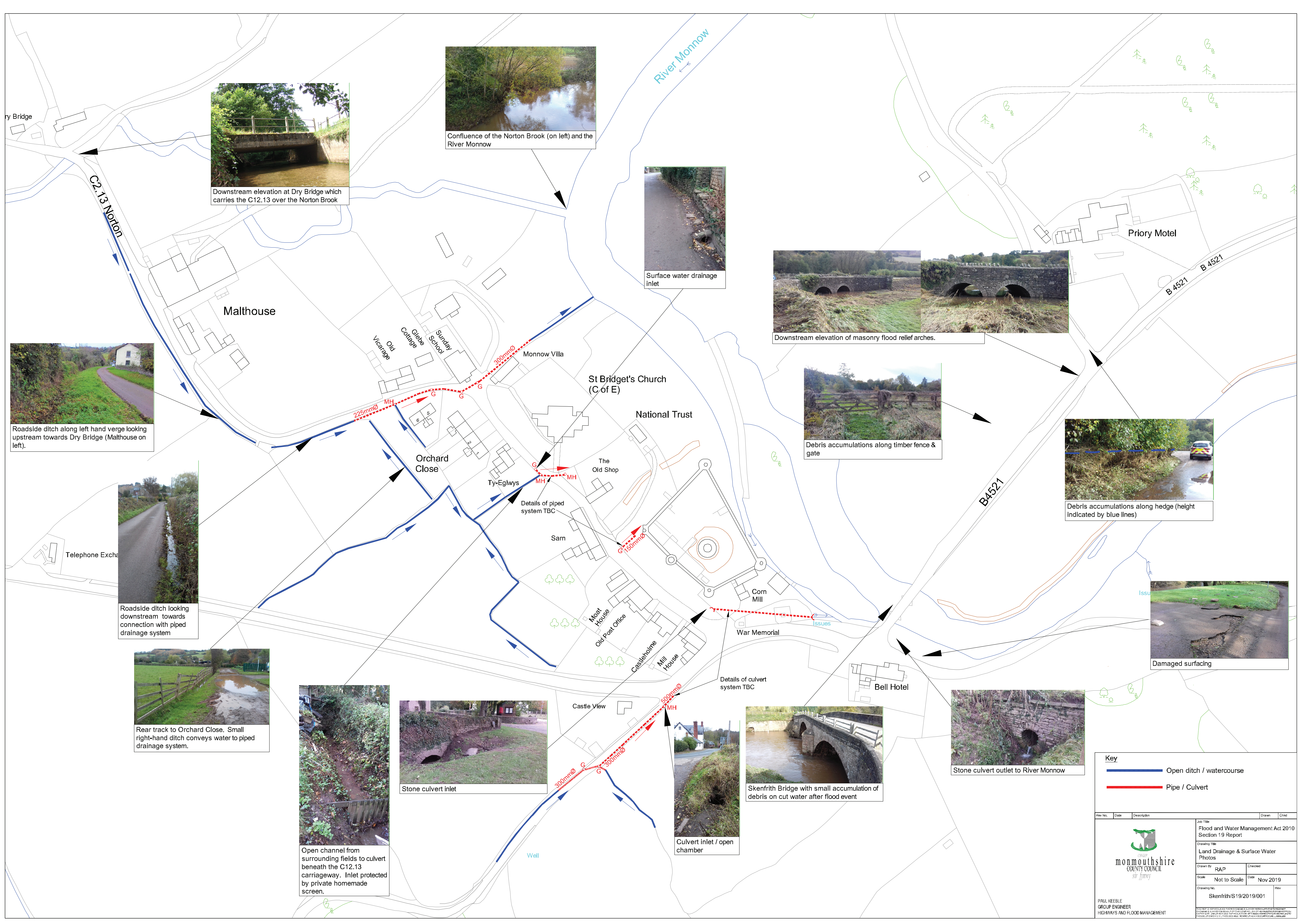
Author: Mike Kendon, Met Office National Climate Information Centre

