SEVERN RIVERS TRUST

Malvern Hills National Landscape Water Quality Monitoring Report

July 2025

Introduction

As part of the Catchment Systems Thinking Cooperative (CaSTCo) project we have engaged volunteers and landowners in water quality monitoring within the northern area of the Malvern Hills National Landscape (MHNL).

There are 14 registered sample sites (see Figure 2), 10 of which continue to be sampled on a regular basis. The frequency of sampling varies across the sites with those on the main Cradley and Leigh brooks tending to be sampled weekly and those on the adjoining tributaries typically being sampled monthly.

The parameters that have been sampled as part of this regular monitoring include phosphate, nitrate, temperature, electrical conductivity and turbidity. Each volunteer or landowner partnership has been provided with their own sampling kit (see Figure 1) to allow sampling at a time convenient for them.

Figure 1 Water sample kit

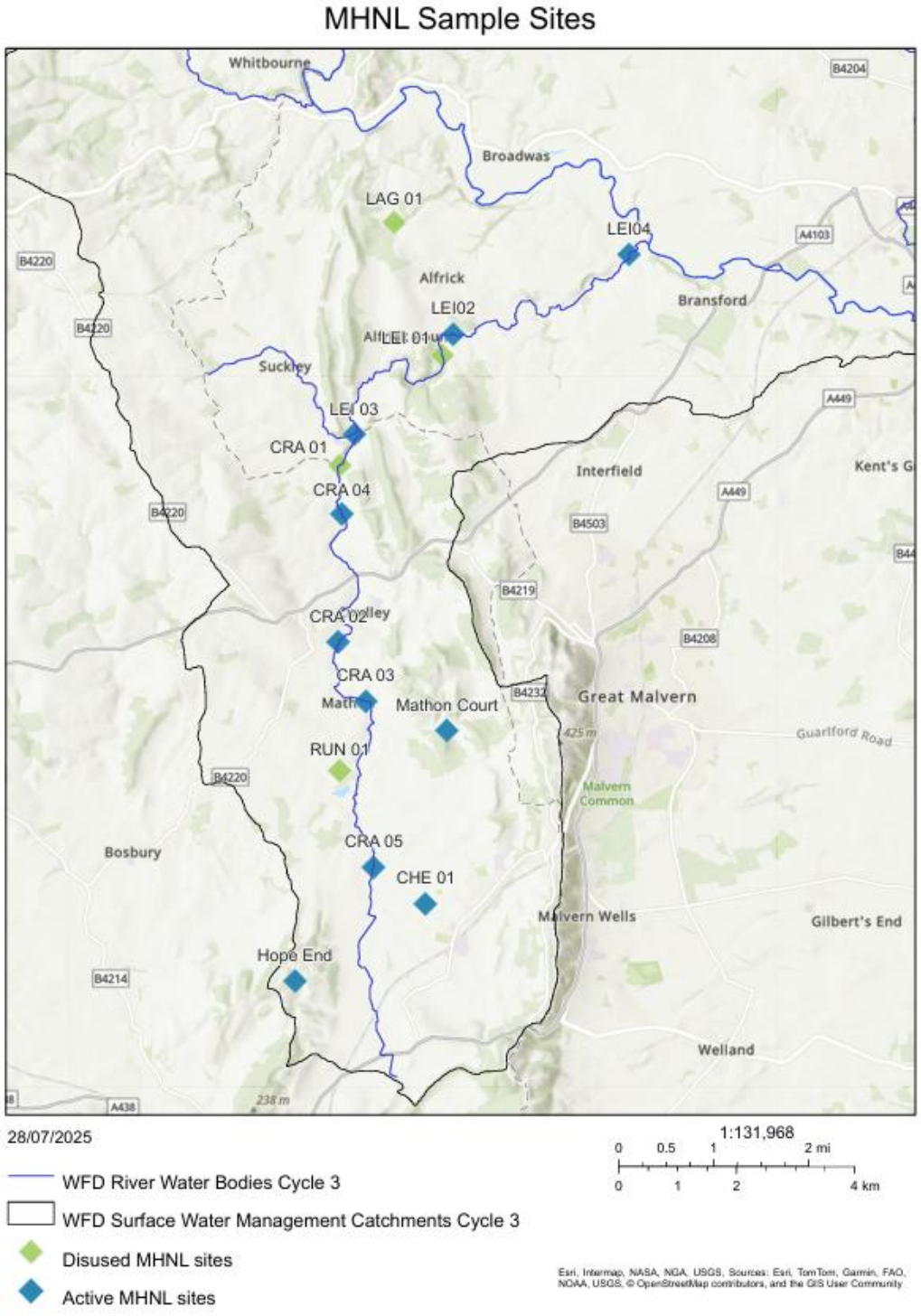

Figure 2 Sample sites within MHNL

Phosphate trends

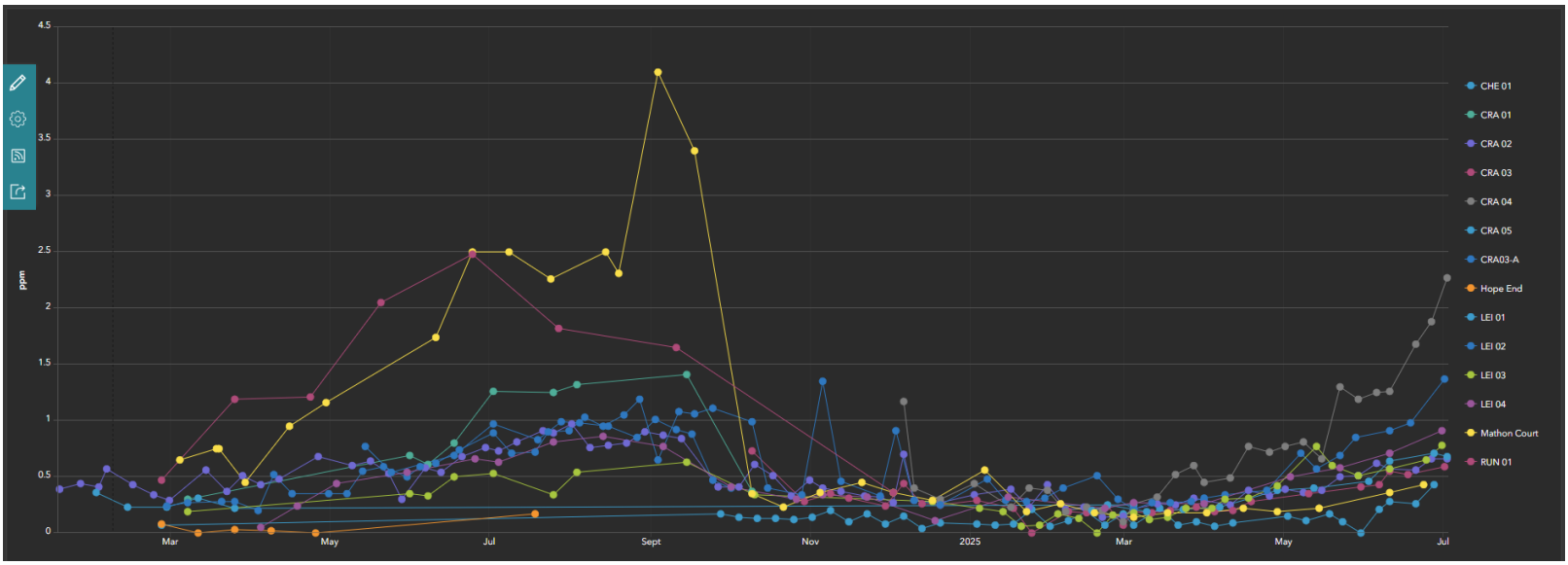

Figure 3 Phosphate trends (as ppm) for all MHNL sites Feb 24-Jul 25

Phosphate is an essential nutrient usually present within watercourses in low concentrations. Sustained periods of elevated levels can pose a serious threat, causing excessive plant and algae growth and triggering eutrophication.

