

# ECP monthly water quality data report July 2024



Prepared by Laura Bannatyne and Rob Rustage

## Contents

1. Overview .....	2
2. Data sources and monitoring period .....	2
3. Rainfall data .....	2
4. Combined sewage overflow data .....	3
5. FWW and EA monitoring .....	3
Nutrient concentrations .....	4
6. Riverfly data.....	7
7. The Blue Brook.....	7
Combined sewage outflows .....	7
FWW data.....	7
Sonde data .....	8
8. Littlestock Brook.....	12
Combined sewage overflows .....	12
FWW and EA data .....	12
Sonde data .....	13
9. Summary .....	16

## 1. Overview

This report provides a synopsis of water quality in the Evenlode catchment for July 2024. Rainfall data and combined sewage overflows (CSOs) from sewage treatment works (STWs) are considered 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, as well as 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 18 - 23 July, i.e., covering the weekend when citizen science (CS) Freshwater Watch (FWW) surveying was carried out (19 - 22 July). All EA data available for July are presented. Riverfly results reported during July are also included. The data sources, determinands, and recording periods are summarised in **Table 1**.

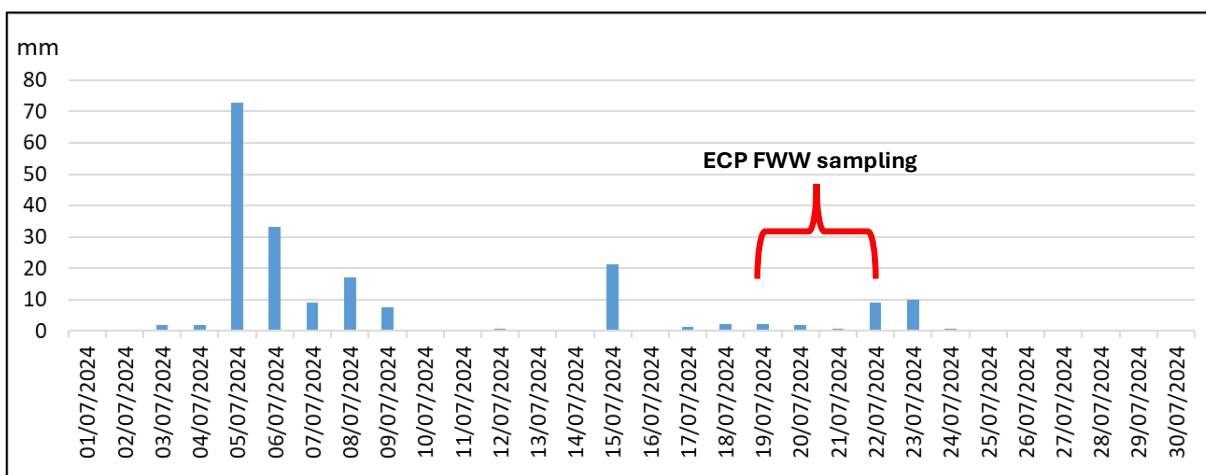
## 2. Data sources and monitoring period

**Table 1: Data types, sources, and monitoring periods**

Data type	Data source	Start	End
Rainfall	Environment Agency	01/07/2024	31/07/2024
Combined Sewage Overflows	Thames Water	01/07/2024	31/07/2024
Nutrients	ECP FWW (citizen science)	19/07/2024	22/07/2024
Nutrients	Environment Agency	1/07/2024	24/07/2024
Biological oxygen demand	ECP Proteus sondes	18/07/2024	22/07/2024
Phosphorous			
Tryptophan			
Turbidity			
Chromophoric dissolved organic matter			
Riverfly	ECP citizen science	July 2024	

## 3. Rainfall data

Rainfall for July at Worsham Mill is shown in **Figure 1**.

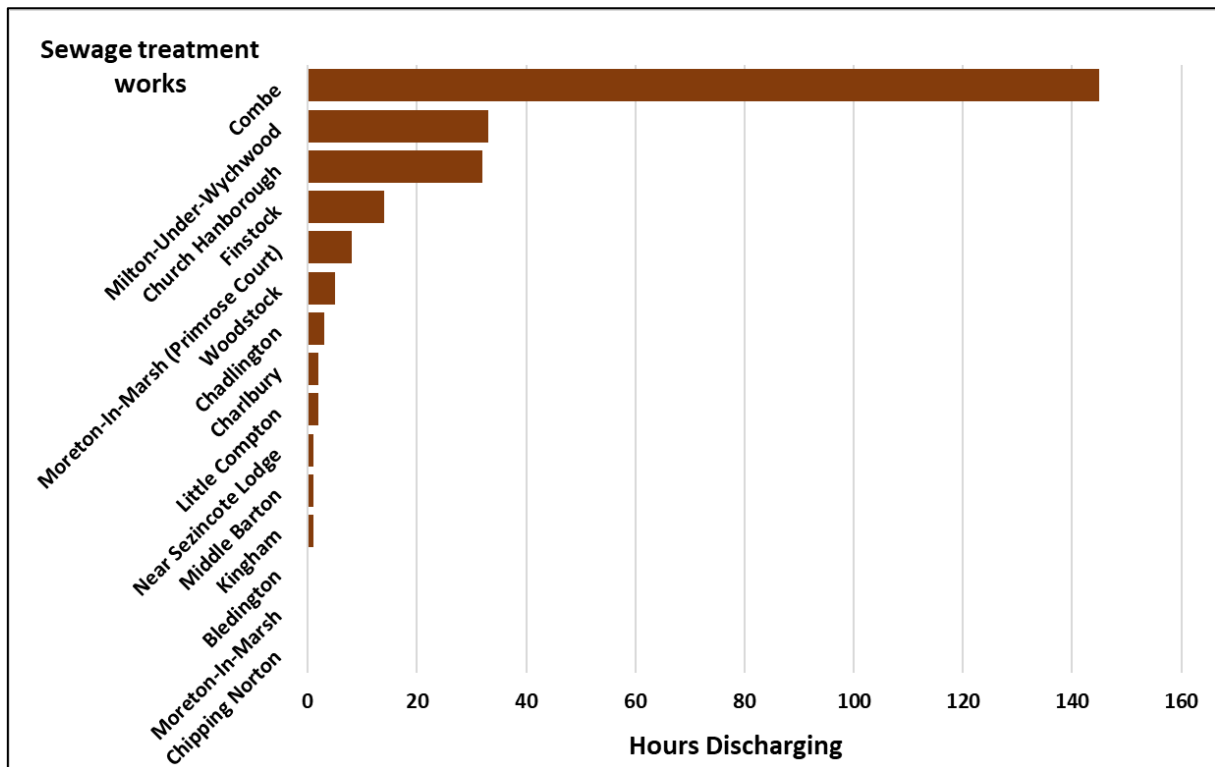


**Figure 1: Rainfall at Worsham Mill 01/07/2024 –29/07/2024**

195 mm of rainfall was recorded at Worsham Mill for July 2024, with 143 mm falling before 9<sup>th</sup> July, but little or no rain during the 10 days prior to the ECP FWW sampling weekend (19<sup>th</sup> – 22<sup>nd</sup> July).

