Cirencester Civic Society: Encouraging a sense of pride

The waterways of Cirencester
Issues, solutions & people

Friends of the Gumstool Brook

The Ashcroft Centre
Cirencester
19th May 2025

Waterways of Cirencester

Content

1. Waterway issues
2. Cotswolds rivers: Natural influences
3. Waterways & the impact of people
4. Delivering solutions
5. The role of citizen science
6. Community engagement & partnerships

Waterway issues

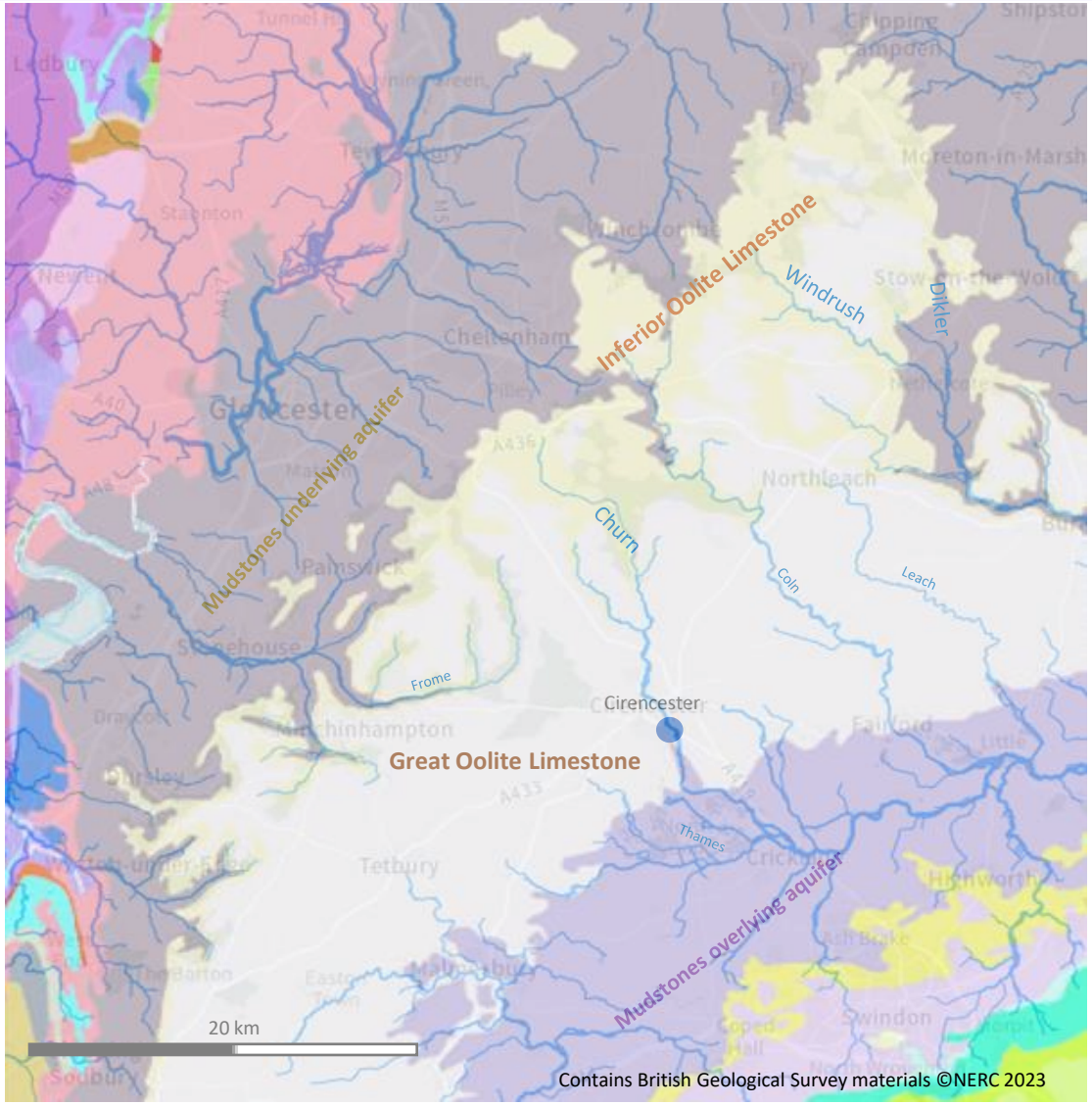
Does this capture all of the issues and concerns?

1. Flooding
2. Water quality
3. Low flow & drought
4. Wildlife & ecology
5. Amenity & wellbeing

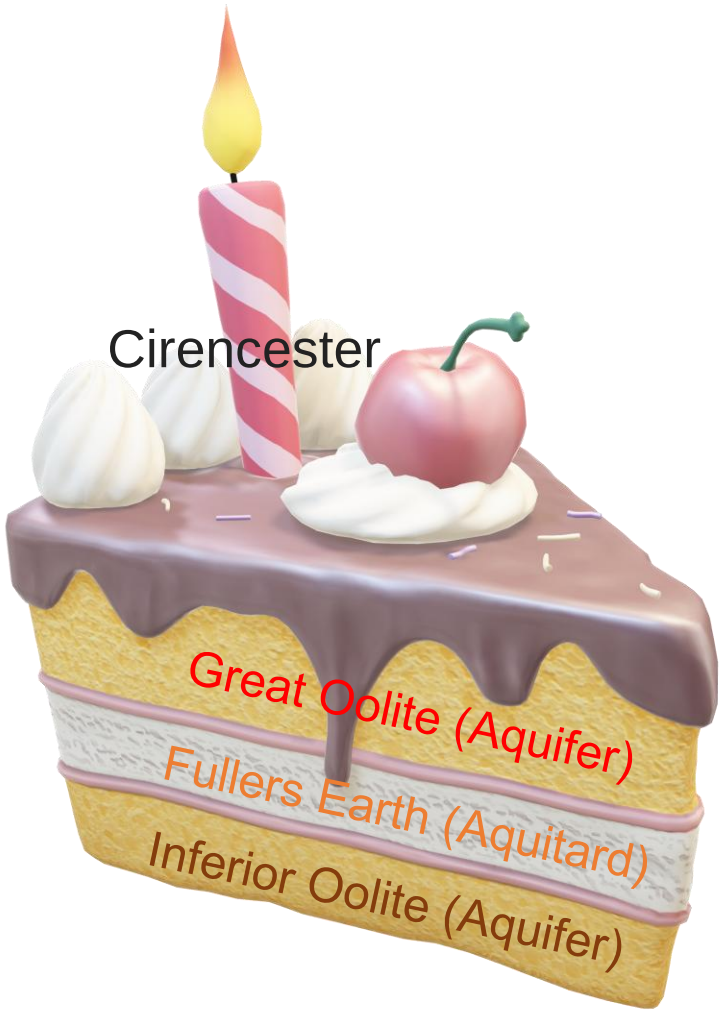
Word Cloud from the Cirencester Waterways Symposium 2024

River characteristics: Influence of geology

- Geology underpins the characteristics of the Cotswolds landscape, its topography, soils & drainage
- The geology of the Cotswolds is dominated by 160 to 200 million years old Jurassic bedrock
- It’s a layer cake of limestones and mudstones
- Originally a marine environment with fluctuating sea levels with limestones formed in warm shallow seas
- Disrupted by plate tectonics & geological faults
- Shaped by glaciation & rivers over the last 0.5 million years, with deposits of gravel & alluvium



