Evenlode Catchment Water Quality Monitoring Programme

2024 – 2025

Version 0.3

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Members of the Evenlode Catchment Partnership Water Quality Group

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Version control table

Version	Date	Author	Rationale
0.1	August 2024	L Bannatyne	First draft for contributor input
0.2	September 2024	L Bannatyne and contributors	Second draft for comment
0.3	December 2024	L Bannatyne & C Shepherd	Final draft

Contents

Acronyms, abbreviations, and symbols

API	Application programming interface
BOD	Biological Oxygen Demand
C	Centigrade
CDOM	Colourised Dissolved Organic Matter
CNL	Cotswolds National Landscape (formerly Cotswolds Area of Outstanding Natural Beauty)
CS	Citizen Scientist
CSO	Combined Sewage Overflows
DO	Dissolved Oxygen
EA	Environment Agency
ECP	Evenlode Catchment Partnership
ECPWQG	Evenlode Catchment Partnership Water Quality Group
ECWQMP	Evenlode Catchment Water Quality Monitoring Programme
EDM	Event Duration Monitoring
EWE	Earthwatch Europe
FWW	FreshWater Watch
GCxGC-TOF-MS	Two-dimensional gas chromatography with time-of-flight mass spectrometry
GES	Good Ecological Status
mg/l	milligrams per litrer
N	Nitrogen
NE	Natural England
NWQIS	National Water Quality Instrumentation Service
NTU	Nephelometric Turbidity Units, a proxy for suspended solids
Ofwat	The Water Services Regulation Authority
P	Phosphate
pH	pH units
ppb	parts per billion (= µg/l)
RMI	Riverfly Monitoring Initiative
RO	Reverse Osmosis
SCoP	Sonde Community of Practice
SOP	Standard Operating Procedure
STW	Sewage Treatment Works
TW	Thames Water

WFD	Water Framework Directive
WQ	Water Quality
WQMP	Water Quality Management Plan
WO	Wild Oxfordshire
YSI	
µg/l	micrograms per litre (= ppb)
µS/cm	microSiemens per centimeter

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1 Introduction

1.1 The purpose of this document

This document is the Evenlode Catchment Partnership Water Quality Monitoring Plan (hereafter referred to as the monitoring plan). It is the most recent of a sequence of such plans developed by the members of the ECP Water Quality Group (ECPWQG) as part of the Smarter Water Catchment initiative.

The monitoring plan is intended as a living document that will be updated throughout the 2024 – 2025 project period. It records the agreed approach of the ECPWQG to water quality monitoring, data analysis and data dissemination, and provides guidance for these activities until March 31, 2025. Earthwatch Europe is responsible for leading the water quality activities of the ECP and for the development of the monitoring plan.

A water quality monitoring plan (WQMP) is foundational to the reliable assessment of water quality at catchment scale. Water quality assessments provide vital information to water resource managers as part of an adaptive management approach. According to Behmel et al. (2016), there is no "one-size-fits all" approach to developing a WQMP, but most have the following components in common:

- Identify monitoring objectives.
- Select sampling sites and water quality parameters.
- Select monitoring approaches/methodologies
- Identify sampling frequencies.
- Consider appropriate actions, based on the results from the WQMP

The monitoring plan aims to optimise both the scientific utility of the resulting data *and* the involvement of local residents as citizen scientists to achieve the overall monitoring objective for the Evenlode Catchment Partnership i.e.

To restore the Evenlode Catchment to "Good Ecological Status" for the benefit of all.

Other available sources of data are described and integrated into the ECWQMP where appropriate, and strategies for disseminating and using data to influence organisations and individuals responsible for the sustainable management of the River Evenlode and its tributaries are proposed.

The monitoring plan is aligned with the 2021 Smarter Water Catchment plan: *Working together to protect and enhance our water environment. Co-creating a long-term plan for the River Evenlode catchment* (ECP, 2021) and builds on preceding WQMPs that have been developed for the Evenlode catchment. Water quality monitoring in the Evenlode catchment is intended to meet the following milestones (as stated in the 2021 Smarter Water Catchment Plan):

1. Collate fixed sonde and handheld probe data with existing Riverfly and Freshwater Watch (FWW) monitoring
2. Recruit and support FWW and Riverfly specialists in monitoring across the catchment
3. Continue monitoring and data analysis
4. Review number of sondes and their locations
5. Deliver a pilot P technology project

6. Disseminate performance data from works to the Environment Agency (EA), the Water Services Regulation Authority (Ofwat), media and academic outlets
7. Continue campaigns
8. Run training workshops for FWW and Riverfly
9. Engage regularly with Catchment Champions

1.2 The structure of this document

Chapter 1 (This Chapter) provides an introduction to the monitoring plan.

Chapters 2 – 7 describe a spatiotemporal plan for water quality monitoring 2024 – 2025 in the Evenlode catchment, Oxfordshire, UK.

Chapter 8 overviews current research collaborations as examples of the type of knowledge co-creation that would be welcomed in future.

Chapter 9 proposes strategies for disseminating and using data to influence organisations and individuals responsible for the sustainable management of the River Evenlode and its tributaries.

Chapter 10 is a tabulated summary of the main components of the monitoring plan.

Appendix 1 is a database of FWW and Riverfly monitoring sites and their coordinates

2 Citizen science data: FWW and Riverfly

Laura Bannatyne, Samantha Frith, Eoghan Concannon

2.1 Introduction

This section describes citizen scientist FWW and Riverfly surveying, which provide foundational, reconnaissance data, with:

- Wide spatial extent,
- Long record lengths (ranging from 10 yrs – some months),
- Monthly time-step (quarterly for Riverfly),

FWW and Riverfly are:

- Relatively low cost, robust, repeatable approaches,
- Relatively easy to expand with new data points in response to gaps or perceived areas of concern,
- Relatively accurate and precise.

These citizen science approaches meet the dual aim of data collection *and* capacity building to empower local residents and improve their agency to protect their water resources. They build a long-term picture of WQ in a sizeable proportion of the Evenlode catchment over time, allows the identification of persistent WQ areas of concern.

Aims

The aim for 2024 – 2025 for both FWW and Riverfly is to **improve the spatial and temporal survey coverage of the Evenlode catchment** (See **Figure 1** and **Figure 2**) especially on the small tributaries that may be less contaminated (e.g., by sewage outflows) and may therefore be important yet unmonitored refugia for invertebrates and fish. This aligns with and will assist with meeting the following milestones from **Section 1.1**:

- Recruit and support FWW and Riverfly specialists in monitoring across the catchment
- Continue monitoring and data analysis
- Continue campaigns
- Run training workshops for FWW and Riverfly
- Engage regularly with Catchment Champions

It is important that CSs can survey sites that are of interest and concern to them, and that are easily reached from their homes. It is also important that FFW surveying takes place at Riverfly sites when quarterly surveys are undertaken, to compare Riverfly scores with water quality. For safety reasons, citizen scientists should not survey alone.