As can be seen from the graph above (Figure 3), most sites follow a similar seasonal pattern for phosphate levels. There is typically an increase seen July-September time before levels reduce again over winter. This pattern of increasing levels during summer months is likely due to lower flows and therefore greater concentrations of phosphate being present. The occasional spikes seen during the winter months are likely to correlate with high rainfall and therefore increased inputs from Sewage Treatment Works (STW) or run off from land. Two sites, LEI 04 and CRA 04, appear to have had greater increases in phosphate levels since May 25 which is currently being investigated through additional sampling and discussions with Severn Trent Water and the Environment Agency.

Generally speaking phosphate levels above 0.2mg/l are considered to be high and would usually put the waterbody into the moderate-poor category in terms of Environment Agency classifications. Looking at the 2024 annual averages for the sites within the MHNL, six of them were above this 0.2mg/l value. So far for 2025 only two

sites are heading for an annual average above this value (LEI 04 and CRA 04). For a waterbody to be considered of good-moderate status phosphate levels need to be lower than 0.09mg/l. Only three sites within MHNL have annual averages under this level across 2024/2025.

The sampling site at Mathon Court recorded the highest phosphate levels across the Teme catchment from July to October 2024, reaching a peak of 4.1ppm or 1.3mg/l. In October/November a phosphate permit was introduced at the West Malvern STW alongside a reedbed regeneration project being carried out. As shown in Figure 4 below, the phosphate levels recorded dramatically decreased as a result of these interventions and have remained low throughout 2025. This demonstrates the potential use of citizen science data as a monitoring tool for interventions and operational work on the ground.

