Save our Swale: Data Report 2025

Sampling date:	From September 2023.
Sample location(s):	Various along the river Swale and tributaries.
Analysis location:	Richmond, North Yorkshire
Personnel:	Citizen Science Volunteers.
Analyses:	Chemical, Microbiological.

Summary.

Citizens science volunteers have conducted 22 monthly river sampling sessions since SoS commenced in September 2023 generating over 1,500 data records from 11 locations along the Swale from the river source through Richmond town to nearby Brompton upon Swale.

The results indicate that pollution is present through the river course with increased levels in urban areas but with some spikes of pollution at times even in the higher reaches of the river. Chemical pollution is detectable in levels of ammonia, phosphate and nitrogen arising from sewage release but also in agricultural areas.

These levels did vary but frequently exceeded allowable limits for safe bathing and are known to have adverse effects on wildlife and river ecology. Levels of potentially hazardous bacteria such as *E. coli* and *Enterococci* were also measured by volunteers and often exceeded recommended safe levels, particularly when effluent overflows directly into the river. Samples from various tributaries into the Swale also had high levels of pollution so contributing to the levels downstream.

Effluent released from the Richmond treatment works at Easby has particularly high levels of phosphate and of *E. coli* indicating inadequate treatment. Even when diluted in the river high levels are recorded downstream further reducing water quality in the river beyond.

Where did we sample?

Our locations.

Locations for sampling were chosen to cover the geographical reach of the upper River Swale from its origin at Wainwath, through the village of Grinton, an urban stretch through Richmond town, past the treatments works at Easby to the village of Brompton upon Swale.

Sample points were particularly focused to be near releases from combined sewage outflows (CFO) and included specific outflows from the Richmond Sewage Treatment Works and Colburn Beck downstream of the Catterick Sewage Treatment Works. Locations of the eight commonly sampled points are shown in Figure 1 below and detailed in Table 1.

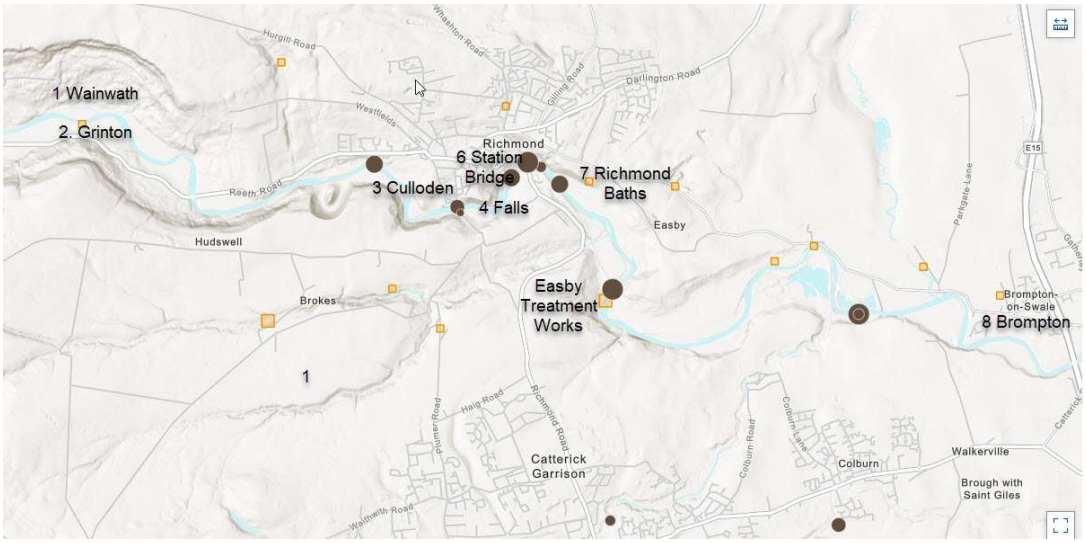

Figure 1. Locations for routine sampling.

The sampling thus covers agricultural locations in the upper reaches of the river allowing comparison with urban locations further downstream.

Table 1. Sampling location details.

Routine Sites			Additional Sites		
Sample Code and #	**Latitude / Longitude**	**Local Geology**	**Sample Code and #**	**Latitude / Longitude**	**Local Geology**
S1 Wainwath	54.409106,-2.179808	Moorland	S 6a. Clink Bank Cottage	54.404504,-1.729812	Urban Riverside Garden
S2 Grinton Bridge	54.381699,-1.933834	Agricultural	Richmond Treatment Works	54.394025,-1.719139	Treatment Works
S3 Culloden woods	54.403917,-1.749537	Established Woodland	Gilling West – Beck Bridge	54.442201,-1.718401	Village Riverside Amenity
S4 Richmond Falls	54.400532,-1.733858	Urban Waterfall	Skeeby Beck – Swale outflow	54.393618,-1.675263	Riverside Inflow
S5 Richmond Batts	54.403151,-1.732028	Urban Amenity Parkland	Colburn Beck	54.391943,-1.685823	Riverside Inflow
S6 Mercury Bridge	54.404173,-1.730374	Urban Riverside Amenity	Catterick Beck	54.375906,-1.630840	Village Riverside Amenity
S7 Swimming Pool Beach	54.403660,-1.728564	Urban Riverside Amenity			
S8 Brompton upon Swale	54.389881,-1.668981	Village Riverside Amenity			

What did we measure?