Cirencester geology: Keeping it simple

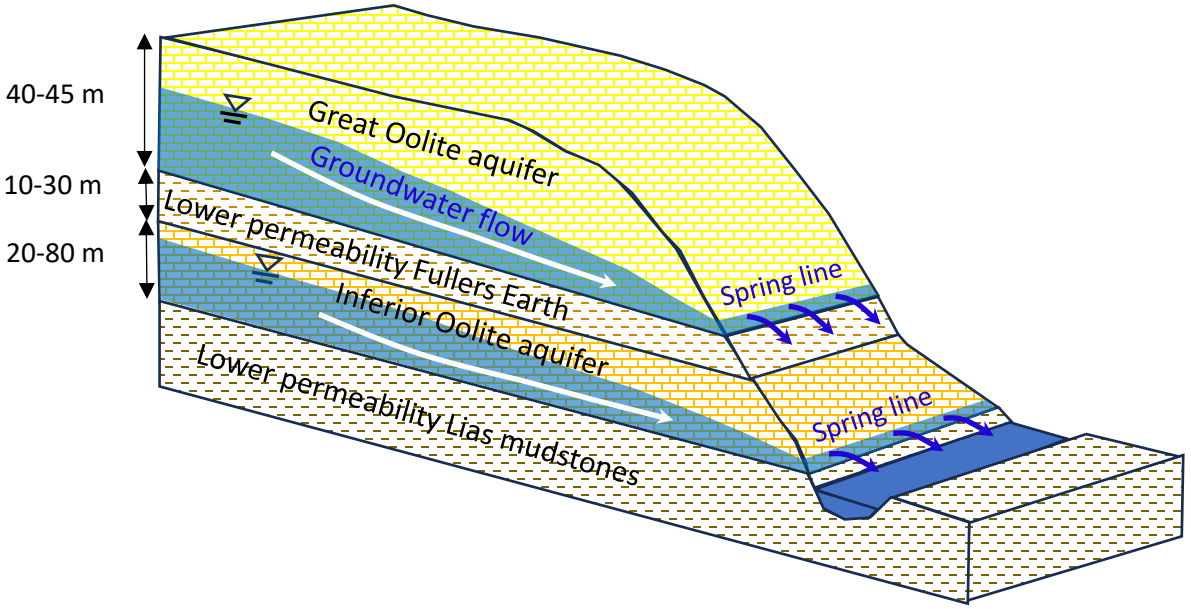


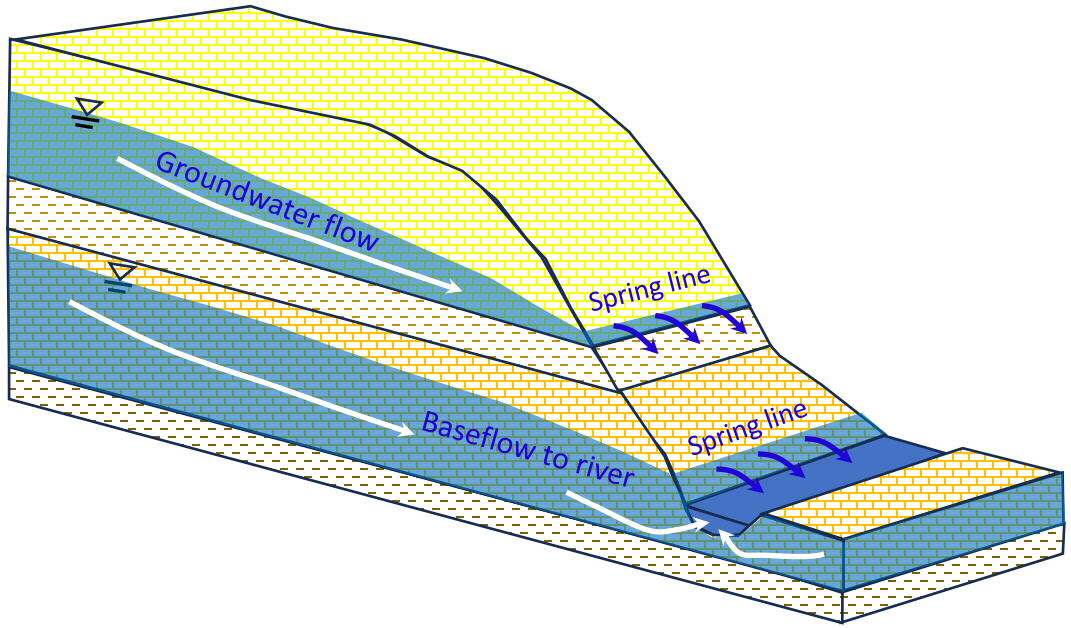
Layer cake of permeable limestones (aquifer) separated by a low permeability layer (aquitard)

Cut into slices by geological faults

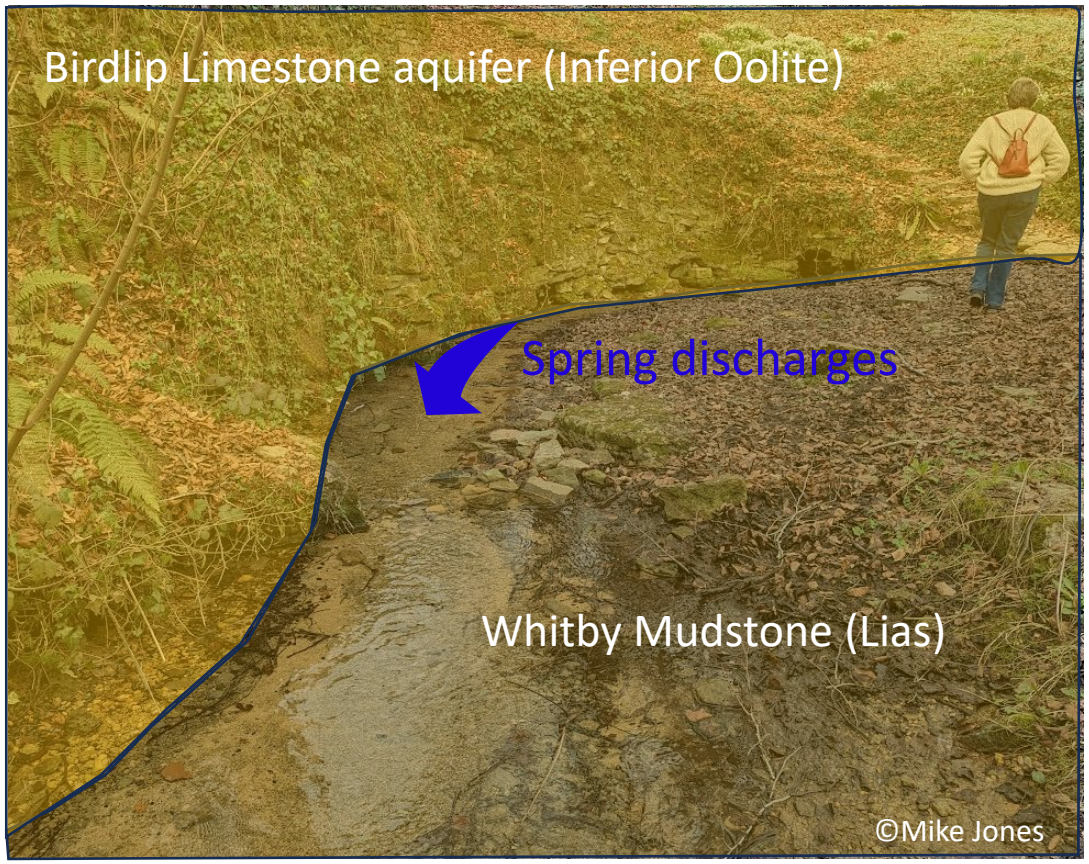
Geology, groundwater & rivers: Interactions

- Key geological feature is the layering of permeable limestone & gravel aquifers with low permeability mudstones & clays with underlie, separate and overlie them
- Creates strong influence on groundwater & river interactions
- Baseflow from aquifers to rivers, with rainfall runoff mainly from non-aquifers
- Leakage from rivers to aquifers – natural & induced