#### 4. Combined sewage overflow data

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



**Figure 2: Combined sewage overflows 01/07/2024 – 29/07/2024**

Chipping Norton did not release CSOs in July, whilst Milton under Wychwood released for 33 hours. This is lower than might be expected considering the wet start to the month. Combe released for over 140 hours and requires further investigation.

#### 5. FWW and EA monitoring

FWW Survey numbers improved to 38 in July. The EA monitored 14 sites in the Evenlode catchment between 1 - 24 July. 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 and Littlestock Brooks.

There was light rain over the sampling weekend, with about half the ECP volunteers reporting light showers, and half reporting no rain at all. Consequently, most river levels were reported as low (55%) or average (45%), while one FWW site had no flow at all. Most rivers were running clear, with 51% of surveys recording water clarity as less than 14 NTU, and all recording 50 NTU or less (**Figure 3**).

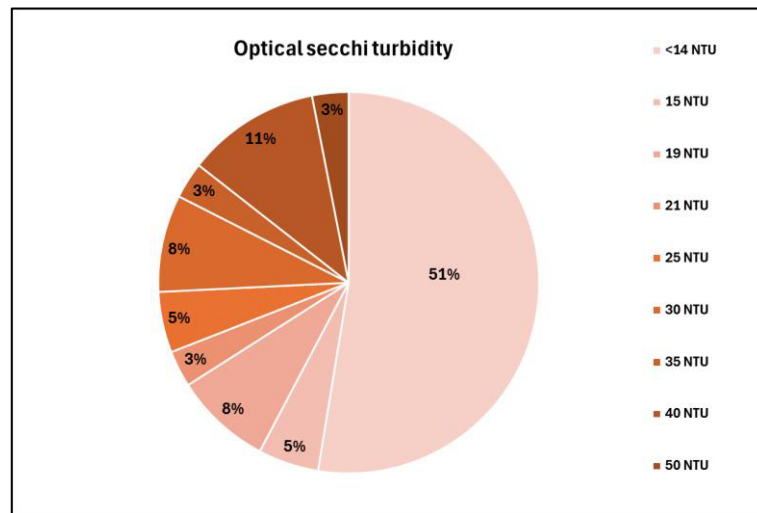


Figure 3: FWW Optical Secchi turbidity reported in the Evenlode catchment (19 – 22 July)

### Nutrient concentrations

Figure 4 shows the distribution of FWW and EA nitrate concentrations throughout the catchment. The graph in Figure 5 confirms the visual impression that the number of FWW surveys recording nitrate concentrations >2 mg/litre increased, although there were also several places where <0.2 - 0.5 mg/litre was recorded. No concentrations of <0.2 mg/litre were recorded by the FWW citizen scientists, although one was recorded by the EA downstream of the Fire College near Moreton-in-Marsh.

