worcestershire countycouncil

Economy and Environment Overview and Scrutiny Panel
Friday, 11 September 2020, 10.00 am, Online only

Membership

Councillors:

Mr A A J Adams (Chairman), Mr P Denham (Vice Chairman), Mr G R Brookes, Mr B Clayton, Mr M E Jenkins, Mr A D Kent, Mr J A D O'Donnell and Mrs R Vale

Agenda Supplement

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Agenda produced and published by the Assistant Director for Legal and Governance (Monitoring Officer) Legal and Governance, County Hall, Spetchley Road, Worcester WR5 2NP. To obtain further information or hard copies of this agenda, please contact Emma James or Jo Weston 01905 844965, email: scrutiny@worcestershire.gov.uk

All the above reports and supporting information can be accessed via the Council's website websitehttp://www.worcestershire.gov.uk/info/20013/councillors_and_committees

Date of Issue: Thursday, 3 September 2020

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AGENDA ITEM 4

ECONOMY AND ENVIRONMENT OVERVIEW AND SCRUTINY PANEL 11 SEPTEMBER 2020

FLOOD RISK MANAGEMENT ANNUAL REPORT / UPDATE ON FLOODING 2019-20

Summary

1. The Panel will receive the Annual Report on Flood Risk Management in Worcestershire from the County Council's Flood Risk & Highway Drainage Manager.

2. The Flood Risk Manager, the Strategic Planning and Environmental Policy Officer and the Cabinet Member with Responsibility for Environment have been invited to attend, as well as representatives from Severn Trent and the Environment Agency.

Background

3. The Flood and Water Management Act 2010 (FWMA) created a new lead role for the County Council in managing flood risk, as reported to Cabinet on 1 July 2010.

4. In 2007 Worcestershire suffered extensive flooding. Subsequently a joint scrutiny on flooding in Worcestershire (with the district councils) took place in 2008, which supported the findings of Pitt's national review of the lessons learned from the 2007 floods. These included a recommendation that overview and scrutiny committees should annually review arrangements for managing flood risk.

5. An Annual Report has been produced which summarises the flood risk management activities and progress over the last 12 months of Worcestershire County Council (as Lead Local Flood Authority, or LLFA), and the other Risk Management Authorities. The Annual Report is attached as Annexe 1.

6. The County Council's website also includes information about flood risk management.
http://www.worcestershire.gov.uk/homepage/147/flood_risk_management

7. Scrutiny's discussion of flooding risk management last year on 18 January 2019 also looked at the role of external partners, including Severn Trent Water Ltd and the Environment Agency. The Minutes of this discussion can be accessed here: Agenda and Minutes of 18 January 2019

Purpose of the meeting

8. The Panel is asked to:
   - consider and comment on the Annual Report;
   - consider the information provided by external partners;

- determine any comments or recommendations to the Cabinet Member with Responsibility.

Supporting Information

Annexe 1 – Flood Risk Management in Worcestershire 2020 Annual Report (to follow)

Contact Points

Specific Contact Points for this report
Emma James / Jo Weston, Overview and Scrutiny Officers, Tel: 01905 844964 / 844965
Email: scrutiny@worcestershire.gov.uk

Background Papers

In the opinion of the proper officer (in this case the Assistant Director for Legal and Governance) the following are the background papers relating to the subject matter of this report:

- Agenda and Minutes of Economy and Environment Overview and Scrutiny Panel on 18 January 2019, 12 January 2018, 23 November 2016 and 25 November 2015.

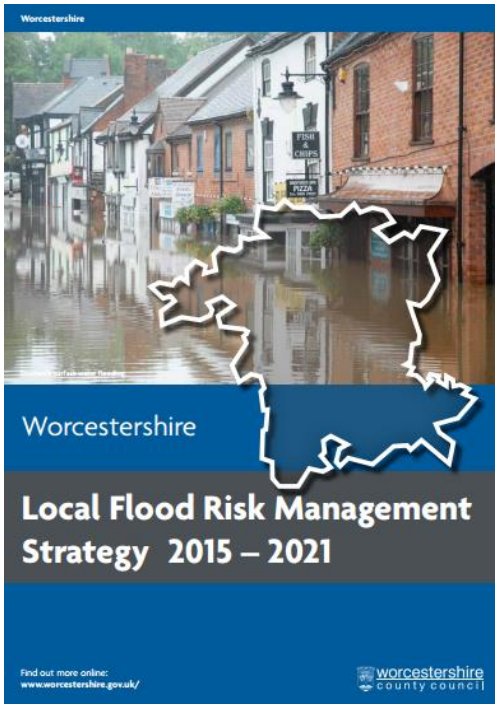
Minutes and Agendas are available on the Council's website at
http://worcestershire.moderngov.co.uk/ieListMeetings.aspx?CommitteeId=388

Flood Risk Management

Worcestershire County Council – Flood Risk Management Team
flooding@Worcestershire.gov.uk
01905 845522

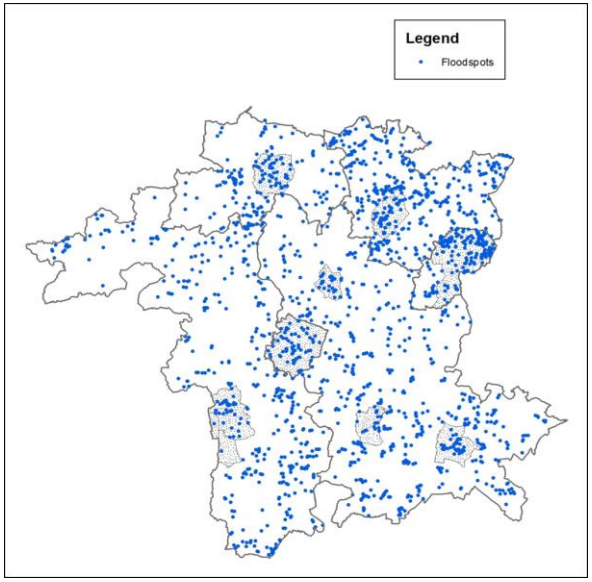
Flood Risk Management – progress since Jan 19

- Understanding and Prioritising Flood Risk
- Reducing the Likelihood and Impact of Flooding
- Governance and Partnerships
- Communications and Engagement
- Plans, Policies and Strategies
- Future challenges



Understanding and Prioritising Flood Risk

- Local Flood Risk Management Strategy Action Plan progress.
- Surface Water Management Plan progress.
- Progress with existing Local Flood Risk Management Plans as well as new ones for Wythall, Redditch and Hagley.



Reducing the Likelihood and Impact of Flooding

- Delivery of flood alleviation schemes and progress with business cases for potential schemes.
- Delivery of Natural Flood Management programme.
- Over 50 ordinary watercourse consents from April 2019 to March 2020.
- 293 major planning consultations and 6 planning policy consultations from April 2019 to March 2020. In addition many pre-app consultations, both formal informal. 100% within statutory deadline.

Reducing the Likelihood and Impact of Flooding

- Response to, and recovery from, flood events.
- Flooding in October and November 2019.
- Major flooding in February and March 2020.
- Flooding in June 2020.
- Post-flood investigations from Autumn and Winter, as well as ongoing investigations.
- Flood Recovery Support Grant Scheme and Property Flood Resilience Grant Scheme.

Governance and Partnerships

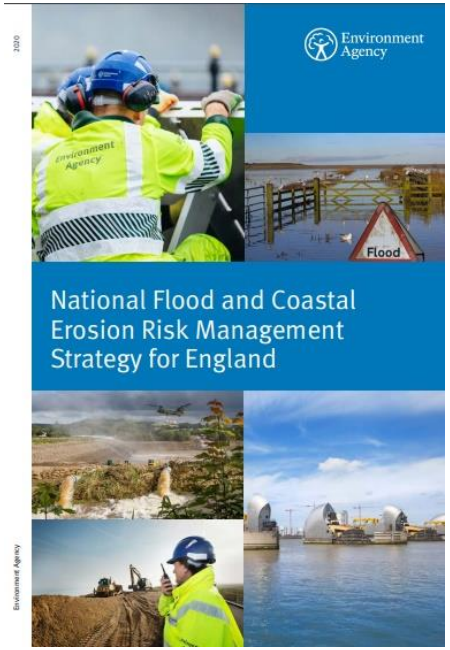
- Regional Flood and Coastal Committees.
- Strategic work with partners to make the most of opportunities – eg. WISE (Water Infrastructure for a Sustainable Economy project in Worcestershire) and River Severn Partnership.
- Developing partnerships and bringing together potential sources of funding.

Communications and Engagement

- Encouraging community resilience
- Development of flood groups
- Innovative community flood recovery support – the ‘virtual recovery trailer’ with the National Flood Forum, Districts, Environment Agency, Severn Trent.

Plans, Policies and Strategies

- Local Flood Risk Management Strategy update planned for 2021
- Input into other related plans and policies including:
  - Multi-Agency Flood Plans
  - Green Infrastructure Concept Plans
  - Worcestershire Minerals Local Plan
  - District Local Development Plans
  - Neighbourhood Plans
  - National Flood Risk Management Plans
  - Catchment Flood Management Plan



defra
Department for Environment Food and Rural Affairs

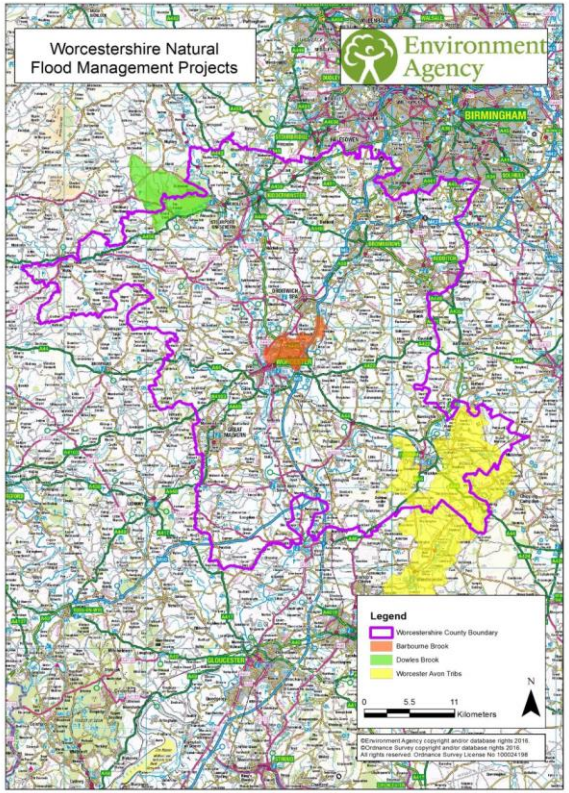
HM Government

Department for Transport

worcestershire county council

Flood risk management – future challenges

- Continued flood recovery and delivery of Property Flood Resilience grant scheme
- Investigation of flooding incidents and production, publication and implementation of recommendations
- Update of Local Flood Risk Management Strategy, including assessment and further investigation of future potential surface water flood risk
- Development and implementation of Redditch Flood Risk Management Plan
- Taking the Worcestershire Natural Flood Management project to the next stage
- Completion of existing and proposed flood alleviation schemes
- Securing funding for new flood alleviation schemes



Flood risk management – future challenges

- Ongoing delivery of the highway surface water drainage scheme programme
- Continued maintenance of Flood Risk Management and highway drainage infrastructure
- Further development and monitoring of the Register & Record of flood risk structures and features
- Further engagement with communities and landowners focusing on the development of local engagement and resilience
- Ongoing scrutiny of planning application drainage plans
- Exploration of options for the future maintenance of SuDS (Sustainable Drainage Schemes)
- Further integration between economic growth, infrastructure development and flood risk management & climate change adaptation

Flood Risk Management in Worcestershire

Annual Report 2020

ABBREVIATIONS

Acronym	Definition
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EU	European Union
FDGiA	Flood Defence Grant in Aid
FMfSW	Flood Map for Surface Water
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FRMSCG	Flood Risk Management Strategic Co-ordinating Group
FRR	Flood Risk Regulations
FWMA	Flood & Water Management Act
GIS	Geographical Information System
HRA	Habitats Regulation Assessment
IDB	Internal Drainage Board
LEP	Local Economic Partnership
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
LSIDB	Lower Severn Internal Drainage Board
MAFP	Multi-agency Flood Plan
NFF	National Flood Forum
NFM	Natural Flood Management
NFU	National Farmers Union
OWC	Ordinary Watercourse
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
RFCC	Regional Flood & Coastal Committee
RMA	Risk Management Authority
SAB	SUDS Approving Body
SEA	Strategic Environmental Assessment
SEP	Strategic Economic Plan
SFRA	Strategic Flood Risk Assessment
SLA	Service Level Agreement
STWL	Severn Trent Water Limited
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
SWDP	South Worcestershire Development Plan
WCC	Worcestershire County Council
WLDG	Worcestershire Land Drainage Group

1. INTRODUCTION

Worcestershire has seen two major flood events in the last 20 months: Autumn 2019 and Winter 2020.

Successive bands of heavy rain led to surface water flooding, ordinary watercourse flooding and then main river flooding in October and November 2019. This resulted in more than 70 flooded residential properties, impacts on 50 businesses and a significant amount of disruption to infrastructure.

Record breaking rainfall, combined with completely saturated ground conditions, led to the River Severn and the River Teme reaching almost record high levels in February and March 2020 and levels remained elevated for an unprecedented period. This impacted on circa 700 residential properties, over 200 businesses and many pieces of critical infrastructure were severely impacted, a number of them twice or even three times during the extended flood event period.

The combined response and recovery effort was significant and some aspects of the recovery are still ongoing, alongside a major focus on investigation and mitigation.

Flood Risk Management remains a high priority for WCC, the Government and other Risk Management Authorities and these flood events corroborate the reason for this. The government has announced funding for Flood Risk Management for the next six years.

The Risk Management Authorities (including Worcestershire) have worked with partners, local communities and landowners over the last 20 months. The River Severn Partnership has also now been formed.

Despite resources committed to major flood events, and operational restrictions from Covid-19, the RMAs have continued their work to develop and deliver flooding and drainage schemes, scrutinise planning applications, manage watercourses, increase community resilience and improve drainage, sewerage and flood defence infrastructure. This all helps to reduce the risk of flooding to homes, businesses and important infrastructure where we can.

2. UNDERSTANDING AND PRIORITISING FLOOD RISK

2.1. Local Flood Risk Management Strategy

Flood risk management in Worcestershire is guided by the statutory Local Flood Risk Management Strategy (LFRMS), a key element of which is the regularly updated action plan. This contains actions to ensure a better understanding of flood risk, prioritisation of resources and management of flood issues.

2.2. Preliminary Flood Risk Assessment

Each LLFA was required to produce a Preliminary Flood Risk Assessment (PFRA) in 2011 in response to the EU Flood Directive. Worcestershire's PFRA was reviewed in 2017 and a revised, national assessment methodology, resulted in central Redditch being identified as a 'Flood Risk Area' (previously called 'Areas of Significant Risk'); the first in Worcestershire. As a result, a multi-RMA group developed a Flood Risk Management Plan for the area and development is ongoing to meet the new requirements of the Regulations.

2.3. Worcestershire Surface Water Management Plan

Worcestershire Surface Water Management Plan (SWMP) continues to provide the key evidence base for the Local Flood Risk Management Strategy. It identifies over 1,700 known flood spots across Worcestershire (a location where flooding has occurred which has impacted on property, business or infrastructure). Detailed information is captured on each location to enable investigation and prioritisation. This information is regularly updated following further investigations, mitigation schemes completed, and any new flood spots identified after further flood events.

The SWMP data continues to help prioritise the procurement and deployment of resources and to inform plans for new infrastructure development.

Information about known previous flood spots is currently being expanded by the identification and investigation of locations which have not yet flooded, but where there may be a potential risk of flooding in the future.

2.4. Local Flood Risk Management Plans

RMA working groups continue to assess and plan mitigation measures to address flooding where there are high concentrations of past and potentially future flood spots.

A standard local ‘Flood Risk Management Plan' (FRMP) process and reporting structure has been adopted and followed at a number of locations, for example Bromsgrove, Droitwich, Hollywood, Redditch and, more recently, Hagley.

2.5. Investigations

The Flood and Water Management Act (2010) places a duty on the LLFA to formally investigate flooding it deems to be significant and publish a report of the findings. A policy defining the LLFA's approach to this, together with criteria confirming what represents 'significant' is set out in the Local Flood Risk Management Strategy.

The circumstances surrounding the flood events in Hagley (Oct/Nov 2019) resulted in a commitment to proceed with a formal investigation, despite the relatively small number of properties that were impacted. The investigation report was delayed due to Covid 19 and the flood events, however this is due to be published in the next few months. An action plan is in place, alongside the investigation, to respond to highlighted issues as they arise.

The major flood events in the Autumn of 2019 and the late Winter of 2020 are also being formally investigated and this information will be captured in a joint investigation report. This will include details of works already undertaken by the Environment Agency in its report of Summer 2020 (attached as appendix 6). Within the major flood events and in a number of smaller scale, localised surface water flood events, some informal investigations have been conducted, many of which are ongoing. These investigations will build on our knowledge and understanding of flood risk in Worcestershire.

2.6. Water Infrastructure for a Sustainable Environment (WISE)

A partnership between Worcestershire County Council, the Environment Agency, Severn Trent Water and the Worcestershire Local Enterprise Partnership has carried out a ground-breaking piece of work to combine multiple layers of data and identify key locations where flood risk management and water supply mitigation might unlock economic growth potential. This work will be taken forward and tested over coming months before potentially being integrated into the existing FRM prioritisation process.

3. REDUCING THE LIKELIHOOD AND IMPACT OF FLOODING

3.1. Flood alleviation schemes

A number of flood alleviation schemes have been completed or further developed over the last 20 months reducing the risk of flooding to more properties, businesses, key roads and other pieces of critical infrastructure. Key locations include:

- Upton-upon-Severn
- Severn Stoke
- Bewdley
- Tenbury
- Toronto Close, Lower Wick
- Areley Kings, Stourport
- Bromsgrove
- Worcester
- Redditch
- Huddington
- Wythall
- Malvern

A number of the above schemes are being accelerated in response to the major flood events and the recent allocation of additional funding from the Government, and match funding by Local Enterprise Partnership and local authorities.

Further scheme proposals are currently being prepared for submission to the Regional Flood & Coastal Committee, for their next six-year programme, which has received increased Government funding and starts in April 2021.

The GIS-based 'Register of FRM Schemes', produced by the WCC Flood Risk Management Team, is kept up to date and includes easily accessible information on past, current and forthcoming schemes in Worcestershire led by all of the RMAs.

3.2. Flood Recovery Property Flood Resilience Scheme

Government grant support of up to £5,000 per property was made available for installation of property flood resilience measures following the major flood events.

In Autumn of 2019, it was only Wychavon District that was eligible under the Government’s criteria and the District council is still in the process of rolling out the grant and supporting the installation of PFR at more than 30 residential and business properties.

Following the February/March 2020 flood event, more than 400 properties in Wyre Forest and Malvern Hills Districts and Worcester City became eligible and the Districts/City Councils are currently in the relatively early stages of rolling out the grants.

This grant funding and the PFR it will enable are extremely welcome.

3.3. Flood Recovery Support Grants

Following each of the major flood events, Government grant funding was made available to support owners of residential properties which were flooded (£500ea) and businesses which were severely impacted (£2,500ea) in eligible districts. This was augmented by some funding from the County Council for districts which were not eligible for the Government funding.

Following the Government's announcement, the District/City Councils promptly administered this funding to those who were eligible; over 500 individual grants were issued.

WCC has committed £250,000 to a community recovery and resilience grant scheme which will be rolled out shortly. The grants will be delivered via the local County Councillors representing the parts of Worcestershire that were most impacted by the major February / March 2020 flood event.

3.4. Highway Surface Water & Drainage Improvement Schemes
More than 100 highway surface water and drainage improvement schemes have been completed over the last 20 months.

In addition, delivery of the Worcestershire Local Enterprise Partnership-funded programme of larger scale capital highway flood adaptation schemes was completed, with Upton-upon Severn coming into full operation. These schemes have increased the resilience of key transport routes and performed well during the five months of flooding during the last autumn and winter flood events, helping to reduce congestion and ensure that Worcestershire stayed open for business.

3.5. Highway Drainage Maintenance
Essential ongoing maintenance of highway drainage infrastructure continues. Another 200 broken gully connections are also repaired annually by Ringway as part of the Highways contract, and more than 55,000 gullies jetted.

3.6. Spatial Planning & Sustainable Drainage Systems (SuDS)
There was the foreseeable lull during the Covid-19 lockdown, but over the last 20 months, the RMAs have assessed and commented on drainage plans of over 1,500 planning applications.

Other planning related work has included:

- Contribution to the development of the South Worcestershire Development Plan accompanying SFRA and Water and Flood Risk Management policies
- Continued contribution to the development of Game Changer sites, including Worcester Six and the Redditch Eastern Gateway
- Contribution to the Minerals Local Plan and its water and flood risk management policies
- Contribution to key infrastructure projects including Worcestershire Parkway Station and Southern Link Road phases 3 and 4

3.7. Ordinary Watercourse Management
The District Council Land Drainage partnerships and the Lower Severn Internal Drainage Board have continued to ensure that the extensive network of smaller watercourses and ditches are appropriately managed and maintained. This has been achieved through:

- Inspection of over 80km of the watercourse network
- Liaison with riparian owners about maintenance and management of watercourses on their land
- Implementation of land drainage consenting duties and powers, including more than 100 applications processed and a number addressed by pre-application discussions
- Implementation of land drainage enforcement powers including more than 150 successful informal enforcement actions

- Recording and monitoring of flood risk management assets on the statutory 'Register & Record of Structures & Features'
- Direct maintenance by the Lower Severn Internal Drainage Board including vegetation management and dredging at Pendock, vegetation management on another 34km of watercourse in the Eldersfield and Longdon area and maintenance access improvements

3.8. Main River Management

A huge focus for the Environment Agency (EA), along with its RMA and responder partners, over the last 20 months has been in response to, recovery from and investigation of, the major flood events in the Autumn and Winter of 2019/20 (see appendices 5 and 6). In addition, the EA has continued to deliver its responsibility for the management of flood risk on 'Main Rivers' including:

- Further development of flood alleviation schemes at Severn Stoke (planning application submitted), Toronto Close in Worcester, Tenbury (funding in place and accelerated scheme development underway), Beale's Corner in Bewdley (accelerated scheme development underway) and Powick
- A business case is being developed to reduce flood risk on the Barbourne Brook, Worcester, and in Bromsgrove
- Further preparation for property flood resilience schemes in Worcester, Himbleton, Evesham, Wickhamford and Droitwich
- Inspection, repair and maintenance of the EA's existing flood defences and structures following the major flood events to ensure they are fit for purpose when next called upon
- Proactive maintenance works on more than 20 watercourses in Worcestershire including vegetation, debris and silt removal.

In its strategic role, the EA has, during the last 20 months:

- Overseen and directly implemented the final stages of the English Severn and Wye Regional Flood and Coastal Committee six-year capital investment programme (2015 – 2021) within which over £12 million in flood defence benefits has reduced flood risk to over 500 homes
- Led preparation for the next RFCC six-year programme beyond 2021 with a further £14 million being bid for to better protect over 1,000 homes
- Strongly supported the establishment and development of the River Severn Partnership
- Played a key partnership role in the Water Infrastructure for a Sustainable Economy project in Worcestershire
- Funded and participated in the virtual community flood recovery drop-in sessions
- Processed more than 50 Environmental Permitting Regulation applications
- Responded to more than 50 planning application consultations.
- Provided flood risk technical support and guidance on a number of major infrastructure projects including the Upton upon Severn highway flood adaptation schemes and the Southern Link Road Phases 3 and 4
- Worked with partners to align economic growth and local development plans with flood and environmental risks.

3.9. Natural Flood Management

The Worcestershire Natural Flood Management Project, funded by Defra via the EA and hosted by Worcestershire County Council, is focused on reducing and slowing the flow in three catchment areas within Worcestershire (with some upper catchment in Gloucestershire and Shropshire) as follows:

- The Cotswold tributaries – River Isbourne, Merry Brook and Badsey Brook
- Dowles Brook
- Barbourne Brook

During the last 20 months, despite significant delays due to flooding, waterlogged ground and Covid-19 lockdown, the project officers have made excellent progress on engagement with key partners, landowners and communities, gaining relevant consents and permissions and designing and installing over 150 interventions on the ground, and there are many more to come. To compensate for the enforced delays, a 12-month extension to the project has been requested from Defra; we are awaiting their response.

In the meantime, a bid to the Regional Flood & Coastal Committee for a six-year NFM Project is currently being developed. This will build on the experience and lessons learned from the current project and encompass many more locations across Worcestershire.

3.10. Sewerage System Management

Severn Trent Water has continued to deliver its flood risk management duties through a range of activities and schemes over the last 20 months, in increasing collaboration with other RMAs by:

- Dealing with and responding to flooding incidents including**:**
    - responding to 138 internal and 1407 external sewer flooding incidents in the Worcestershire area during 2019
    - supporting response to and recovery from the flood events in Hagley in October and November 2019
    - responding to multiple sewer flooding incidents during the wider major flood events in 2019 and 2020
    - supporting the operation of EA flood defences during the major flood events through deployment and operation of mobile pumps and amendment of vulnerable infrastructure at Bewdley, Worcester and Upton upon Severn
    - contributing to recovery from, and investigation of, the major flood events
    - contributing to implementation of Flood Risk Management Plans in a number of locations around the county
- Educating customers including:
    - visiting schools in Worcestershire and delivering key messages on saving water and sewer misuse to over 1,500 children through interactive assemblies, workshops and eco talks
    - proactively seeking new schools to visit and continuing to build on partnerships with existing schools and colleges
    - touring with the 'Wonderful Water tour bus'
- Dealing with developer enquiries including:
    - responding to over 40 sewer pre-planning developer enquiries seeking new connections to the sewerage system
    - responding to local planning authorities on planning applications for Worcestershire
- Carrying out CCTV Surveys including:
    - a focus on Critical Trunk Sewer CCTV Surveys including 2.8km of sewers in Redditch
    - continued proactive sewer surveying, cleansing and repairing programme to reduce the risk of flooding from sewers
- Delivering and supporting schemes including:
    - working jointly with the EA on a PFR scheme at Beale's Corner, Bewdley

    - supporting EA and LLFA led schemes and initiatives at Severn Stoke, Toronto Close, Perdiswell, Beale's Corner in Bewdley, A38 Morrison's, Bromsgrove, and Broadway
- Supporting strategic growth including:
    - consulting on the STW Drainage and Waste Water Management Plan.
    - responding to consultations from Local Planning Authorities on the development of local plans and environmental policies
    - supporting the Water Infrastructure for a Sustainable Economy project
    - contributing to the Worcester City Integrated Drainage Strategy
- Improving our customer map request service including:
    - moving to an automated asset data approach using a leading external company, DIGDAT
    - updating our website and our HD website to show the new information, including links to DIGDAT

3.11. Emergency Planning and Response

WCC and District Council Emergency Planning, Drainage and Highways officers have worked with other RMA partners, responders and the overarching West Mercia Local Resilience Forum in order to:

- Help co-ordinate the response to and recovery from the major flood events inc:
    - Provision of 24/7 Emergency Planning single point of contact for the north Worcestershire Districts to link with Local Resilience Forum partners through Command & Control arrangements
    - Contribution to the West Mercia Local Resilience Forum Command & Control structure:
    - Bewdley Operational Co-ordination Group (Bronze Cell)
    - Tactical Co-ordination Group
    - Strategic Co-ordination Group
    - Communications Cell
    - Operation of internal Gold, Silver and Bronze co-ordination structures
    - Co-ordination of support to the community and professional partners from the County Volunteers Emergency Committee (CVEC) including 4 x 4 support / Search and Rescue
    - Coordination, chairing and contribution to the Recovery Co-ordination Group – ongoing
    - Contribute to and help co-ordinate the flood event response de-brief process
- Contribute to the flood event formal investigation and production of an investigation report
- Continue to support resilience within the identified Rapid Response Catchments
- Continue development of a network of local rain gauges to assist in future investigations and flood warning
- Attend Parish Council emergency planning fora and work with local communities to develop local resilience plans
- Further develop individual organisation response plans
- Install more remote watercourse monitoring equipment
- Monitor and respond to watercourse gauge triggers
- Further review sandbag policies
- Produce generic resident update sheets for use during and after a flood event

4. GOVERNANCE & PARTNERSHIPS

4.1. Regional Flood & Coastal Committee

The English Severn & Wye Regional Flood & Coastal Committee (RFCC) comprises elected representatives from each of the Lead Local Flood Authorities within the catchment area, along with a number of EA representatives and co-opted specialists.

The RFCC plays an important role in coordinating flood risk management including assessing proposed flood related schemes and allocating both Local Levy and Central Government Flood Defence Grant in Aid capital funding via its six-year plan of flood alleviation schemes.

The main focus for the RFCC over the last 20 months has been delivery of schemes and achievement of targets within the final year of the current six-year programme. More recently, this priority has been joined by preparation for the next six-year programme which will include a number of schemes in Worcestershire.

4.2. River Severn Partnership

The River Severn Partnership, formed in September 2019, brings together the Environment Agency, Local Authorities, Local Enterprise Partnerships, Severn Trent Water, Water Resources West, Natural Resources Wales, Wildlife Trusts and others to establish a strategy for adapting to climate change and to improve resilience across an area which covers the Rivers Severn, Teme, the Warwickshire Avon and the Wye.

The River Severn Partnership has secured funding of around £40 million to progress flood defence schemes and drive forward innovation. Around £35 million will be used to accelerate delivery of schemes to manage flood risk, including Tenbury Wells, and an additional £5.4 million to undertake carbon offsetting, resulting in significant tree planting and improving habitats and green spaces for local people along the river network.

Alongside scheme delivery, a further £1.5 million was secured by the Partnership in recognition of the innovative action it is seeking to take to build resilience. The Partnership has been chosen as one of four nationally to trial and develop new ways of planning ahead and making wise investment choices based on the long-term uncertainties brought by climate change. The hope is that this will provide a strong basis for the Partnership to bid into the wider £200million Innovative Resilience Programme which will be available later this year.

4.3. Other Groups, Partnerships and Fora

Representatives from WCC, the District Councils and often the other RMAs have attended meetings and fora including:

- Worcestershire FRM Strategic Coordinating Group
- Worcestershire Land Drainage Group
- District Council Land Drainage Partnership Boards
- Regional EA / LLFA Networking Group
- Worcestershire NFM Project Steering Group
- The West Mercia LRF (Worcestershire) Severe Weather Group
- The Local Government Flood Forum
- The Worcestershire Local Nature Partnership
- The Worcestershire Green Infrastructure Partnership
- The Worcestershire Infrastructure Steering Group
- The Worcestershire Local Transport Board

5. COMMUNITY ENGAGEMENT & RESILIENCE

5.1. Local Flood Groups

The Risk Management Authorities have worked closely with an increasing number of community flood groups over the last 20 months at locations including: Hollywood, Powick, Tenbury, Severn Stoke, Sedgeberrow, Charlton and Wolverley.

Community resilience is a major priority within the new National FRM Strategy and it is key that support for, and engagement with, these groups is continued and that more groups are encouraged to take shape in other at-risk communities, not least those severely impacted in the major 2019-20 flood events.

These groups are generally very active within the community and they provide a key link with the RMAs.

This important work is made possible and most effective by the embedded partnership with the National Flood Forum (NFF), a Bewdley-based charity with considerable experience and expertise in working with flooded individuals and communities.

The NFF's experience, empathy and critical independence is a key component in the successful engagement record we have and helps augment the development of trust.