Last updated 06/11/2019

Appendix B – Land Drainage and Surface Water Photos


Drawing No. Skenfrith/S19/2019/001

Land Drainage and Surface Water Photos



Key

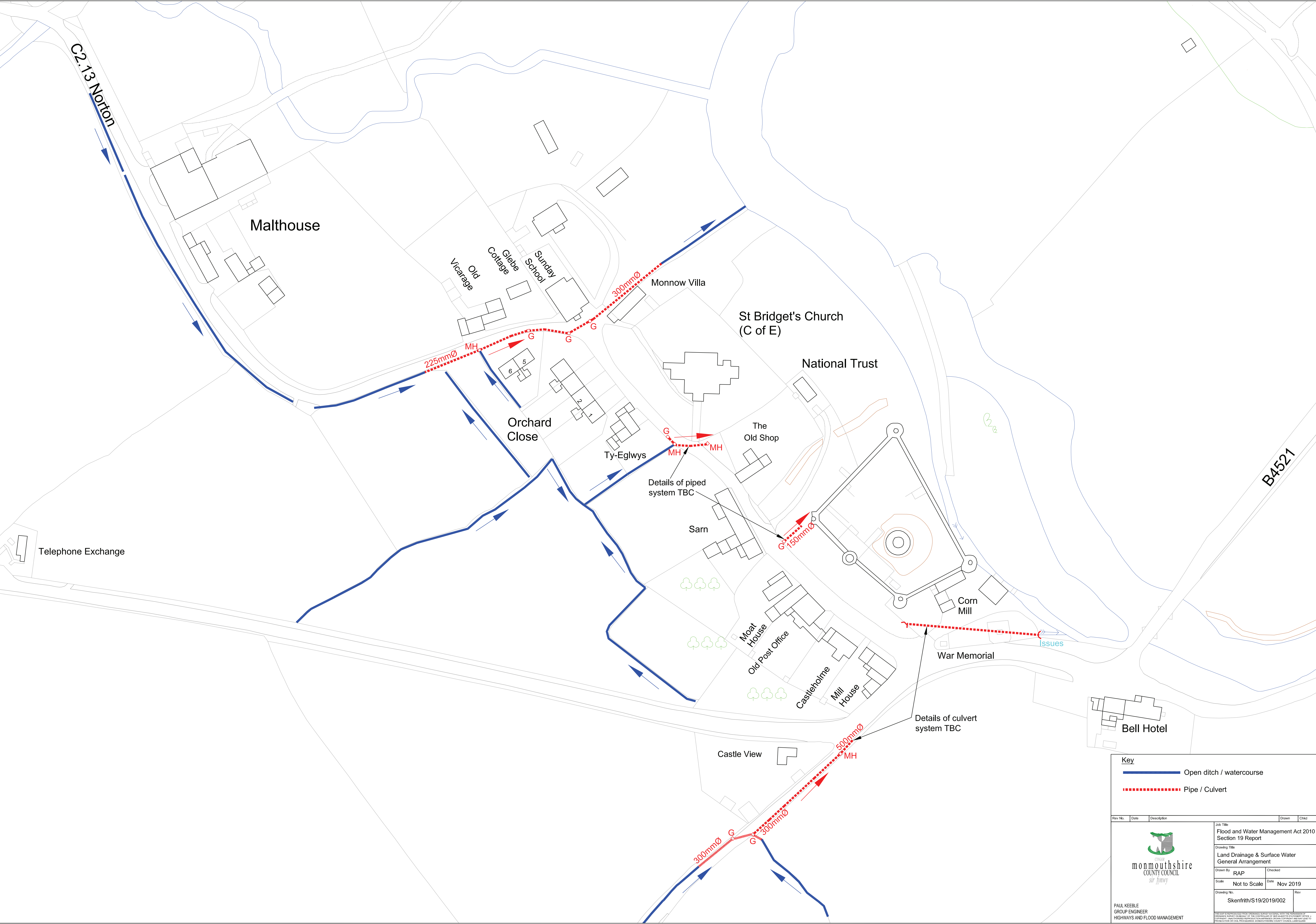
- Open ditch / watercourse
- Pipe / Culvert

Rev.No.	Date	Description	Drawn	Chkd
 monmouthshire COUNTY COUNCIL <i>sir jimmy</i>			JOB Title	
			Flood and Water Management Act 2010 Section 19 Report	
			Drawing Title	
			Land Drainage & Surface Water Photos	
			Drawn By	
RAP		Checked		
Scale		Date		
Not to Scale		Nov 2019		
Drawing No.		Rev		
Skenfrith/S19/2019/001				
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PAUL KEEBLE GROUP ENGINEER HIGHWAYS AND FLOOD MANAGEMENT				

Appendix C - Land Drainage & Surface Water General Arrangement


Drawing No. Skenfrith/S19/2019/002

Land Drainage & Surface Water General Arrangement



- Key**
- Open ditch / watercourse
 - Pipe / Culvert

Rev No.	Date	Description	Drawn	Chkd

 monmouthshire COUNTY COUNCIL <i>si'r fynydd</i>		Job Title: Flood and Water Management Act 2010 Section 19 Report
Drawing Title: Land Drainage & Surface Water General Arrangement		
Drawn By: RAP	Checked:	
Scale: Not to Scale	Date: Nov 2019	
Drawing No. Skenfrith/S19/2019/002	Rev:	

PAUL KEEBLE
GROUP ENGINEER
HIGHWAYS AND FLOOD MANAGEMENT

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