



**Water Quality Monitoring Network
Severn Pilot – Shrewsbury
November 2023**



Water Quality Monitoring Network Severn Pilot - Shrewsbury



Introduction

The Angling Trust launched the Water Quality Monitoring Network (WQMN) in May 2022 with a pilot on the Severn catchment. Following the success of the pilot the WQMN was rolled out across England and Wales in July 2022. The WQMN now has 626 volunteers from 237 angling clubs sampling water quality on 188 rivers across 60 catchments with over 3,575 samples recorded so far.

On the Severn catchment more than 65 volunteers from 25 angling clubs are now monitoring over 50 sites across the Severn catchment from the Upper Severn and its tributaries to below Tewkesbury.

Volunteers use a variety of equipment to test for Phosphate and Nitrate levels plus electrical conductivity (a measure of total dissolved solids) on a monthly basis and record their results using a smartphone app called Epicollect. The WQMN focuses on nutrients as these are the main concern for fish and therefore anglers. High nutrient levels, eutrophication, contribute to algal blooms and excessive plant growth which in turn lead to oxygen depletion. Without oxygen aquatic species, including fish, cannot survive and the river ecosystem collapses.

The data gathered is not to replace the statutory monitoring undertaken by the Environment Agency, NRW or Water Companies or to directly challenge this data. Statutory monitoring is extremely limited both spatially and temporally meaning there are significant gaps in our understanding of water quality. The WQMN data will help to fill these gaps. The data can be used by the local networks but will also be made available to other organisations to help inform the wider understanding of water quality. The data will help to show us patterns in water quality across a wide area, trends in water quality over time and potential problem sites or regions. This solid foundation of data will be used to better understand the factors affecting water quality, aid in the development of effective solutions to improve water quality, and provide the Angling Trust with evidence to support its campaigning work.

Shrewsbury Town Fisheries were one of the very first clubs to sign up to the WQMN pilot on the Severn purchasing 6 monitoring kits for their bailiffs to test sites on the main stem of the Severn through Shrewsbury and the Rea Brook at Meole Brace. They now regularly test 11 sites across Shrewsbury including Rossall, the Quarry, the Weir, Emstrey and Wroxeter with other sites tested on an ad hoc basis.

Overall Results

The overall results on the Severn are of concern. As of the end of November 2023 ..

- 661 samples have now been recorded on Epicollect
- Electrical conductivity results range from 49 to 1,380 ($\mu\text{S}/\text{cm}$)
- Temperature results range from 0 to 24.6 (degrees centigrade)
- Phosphate results range from 0.0 to 2.5 (ppm). **299 samples exceeded the upper limit for Phosphate, 45%**
(Note: WFD limits for Phosphate are site-specific and we are assessing against the upper limit, so it is likely that many more samples exceed their site-specific standards.)
- Nitrate results range from 0 to 50 (ppm). **370 samples were 5 ppm or over, 56%**
- **243 samples exceeded both Phosphate and Nitrate limits, 37%**
- 13 results exceeded the upper limit for Ammonia with **20 observed algal blooms and 85 observed pollution incidents.**

As a result, 2 clubs have already escalated the situation on their part of the catchment due to the very high phosphate readings and have approached the EA and Severn Trent to explore the causes and resolutions.

Interpreting the results

Electrical Conductivity - Different forms of water have different typical electrical conductivity ranges.

Water Type	Typical Conductance Range
Distilled Water	0.5 - 3 ($\mu\text{S}/\text{cm}$)
Melted Snow	2 - 42 ($\mu\text{S}/\text{cm}$)
Tap Water	50 - 800 ($\mu\text{S}/\text{cm}$)
Freshwater Streams	50 - 1,500 ($\mu\text{S}/\text{cm}$)
Chalk Streams	100 - 2,000 ($\mu\text{S}/\text{cm}$)

Significantly elevated electrical conductivity (EC) can indicate that pollution has entered the river. A measure of EC cannot tell you what the pollutant is, but it can help identify that there is a problem that may harm invertebrates and/or fish. EC may be high in a river without any visible effects on the clarity of the river water. Any human activity that adds inorganic, charged chemicals to a river will alter the EC. For example, EC may be higher in a river downstream of a sewage treatment works due to chemicals such as chloride and phosphate from household products. Winter road runoff, containing salt, can be very high in electrical conductivity. If this runoff reaches rivers, then it may, depending on the quantity of water, temporarily elevate the EC in the river.

Phosphate - Standards for Phosphorus in UK Rivers were introduced under the Water Framework Directive (WFD) and associated Regs/Directions in 2009 and were updated in 2015. The standards are site-specific and depend upon the altitude and alkalinity of the site. The standards for good ecological status (close to natural) in Rivers are broadly in the range 0.077 – 0.306 ppm of Orthophosphate (PO_4^{3-}), as annual means. This is as measured by the Hanna Phosphate Colorimeter.

Note - The Phosphate Checker upper limit is 2.5 ppm, the lower test limit is 0.00 ppm with an accuracy of ± 0.04 ppm. So, a 0.00 ppm reading does not mean there is no phosphate present, it will be between 0.00 and 0.04 ppm. A 2.5 reading does not mean that is the total phosphate, it means that it is in excess of 2.5 ppm.

Phosphate - Orthophosphate (PO_4^{3-}) as measured by Hanna Colorimeter

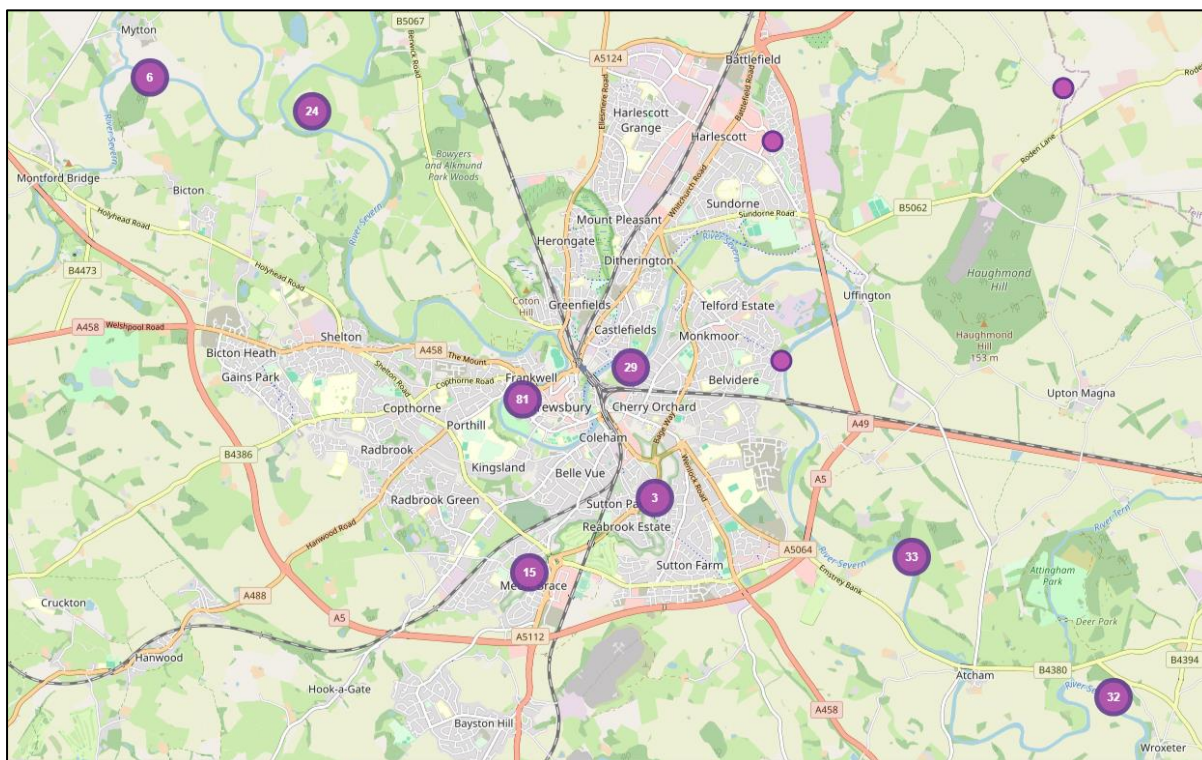
High	Good Ecological Status	Moderate / Poor
< 0.077 ppm	0.077 – 0.306 ppm	> 0.306 ppm

Nitrate - There are no ecological status standards for Nitrogen in Rivers. The Environment Agency’s approach is to focus on Phosphate as the main cause of river eutrophication and the nutrient they are most able to reduce to levels that will improve the ecology. There is a standard for Lakes and Reservoirs, which is 0.75 – 1.5 mg/l (ppm). Natural levels of Nitrate in freshwater are typically low, generally well below 5 ppm.