5.2. Innovative Community Flood Recovery Support

During the summer of 2020 the NFF led a ground-breaking exercise to support flooded individuals via a series of virtual drop-in sessions. These were necessary due to Covid 19 lockdown restrictions.

The exercise was funded by the EA and each session was attended and supported by the full range of RMAs. Feedback from those who joined the sessions was extremely positive.

6. PLANS, POLICIES & STRATEGIES

6.1. Flood Risk Management Strategy

The Strategy Action Plan articulates a number of targets for the RMAs. The Strategy will be reviewed and updated during 2021. Progress with implementation has been monitored by the Worcestershire Flood Risk Management Strategic Co-ordinating Group.

6.2. Other Related Plans, Policies and Strategies

A range of other related plans, policies and strategies has been produced and/or contributed to by the RMAs over the last 12 months including:

- Preliminary Flood Risk Assessment
- Worcestershire Surface Water Management Plan
- Local Flood Risk Management Plans
- Multi-Agency Flood Plans
- Green Infrastructure Concept Plans
- Worcestershire Minerals Local Plan
- District Local Development Plans
- Neighbourhood Plans
- Catchment Flood Management Plan

7. FUTURE SCOPING

7.1. Future Actions

Even with the resources which we had to apply in response to, recovery from and investigation of the major flood events over the last autumn and winter, a great deal of progress has been made with many aspects of flood risk management over the last 20 months. However, more work is required, not least that which has emerged from or been confirmed by the recent major flood events.

In addition, whilst the increased funding opportunities are extremely welcome, they all carry an increased expectancy and need for resources to be allocated in terms of both securing and delivering them.

Priorities for the next 12 months include:

- Production, publication and implementation of the Hagley and countywide formal investigation reports
- Continued implementation of the Hollywood formal investigation report recommendations
- Continued implementation of the Local Flood Risk Management Strategy Action Plan
- Review and refresh of the Local Flood Risk Management Strategy and accompanying action plan
- Assessment and investigation of future potential surface water flood risk
- Development and implementation of the local flood risk management plan for the new Redditch 'Flood Risk Area', as identified by the review of the Preliminary Flood Risk Assessment
- Implementation of the final year of the Worcestershire Natural Flood Risk Management Project
- seek to secure the next, six-year, countywide Natural Flood Management project
- Further development of the River Severn Partnership
- Completion of schemes already on the RFCC six-year Medium Term Plan
- Introduction and implementation of new schemes onto the next RFCC six-year Medium Term Plan
- Further development of plans for the STWL Asset Management Plan 7 (2020-2025)
- Ongoing delivery of the highway surface water drainage scheme programme
- Implementation of lessons learned from the major flood events and further development and testing of emergency plans
- Continued maintenance of FRM infrastructure including highway drainage and flood defences
- Further development and monitoring of the Register and Record of flood risk structures and features
- Further development and updating of the Register of FRM Schemes
- Further engagement with communities and landowners focusing on the development of local engagement and resilience
- Ongoing scrutiny of planning application drainage plans
- Exploration of options for the future maintenance of SuDS
- Further integration between economic growth, infrastructure development and flood risk management
- Continued liaison with communities to support existing flood action groups and establish new ones in areas at risk of flooding

APPENDIX 1. RISK MANAGEMENT AUTHORITY ROLES

Risk Management Authority	Core flood risk management role
Environment Agency	Main rivers, the sea and reservoirs
Water Authority (STWL)	Sewerage system
Lead Local Flood Authority (WCC)	Surface water, groundwater, ordinary watercourses, Local Flood Risk Management Strategy, local leadership
Highway Authority (WCC)	Flooding caused by rain falling on the highway, highway drainage
District Councils (BDC, MHDC, RBC, WCityC, WDC, WFDC)	Ordinary watercourses
Internal Drainage Board (LSIDB)	Ordinary watercourses

APPENDIX 2. ROLE OF THE LEAD LOCAL FLOOD AUTHORITY

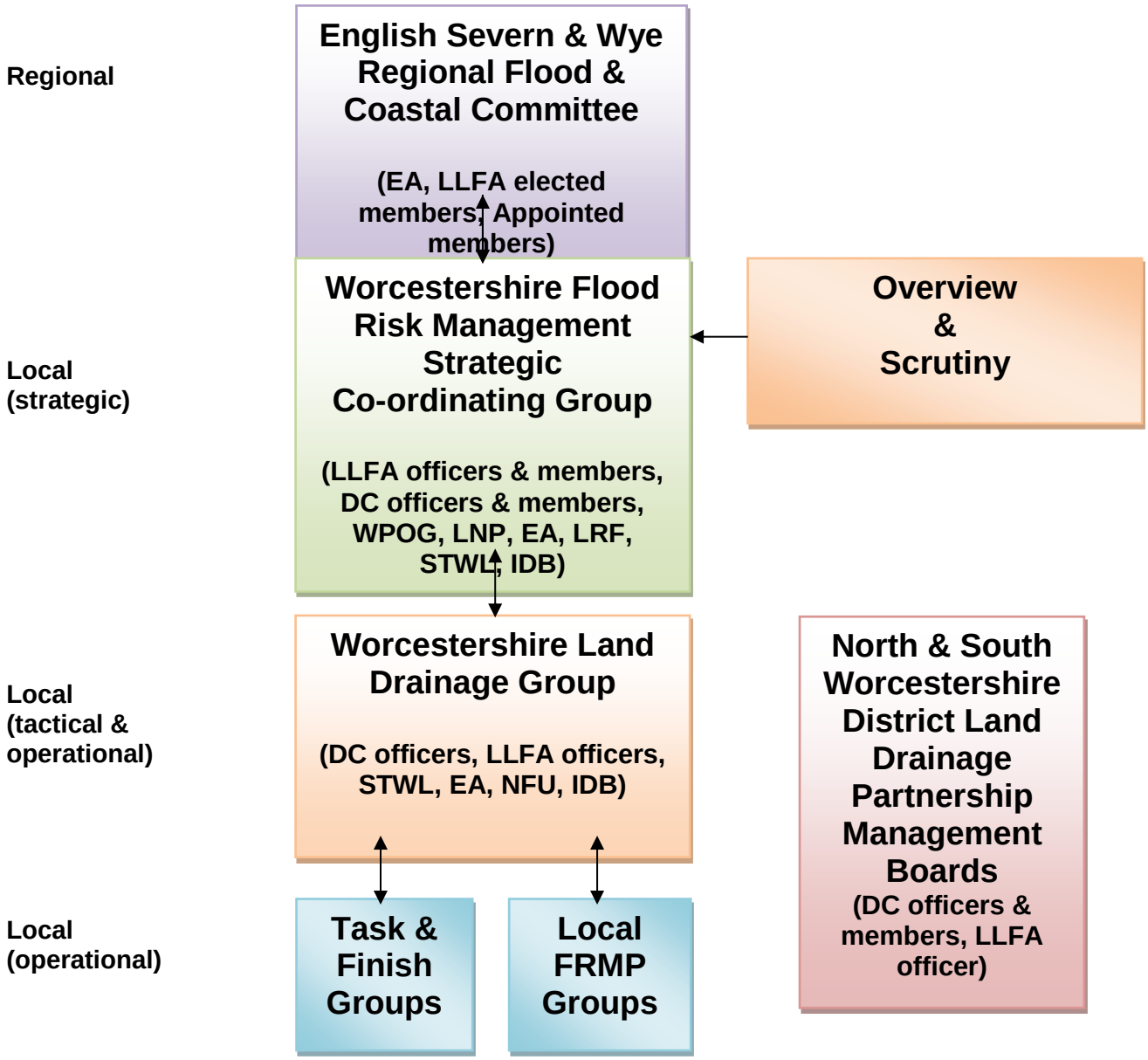
The Flood and Water Management Act 2010 (the Act) designated upper tier / unitary local authorities as Lead Local Flood Authorities (LLFA) and gave them a number of duties and powers including those listed below.

LLFA Role	Summary of requirements
Duty to publish a Local Flood Risk Management Strategy	Develop, maintain, apply and monitor a strategy for local flood risk management of the area.
Duty to investigate flooding	Co-ordinate the investigation of significant flood events.
Duty to produce a record and register of structures and features	Maintain a register and record of structures and features which have a significant impact on flood risk.
Power to designate flood risk structures and features	Designate structures and features that affect flooding in order to safeguard them.
Power to carry out works	Undertake works to manage flood risk from surface runoff and groundwater.
Duty & power to administer and enforce the Land Drainage Act with regard to Ordinary Watercourses	Discharge consent applications for significant changes to ordinary watercourses and take enforcement action under the provisions of the act as required.
Duty to respond to requests for scrutiny of planning application surface water issues	Respond to requests from LPAs to scrutinise and report on surface water issues within planning applications

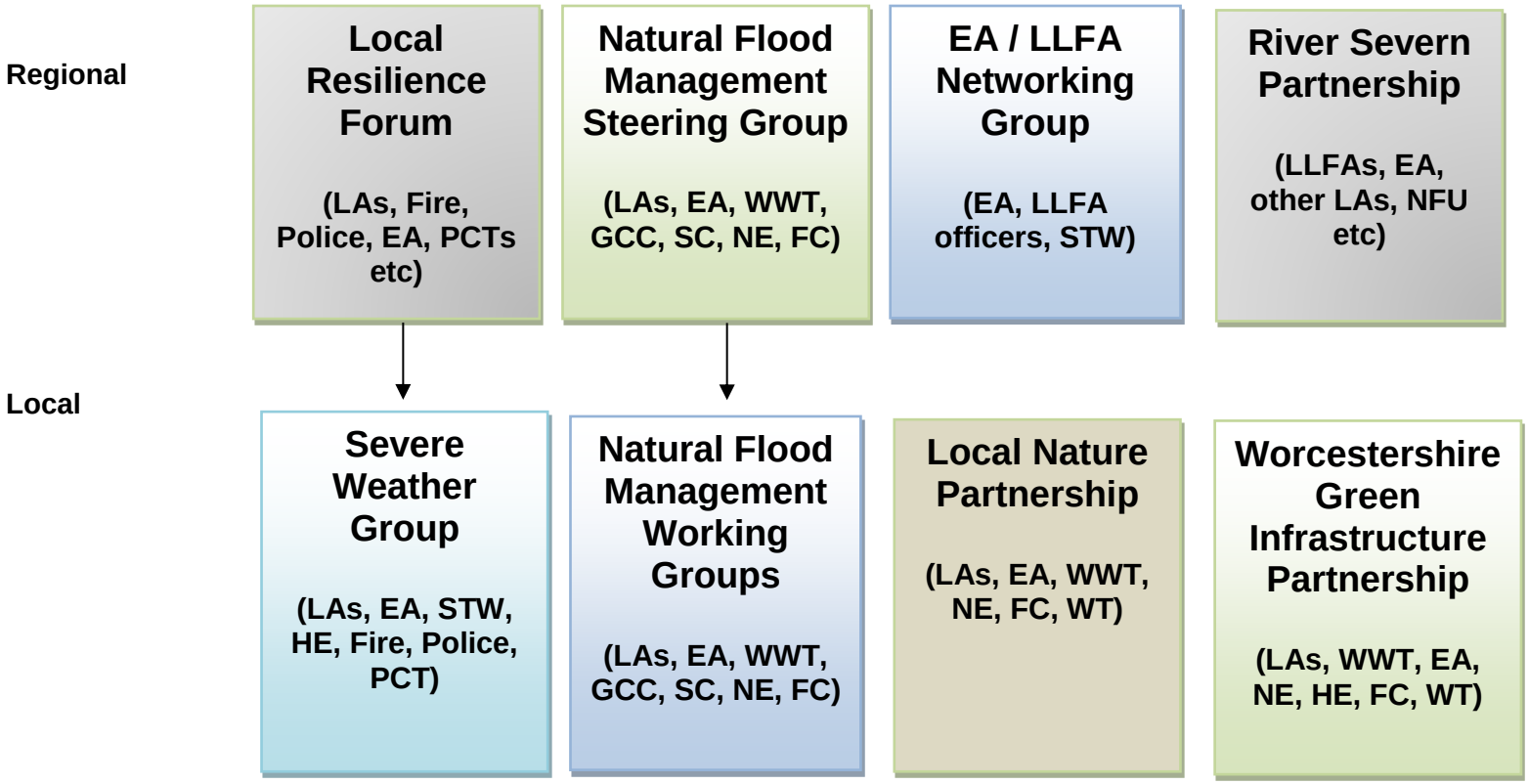
Under the Flood Risk Regulations (2009) LLFAs have some additional duties listed below.

LLFA Role	Summary of requirements
Duty to produce a PFRA	Produce a Preliminary Flood Risk Assessment by 2011 in partnership with the EA
Duty to review the PFRA every six years	Carry out a review in partnership with the EA
Duty to produce a map and Flood Risk Management Plan for 'Flood Risk Areas'	Production of Maps and Flood Risk Management Plans led by the EA supported by LLFAs

APPENDIX 3. MAIN FLOOD RISK MANAGEMENT GOVERNANCE GROUPS



APPENDIX 4. OTHER FLOOD RISK MANAGEMENT RELATED GROUPS



APPENDIX 5. WCC SUMMARY OF MAJOR FLOOD EVENTS

APPENDIX 6. EA STORYBOARD OF FEBRUARY 2020 FLOOD EVENT

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Wyre Forest District Council Scrutiny Committee Report - Flooding February 2020

Date: June 2020

Report version: FINAL 1.2

We are the Environment Agency. We protect and improve the environment.

We help people and wildlife adapt to climate change and reduce its impacts, including flooding, drought, sea level rise and coastal erosion.

We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

We can't do this alone. We work as part of the Defra group (Department for Environment, Food & Rural Affairs), with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

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Email: enquiries@environment-agency.gov.uk

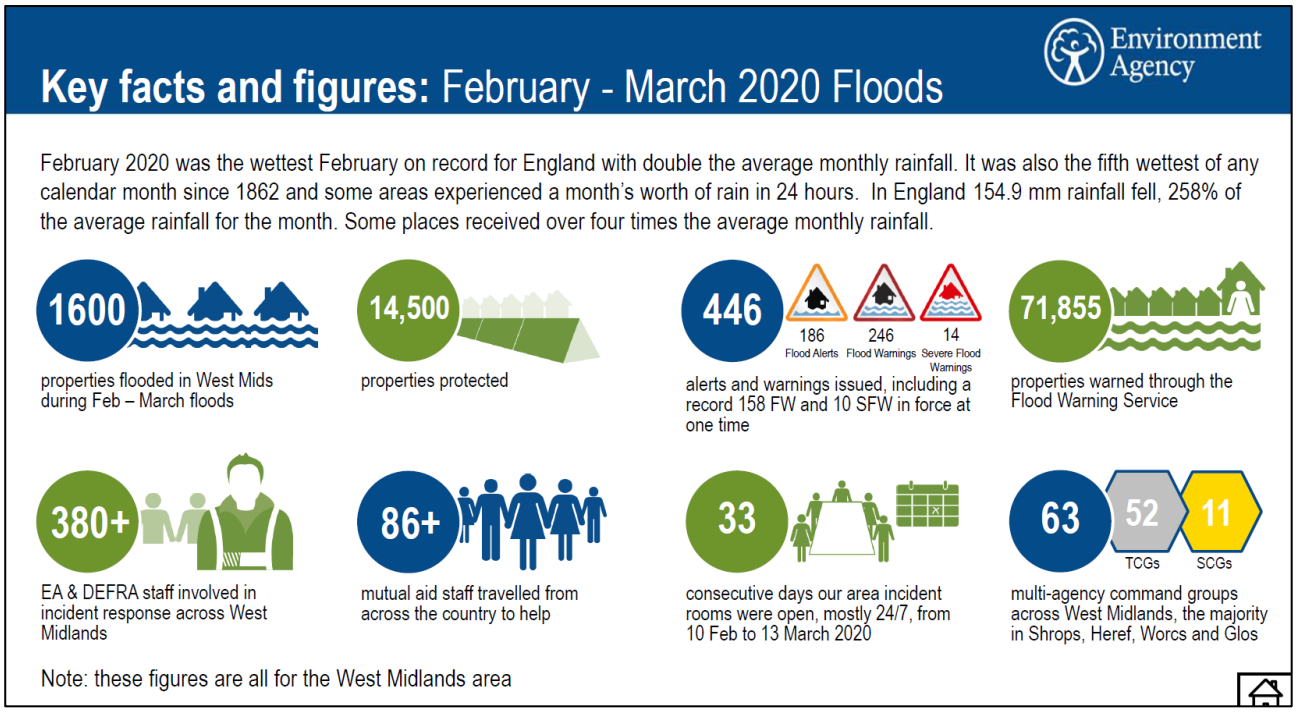
Contents

1. Introduction

Over the winter of 2019/20 the River Severn catchment saw some of the highest river levels ever recorded. Significant flood events were experienced October, November, February and March. Major Incidents were called in Shropshire, Worcestershire and Herefordshire, with the Local Resilience Forums (LRFs) responding to widespread issues.

Over 70,000 properties across the West Midlands were warned of potential flooding allowing residents to take action. Unfortunately, initial indications are that approximately 1,600 properties were flooded. However Environment Agency flood risk management assets prevented over 14,500 properties from flooding across the West Midlands.

It is expected that climate change will have a significant effect on the River Severn. Over the next 30 years it is predicted that flood peaks upstream of Worcester will be 0.6-0.8m higher than those experienced today. Such changes would result in normal winter flooding levels currently experienced in most years being close to those seen in February. More extreme events (like February) would exceed highest recorded levels.



Statistics from the February and March 2020 floods for the West Midlands

This report has been produced in response to the request made in the Flood Briefing Paper (Agenda Item 6) in the Agenda for the Wyre Forest District Council Overview & Scrutiny Committee meeting held on 11th June 2020. This set out the following issues to be explored with the Environment Agency:

- Arrangements for predicting river levels;

- Why the barriers were not deployed along the whole length of Severnside on 12 February;

- The number of properties that had property level protection installed at Beales Corner and why it did not operate successfully;

- What Government or Environment Agency funding is available to provide better protection for communities in Wyre Forest in future;

- Whether permanent flood defences at Beales Corner are technically feasible; how much they might cost and how long would they take to construct if Government or Environment Agency funding were to be available; what implications they might have for the listed bridge and movement of traffic when deployed.

Following this introductory chapter, each chapter provides information relating to each of the subject areas.

Roles and responsibilities

The Environment Agency is an executive non-departmental public body, sponsored by, but independent from, the United Kingdom Government's Department for Environment, Food and Rural Affairs ("Defra"). The Environment Agency was established in 1996 to protect and improve the environment. As part of its functions in relation to water, the Environment Agency manages the risk of flooding from rivers designated as "main rivers", reservoirs, estuaries, and the sea, and has a general supervisory role for all types of flooding and coastal erosion. There are a number of designated main rivers in the Wyre Forest District area, including the River Severn and the River Stour.

The Environment Agency has legal powers to undertake certain flood risk management works for the public good, but these are permissive powers rather than statutory duties. Works are carried out across the country, at public expense, to reduce flood risk because of the wider economic and social case for reducing the effects of flooding. There is no general right to be protected from flooding and no right to be protected to any particular standard where risk management action is taken. In common law, the owners of land are responsible for safeguarding their own land and property.

The Environment Agency also has a role in responding to flood incidents, primarily operating Environment Agency flood risk management assets, the issuing of flood warnings where possible, and supporting LRFs. The free flood warning service issues warnings by text email and phone to the public and professional partners across England to warn of flooding from river and the sea. There is no legal right to be warned about floods. Flood warning is a flood risk management tool which enables those acting upon the warning to reduce the potential impact of flooding, including any potential damage.

Flood risk information, including action that home owners can take along with the latest flood warning information and Environment Agency river level data, can all be freely viewed on the .GOV website:

Flood risk data:

https://www.gov.uk/check-flood-risk

Flood Warnings:

https://flood-warning-information.service.gov.uk/warnings

River level data:

https://flood-warning-information.service.gov.uk/river-and-sea-levels

Flood risk management in the Wyre Forest District

The main risk to properties from fluvial flooding in the Wyre Forest District is from the River Severn and the River Stour. Areas which are affected include the towns of Bewdley, Stourport and Kidderminster. Properties and roads can also be affected by flooding from the Blakedown and Hoo Brooks.

To reduce the risk of flooding to properties in Kidderminster, the Environment Agency constructed a flood alleviation scheme just upstream of the town centre in 2004, with a significant developer contribution. This storage area is a large raised reservoir, as defined by the Reservoirs Act 1975, and consists of several embankments, a control structure, a trash screen and multiple outfalls. The storage area operates to attenuate flood flows from the River Stour which would otherwise pass through the town. This scheme also offers a reduced benefit to properties in Stourport.

Kidderminster Flood Alleviation Scheme storing water - winter 2019/20

At Bewdley, a combination of demountable barriers and temporary barriers are used to reduce flood risk from the River Severn. There is also a storage area on the Riddings Brook (Wribbenhall), further reducing flood risk within the town.

The Environment Agency routinely inspects the River Stour and the brook channels, and removes debris and obstructions where they are considered to present a flood risk. We manage vegetation on Riddings Brook and also sensitively clear vegetation on the Blakedown and Hoo brooks. The amount of maintenance work the Environment Agency is able to carry out depends on the amount of public funding allocated to the Environment Agency. Maintenance is prioritised based on the benefit-to-cost ratio of the works, the urgency of works and the Environment Agency's legal liabilities.

The Wyre Forest District is covered by 4 Flood Alerts and 13 Flood Warnings.

Clearance works on the River Stour at Stourport

River Stour debris and rubbish clearance working with Canal and Rivers Trust

River Stour debris and rubbish clearance working with Canal and Rivers Trust

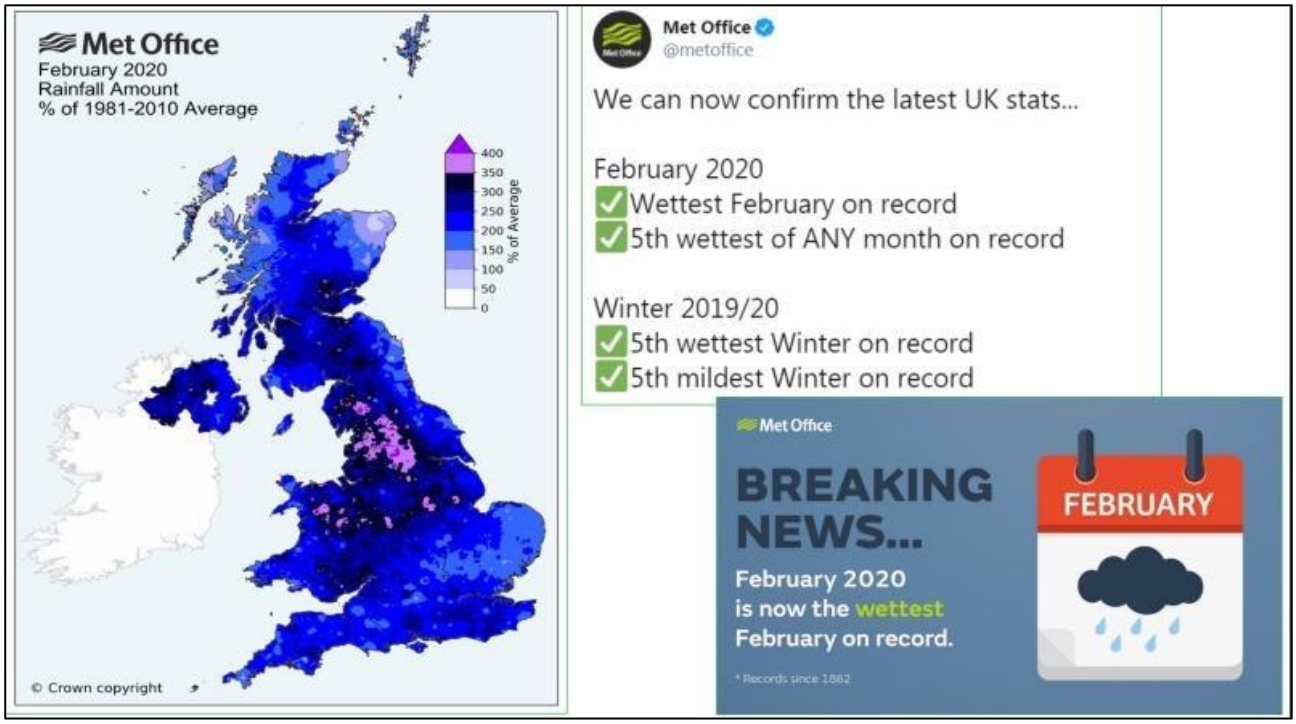
The flood story of February 2020

February 2020 was the wettest February on record for England with double the average monthly rainfall. Storms Ciara (8th-9th February), Dennis (15th-16th February), 'no name' (22nd-23rd Feb) and Jorge (28th Feb – 1st March) crossed the country in quick succession. It was also the fifth wettest of any calendar month since 1862 and some areas experienced a month's worth of rain in 24 hours. In England 154.9 mm rainfall fell, 258% of the average rainfall for the month.

In just a 9 day period between 8th-16th February, 150% of the monthly average rainfall fell across the West Midlands; over 200% of the monthly average rainfall fell in parts of Herefordshire and Worcestershire. With ground already sodden from last autumn's heavy rains and floods, the West Midlands quickly became flooded. The main rivers Severn, Wye and Trent, along with others including the Teme and Lugg, reached some of the highest levels ever seen or reached levels not seen since 2000 and 2014. Around 20% of the river gauges in the Environment Agency West Midlands Area recorded their highest ever levels. In many places river levels remained high and for a prolonged period.

Our incident response in the Wyre Forest District included:

- Deployment of Severn Side demountable barrier and Beales Corner temporary barrier, including logistics, maintenance and security;
- Inspection, monitoring and clearing of obstructions from control structure and screens prior to and during operation of Kidderminster and Wribbenhall flood storage areas, as well as reactive removal of debris and obstruction from structures and trash screens and Riddings Brook channel.



Our Community Information Officers (CIOs) visited Bewdley on a number of occasions during the flooding on 16th February, 19th February, 25th February, 26th February, 28th February, 3rd March and 9th March. The CIOs aim to provide support to communities during incidents and gather information to improve situational awareness for us and our partners.

Storm Ciara – 8th-9th February 2020

Storm Ciara on February 8th and 9th brought very strong winds across the West Midlands. Persistent heavy rain fell over areas of the Environment Agency West Midlands Area, including over the higher ground in Wales which led to high levels down the River Severn. We issued widespread flood alerts, as well as flood warnings in some areas.

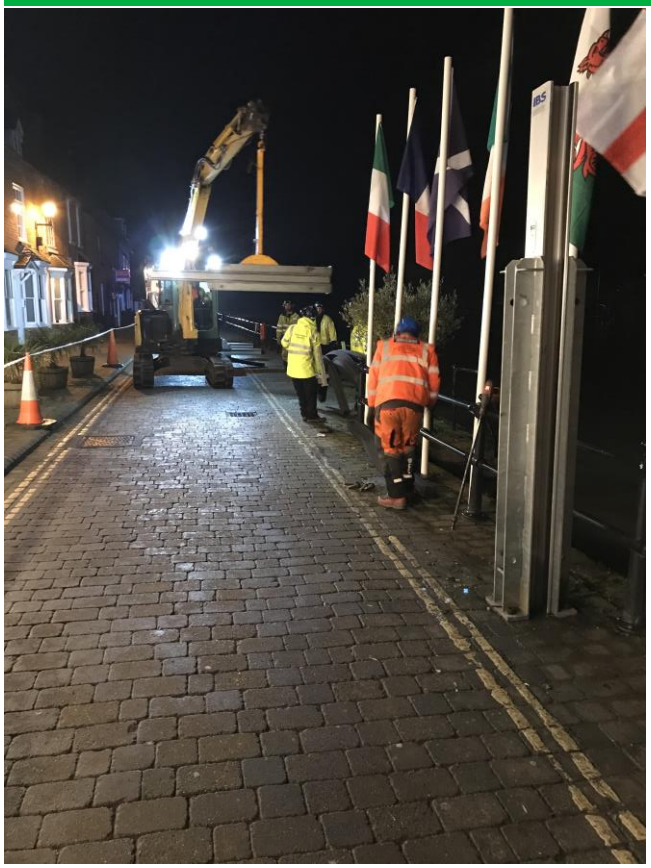
Storm Dennis – 15th-16th February 2020

Rivers did not have time to recover from Storm Ciara before Storm Dennis arrived on the 15th and 16th of February. Storm Dennis brought very heavy rainfall across the West Midlands, including in the lower ground, leading to very high levels in the Rivers Severn and Wye as well as in the tributaries. The river level at the Puxton gauge on the River Stour was the second highest in the gauge record (since 2004).

Between 5pm on 15th February and 9pm on 16th February we issued 144 flood warnings across the Environment Agency West Midlands Area, including 4 severe flood warnings; 76 of these were between 5pm on 15th February and 7.30am on 16th February. These 144 flood warnings covered 48 different rivers and brooks in the Environment Agency West Midlands Area, including the River Severn and River Stour in the Wyre Forest District. We issued a further 17 flood warnings and 8 severe flood warnings across the Environment Agency West Midlands Area between 17th February and 18th February.

In Bewdley:

- Phase 1 of the Severn Side defences was deployed late night on the 12th February through into the 13th February, as the river level forecast indicated barriers would be required early hours on 13th February.
- Phase 2 of the Severn Side defences was deployed and in place at 10.20 am on 16th February.
- We then, on 16th February, placed barrier around property on Beales Corner and Mill Side Court. We were unable to erect the full length of the temporary barriers at Beales Corner at this time due to water levels and poor light on Stourport Road, obstructing any underwater hazards.
- We also deployed Phase 3 of the Severn Side barriers on 16th February, finishing the deployment, by adding the last slats along Severn Side North, on the night of the 17th.
- Water levels receded overnight on the 16th February. As it was then safer to do so, we deployed the temporary barriers at Beales Corner in its standard deployment (i.e. along the length of Stourport Road).
- We placed a sandbag wall as a best endeavours effort at the top of Pewterers Alley to push the level of protection above that which the temporary barriers would otherwise have provided. The river level peaked at 5.24m ASD on 19th February.
- The barriers along Severn Side and Beales Corner remained in place for the successive river level peaks that followed. Between peaks, we removed the short section of temporary barrier that runs alongside Kidderminster Road to allow for Bewdley Bridge to be reopened. These short sections of temporary barrier were replaced in time for each peak thereafter.



Environment Agency staff supported by Jackson Civil Engineering deployed the Severn Side demountable barrier

Rainfall - 22nd February - 24th February 2020

Rainfall over 3 consecutive days 22nd - 24th February caused rivers and brooks to respond across the Environment Agency West Midlands Area. This included the River Severn, following rainfall in the Severn Uplands and Welsh mountains. In the upper reaches of the River Severn an additional 100mm of rainfall fell on top of the roughly 100mm which had fallen there in Storm Dennis. This additional rainfall led to a further river level rise on the River Severn leading to the highest levels since 2000.

Between 22nd February and 26th February we issued a further 21 flood alerts, 40 flood warnings and 2 severe flood warnings covering 28 different rivers and brooks in the Environment Agency West Midlands Area. The flood warnings included the River Severn in the Wyre Forest District.

The Severn Side demountable barriers and the temporary barriers at Beales Corner were still in place following the earlier period of flooding. As we did for the flood which peaked on 18th February, we placed a sandbag wall at the top of Pewterers Alley to push the level of protection above that which the temporary barriers would otherwise have provided. Floodwater overtopped the Beales Corner barrier and sandbag wall on 25th February. In preparation for overtopping, we placed a number of mobile pumps behind the temporary barrier, to help with giving as much time as we possibly could for residents to move possessions upstairs and evacuate. These were rendered useless after the water reached a certain point, as the equilibrium of water pressure behind and in front of the barrier caused the membrane to lift, further adding to the overtopping.

