ECP monthly water quality data report November 2024

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1. Overview

This report provides a synopsis of water quality in the Evenlode catchment for November 2024. Rainfall data and combined sewage overflows (CSOs) from sewage treatment works (STWs) are considered as the "inputs" or drivers of water quality in terms of contamination and available dilution. No data were available for specific pollution sources other than from STWs, but diffuse pollution for agriculture, road runoff, and outflows from septic tanks and other small sewage treatment facilities at household level also impact water quality in the Evenlode catchment.

Data from citizen science (CS) Freshwater Watch (FWW) surveys, Environment Agency (EA) water sampling, and near-continuous sonde measurements were used to develop this synopsis. Sonde data is presented for 02 November – 05 November to demonstrate the effects of high rainfall and storm overflow discharges on the sonde data. Freshwater Watch (FWW) surveying was carried out over the weekend of 15 - 18 November. All available EA data for November are presented. Riverfly results reported during November are also included. The data sources, determinands, and recording periods are summarised in **Table 1**.

2. Data sources and monitoring period

Table 1: Data types, sources, and monitoring periods

Data type	Data source	Start	End
Rainfall	Environment Agency	01/11/2024	30/11/2024
Combined Sewage Overflows	Thames Water	01/11/2024	30/11/2024
Nutrients	ECP FWW (citizen science)	15/11/2024	18/11/2024
Nutrients	Environment Agency	1/11/2024	30/11/2024
Various	ECP Proteus sondes	14/11/2024	19/11/2024
Riverfly	ECP citizen science	November 2024	

3. Rainfall data

Rainfall for November recorded at Worsham Mill and Chipping Norton is shown in **Figure 1**.

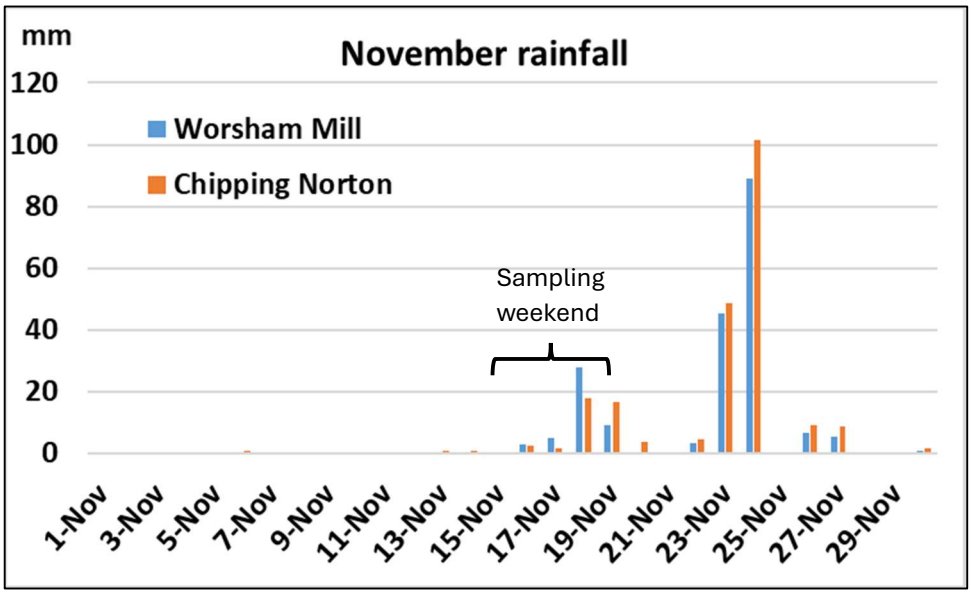


Figure 1: Rainfall at Worsham Mill and Chipping Norton 01/11/2024 –30/11/2024

Following the very wet period during September and October, the beginning of November was dry. Only 1 mm and 2 mm of rain fell in the week preceding FWW sampling at Worsham Mill and Chipping Norton respectively, with 22 mm and 35 mm recorded over the sampling weekend, mainly falling on the 18th of November. 72 % of citizen scientists reported average water levels, while 18% reported low water levels, an indication of the dilution available for treated effluent outflows downstream of STWs.

4. Combined sewage overflow data

The hours that CSOs were discharged from STWs into the River Evenlode and its tributaries during November are shown in **Figure 2**.