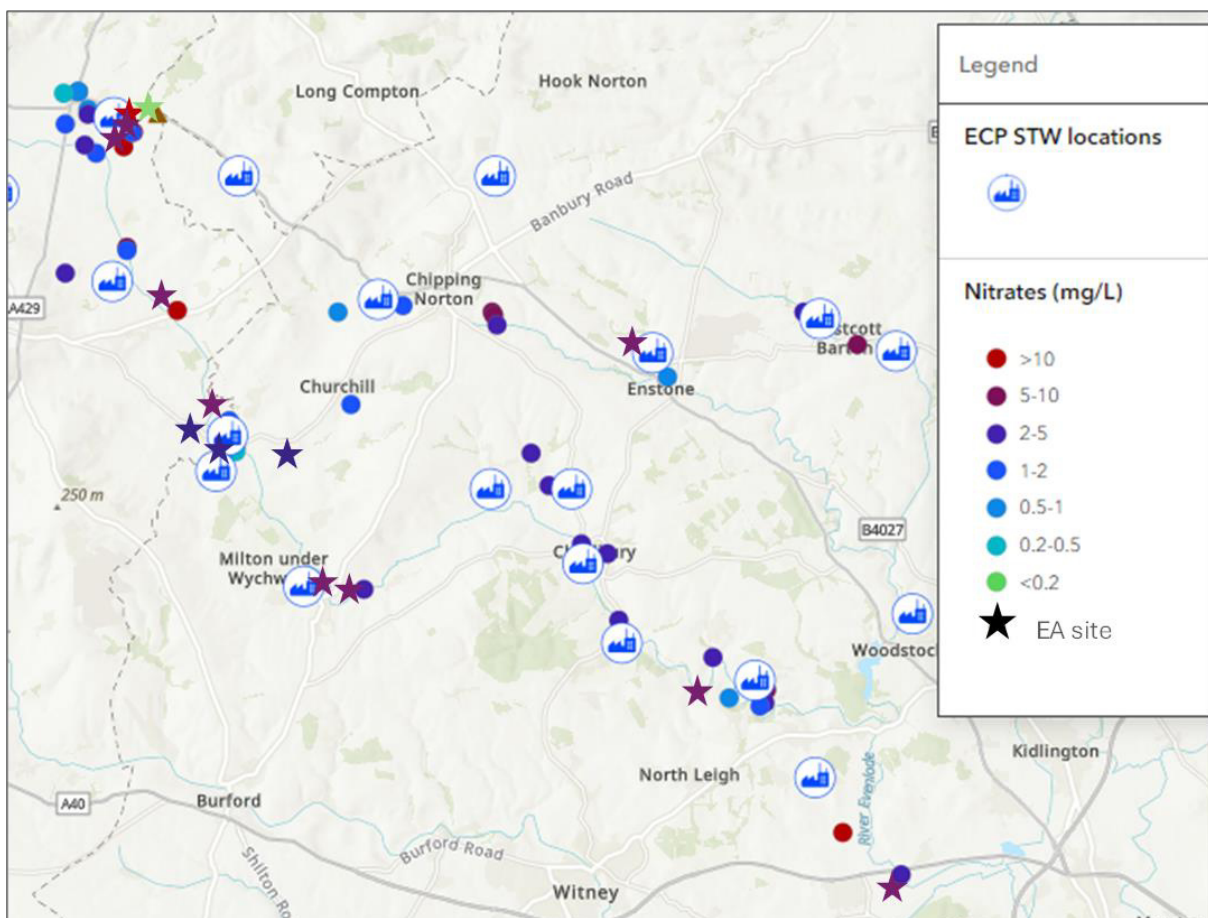


Figure 4: FWW (19 – 22 July) and EA (01 – 24 July) nitrate concentrations

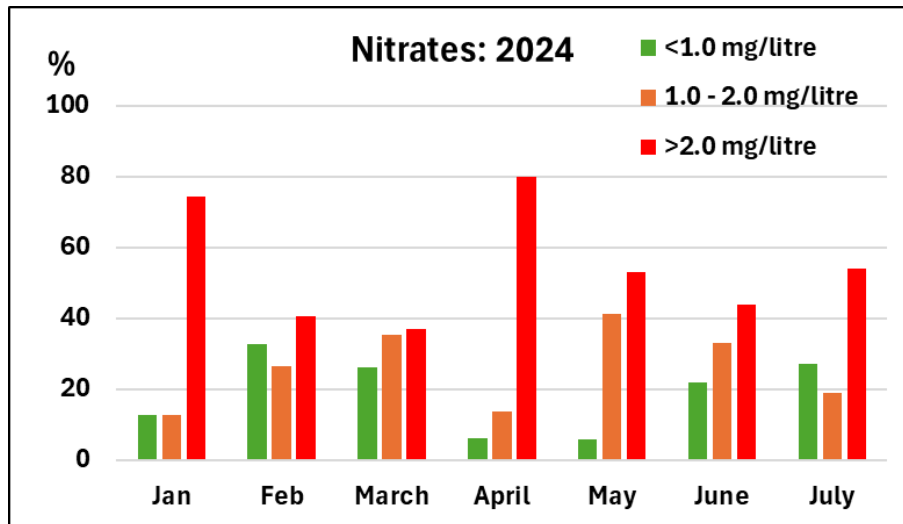


Figure 5: FWW nitrate concentrations January – July 2024

Figure 6 shows the distribution of FWW and EA phosphate concentrations. The majority of FWW concentrations reported were <0.02 mg/litre, with some of >0.1 mg/litre, particularly upstream of Oddington. Figure 7 shows that the percentage of FWW surveys recording <0.1 mg/litre increased this month, but surveys recording > 0.2 mg/litre phosphate also increased somewhat in July.

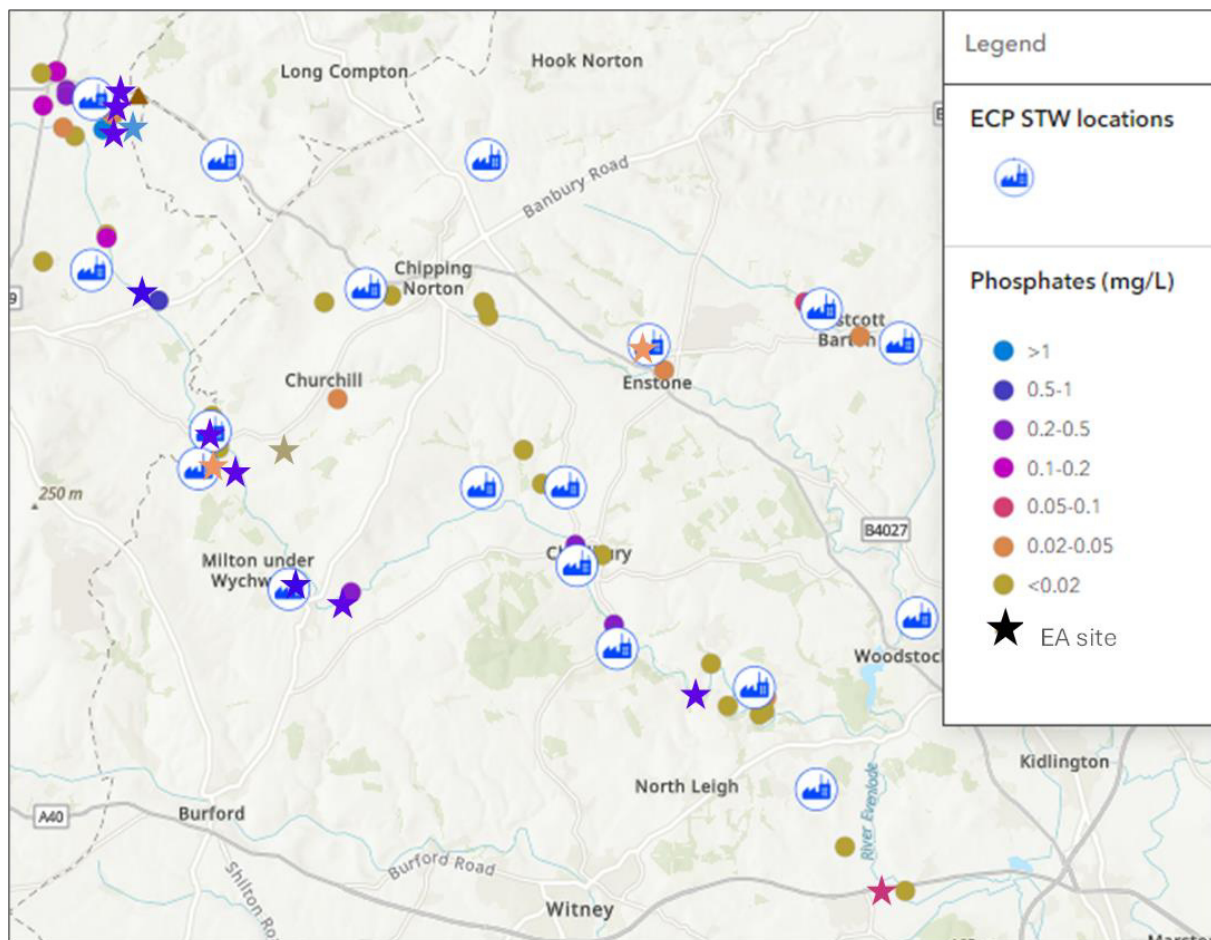


Figure 6: FWW (19 – 22 July) and EA (01 – 24 July) phosphate concentrations

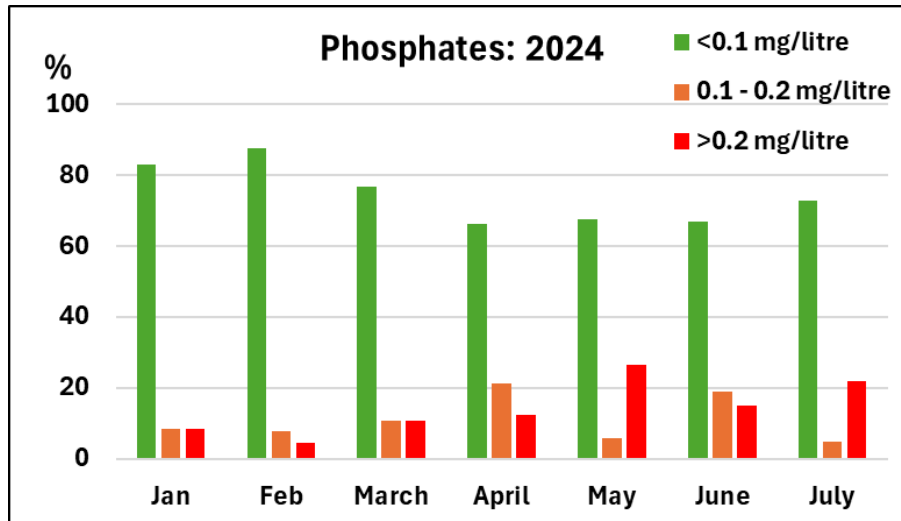


Figure 7: FWW phosphate concentrations January – July 2024

Figure 8 shows the spatial distribution of FWW surveys that recorded poor, moderate, and good water quality throughout the catchment for July. 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.