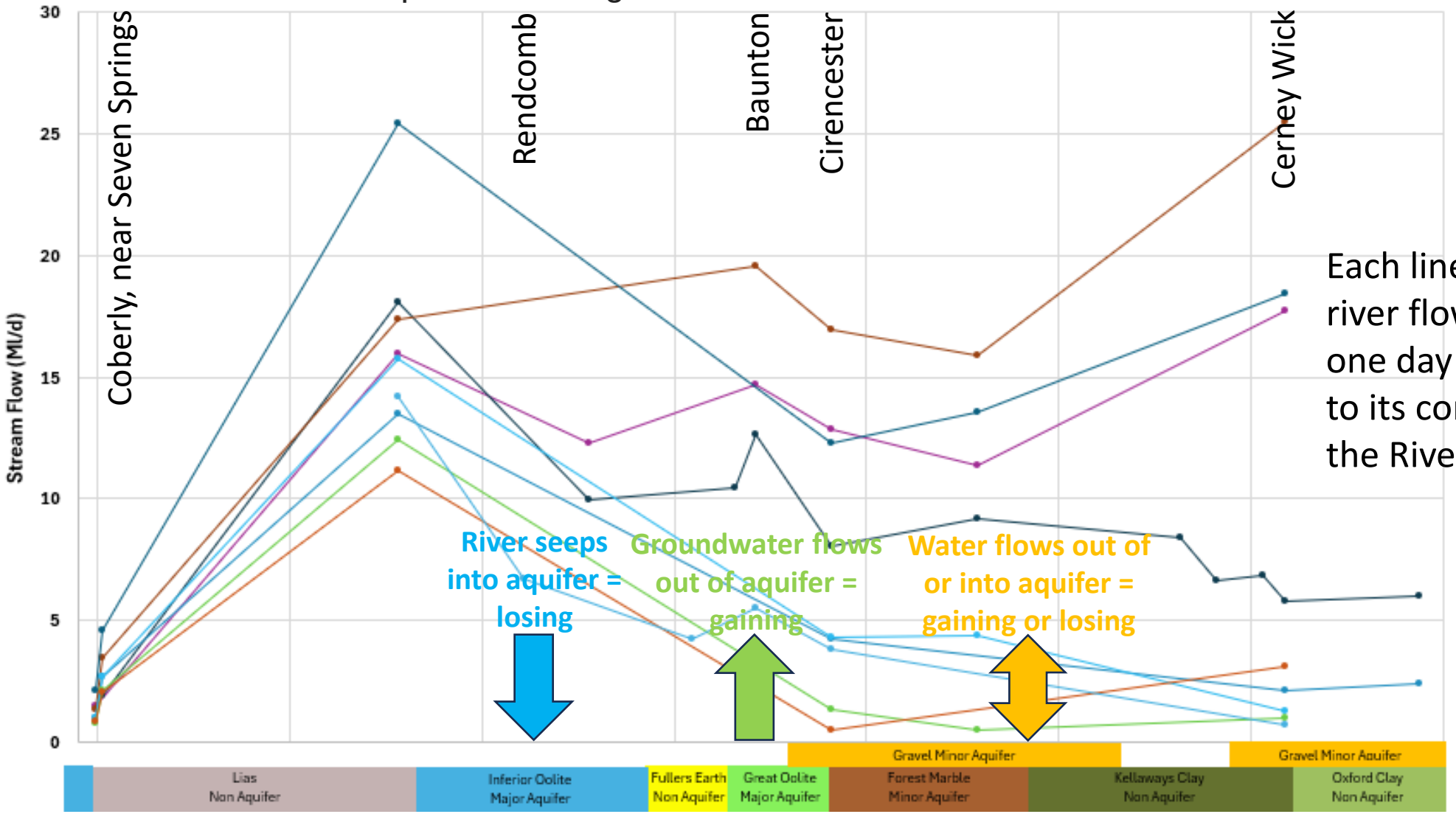


Seven Springs, source of the Churn



Geology, groundwater & rivers: Interactions

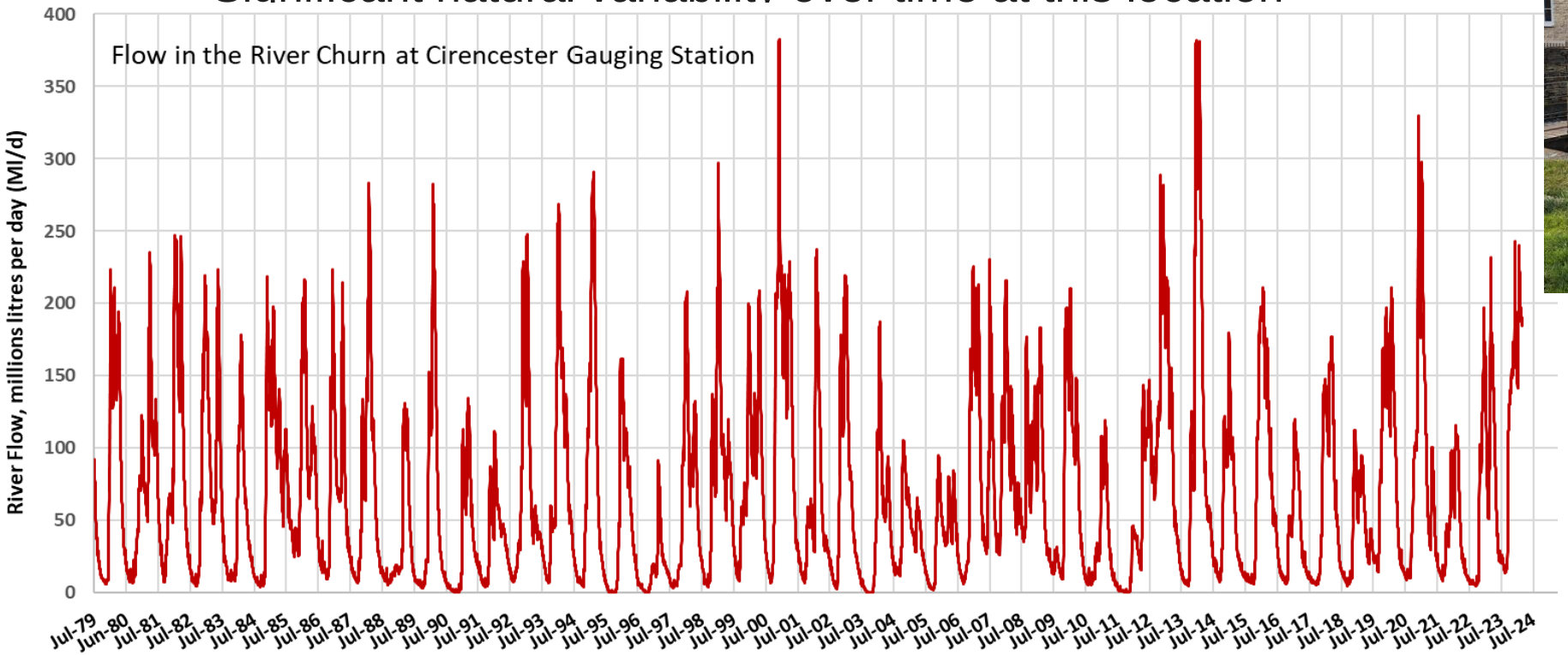
- Focus on low river flow periods during 1980 to 1998



Each line represents river flow measured on one day from its source to its confluence with the River Thames

River Churn flows: From drought to flood

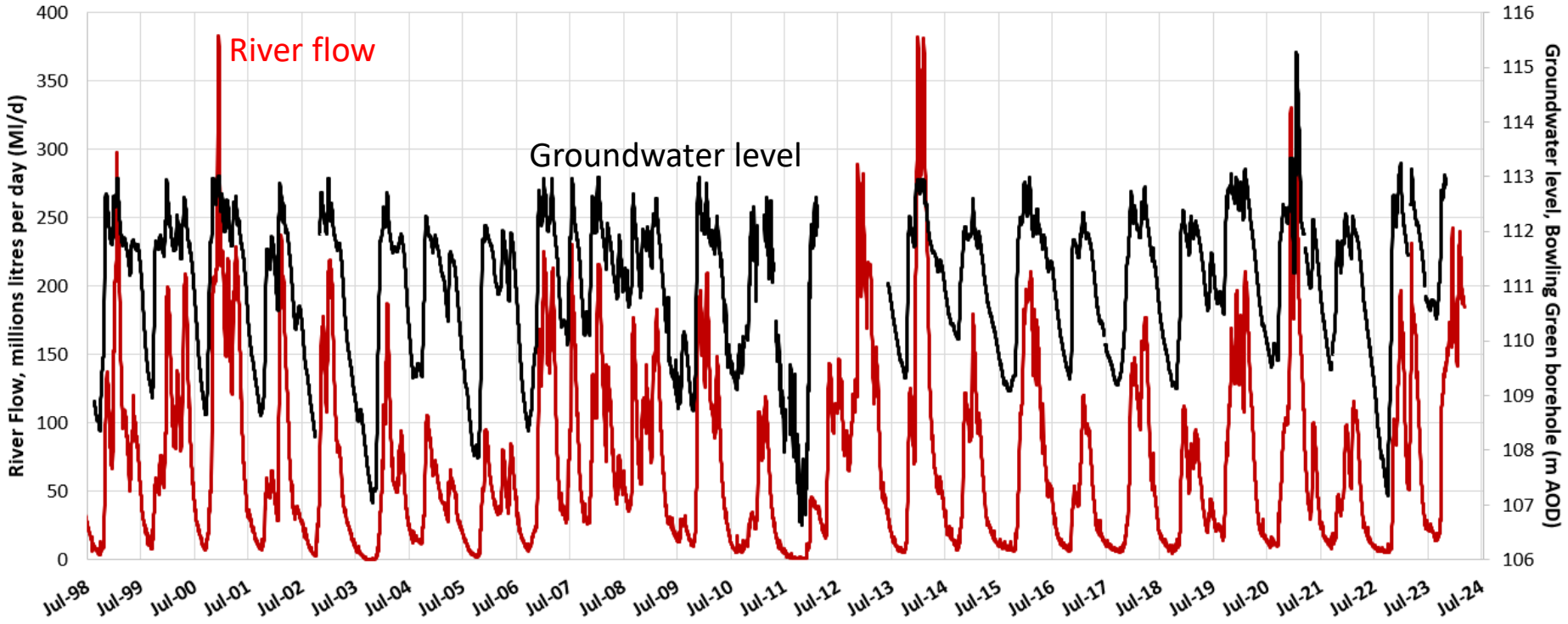
- The River Churn: Most visible component of the water environment, with floods and low flows
- Characterised by a wide range of flow rates, as illustrated by EA flow data:
  - Very low flows, e.g. 1995, 2003 (dry), 2011
  - Exceptionally high in 2000 & 2014
- Significant natural variability over time at this location



River Churn at Gloucester Street sluice & Barton Mill offtake to Daglingworth Stream

River Churn flows & groundwater

- Why does flow in the River Churn vary during each year and from year to year?
  - Weather: rainfall & temperature – How wet & how much evaporation
  - Plant growth – Using water & evapotranspiration
- There is a clear, but not perfect relationship between groundwater level fluctuations & river flows
  - River Churn flow at the EA Cirencester gauging station
  - Groundwater levels in the Great Oolite aquifer along Bowling Green Lane

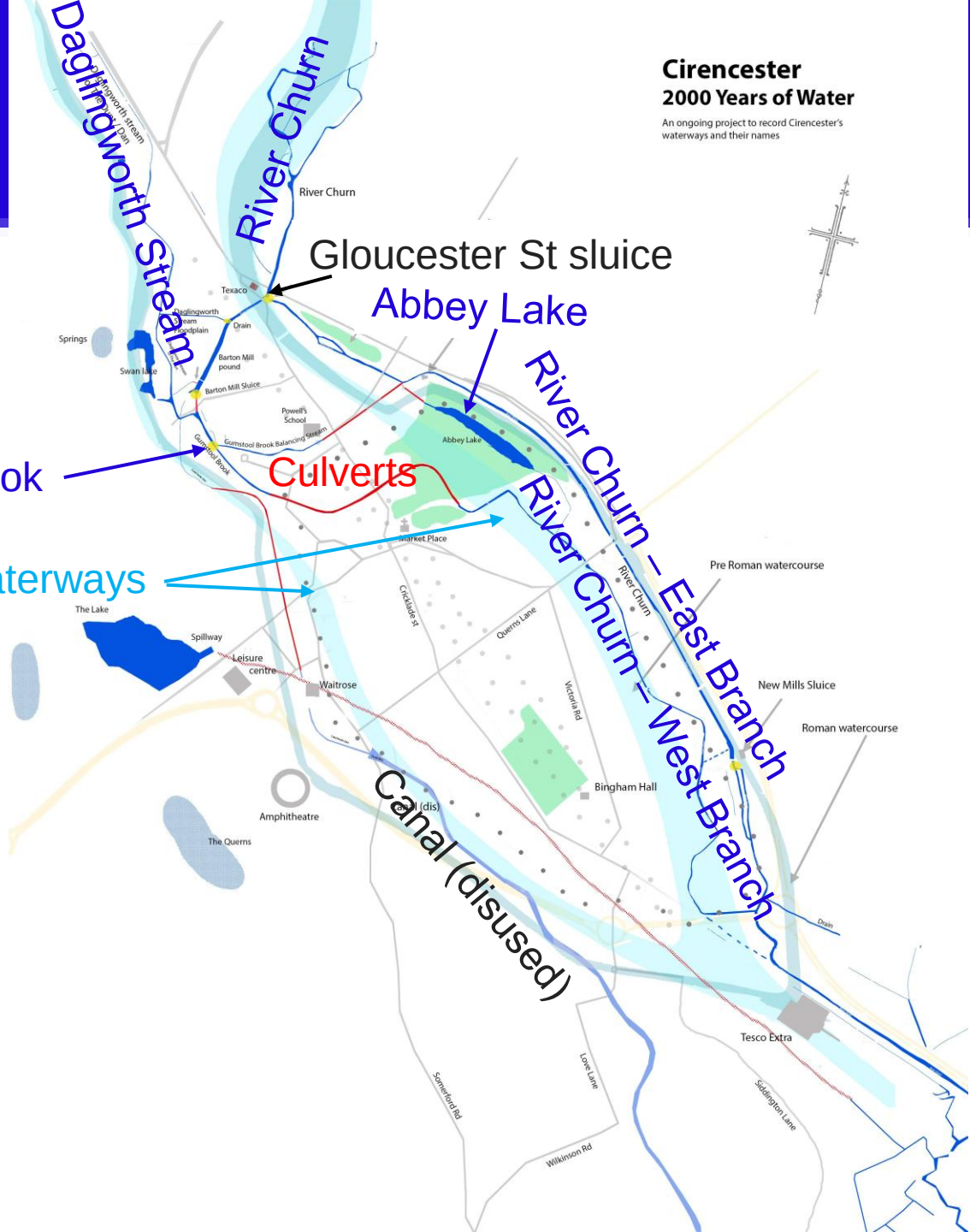


Waterways & people

- Bedrock geology is 160 to 200 million years old
- Superficial deposits have formed during the last 0.5 million years
- Both provide the foundation for current flows of rainfall, groundwater and rivers through the environment
- There have been 2000 years of people modifying the water environment in and around Cirencester