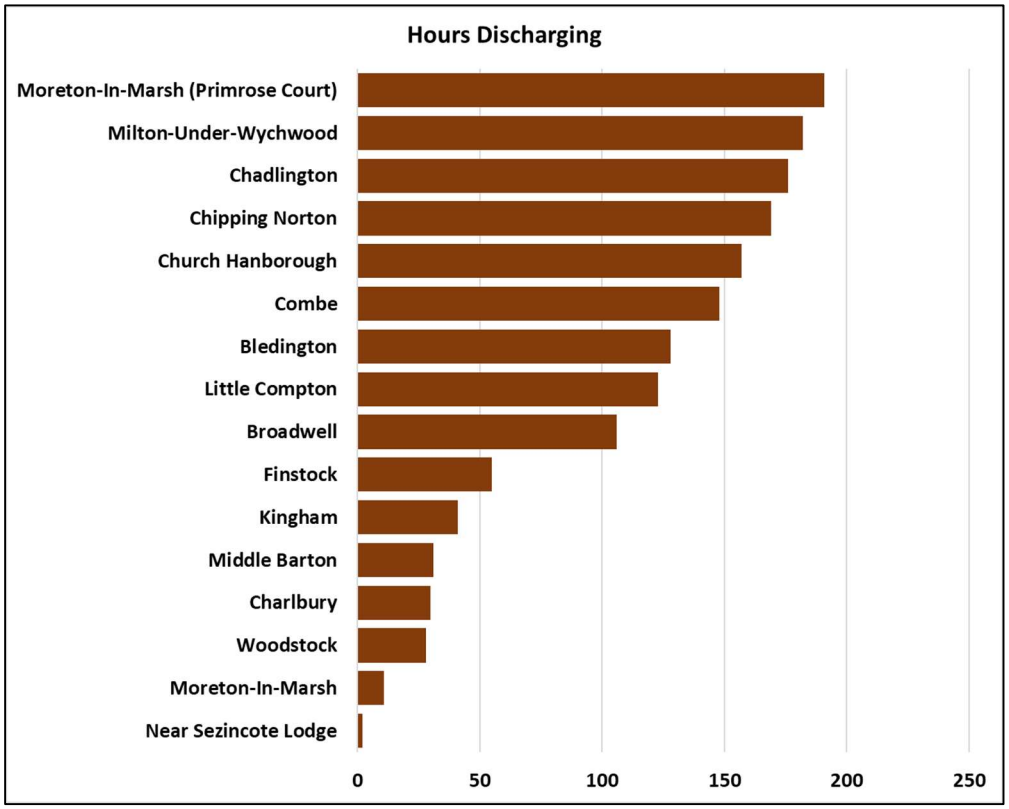


Figure 2: Combined sewage overflows 01/11/2024 – 30/11/2024

The nine STWs at the top of the table all discharged for more than 100 hours in November which all took place after the FWW sampling weekend. This represents a significant reduction from the storm overflows of September and particularly October.

5. FWW and EA monitoring

25 FWW surveys were taken by 44 participants in November. The EA monitored 15 sites in the Evenlode catchment between 1 - 30 November. Nitrate as N, and orthophosphate reactive as P analysed by the EA are comparable with the N and P concentrations measured by citizen scientists using the FWW test kits, and with P monitored by the four Proteus sondes installed in the Blue/Chipping Norton, Littlestock, and Four Shires Brooks.

Figure 3 shows the spatial distribution of FWW surveys that recorded poor (64%), moderate (16%), and good (20%) water quality throughout the catchment for November, with the percentage of each represented by the inset pie chart. The percentage of surveys recording good

water quality remained the same as in October, whilst the percentage recording poor water quality increased. Water quality is derived from a combination of nitrate, phosphate, and turbidity values, as well as other observations, including of algae and of sewage fungus.

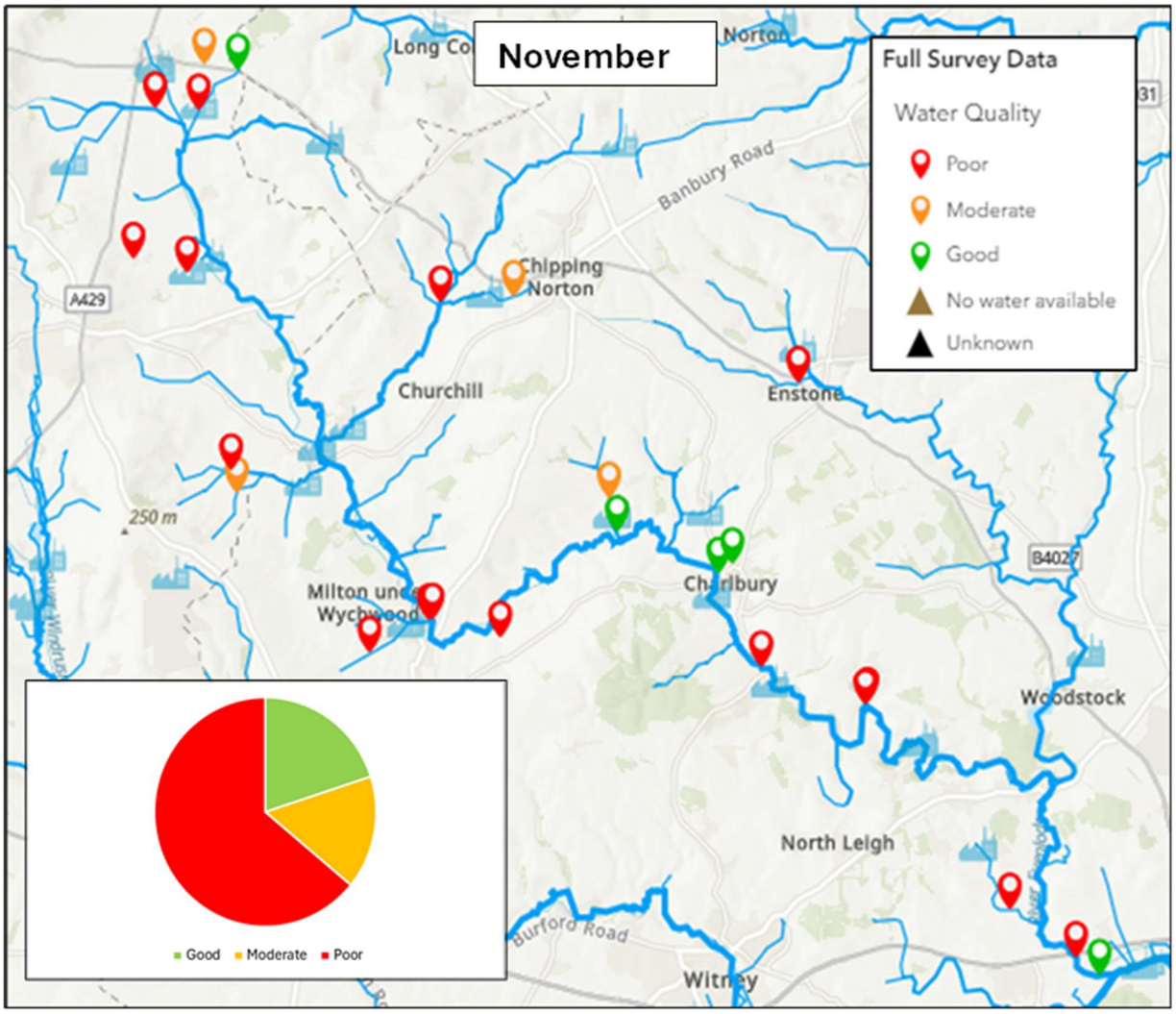


Figure 3: FWW full survey data (15 - 18 November)

Nutrient concentrations

Figure 4 shows the distribution of FWW and EA nitrate concentrations throughout the catchment. the headwaters and lower part of the catchment show low nitrate concentrations (< 1.0 mg/L, good) whilst the remainder of the catchment shows generally high concentrations (>2.0 mg/L, poor) The inset pie chart indicates the percentage of FWW surveys that showed good (24%), moderate (16%) and poor (60%) nitrate concentrations. Together with the graph in **Figure 5** this shows that the percentage of samples with N> 2.0 mg/L rose markedly from October, although approximately a quarter of samples showed good nitrate concentrations. The EA and FWW samples show broad agreement.