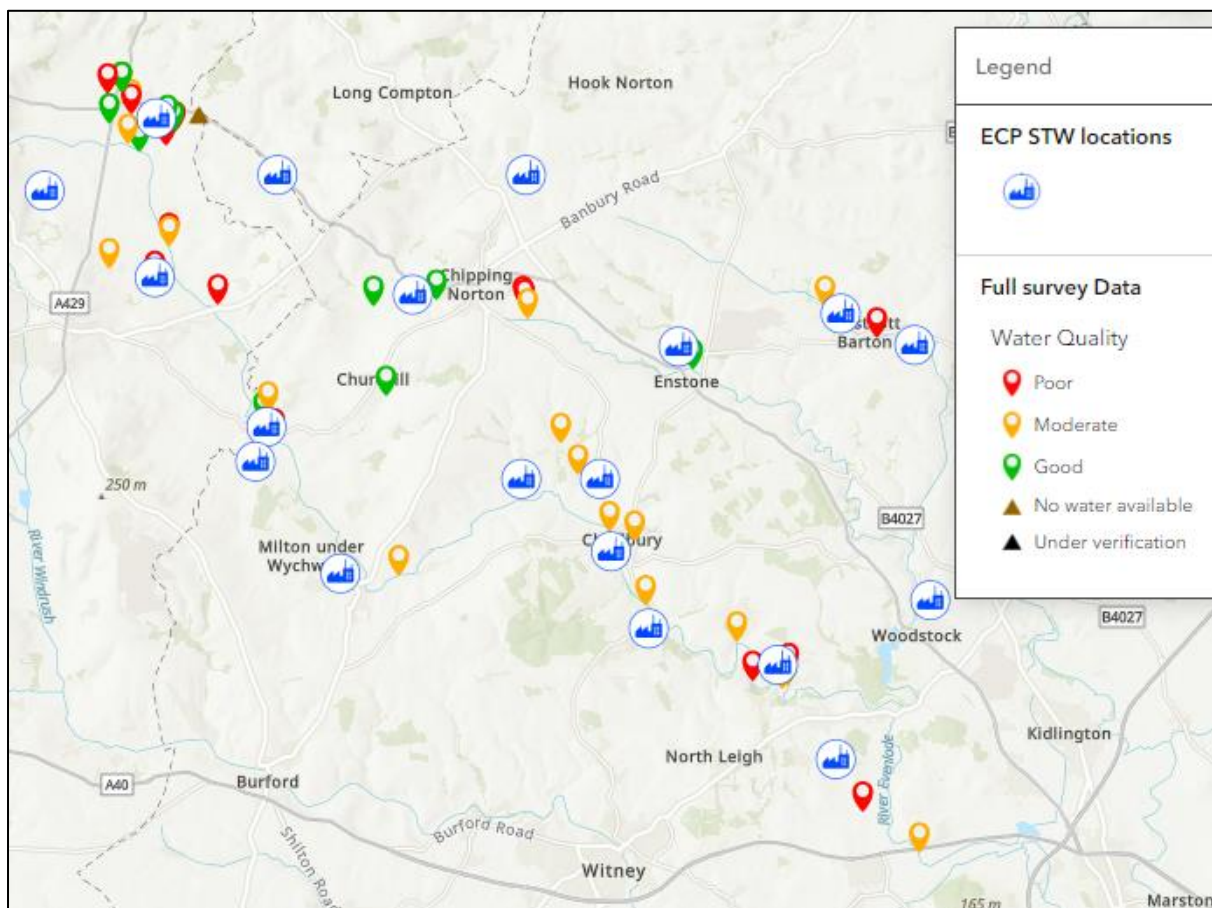


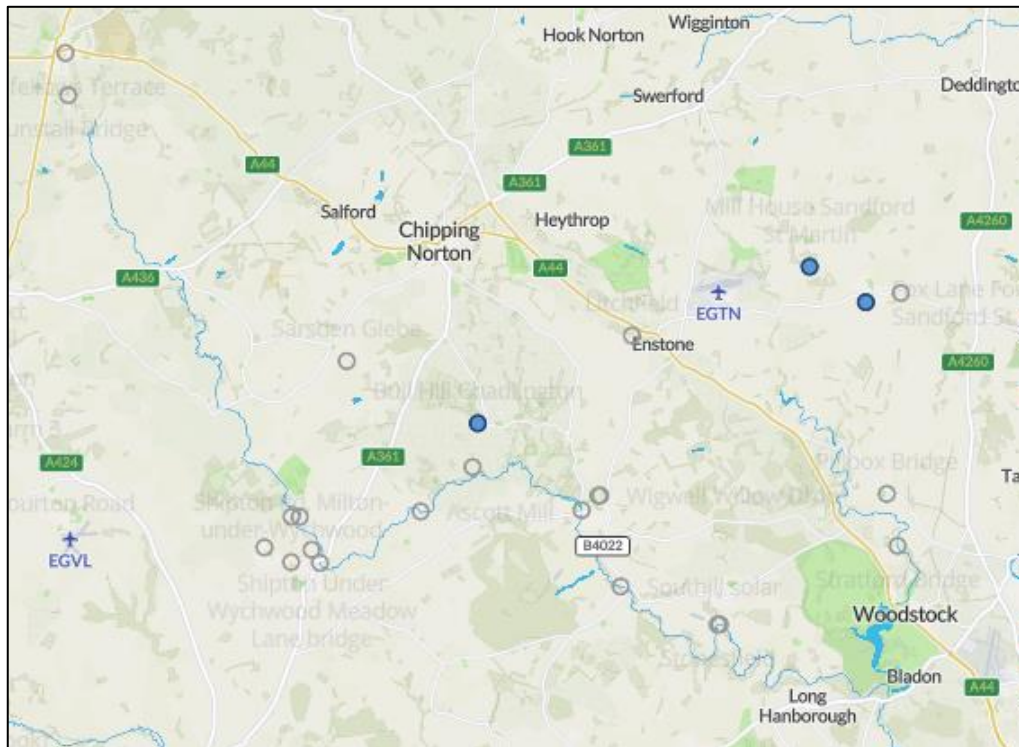
Figure 8: FWW full survey data (19 – 22 July)

In general, good water quality was restricted to tributaries, whilst water quality in the main stem of the Evenlode was moderate and poor. These less impacted tributaries are important

contributors to dilution and play a large role in preventing the further decline of water quality due to the contaminants being released into the Evenlode. As such they should be protected where possible and monitored regularly to detect any downward trajectory.

## 6. Riverfly data

Three Riverfly sites were surveyed in July. No trigger level breaches were reported (**Figure 9**).