- The river peaked at 5.48m ASD at the Bewdley gauge on 26th February and levels started to drop on the 27th February. This was the highest river level since the temporary barrier trial was put in place, though was below the highest recorded in 1947.
- Approximately 40 properties flooded, but we managed to prevent flooding to 28 properties by holding back the flood water for longer.
- We inspected the barriers and carried out minor repairs on 28th February in time for Storm Jorge. As soon as it was safe to do so after the barriers overtopped, we entered the flooded area, and reconstructed the temporary barrier on Beales Corner, then pumped out the water from behind the barrier. This gave residents the ability to enter their property 24-48 hours earlier than if we had waited for water levels to recede. The barrier stayed mostly intact during the exceedance, but there were a few elements which had lifted due to water being both side of the barrier and a couple of clips that had failed. The membrane that covers the barrier was torn in places, and we made good by folding it over and weighing it down.

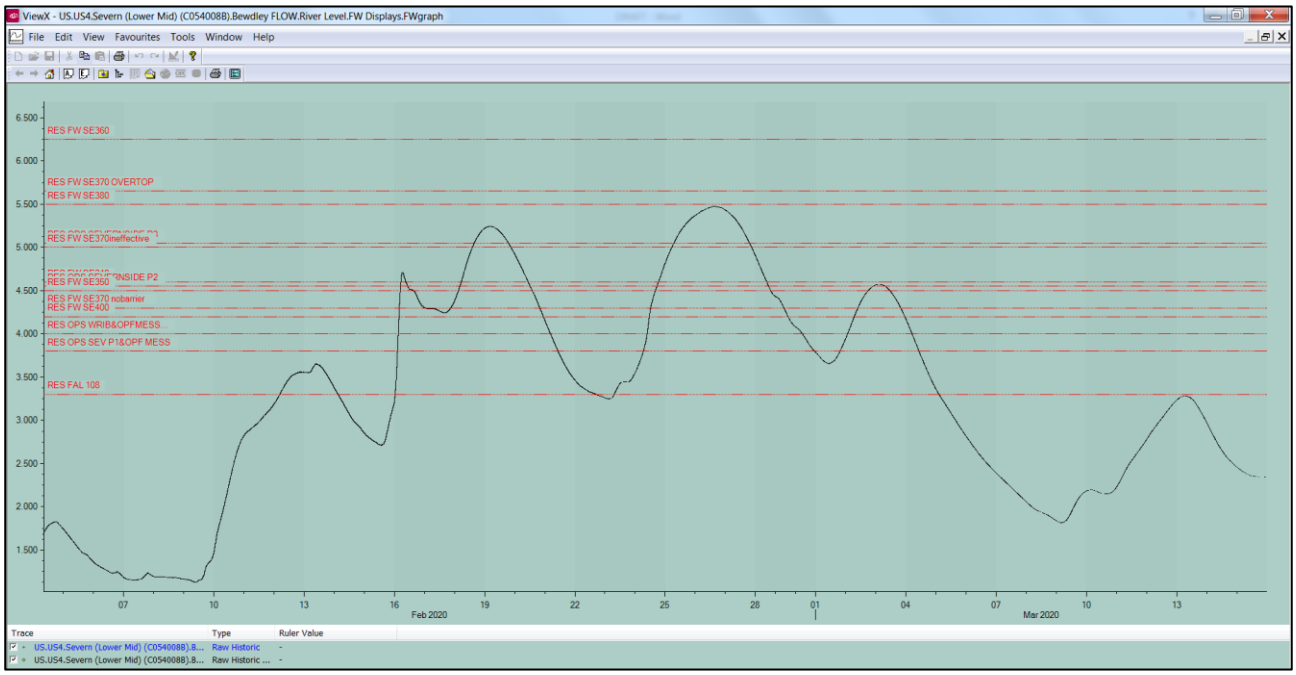
Barrier deployment at Beales Corner, Bewdley

Storm Jorge (28th February - 1st March)

Rain falling in Storm Jorge kept river levels high and elevated for a prolonged period along the River Severn. We issued flood alerts and flood warnings in areas across the Environment Agency West Midlands Area, including two flood warnings in the Wyre Forest District area on 1st and 2nd March. The River Severn level peaked at 4.57m ASD at the Bewdley gauge on 3rd March 2020.

The temporary barrier at Beales Corner had slid in a few locations in the recent flooding. This is normal, as the barrier will “lock” against itself and provide it with additional support. On Sunday 1st March, in-between peaks and following the exceedance of the barrier, we completely deconstructed the barrier and moved it so it was no longer on top of the damaged road surface. This gave assurance over the barriers' stability ready for the next flood event - Storm Jorge, on the 2nd and 3rd March.

Following the successive flood events, the Beales Corner temporary defences were taken down on 13th March and the Severn Side demountable barriers were all removed by the 15th March.



River Severn levels at Bewdley February and March 2020

2. Flood forecasting

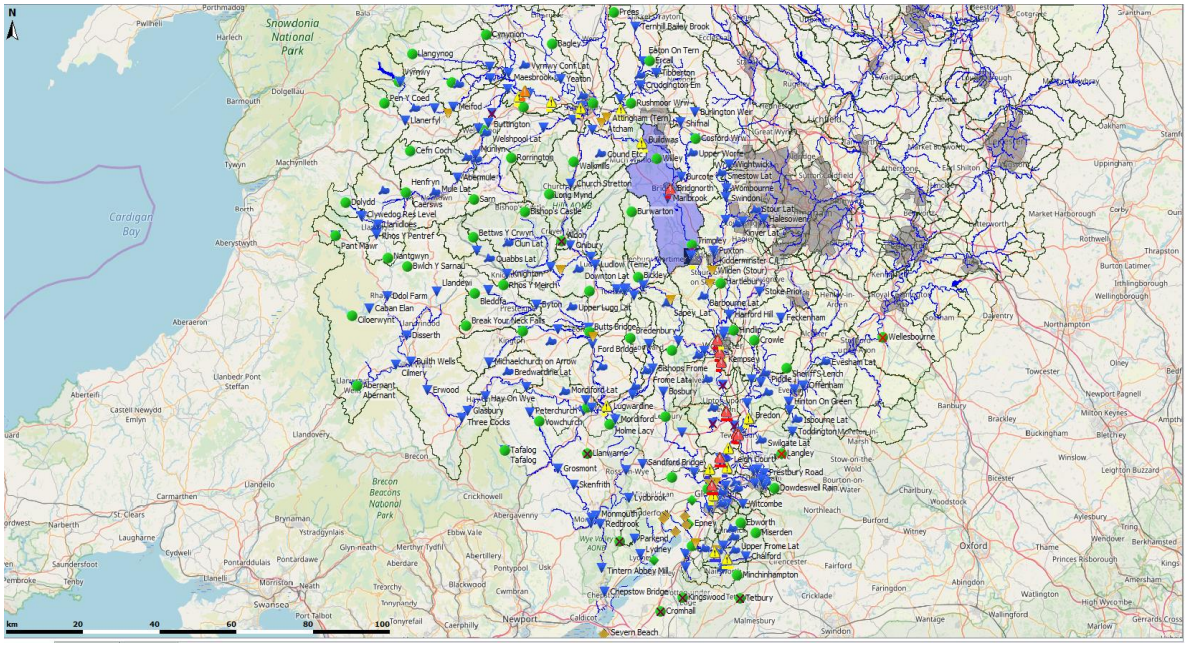
The Met Office and the Environment Agency

The Environment Agency works closely with the Flood Forecasting Centre (FFC) at the Met Office, whereby we receive regular updates or products in emails from them twice a day, and which can be increased depending on the confidence of the forecast. We hold a joint telephone conference with the FFC every morning to discuss the weather conditions, and we have access to radar data so we can visualise the forecast rainfall. We can also call them to check if we have any questions on the weather conditions.

Environment Agency Monitoring and Forecasting Duty Officers

There is a designated duty officer on duty per Environment Agency Area; this duty officer is called a Monitoring and Forecasting Duty Officer (MFDO). The MFDO monitors weather conditions and local flood forecast models, and alerts the local area Flood Warning Duty Officers if there are any concerns or forecast impacts. There is also a 'Lead MFDO' for each region of the Environment Agency. Their role is to have regional oversight, liaise with national teams, and co-ordinate the activities of the Area MFDOs.

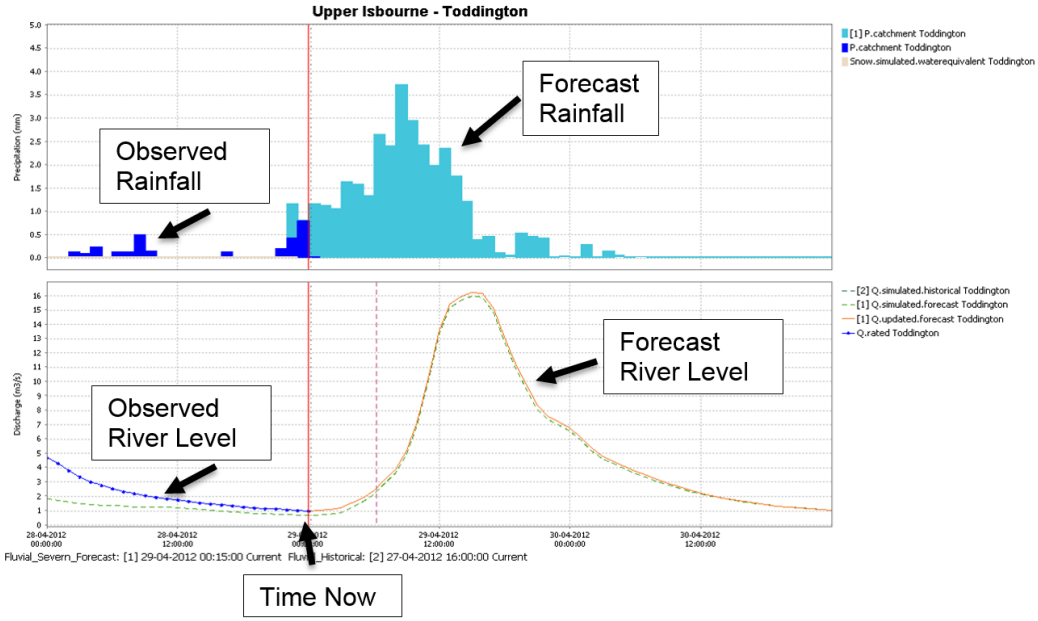
The Bewdley area is monitored by the SHWG (Shropshire, Herefordshire, Worcestershire and Gloucestershire) Area MFDO. They are also monitoring ~150 sites throughout these 4 counties. In addition this MFDO needs to maintain an awareness of activity in Powys Natural Resources Wales (NRW) areas, as the rainfall and water in these areas flows into Midlands England areas.



Shropshire, Herefordshire, Worcestershire, Gloucestershire MFDO Monitoring Sites

The Local Flood Forecasting Models

There are hundreds of local flood forecasting models in each Environment Agency region. The MFDOs monitor these by using alarms and active monitoring of computer systems during flood events. In Midlands we use a mixture of catchment models and reach models.



Example of a catchment flood forecasting model

Bewdley Models

At Bewdley we use reach models, with catchment models feeding in at the sides. All our reach models link together so all the rain that falls at the top of the river flows down. Catchment models collect the rainfall, and work out how much water to feed into the sides of the rivers. The reach models predict how much water there will be in the river at any one point, by adding up all water upstream and all the water going in the sides from the catchments.

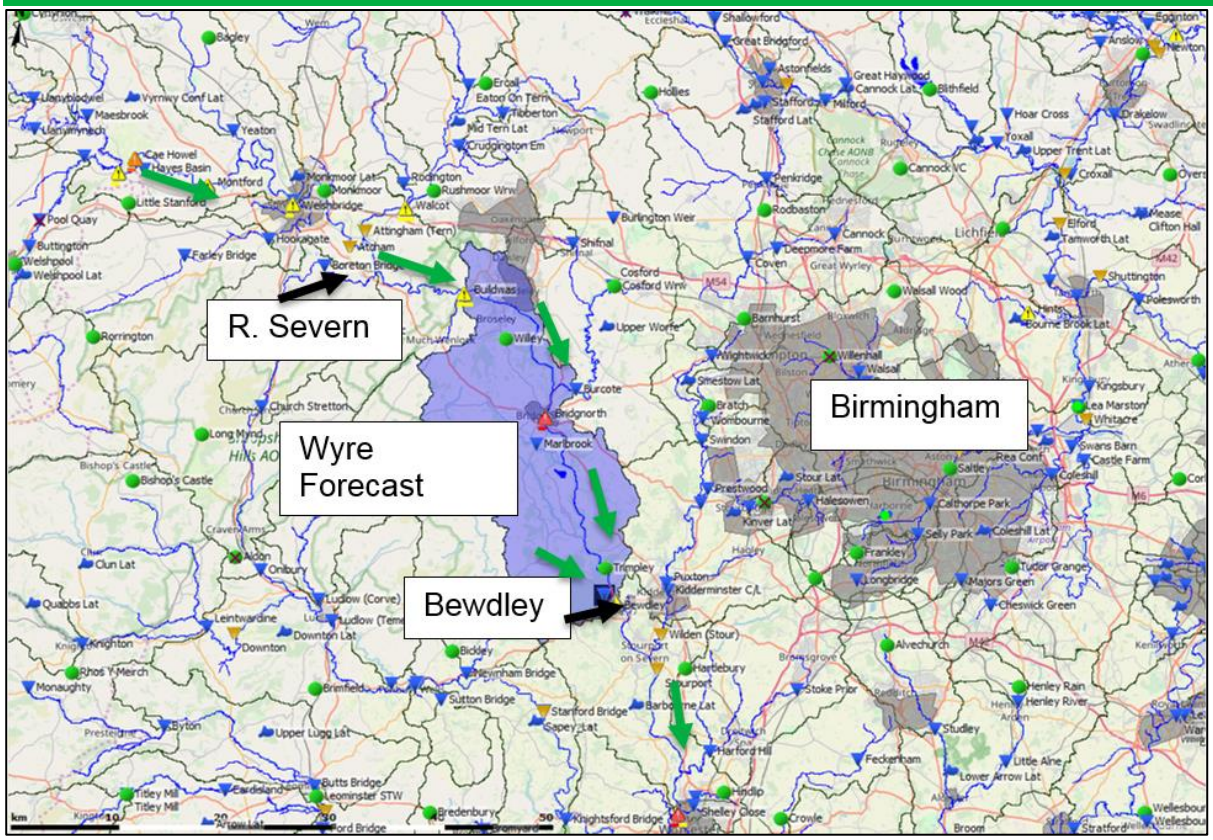
At Bewdley river levels are susceptible to runoff from the Wyre Forest catchment at the side. This catchment is very large (352 Km2), stretching all the way from Ironbridge down to Bewdley.

There is a separate catchment model to estimate rainfall and runoff from Wyre Forest catchment into Bewdley. Without the influence of significant rainfall in side catchments, the Bewdley reach model is normally very reliable.

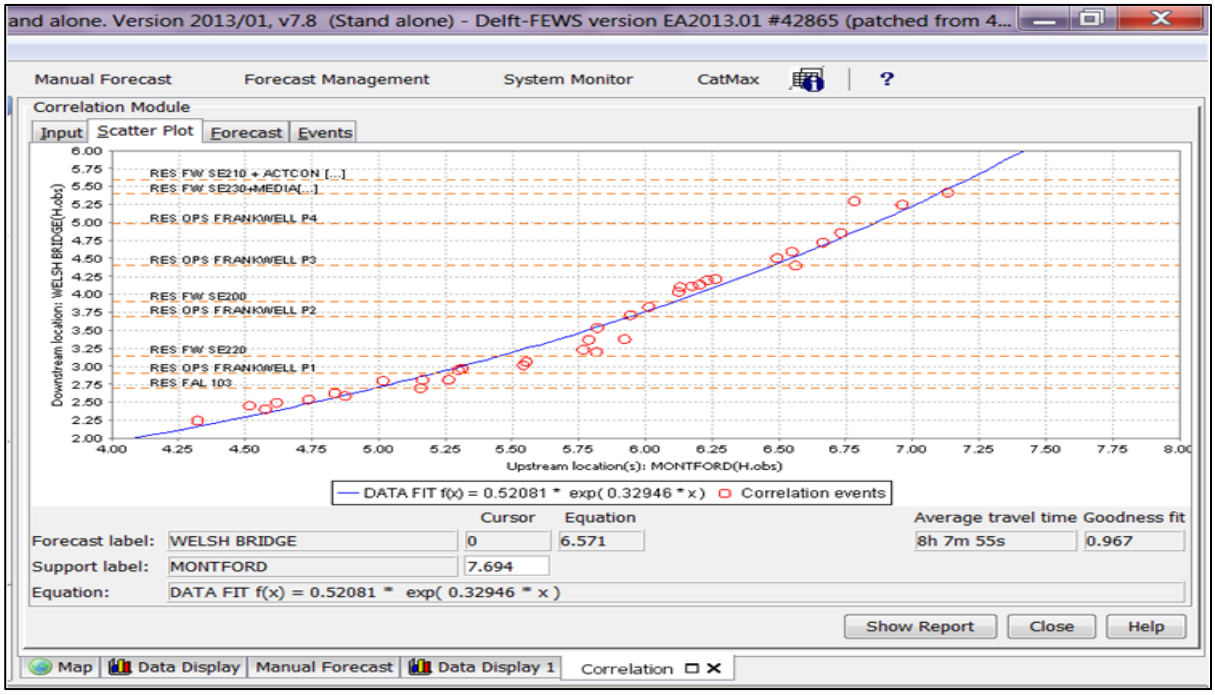
Environment Agency duty officers are taught not to just rely on the computer models, as sometimes they can be unreliable. Duty officers will also use correlations to check models are correct and local catchment information files to give them more information about sites and local geography. They take account of local catchment conditions during their activities.

Correlations on the River Severn are very good, and there was no known problems with the Bewdley reach model on the day of 15th/16th February 2020.

Reasonable worst case scenarios are carried out before rainfall events occur. During an event our MFDOs routinely give a 'range' of forecast water levels for barrier sites, this will cover a range of forecast impacts.



Location of Bewdley and nearby catchments



Example of river correlations on the River Severn

3. Bewdley Severn Side barrier deployment February 2020

Background to flood risk management in Bewdley

Bewdley has a long history of flooding including in 1947, 1965, 1998, 2000, 2002, 2004, 2008, 2014 and more recently in 2019 and 2020. The highest known river level of 5.82m ASD was recorded at the Bewdley gauge in 1947.

Flooding to property can occur directly and indirectly from the River Severn. Indirect flooding can occur due to rising groundwater with cellars filling with water, and from surface water and sewers when the rise in river level means the sewers cannot discharge to the River Severn. High river levels also lead to the flooding of Kidderminster Road, being the main through road, and Stourport Road at Beales Corner. These roads become impassable and cut off one side of the river from the other. Bewdley is also affected by flooding from the Riddings Brook.

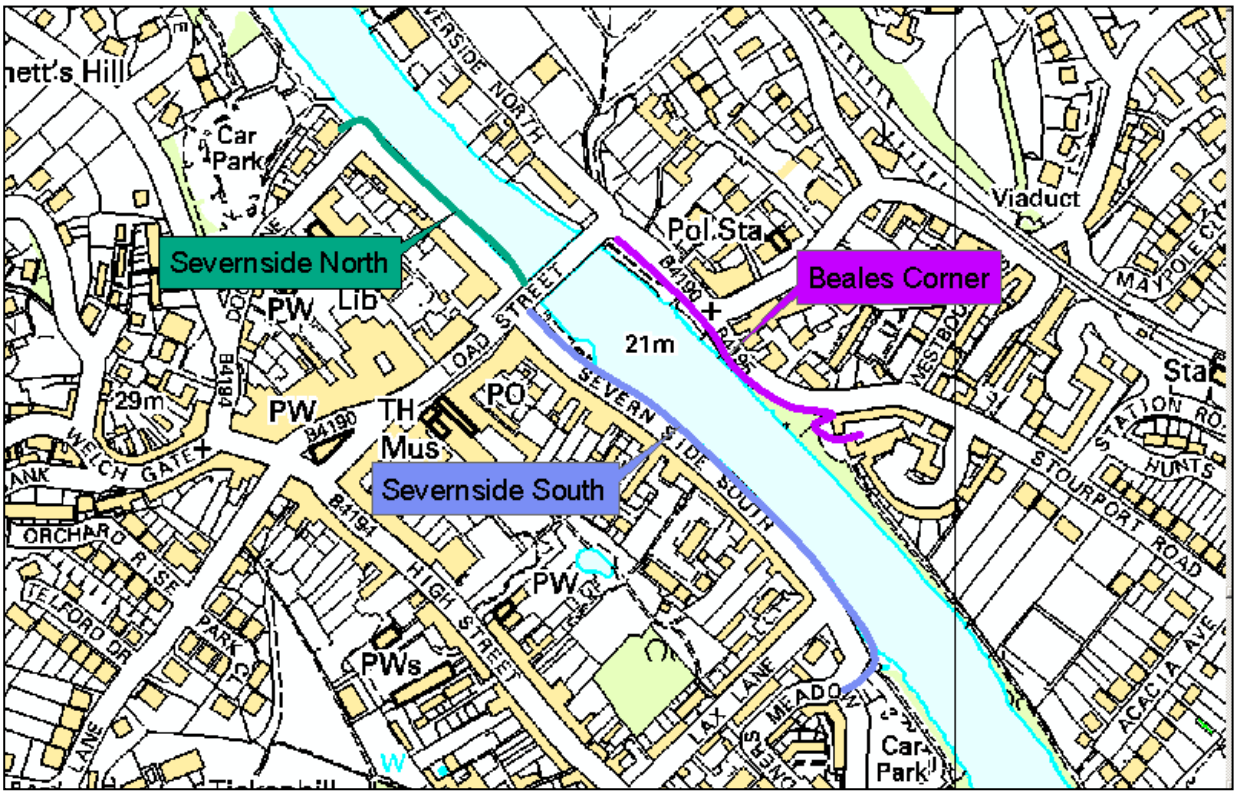
In spring 2003, the Environment Agency was allocated funding from Defra to purchase plant and equipment that would facilitate the trials of temporary flood defences. Several types of temporary flood defence barriers were purchased and joint action plans were established with local authorities and other professional partners such as Severn Trent Water. Three locations along the River Severn were initially identified as suitable for the trials including Beales corner in Bewdley.

The trial at Beales Corner consists of temporary pallet barriers which are 1.2m high. This provides a level of protection up to 5m ASD at the Bewdley gauge for approximately 20 properties. Above the 5m ASD level water flows over Pewterers Alley and down Kidderminster Road, and water makes its way through the ground under Pewterers Alley and through Courtyards on this side of the river. Properties are thus at risk of flooding before the barriers are overtopped. We have engaged in the past with Bewdley Town Council to make them aware of these issues.

Elsewhere in the town, the Environment Agency constructed a scheme to reduce the risk of River Severn flooding along the right bank of the river (along Severn Side North in 2004 and along Severn Side South in 2006). This scheme provides a greater than 1 in 100 year standard of protection (1% annual probability) and consists of 200m of brick wall, around 600m of demountable barriers, and two pumping stations to facilitate seepage and surface water backing up when it cannot freely outfall into the River Severn. The demountable defences are erected in the event of a flood. During the rest of the year when the river is not a threat, there is an uninterrupted view of the river. The Severn Side scheme protects approximately 270 properties to a level of 6.25m ASD at the Bewdley gauge. It had a capital cost £11m, which included a contribution of £0.5m from Advantage West Midlands.

The Severn Side demountable barriers have been deployed 23 times since 2004, and the Beales Corner temporary barriers have been deployed 15 times since 2007. There has been water against the barriers on 12 of the 14 times they have been erected since 2012.

When not in use, the Severn Side and temporary barriers are stored at an Environment Agency depot near Kidderminster. When required, our emergency workforce will bring them out of storage, transport them to site and erect them. The Severn Side and Beales Corner defences are not dependent upon each other.



Location of Bewdley demountable and temporary defences

In 2011, the Environment Agency constructed a flood storage area at Wribbenhall which temporarily retains water in the field above the culvert (underground pipe) running beneath the Queensway Estate. This reduces the flood flows passing down the Riddings Brook. The construction of two debris screens reduces the risk of blockages occurring which would contribute to flooding. The scheme provides a level of protection to approximately 60 properties.

Incident planning approach

The Environment Agency's incident response includes deployment and operation of flood risk management assets across the Environment Agency West Midlands Area. This is planned so that these activities are carried out in a sequence, depending on available resources and when the forecast of river levels indicates they will be needed.

The Environment Agency acts on the most likely forecast river levels for the deployment of assets and the issuing of flood warnings, however at the same time prepares to respond to the reasonable worst case forecast. This allows the response to be proportionate while also being prepared if the reasonable worst case materialises.

Thresholds for barrier deployment have been optimised to ensure that disruption is kept to a minimum, and that the Environment Agency provides a measured response to predicted flood peaks. As it is elsewhere, it is standard practice to phase the deployment of the Bewdley flood barriers. It is common that only the earlier barrier phases are required to manage the impacts of most floods and the normal rate of rise is slow enough to allow later phases to be added as the forecast suggests necessary. This phased approach minimises the disruption to the town and also minimises the cost to the public purse. Minimising the amount of barrier deployed also minimises the risk of vandalism and theft of the barrier sections - currently the Environment Agency has to provide 24/7 security to safeguard the barriers.

Demountable barriers at Severn Side showing some of the disturbance to the local community

Deployment phases of the Severn Side flood barriers

In our planning approach, there are three phases of deployment of the Severn Side demountable barrier in Bewdley. These phases are:

- Phase 1 is deployed at a forecast of 3.85mASD and rising at the Bewdley gauge - involves deployment of flood barrier along the full length of Severn Side North, as well as some flood barrier to the south of the bridge, between the bridge and the band stand. The barriers are made up of 2.8m high columns, which we then put a slat in-between. The area between columns is named a bay. We will fill each bay with six slats, giving this side of the river a 4.55mASD level of protection (at the Bewdley gauge). Phase 1 takes approximately 8 hours to deploy.
- Phase 2 is deployed at a forecast of 4.55mASD and rising at the Bewdley gauge - involves the deployment of 1.8m high columns along the length of Severn Side South. We fill each bay with three slats, but then also add an additional two slats along the full length of barrier deployed in Phase 1. We will also deploy the columns only on Lax Lane flood wall. This gives a 5.0mASD level of protection (at the Bewdley gauge). Phase 2 takes approximately 6 hours to deploy.
- Phase 3 is deployed at a forecast of 5.00mASD and rising at the Bewdley gauge - involves a full height deployment, adding an additional nine slats along the full length of the barrier and bringing the standard of protection to 6.25mASD (at the Bewdley gauge). Backing braces will be installed on the 2.8m high columns to counteract the

high hydraulic forces exerted on the barrier. Phase 3 takes approximately 12 hours to deploy.

In between Phase 1 and Phase 2 deployments of the Severn Side flood barriers, the Beales Corner temporary barriers are deployed by 4.0mASD (at the Bewdley gauge); the barriers though do not get wet until 4.3mASD. The reason for the lower threshold is that flooding occurs on the Stourport road at 4.0mASD, resulting in us otherwise deploying flood barriers in the wet. As mentioned above, these barriers provide a standard of protection of 5.0mASD (at the Bewdley gauge) before the local topography and geology render them ineffective. Beales Corner takes approximately 4 to 6 hours to deploy.

Demountable barriers at Severn Side

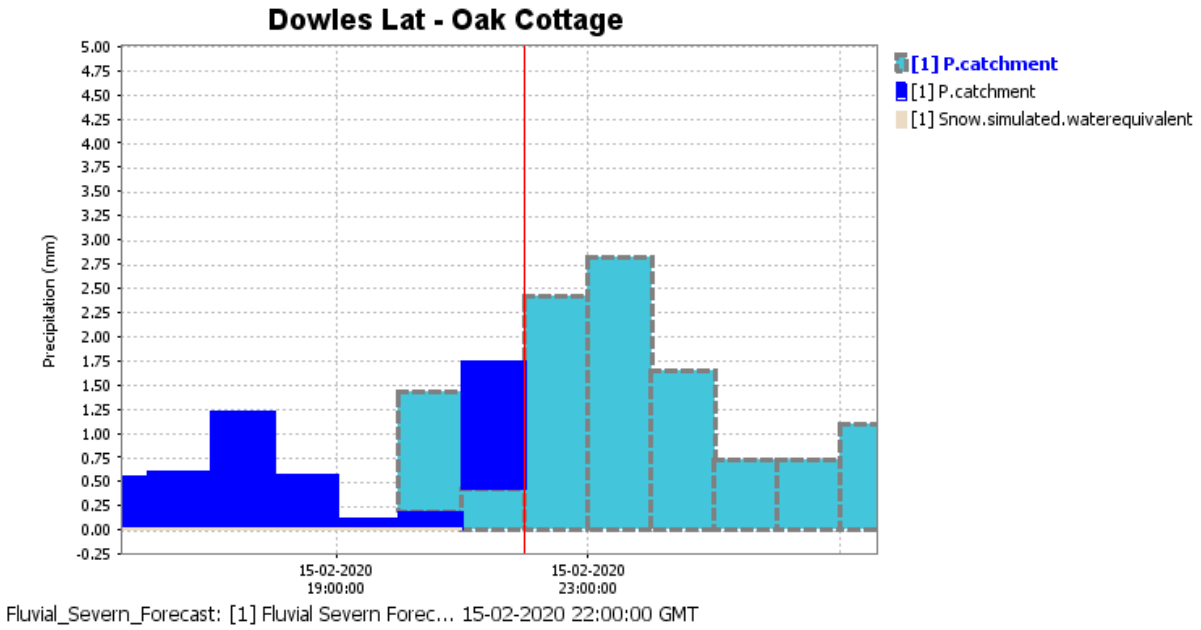
Barrier deployment 12th February 2020

On Saturday 15th February, demountable barriers had been deployed at Shrewsbury (Frankwell Phase 1) and Severn Side, Bewdley (Phase 1 - deployed late on 12th February through to 13th February), in addition to other flood risk management assets being deployed or operated at Hereford, Kempsey and Upton upon Severn. In consideration of when the river level peak was forecast to occur at locations down the River Severn, further deployment of barriers was planned for Sunday morning 16th February at Shrewsbury (Frankwell Phase 2 and Coleham Head) and for Monday 17th February at Shrewsbury (Frankwell Phase 3), Ironbridge and Beales Corner, Bewdley. The deployment of Phase 2 of the Severn Side barriers was to follow on from the Beales Corner deployment later on the Monday/Tuesday. At this planning stage the forecast river level peak for Bewdley was between 4.1-4.6mASD on Tuesday night 18th February at the earliest.