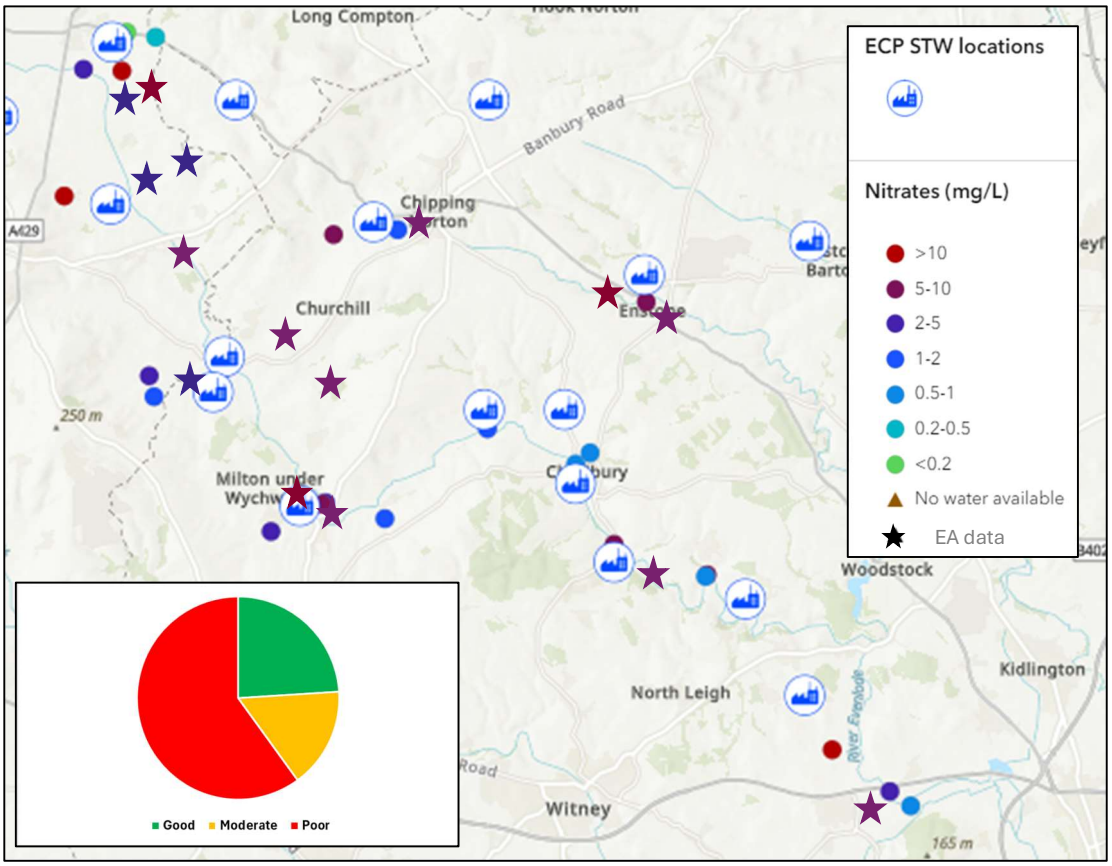


Figure 4: FWW (15 - 18 November) and EA (01 – 30 November) nitrate concentrations

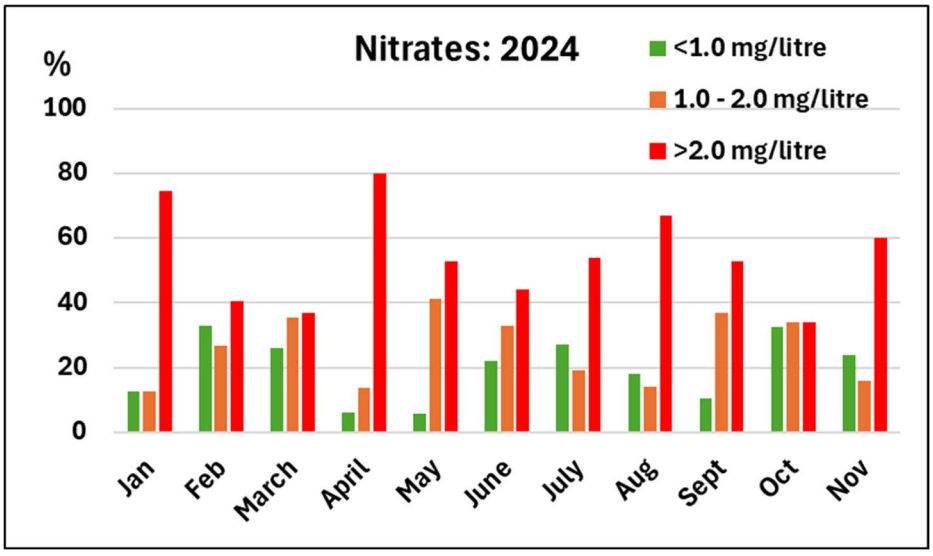


Figure 5: FWW nitrate concentrations January – November 2024

Figure 6 shows the distribution of FWW and EA phosphate concentrations. The inset pie chart indicates the percentage of FWW samples that showed low (80%), moderate (12%) and high (8%) P concentrations, which together with the graph in **Figure 7** shows that phosphate concentrations increased only slightly in November. EA phosphate concentrations tended to be higher than those from FFW sampling throughout the catchment and overall indicate somewhat poor water quality due to nitrates than the FWW sampling. This may be due to the majority of EA samples being collected after the FWW sampling weekend, when rainfall events caused STWs to begin releasing untreated effluent as storm overflows.