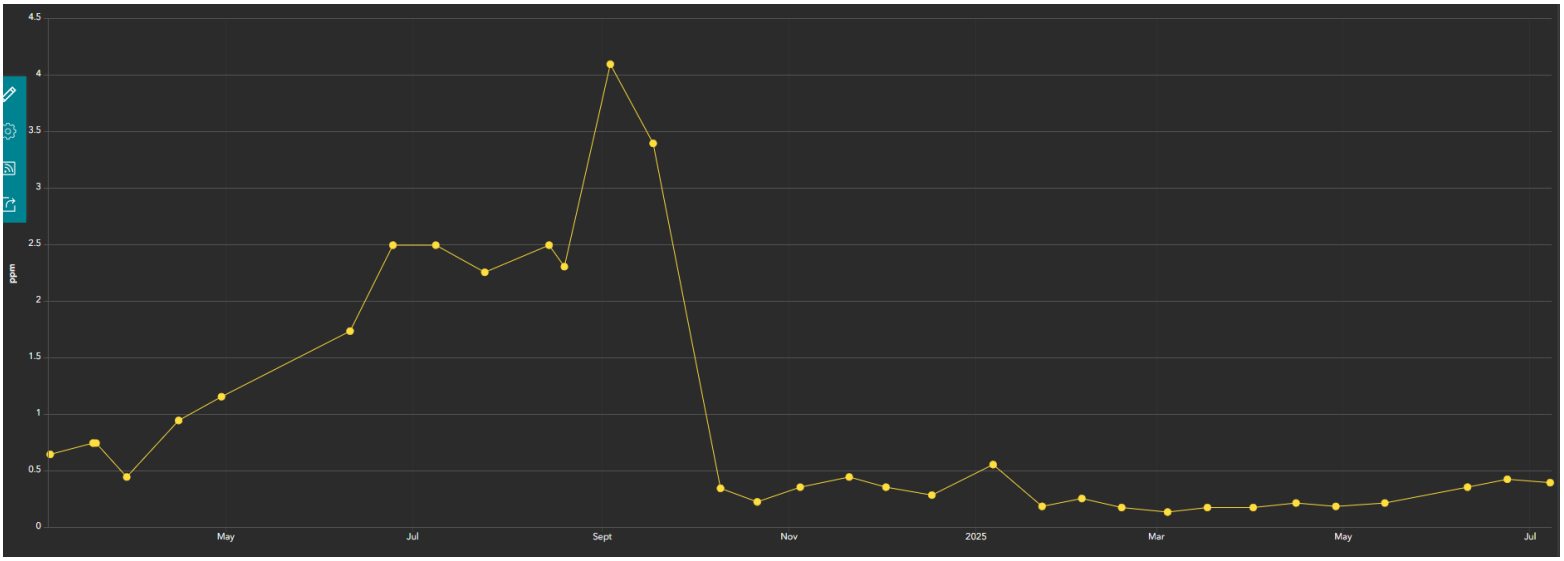

Figure 4 Mathon Court phosphate levels March 2024-July 2025

Nitrate trends

Nitrate is also an essential nutrient typically present in low concentrations within watercourses. Similarly to phosphate, prolonged periods of high nitrate levels can be linked to excessive plant and algal growth and can contribute to eutrophication.There are no ecological standards for nitrogen in rivers, but natural levels are generally below 5ppm.

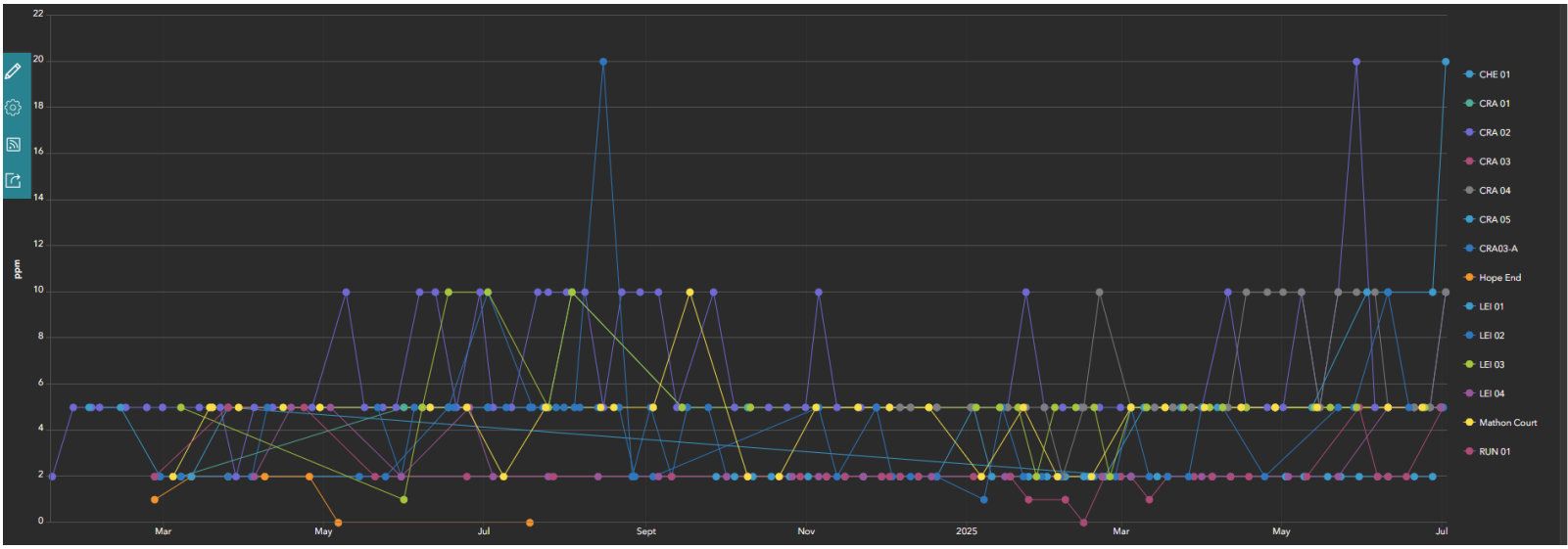

Figure 5 Nitrate trends (as ppm) for all MHNL sites Feb 24-Jul 25

The graph above (Figure 5) shows that the majority of measurements for the MHNL sites are at 5ppm or below, but that there are a few sites consistently measuring higher than this. Three sites on the Cradley Brook, CRA 02, CRA 04 and CRA 05, are regularly measuring greater than 5ppm, even hitting levels of 20ppm on occasions. Given these spikes are seen May to September low flows and greater concentrations are likely to be contributing factors, but the spikes of 20ppm are indicative of external inputs. Both CRA 04 and CRA 05 are downstream of STW which could be a potential source.