Nitrate - as measured by Hach Nitrate Test Strips

Natural	Elevated	Excessive
< 1 ppm	1 – 4.9 ppm	≥ 5 ppm

Shrewsbury Sampling Locations

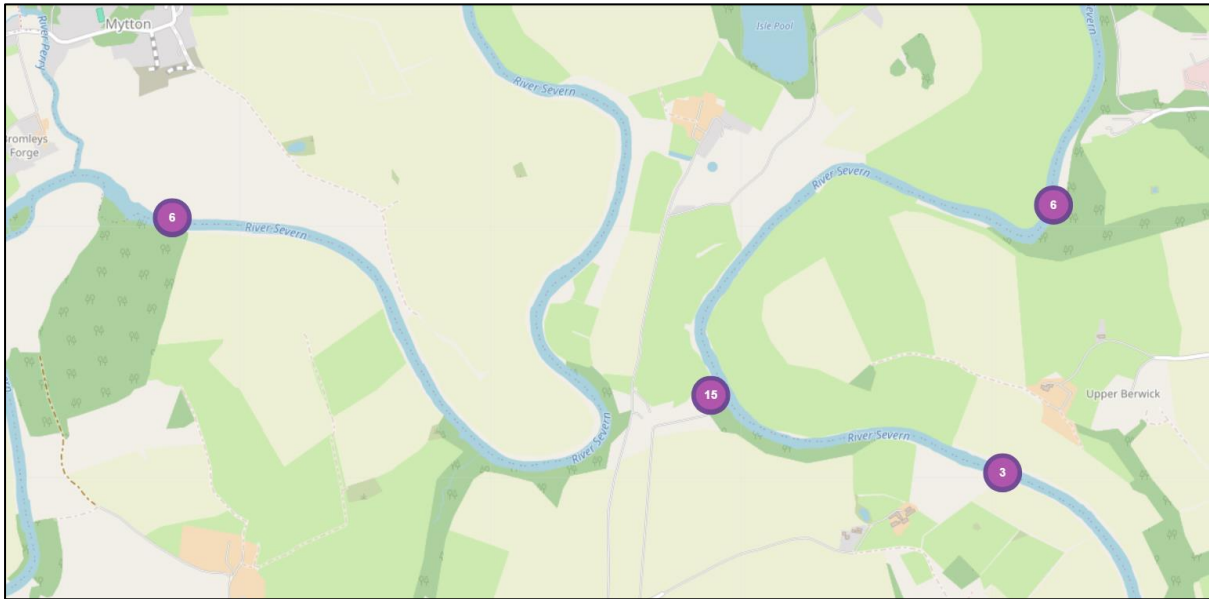


Shrewsbury Town Fisheries Results

Shrewsbury Town Fisheries bailiffs have recorded over 200 samples:

- Electrical conductivity results range from 101 to 939 ($\mu\text{S}/\text{cm}$). Average is 324 ($\mu\text{S}/\text{cm}$).
- Phosphate results range from 0.0 to 2.30 (ppm). Average result is 0.29 (ppm).
63 samples exceeded the upper limit for Phosphate, 32%!
- Nitrate results range from 1 to 20 (ppm). Average result is 4.31 (ppm).
80 samples were 5 ppm (trigger level) or over, 41%!
- **10 algal blooms were observed, and pollution was noted on 35 occasions.**

Upstream of Shrewsbury

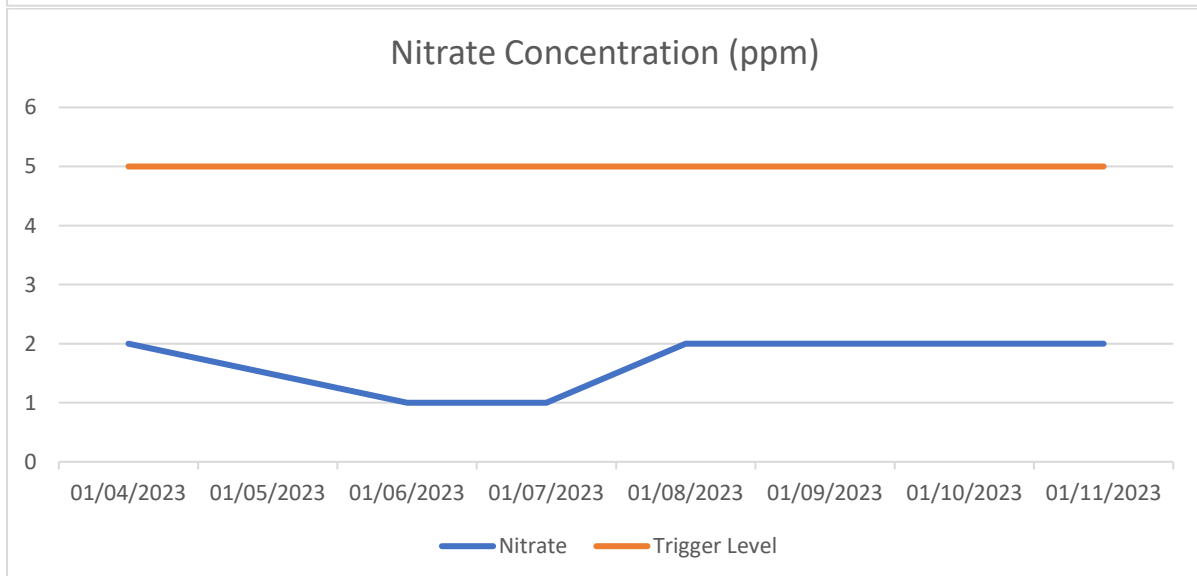
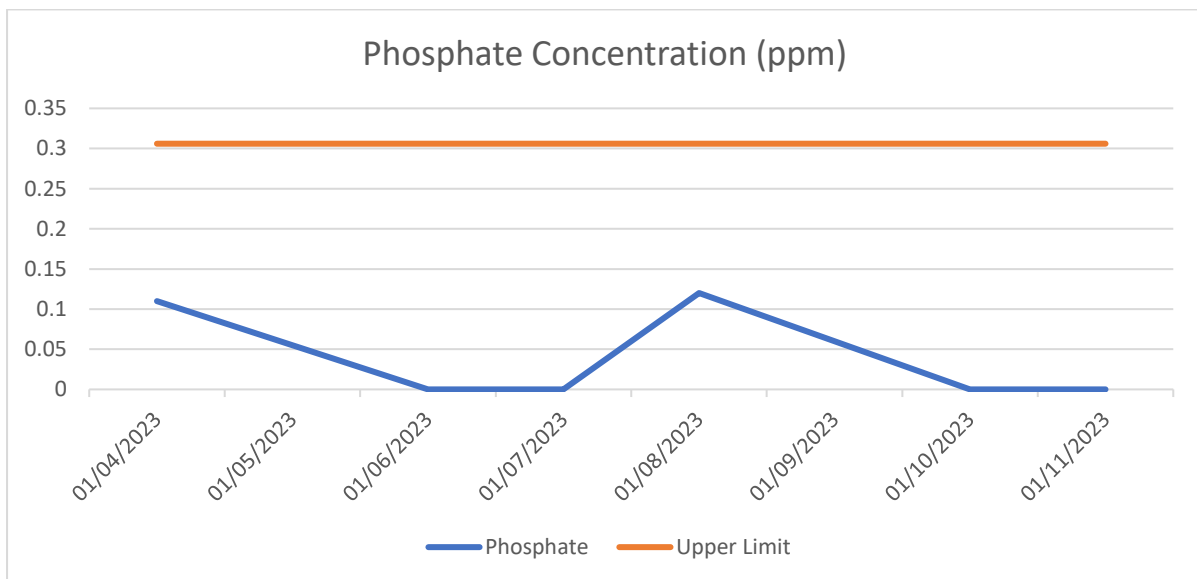


Roundabout

Roundabout is just south of Mytton (Location 52.743181, -2.826441)
6 samples were recorded between the 24th April 2023 and 6th June 2023.