2.2 Monitoring

Citizen Scientists, Samantha Frith, Eoghan Concannon, Laura Bannatyne

FWW sites will be surveyed by citizen scientists on a monthly basis, while Riverfly sites will be surveyed by citizen scientists on a quarterly basis. FWW and Riverfly Volunteer citizen scientists will be supported and coordinated to ensure that volunteers are confident to carry out their surveys and that they are supplied with sufficient and appropriate kits and equipment (Samantha Frith, Eoghan Concannon respectively).

2.3 Coverage

Citizen Scientists, Samantha Frith, Eoghan Concannon, Laura Bannatyne

The map in **Figure 1** shows the FWW survey sites that were sampled in 2024 and the STWs in the Evenlode catchment, revealing relatively good coverage, although some the tributaries and reaches of the Evenlode have not been routinely sampled over the past year.

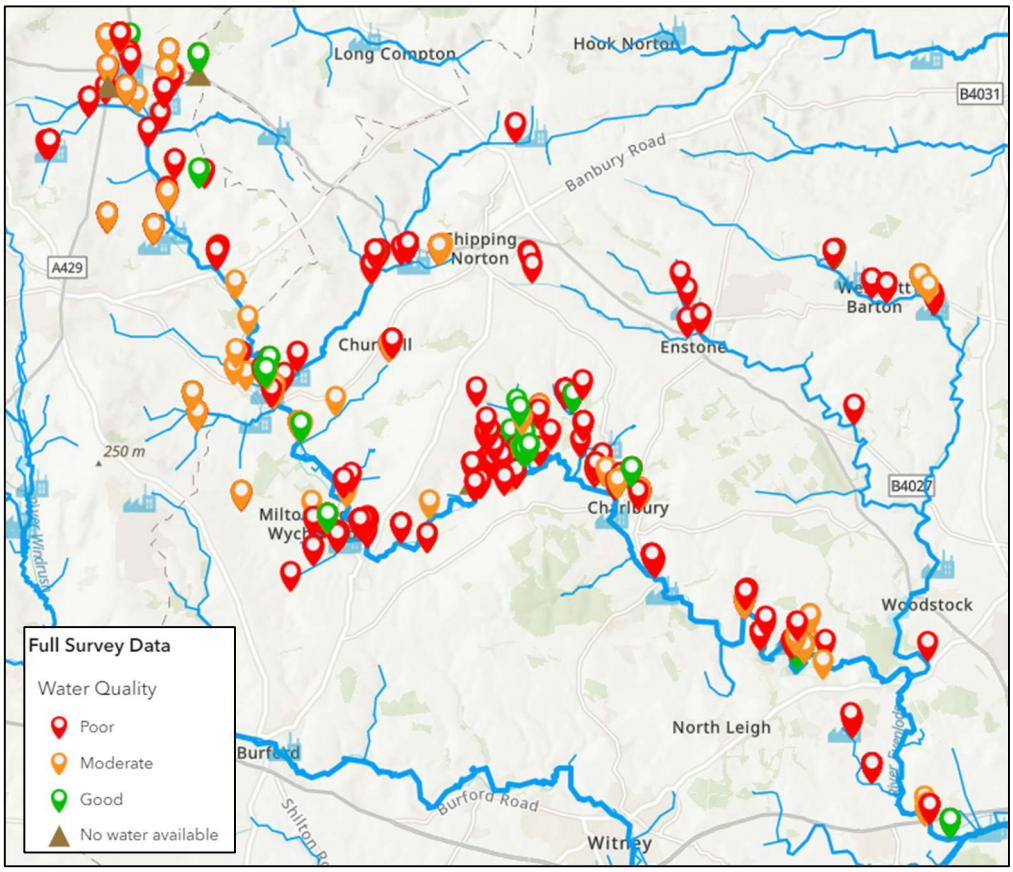

Figure 1: FWW sites and STWs in the Evenlode catchment 2024

The map in Figure 2 shows the Riverfly survey sites that were active in 2024, revealing that several tributaries and many reaches of the Evenlode have not been routinely sampled over the past year.

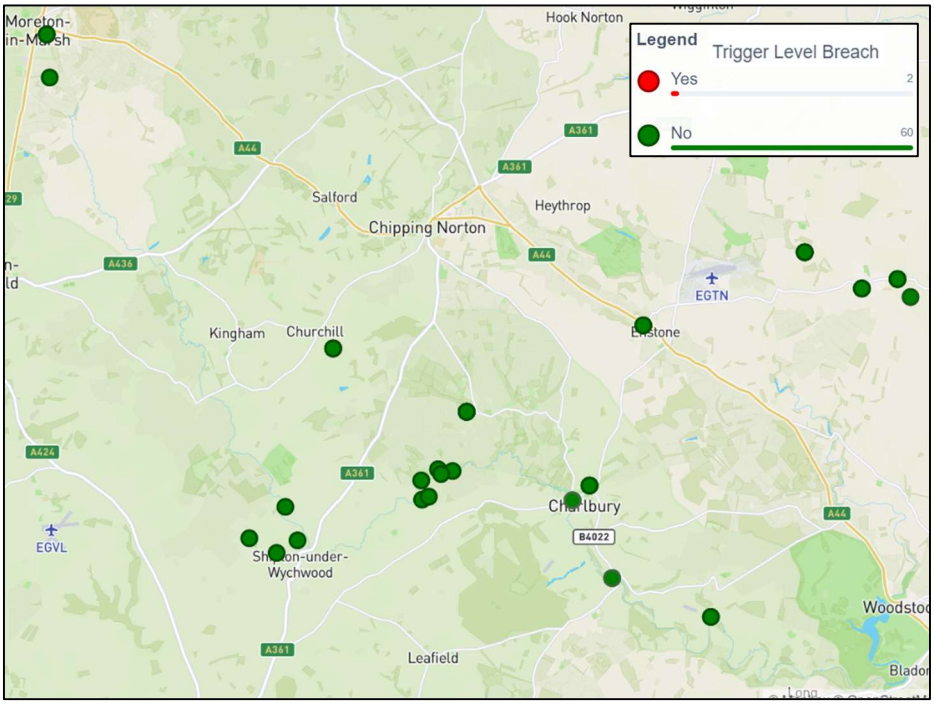

Figure 2: Riverfly sites in the Evenlode catchment November 2023 – 2024

Table 1 summarises the sites and waterbodies that have been collaboratively identified by the "Cream Teas and Cartography" events as FWW and/or Riverfly priority areas that are currently not monitored.