Electrical conductivity trends

Electrical conductivity is a measure of the waters ability to pass an electrical current and is primarily affected by the underlying geology of an area. The conductivity of rivers generally ranges from 50 to 1500 µs/cm. Given the underlying geology of the MHNL (excluding the Malvern Hills themselves) predominantly consisting of mudstone and siltstone with occasional bands of limestone it would be expected that conductivity levels in this area would mid-high.

As can be seen from the graph below (Figure 6) all of the conductivity levels are within the expected range but there appears to be quite a degree of fluctuation. The increased levels seen during summer months are likely linked to temperature as conductivity increases in warmer water. The fluctuations seen during the winter, wetter months are likely down to higher rainfall and therefore greater runoff and discharges from STW. The isolated spike at Mathon Court in January 2025 is likely to be linked to a high rainfall discharge event from West Malvern STW as there had been heavy or prolonged rainfall in the preceding 24 hours to sampling.

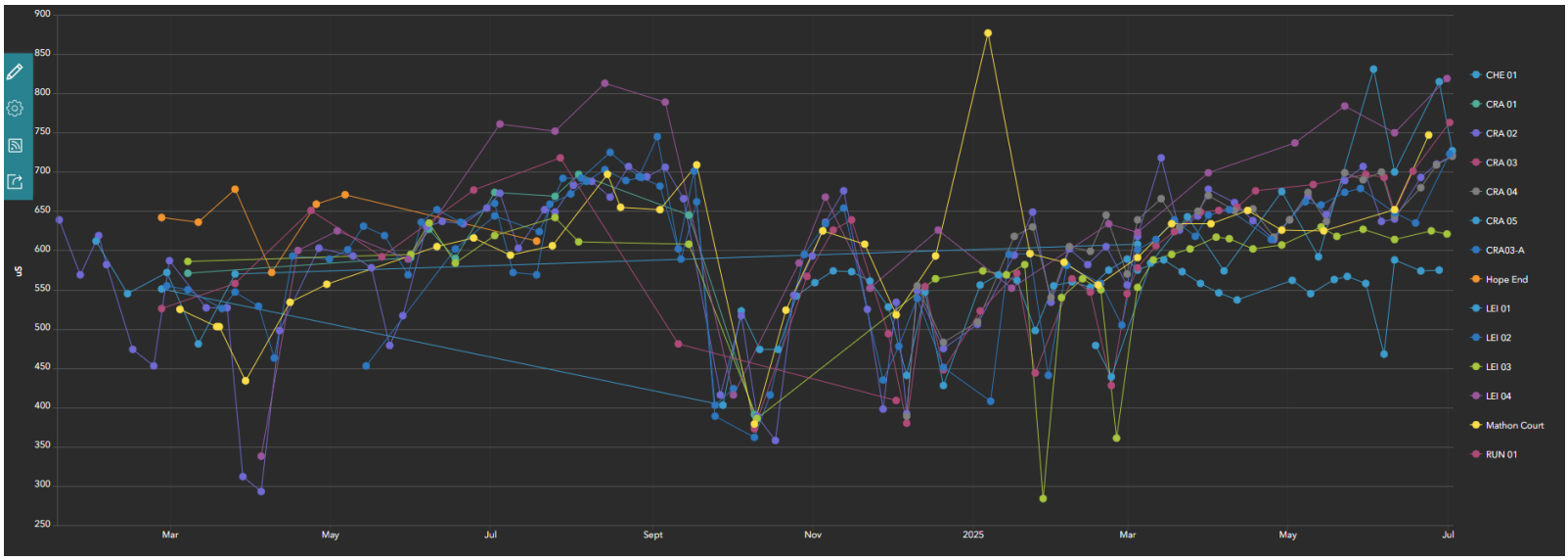

Figure 6 Electrical conductivity trends (µs/cm) for all sites Feb 24-Jul 25

Turbidity trends

Turbidity is the measure of how much material is suspended within the water and is monitored by how cloudy it is. A higher turbidity reading represents a cloudier river with more particles throughout. Turbidity can impact upon water temperature which in turn reduces dissolved oxygen levels; but it can also directly impact upon habitats via siltation and aquatic life through clogging gills and reducing resistance to disease.