Waterways & people

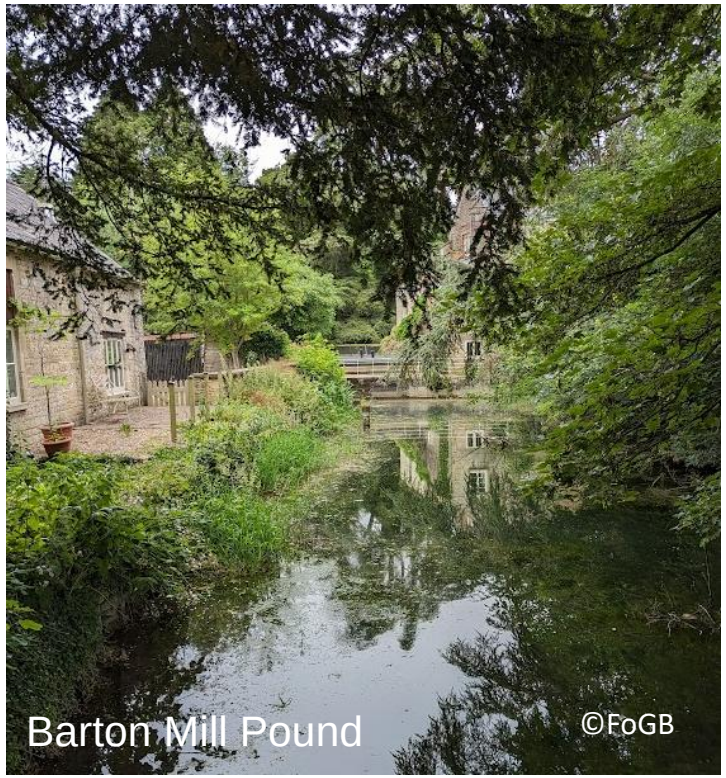
- Summary of key features, as this map appears in several of the following slides



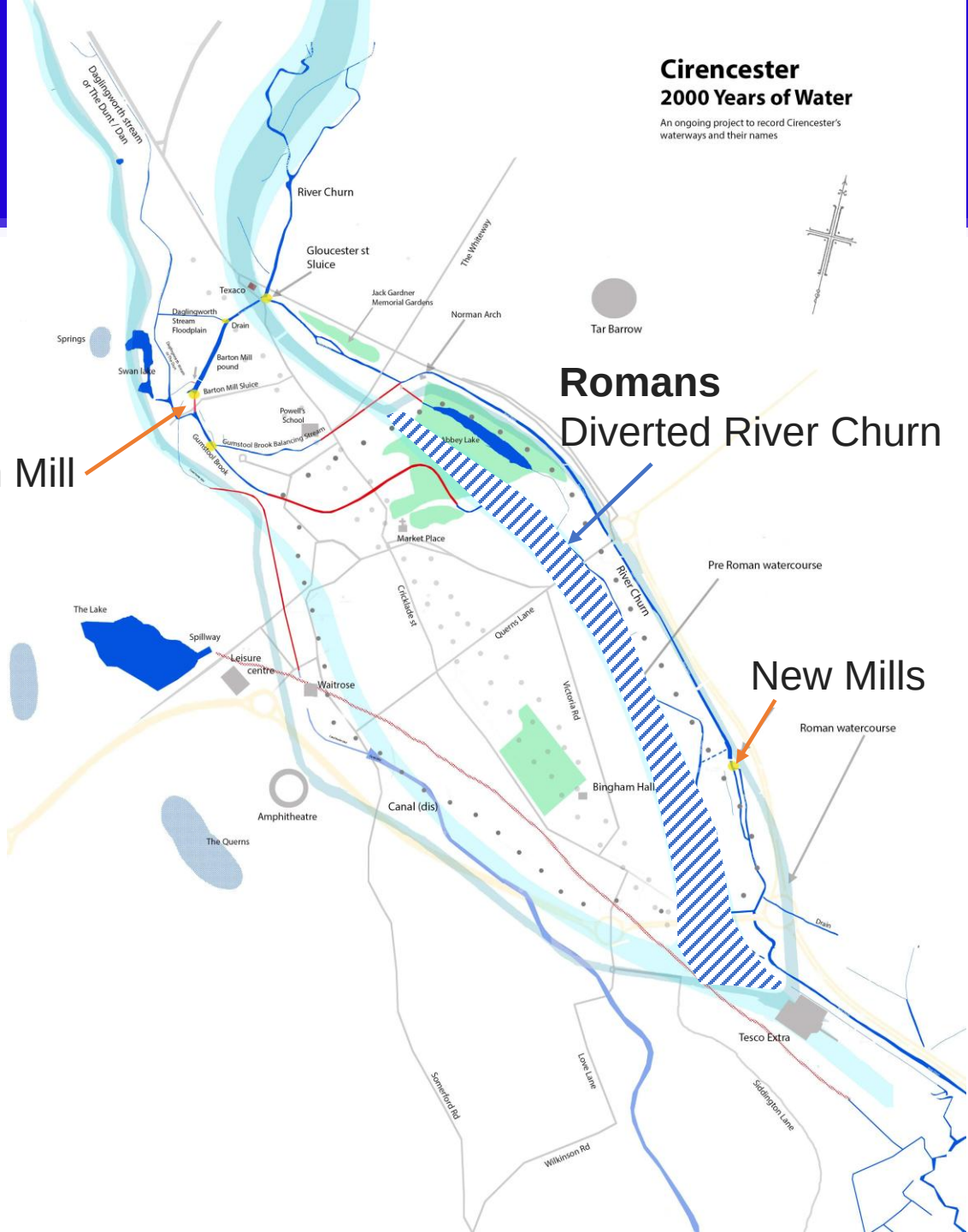
Waterways & people

Millers

Corn, fulling



- Long history of mills back to the 11th & 13th century
- Disputes over water diversions in 18th century
- Now play a role in flood management
- Increasingly requiring maintenance