Averages are:

Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
206	0.04	1.67

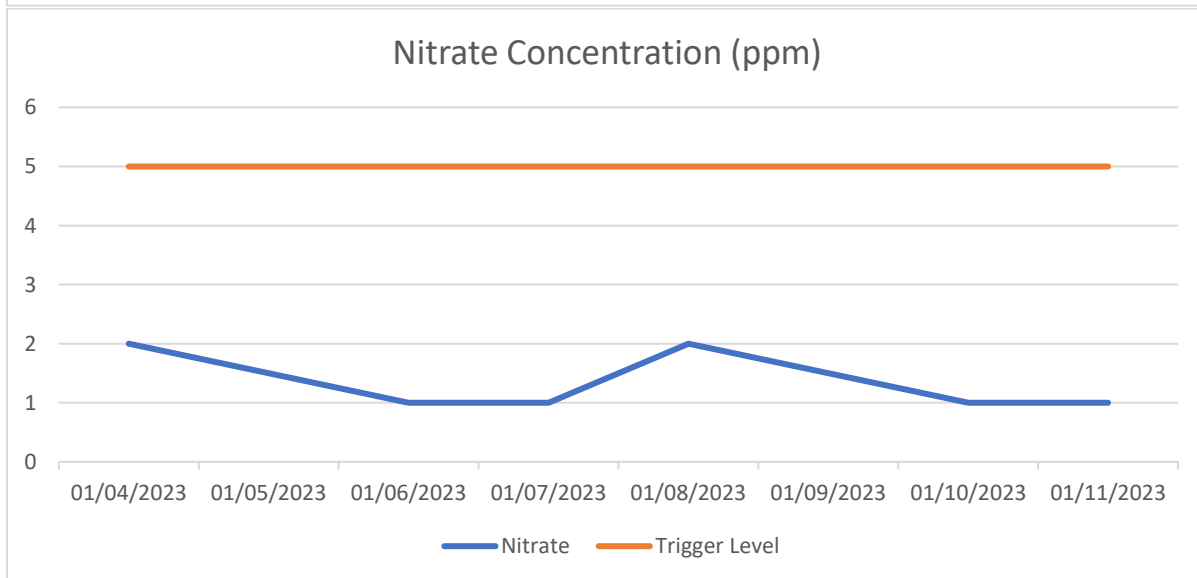
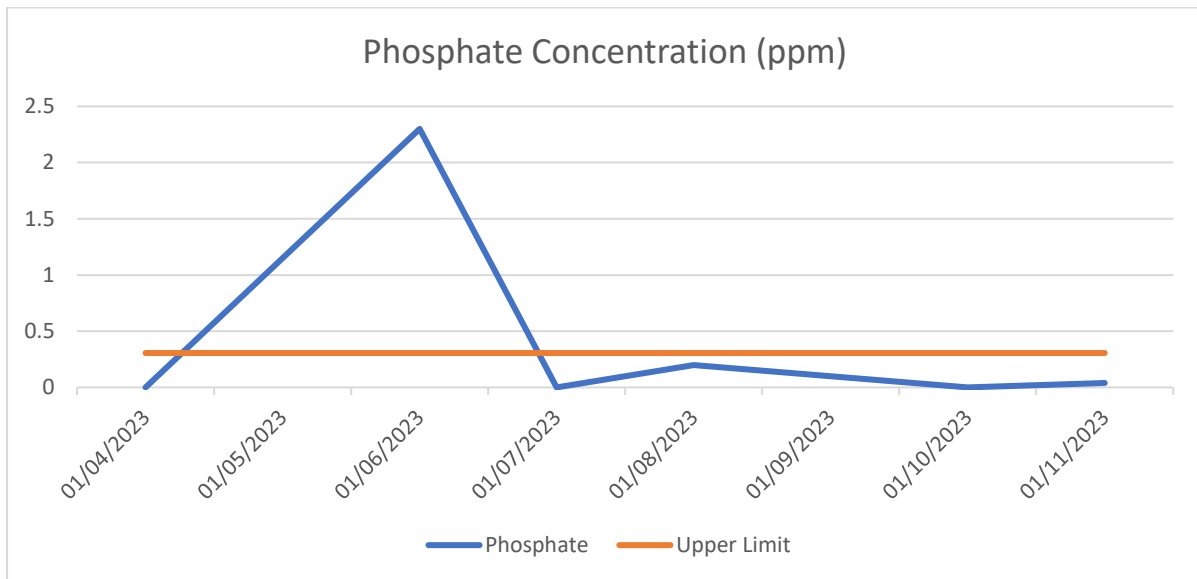


Ell Hole

Ell Hole is upstream of Rossall (Location 52.743575, -2.787841)
6 samples were recorded between the 24th April 2023 and 6th June 2023.

Averages are:

Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
216	.42	1.33



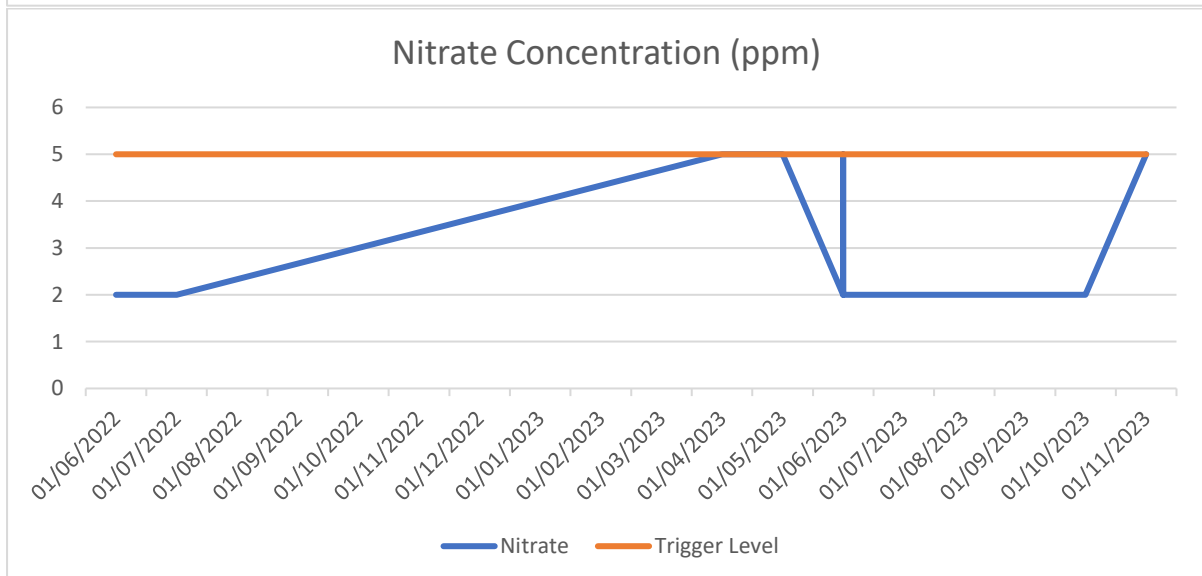
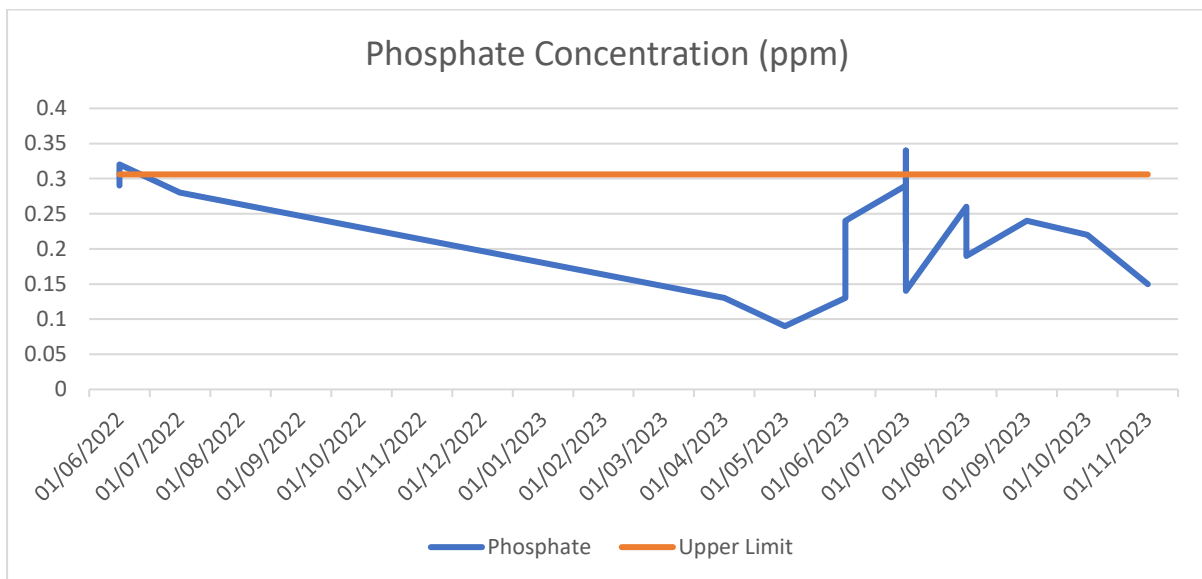
Rossall Grange

Rossall is upstream of Shrewsbury (Location 52.736421, -2.790039)