**Figure 9: Riverfly surveys in the Evenlode catchment in July 2024**

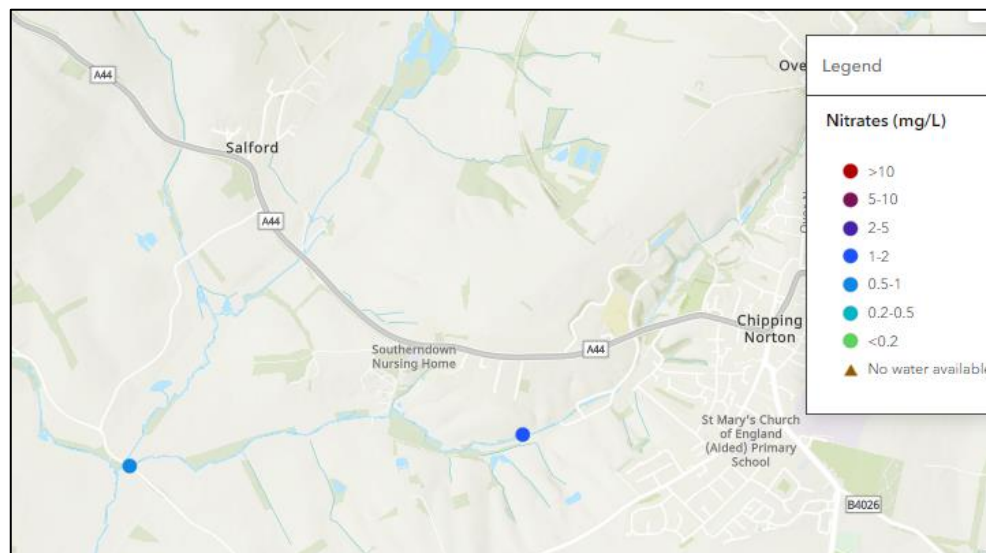
## 7. The Blue Brook

### Combined sewage outflows

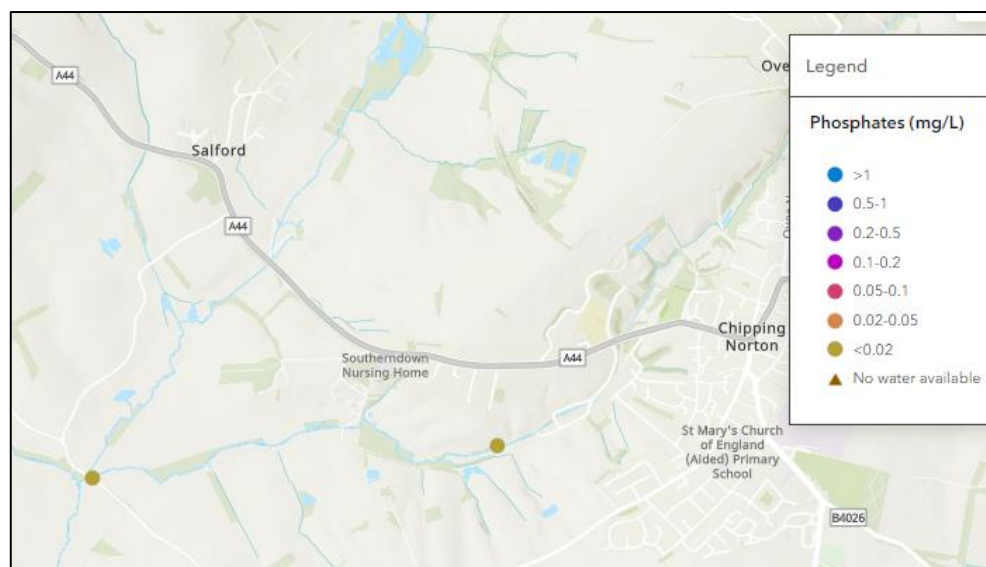
No Storm Overflow Discharges were released from Chipping Norton STW in July.

### FWW data

No EA data was collected for the Blue Brook in July. FWW nitrate and phosphate concentrations are shown in **Figure 10** and **Figure 11**.



**Figure 10: FWW nitrate data for the Blue Brook in July**



**Figure 11: FWW phosphate data for the Blue Brook in July**

FWW nitrate concentrations were slightly lower below the wetland than below the STW. FWW phosphate concentrations were within the same range at both sites.

### Sonde data

Two Proteus sondes are installed on the Blue Brook, one downstream of the Chipping Norton STW, and one further downstream below a constructed natural flood management intervention (wetland). They measure and derive several determinands including Biological Oxygen Demand (BOD), phosphorus, tryptophan, turbidity and chromophoric dissolved organic matter (CDOM).

**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.

The graphs in **Figure 12** and **Figure 13** shows the BOD, phosphorus, tryptophan, turbidity and CDOM data recorded by the sondes downstream of Chipping Norton STW and downstream of the Cornwell wetland. The axes and line colours are the same for both graphs. **Table 2** summarises the average values from the sonde.

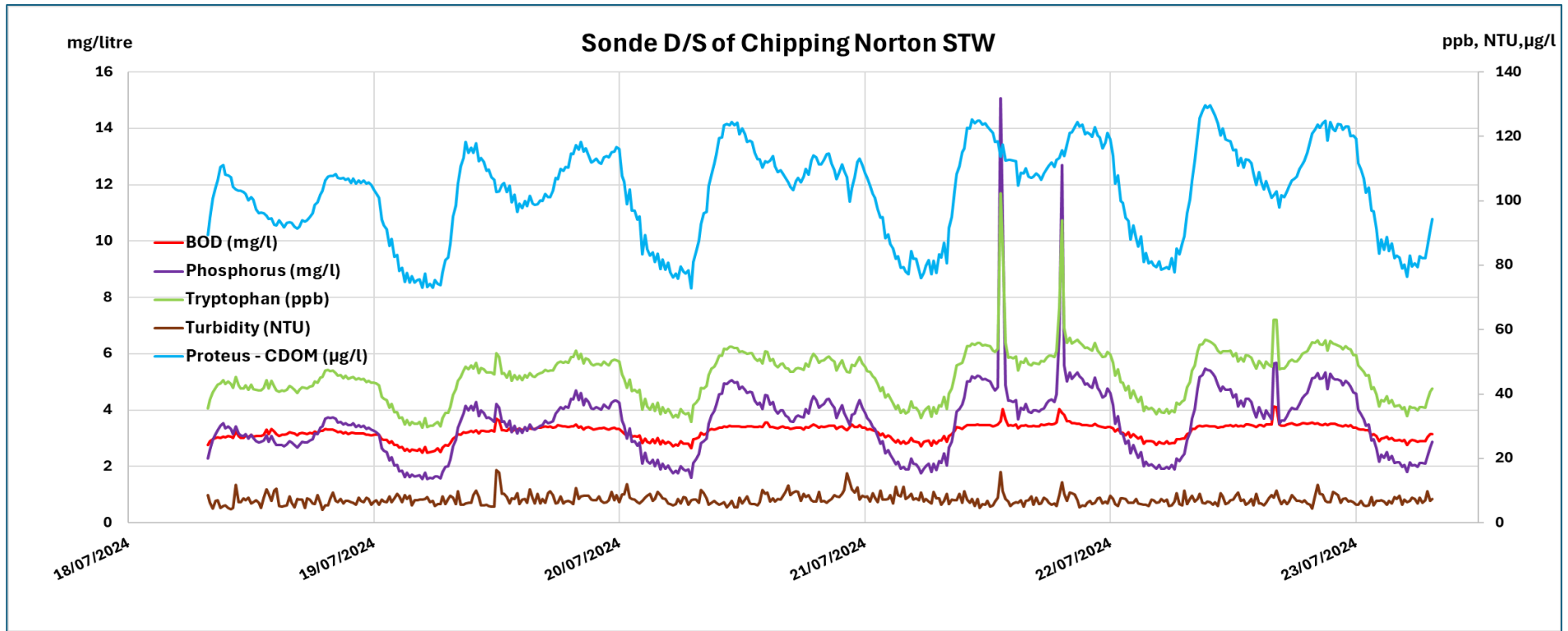
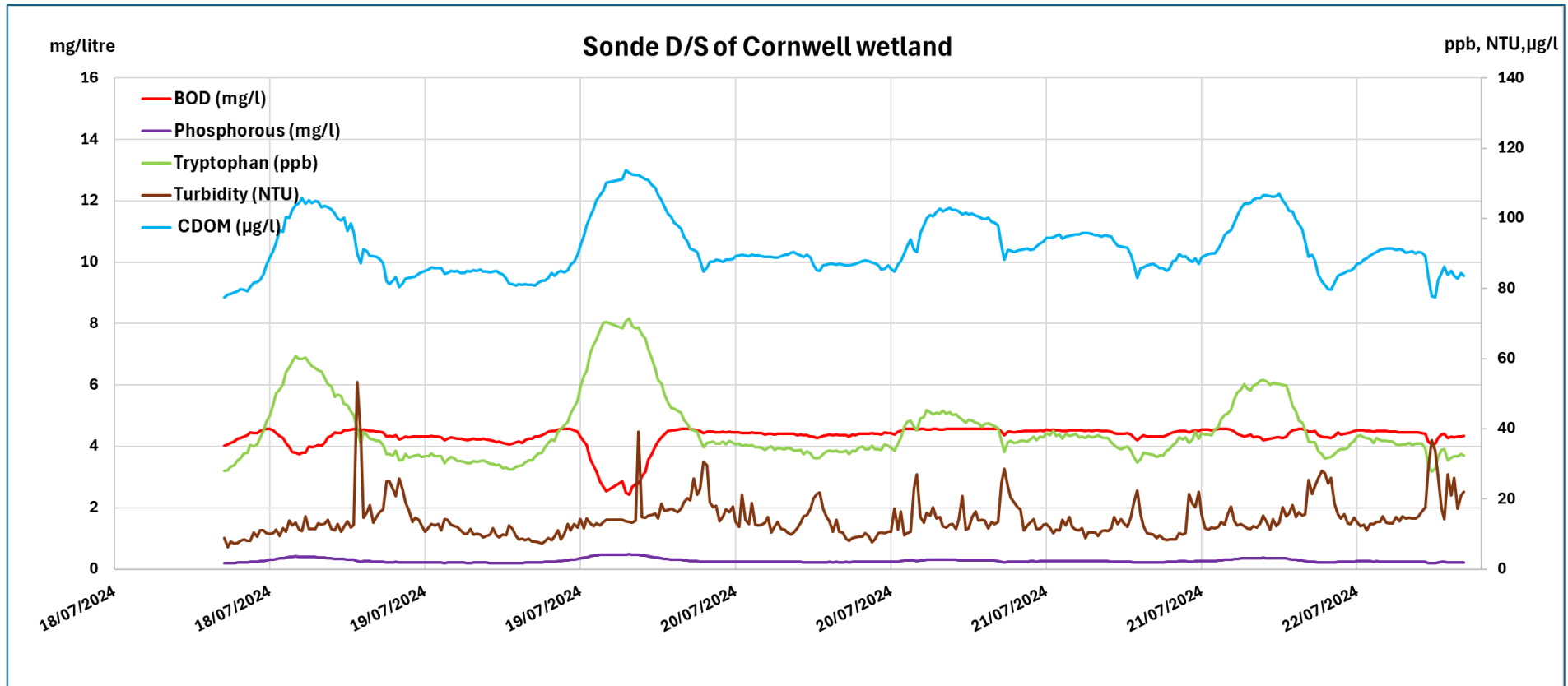