Table 1: Priority sites for FWW and Riverfly monitoring expansion

Site name	Waterbody	FWW/Riverfly	Comments
Common Bridge	Four Shires Brook	Riverfly	This site is downstream of the outflow from M-u-W STW but is challenging to monitor due to deep bed sediments
	Glyme	FWW	
	Dorn	FWW	
	Dorn tributary	Riverfly	Sanford st Martin STW
	Dorn tributary	Riverfly	Middle Barton STW
	Sars Brook	FWW	
Dunstall bridge		Riverfly	south of MiM, Broadwell and/or Longborough STW (downstream only)
	Main Evenlode	Riverfly	Charlbury STW
	Main Evenlode	Riverfly	Finstock STW (Stonesfield Common, downstream only)
	Chadlington stream tributary	Riverfly	Chadlington STW

To improve coverage, Samantha Frith, Eoghan Concannon and Laura Bannatyne will continue to:

- Identify areas of concern that require additional monitoring
- Identify gaps in the FWW and Riverfly coverage
- Organise meetings (dubbed "Cream Teas and Cartography") in the upper, middle and lower catchment with FWW and Riverfly CSs
- Collate and verify CS details, site locations, and past sampling dates
- Bring CSs together to continue to engage and motivate them
- Continually review CSs sampling sites to improve FWW and Riverfly sampling coverage and ensure FWW/Riverfly overlap.

Existing FWW and Riverfly databases and maps will be updated and coordinates and "what three words" will be finalised for each monitoring site and provided to CSs to ensure that identical positional data is recorded with every survey.

2.4 Data

Laura Bannatyne, Samatha Frith, Eoghan Concannon

2.4.1 Hosting

FWW data are uploaded and stored on the FWW Esri platform hosted by Earthwatch Europe. Global FWW data are hosted here: Explore our data | FreshWater Watch Wild Oxfordshire and ECP group data are accessible to group members here: Wild Oxfordshire and the Evenlode Catchment Partnership | FreshWater Watch . All data are available for public download in .csv or .xlsx file format. Some analytical functions are also available on these pages.

Riverfly data are uploaded to the Riverfly Partnership Cartographer data portal hosted by the Freshwater Biological Association, here: https://riverflydata.org/ Quality control and analysis

Earthwatch Europe will be responsible for FWW data quality control and analysis (Samantha Frith and Laura Bannatyne).

2.4.2 Reporting

Monthly CS Newsletter. FWW analysis, with Riverfly data where available, will be included in the ECP monthly CS Newsletter (Samanatha Frith) and emailed to all group members and other interested parties.

Monthly data reports. FWW data (Laura Bannatyne) and Riverfly data will be included in monthly data reports (Laura Bannatyne). These will be available on the WO&ECP FWW page once approved by the ECPWQG and may be disseminated to the public.

Spring and Autumn WaterBlitz results will be reported in the form of a short summary document.

Annual report. FWW and Riverfly data will be included in the Annual Report (Laura Bannatyne and ECPWQG members). A draft will be available by the end of January 2025 with finalisation by March 2025.

2.5 Training, capacity building, and outreach

2.5.1 FWW

Samantha Frith, Jennifer Lanham

Training interventions will be organised to recruit new CSs to the WO&ECP group, and to refresh existing CSs. A training video will be available on the FWW page (LINK) (Samantha Frith). Regular webinars and podcasts will be held (Fortnightly when possible). These will focus on topics and themes of interest to ECP volunteers and will be presented by individuals, sometimes from outside of the ECP, with expertise in the topic or them area (Samantha Frith, Jennifer Lanham). In-person events including outreach to schools and community groups will be held when opportunities arise (Jennifer Lanham).

Group leaders will be identified and trained to manage their sub-groups (training video: FWW Group Manager Resources - Google Drive), access group manager resources (FWW Group Manager Resources - Google Drive) and undertake data analysis using the Wild Oxfordshire and the Evenlode - Analyze ArcGIS Survey 123 platform (Training video: FWW Group Manager Resources - Google Drive).

2.5.2 Riverfly

Eoghan Concannon Tony Bostock

A Riverfly training workshop will be held for 15 to 20 people in January 2025 (Tony Bostock). Ongoing support will be provided to Riverfly volunteers, particularly new individuals and until the Riverfly thresholds (trigger levels) for their sites have been established (Eoghan Concannon).

2.6 Events

Laura Bannatyne, Samantha Frith, Jennifer Lanham

2.6.1 WaterBlitz

Earthwatch will hold Spring and Autumn WaterBlitzes to involve and hopefully recruit people who do not normally undertake routine FWW testing. WaterBlitz is a “FWW light” survey restricted to N and P testing (no turbidity monitoring), and some observations of River condition. ECP FWW

group members will be encouraged to participate in the Great UK Spring and Autumn WaterBlitzes.

2.6.2 ECP CS Summit

An ECP CS summit will be held at a central location in March 2025. The purpose will be to report on the activities and data from the past year, to bring members together, to allow the opportunity for questions and discussions, and to consider activities for the year ahead. This is key to maintain and continue to build engagement and motivation.

3 Proteus sondes

Robert Rustage, Laura Bannatyne

3.1 Introduction

This section describes the use of four fixed-location Proteus sondes that provide accurate, calibrated near continuous (15 minute) real-time water quality data from sites associated with suspected point source pollution sites. The sonde data supplements the CS data.

3.2 Aims

The sonde deployment and data gathering aligns with and will assist with meeting the following milestones from Section 1.1:

- Collate fixed sonde and handheld probe data with existing Riverfly and Freshwater Watch (FWW) monitoring
- Continue monitoring and data analysis
- Review number of sondes and their locations
- Disseminate performance data from works to the Environment Agency (EA), the Water Services Regulation Authority (Ofwat), media and academic outlets
- Continue campaigns

3.3 Monitoring

The sondes measure or calculate the following determinands:

- Temperature (°C)
- Turbidity (NTU - nephelometric turbidity unit as a proxy for Suspended Solids)
- Conductivity (µS/cm - microSiemens per centimeter)
- pH (pH units)
- Dissolved Oxygen (in mg/l and O_2%saturation)
- Phosphorus (mg/l)
- Ammonia (mg/l - by two different methodologies)
- CDOM (µg/l - Colourised Dissolved Organic Matter and is used as an indicator of organic pollution of the watercourse)
- Tryptophan (ppb – measured as Tryptophan like fluorescence and is used an indicator of organic pollution of the watercourse)
- BOD (mg/l - Biochemical Oxygen Demand)

3.4 Coverage

Figure 3 shows the default locations of the Proteus sondes in relation to STWs in the Evenlode catchment.