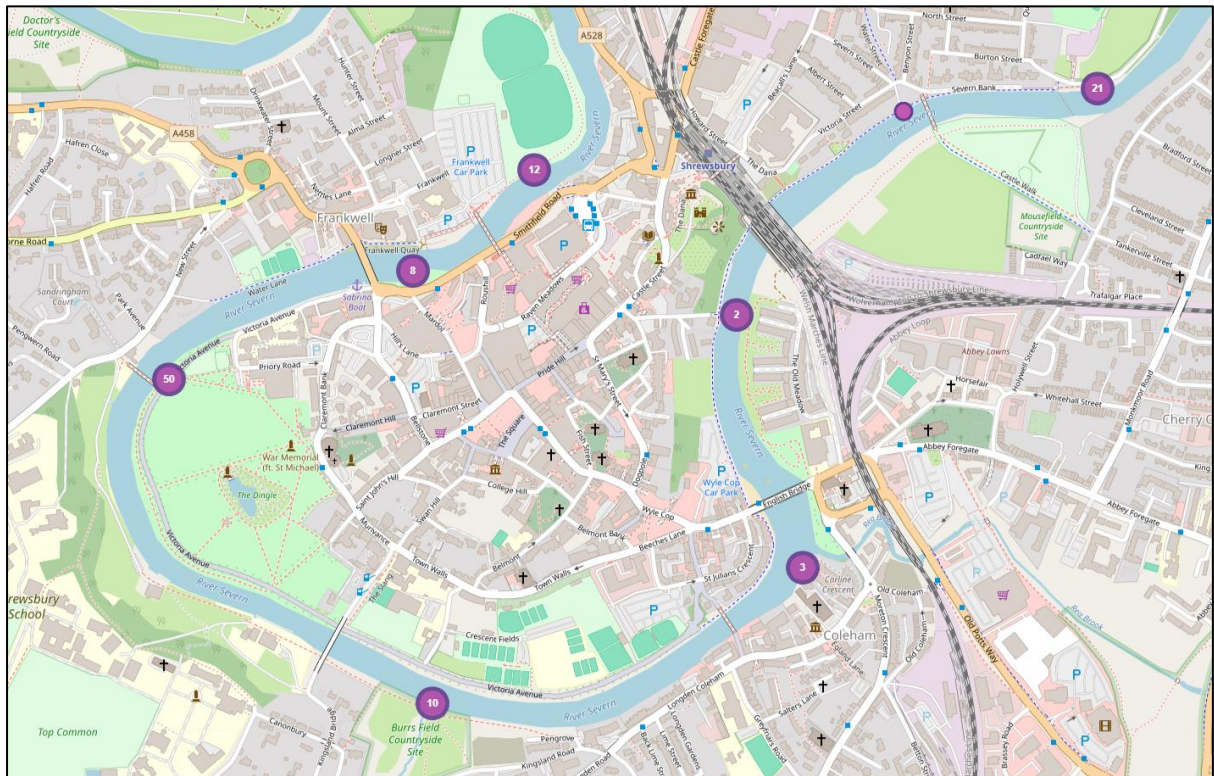
18 samples were recorded between the 3rd June 2022 and 13th November 2023.

Averages are:

Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
254	0.22	2.67



Central Shrewsbury



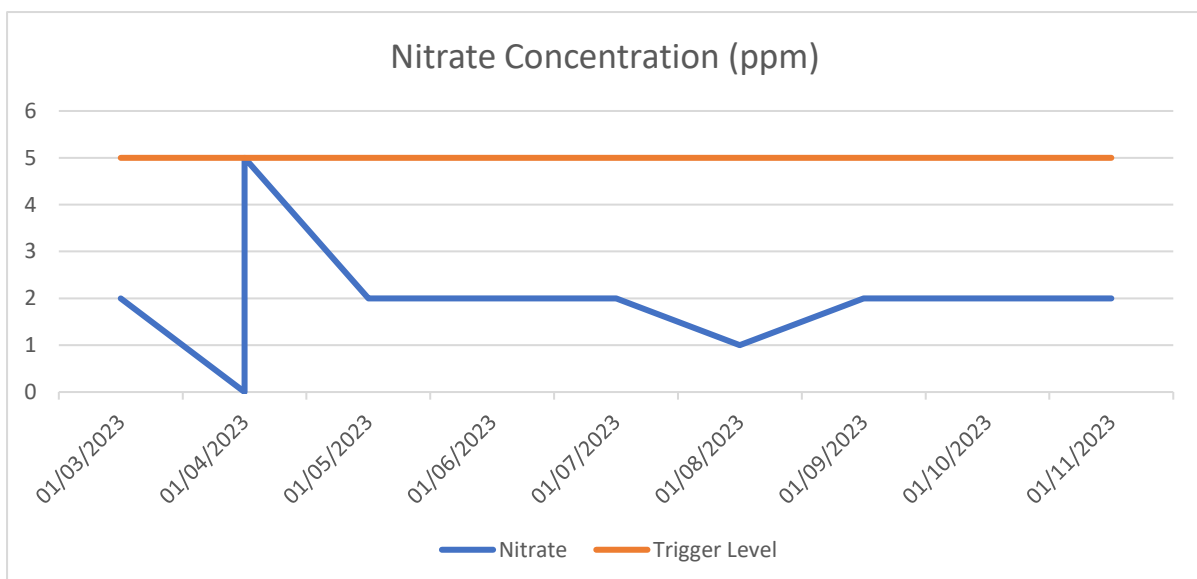
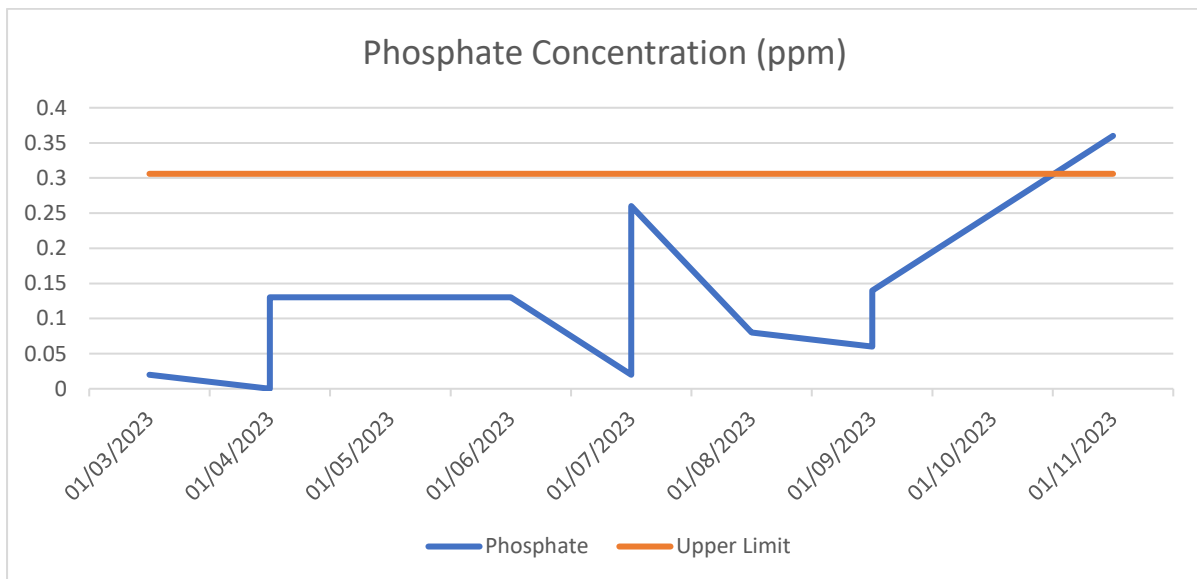
Cricket Field Wharfage

The Cricket Field Wharfage is adjacent to the Frankwell Car Park (Location 52.711632, -2.75371)

12 samples were recorded between the 1st March 2023 and 10th November 2023.