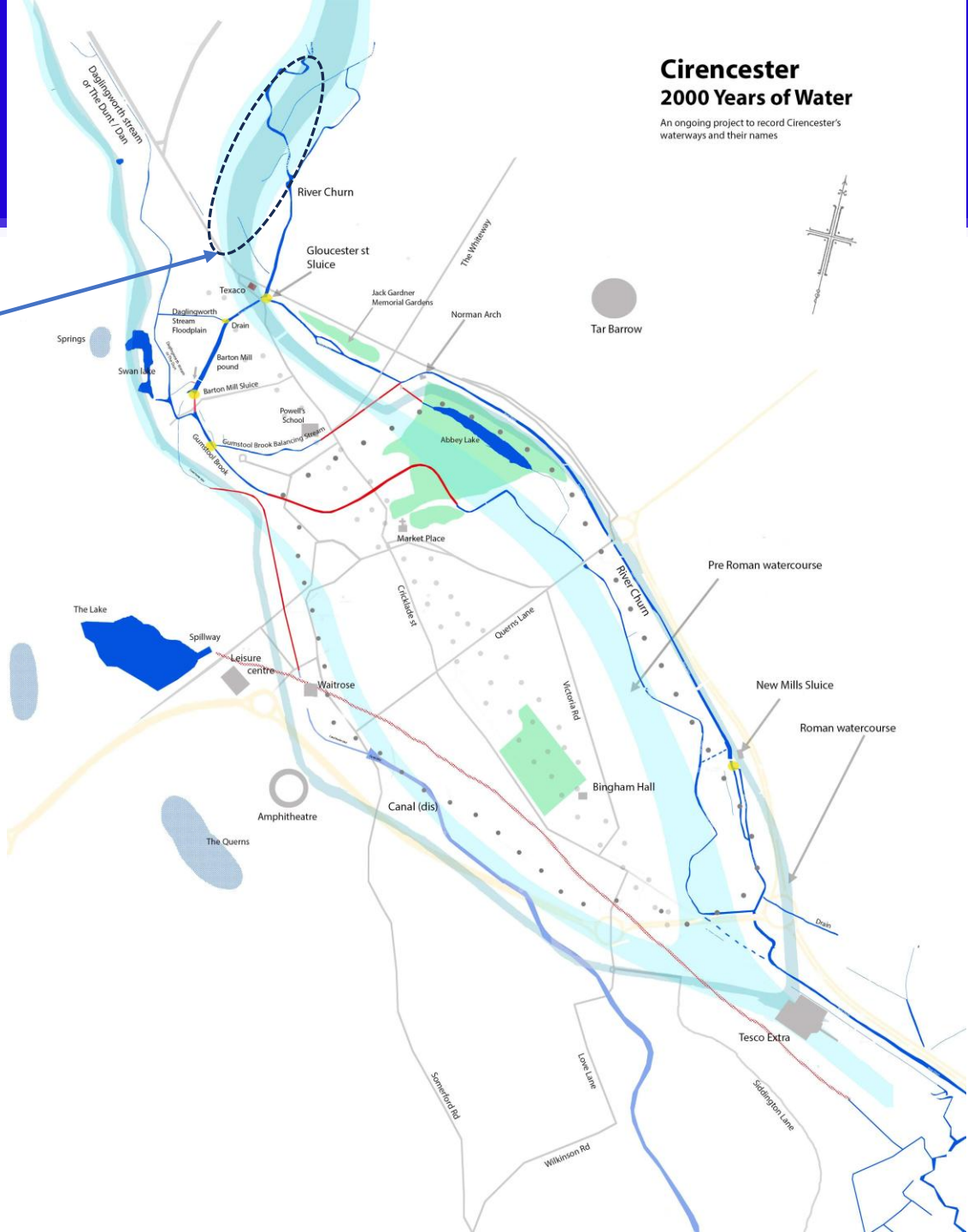


Waterways & people

Farmers

Land management, grazing

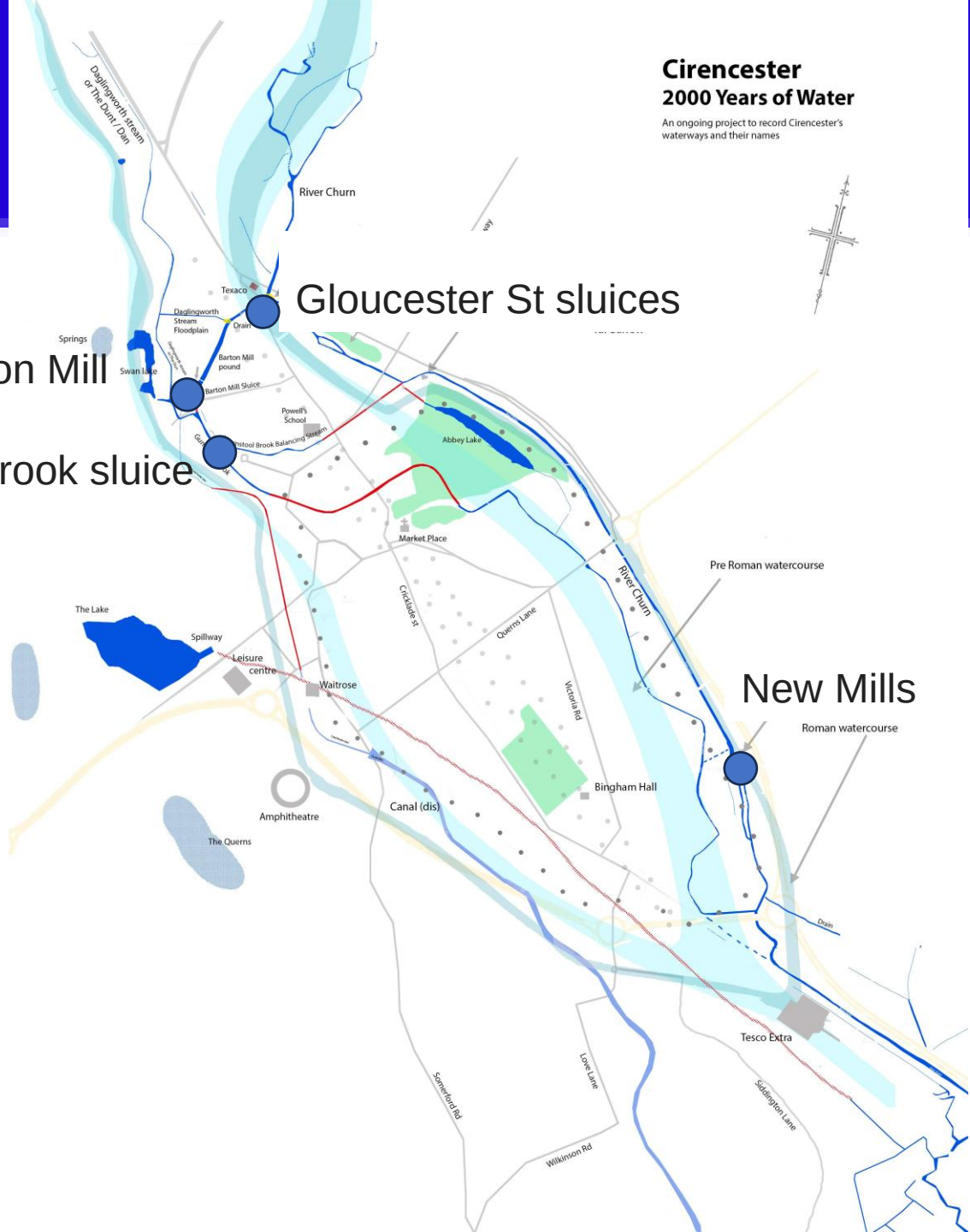
- Originally developed in the late 18th century
- Complex water management
- Produced early grass, cattle grazing & hay crop
- Last used in 1920
- Now derelict & unmanaged



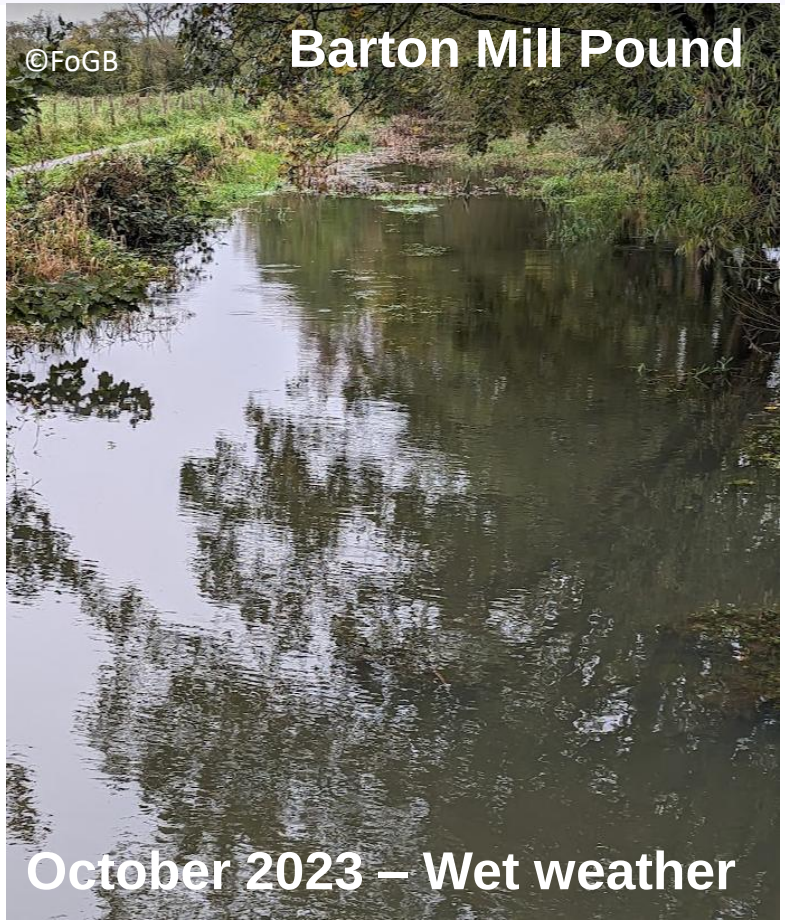
Waterways & people

Flood management

- Sluices play an important role in flood management
- Operating philosophy is set out by Cirencester Town Council (CTC) in a Memorandum of Understanding
- Competing financial, social & environmental drivers:
  - Sluice operation helps mitigate flood impact
  - Can it support a healthy ecosystem during dry weather?



Waterways & people

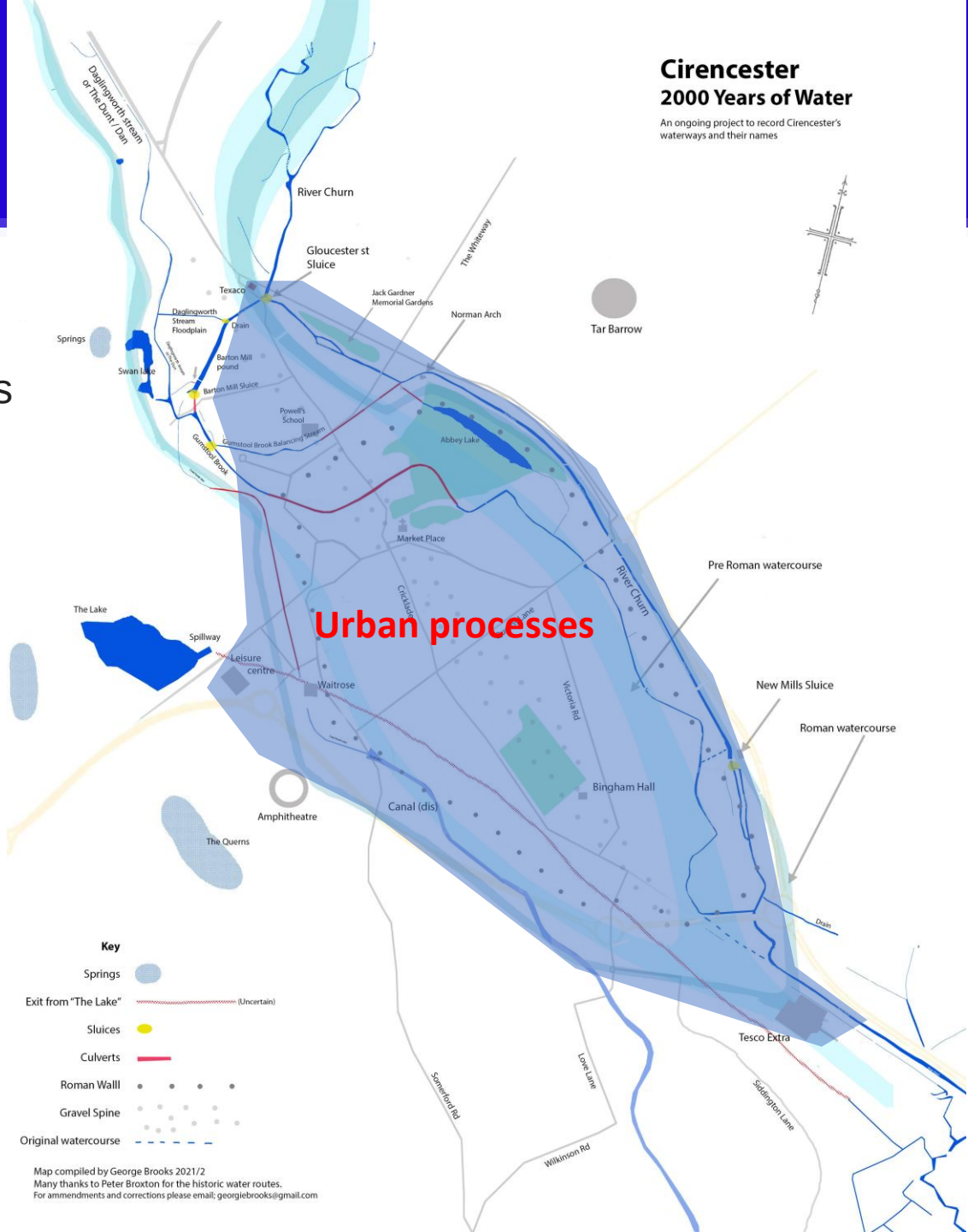


- Sluice operation supports water levels & flows
- Low quality aquatic environment

- Sluice operation does not support low flows
- Very poor quality aquatic environment

Waterways & people

Urban process	Example issues
1. Water supply	• Leakage, but can recharge aquifers
2. Foul sewers	• Groundwater infiltration leading to overflowing sewers
3. Storm sewers	• Misconnections to foul sewers
4. Road runoff	• Pollutant flows to rivers



Waterway issues – Delivering solutions?