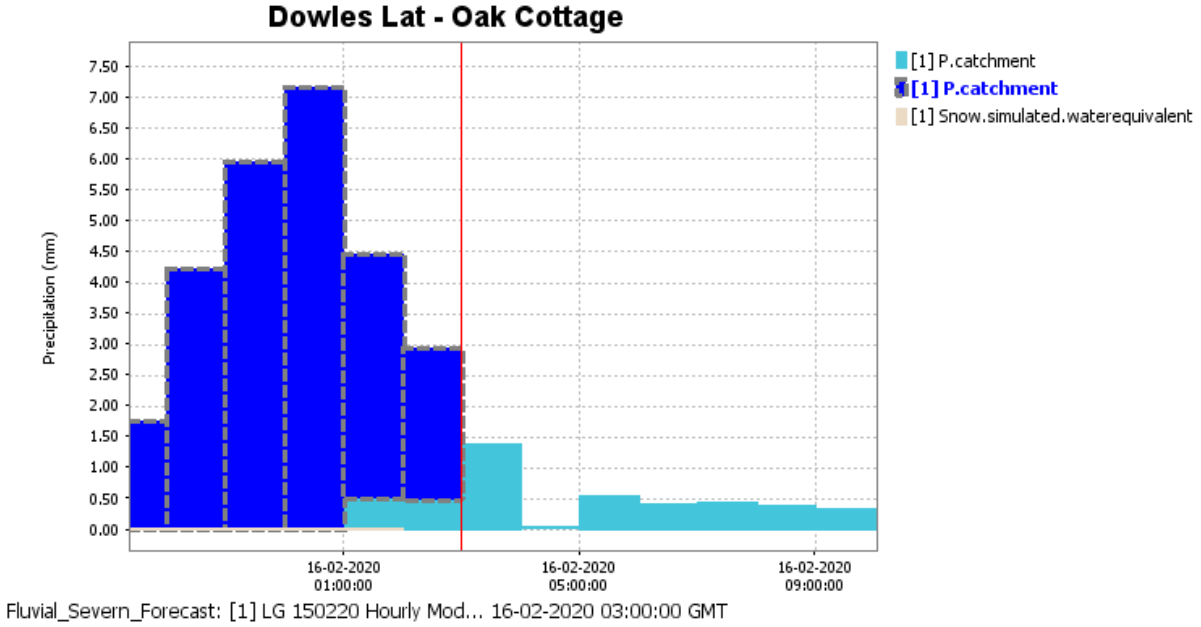
The peak was still forecast to be within this range at 9.43pm on Saturday 15th February. This was based on the reasonable worst case scenario of 11mm of local rainfall across the Wyre Forest Catchment over the Saturday night into Sunday morning.

The heaviest of the forecast rain was forecast at this point to fall further west and north. However it actually fell further south and east of the line convection during the storm, with the result that at 3.00am on Sunday 16th February, rainfall totals of 27mm had been recorded over the Wyre Forest Catchment. The Wyre Forest Catchment is a tributary of the River Severn and runs into the river at Bewdley. The sudden increase in run off from this catchment into an already saturated area and with already high levels in the River Severn caused abnormally fast rises on the main River Severn at Bewdley on the night of 15th/16th February. This resulted in two peaks in the River Severn level at Bewdley, rather than the one from water coming down the river which was expected at the earliest on the night of Tuesday 18th February; the first peak occurring at 6.30am on the 16th February (4.71mASD at the Bewdley gauge) as a result of this localised rainfall from the Wyre Forest Catchment. This effect was above and beyond that expected in any of the reasonable worst-case scenarios forecasted. (The second and expected peak on the River Severn occurred on Wednesday 19th February at 5.24mASD at the Bewdley gauge).

This heavy rainfall occurred between 1.00am and 3.00am on 16th February and was not visible in the forecasting system until the 3.00am model run on 16th February, by which time it was too late to put up all the barriers.



Wyre Forest catchment – 10 pm forecast - 11mm event totals forecast



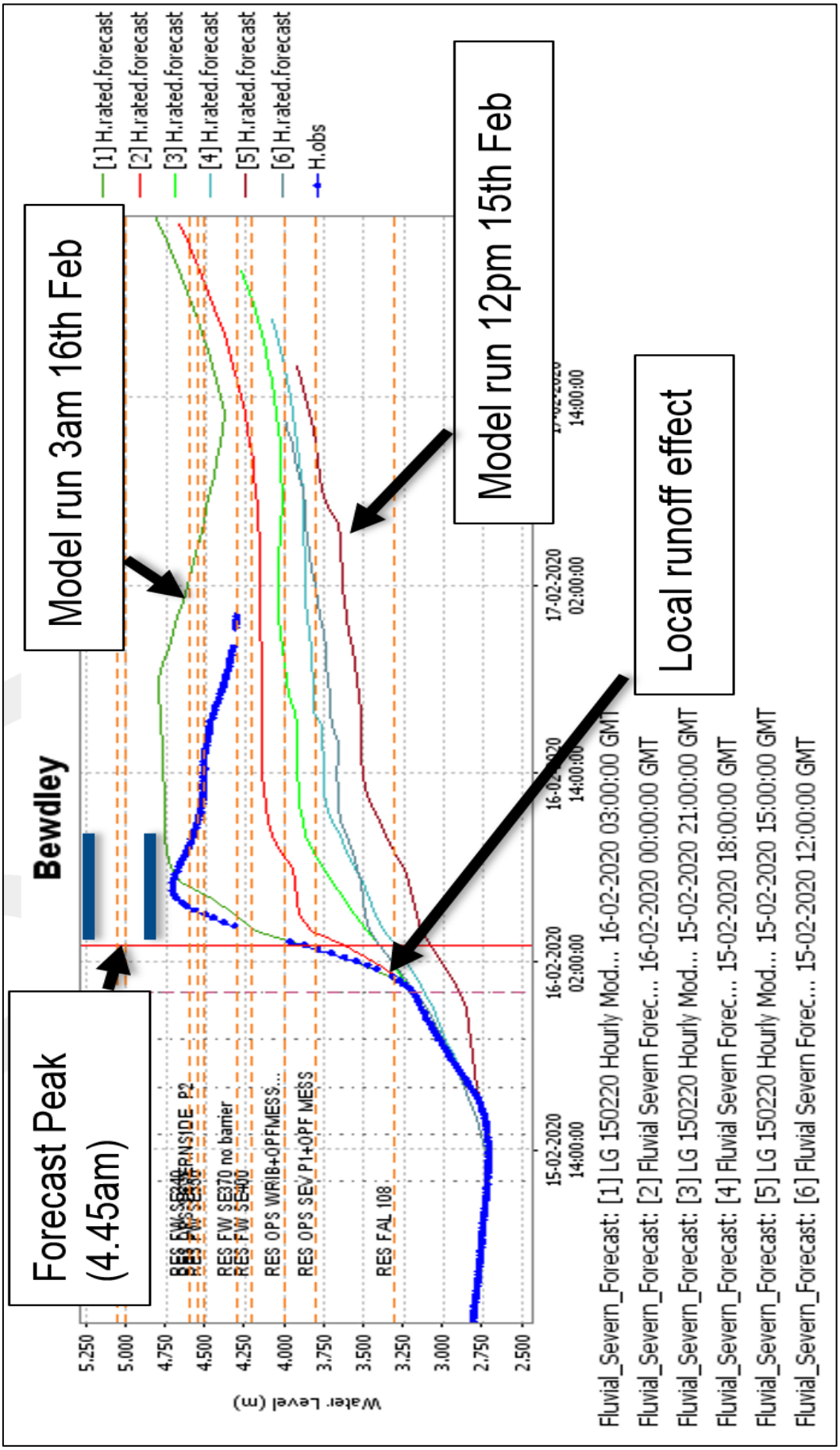
Wyre Forest catchment – 3.00 am (after event) forecast - 27mm catchment totals fell

These model outputs illustrate how in the hours running up to the event there was no significant rainfall totals forecast over the Wyre Forest catchments (please note that these are at different scales). It was not until the 3.00am run that large rainfall totals appeared to have fallen in the Wyre Forest catchments.

The graph below shows several forecasts for the Bewdley gauge on top of each other, from midday Saturday15th February until 3am Sunday 16th February. This shows how the forecast increased significantly in the period midnight Saturday to 3am Sunday. The 4.55m ASD level by which we aim to have erected Phase 2 of the Severn Side barrier was not forecast to be exceeded any earlier than the evening of Monday 17th February until the 3am model run.

Our Field Operations Teams were mobilised at 3.20am and started to arrive on site from 3.40am. Temporary barriers for Beales Corner had already been loaded in the Environment Agency's depot in Kidderminster in preparation for their being transported to site to be deployed on Monday 17th February. They arrived on site at 4.15am, with a team of 10 operatives ready to deploy. By this point the conditions were no longer safe to deploy these barriers, due to both the depth and velocity of the water.

The barriers for Phase 2 had not yet been loaded. In following our planned approach, we had intended to do this in time to be able to deploy on Monday 17th February, the river level not having been forecast to come anywhere near the deployment threshold for at least another 48-72 hours. Nevertheless we were able to get the barriers loaded onto third party transport and mobilised to site in less than 4 hours. The barriers arrived on site at approximately 7.15am, 30 minutes after water had started to over top the promenade that runs along Severn Side South. After conducting a through risk assessment, barrier deployment started as soon as they arrived on site, with the barriers in place by 10.20am. Pumps were placed behind the barriers, with water removed from households by 10.50am.



Forecast river levels at Bewdley on the 15th and 16th February 2020

Community Support

During the February 2020 flooding, our field operatives provided the community with additional support, over and above the operation of flood barriers. While not the role or responsibility of the Environment Agency, and not possible in most situations, once we had evacuated water from properties on Severn Side South we hired skips, dehumidifiers and wet/dry vac cleaners to help residents clean their houses as quickly as possible. We supported them by moving furniture and cleaning floors. We also supported with the deployment of property flood resilience measures, and where residents reported pumps had failed, we sourced and installed mobile pumps for them. We also sourced sandbags for residents, and helped with deploying them against their property.

4. Property flood resilience measures at Beales Corner

Property Flood Resilience measures

Property level protection is commonly referred to now as Property Flood Resilience (PFR).

PFR are measures installed or incorporated into a property to reduce the impact of flooding. PFR measures are not designed to stop all water from entering the property but are designed to minimise the entry of water, offer residents additional time to move furniture and other valuables and to minimise the impacts when water does enter the property, for example by minimising sewage and silt entering the property.

PFR measures can be broad ranging, but often include products such as flood doors, non-return valves, small pumps and flood resilient wall and floor surfaces. To achieve the maximum benefits from any PFR products it is important that the property owner maintains the products and installs the product in accordance with the manufacturer's recommendations.

Due to the structural limitations of a normal residential property, PFR products can only offer a maximum level of risk reduction of up to 600mm above the properties threshold level. It is common for water to be able to seep in through the floor even where PLR products have been installed; this can only be prevented by fully sealing the floor cavity which is not normally practical.

The Beales Corner PFR Project

The Beales Corner PFR project has offered PLR measures to 45 properties at Beales Corner and the surrounding area. One property opted out of the scheme and one we haven’t been able to access yet, therefore 43 of these properties have PFR (Property Flood Resilience) measures installed. The Environment Agency has covered the up-front installation costs of the PFR measures, with residents responsible for the future upkeep and maintenance of the products.

Each property has had property specific products selected by a specialist company to help minimise flood risk. Due to the differing property thresholds, each property therefore has a different level of flood risk.

All of these properties are identified in the Multi Agency Response Plan under West Mercia LRF Beales Corner MA Operational Response Arrangements, Appendix B.

By the February 2020 floods most of the key elements had been installed. However some products were still to be installed and the final quality assurance checks were still to be completed.

Timeline of PFR Works

November 2015	Property Flood Resilience (PFR) Surgeries. The surgeries provided the opportunity for residents to talk in more detail about the plans for PFR measures proposed for their properties

November and early December 2015	Individual property survey reports sent to residents highlighting indicative PFR measures suitable for their properties
December 2015 to March 2016	Completion of detailed surveys and designs of specific PFR measures
January 2016 to January 2018	Installation of PFR measures to NON-LISTED properties in accordance with detailed professional surveys
October 2018	NON-LISTED properties Receive surveyors' formal approval for completed PFR measures
January 2018 to December 2020	Installation of PFR measures to LISTED properties in accordance with detailed professional surveys
October 2020	Target date for the installation of the final PFR products
January 2021	LISTED properties Receive surveyors' formal approval for completed PFR measures

Delivering PFR to properties in Bewdley has been made more challenging due to the historic nature of the town and buildings being listed. The installation of PFR measures has had to be phased over several years due to the challenges, sometimes with new products having to be developed. Due to the long lead time for listed building compliant flood doors, individual flood barriers have been provided to those properties.

Homeowner Agreements

We have provided clear and regular communications to homeowners and partners since the scheme began in 2015. Whilst our contractor, Watertight, has been leading on direct communications with homeowners, our work with the community has included scheme updates, annual newsletter briefings, resident drop in sessions and numerous meetings with Bewdley Town Council and local flood group.

We set out very early on the benefits but also the limitations of PFR measures. This extract is from the original JBA surveys that went to each homeowner prior to the measures being installed:

'It should be noted that it is not possible to completely prevent flooding. Flood resilience and resistance measures are designed to mitigate flood risk and reduce damage and adverse consequences. They will help you to recover more quickly following a flood event.'

There is an agreement for each property between the Environment Agency and the property owner that sets out that while the Environment Agency will fund the upfront work, the resident is responsible for the operation and future maintenance of the PFR products:

'The products installed are covered by our contractor, Watertight, for a 12 month period (from the date of installation) from all defects in the products arising from faulty product, material or workmanship. After which period Watertight nor the Agency will hold any responsibility for future maintenance, replacement, or repair any damage, wear or tear or defects to the goods and that such responsibility will be the householders.'

PFR performance winter 2019/20

Following the recent flood events, work is underway to investigate the effectiveness of the installed measures and to ensure they performed as they should so that any issues can be resolved within the warranty period. This has been made more challenging by the impacts of Covid-19 however the Environment Agency has been trying to progress works while working to the government and Public Health England guidance.

The feedback received to date on the effectiveness of the PFR measures is mixed and largely dependent on the depth of water against the properties. Due to the scale of the February 2020 flood event, the majority of the measures in the Beales Corner area were overwhelmed as their design level was exceeded.

PFR measures in use at Beales Corner February 2020

5. Flood risk government funding mechanism

Funding of flood risk management activities

The Environment Agency acknowledges the high public expectation of better flood protection. The government aims for the best outcomes for society as a whole and allocates funding to provide the greatest overall benefit to society. Decisions have to be taken on where flood risk management activities can be carried out with public funding, both nationally and locally, balancing the needs of communities, the economy and the environment. A risk-based management approach is taken to prioritise where public funding is spent.

Funding for the Environment Agency and other risk management authorities to manage flood risk is mainly provided by Defra as Flood and Coastal Erosion Risk Management Grant in Aid (FCERM GiA). There are strict rules governing how government funding is invested.

The UK Government promotes a nationally consistent approach for the assessment and funding of flood risk management works. Projects need to be developed in accordance with the Defra Policy Statement on Appraisal and follow the approach to appraisal provided in Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG). Whether the Environment Agency (or any other risk management authority) can exercise its statutory permissive powers to carry out works using government funding depends on these works being technically feasible and adaptable to change, socially and environmentally acceptable and the economic benefits to the country outweighing the costs.

The FCERM-AG outlines the principles for assessing benefits. Risk management authorities (including the Environment Agency) use additional industry standards such as the Multi-Coloured Handbook and Manual (MCM)[1], written and published by the Flood Hazard Research Centre at Middlesex University, which provides specific methods for the benefit assessment.

The costs of a scheme that need to be included in the economic assessment are the 'whole life' costs. These include appraisal, design, construction and maintenance (including refurbishment) costs over the lifetime of the scheme. Whole life costing helps to identify future costs and optimise the selection of the preferred option.

Flood risk management works have to compete with other areas of public expenditure, and even where there is an economic case for a project this does not guarantee its being funded with taxpayers' money. The availability of public funds for delivering flood risk management works is dependent on national priorities for investment, and individual projects need to compete for funding with other possible flood and coastal erosion risk management interventions around England. The Defra Flood and Coastal Resilience Partnership Funding arrangement sets out how much FCERM GiA may be contributed towards a project. Where government funding would not fully cover the costs of a project,

[1] The Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal (Multi-Coloured Manual – latest version 2013) and its Handbook (latest version 2018).

the costs would either need to be reduced or the remainder of the funding would need to be provided through local contributions.

Each project is given a partnership funding score based on the outcomes delivered, costs, benefits and local contributions. This score is used to prioritise and allocate FCERM GiA funding. Those schemes indicatively allocated FCERM GiA funding are then entered onto the government's national six year programme of investment for flood and coastal erosion risk management.

A business case is required to set out the justification for the investment. This would need to be approved, by the Environment Agency where within limits defined by Defra under the Financial Scheme of Delegation (FSoD). All funding, including local contributions need to be secured before works can be designed in detail and all relevant permissions and approvals secured before works can start on the ground.

Others can also carry out works to manage flood risk, including from main rivers, partly or wholly with other sources of funding. This is subject to the impacts being assessed and such works being in accordance with any relevant statutory requirements. These include communities, individuals, voluntary groups, and private and other public sector organisations. The Environment Agency supports them where it can to do this.

Planned future work in the Wyre Forest District

Flood recovery work is a priority for the Environment Agency. A £7.5m flood recovery programme is now underway for the repair of assets in the Environment Agency West Midlands Area which were damaged in the February floods. The programme includes the Severn Side Capital Maintenance Scheme in Bewdley, Worcestershire.

The £300k investment includes the resetting of the block pavers that sit under the flood barriers to reduce seepage during a flood, following damage caused during the October and February floods. It also includes the resealing of the elements of the barrier that remain in place and the recladding of the floodwall at Gardners Meadow.

In addition to the above recovery work the Environment Agency is planning the following investments:

- We are working with Worcestershire County Council to develop a bid for natural flood management measures for Wolverley.
- The Environment Agency intends to continue its inspection and maintenance activities on flood risk management assets. This equates to approximately £400k a year in the Wyre Forest District.
- The Environment Agency intends to continue to provide a flood warning service for areas in the District. In the Wyre Forest District, investment was approximately £100k for 2019/20. Future spend over the next 5 years is estimated to be £300k. This includes river gauge maintenance, gauge upgrades, maintaining, operating and improving the flood warning service, and a contribution to support the LRF.
- The Environment Agency also seeks to continue to reduce flood risk in the District through its role in permitting certain activities in the floodplain and as a statutory consultee, since 2006, in the town and country planning process.
- Looking further to the future, the Environment Agency has set up a new partnership group, the River Severn Partnership, to look holistically at flood risk along the River Severn from mid Wales to Gloucestershire. As well as the Environment Agency, the

Partnership includes Local Authorities, Local Enterprise Partnerships, Natural Resources Wales, Severn Trent Water and Water Resources West. This approach has the political backing of all MPs within the Severn catchment. The ambition of the River Severn Partnership is: ‘To make the Severn Catchment Britain’s most vibrant and resilient river network; where an exceptional quality of life, prosperous local economies and an outstanding natural environment is driven by a programme of innovation to reduce flood risk, secure future water resources and improve and deliver shared natural assets’.

Post flood repairs at Severn Side, Bewdley

6. Options for a permanent scheme for Beales Corner

Permanent options have previously been assessed and reviewed for Beales Corner. As set out in section 5 of this report, any scheme delivered by the Environment Agency has to meet government rules on public funding. To date no study has shown a viable option, with the 2012 Halcrow report concluding that any permanent scheme would have a benefit cost ratio of less than 1 and would therefore preclude public funding. Previous studies have estimated the costs of a permanent scheme to be in the region of £3m to £4m.

Following recent changes to the way flood risk benefits are calculated and a change in the partnership funding calculator, the Environment Agency is once again reviewing possible options and associated costs. This review forms part of the Environment Agency's accelerated programme. Following the winter flooding the Environment Agency has prioritised 13 projects to review flood hit communities. For any scheme to be viable for delivery a partnership approach is going to be required from all local partners and community support. The Environment Agency is aiming to complete the initial review by the end of the summer. We hope then to meet with all partners to discuss possible delivery opportunities and to allow partners to help shape any scheme. Following this work a public update will be given.

The ambition is that any permanent scheme will allow the historic bridge crossing to remain open to traffic during any future flood event, thereby allowing the town to remain connected. However it is worth noting that all options will have to be considered in the search for a viable scheme and that the cost to achieve this, along with any restrictions on what can be done to the bridge, may prevent this ambition. The opportunities to keep the bridge open will be explored by the partners as part of the work in the autumn and if any scheme progresses.

At this point in time it is not possible to provide any delivery timescales due to the great uncertainty as to whether a viable scheme is possible or not. However, if a scheme is found to be viable any scheme will require a business case to be produced and approved in accordance with HM Treasury rules, any site investigations to be undertaken, a planning application to be approved along with any specialist permissions from organisations such as Historic England, landowner permissions secured and the detailed design to be produced prior to any construction commencing. The construction period for a scheme of this scale is likely to be in the region of six months.

It is worth noting that the installation of PFR for properties at Beales Corner does not prevent the funding of any future permanent scheme if a viable option can be identified.

7. Lessons learnt

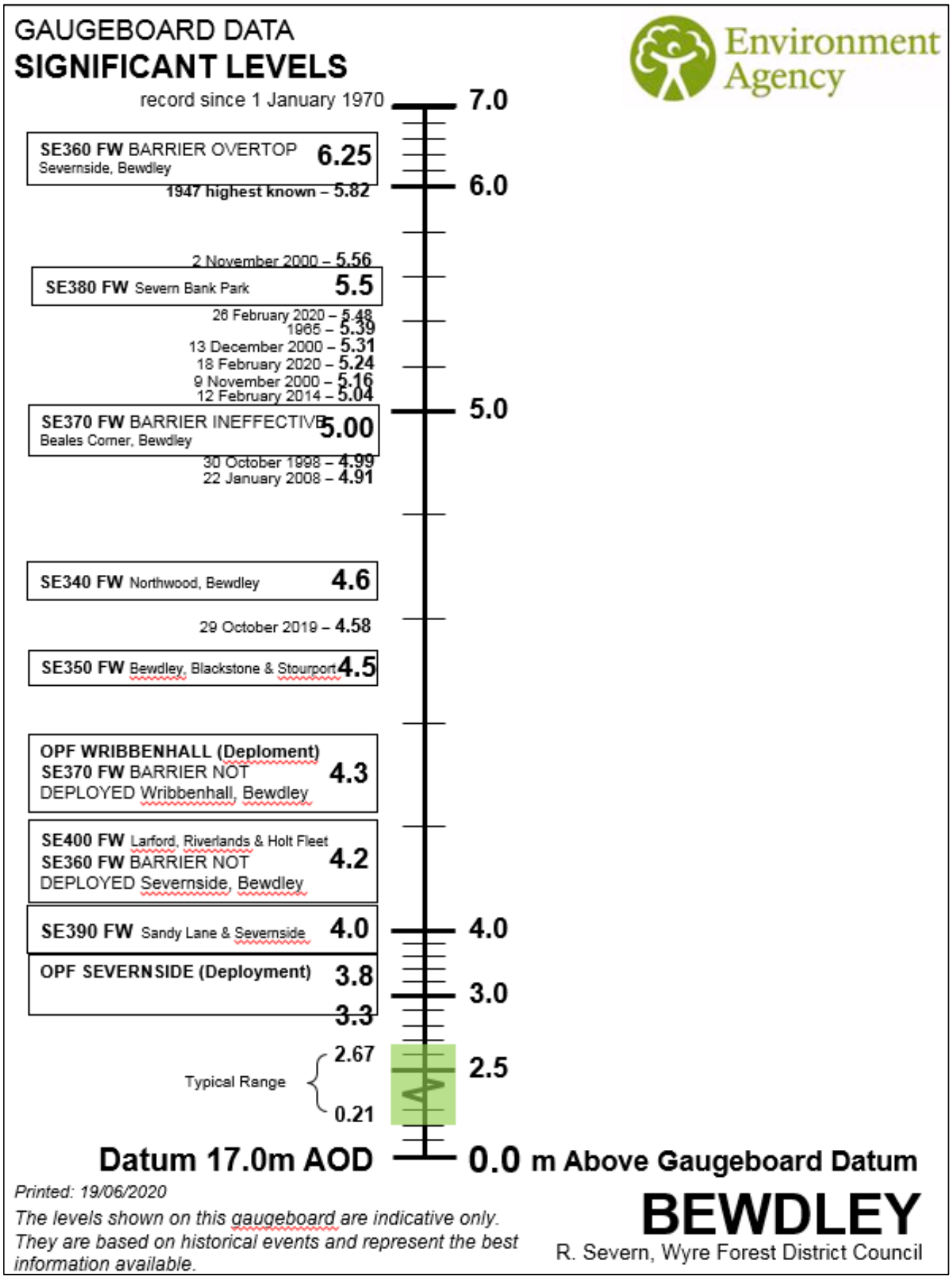
Following any significant flood event the Environment Agency reviews the event to identify any lessons that may reduce future flood risk. The events of February and March 2020 are being reviewed by the Environment Agency West Midlands Area. The Environment Agency is organising Bronze level debriefs for each of the operational sites along the Severn, which will include Bewdley, where all LRF members will be invited to share their experiences and will allow any learning to be implemented.

A number of improvement items have so far been identified by the Environment Agency to reduce flood risk for the future. The key changes are:

- Barriers for Bewdley to be loaded for the next deployment phase, regardless of forecast and to be located on site within the compound on Dog Lane Carpark. This would reduce mobilisation times by up to two hours but will impact space in the Dog Lane car park.
- An additional forecasting officer to be placed on duty for large or significant weather events.

While the Environment Agency and partners will always endeavour to identify new approaches to reduce flood risk, there will always remain a residual risk. We therefore ask communities to be prepared and to consider what they too can do to ensure that their home and their community is climate resilient.

Appendix A: Bewdley historic peak levels



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English Severn and Wye Regional Flood and Coastal Committee
Meeting date: 21 January 2019
INFO ONLY – Item C

Paper by: Evidence & Risk (Solihull)

Subject: Flood Forecasting and Flood Resilience Report – October 2019 – Early Jan 2020

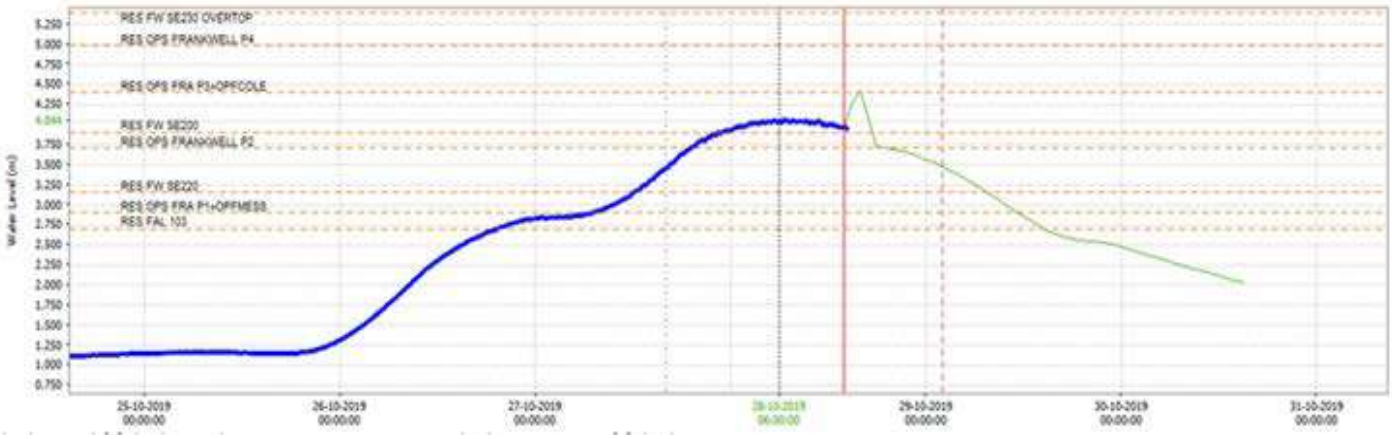
Recommendation
The Regional Flood and Coastal Committee is asked to:
1. Note the content of this report.

1.0 Flood Summary Report

1.1 October 2019

Due to the Jet Stream being further south than usual, the beginning of October was very unsettled. Various low pressure systems moved across the country until the 20th, before turning briefly more settled. Very wet and unsettled weather than moved in for the remainder of the month. There were flooding impacts along the Severn from the 26th in response to this rain. Train lines were closed across the West Midlands and barriers were put up at Shrewsbury due to the forecast river levels (see hydrograph below).

177% of the LTA rainfall fell over the Severn Basin in October.



1.2 November 2019

November began with further unsettled weather, although with major impacts being seen away from the West Midlands in Yorkshire and the East Midlands. More substantial totals fell around the 13th and 14th but without causing major disruption. More settled conditions then set in before the last week of November became unsettled once again, though with no large rain totals.

150% of the LTA rainfall was recorded in November for the Severn Basin.

1.3 December 2019

December was also an unsettled month, especially around the 12th to the 15th on December where some sizeable totals were recorded. The Christmas and New Year period were relatively settled however with no significant rainfall being seen and river levels dropping.

110% of the LTA rainfall fell in December.

1.4 Early January 2020

January has so far been dry with no notable rainfall events. 6% of the LTA rain has been received at the time of writing for the Severn Basin.

2.0 Flood Alerts and Warnings Issued

Flood Alerts

	Severn & Wye
Oct-19	14
Nov-19	21
Dec-19	19
Jan-20	2
TOTAL	56

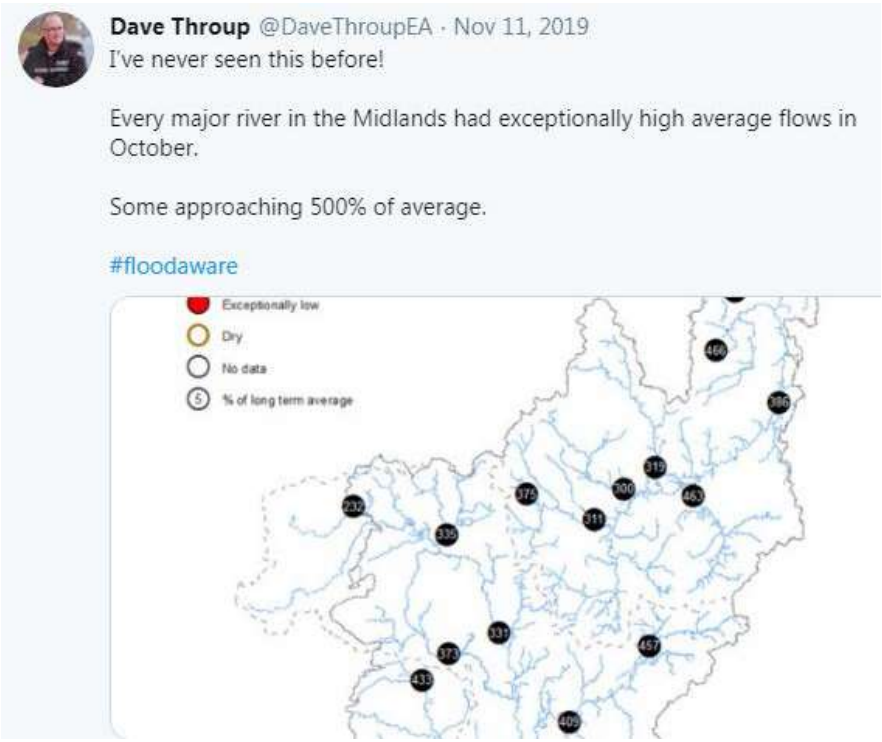
Warnings Issued

	Severn & Wye
Oct-19	14
Nov-19	32
Dec-19	10
Jan-20	1
TOTAL	78

3.0 Severn and Wye RFCC Community Engagement Return – January 2020

In autumn 2019 the Severn and Wye area was subject to heavy rain and flooding, and here is a summary of impacts and the Environment Agency response, as well as other engagement, through October November and December.

Here are some images to best summarise the events and multi-agency activity across the area through that period, followed by location specific information.