Figure 12: BOD, phosphorus, tryptophan, turbidity and CDOM for the Blue Brook downstream of Chipping Norton STW 18 - 23 July 2024



**Table 2: Average values for the Blue Brook downstream of the STW 18 - 23 July**

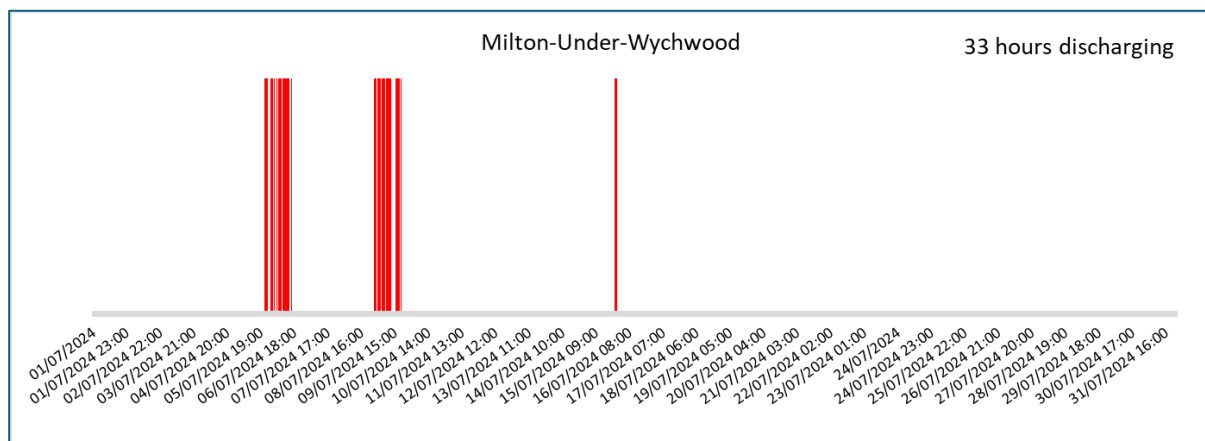
Site	BOD (mg/l)	Phosphorous (mg/l)	Tryptophan (ppb)	Turbidity (NTU)	CDOM (µg/l)
D/S STW (n=480)	3.22	3.56	45.65	7.21	102.44
D/S wetland (n=380)	4.34	0.27	39.58	14.27	91.55

The expected twice daily pattern of peaks and troughs due to the domestic sewage cycle is very clearly seen in **Figure 12**. Of additional interest are the two spikes in all determinands except CDOM on the 21<sup>st</sup> of July. These spikes appear to be superimposed on the twice daily cycle, but there was no coincident rainfall or CSO event to explain this occurrence. A similar but smaller response is also seen on the 22<sup>nd</sup>. In **Figure 13** the twice daily peaks are somewhat apparent but are suppressed by the effect of the wetland. **Table 2** confirms that the wetland reduced particularly phosphorus, but also tryptophan and CDOM values, although BOD and turbidity increased.

## 8. Littlestock Brook

### Combined sewage overflows

Milton under Wychwood STW released raw sewage into the Littlestock Brook for 33 hours during July (**Figure 2**). The days on which this occurred are shown in **Figure 14**.



**Figure 14: Storm overflows from Milton-under-Wychwood STW**

The Storm Overflow Discharges occurred on the 6<sup>th</sup>, 9<sup>th</sup> and 15<sup>th</sup> July, coincident with rainfall events

### FWW and EA data

No FWW data were collected for the Littlestock Brook in July, although a site was surveyed for the Evenlode downstream of the confluence. The EA and FWW nitrate and phosphate data for the Littlestock Brook and the Evenlode downstream of the confluence agree well and are shown in **Figure 15** and **Figure 16**.