Issue	Driver
1. Flooding	• Complex interactions of river, surface water & groundwater flooding
2. Water quality	• Sewage discharges, road & agricultural runoff
3. Low flow & drought	• Dependency on weather, riparian management (& water supply?)
4. Wildlife & ecology	• Dependency on water flow & quality and riparian management
5. Amenity & wellbeing	• Served by healthy aquatic environments, access & information

These are complex issues that have interdependencies at local and catchment scales

How can appropriate solutions be delivered?

Building blocks for delivering solutions

Component	Function
1. Integrated catchment management	• Recognition of multiple interacting issues that require appropriate solutions that avoid unintended consequences & consider climate change influences
2. Nature based solutions	• Mitigation measures that are sustainable, provide habitat improvement & increase biodiversity, and lend themselves to community engagement
3. Flood management infrastructure	• Optimise the combined function of engineered flood management & *NFM mitigation measures*
4. Community engagement	• Promote appreciation of the water environment & raise awareness of the issues it faces to cultivate a community of custodians and coordinated *citizen scientists*
5. Partnerships	• Bring together stakeholders, e.g. local councils, environmental groups, landowners, regulators, water companies & the public, to develop & deliver coordinated aims

Note: NFM = Natural flood management
NBS = Nature-based solutions

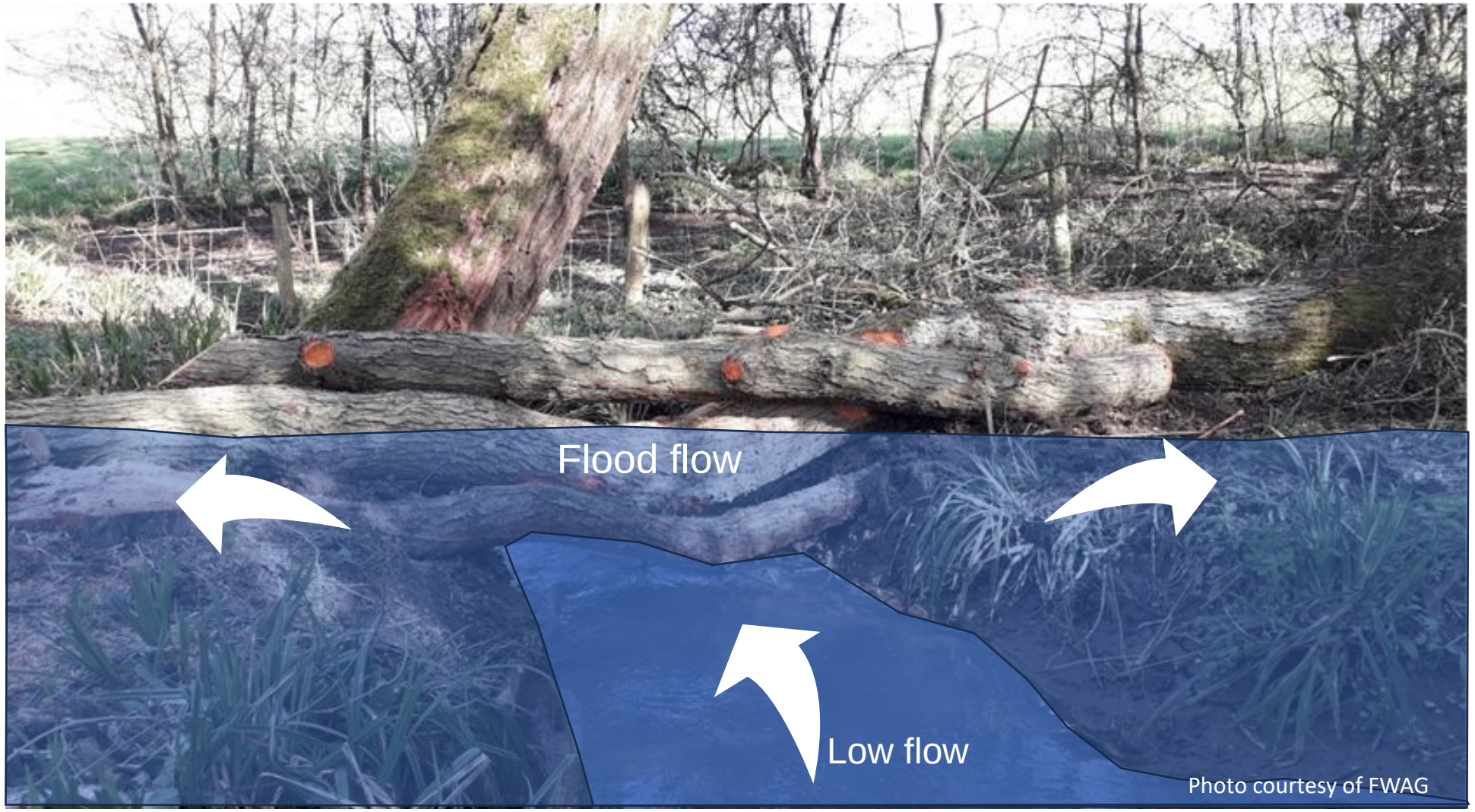
Natural Flood Management (NFM) - Examples

River berm

- Berm during construction by volunteers
- Aim is to deflect flows in a previously straight, artificial channel
- Meandering channel helps slow flood flows
- Produces different rates of flow within the channel to generate more diverse habitats
- Progressive sediment accumulation occurs within the berm, which ultimately will become vegetated

Natural Flood Management (NFM) - Examples

Woody debris leaky dam

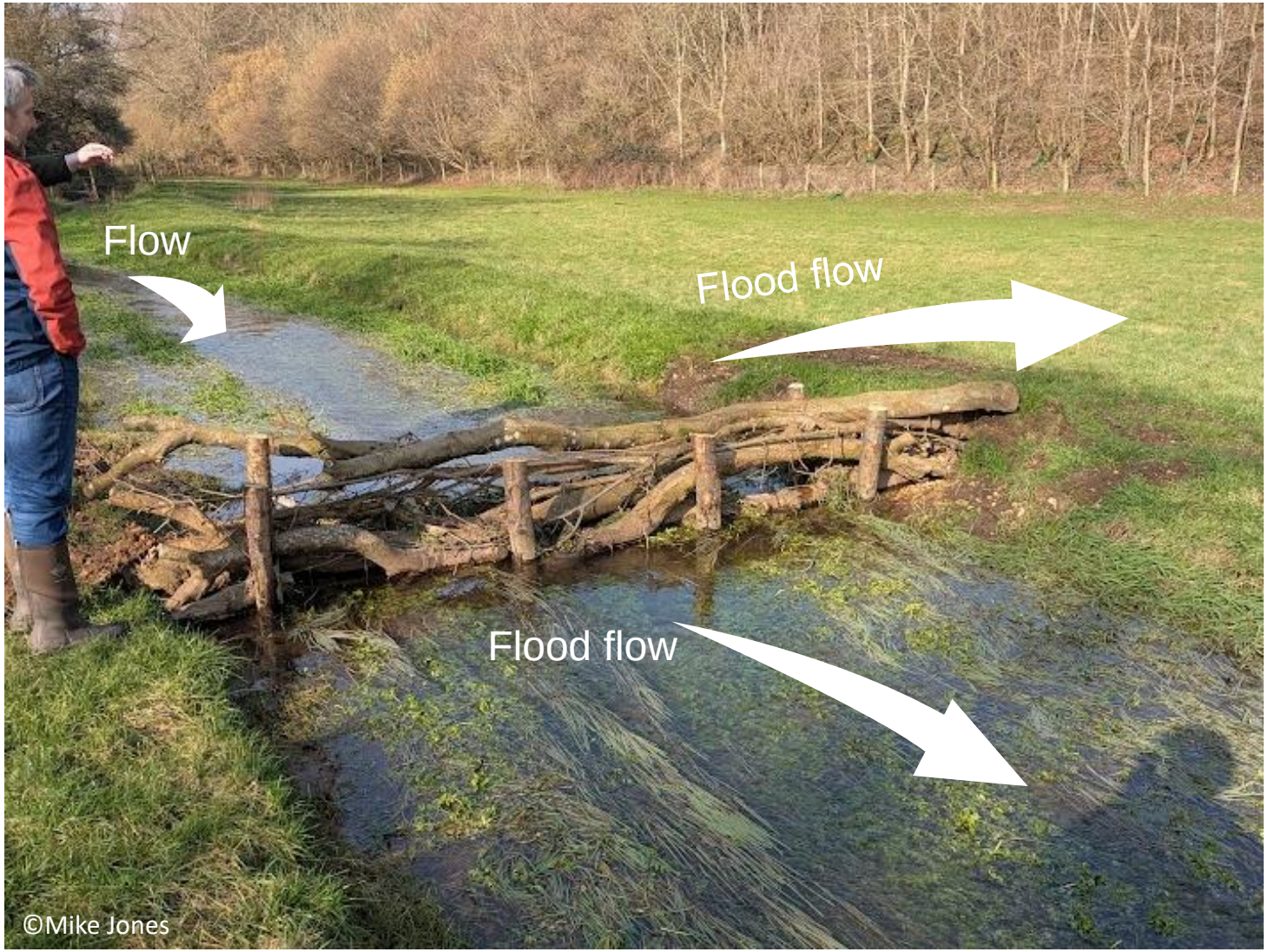


Aim is to divert flood flows out of the stream channel

Low flows pass beneath the leaky dam

Natural Flood Management (NFM) - Examples

Woody debris leaky dam - Daglingworth Stream, upstream of Daglingworth



- Two dams installed by Duchy of Cornwall in 2024 with support of the Parish Council
- Aim is to divert some of flood flow out of the current stream channel & reconnected with a former channel & floodplain
- FoGB carrying out photographic monitoring to help understand how they perform & the benefits they deliver **= Citizen Science**