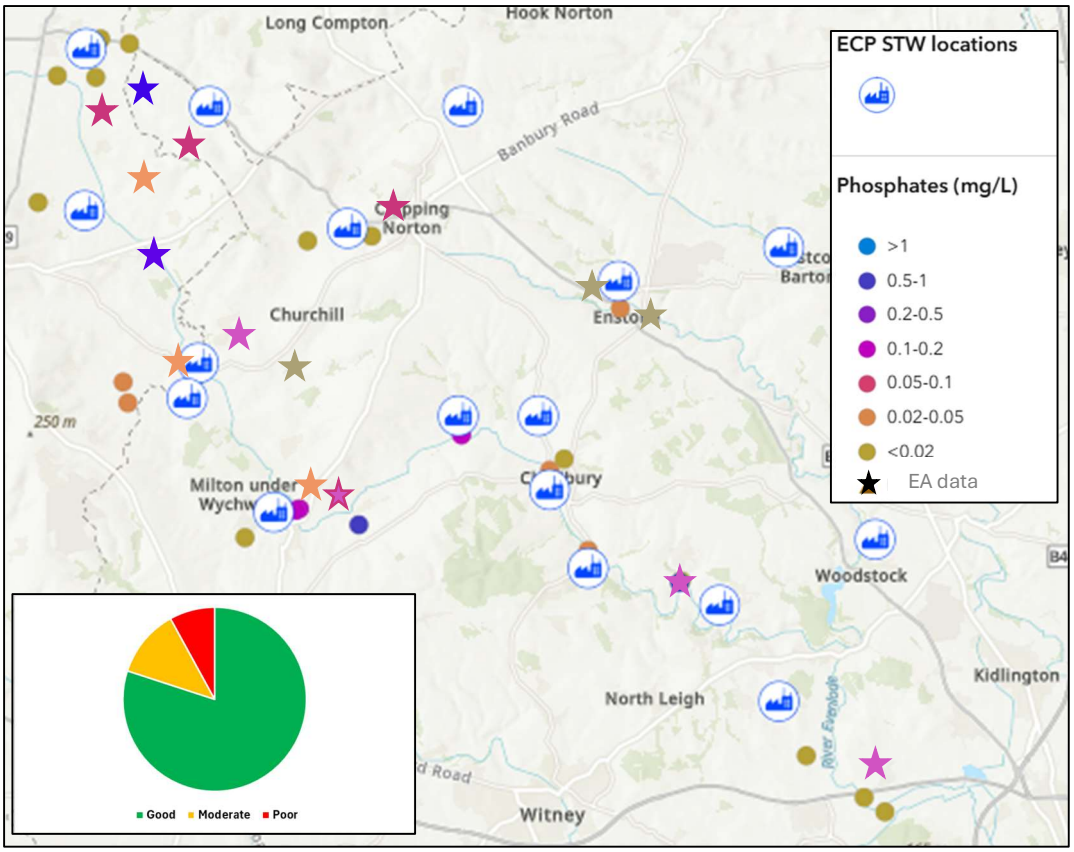


Figure 6: FWW (15 - 18 November) and EA (01 – 30 November) phosphate concentrations

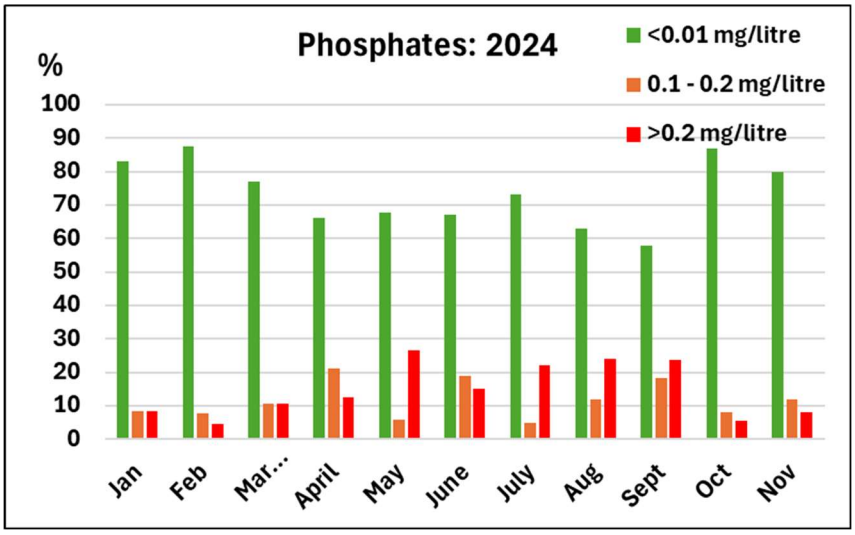


Figure 7: FWW phosphate concentrations January – November 2024

6. Riverfly data

Eight Riverfly sites were surveyed in November (Five in the Evenlode catchment, two on the Dorn and one on the Glyme. No trigger levels were breached (**Figure 8**).