Averages are:

Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
245	0.12	2.00

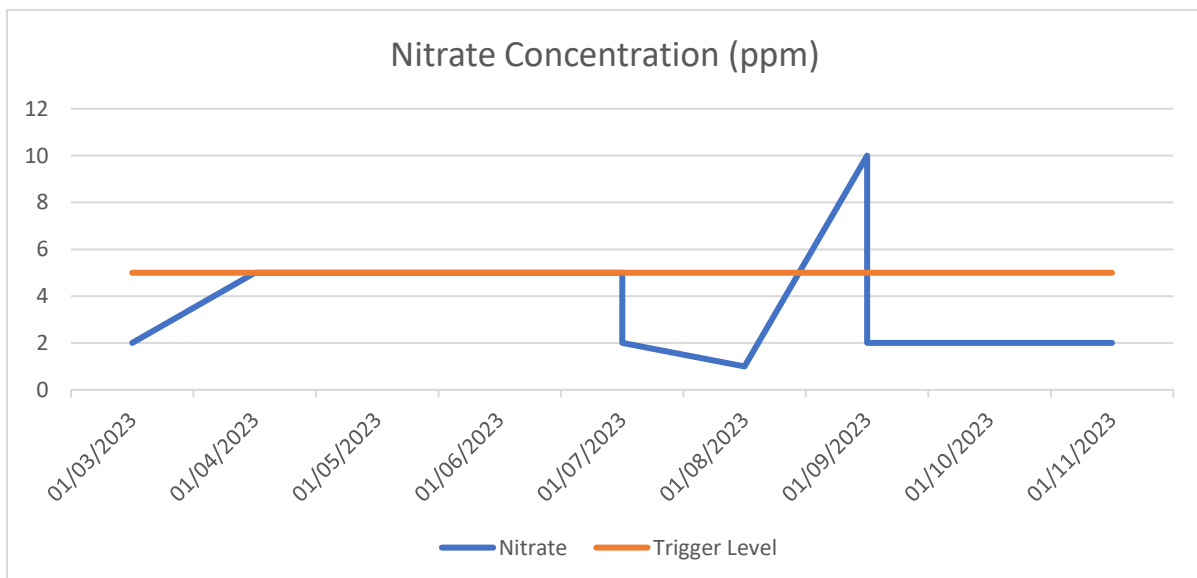
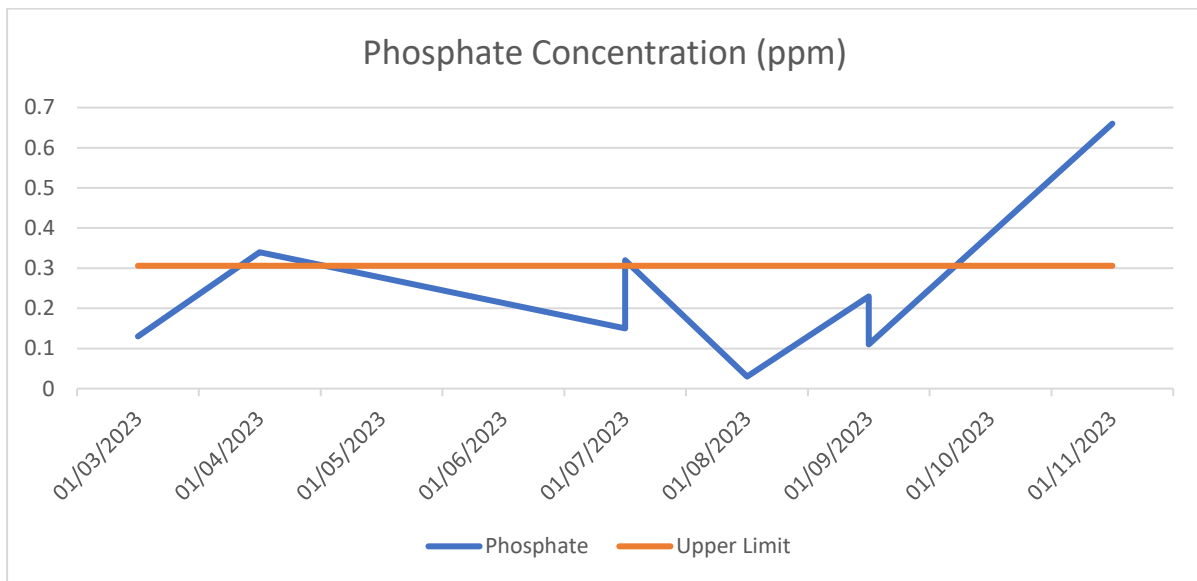


Darwin Sculpture

The Darwin Sculpture is opposite the Frankwell Quay (Location 52.710051, -2.756922)
8 samples were recorded between the 1st March 2023 and 10th November 2023.

Averages are:

Electrical Conductivity ($\mu\text{S}/\text{cm}$)	Phosphate (ppm)	Nitrates (ppm)
232	0.25	3.63

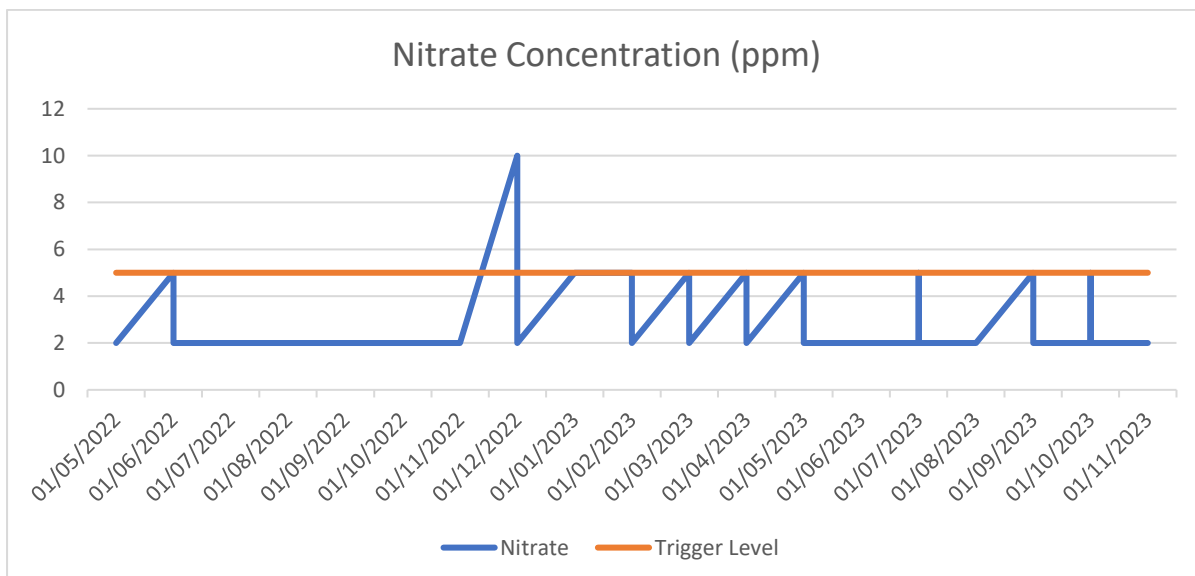
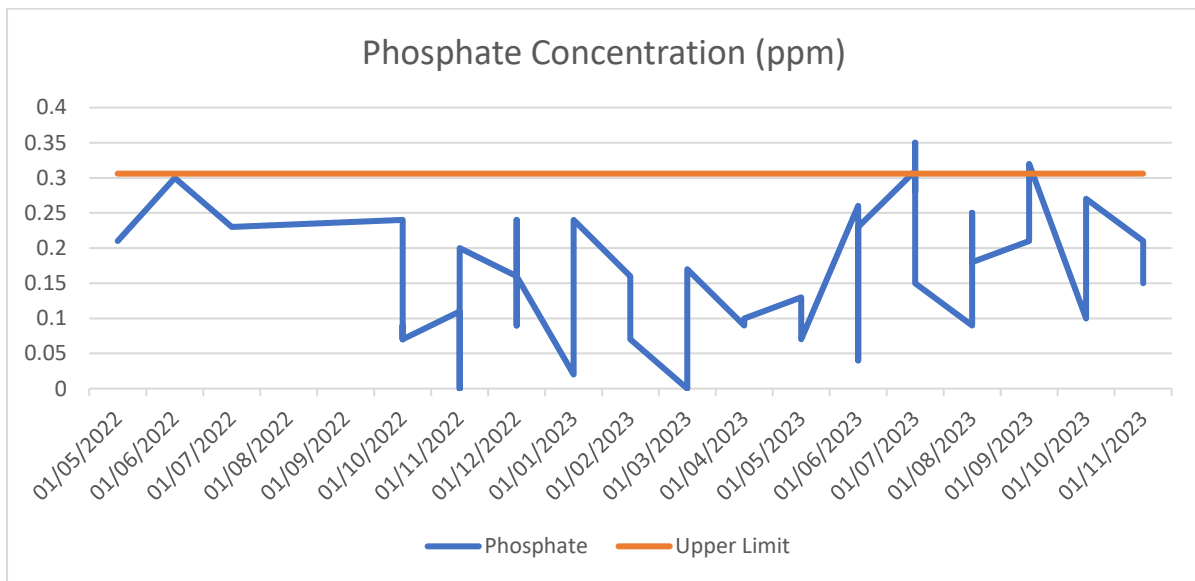


Shrewsbury Quarry

Shrewsbury Quarry is in the centre Shrewsbury (Location 52.70834, -2.762968)
50 samples were recorded between the 30th May 2022 and 28th November 2023.