Citizen science

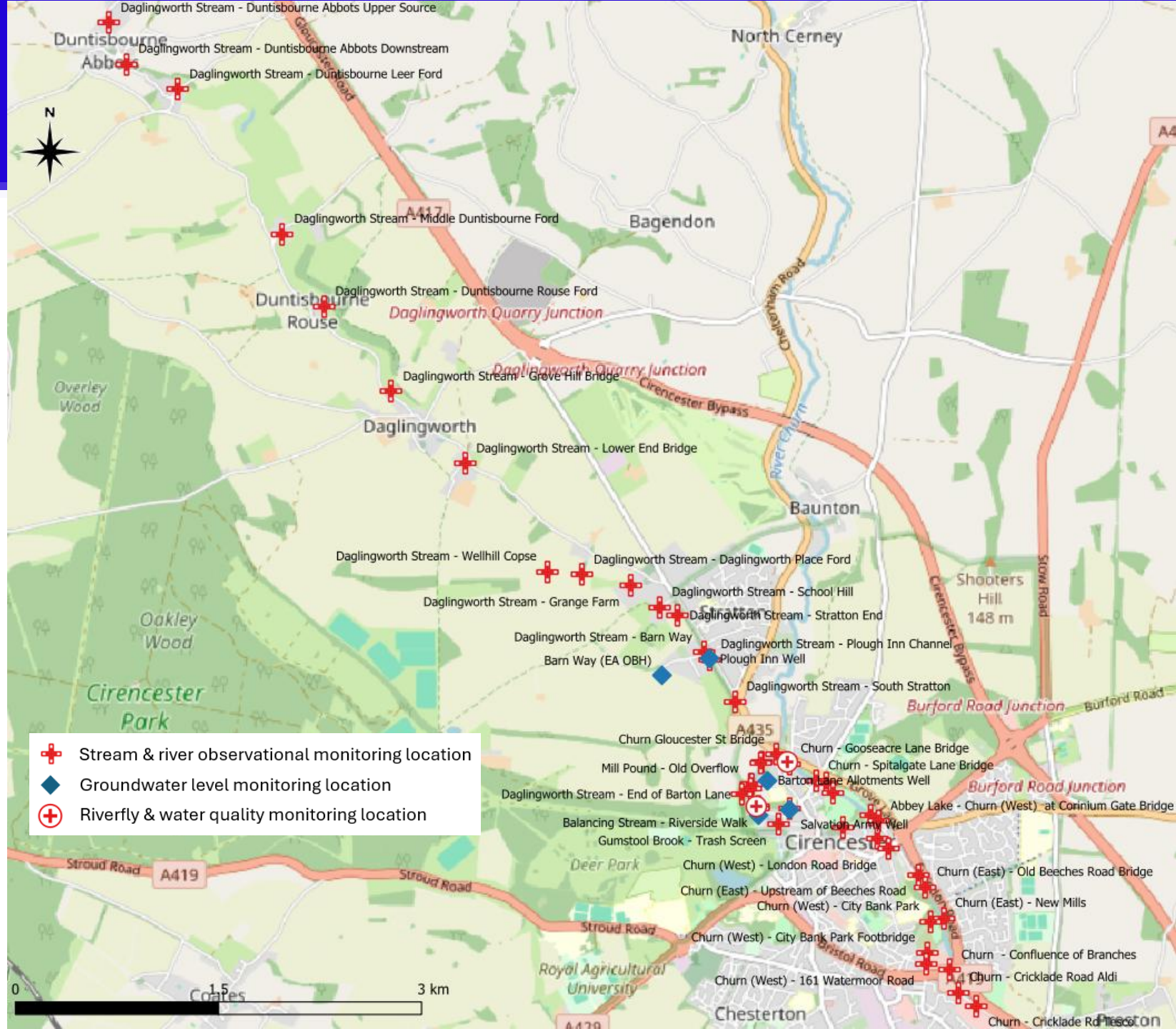
FoGB gather a wide range of data to help understand the behaviour & health of Cirencester's waterways

Component	Data
1. River water flow	• Monthly photographs at 50 locations on the Churn & Daglingworth Stream
2. River water levels	• Measured at 4 key locations; linked to groundwater levels
3. Groundwater levels	• Monthly measurements at 4 Wells into the Gravel aquifer
4. River water quality	• Monthly samples from the Churn & Gumstool Brook analysed for nutrients
5. Riverfly sampling	• Kick sampling of the Churn & Gumstool Brook bed for fly larvae

These data sets are combined with rainfall, river flows and groundwater levels measured by the Environment Agency and available from the online Hydrology Data Explorer

Monitoring locations

- FoGB network of citizen science monitoring points
- Record of stream & river observations started in 2014. Initiated by EA, supported by Thames Water
- Monitoring taken over by FoGB in 2017 and have progressively expanded the scope & locations
- FoGB gratefully acknowledges funding from The Kate Winstone Trust, and support from Cirencester Town Council & Cirencester Community Development Trust (CCDT)



16b. Daglingworth stream at Barton Lane downstream of Bathurst Estate boundary wall.

There is a low flow of muddy water.

17. Gumstool Brook balancing stream at sluice gate.

No Flow, stream dry at this point

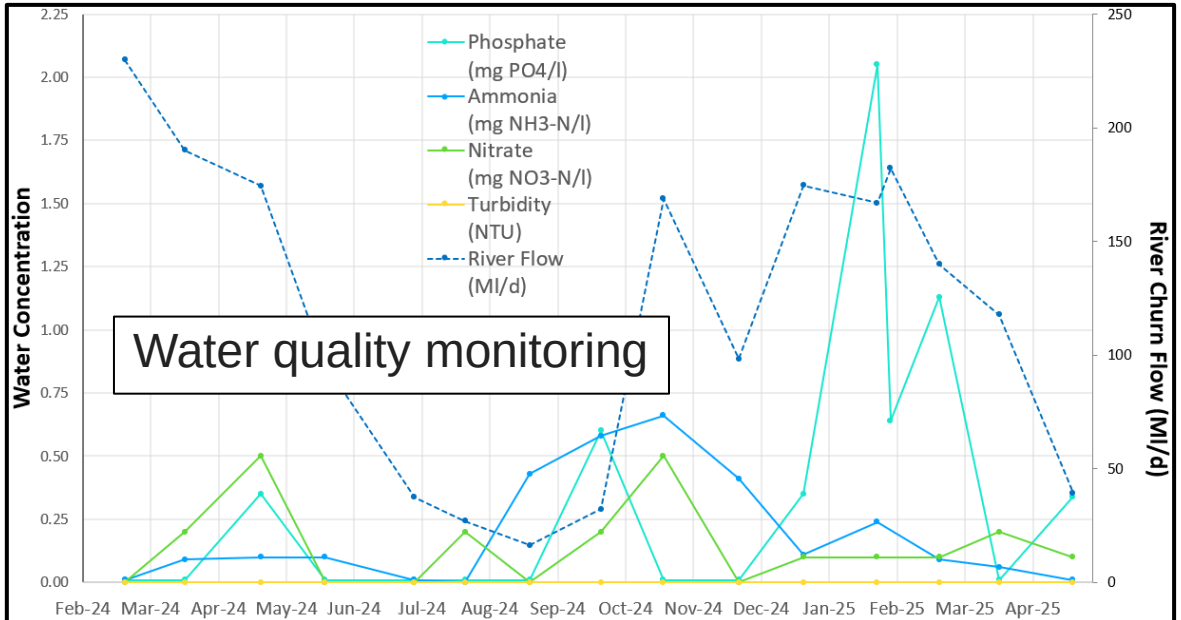
Extract from monthly water flow monitoring