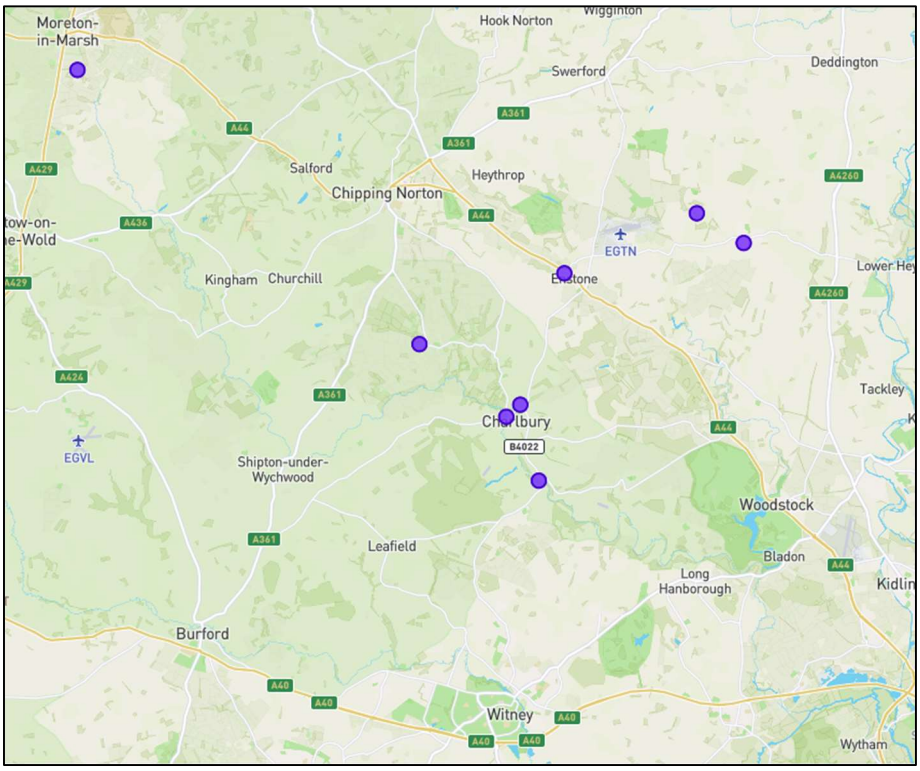


Figure 8: Riverfly surveys in the Evenlode catchment in November 2024

7. The Chipping Norton Brook (Also known as the Blue Brook)

Combined sewage outflows

Chipping Norton STW released Storm Overflow Discharges for 169 hours after the sampling weekend in November (Figure 2), in association with the rainfall that began on November 19th.

FWW data

FWW data was collected for the Blue Brook between 15 - 18 November:

- U/S of the Chipping Norton STW:
  - N = 1 - 2 mg/L, moderate,
  - P = < 0.02 mg/ L, low/good
- D/S of the Chipping Norton STW
  - N = 5 – 10 mg/ L, high/poor
  - P = < 0.02 mg/ L, low/good

As shown in **Figure 3**, in combination these nutrient concentrations indicated moderate and poor water quality respectively which appears to be largely driven by unacceptable N concentrations.

EA data

The EA sampled the Blue Brook above Chipping Norton STW:

- N = 5 - 10 mg/L (high/poor)
- P = 0.05 – 0.1 (low/good)

In combination these nutrient concentrations indicated poor water quality upstream of the Chipping Norton STW, indicating worse water quality than the FWW result but again with N causing the unacceptable water quality.

Sonde data

One Proteus sondes is installed on the Blue Brook, downstream of the Chipping Norton STW. No data were recorded by this sonde in November as it malfunctioned and went offline on 15/10/2024. This was initially thought to be a battery fault caused by insufficient daylight for the solar panel to charge, but after various tests it was taken to RS Hydro for a suspected 'voltage regulator' fault.

The sonde formerly located downstream of the wetland was moved to the Four Shires Brook downstream of Morton-in-Marsh STW in August.

8. Littlestock Brook

Combined sewage overflows

Milton-under-Wychwood STW released raw sewage into the Littlestock Brook after the November FWW sampling weekend for 182 hours.

FWW and EA N data

Table 2 summarises the N concentrations and classifications, and the resulting water quality classes for samples taken from watercourses up-and downstream of the Milton-under-Wychwood STW.

Table 2: FWW and EA N sampling results around Milton-under-Wychwood STW

Data source	Location	N (mg/L)	Class
FWW	Evenlode U/S of confluence	2-5	High/poor
FWW	The Liffs U/S of STW,	2-5	High/poor
FWW	Littlestock Brook D/S of STW	5-10	High/poor
EA (11/11/2024)	Littlestock Brook D/S of STW	>10	High/poor
EA (01/11/2024)	Evenlode D/S of confluence	5-10	High/poor

High N concentrations were found at all the sites summarised in **Table 2**, with the highest concentrations downstream of the STWs.

Sonde data

Two Proteus sondes are installed on the Littlestock Brook.

The sondes measure and derive several determinands including Biological Oxygen Demand (BOD), phosphorus, tryptophan, turbidity, chromophoric dissolved organic matter (CDOM), conductivity, and dissolved oxygen (DO).

BOD indicates the impact that decaying matter would have on dissolved oxygen levels in the water course. High BOD may indicate eutrophication, due to excess nutrients.

Phosphorus is comparable with the EA and FWW data, with a strong correlation to sewage discharges at the sonde locations.

Tryptophan is an amino acid, indicative of organic contamination and microbial activity. Sewage discharge is the dominant source at these locations.

Turbidity indicates the total suspended solids present, which may be linked to rainfall and river flow, or to the introduction of solid matter, or to algae.

CDOM is the light-absorbing part of organic matter. It does not specifically measure sewage, but at the sonde locations, there is a strong correlation between CDOM and the sewage discharges.

Conductivity indicates the amount of dissolved solids and inorganic content present. These are present naturally in freshwater bodies, due to the subsurface movement of water through rocks and soils. However, high levels of dissolved solids are indicative of pollution sources such as discharge from STWs.

Dissolved Oxygen (DO) is present in freshwater from atmospheric absorption and as a byproduct of photosynthesis. Low DO is (i.e. < 4 mg/L) can be lethal to fish, and is negatively impacted elevated water temperature and decaying organic matter which may be elevated downstream of STWs.

BOD, CDOM, phosphorus, tryptophan, turbidity, conductivity and DO data from the sondes up- and downstream of the Milton under Wychwood STW are shown in **Figure 9** and **Figure 10** respectively. The axes values and line colours are the same for both graphs.