Averages are:

Electrical Conductivity ($\mu\text{S}/\text{cm}$)	Phosphate (ppm)	Nitrates (ppm)
245	0.17	3

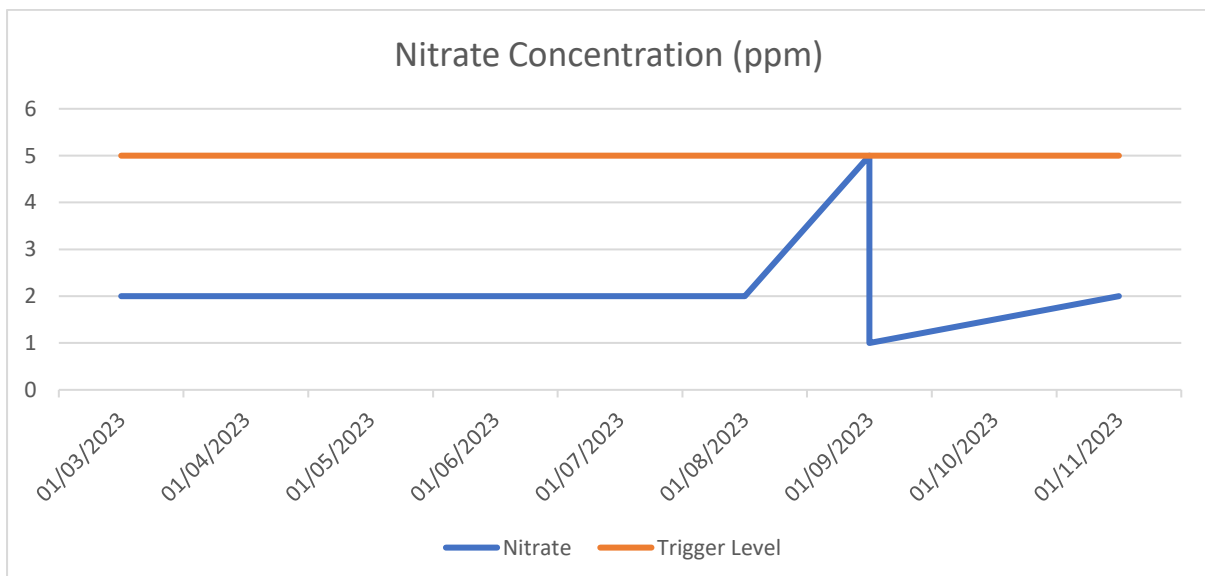
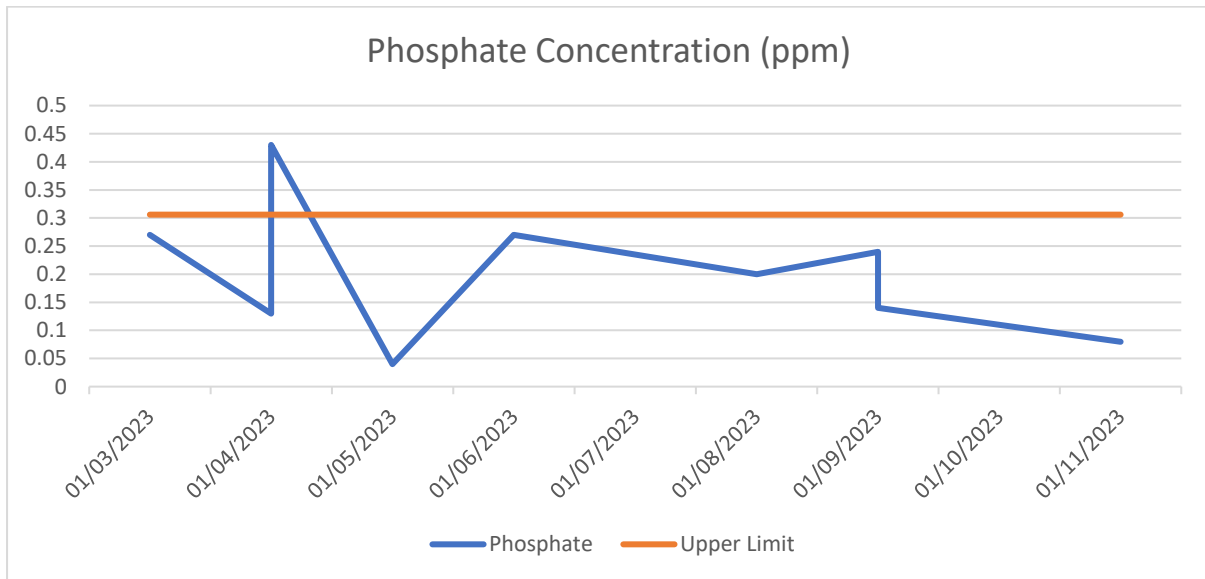


Burrs Field

Burrs Field is to the south of the town centre (Location 52.703334, -2.756476)
8 samples were recorded between the 7th March 2023 and 11th November 2023.

Averages are:

Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
305	0.20	2.22

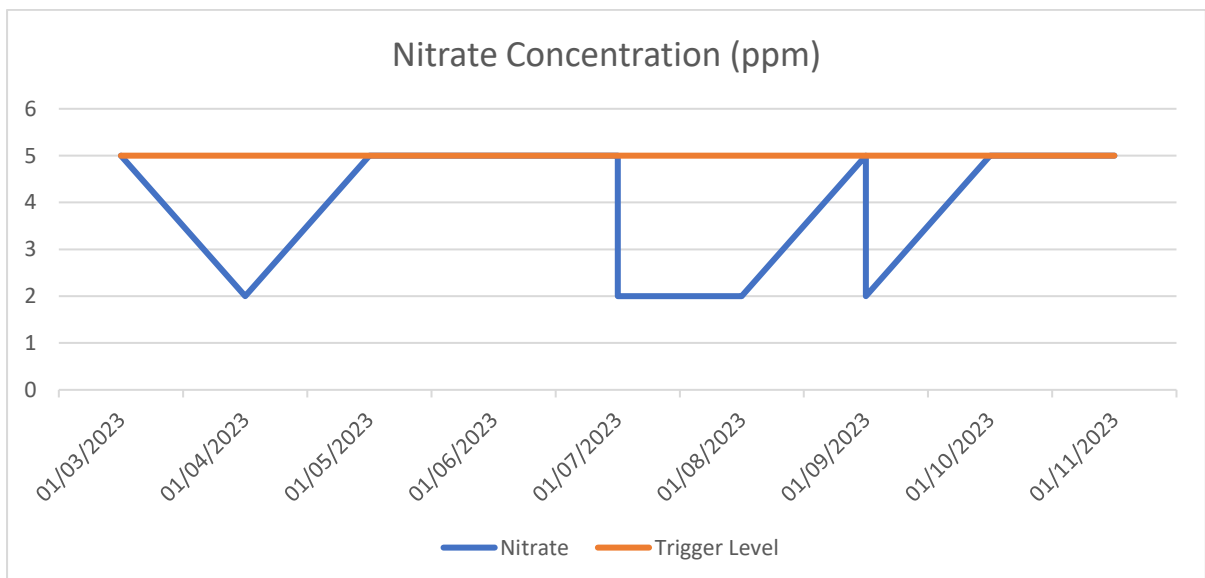
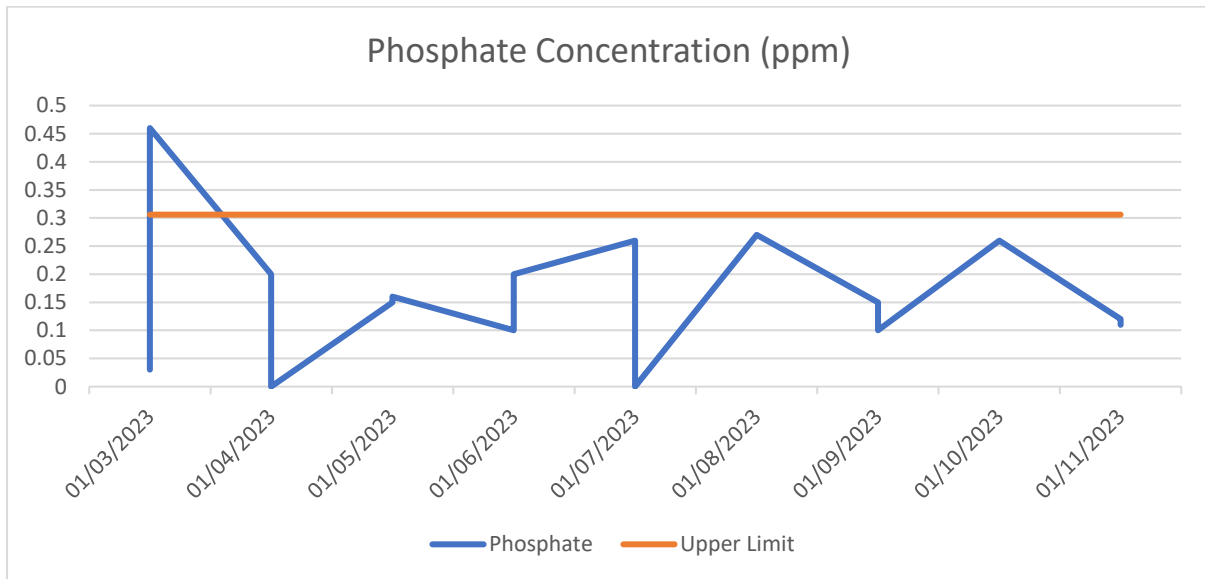