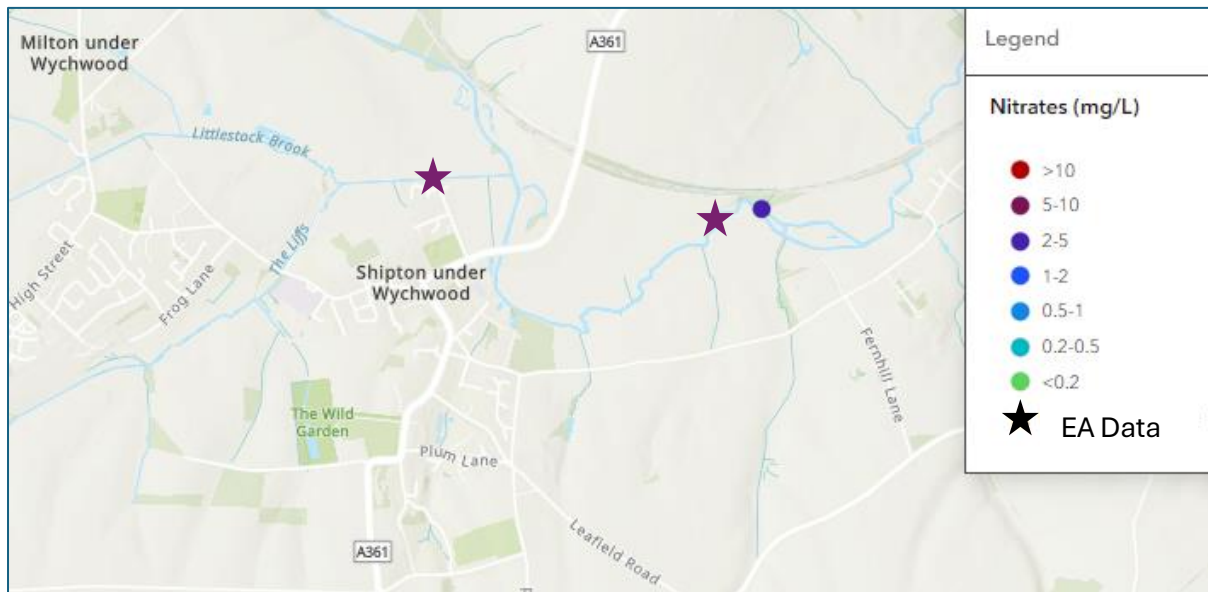


Figure 15: EA and FWW nitrate data for Littlestock Brook in July 2024

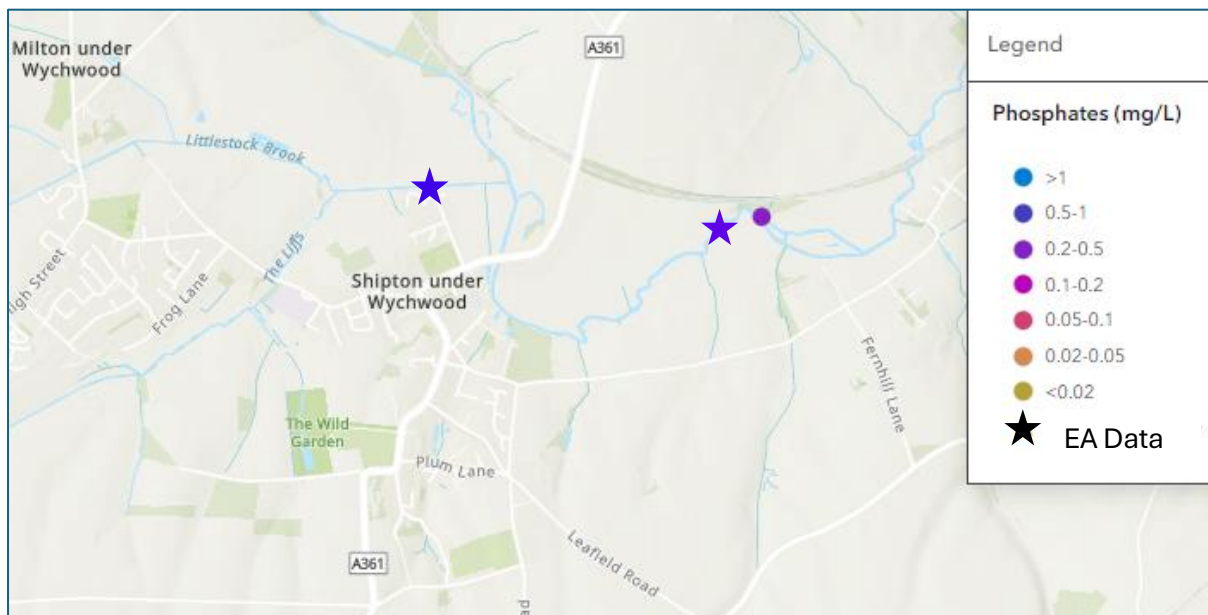


Figure 16: EA and FWW phosphate data for Littlestock Brook in July 2024

### Sonde data

Two Proteus sondes are installed on the Littlestock Brook, up- and downstream of the Milton under Wychwood STW. **Figure 17** and **Figure 18** show the BOD, phosphorus, tryptophan, turbidity and CDOM data from the sondes up- and downstream of the STW.

Note that the left-hand vertical axes (mg/litre) are the same in both graphs (**0- 5 mg/litre**). However, the maximum value of the right-hand axis of **Figure 17** is **one-tenth** of the **Figure 18** right-hand axis maximum. (**0 – 40 ppb**, NTU, and  $\mu\text{g/l}$ , and **0 – 400 ppb**, NTU, and  $\mu\text{g/l}$ ), to accommodate the spikes in turbidity recorded downstream of the STW. The line colours are consistent between both graphs. **Table 3** summarises the average values from the two sondes.