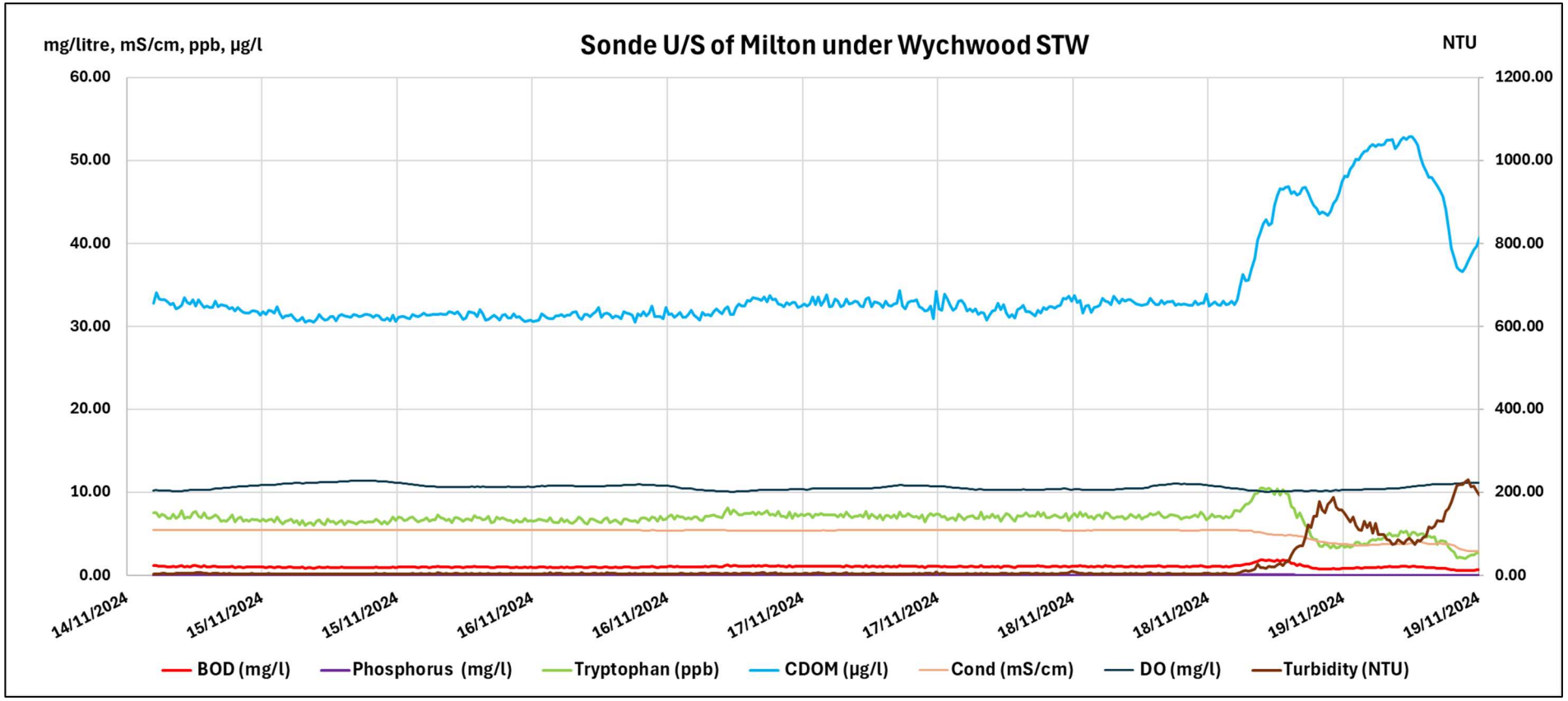


Figure 9: BOD, phosphorus, conductivity, DO, tryptophan, turbidity and CDOM for the Littlestock Brook at Heath Farm, upstream of Milton-under-Wychwood STW 14 - 19 November