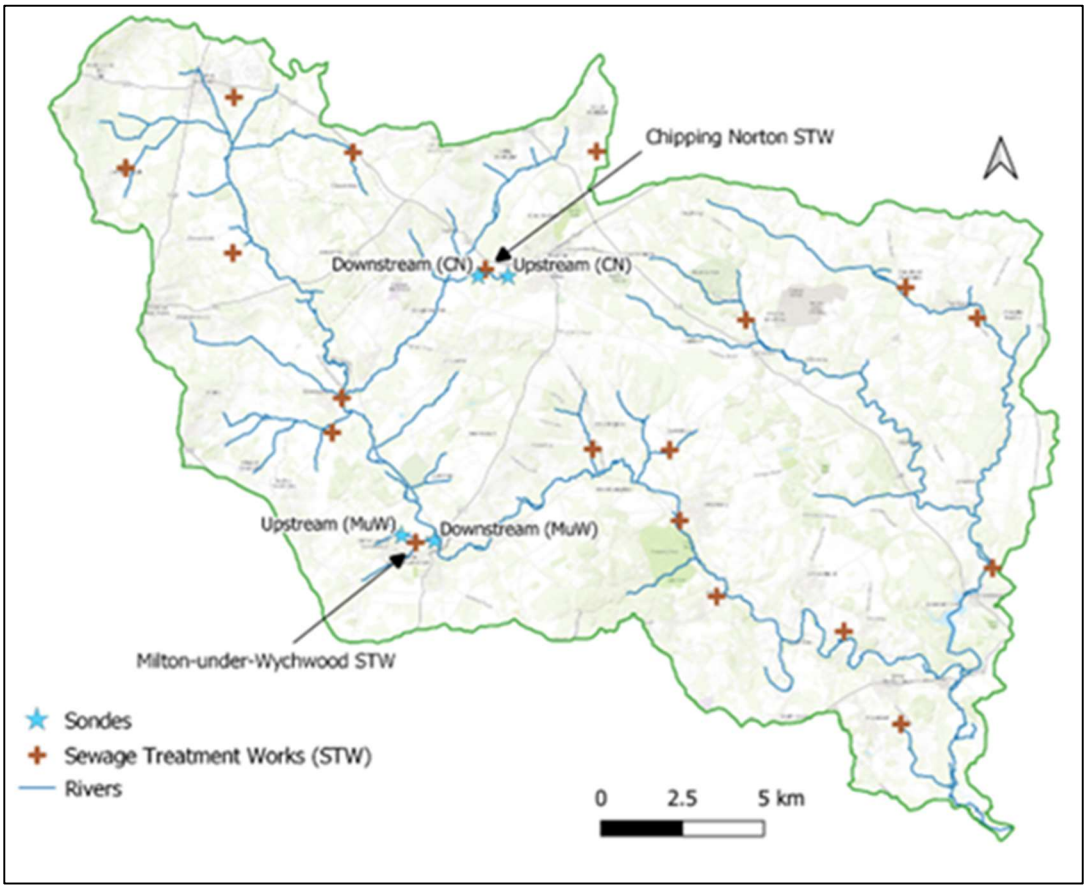

Figure 3: Sondes and STWs in the Evenlode catchment: sonde locations subject to change

The positioning of the sondes is reviewed from time-to time in response to changing conditions and emerging situations of water quality concern. For example, the sonde that was located at the Old Piggery upstream of the Chipping Norton STW on the Chipping Norton Brook (see **Figure 4**) was moved downstream of the natural flood management interventions to compare changing post-construction water quality with water quality immediately downstream of the STW, and later moved again (temporarily) to the Four Shire Brook downstream of the Milton-under-Wychwood STW outlet).

Sonde locations can be influenced by the presence of privately-owned land (to reduce the risk of theft), access permissions, and suitable bed and bank conditions that allow secure tethering, flood protection for the data logging and solar components, and minimal risk of very low water levels that can damage sensors if they dry out. Paired monitoring (i.e., up- and downstream of suspected point source pollution sites) will be implemented where possible/practical. The monitoring period at each site will be reviewed on a case-by-case basis to allow the establishment of baseline data for comparison and analysis.

3.5 Calibration and maintenance

The manufacturer's recommended calibration intervals are as follows:

- Fluorometers - 6 -12 months
- Turbidity - 3 - 6 months
- ISEs - 6 weeks (max)
- Other sensors - 3 months

The sondes are either returned to RS Hydro for laboratory calibration, or an RS Hydro field calibration is carried out, on a six-monthly basis. Rob Rustage also undertakes field calibration of the sondes. The ammonia ISE probe is calibrated more frequently (i.e., at two- week intervals) in support of a Birmingham University study that aims to improve the reliability of the optical ammonia probe. A final calibration interval will be determined based on the outcomes of that study.

Sondes are maintained on a regular basis, typically weekly basis (Robert Rustage). This includes removing silt, invertebrates, and debris from the protective copper sleeve and the sensor assembly, checking all connections, the solar panel, and the battery, and ensuring that the sondes are securely attached to their tethering posts.

3.6 Data

3.6.1 Hosting

Data is sent telemetrically in real time to OutPost Central and can be viewed or downloaded for further analysis from that site (Robert Rustage, Laura Bannatyne). Sonde reports are sent by Outpost central to the Water@Earthwatch.org.uk inbox.

3.6.2 Quality control and analysis

Sonde data is quality controlled and analysed each month (Robert Rustage, Laura Bannatyne).

3.6.3 Reporting

Monthly data reports. Sonde data is included in monthly data reports (Laura Bannatyne, Robert Rustage). These are available on the WO&ECP FWW page once approved by the ECPWQG, and may be disseminated to the public.

Annual report. Sonde data is included in the Annual Report (Laura Bannatyne, Robert Rustage and ECPWQG members). This may be in the form of specific case studies, e.g., describing water quality issues associated with the Chipping Norton and Moreton-in-Marsh STWs. A draft Annual Report will be available by January 2025 with finalisation by March 2025.