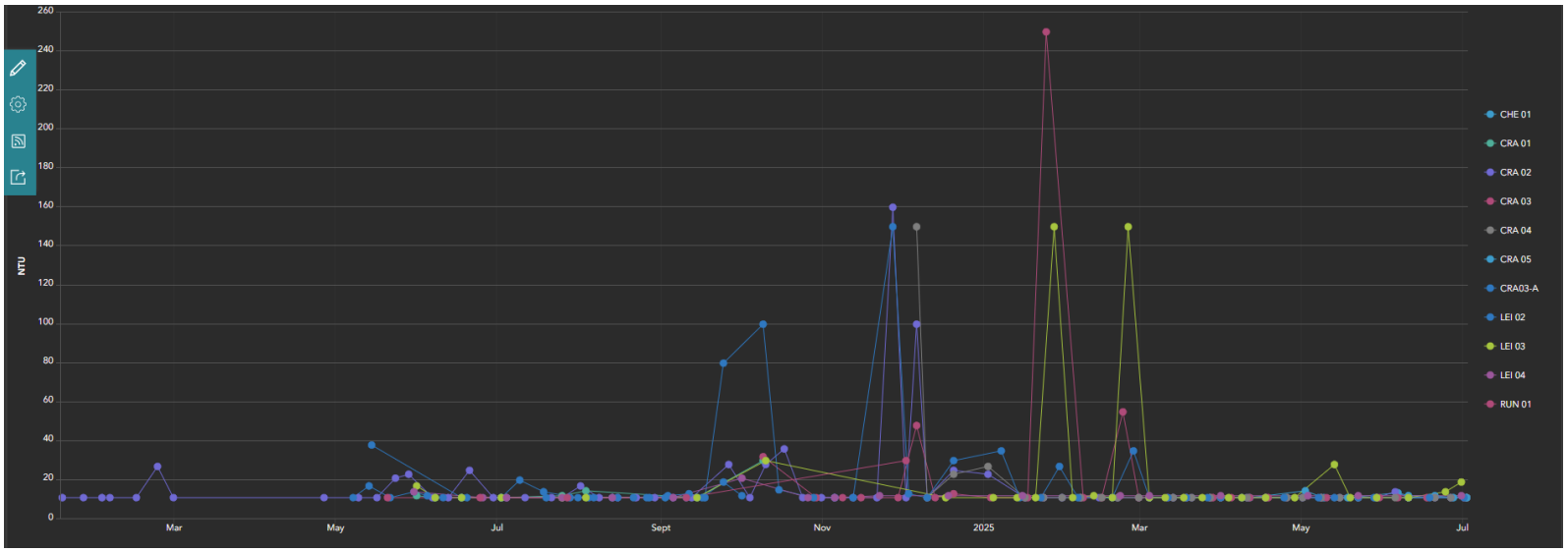

Figure 7 Turbidity trends (NTU) for all MHNL sites Feb 24-Jul 25

As can be seen from the graph above (Figure 7) turbidity levels for the MHNL sites remain consistently low with the exception of a few spikes during the winter months. This is to be expected due to there being higher rainfall during these months and therefore greater surface water runoff and discharges of material into the rivers.

Temperature trends

Water temperature is key to controlling many biological, chemical and physical processes in a river. It will naturally fluctuate on a daily and seasonal basis but can also be affected by human activities, habitat destruction and discharges of polluted water. An unseasonal change in temperature can impact plants and animals that are adapted to living within specific temperature ranges and result in them being more sensitive to parasites and disease. It can also impact upon oxygen levels.

As can be seen from the graph below (Figure 8) there is an expected seasonal variation in temperature across all sites. The temperature data does not highlight any sites of concern within the MHNL, though it is noted that temperatures recorded at one site on the Cradley Brook (CRA 02) are often higher than other sites samples around the same time.