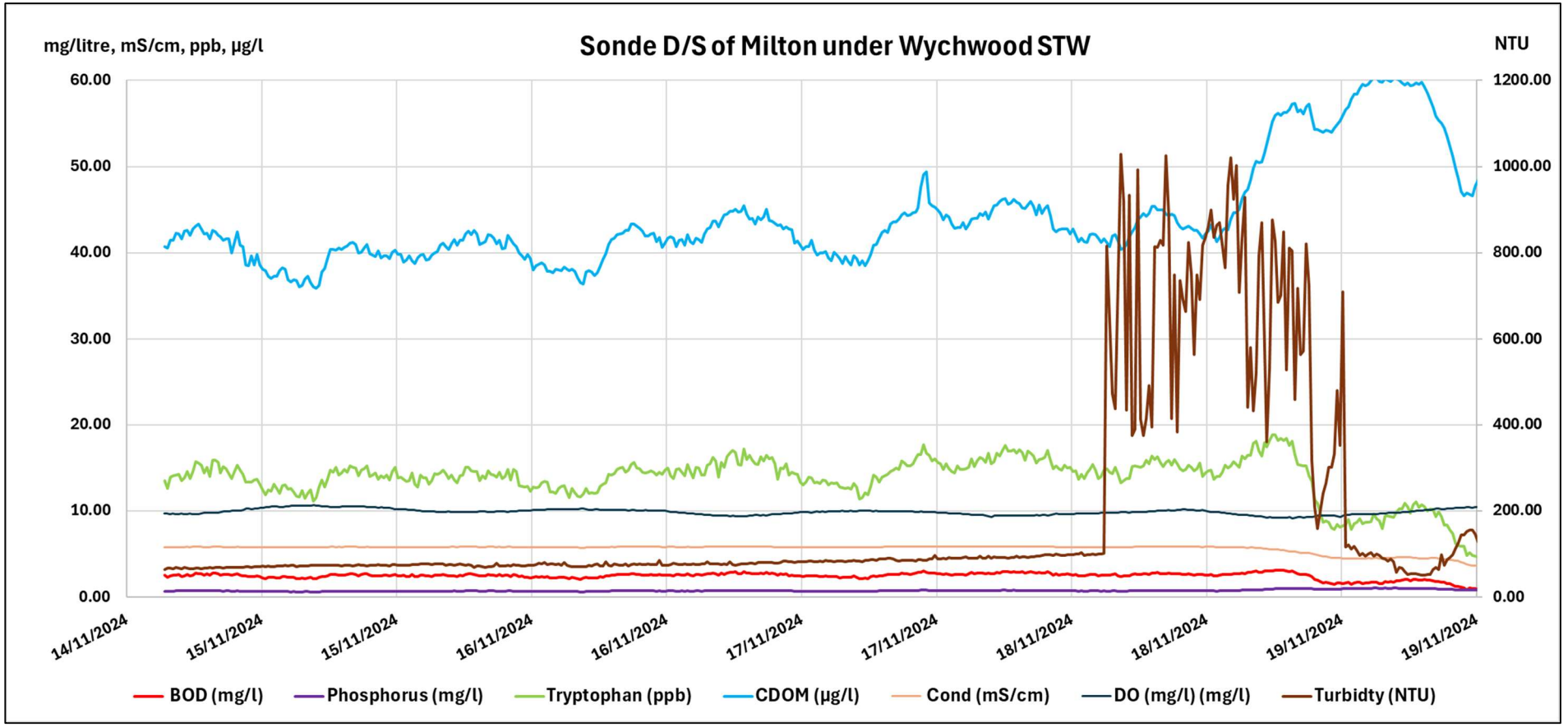


Figure 10: BOD, phosphorus, conductivity, DO, tryptophan, turbidity and CDOM for the Littlestock Brook at Littlestock House, 14 - 19 November

The rainfall that occurred on 19 November was reflected in the CDOM and tryptophan data both up- and downstream of the Milton-under-Wychwood STW, and particularly in the downstream turbidity data. CDOM, tryptophan, phosphorus, and turbidity were notably higher downstream of the STW, displaying the classic twice daily peaks due to domestic water usage. However, DO and conductivity remained steady throughout the period and at similar concentrations at both sites. Table 3 summarises the average values for sonde data 14 – 19 November up- and downstream of Milton-under-Wychwood STW.

Table 3: Average sonde data values for the Littlestock Brook up- and downstream of the Milton under Wychwood STW for 14 - 19 November

Site	BOD (mg/l)	P (mg/l)	CDOM (µg/l)	Tryptophan (ppb)	Turbidity (NTU)	Conductivity (mS/cm)	DO (mg/l)
U/S STW	1.06	0.05	34.67	6.61	25.69	5.16	10.61
D/S STW	2.45	0.78	44.26	13.64	184.05	5.59	9.91

Table 4 compares P concentrations up- and downstream of Milton-under-Wychwood STW from all available sources.

Table 4: P concentrations U/S and D/S of Milton-under-Wychwood STW

Data source	Location	P (mg/L)	Class	Water quality*
FWW	Evenlode U/S of confluence	0.1 – 0.2	Moderate	Poor
FWW	The Liffs U/S of STW	<0.02	Low/good	Poor
ECP sonde	U/S of STW	0.02 - 0.05	Low/good	
FWW	Littlestock Brook D/S of STW	0.1 – 0.2	Moderate	Poor
ECP sonde	D/S of STW	0.5 - 1	High/poor	
EA (04/10/2024)	Littlestock Brook D/S of STW	0.2 – 0.5	High/poor	Poor
EA (02/10/2024)	Evenlode D/S of confluence	0.1 – 0.2	Moderate	Poor

* In combination with N concentrations

P concentrations are generally lower upstream of the STW, with the poor water quality classification here being driven by N. Downstream of the STW both N and P concentrations are high or moderate to high respectively, indicating poor water quality.

9. The Four Shires Brook

The sonde located at the Four Shires Brook downstream of the outlet of the Moreton-in-Marsh STW in mid-August malfunctioned on the 7th of November.

Combined sewage overflows

Moreton-in-Marsh STW discharged untreated sewage for only 11 hours, on the 24th November.

FWW and EA data

Table 5 summarises the N and P concentrations and classifications, and the resulting water quality classes for samples taken from watercourses up-and downstream of the Moreton-in-Marsh STW.

Table 5: FWW and EA Nand P sampling results around Moreton-in-Marsh STW

Data source	Location	N (mg/L)	Class	P (mg/L)	Class	Water quality
FWW	Fire College stream, U/S	<0.2	Low/good	<0.02	Low/good	Moderate*
FWW	4 Shires Brook headwater	0.2 – 0.5	Low/good	<0.02	Low/good	Good
FWW (22/10/2024)	4 Shires Brook2, D/S	>10	High/poor	<0.02	Low/good	Poor
EA (17/10/2024)	4 Shires Brook, D/S	>10	High/poor	0.5 - 1	High/poor	Poor

*due to high turbidity

10. Summary

October's low nutrient concentrations due to excess precipitation gave way to a fortnight of dry weather during which no storm overflows occurred before the reporting period of the FWW sampling weekend. Nevertheless, water quality in the Evenlode catchment deteriorated in November. This appeared generally to be driven by moderate to high nitrate concentrations although high phosphate concentrations contributed to poor water quality downstream of STWs. November could therefore be considered to reflect the status quo in the catchment at average flows, with the poor to moderate water quality largely due to legacy nitrate contamination and routine STW discharges.

11. November sonde report

Sondes analysis November 2024

November has mostly been plagued with faults developing with the sondes. This is thought to be caused by a combination of age of the equipment, wet weather and corrosion. Two have been back to RS Hydro for repair, and a third has developed a fault just at the end of the month. Maintenance visits this month has included visits to retrieve batteries for charging, to clear snow off the solar panel and to check on them after storm Bert.