3.7 Training, capacity building, and outreach

Relationships have been established with several academic institutions, commercial entities and interest groups during specialist studies, site visits, and opportunities for equipment installation/comparison. These relationships will be fostered going forward, with the aim of increasing knowledge and experience of the ECP WQ team.

A Sonde Community of Practice (SCoP) was initiated in July 2024 with the aim of bringing together sonde users and potential users with a range of experience and back grounds. Workshops and events will be organised on an ongoing basis to improve knowledge, expertise and networking.

4 YSI probes

Laura Bannatyne, Robert Rustage, Samantha Frith

4.1 Introduction

This section describes the use of two YSI Pro-DSS hand-held probes. One has been purchased and a second one ordered from Xylem Environmental Solutions. These probes are the same make and model as used by the EA, and provide accurate, calibrated, conductivity, temperature, pH,

dissolved oxygen, and ammonium data in response to concerns raised by CS FWW and Riverfly monitoring.

4.2 Aims

YSI probes provide accurate data to further the aim of improving water quality in the Evenlode catchment. This may include using the data in support of requests to the EA for water quality investigations. The YSI deployment and data gathering aligns with and will assist with meeting the following milestones from Section 1.1:

- Collate fixed sonde and handheld probe data with existing Riverfly and Freshwater Watch (FWW) monitoring
- Continue monitoring and data analysis
- Review number of sondes and their locations
- Disseminate performance data from works to the Environment Agency (EA), the Water Services Regulation Authority (Ofwat), media and academic outlets
- Continue campaigns

4.3 Monitoring

The YSI probes measure the following determinands:

- Conductivity
- Temperature
- pH
- Ammonium
- Dissolved oxygen

They will be rapidly deployed in response to event-based concerns such as sewage outflows, as well as being used for longitudinal surveys e.g. of the Four Shires, Chipping Norton, and Littlestock Brooks to determine the downstream effects of STW outflows. They can also be deployed to extend road-runoff investigations to include salinity resulting from road gritting in response to ice/snow. This agile monitoring approach lends itself to discrete “project-type” investigations that are spatiotemporally limited. They will also provide independent ammonium readings and DO readings against which to compare the data from the fixed Proteus sondes, and salinity data against which to compare the data from the Eutech handheld probes as well as the sondes.

4.4 Coverage

Longitudinal river profiles will be surveyed where water quality concerns are raised by CS monitoring and observations. Examples include the Four Shires Brook and the headwaters of the Evenlode near Moreton-in Marsh STW, the Littlestock Brook near Milton-under-Wychwood STW, and the Chipping Norton Brook near Chipping Norton STW, but this list will be continually updated.

The YSI probes will also be deployed as fixed instruments in certain circumstances, restricted by battery life, the presence of privately-owned land (to reduce the risk of theft), access permissions, and suitable bed and bank conditions that allow secure tethering and flood protection for the data logging components. Two probes can be used in tandem to provide simultaneous readings and paired data, for example up and downstream of a suspected pollution source such as an outfall pipe or a road drain.

Coverage will be extended to support the investigations taking place into individual STWs (See "Adopt a STW", Section 9.2).

4.5 Calibration and maintenance

The YSI probes require regular and precise calibration. Manufacturer's calibration and maintenance SOPs will be followed.

4.6 Training, capacity building and outreach

Members of the ECPWQG will be trained to use the YSI probe. Online and in-person training will be accessed from Xylem. Further training on SOPs is available and will be accessed from National Water Quality Instrumentation Service (NWQIS).

4.7 Data

4.7.1 Hosting

YSI data will be downloaded and stored on the Earthwatch SharePoint.

4.7.2 Quality control and analysis

YSI probe data will quality controlled and analysed each month (Robert Rustage, Laura Bannatyne).

4.7.3 Reporting

Monthly data reports. YSI data will be included in monthly data reports (Laura Bannatyne, Robert Rustage). These will be available on the WO&ECP FWW page once approved by the ECPWQG and may be disseminated to the public.

Annual report. YSI data will be included in the Annual Report (Laura Bannatyne, Robert Rustage and ECPWQG members). This may be in the form of specific case studies, e.g., describing water quality issues associated with the Moreton-in-Marsh and Milton-under-Wychwood STW, amongst others. A draft Annual Report will be available by the end of January 2025 with finalisation by March 2025.

5 Eutech meters

Samantha Frith, Anne Miller

5.1 Introduction

This section describes the use of two hand-held Eutech total dissolved solids (TDS) meters that have provided additional data at 12 CS FWW monitoring sites for ~three years. The data from these meters has thus far been under-utilised.

5.2 Aims

Baseline TDS data will be provided against which the data from the YSI Pro-DSS probes can be compared. The salinity data from these probes can also provide insight into the impact of road gritting. This aligns with and will assist with meeting the following milestones (See Section 1.1)

- Collate fixed sonde and handheld probe data with existing Riverfly and Freshwater Watch (FWW) monitoring
- Continue monitoring and data analysis

- Disseminate performance data from works to the Environment Agency (EA), the Water Services Regulation Authority (Ofwat), media and academic outlets
- Continue campaigns

5.3 Monitoring

Data is collected monthly at the time of FWW surveying, and can be collected in response to ice/snow events (Samantha Frith, Anne Miller).

5.4 Coverage

Twelve sites are regularly monitored, near Moreton-in-Marsh, and between Ascot-under-Wychwood and Charlbury. Sites up and downstream of road drains can be added during winter.

5.5 Data

5.5.1 Hosting

The TDS data form part of the wider FWW dataset, hosted here: Wild Oxfordshire and the Evenlode Catchment Partnership | FreshWater Watch .

5.5.2 Quality control and analysis

Primary quality control comprises calibrating the meters (Samantha Frith, Anne Miller). Quality control will be undertaken once these data are collated (L Bannatyne). To date, no spatial or temporal analysis has been undertaken using these data. Going forward, these data will supplement data from other sources to better understand temporal water quality trends at these 12 sites.

5.5.3 Reporting

These data have not been included in reports to data. Going forward they will be included in monthly and annual reports.

6 External data: Environment Agency water quality monitoring

Laura Bannatyne, Robert Rustage

6.1 Introduction

This section describes the use of the water quality data routinely collected by the EA in the Evenlode catchment.

6.2 Aims

The EA provides accurate and precise water quality data, but at a lower level of spatial and temporal coverage than the monthly CS FWW surveys. The purpose of incorporating EA data into the monitoring plan is as a comparison with both the CS and the sonde data collected by the ECP. This is limited by the spatial and temporal coincidence of the respective monitoring sites and dates.