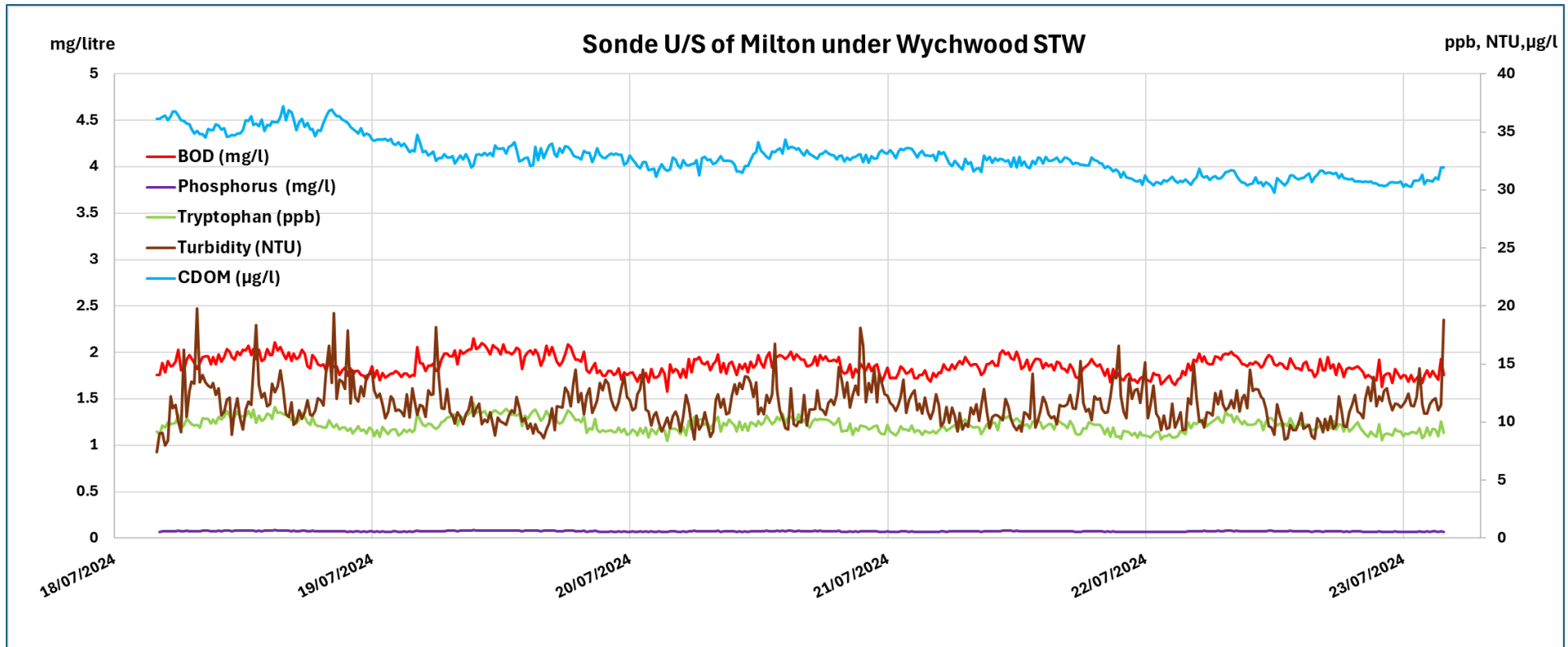


Figure 17: BOD, phosphorus, tryptophan, turbidity and CDOM for the Littlestock Brook at Heath Farm, 18 - 23 July

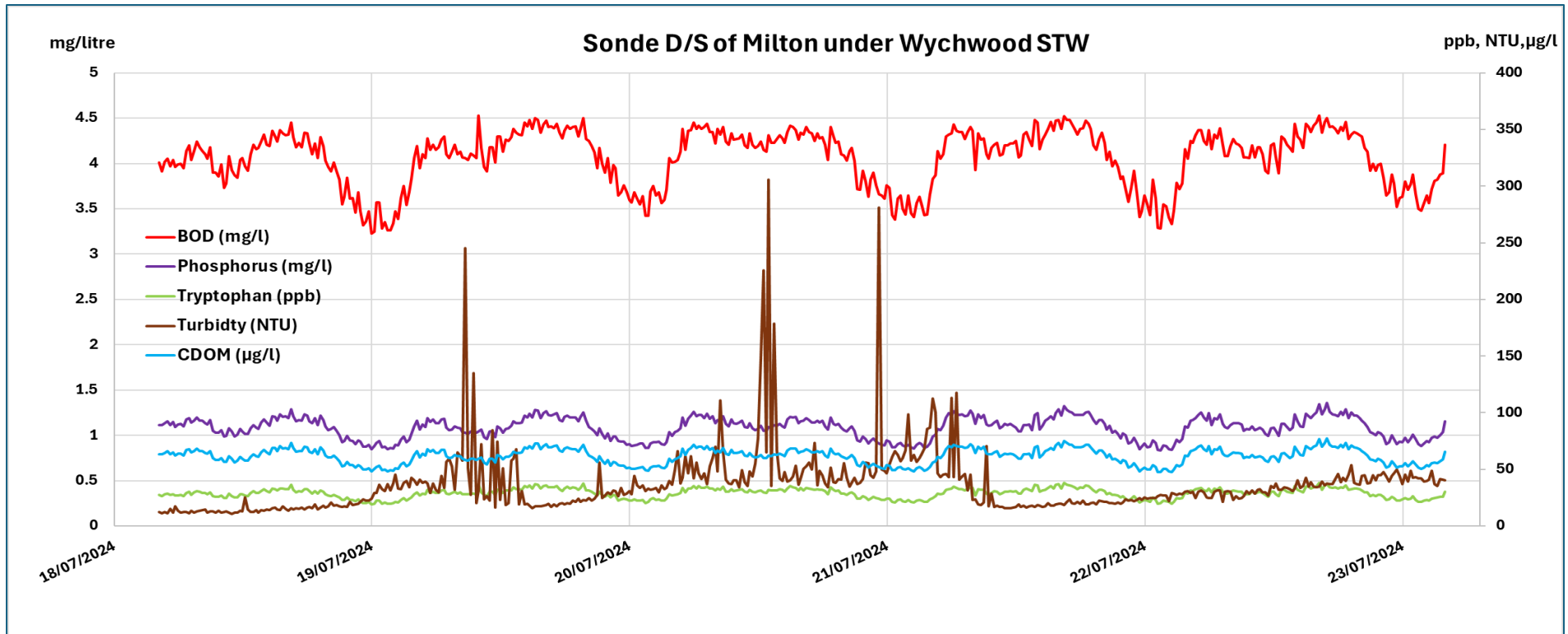


Figure 18: BOD, phosphorus, tryptophan, turbidity and CDOM for the Littlestock Brook at Littlestock House, 18 - 23 July

Upstream of the STW, all determinands trended slightly downwards over the course of the reporting period, (**Figure 17**), but were otherwise relatively constant. BOD rose and fell slightly throughout the day. BOD, phosphorus, tryptophan and CDOM downstream of the STW responded clearly to the twice daily peaks in sewage effluent due to daily domestic cycles (**Figure 18**). Notable periods of multiple turbidity spikes are seen on the 19<sup>th</sup>, 20<sup>th</sup> and 21<sup>st</sup> July downstream of the STW, with other determinands unaffected. Many of the peak values exceed 100 NTU, with a maximum of 306 NTU. The peaks are very short lived and suggestive of animals in the stream disturbing the sediment on the stream bed. As expected, **Table 3** shows marked increases in the average values of all determinants downstream of the STW.

**Table 3: Average values for the Littlestock Brook up- and downstream of the Milton under Wychwood STW for 18 - 23 July**

Site	BOD (mg/l)	Phosphorous (mg/l)	Tryptophan (ppb)	Turbidity (NTU)	CDOM (µg/l)
U/S STW (n=480)	1.86	0.07	9.75	11.51	32.82
D/S STW (n=480)	4.06	1.08	28.86	35.82	61.52

The average values downstream of Chipping Norton STW were higher than for downstream of Milton under Wychwood STW, except for turbidity. The impact of Milton under Wychwood STW on the Littlestock Brook is clear from Error! Reference source not found., with the averages of all d eterminands, particularly phosphate, increasing downstream.

## 9. Summary

The FWW nitrate and phosphate concentrations increased compared with June and generally agreed well throughout the catchment with the EA results, with nitrate ranging mainly from 1 mg/litre to 5 mg/litre, with three concentrations > 10 mg/litre recorded by ECP citizen scientists. Phosphate concentrations improved somewhat, with the majority of concentrations reported <0.02 mg/litre, but some of >0.1 mg/litre, particularly upstream of Oddington.

It is recommended that additional to continuing to closely observe the Chipping Norton and Milton under Wychwood STWs, the high number of Storm Overflow Discharge hours at Combe, and the downstream effect of this on the Evenlode be investigated further.