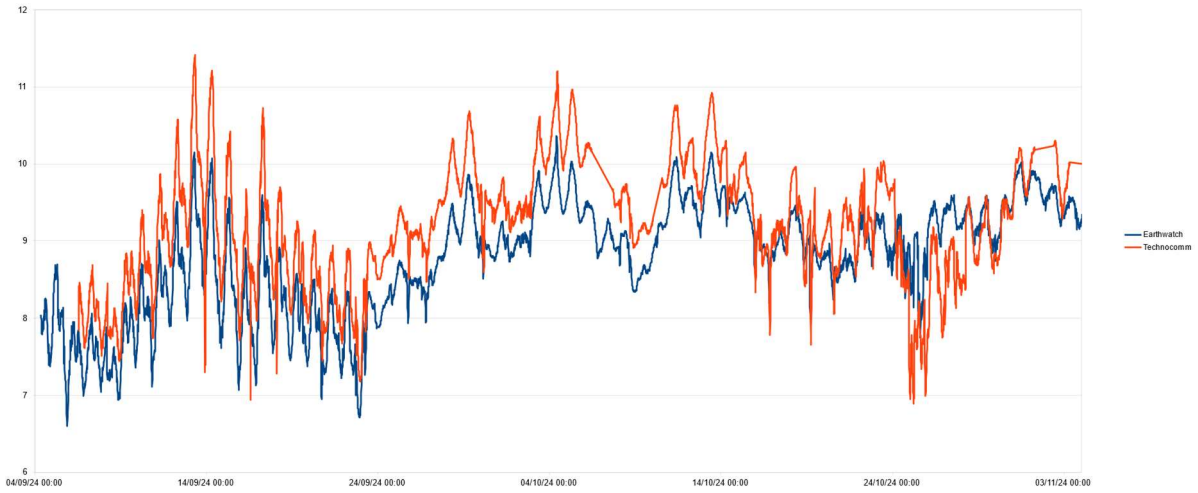
Cornwell Farm below Chipping Norton STW developed a fault at the end of October, which was initially thought to be a battery fault, caused by insufficient daylight for the solar panel to charge, but after various tests had to be taken back to RS Hydro, for a suspected 'voltage regulator' fault.

Common Bridge below Moreton in Marsh STW – was working ok until the 7th November. Low flows at the time, to the extent that the probe was showing signs of drying out overnight – when there were low flows from the STW. The new YSI handheld probe was deployed side by side for a while on the 6th as a comparator and also used at a couple of points downstream. The trace

started to become erratic after the 7th, after on-site fault checking, this unit was also returned to RS Hydro (12th November).

Heath Farm – upstream of Milton under Wychwood STW. Working fine all month.

Littelstock House – below Milton under Wychwood STW. Worked fine for most of the month, despite being flooded after Storm Bert on the 24th. Good correlation between our Sonde O_2 readings and the Aquasense monitor installed side by side (see below). The YSI hadheld monitor was also installed side by side 20th until the 22nd – although some of the determinants had good correlation, others need more analysis. The Sonde stopped working on the 28th and will be returned to RS Hydro on the 3rd December for maintenance and calibration.



Additional Investigations

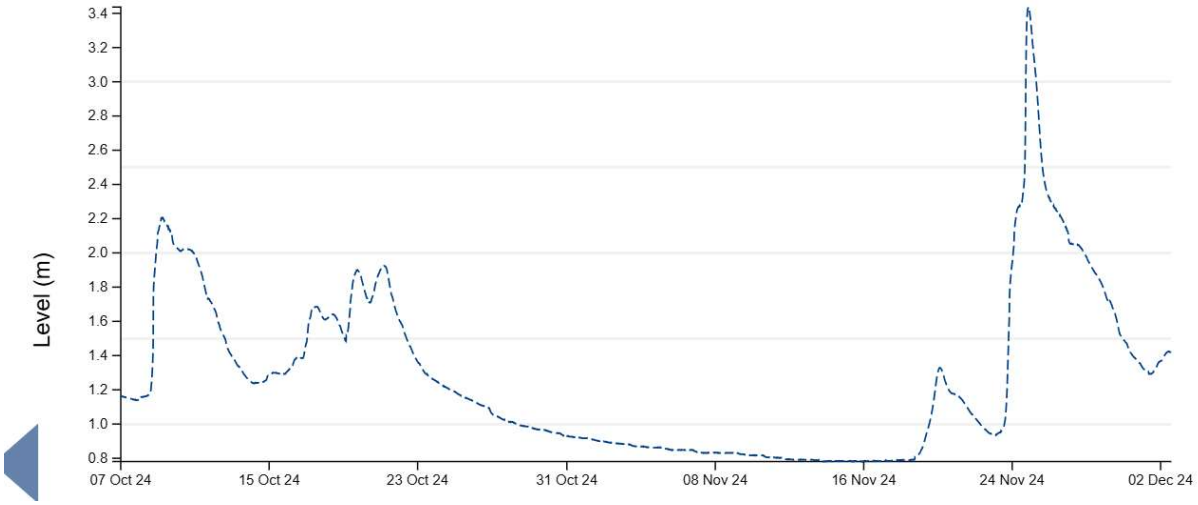
Notification of the sewage overflow at Church Road, Milton under Wychwood from Ann Berkeley after last month's WQ Meeting. Although there are occasional spikes of sanitary determinants upstream of MuW STW, they are not strong enough signals, or do they last long enough to give sufficient evidence of sewage discharges. I had a look at the point where the pipe should enter the stream, but no evidence of any outfall pipe, or any evidence of sewage debris. Brief chat with the landowner of the house downstream of the bridge – no mention of sewage. This is also the upstream riverfly sampling point, so worth keeping an eye on when passing.

Handheld YSI probe

This has been deployed a couple of times to see how it works and what calibrations and maintenance are needed. It was deployed side by side with a couple of the sondes and results are being analysed and compared with the Proteus Sondes.

Flows

Floods have come earlier this year than usual with both Storm Ashley (20-21 October 2024) and Storm Bert (22-25 November 2024) causing significant disruption. The speed of rise of the river level can be seen on the hydrological graph below.



Storm overflows discharging on the 25th November.