6.3 Monitoring

The EA collect and analyse water quality samples in accordance with strict and standardised protocols.

6.4 Coverage

There are 20 EA sampling sites in the Evenlode catchment. These are shown in Figure 4:

- TH-PEVR0002 Cornwell Brook At Kingham
- TH-PEVR0006 EVENLODE AT B4449, CASSINGTON
- TH-PEVR0010 EVENLODE AT ODDINGTON
- TH-PEVR0011 EVENLODE AT SHIPTON UNDER WYCHWOOD
- TH-PEVR0013 EVENLODE BELOW ASHFORD BRIDGE
- TH-PEVR0016 Four Shire Stream At Common Bridge
- TH-PEVR0021 LITTLESTOCK BROOK ABOVE EVENLODE AT SHIP
- TH-PEVR0030 Coldron Brook Above Evenlode
- TH-PEVR0033 BLEDINGTON BROOK ABOVE EVENLODE
- TH-PEVR0043 Little Compton Stream At Heath End Bridg
- TH-PEVR0052 Fire College Stream 150 M Below A44
- TH-PEVR0061 Blue Brook Above Chipping Norton Stw
- TH-PEVR0069 Sars Brook Above Land Drain, Rynehill Fa
- TH-PEVR0077 Westcote Brook At B4450
- TH-PEVR0078 EVENLODE AT COLDICOTE FARM, MORETON IN H
- TH-PEVR0079 Glyme At Woodford Bridge:Enstone
- TH-PEVR0081 EVENLODE D/S OF WESTCOTE BROOK TRIBUTARY
- TH-RSN0626 Heythrop Park
- TH-RSN1250 D/S Heath End Bridge
- TH-SSN0207 D/S Station Road - Kingham Stream

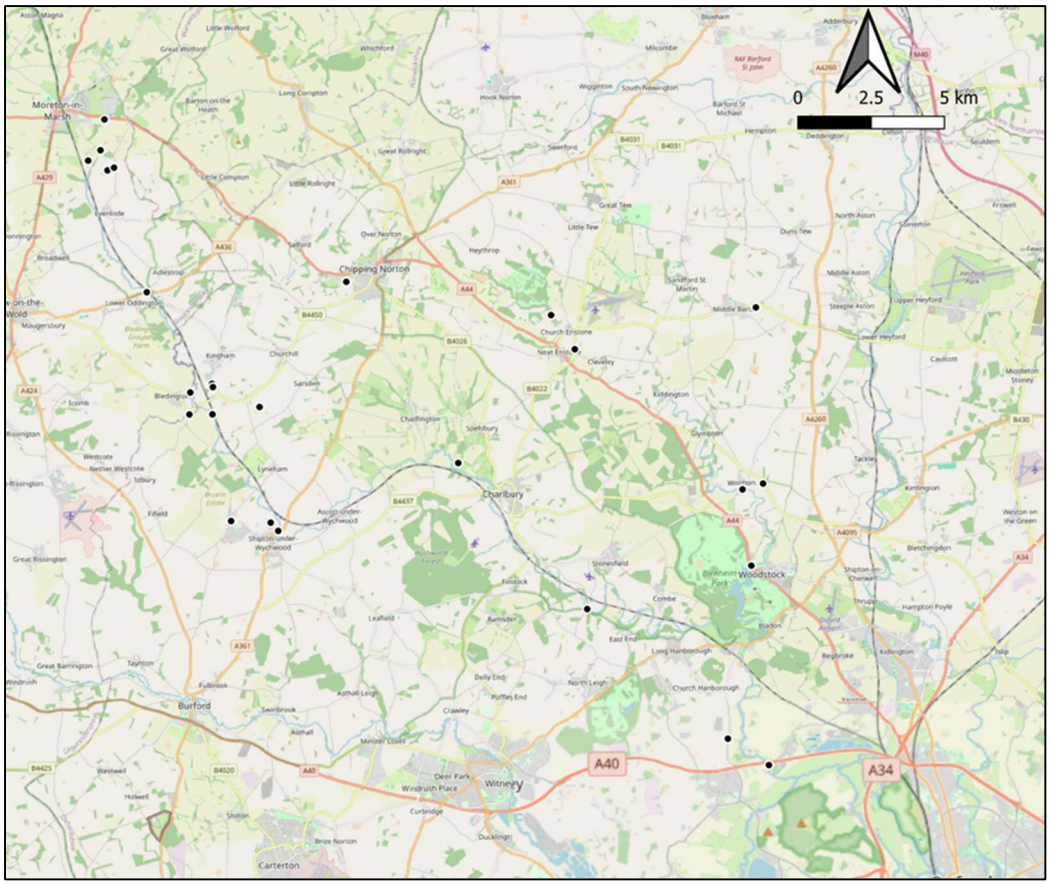

Figure 4: EA monitoring sites in the Evenlode catchment

6.5 Data

6.5.1 Hosting

EA data are downloaded from here: Open WIMS data

6.5.2 Quality control and analysis

Quality control is performed by the EA.

EA data will be compared with CS FWW and with Proteus sonde and YSI probe data where possible.

6.5.3 Reporting

Monthly data reports. EA data will be included in monthly data reports (Laura Bannatyne). These will be available on the WO&ECP FWW page once approved by the ECPWQG and may be disseminated to the public.

Annual report. EA data will be included in the Annual Report (Laura Bannatyne and ECPWQG members). This may be in the form of specific case studies, e.g., describing water quality issues associated with the Moreton-in-Marsh STW. A draft Annual Report will be available by January 2025 with finalisation by March 2025.

7 External data: Rainfall, flow data, and event duration monitoring/combined (storm) sewage overflow data

Robert Rustage

7.1 Introduction

This section describes the access to and use of external rainfall and combined sewage overflow data as input to the ECP monitoring plan.

7.2 Aims

Rainfall and river level/flow data provide insight into river levels and the possible dilution of contaminants, as well as to turbidity and specific conductivity levels. Event duration monitoring (EDM) and combined (storm) sewage overflow (CSO) data provide insight into an important source of nutrient pollution in the Evenlode catchment and as such will continue to be included in water quality analyses.

7.3 Monitoring and coverage

These data are not actively monitored by the ECP. Rainfall and river level/flow data are available from Hydrology Data Explorer - Explore (Figure 5).