18. Gumstool Brook alongside Swimming pool on the Riverside Walk.

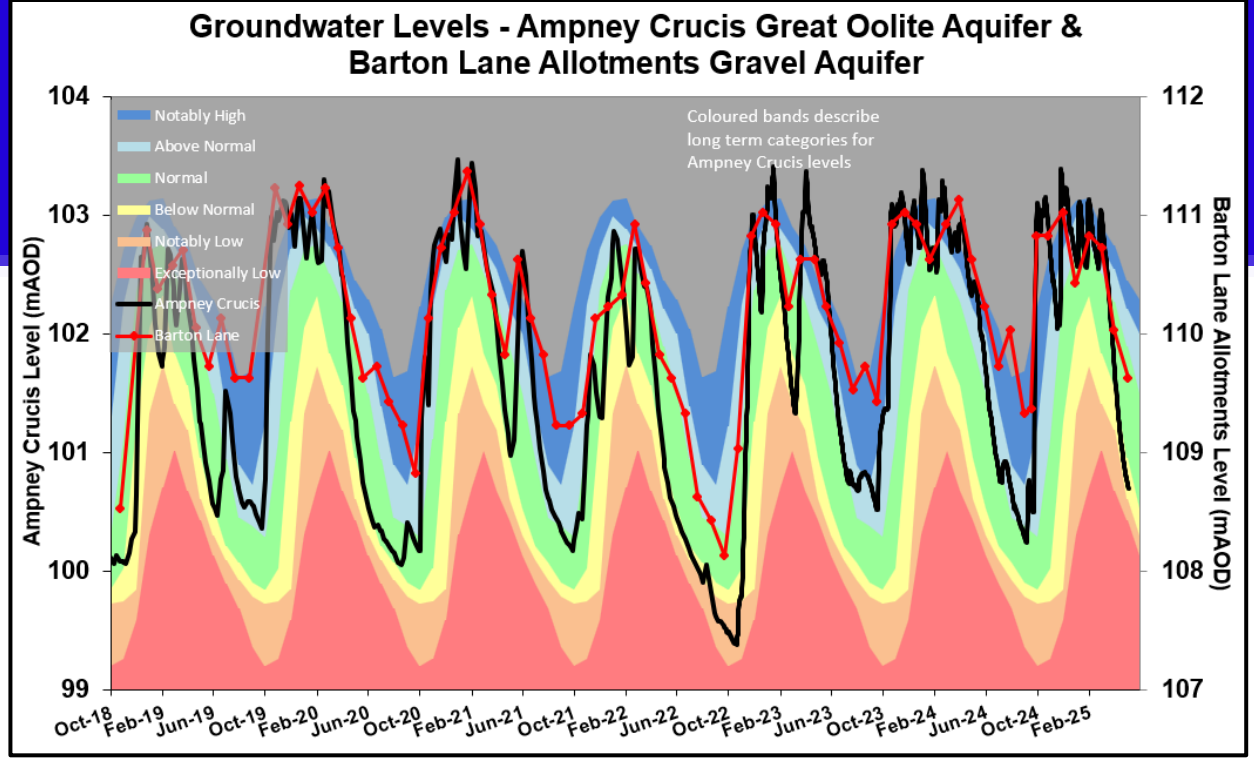
Negligible flow and weed plus a lot of algae very visible. Water murky.

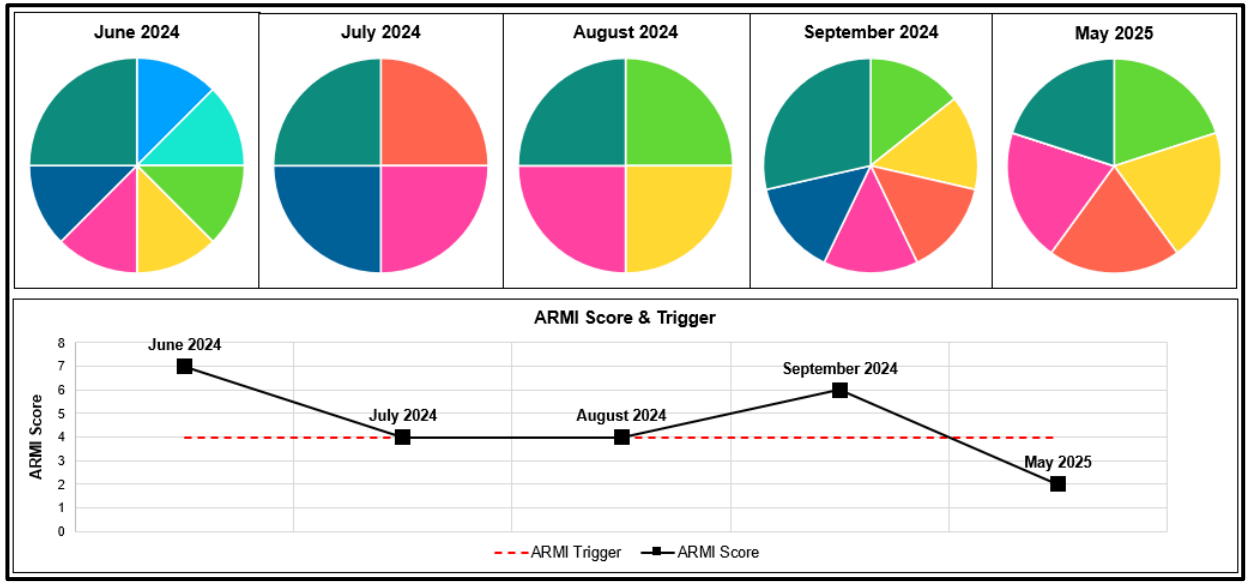
20. Gumstool Brook at Thomas Street culvert trash screen.

Very low flow, water murky and a lot of debris on surface



Water quality monitoring





Riverfly monitoring

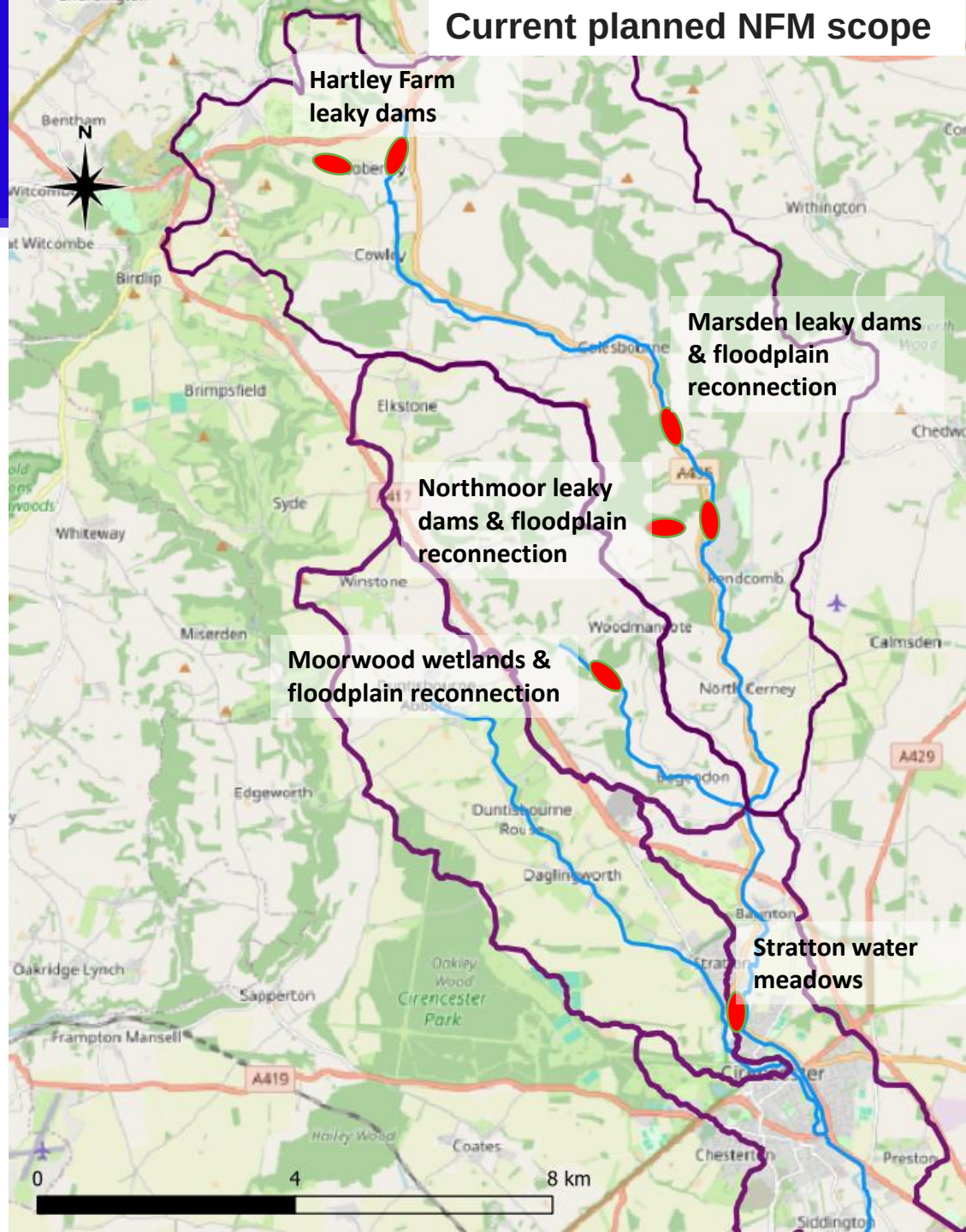
Community engagement opportunities

Thames Source Natural Flood Management (NFM): Re-naturalising the Churn

- Delivering a range of NFM projects in the Churn & Elkstone Brook catchment to mitigate flood impacts
- Engaging the community & encourage citizen science monitoring of flood mitigation, habitat & biodiversity benefits from NFM
  - Lead Team: GCC, FWAG & FoGB
  - Partners: CTC, CCDT & RAU
  - Funders: Thames Regional Flood & Coastal Committee (RFCC), CTC & The Kate Winstone Trust

Cirencester Water Festival

- Aims to promote awareness of the water environment, issues & solutions, and encourage involvement of all parts of the community, especially young people
- Planning beginning for August 2026



Partnership opportunities

- Cirencester Waterways Symposium (June 2024) brought together a diverse stakeholder group to discuss a range of issues & solutions
- Key recommendation to establish Cirencester & Churn Waterways & Environment Partnership
  - Meeting held on 30th April to promote the launch of CCWEP
  - Next meeting planned for 1st October with CCWEP Working Group to be appointed
- The CCWEP terms of reference set out aims that include:
  - Develop & promote a catchment programme of NBS
  - Engage communities to raise awareness of NBS benefits and to become advocates
  - Encourage involvement of volunteers in delivering NBS
  - Mobilise volunteers to become citizen scientists to monitor the environment.

What have we found out?

- Natural geological characteristics shape the groundwater and river water environments
- People, past and present, influence the water environment
- Greater insight helps appreciate that issues affecting Cirencester waterways are multifaceted
- Successful solutions need to integrate multiple building blocks
- Nature-based solutions can be an essential element of integrated catchment management
- Engaging the community is vital to raise awareness, engender enthusiasm & deliver value through citizen science
- Opportunities are developing for diverse stakeholders to work in partnership.

Thank you. Any questions?

- If you are interested in joining the Friends of the Gumstool Brook let me know, or contact us on FriendsOfGumstoolBrook@gmail.com

Friends of the Gumstool Brook