Phil Major @HWFireNcluster · Oct 27, 2019

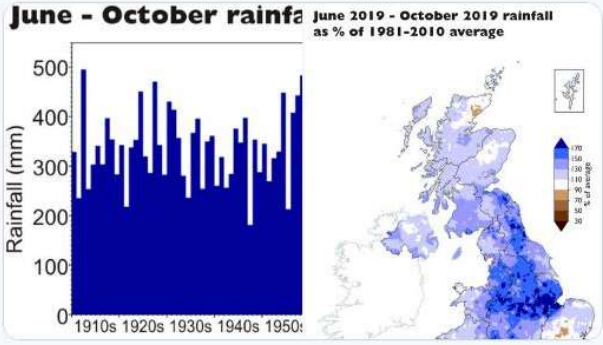
Hereford and Evesham boat crews completing an evacuation of several properties and a nursing home by boat, medical staff being transported to vulnerable members of the public to give support.

Dave Throup @DaveThroupEA · Nov 22, 2019

In the Severn Trent catchment area it has been the wettest June - October period on record (going back to 1910).

Explains why just small amounts of rainfall now results in flooding problems.

#geographyteacher

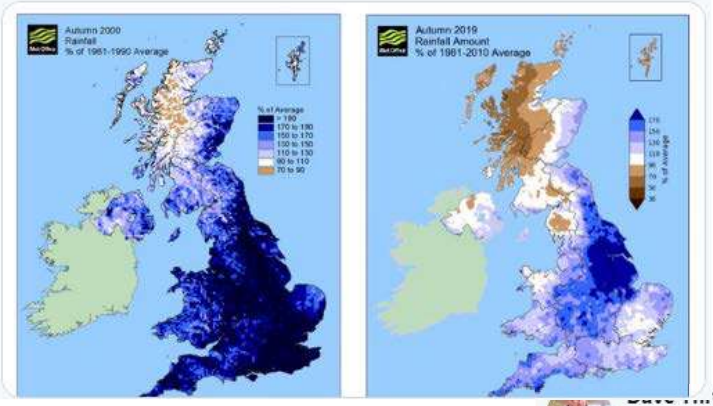


Dave Throup @DaveThroupEA · Dec 2, 2019

For some counties (South Yorkshire, Lincolnshire, Nottinghamshire) it's been the wettest Autumn on record.

For England it's the fifth wettest

Autumn 2000 which saw severe flooding at many locations across England had more widespread heavy rainfall.

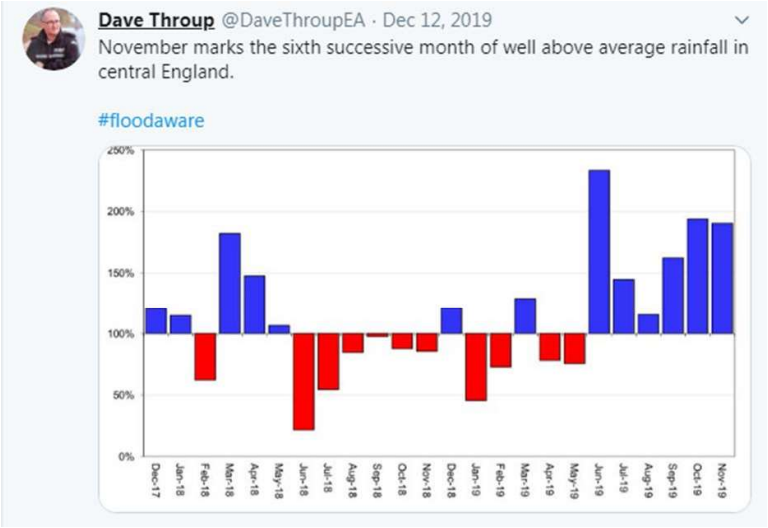


Dave Throup @DaveThroupEA · Nov 18, 2019

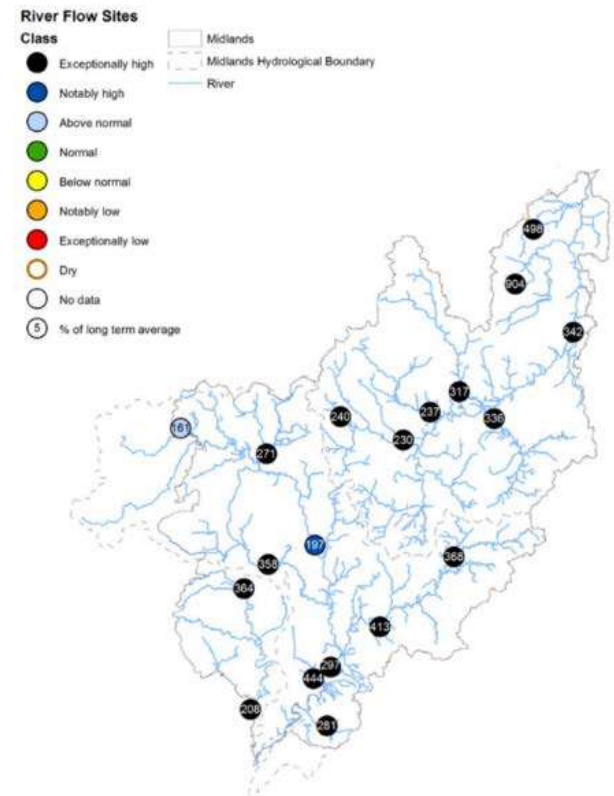
Conveniently beautiful clear conditions today coincided with @CopernicusEU @sentinel_hub satellite pass.

Allows great view of the incredible amounts of water still making its way through the lower Severn floodplains.

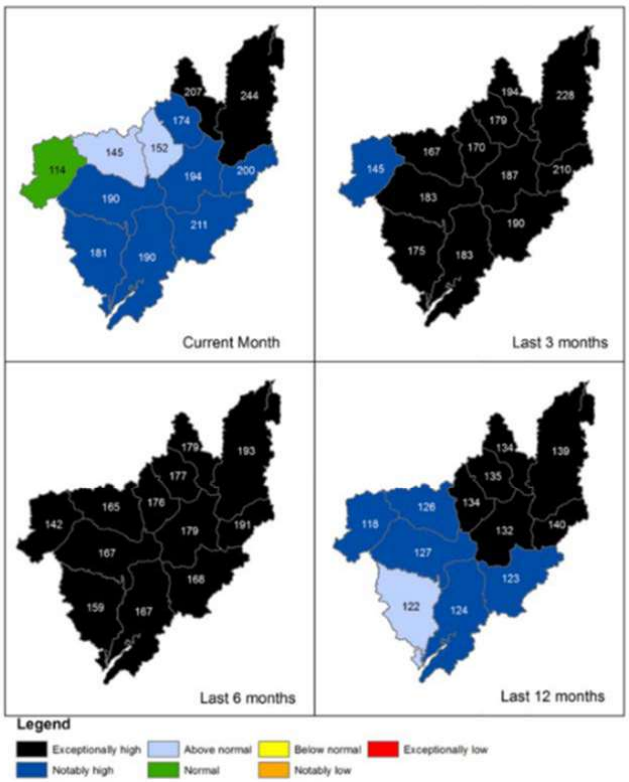
Thousands of acres currently inundated.



Midlands Mean River Flows For November 2019



Midlands Rainfall Map For November 2019



Worcestershire

We deployed the barriers in Bewdley to good effect, as well as many other flood alleviation schemes and barriers being tested, and we were kept busy throughout the period with repairs and maintenance, including river blockages.

We had staff out during the highest river levels to inform and collect information.

Dave Throup @DaveThroupEA · Oct 27, 2019

High level gauging on the Teme at Tenbury today.

117 tonnes of water per second going under the bridge at the moment.

Important work as it helps to improve our flood models and ensure our fixed gauges are accurate.

Dave Throup Retweeted

Worcestershire County Council @worcscc · Nov 4, 2019

Today's planned closure of Worcester Bridge eastbound to remove flood debris has been postponed due to higher river levels and flows. We are working @EnvAgencyMids to reschedule when river levels are safe to do so. @DaveThroupEA @WorcsTravel @WMerciaPolice

Worcs Highways & Travel @WorcsTravel · Nov 11, 2019

Work to remove the debris from #Worcester Bridge is underway - the crane arrived about half an hour ago. We're monitoring river levels and hopeful we can get a good amount out - this was the scene at the start of work @DaveThroupEA @worcscc #floodaware #WorcestershireHour

Evesham was the worst affected area, with property flooding and very high river levels.

We were pleased how well our assets performed in general, and we were able to collect useful data to seek to improve our models.

Upton was one of the places to see repeated high river levels.

Dave Throup @DaveThroupEA · Oct 31, 2019
The Isle of Upton

Tuesday

By digitlight.co.uk

Dave Throup @DaveThroupEA · Nov 12, 2019
At Upton where a very full River Severn is still creeping up slowly.

Our flood defences are doing what they've done over 40 times since they were built in 2011 - protecting homes & keeping the town open for business.

More rain forecast. Stay #floodaware

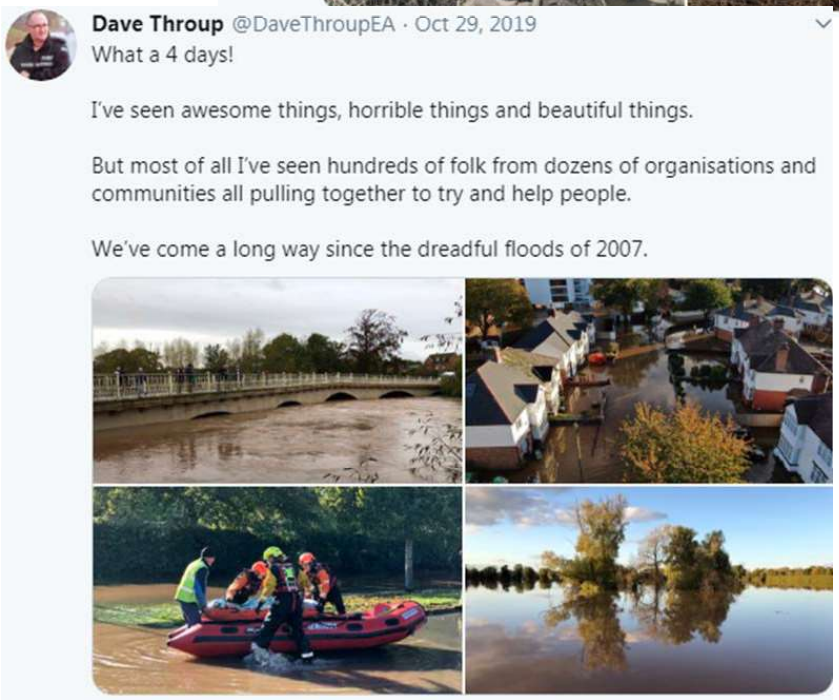
Dave Throup @DaveThroupEA · Dec 21, 2019
For the fifth time this year @EnvAgency flood defences are keeping homes and businesses in Upton #worcestershire dry.

Hanley Road is closed but other routes fine and the town is fully open for business.

Keeping in touch with affected businesses and communities, makes it easier for us to do our work … including looking for stranded fish after flooding!

Our flood alleviation schemes can be useful outside of operational use too - and of benefit to wildlife – or just of interest to passing cats!

Most of our staff have roles they take up in an incident to help keep people informed, or keep us operational by working weekends and night shifts. Of course the work does not stop after the flooding – that's when the repairs and engagement really get going. We will be meeting with communities across the area about this flood event for months to come, to learn, support and form new partnerships to make us all stronger. This includes to work we are doing to develop new and innovative ways to engage and inspire people to work with us towards healthier rivers and community and climate resilience.



February & March 2020 flood story: River Severn Catchment - Worcestershire

July 2020
v1.2

Environment Agency

Introduction

Over the winter of 2019/20 the River Severn catchment saw some of the highest river levels ever recorded. Significant flood events were experienced October, November, February and March. Major Incidents were called in Shropshire, Worcestershire and Herefordshire, with the Local Resilience Forums (LRFs) responding to widespread issues.

Over 70,000 properties across the West Midlands were warned of potential flooding allowing residents to take action. Unfortunately, initial indications are that approximately 1,600 properties were flooded. Environment Agency flood risk management assets prevented over 14,500 properties from flooding across the West Midlands.

This report captures the key statistics for the for the February and March 2020 flood events and the actions taken by the Environment Agency.

Environment Agency

The winter storm events

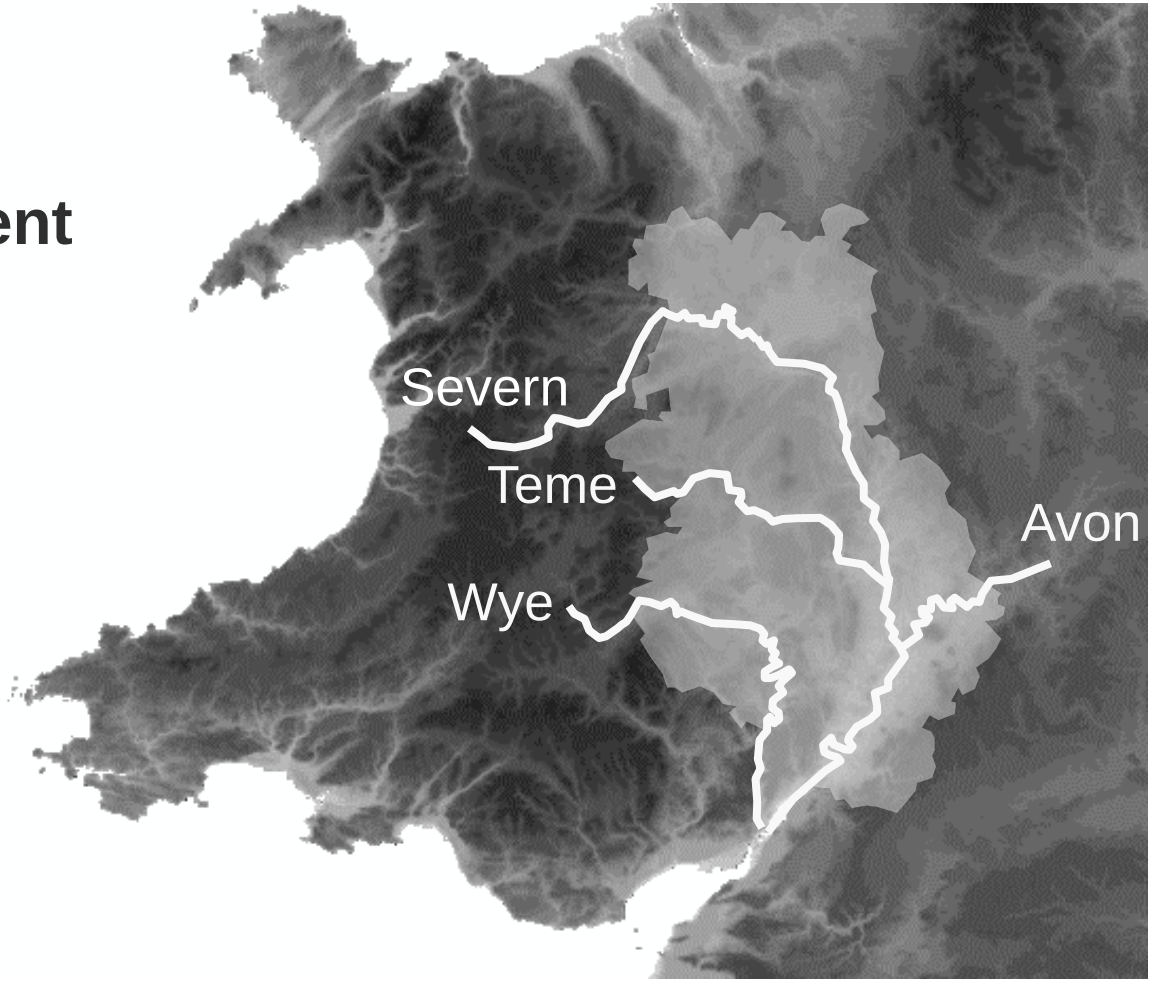
February & March 2020

Environment Agency

The Severn catchment

The largest rivers within the catchment:

- River Severn
- River Teme
- River Wye
- River Avon



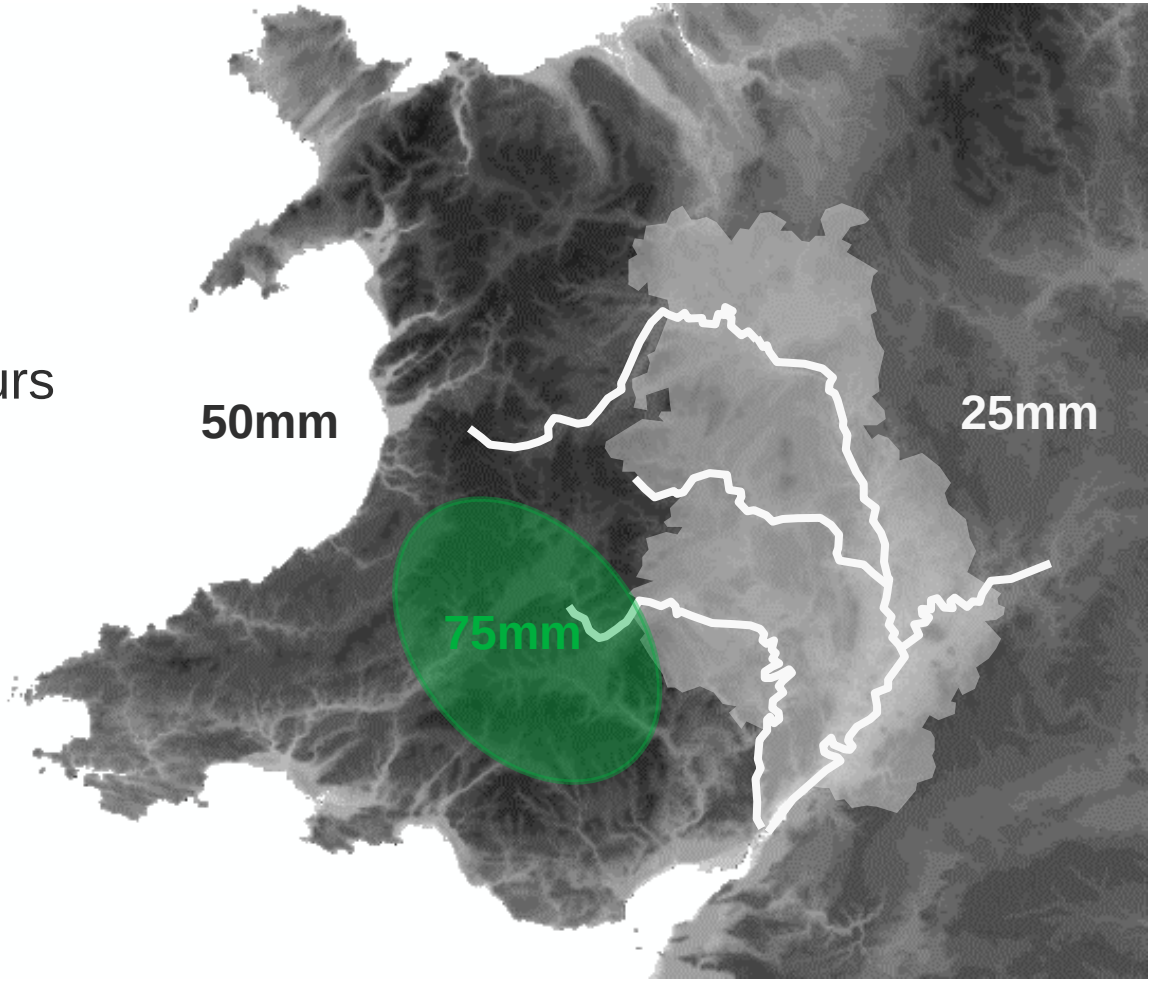
8 Feb 15 Feb 22 Feb 29 Feb 7 Mar

Environment Agency

Rainfall overview

Storm Ciara

- ‘Normal’ winter storm
- Up to 75mm in 48 hours over south Wales



Ciara

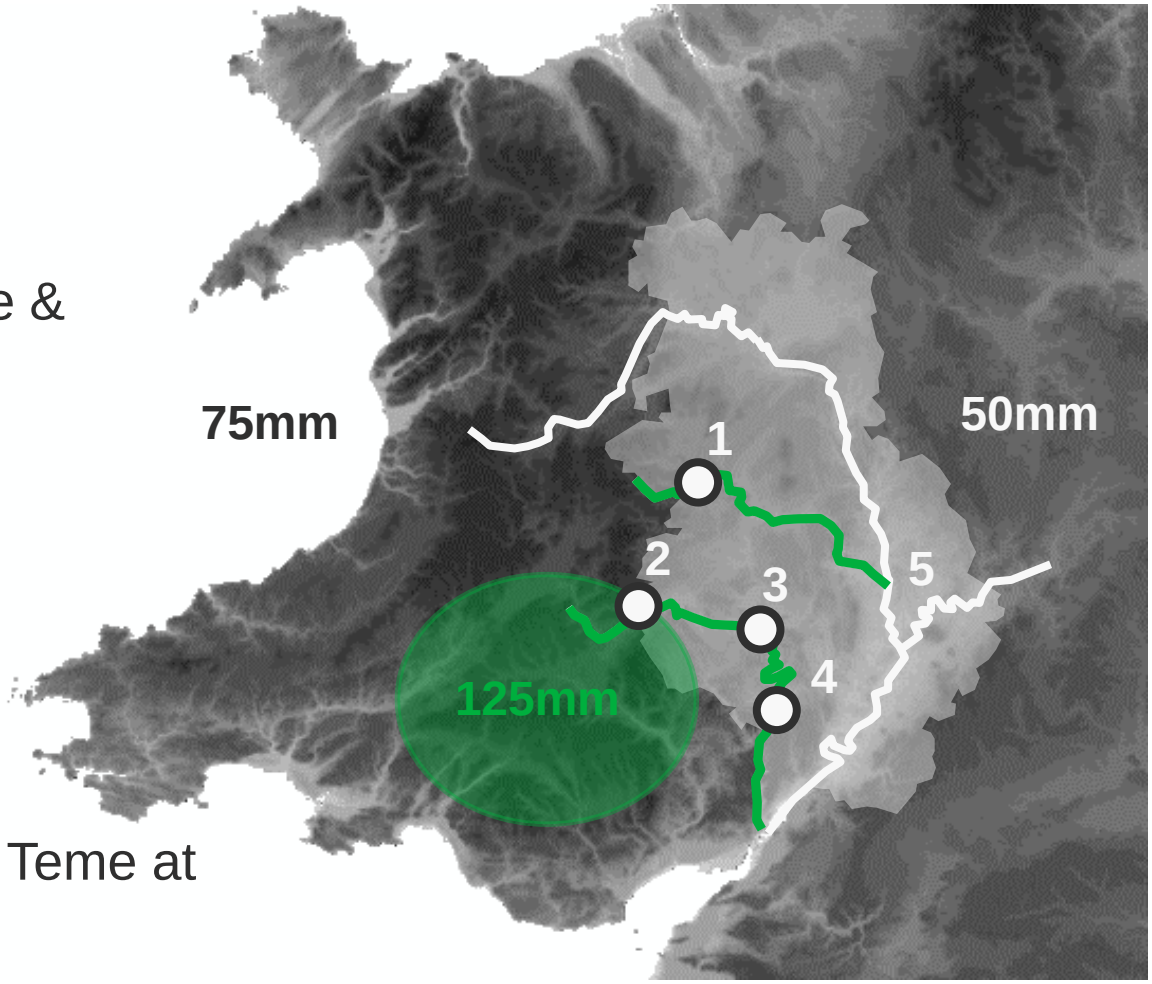
8 Feb *15 Feb* *22 Feb* *29 Feb* *7 Mar*

Environment Agency

Rainfall overview

Storm Dennis

- Records on Wye, Teme & Lugg, including:
    1. Leintwardine
    2. Hay-on-Wye
    3. Hereford
    4. Ross-on-Wye
- Ciara peak on Severn meets Dennis peak on Teme at Powick (5)

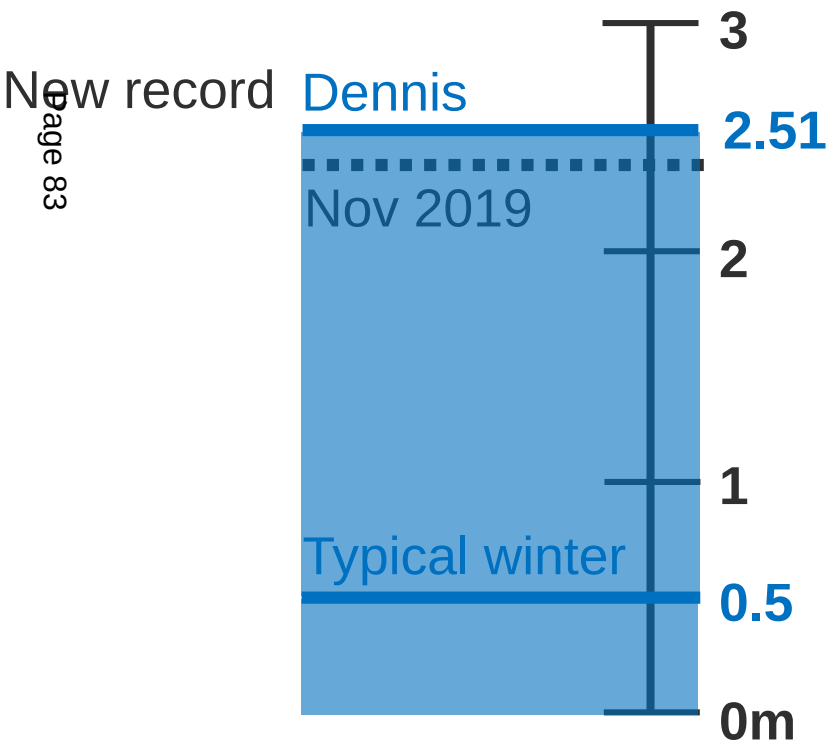


Environment Agency

Rainfall overview

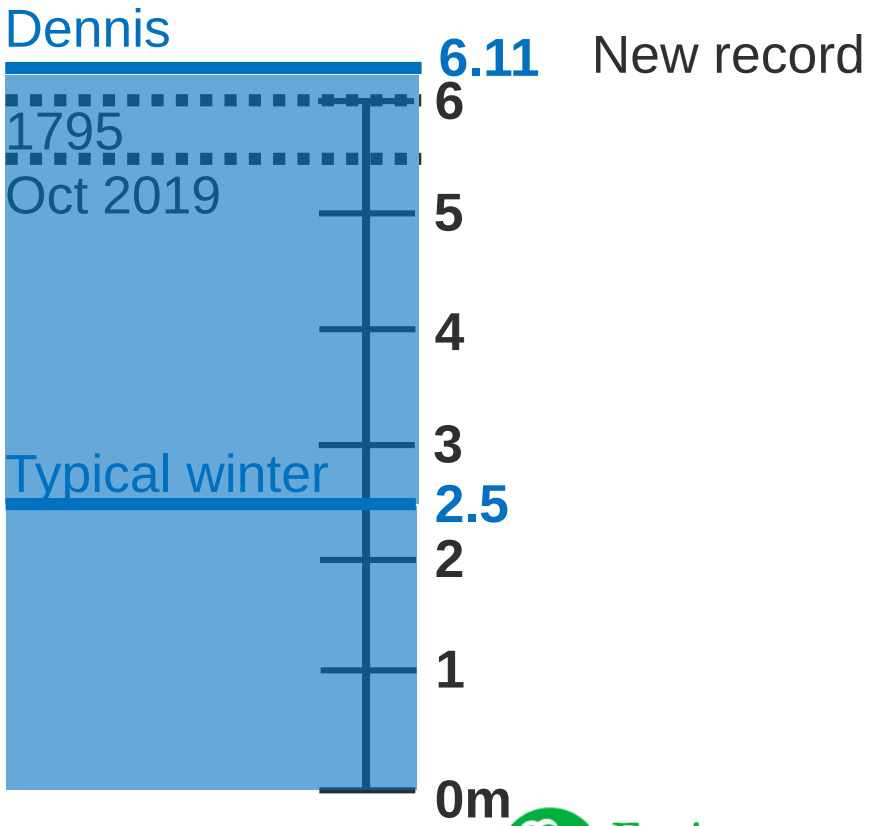
River Teme
Leintwardine

gauge since 1998



River Wye
Hereford

gauge since 1988, records since late 1700's

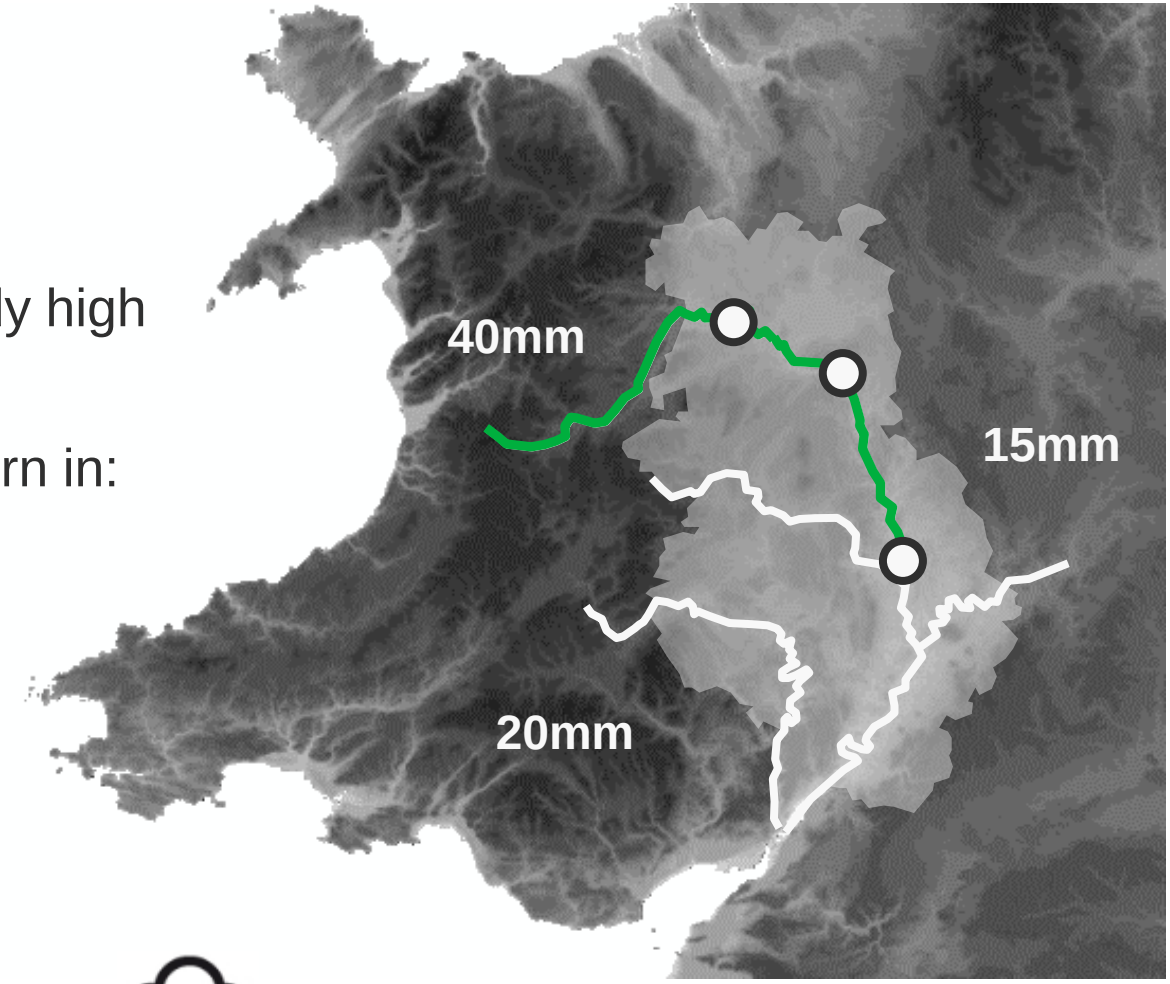


Environment Agency

Rainfall overview

22-23 February rain

- Rain topped up already high river levels
- Near-records on Severn in:
  - Montford
  - Ironbridge