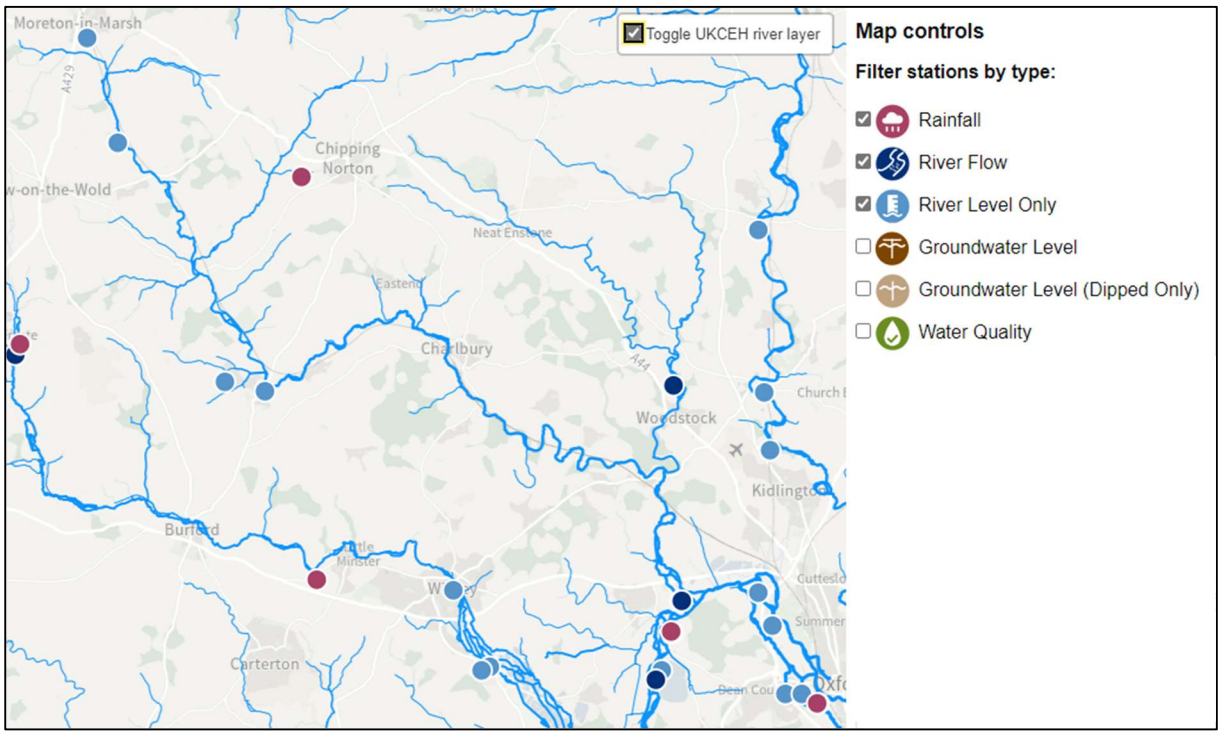

Figure 5: EA rainfall, river level and river flow stations in the Evenlode catchment

EDM data are accessible from Thames Water (TW). Application programming interface request (API requests) are made monthly to TW databases, which provides a minute-by-minute record of the CSO discharges in the catchment (Robert Rustage).

CSO data are available for all STWs in the Evenlode catchment except Enstone, Longborough, Great Rollright, Sandford St Martin, and Spelsbury which are "treat-all" works and do not have storm discharge facilities.

7.4 Data

7.4.1 Hosting

Rainfall data are available here, and will be accessed using an API: https://environment.data.gov.uk/flood-monitoring/id/stations/253861TP.html

TW hosts a live website map that shows real-time data for their CSO EDMs, but does not provide historical discharge data. There are some third-party websites that provide more data (https://www.sewagemap.co.uk/, https://theriverstrust.org/sewage-map).

EDM data will be accessed using Python (Robert Rustage) from here: https://data.thameswater.co.uk/s/

7.4.2 Quality control and analysis

Quality control is undertaken by the host organisations.

CSO data are analysed on a monthly basis in a spreadsheet developed by Robert Rustage that allows comparison with rainfall data. These data are used to provide insight into SFWW and Riverfly data, as well sonde data.

7.4.3 Reporting

Monthly CS Newsletter. Rainfall and EDM data are included (Laura Bannatyne) in the ECP monthly CS Newsletter (Samanatha Frith) and emailed to all group members and other interested parties.

Monthly data reports. Rainfall and EDM data are synthesised into monthly data reports (Laura Bannatyne Robert Rustage) These are available on the WO&ECP FWW page once approved by the ECPWQG, and may be disseminated to the public.

Annual report. Rainfall and EDM data will be included in the Annual Report (Laura Bannatyne, Robert Rustage and ECPWQG members). A draft will be available by January 2025 with finalisation by March 2025.

8 Ad hoc research

This section gives a brief overview of recent research activities and/or external academic/commercial projects that offered or requested assistance to the ECP (e.g., water sampling or use of sonde data), and/or provided expertise and other data. Going forward, the ECP will continue to offer opportunities for collaboration towards related research goals.

8.1 Road runoff

Road runoff is increasingly recognised as a significant source of freshwater contamination, delivering a cocktail of substances from (usually urban) areas to water courses. These include complex synthetic as well as organic compounds that may be persistent, accumulative, bio-available, and have long-term impacts on aquatic ecology and human health.

In collaboration with Emissions Analytics, the ECP and WASP has been investigating tyre pollution in the Evenlode and the Windrush catchments. Emissions Analytics uses a method called two-dimensional gas chromatography with time-of-flight mass spectrometry (GCxGC-TOF-MS) to discover, identify and quantify water contaminants. Sixteen samples were taken along the Evenlode, and initial results suggest that the typical “chemical fingerprint” of tyre pollution can be detected in every sample. A full analysis will be conducted over the coming months, with plans to publicly publish the results as a set of policy recommendations in November.

8.2 Ammonia calibration

Ammonia is an indicator of nutrient pollution. However, ammonium sensors are widely recognised as being difficult to maintain in their calibrated state, leading to measurement errors as the readings “drift” in a non-linear manner over time. The ECP has been working with researchers for Birmingham University to research and address this problem using data from the four Proteus sondes and will continue to engage with this research going forward.

8.3 Aquatic plants and algae

A University College London student undertook aquatic plant and algae surveys at sites around the Littlestock Brook as part of their final year project, using FWW and Riverfly data as part of their research framework. Their results will add a valuable dimension to the picture of water quality and ecosystem health associated with the reaches of the Littlestock Brook up- and downstream of the Milton-under-Wychwood STW. Insight into algal presence and abundance will be especially useful.