The Weir

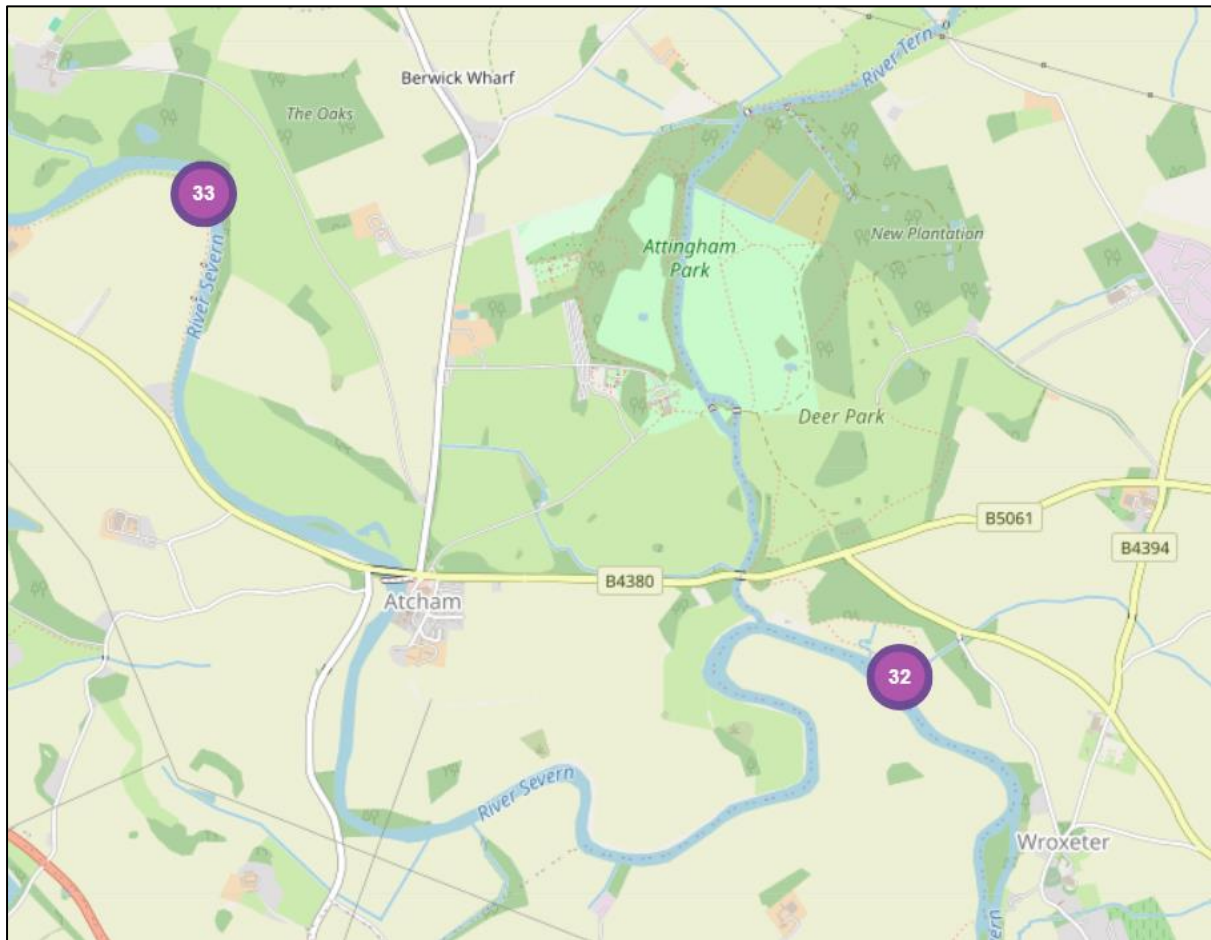
Shrewsbury Weir is to the east of the town centre (Location 52.712795, -2.739384)
17 samples were recorded between the 5th March 2023 and 26th November 2023.

Averages are:

Electrical Conductivity ($\mu\text{S}/\text{cm}$)	Phosphate (ppm)	Nitrates (ppm)
261	0.15	3.94



Downstream of Shrewsbury



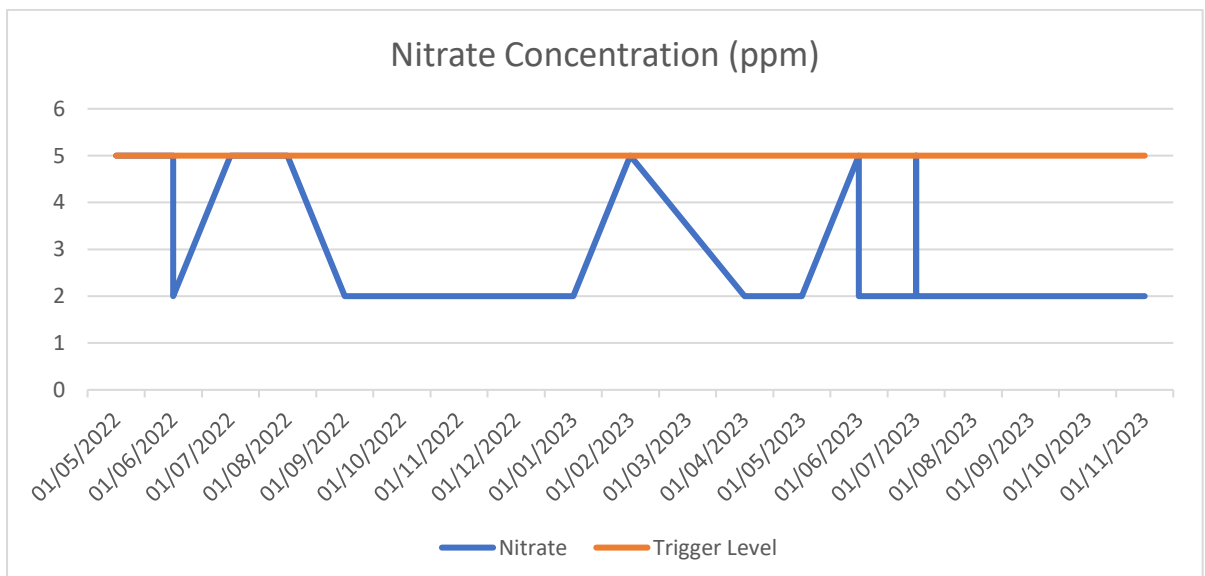
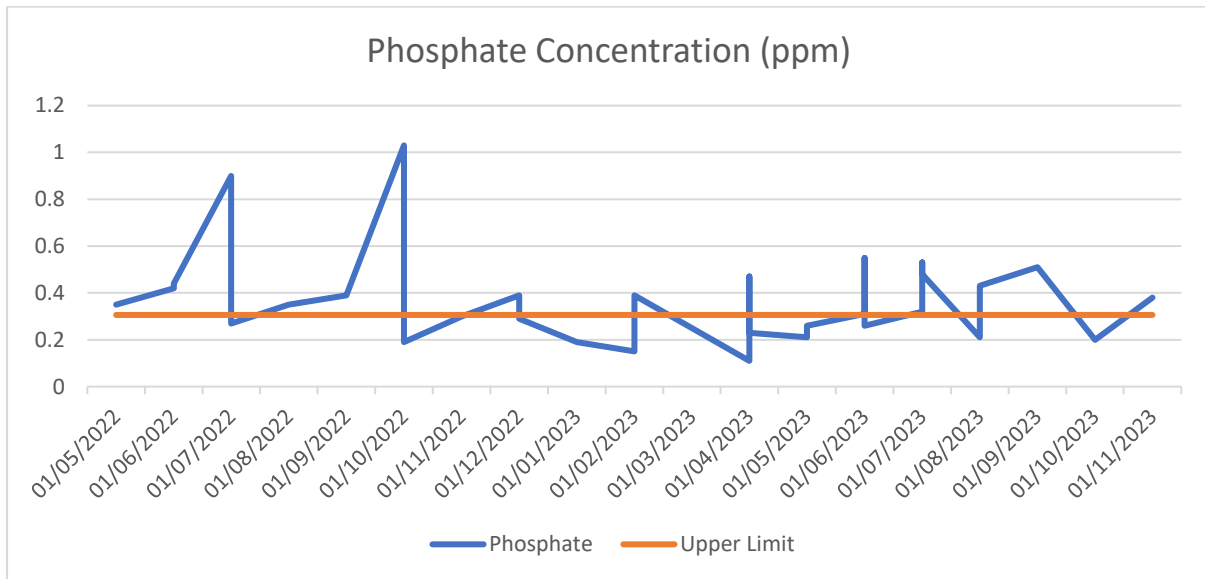
Emstrey

Emstrey is downstream of Shrewsbury (Location 52.691628, -2.690939)

33 samples were recorded between the 30th May 2022 and 25th November 2023.