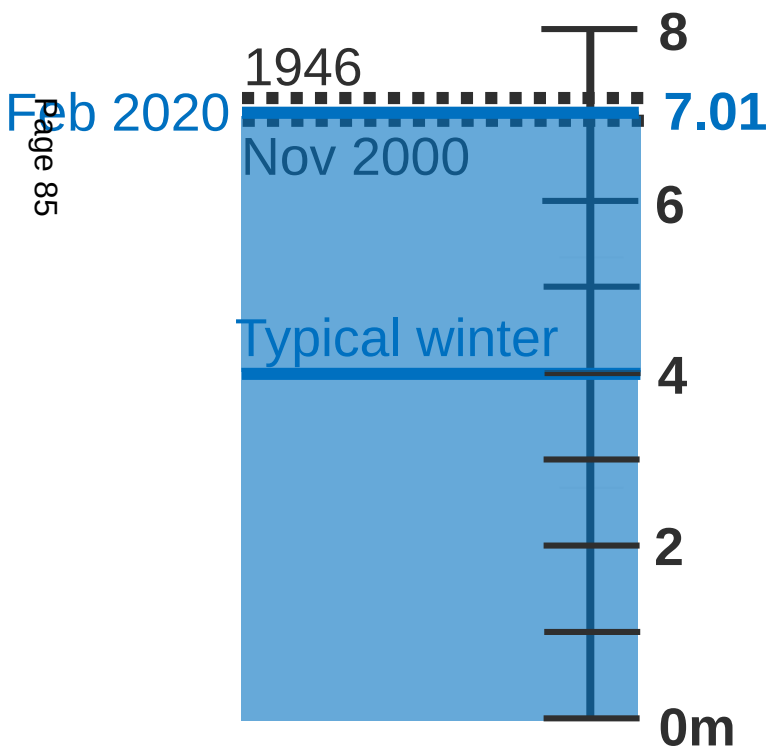


Environment Agency

Rainfall overview

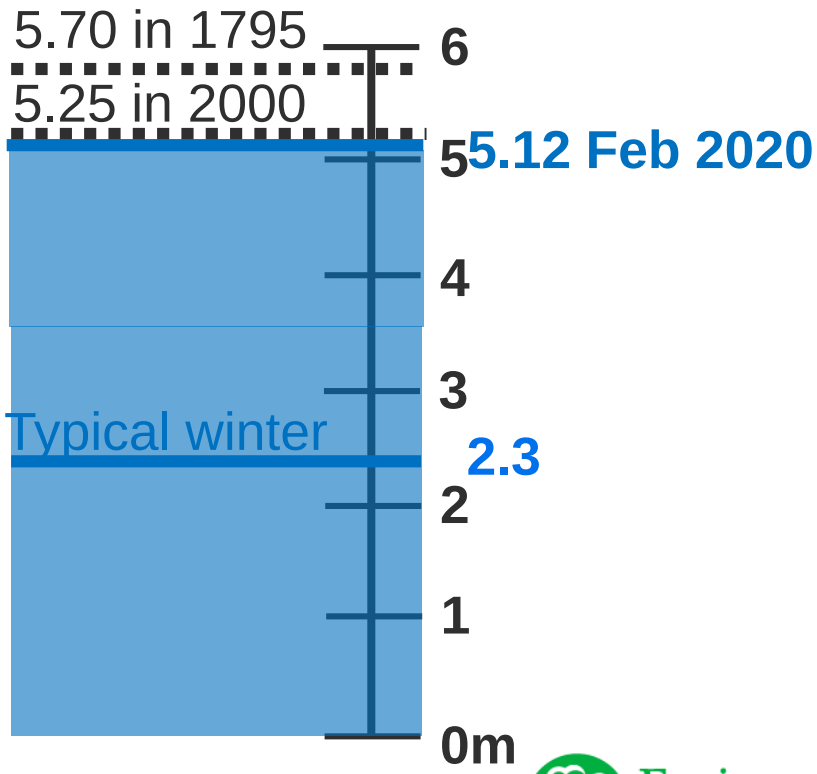
River Severn
Montford

gauge since 1958



Welshbridge Gauge

gauge since 1985

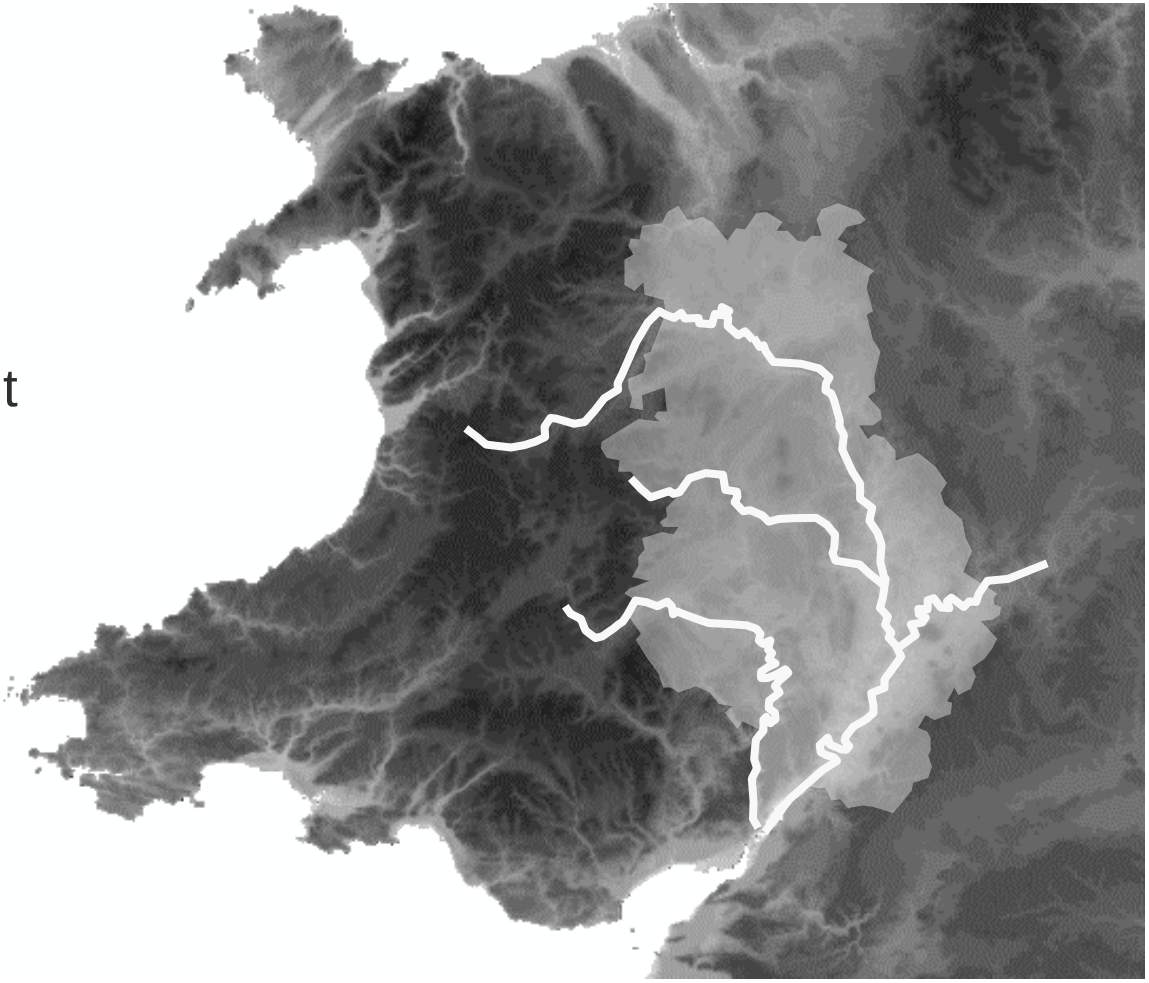


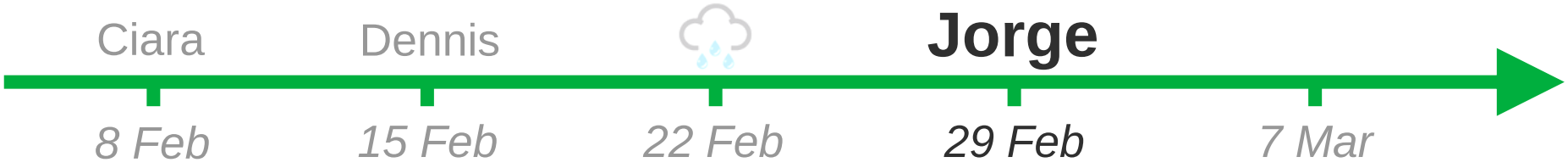
Environment Agency

Rainfall overview

Storm Jorge

Peaks smaller than storm Dennis and 22-23 Feb, but levels remain high



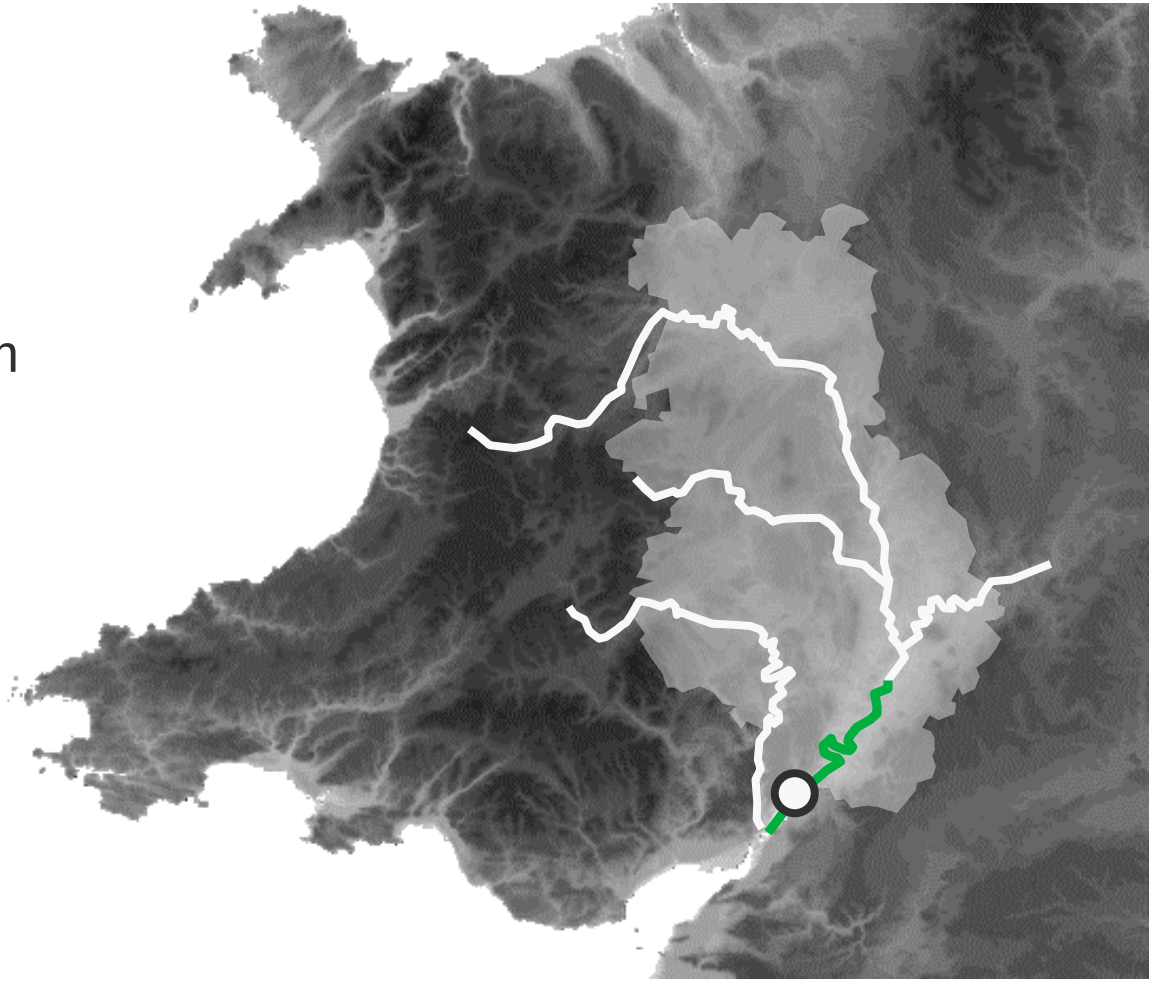


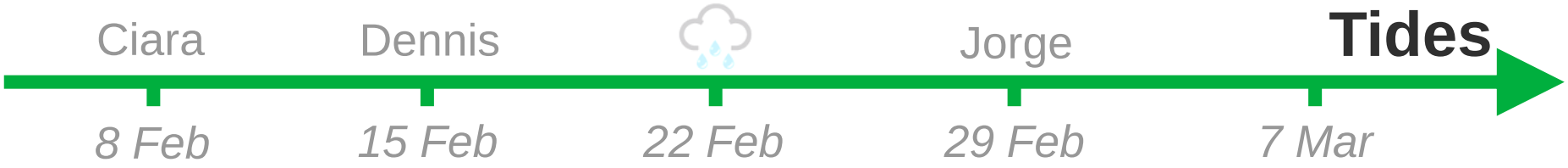
Environment Agency

Rainfall overview

Record tides

Beat previous highest at Sharpness (1936) by 0.2m



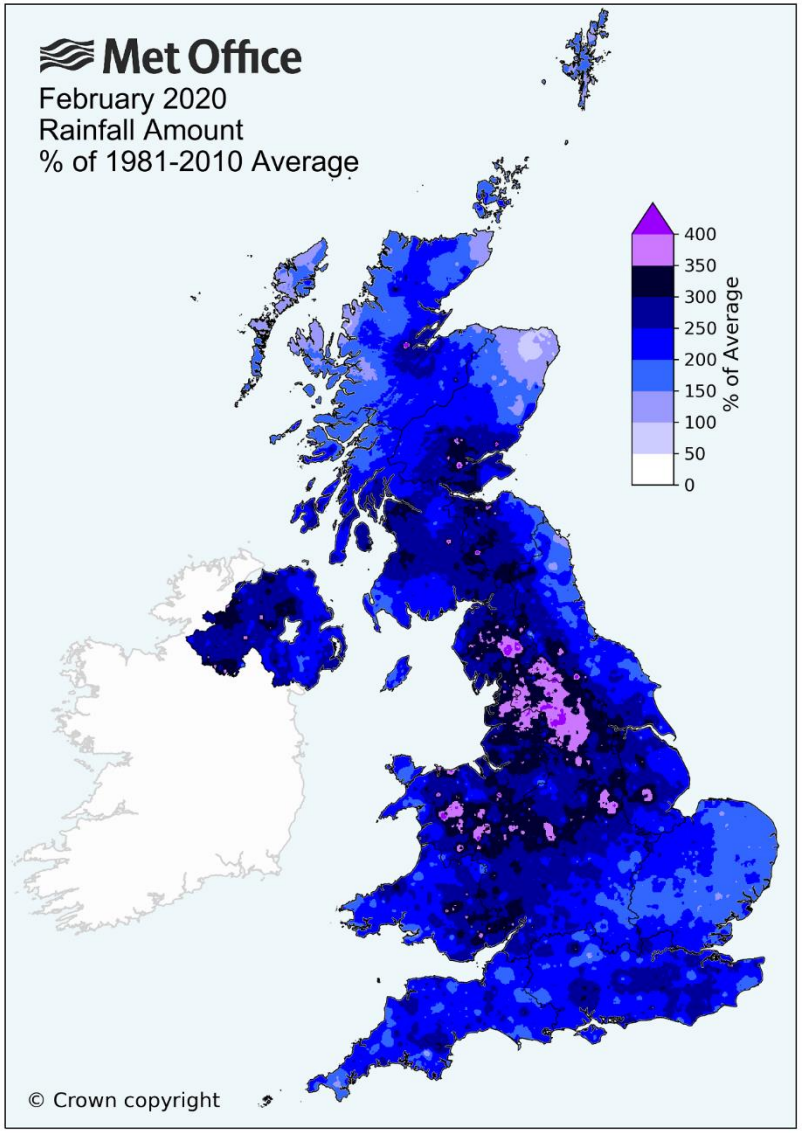


Environment Agency

Rainfall overview

February 2020

- Wettest June to October on record for the Severn catchment, with widespread flooding autumn 2019
- Warm, wet winter
- Multiple rainfall events
- Wettest February since records began
- Prolonged high river levels
- Records on Wye, Lugg, Teme & Severn *(but gauge records generally no more than 40 years old).*



Environment Agency

Summary of the EA response

February and March 2020 – West Midlands wide

Environment Agency

February - March 2020 Floods: West Midlands Area

February 2020 was the wettest February on record for England with double the average monthly rainfall. It was also the fifth wettest of any calendar month since 1862 and some areas experienced a month's worth of rain in 24 hours. In England 154.9 mm rainfall fell, 258% of the average rainfall for the month. Some places received over four times the average monthly rainfall.

1600

properties flooded in West Mids during Feb – March floods

14,500

properties protected

446

186 Flood Alerts | 246 Flood Warnings | 14 Severe Flood Warnings

alerts and warnings issued, including a record 158 FW and 10 SFW in force at one time

29,885

properties warned through the Flood Warning Service

380+

EA & DEFRA staff involved in incident response across West Midlands

86+

mutual aid staff travelled from across the country to help

33

consecutive days our area incident rooms were open, mostly 24/7, from 10 Feb to 13 March 2020

63

52 TCGs | 11 SCGs

multi-agency command groups across West Midlands, the majority in Shrops, Heref, Worcs and Glos

Worcestershire

Environment Agency

Flood risk in Worcestershire

There is a long history of flooding in Worcestershire on the River Severn, River Teme and the small watercourses around the county.

The largest flood in the last 100 years was recorded in 1947 where snow melt was met with heavy rainfall.

In July 2007 prolonged heavy rain over much of the county resulted in widespread flooding from various sources including watercourses, groundwater, surface water and sewers.

The flood events during February 2020 primarily impacted the largest rivers however there was still flooding on the smaller water courses and widespread surface water issues.

The following section provides an overview of the individual communities impacted.

Environment Agency

Worcestershire Flood Warnings

The following numbers of flood warnings were issued across Worcestershire during the winter of 2019/20:

	Number of Severe Flood Warnings Issued - WMD West (SHWG) (Monthly)					
County	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020
Worcestershire	0	0	0	0	5	0

	Number of Flood Warnings Issued - WMD West (SHWG) (Monthly)					
County	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020
Worcestershire	29	34	14	2	61	2

	Number of Flood Alerts Issued - WMD West (SHWG) (Monthly)					
County:	October 2019	November 2019	December 2019	January 2020	February 2020	March 2020
Worcestershire	26	34	33	16	41	3

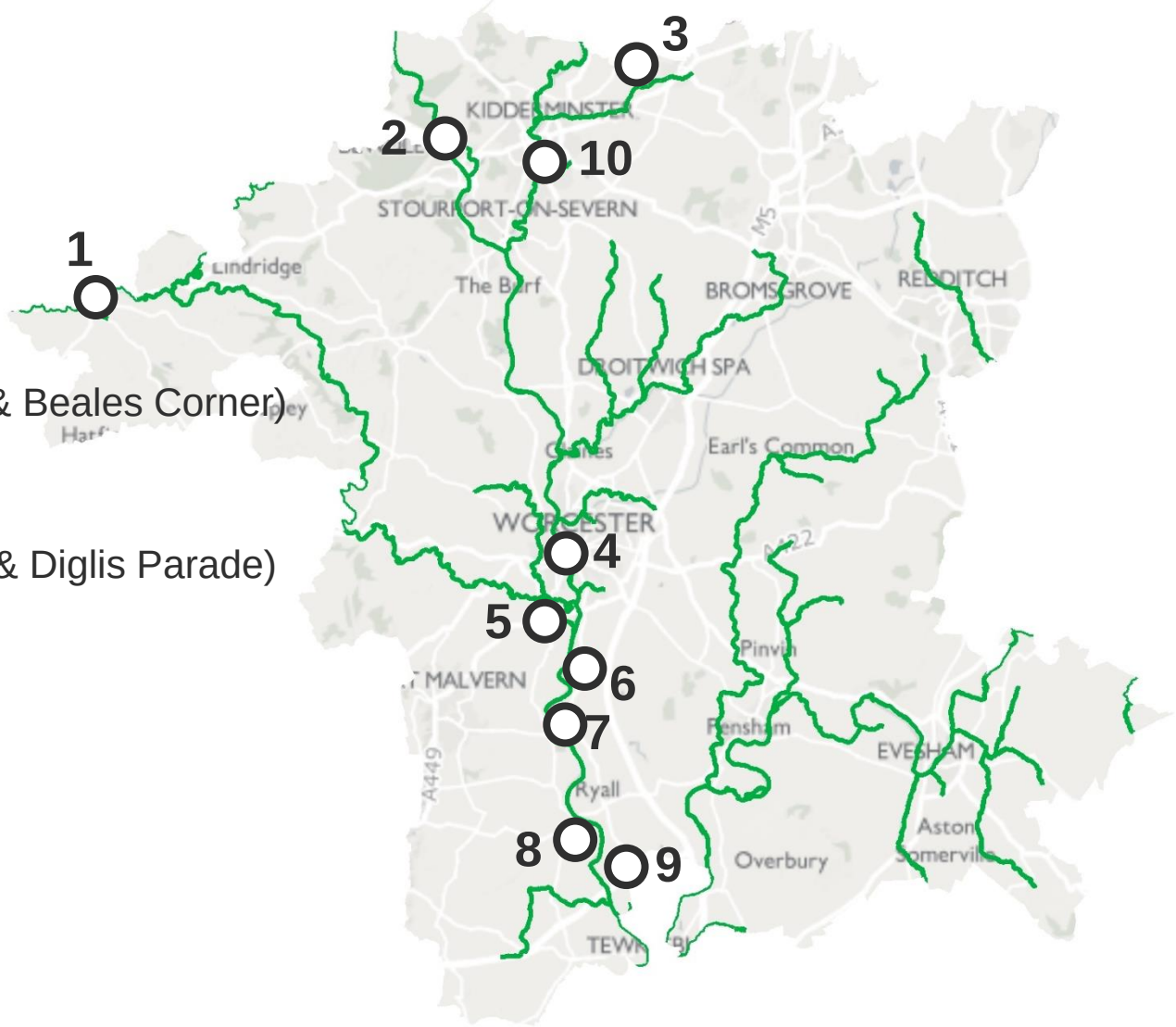
Environment Agency

Incident response – Worcestershire

Main river

Most impacted communities:

1. Tenbury Wells
2. Bewdley (Severnside & Beales Corner)
3. Blakedown Pool
4. Worcester (Hylton Rd & Diglis Parade)
5. Powick
6. Kempsey
7. Severnstoke
8. Upton on Severn
9. Uckinghall
10. Stourport & Kidderminster



Environment Agency

Community: Tenbury Wells

Flooding mechanism: high river levels on the River Teme and the Kyre Brook resulted in flooding within the town.

Water initially entered the town from the Kyre Brook before flooding from the River Teme.

The EA was part of the West Mercia LRF response that organised a mass scale evacuation of properties at risk along with overnight accommodation for those impacted.

Numbers impacted: over 125 properties (residential and businesses) were reported to have been impacted by flooding.

Flood warnings issued: Flood Warning issued 15 February followed by a Severe Flood Warning later on the 15 February 2020.

Peak river level: Tenbury gauge on the River Teme: 5.89m ASD 16 February 2020. Levels were similar to those experienced in 2007 – 5.97m ASD.

Kyre Brook gauge: 3.51m ASD 15 February 2020. This is the highest level recorded since the gauge was installed in 2009.

EA assets: currently there are no built EA assets in the town.

EA operation of assets: N/A.

Community engagement: CIOs (Community Information Officers) attended the town during the peak of the event and over the following days to support residents.

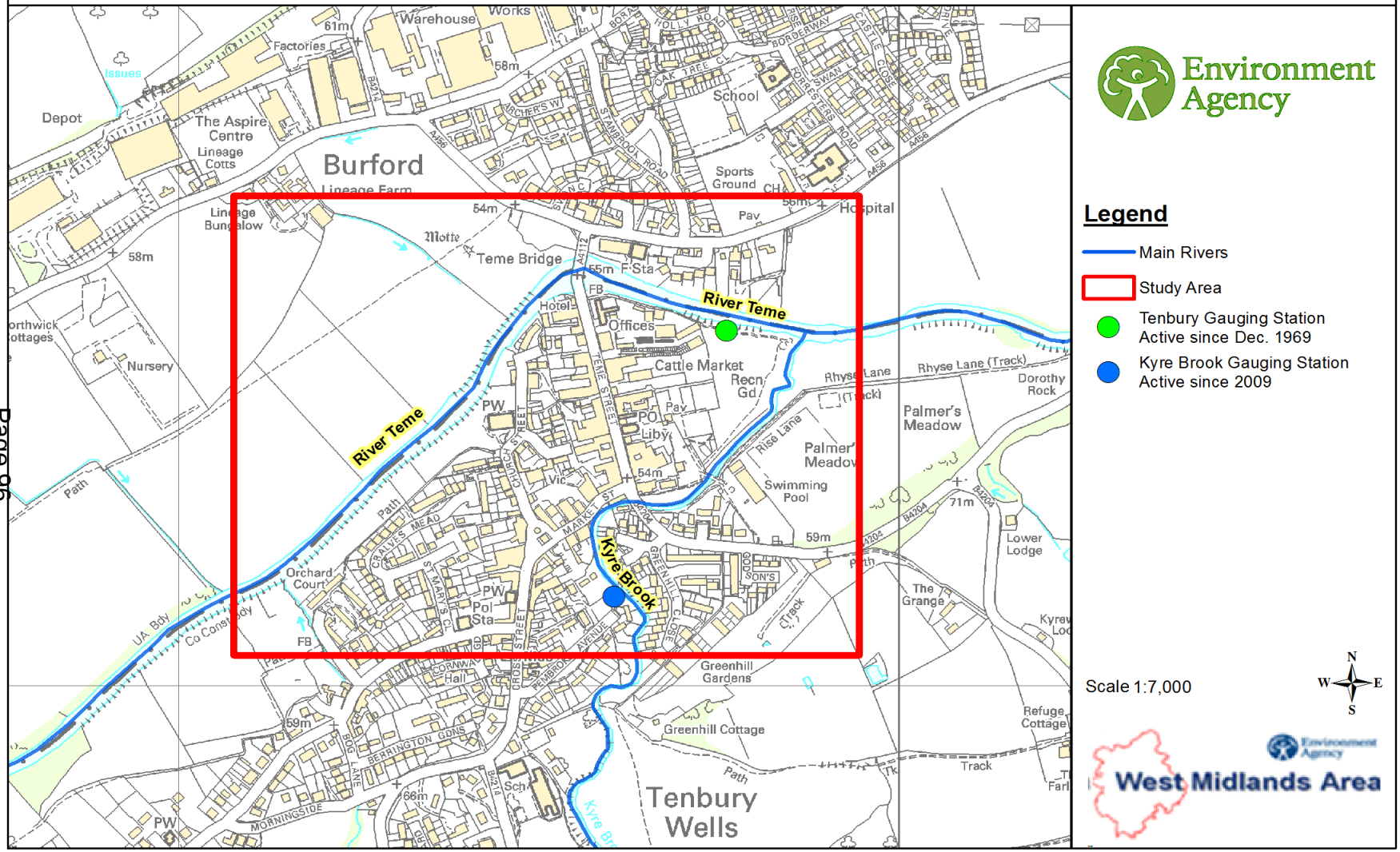
Post flood work: a project is underway looking to deliver a scheme to reduce flood risk at Tenbury Wells. Funding was confirmed for the scheme July 2020.

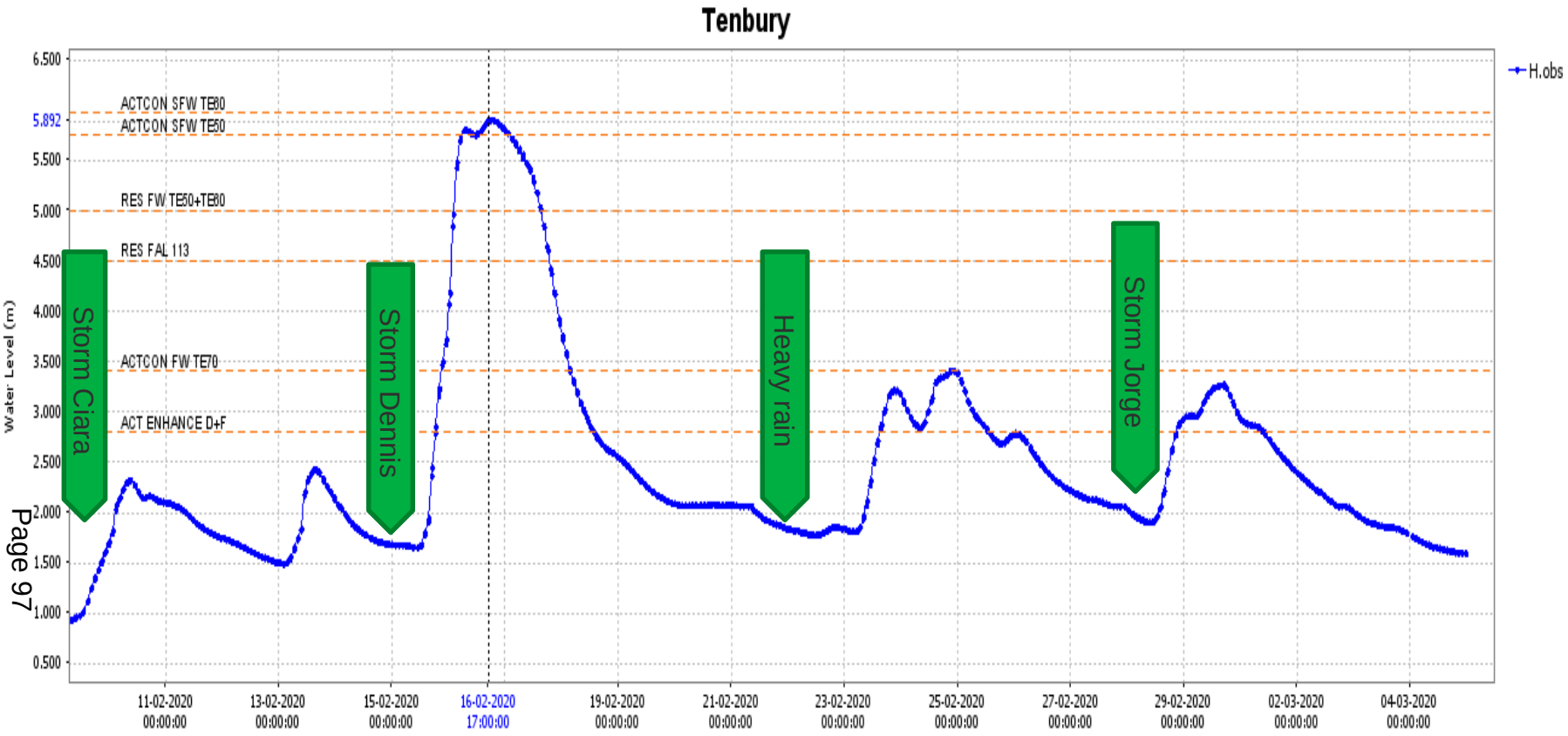
Feasibility of a scheme was previously assessed in 2004 and 2009, but without a strong justification for GiA funding scheme.