8.4 Social research

A PhD student from the University of Oxford conducted interviews with several members of the ECP as part of their research examining how, why and with what consequences digital river technologies are used, centring around the River Thames and its tributaries in and around the Oxfordshire area, including the Evenlode and the Windrush river catchments. Their research aims to determine what difference technologies make to how data and knowledge is produced about rivers, how people experience, recreate and engage with rivers, and finally, how rivers are governed or managed.

9 Using data for change

This section proposes actions ***to restore the Evenlode Catchment to "Good Ecological Status" for the benefit of all***. These actions will aim to:

- Raise awareness of the current poor water quality of the Evenlode catchment.
- Advocate for the improvement of water quality in the Evenlode catchment for the benefit of people and the environment.
- Build the capacity of community members to intersect planning and governance processes that may lead to a decline in water quality in the Evenlode catchment.

This aligns with and will assist with achieving the following milestones (See Section 1.1):

- Deliver a pilot P technology project
- Disseminate performance data from works to the Environment Agency (EA), the Water Services Regulation Authority (Ofwat), media and academic outlets
- Continue campaigns

9.1 Adopt a sewage treatment works

This initiative will be piloted in the Evenlode catchment with a view to possible expansion to other areas. The aim is to empower local people to provide the necessary evidence to relevant organisations and agencies when local STWs are known to be operating beyond their design capacity. The need for evidence-based local input to planning processes is particularly important when development proposals are made that may exceed the capacity of existing STWs to deal with the *additional* volumes of sewage (e.g., at Moreton-in-Marsh where proposals for housing developments and for population densification including care homes have been submit despite the STW already having insufficient operational capacity).

It is not the aim of this initiative to prevent housing development. In line with the aim of the ECP, the aim is to prevent further negative impacts on the Evenlode from the inflow of nutrients from sewage. Other sources of nutrient pollution are recognised and will be addressed by different approaches.

Earthwatch Europe will seek funding to support their development of a web-hosted resource to build the capacity of community members to engage with local development and sewage infrastructure planning processes. Knowledge resources will include data, links to databases and other resources, planning process guidelines, template documents, instructional videos and documents, glossaries of terminology, and a suite of supporting documentation. Much of the material is already available, and local expertise (chiefly from Windrush Against Sewage Pollution members) exists to advise and assist with this initiative. Support in the form of advice and

guidance has been offered by the EA and other bodies. Some webinars and podcasts have already been presented that showed that there is appetite for this resource.

A report collating all available ECP WQ data, STW permits, and storm overflow data has already been compiled for Moreton-in-Marsh STW. Another is being developed for the Milton-under-Wychwood STW. Other STWs will be prioritised by the WQ Group in the coming months and their reports added to the available resources mentioned above.

9.2 Engagement

Engagement with local MPs, Councillors, and water companies will actively continue. The aim of this engagement is to use the data-based evidence to raise awareness of the current water quality status of the Evenlode, and of the pressure placed on already over-burdened STWs by new development. The need for infrastructure upgrades to be implemented ahead of and in line with housing development will be emphasised, together with the value of the ecological goods and services provided by the Evenlode not only as a drinking water resource that supplies the Farmoor Reservoir, but also in terms of its value to tourism and recreation in the area.

Engagement with communities, individuals and interest groups including schools, Scouts, Women's Institutes and Duke of Edinburgh Award with actively continue with the aim of using data-based evidence to raise awareness of the Evenlode and its ecosystems, and the pressures on the river from development, agriculture and climate change. Personal and societal actions that can bring about positive change will be emphasised.

9.3 Communication

Communications about the activities of the ECP, the status of the Evenlode, and the actions needed for positive change has been ongoing through:

- Social media including Facebook, YouTube, podcasts, WhatsApp and Instagram,
- Print media,
- Interviews and articles via radio and television,

Capacity building of citizen scientists has been made available via train the trainer videos, in person training, recorded "Frequently asked Questions" videos.

These approaches will continue to be actively pursued.

10 Summary

Table 2 summarises the main elements of the monitoring plan

Table 2: Summary of the ECP water quality monitoring plan 2024 - 2025

What	Why	How	Who	Where	When	Data				Reporting
						Record length	Hosting	Quality control	Analysis	
Nitrate Phosphate Turbidity Biophysical observations	Reconnaissance-level WQ data; community engagement	FWW: Volunteer citizen scientists	S Frith L Bannatyne	Catchment wide	Monthly	From 2014	Explore our data | FreshWater Watch	S. Frith L Bannatyne	L Bannatyne	Newsletter Monthly Annually
Benthic invertebrates	Ecological impact data; community engagement	Riverfly: Volunteer citizen scientists	E Concannon		Quarterly	From August 5th 2017	https://riverflydata.org/	EA	EA	Newsletter Monthly Annually
Temperature Turbidity Conductivity pH Dissolved Oxygen Phosphorus Ammonia Colorised Dissolved Organic Matter Tryptophan Biological Oxygen Demand	Fixed, accurate WQ data	Proteus sondes (4)	R Rustage	Four sites	Near-continuous data	Two years to 1 month	Outpost Central	R Rustage	R Rustage L Bannatyne	Monthly Annually
Conductivity Temperature pH Ammonium	Mobile, accurate, WQ data	Hand held YSI probes (2)	S Frith R Rustage L Bannatyne	Mobile	Near continuous data	Hours or days	TBA	L Bannatyne R Rustage	L Bannatyne R Rustage	Case study Annually
Conductivity Temperature pH	Mobile, accurate TDS data	Hand held Eutech TDS meters (2)	A Miller S Frith	At 12 sites	Monthly	Three years	Explore our data | FreshWater Watch	L Bannatyne	L Bannatyne	TBA
A range of WQ determinands including Temperature Conductivity pH Dissolved Oxygen	National government WQ monitoring strategy	Water sampling and laboratory analysis	EA	20 sites	Usually monthly	Variable, from years to months. Some discontinued	Open WIMS data	EA	L Bannatyne	Monthly Annually

Phosphorus Ammonia Colorised Dissolved Organic Matter Tryptophan Biological Oxygen Demand										
Precipitation	Water level/dilution data	EA data API	R Rustage	Whorton Mill	Near continuous	Historic - present	https://environment.data.gov.uk/flood-monitoring/id/stations/253861TP.html	R Rustage	L Bannatyne R Rustage	Newsletter Monthly Annually
CSO	Nutrient contamination data	TW EDM data API with python	R Rustage	All STWs	On discharge		https://data.thameswater.co.uk/s/	R Rustage	R Rustage L Bannatyne	Newsletter Monthly Annually

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