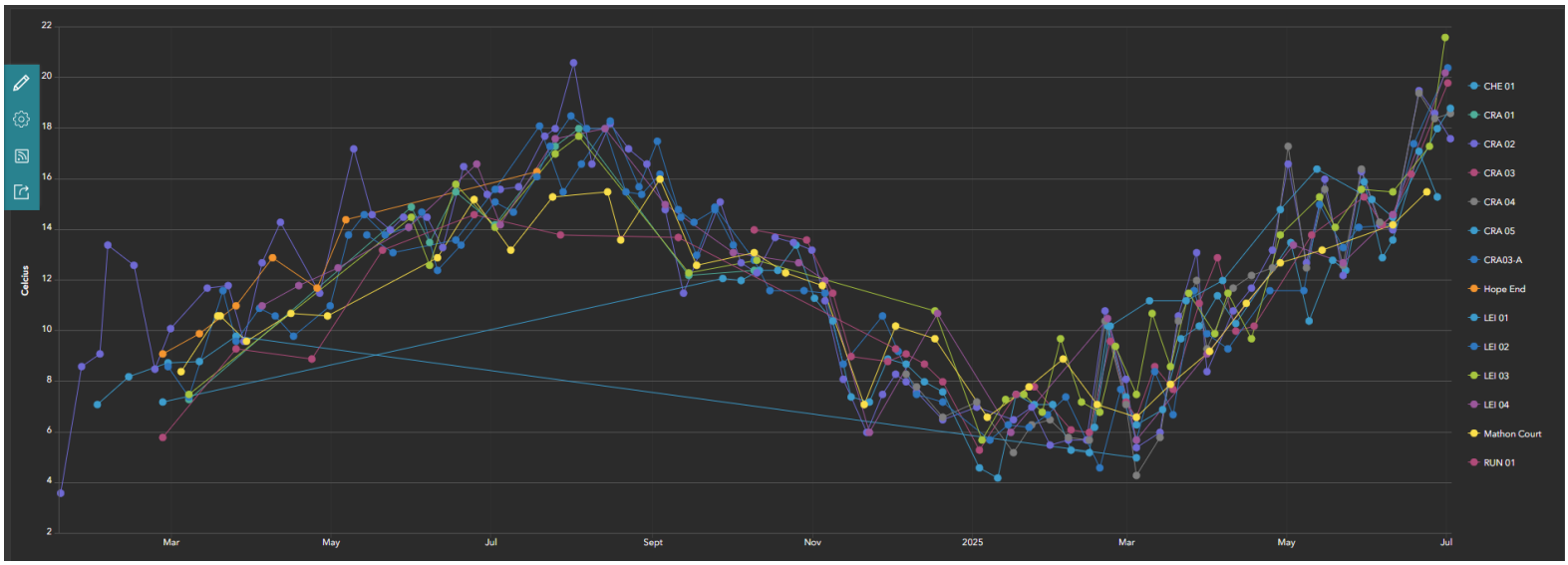

Figure 8 Temperature trends for all MHNL sites Feb 24-July 25

Bacteria trials

As part of the work carried out for the CaSTCo project, bacteria monitoring with volunteers has been trialed. Five sites within the MHNL have been included within these trials (CRA 02, CRA 04, CRA 05, LEI 02 and LEI 04). The graph below (Figure 9) shows the results from four separate testing occasions using the R card method. The two sites on the Leigh brook have consistently had low levels of *E.coli* detected on the three occasions they were included. The three sites on the Cradley Brook have all detected higher levels of *E.coli* with CRA 05 detecting the highest level of all the trials carried out across the Teme catchment. As CRA 05 was only included on one occasion it is not possible to say if this was an isolated incident, subject to contamination or in fact indicative of an ongoing issue.