It is the ambition of the EA to run a community engagement event late September 2020.

Environment Agency

Tenbury Wells - FAS





River Teme levels at the Tenbury Wells gauage, February 2020 (m ASD)

Environment Agency

Incident response – Worcestershire

Tenbury Wells

- Similar levels to 2007 (not a record)
- More than 126 properties flooded here and more along River Teme

Community: Severnside, Bewdley

Flooding mechanism: high river levels on the River Severn resulted in the flooding of low lying land and properties.

An exceptional increase in level on the River Severn was experienced on the 15 March 2020 as heavy rainfall fell on the local catchment.

Numbers impacted: 12 properties were reported to have been impacted by flooding.

Flood warnings issued: Flood Warning issued 16 February when the Phase 1 Severnside north barriers were exceeded by the extreme increase in level.

Peak river level: 5.48m ASD on the 26 February 2020. This is the highest level recorded since the Severnside scheme was completed.

The highest recorded level on record is the 1947 level which reached 5.82m ASD. The November 2000 flood levels reached 5.56m ASD.

EA assets: combination of demountable barrier and flood walls for approximately 200 properties.

Dog Lane pumping station reduces the risk of surface water flooding.

Severn Severn Trent Water have the Lax Lane pumping station to also help manage surface water.

EA operation of assets: all phases of the Severnside barriers were deployed during February 2020.

- Phase 1 was deployed 12 February 2020.
- Phase 2 was deployed early morning on the 16 February 2020 fallowing an un-forecast rise in river levels in the early hours that resulted in several properties flooding at Severnside North.
- Phase 3 was deployed over the 16 and 17 February 2020.

The barriers were finally taken down early March 2020.

Community engagement: CIOs attended Bewdley during the March events.

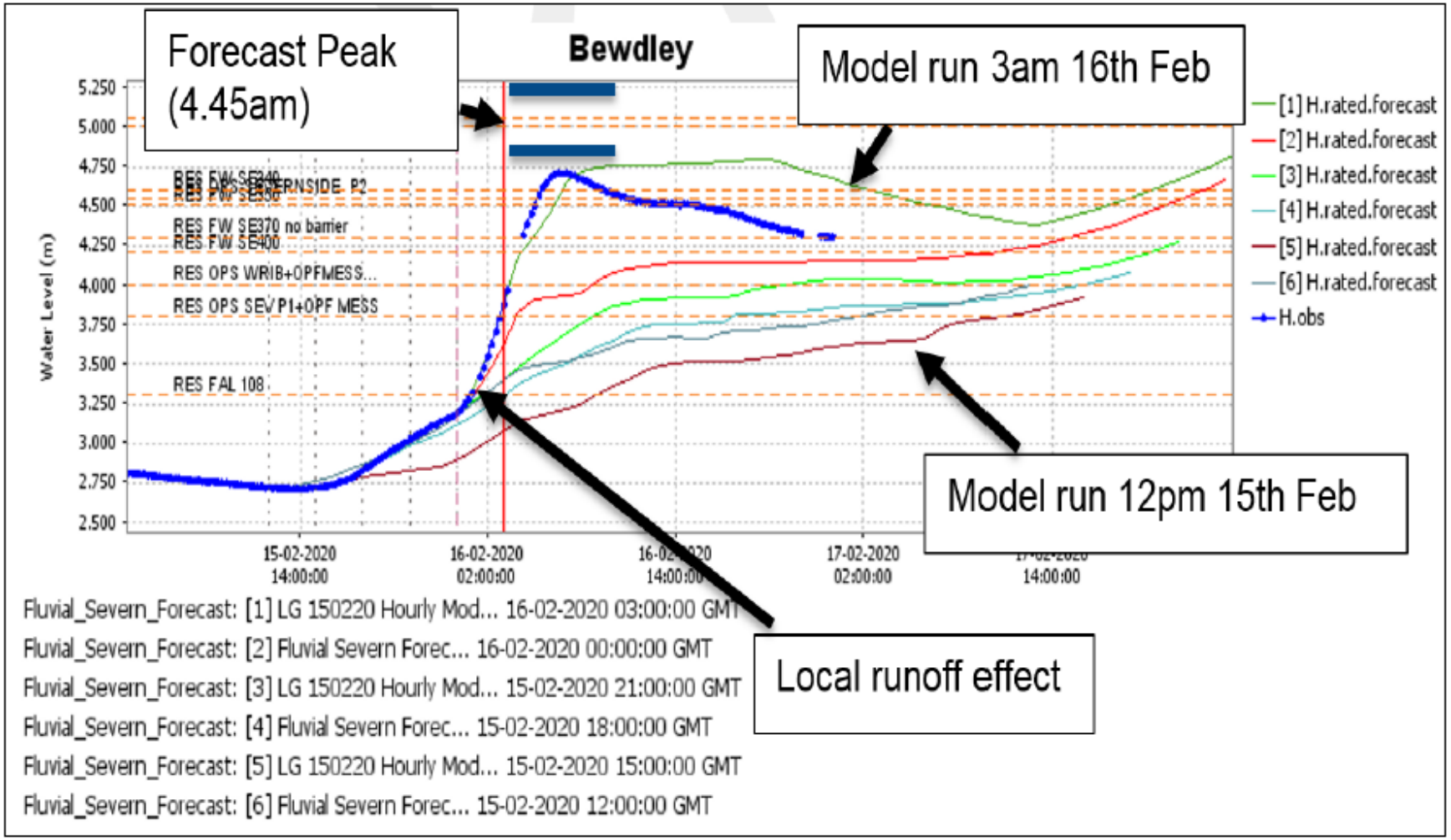
Boris Johnson attended Bewdley to meet residents 8 March 2020.

Post flood work: a lessons learnt review has been undertaken, looking at how the barriers are deployed and what can be improved for the future.

The demountable barriers have been cleaned and serviced following the flooding, stored ready for the next deployment.

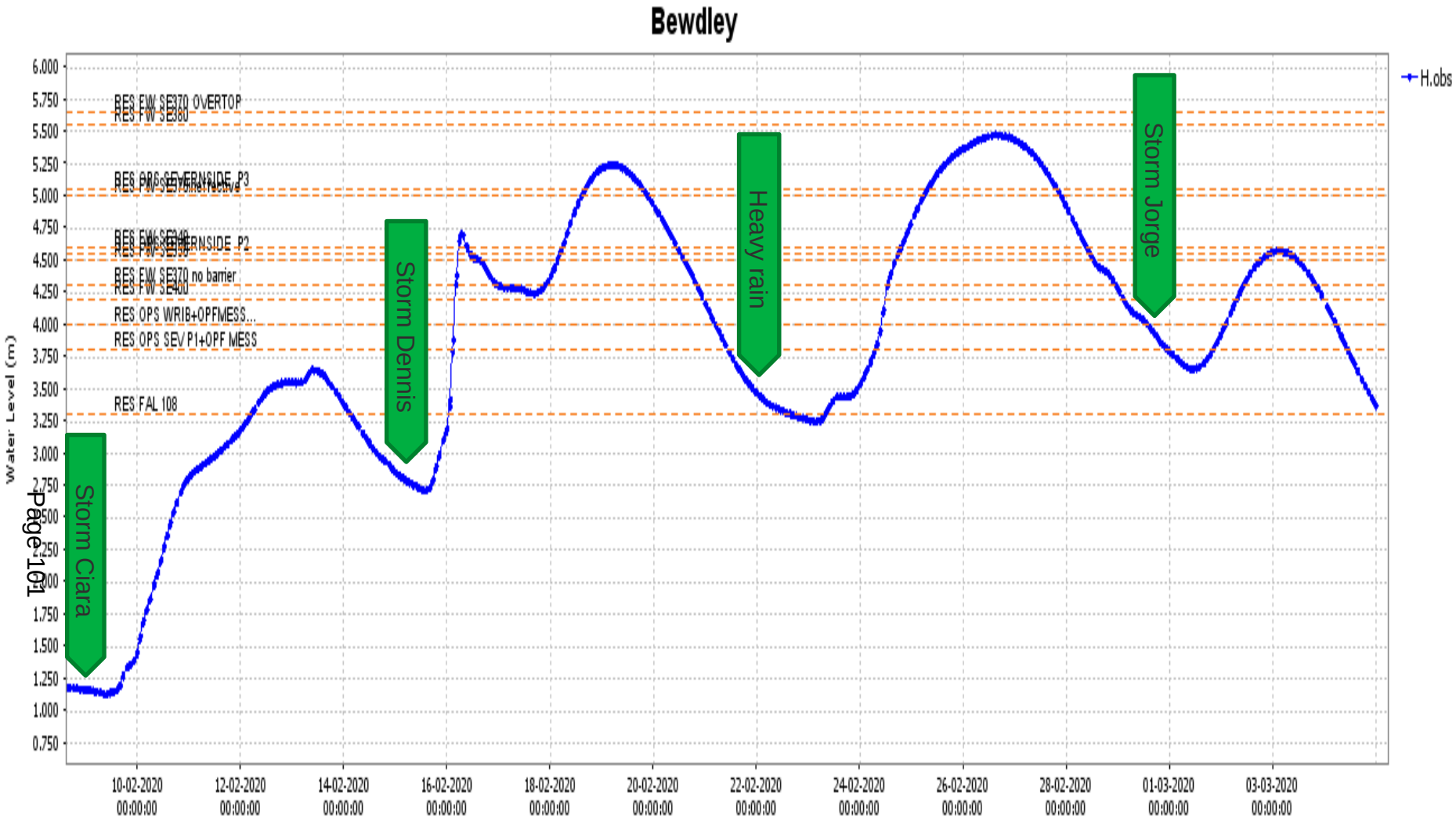
Following the flooding the flood walls FCRM assets were inspected. Defects were identified which are currently being repaired. Work is scheduled to be complete by September 2020.

Environment Agency



Changes in forecast levels over the evening of the 15/16 February 2020

Environment Agency



Bewdley gauge levels on the River Severn (m ASD)

Environment Agency

Incident response – Worcestershire

Bewdley

- Highest level since schemes implemented (2000 and 2006)

Incident response – Worcestershire

Severnside phase 3 deployed

25 February 2020

Community: Beales Corner, Bewdley

Flooding mechanism: prolonged high river levels on the River Severn resulted in flooding of low lying land and properties.

The very high peak levels resulted in the overtopping of the Beales Corner temporary flood barrier.

Numbers impacted: 40 properties were reported to have been impacted by flooding.

Flood warnings issued: Flood Warning issued 16 February for when it was not possible to deploy the Temporary Barrier.

Flood Warning issued 25 February 2020 in advance of the Temporary Barriers being overtopped.

Peak river level: 5.48m ASD on the 26 February 2020. This is the highest level recorded since the Severnside scheme was completed.

The highest recorded level on record is the 1947 level which reached 5.82m ASD. The November 2000 flood levels reached 5.56m ASD.

EA assets: a temporary barrier is deployed by the EA along the river front at Beales Corner. Severn Trent Water deploy mobile pumps to manage the local drainage.

Most properties at Beales Corner have Flood Resilience Measures (PFR) following an EA lead scheme.

EA operation of assets:

It was not possible to fully deploy Beales Corner on the 16 February, however a best endeavours effort was made to deploy a section of the barrier and to sandbag properties.

Beales Corner was fully deployed on the 17 February once levels allowed, ready for the following peak levels.

The temporary barrier provides a level of protection to 5.0m ASD. Work by the teams on the ground managed to increase the level of protection from 5.0m ASD to 5.3m ASD by preventing water from out-flanking the barrier. On the 25 February 2020 levels exceeded this increased level of 5.3m ASD and the barrier was overtopped.

As levels receded the EA used large pumps to pump the area behind the defence dry. The barriers were inspected and minor repairs undertaken where required, ready for Storm Jorge.

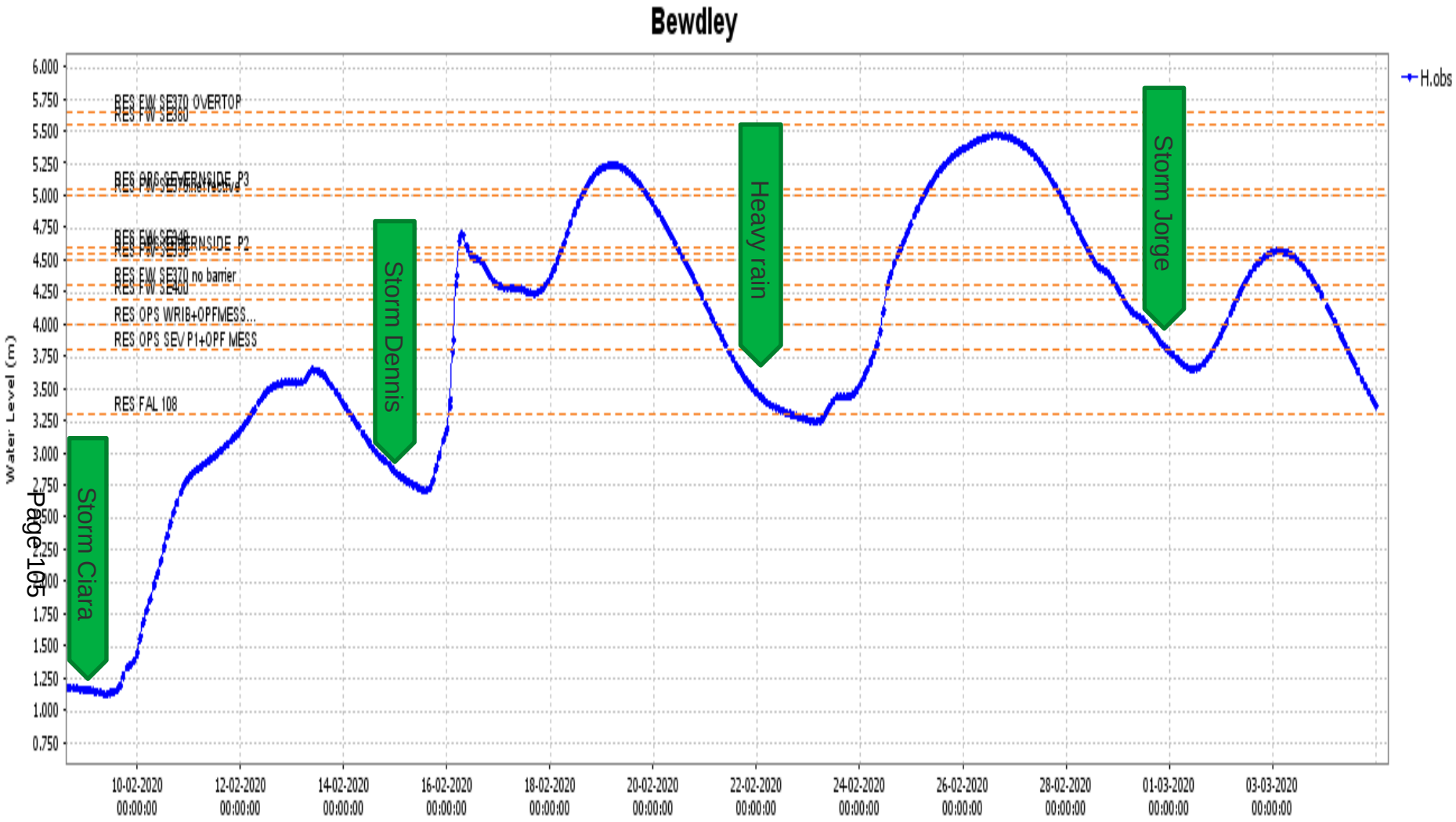
Community engagement: CIOs attended Bewdley most days to talk to residents and to collect data.

Boris Johnson attended Bewdley to meet residents 8 March 2020, visiting both Severnside and Beales Corner.

Post flood work: a project is underway looking at what can be done to reduce flood risk for Beales Corner. The Strategic Business Case is being produced for review and approval September 2020.

Work is underway with residents to review the performance of the PFR measures.

Environment Agency



Bewdley gauge levels on the River Severn (m ASD)

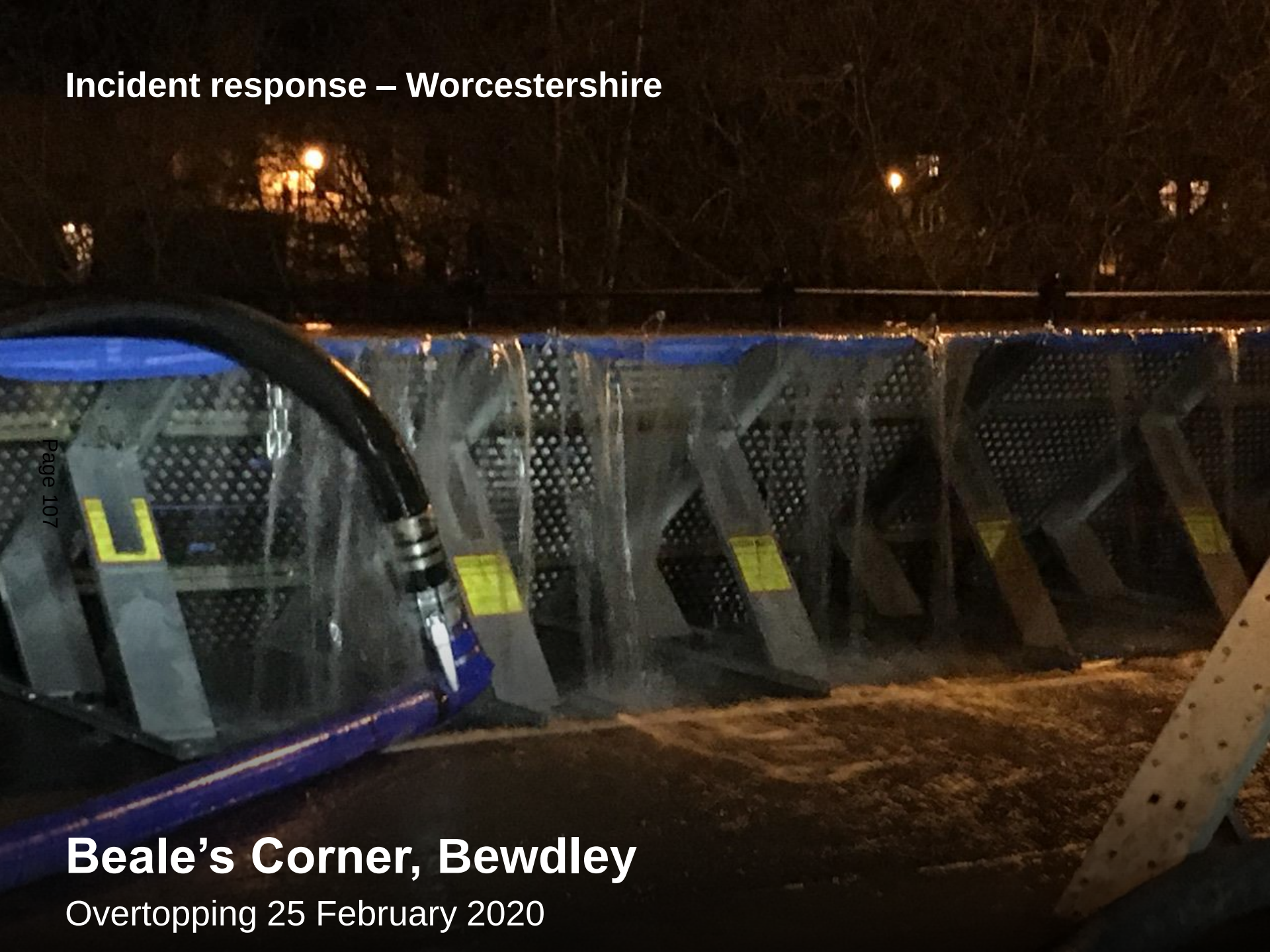
Environment Agency

Incident response – Worcestershire

Beale’s Corner, Bewdley

25 February 2020, 14:15

25 February 2020, 17:15



Beale’s Corner, Bewdley

Overtopping 25 February 2020

Community: Blakedown Pool

A member of public reported the risk of a potential breach at the Blakedown Pool. The Blakedown Pool is a non statutory reservoir.

The EA managed the response with the same approach as for a higher risk reservoir. A Panel Engineer attended site and advised on the mitigation measures.

The EA worked with their contractor, Jackson Civil Engineering, to reduce the height of the retaining structure and thereby reduce the risk of flooding to the nearby community.

Environment Agency

Incident response – Worcestershire

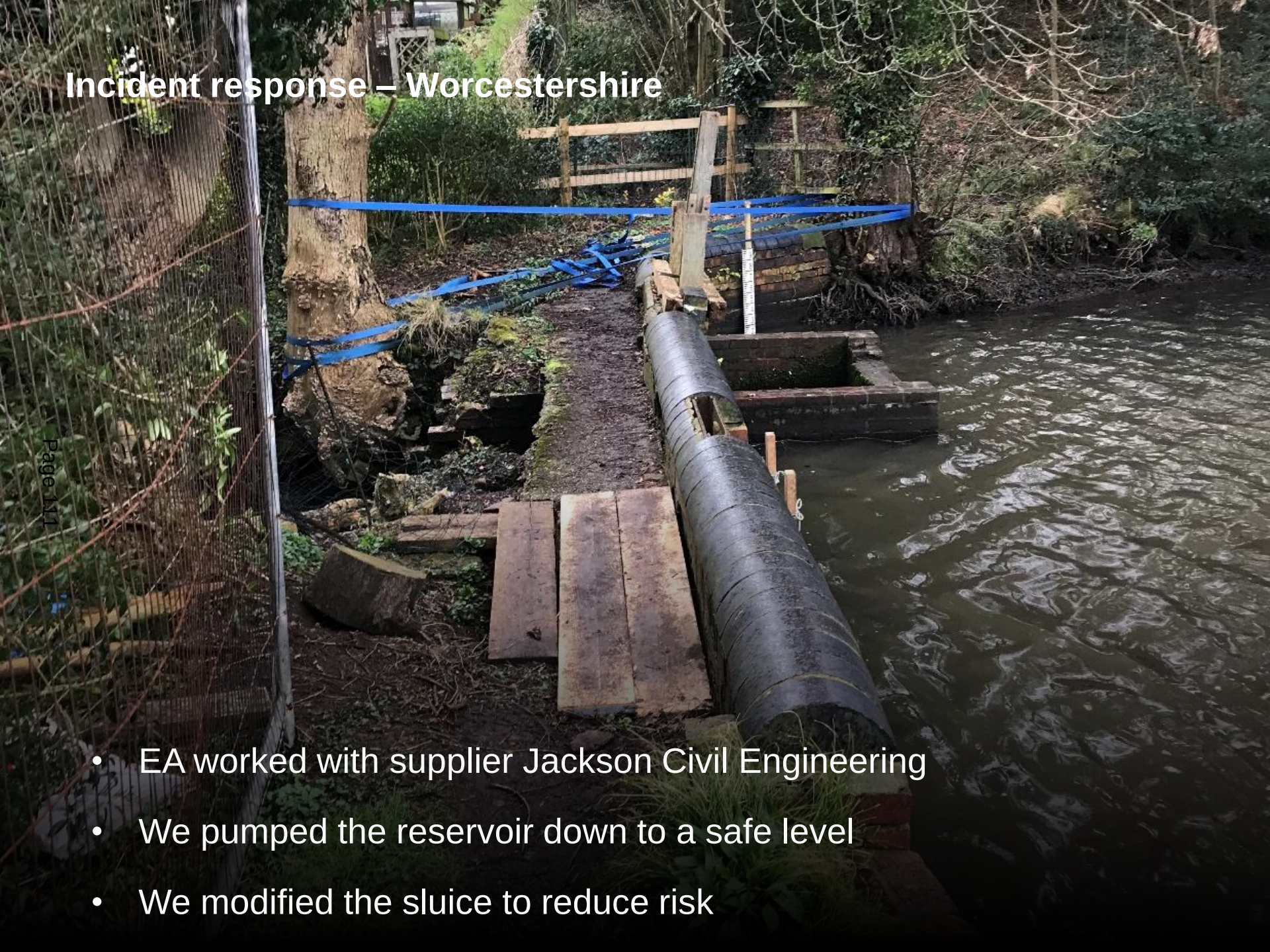
Blakedown Pool

Private reservoir on Blakedown Brook near Bromsgrove

Incident response – Worcestershire

- Report of historic sluice structure in poor condition after Storm Dennis
- More rain forecast

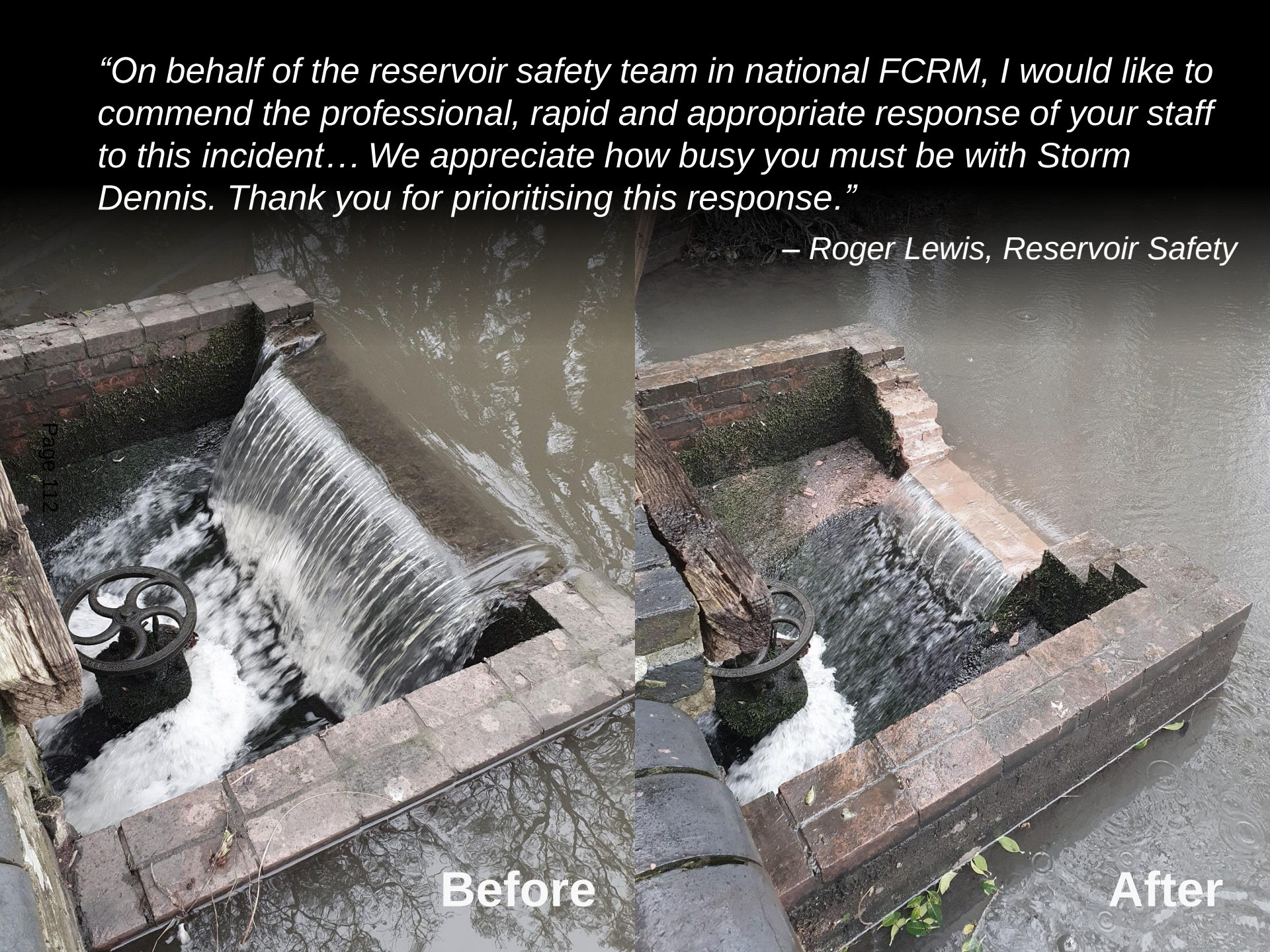
Incident response – Worcestershire



- EA worked with supplier Jackson Civil Engineering
- We pumped the reservoir down to a safe level
- We modified the sluice to reduce risk

“On behalf of the reservoir safety team in national FCRM, I would like to commend the professional, rapid and appropriate response of your staff to this incident… We appreciate how busy you must be with Storm Dennis. Thank you for prioritising this response.”

– Roger Lewis, Reservoir Safety



Community: Hylton Road, Worcester

Flooding mechanism: high levels on the River Severn resulted in the flooding of low lying land and the A44.

The River Severn road bridge was closed to all traffic at the peak of the event.

Numbers impacted: 0 properties were reported to have been impacted by flooding.

(11 properties have been reported as flooded on the east bank near the race course)

Flood warnings issued: No Flood Warnings issued for Hylton Road.

Peak river level: Worcester gauge: 5.79m ASD on the 27 February 2020.

This is the highest recorded level since the gauge was installed in 2005. This gauge reached 5.63m ASD in July 2007 and 5.74m ASD February 2014.

EA assets: a combination of flood banks and flood walls along the river bank combined with a length of demountable flood barrier across the A44 prevents 20 properties from flooding.

EA operation of assets: the EA demountable barrier across Hylton Road was deployed twice during February 2020. Firstly on the 16 February and again on the 25 February 2020.

Severn Trent Water deployed pumps to over pump surface water and sewage collecting behind the defence during February 2020. Large volumes of surface water is frequently a challenge to manage. The EA supported by providing additional pumps to help pump surface water at peak flows.

Community engagement: EA staff attended site to both inspect the EA assets and to talk to local residents.

Post flood work: work has been undertaken to check the assets for any damage and to undertake repairs where required – a repair to a section of erosion caused by the over pumping and minor superficial wall repairs.

The demountable barriers have since been cleaned and serviced, and are now stored ready for the next deployment.