Averages are:

Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
308	0.37	3

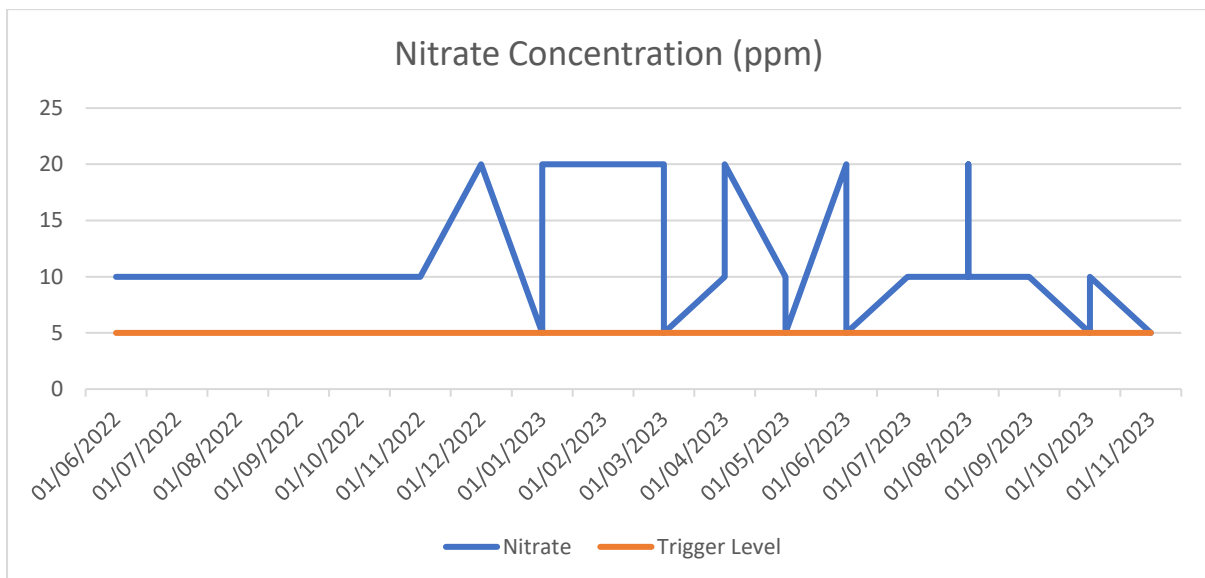
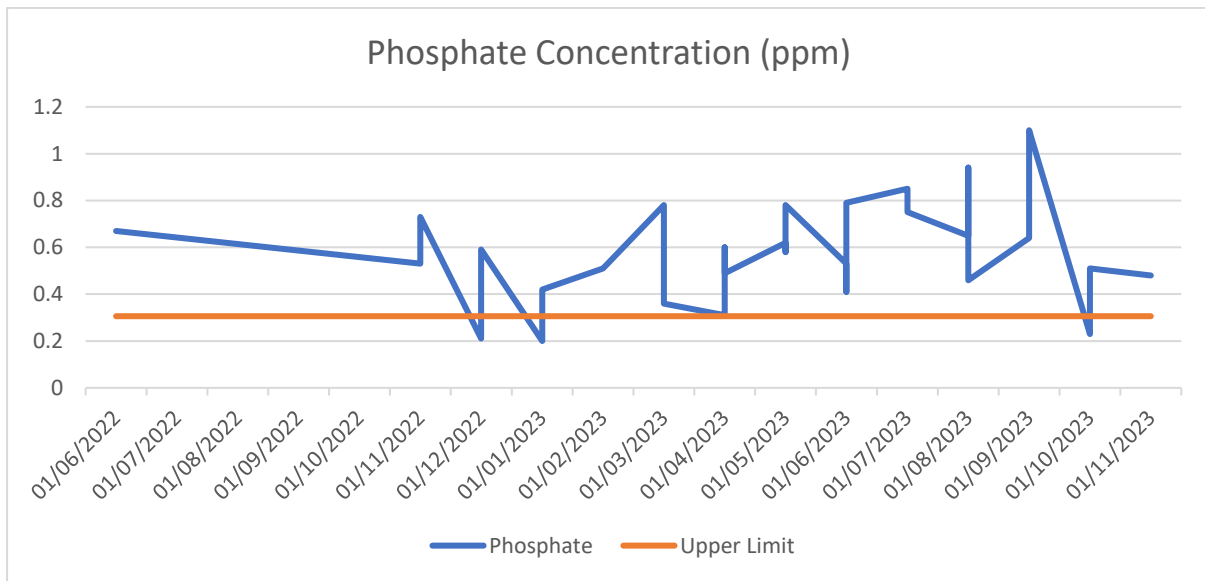


Ismore Coppice Wroxeter

Ismore Coppice Wroxeter is downstream of Shrewsbury (Location 52.676434, -2.655355)
32 samples were recorded between the 8th June 2022 and 13th November 2023.

Averages are:

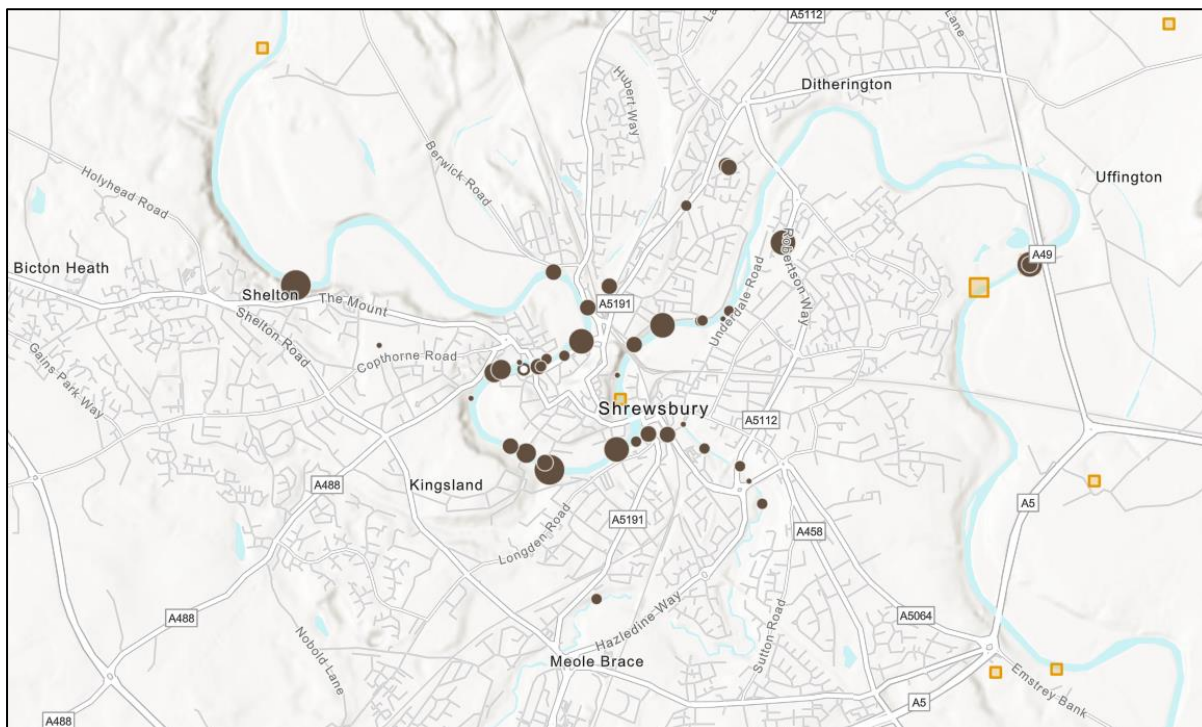
Electrical Conductivity (µS/cm)	Phosphate (ppm)	Nitrates (ppm)
564	0.59	11.41



Observations

Levels of Phosphate have exceeded the Water Framework Directive (WFD) upper standard for good ecological status at all sites, except at Roundabout, at some point during the sampling period. It is important to recognise that this is the overall upper level for England as a whole and that the site-specific WFD standards for the Severn may be lower than this. This would need to be checked with the Environment Agency.

Heightened levels of Phosphate and Nitrate generally coincide with rain events. This would suggest that nutrients are being washed off agricultural fields adjacent to the Severn and its tributaries or entering the river via combined sewer overflows, of which there are a significant number through Shrewsbury, see map below.



Rivers Trust 'Poo Map' for Shrewsbury (2022)

The results get worse as you progress downstream, particularly below Shrewsbury, with the Wroxeter site recording the worst overall results.

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