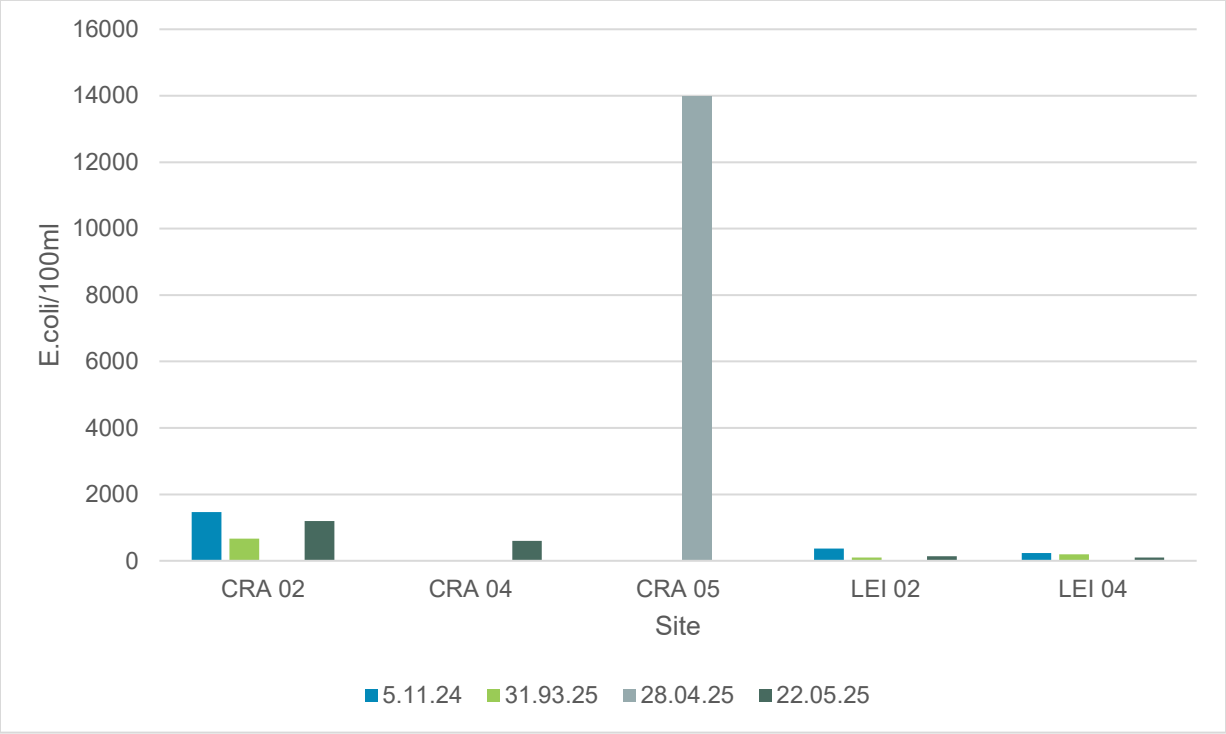

Figure 9 Results from bacteria trails carried out on MHNL sites

Conclusions

A wealth of knowledge on the quality of rivers in the northern area of the MHNL has been generated over the last 17 months. This will provide vital baseline data which can be used to identify changes overtime and help pinpoint areas where interventions or actions may be required to improve river health.

Based on the Environment Agency being ‘certain of a eutrophication problem’ for the Cradley Brook and being ‘quite certain of a eutrophication problem’ for the Leigh Brook it is not surprising the nutrient levels being detected in the monitoring. This coupled with continuous sewage discharge, bankside erosion and poor nutrient management being listed as reasons for the waterbodies not achieving good status, suggests that the data collected is a true reflection of river condition.

Since the resolution of the high phosphate levels at Mathon Court, none of the other 10 regularly monitored sites stand out as having excessively high trends on any of the parameters measured. A close eye is being kept on a couple of sites with increasing phosphate levels and further investigations will be carried out if significant reductions in levels are not seen with increased flows heading into the winter months.

Looking ahead we hope to be able to carry out wider bacteria monitoring across the MHNL area and determine if the extremely high *E.coli* levels detected at CRA 05 were an isolated incident or perhaps indicative of an ongoing issue. More targeted monitoring related to work in the area, be it river-related interventions or more general land management, would also be advantageous to allow the impact of such work on water quality to be monitored.

With the CaSTCo project coming to an end in September 2025 monitoring across the Teme catchment, including the MHNL sites, will continue but potentially at a reduced frequency until successional funding is sourced.