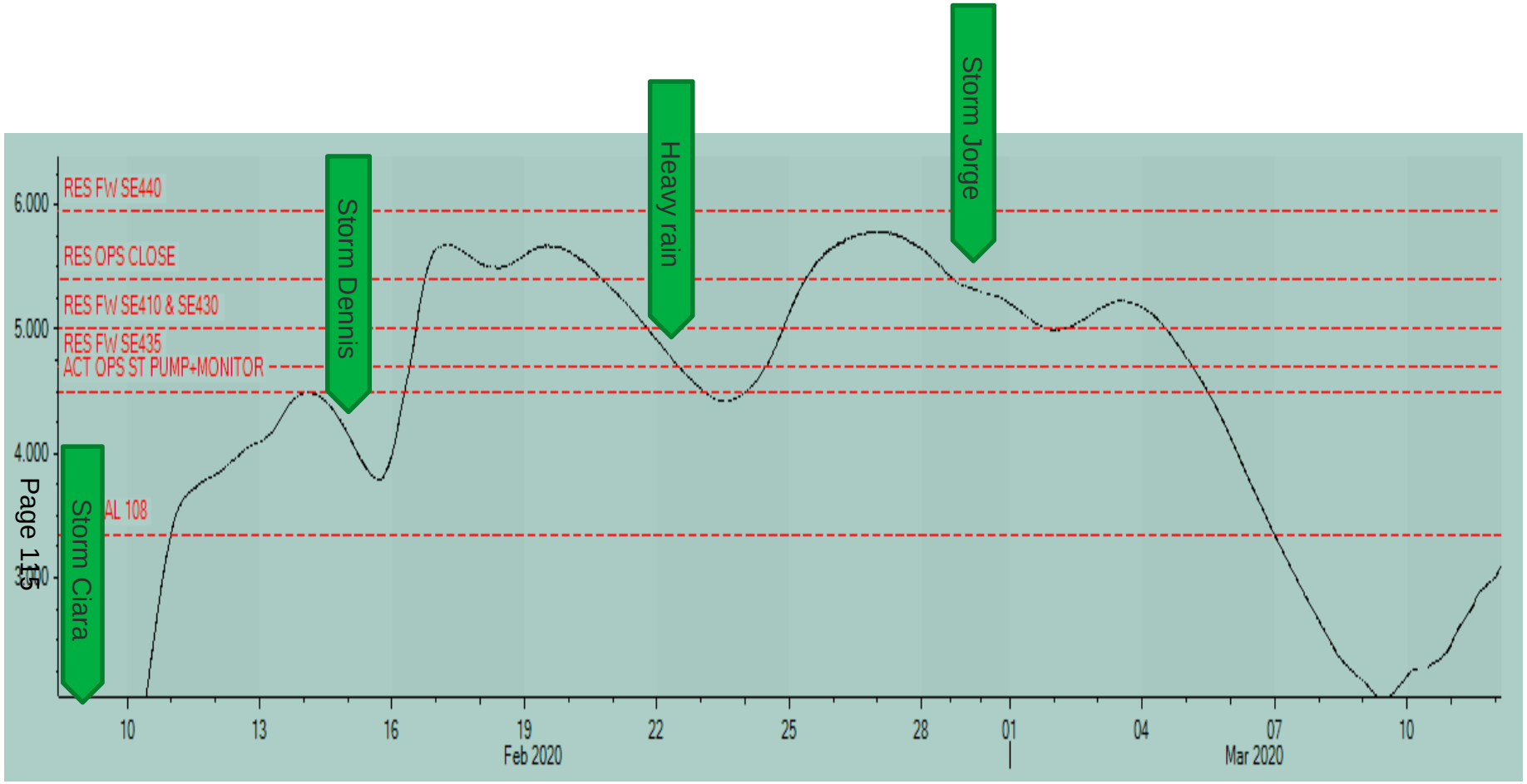
Severn Trent Water are investigating long term options to manage surface water at Hylton Road.

Environment Agency

Incident response – Worcestershire

Worcester

- Highest recorded level (50cm from top of barriers)
- EA deployed demountable barriers, gates and pumps on Hylton Rd
- Severn Trent water pumps deployed
- 20 properties benefitting from defences



Worcester gauge levels on the River Severn, February 2020 (m ASD)

Environment Agency

Community: Diglis Parade, Worcester

Flooding mechanism: high river levels on the River Severn caused property flooding in the Diglis area of Worcester.

Numbers impacted: 30 properties were reported to have been impacted by flooding.

Flood warnings issued: Flood Warning issued for South Worcester on the 16 February 2020.

Peak river level: Worcester gauge: 5.79m ASD on the 27 February 2020. This is the highest recorded level since the gauge was installed in 2005. This gauge reached 5.63m ASD in July 2007 and 5.74m ASD February 2014.

Diglis gauge: 5.28m ASD on the 17 February 2020, and again reached 5.1m ASD on the 26 February 2020.

The highest recorded level at the Diglis gauge is 5.58m ASD in 1947. Levels reached 5.3m ASD during July 2007.

Reference 1998 XXXXXXXXXXXXXX

EA assets: the EA has no built assets on the River Severn other than at Hylton Road.

Note: properties at Diglis Parade previously had a project to raise floor levels to reduce flood risk. This was undertaken during the 1990's.

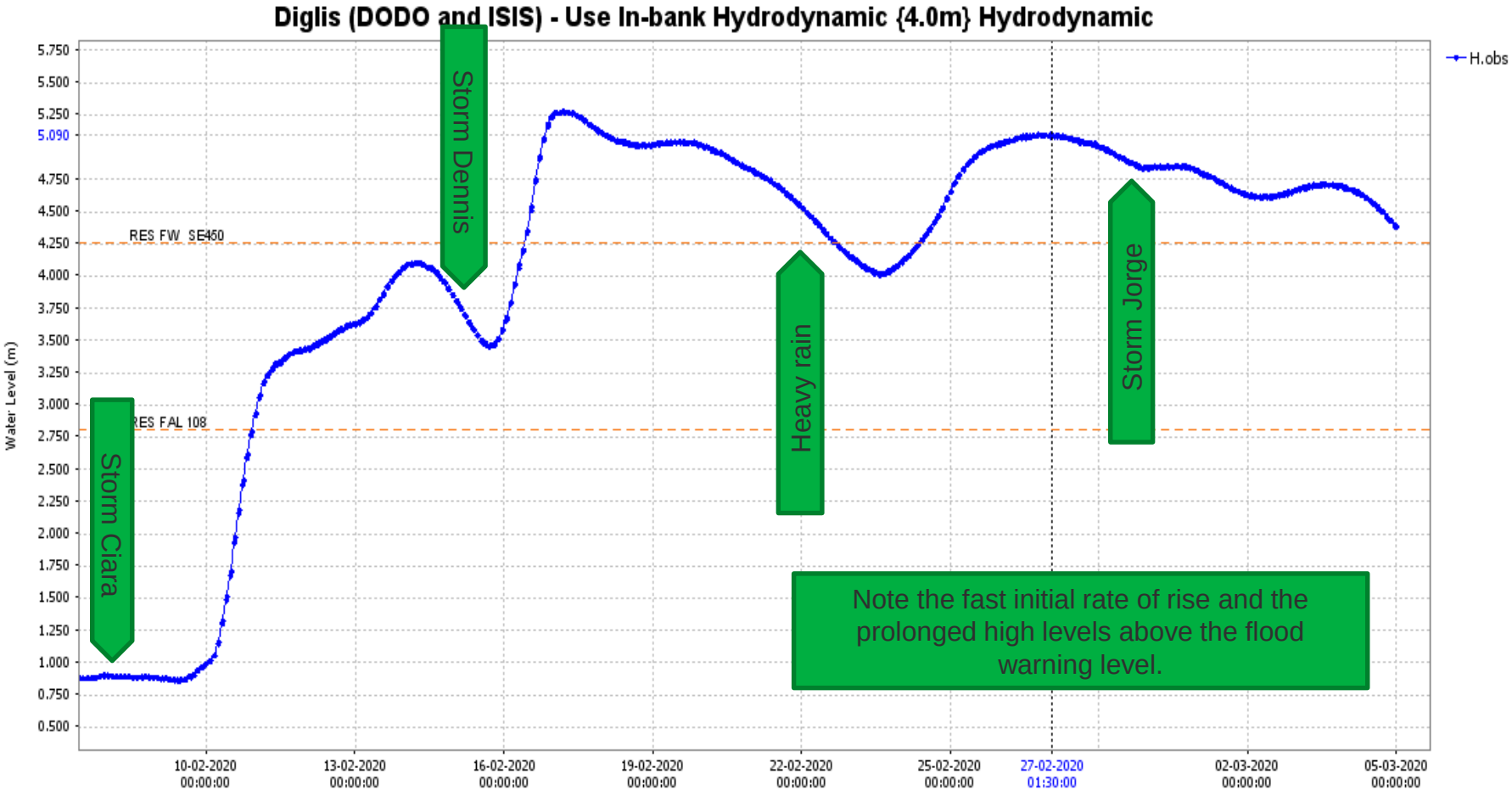
EA operation of assets: N/A

Community engagement: following the flooding there has been engagement between the residents and the EA looking at longer term options.

Post flood work: further community engagement is being planned for when Covid-19 restrictions allow.

Property Level Resilience is being considered for the properties but may not be suitable for all properties in the area. A permanent scheme is unlikely for the area.

Environment Agency



River Severn levels at the Diglis gauge, Worcester, February 2020 (m ASD)

Environment Agency

Community: Powick

Flooding mechanism: Peak of Storm Ciara on the Severn met with the peak of Storm Dennis on Teme at Powick.

The scheme was overtopped as the River Teme peak arrived on the 16 February 2020. Approximately 20 properties were flooded.

At this peak the A449 flooded, closing the main road between Worcester and Malvern.

Numbers impacted: 20 properties were reported to have been impacted by flooding.

Flood warnings issued: Flood Warning issued on the 16 February 2020.

Peak river level: Bransford Bridge gauge: 5.9m ASD on the 16 February 2020.

This is below the July 2007 peak level of 6.08m ASD.

EA assets: following the July 2007 floods the EA delivered a raised earth flood bank to reduce flood risk from the River Severn and the River Teme.

EA operation of assets: the scheme built following the July 2007 floods was overtopped as the River Teme exceeded the defence level at 5.7m ASD on the 16 February 2020. Approximately 20 properties were flooded.

As levels on the River Teme receded, additional EA mobile pumps and the existing pumps were used to evacuate water from behind defence over 4 days.

The scheme prevented further property flooding during the following storms.

The EA deployed pumps to manage surface water behind the defence. These pumps are monitored by EA officers.

Community engagement: EA officers attended Powick to talk to resident and to record data.

Post flood work: an initial assessment is underway looking at what can be done to reduce flood risk for the area. This IA is expected in the autumn.

The IA will also undertake a high level review of the highway flood risk. It is likely that any scheme improvement would only be possible as part of a collaborative project with Worcestershire County Council to also raise the road.

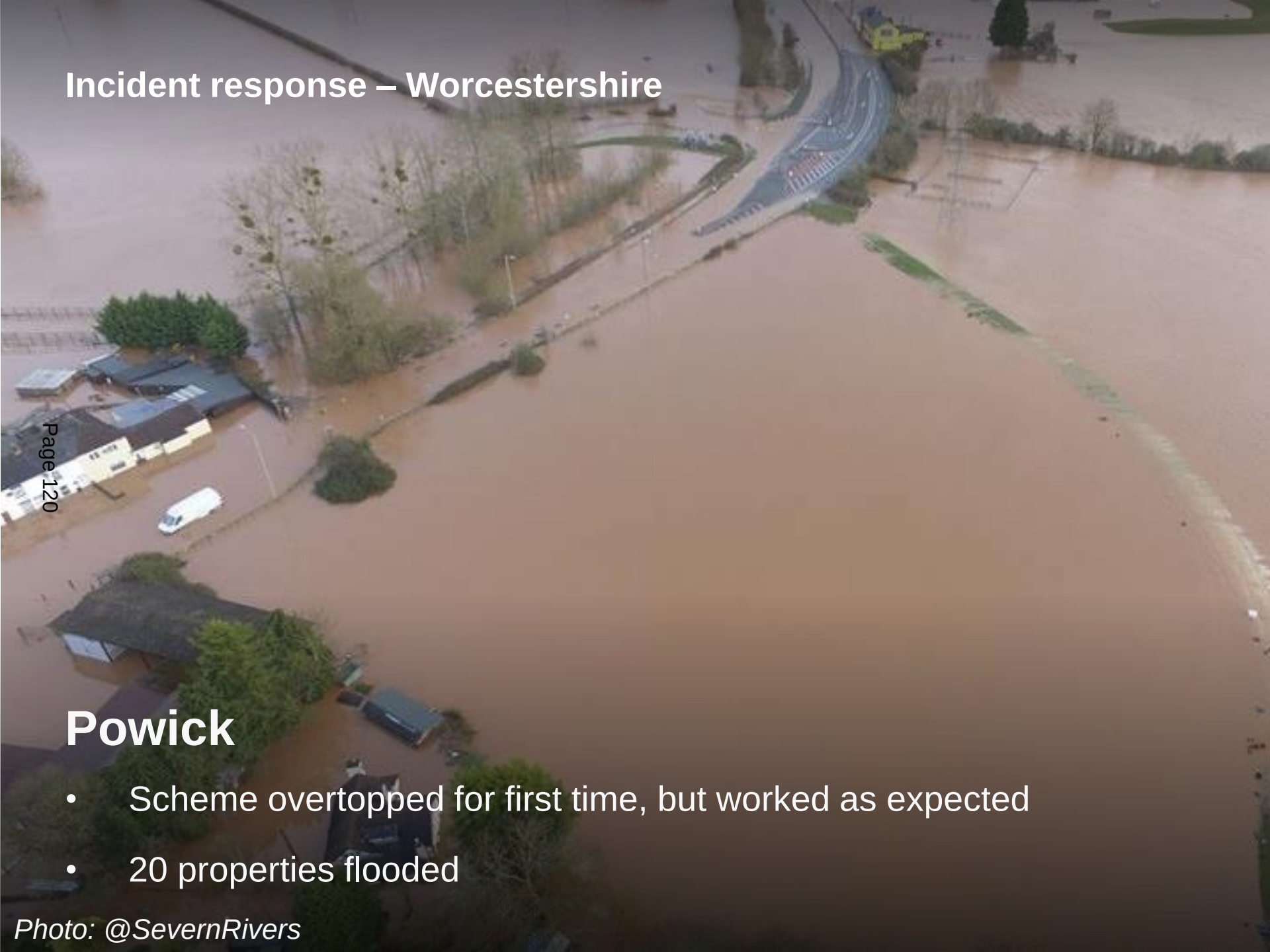
Environment Agency

Incident response – Worcestershire

Powick

- Separate peaks on Teme (Dennis) and Severn (Ciara) met at Powick
- Levels not as high as in 2007

Incident response – Worcestershire



Powick

- Scheme overtopped for first time, but worked as expected
- 20 properties flooded

Photo: @SevernRivers

Incident response – Worcestershire

Powick

- EA pumps drew down levels behind defences over 4 days

Community: Kempsey

Flooding mechanism: high river levels on the River Severn flooded low lying land and properties outside the defended area.

Numbers impacted: 3 properties were reported to have been impacted by flooding – these properties are located outside of the defended area.

Flood warnings issued: Flood Warning issued for the 17 properties outside the defended area on the 12 February 2020.

Peak river level: Kempsey Yacht Club gauge: 7.47m ASD on the 17 February 2020.

This equalled the July 2007 peak level of 7.46m ASD.

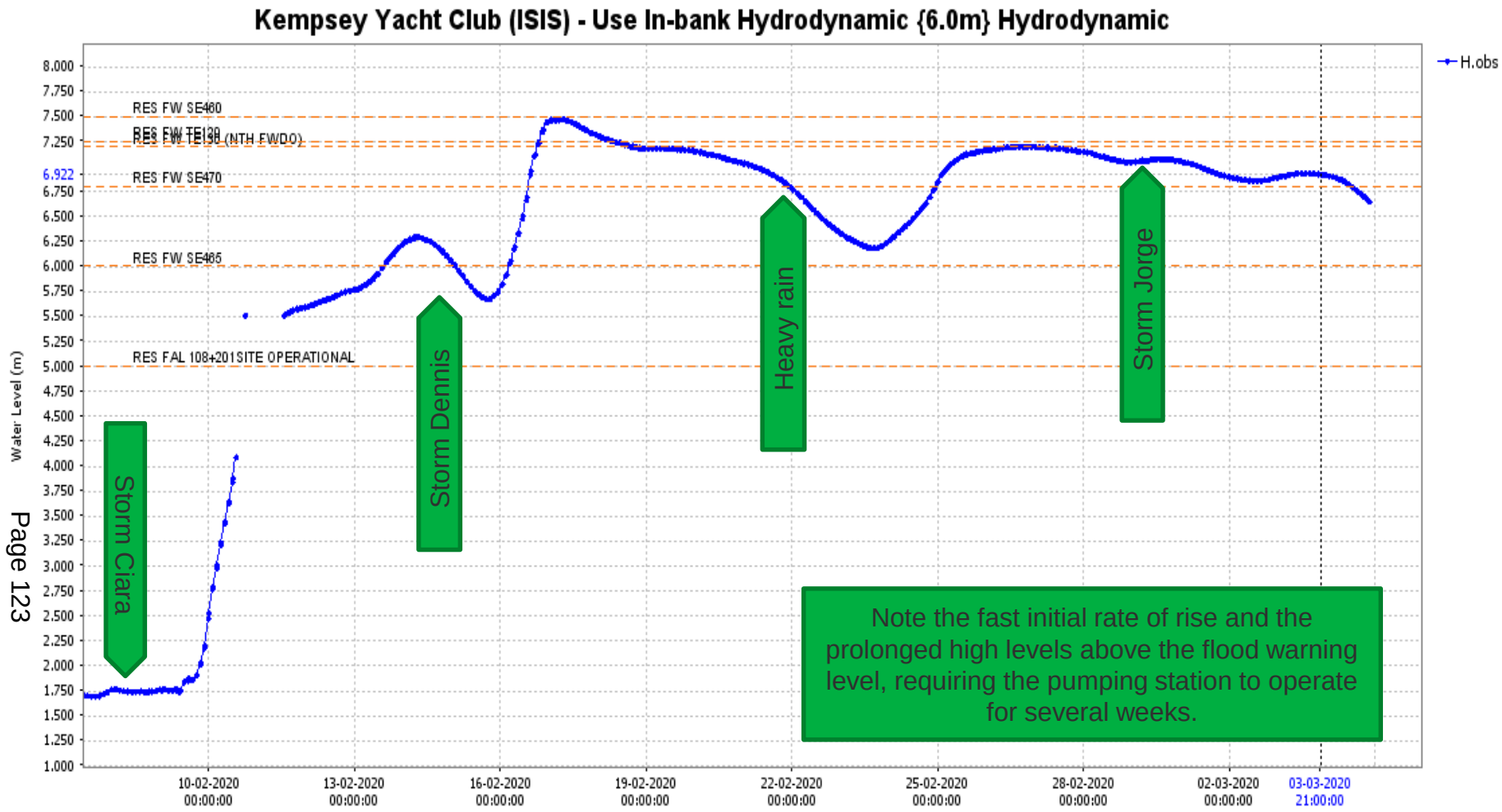
EA assets: following the July 2007 floods the EA delivered a raised earth flood bank and pumping station to reduce flood risk from the River Severn and the Hatfield Brook for 45 properties.

EA operation of assets: the scheme operated as designed with no issues. The scheme was constantly monitored remotely using the site telemetry.

Community engagement: engineers attended the site to check the operation of the assets and spoke to residents while also collecting flood data.

Post flood work: following the flooding, the assets have been inspected and minor repairs undertaken as required.

Environment Agency



River Severn levels at the Kempsey Yacht Club gauge, February 2020 (m ASD)

Environment Agency

Community: Severn Stoke

Flooding mechanism: high river levels on the River Severn flooded low lying land and properties.

When the flood bank directly adjacent to the river overtopped the land behind took several days to fill with river water before property flooding finally occurred.

Numbers impacted: ~10 properties were reported to have been impacted by flooding.

Flood warnings issued: Flood Warning issued for the 22 properties at Severn Stoke on the 16 February 2020.

Peak river level: Kempsey Yacht Club gauge: 7.47m ASD on the 17 February 2020.

This equalled the July 2007 peak level of 7.46m ASD.

It is worth noting that Severn Stoke is located approximately half way between the Kempsey Yacht Club gauge and the Saxon's Lode gauge. Residents have reported that levels within the village were approximately 300mm lower than 2007. This aligns with the Saxons Lode gauge which was approximately 500mm lower than the 2007 levels.

EA assets: adjacent to the river there are flood banks that run between Worcester and Tewkesbury to reduce flood risk. These flood banks have a relatively low level and are primarily to reduce flood risk to agricultural land.

EA operation of assets: the EA provided sandbags for the community to help allow residents to prepare their properties for flooding.

Community engagement: CIOs attended site during the event.

Post flood work: a community scheme is currently being progressed with the planning application submitted spring 2020.

Following the flooding, the riverside flood banks were inspected for damage. Several small areas are to have minor damage repaired summer 2020 to reinstate the flood bank level.

Environment Agency

Community: Upton upon Severn

Flooding mechanism: very high river levels were experienced at Upton upon Severn for a duration of four weeks.

Levels experienced were the highest recorded since the current scheme along the waterfront and at New Street was built in 2012.

Peak levels forecast in response to Storm Dennis suggested that the New Street and Waterfront defences could be overtopped, however levels did not overtop the defences.

The high river levels resulted in the East Waterside scheme being overtopped and approximately 6 properties flooding.

Numbers impacted: 6 properties were reported to have been impacted by flooding at East Waterside.

No properties were reported to have flooded in the main town.

A further 6 properties have been reported as flooded in the local area.

Flood warnings issued: Severe Flood Warning issued 17 February 2020 due to forecast levels suggesting that the scheme could be exceeded. Fortunately levels did not reach the maximum forecast level and the scheme was not overtopped.

Peak river level: Saxons Lode gauge: 5.49m ASD on the 17 February 2020. This is the largest flood event since the scheme was completed in 2012.

Levels reached 5.92m AOD in 2007 and 6.06m ASD in 1947.

EA assets: at East Waterside there is a flood bank that reduces flood risk to approximately 6 properties on the left bank. Most properties also have private PFR measures.

Within the main town there is a flood wall with flood gates along the riverside, reducing flood risk to ~40 properties.

There is a further flood bank to the west of the village, with a large highway flood gate at New Street, reducing flood risk to a further ~40 properties.

EA operation of assets: the EA managed the flood gates at waterfront and New Street, with all needing to be closed.

The EA managed surface water using mobile pumps.

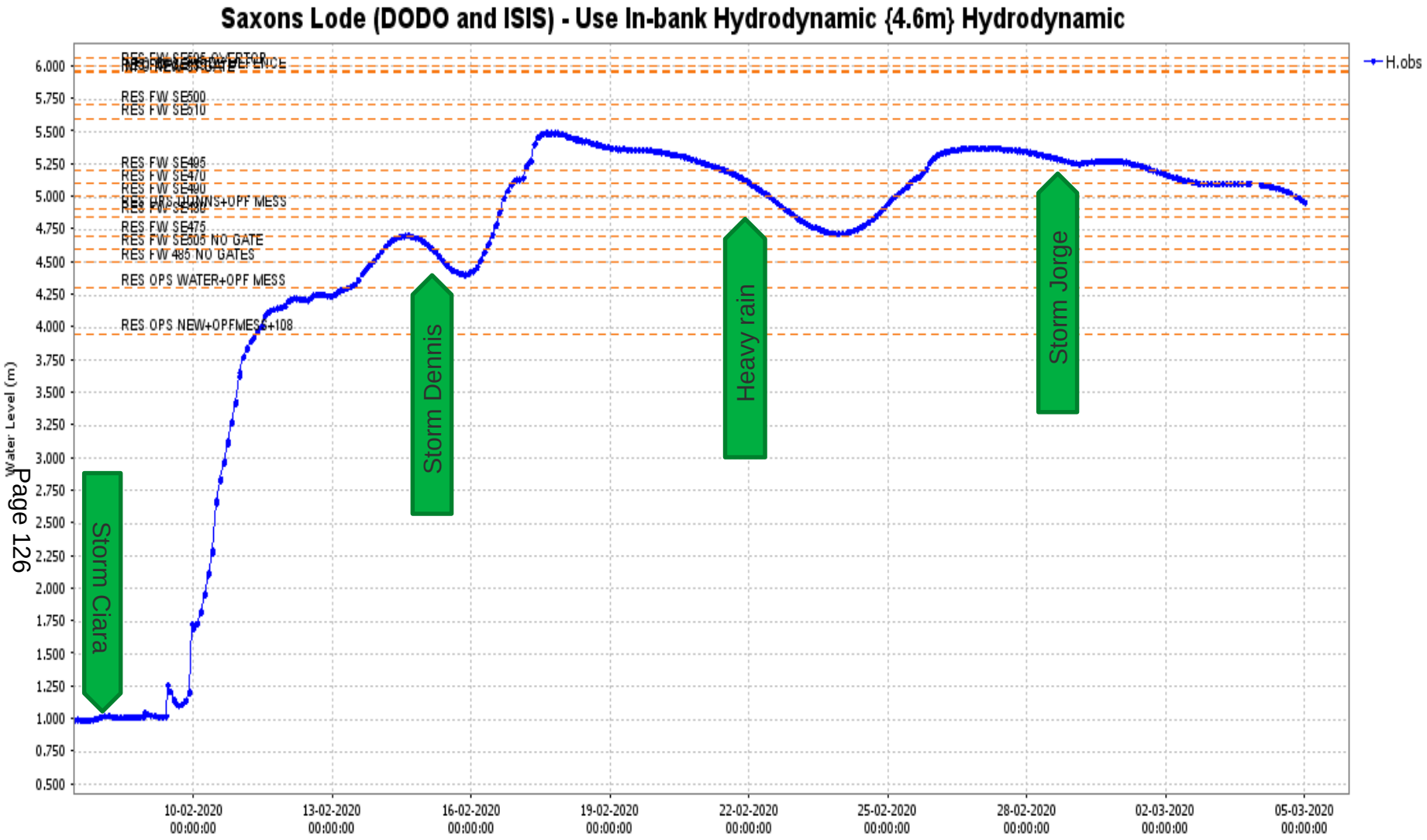
Severn Trent Water managed sewage and surface water using mobile pumps setup adjacent to The Swan public house.

The EA enacted a contingency plan at New Street flood gate when there was risk of the levels overtopping the flood gate.

Community engagement: the EA had officers at the Bronze Cell set-up in Upton upon Severn to help manage the potential evacuation of properties.

Post flood work: following the flooding, all assets have been inspected and minor repair work undertaken. As part of this work the flood gate seals are being replaced summer 2020.

Environment Agency



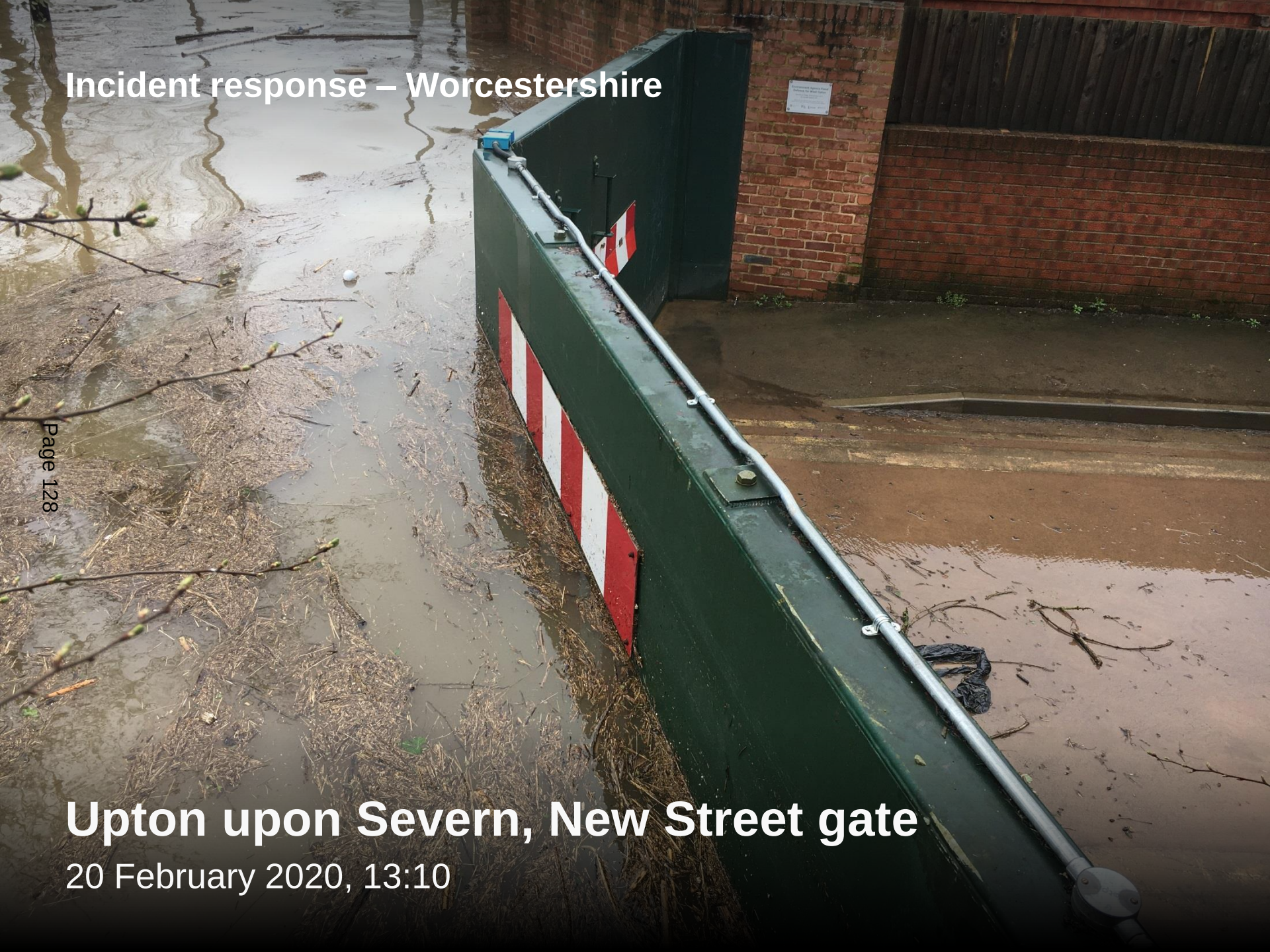
River Severn levels at the Saxons Lode gauge, February 2020 (m ASD)

Environment Agency

Incident response – Worcestershire

Upton upon Severn, Waterside defences

27 February 2020, 13:30



Incident response – Worcestershire

Upton upon Severn, New Street gate

20 February 2020, 13:10

Incident response – Worcestershire

New Street gate contingency work

26 February 2020

Community: Uckinghall

Flooding mechanism: high levels on the River Severn resulted in the flood bank directly adjacent to the river to be overtopped.

The farm land behind this defence filled, resulting in water against the community defence at the Uckinghall village.

Numbers impacted: 1 properties were reported to have been impacted by flooding that is situated adjacent to the river by the fishing pond.

Flood warnings issued: Severe Flood Warning issued on the 17 February 2020.

Peak river level: Saxons Lode gauge: 5.49m ASD on the 17 February 2020. This is the largest flood event since the scheme was completed in 2011.

Levels reached 5.92m ASD in 2007 and 6.06m ASD in 1947.

EA assets: a flood bank, flood gate and pumping station to manage surface water reduce flood risk to 35 properties within the village. This scheme was built following the July 2007 floods.

EA operation of assets: the flood gate was closed by the Uckinghall Flood Action Group (UFAG).

Mobile pumps operated by the EA adjacent to the flood gate managed surface water behind the defence.

Community engagement: CIOs and engineers attended the site during the event to talk to residents and to inspect the assets.

Post flood work: following the flooding, all assets have been inspected and minor repair work undertaken.

Environment Agency

Incident response – Worcestershire

Uckinghall

27 February 2020, 15:30

Community: Kidderminster & Stourport

Flooding mechanism: high levels on the River Stour caused flooding to low lying land and properties.

Property flooding was experience at Wolverley from a tributary of the River Stour.

Numbers impacted: 11 properties were reported to have been impacted by flooding at Wolverley.

Flood warnings issued: Flood Warning issued 16 February 2020.

Peak river level: Puxton gauge (within the storage area): 4.29m ASD on the 17 February 2020.

July 2007 levels reached 4.43m ASD within the flood storage reservoir.

EA assets: the Kidderminster flood risk management scheme consists of an engineered channel through the town and a flood storage area. This scheme reduces flood risk to over 500 properties

In addition, some properties have private PFR measures.

EA operation of assets: EA Deputy Catchment Engineer inspected the reservoir along with the reservoirs Panel Engineer.

Community engagement: EA staff attended these locations to collect data and to talk to local residents.

Post flood work: a Natural Flood Management scheme is planned for the Wolverley catchment.

Following the flooding, all assets were inspected and minor repairs undertaken to ensure the scheme is ready for the next flood event.

Environment Agency

Kidderminster flood storage area controlling flood water and reducing flood risk

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