Chemical Methods.

Analysis of specific chemicals was conducted to reflect indicators of pollution and of general water components along with suitability for safe processing by volunteers and a calculation of costs and resources. Portable and handheld instruments were used with calibration checks to ensure accuracy and precision. The specific tests conducted are listed in Table 2.

Table 2. Test methods and instruments.

Test	Target Chemistry	Instrument	Measurement units	Indicator of
Conductivity	Dissolved salts	HM Digital COM-100	µ Siemens / cm	Natural dissolved salts and pollution
pH	Acidity / alkalinity	Aqua Master pH meter	pH units	Pollution from acid or alkali addition
Turbidity	Suspended solids	Hach 847493 Haze meter	RTU	Silt, Organic debris,
Phosphate	Phosphate salts	Hannah low range checker	mg per litre (ppm)	Organic digestion, pollution
Ammonia	Ammonium salts	Hannah low range checker	mg per litre (ppm)	Effluent

Nitrate tests were conducted until September 2024 but discontinued due to the complexity of the analysis required in the time available. Ammonia tests were conducted from August 2024 as an alternative indicator of pollution being more directly correlated to effluent.

Microbiological Methods.

Presence of microorganisms was assessed by standard plating on selective agar media as a recommended method for coliform bacteria. Colonies of coliform bacteria stain red in contrast to other bacteria. From September 2025 the Petrifilm coliform test was adapted as easier to process and interpret as well as providing a definitive count of *E. coli* as well as total coliform bacteria through colour differences and gas production.

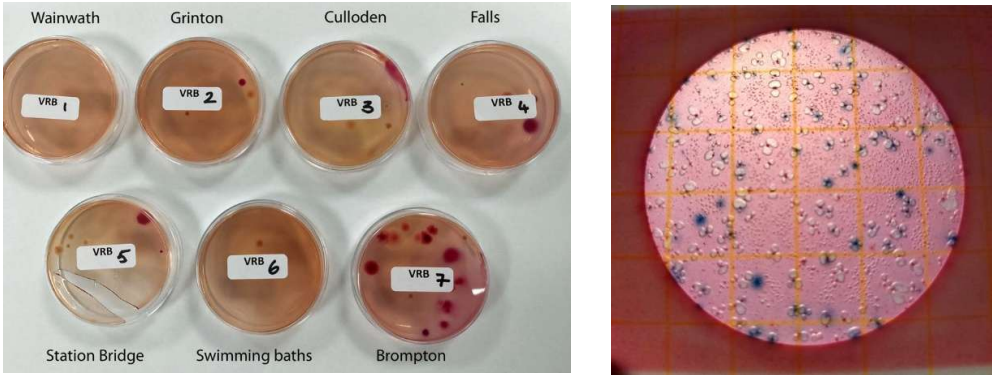

Figure 2. Example VRB (left) and Petrifilm (right) results. Red colonies on VRB are coliform bacteria. Blue colonies with a gas bubble on Petrifilm are *E. coli*.

Samples were also assessed in some instances for the presence of *Micrococcus* bacteria by plating on selective media. Confirmation of bacteria identification was obtained by DNA extraction and PCR sequencing.

Authentication of results for phosphate and microbiology was obtained by external, independent analysis by accredited laboratory services. Results indicated a good concordance indicating that the methods used by volunteers were representative.

In addition, SoS conducted weekly testing for the Surfers Against Sewage national rivers campaign, sampling at Brompton and forwarding these to an external laboratory. Duplicate sampling and analysis by volunteers allowed a comparison to be made to provide further reassurance of accuracy. The data presented here are averages as being easy to interpret in a general report but percentiles indicate similar profiles.

What did we find? Our results.

Conductivity.

Conductivity and pH increased along the river course as would be expected with increasing uptake of salts from the local geology. Levels were low in samples from moorland and agricultural areas but notably higher in urban samples due to household and industrial release. Run off from roads will contribute to conductivity analysis as salts are washed into the river further elevating urban levels.

Figure 3 shows the increase in conductivity along the river Swale with a steep increase between Wainwath and Grinton and progressive increases to Brompton. Subsidiary samples in Catterick beck show higher levels for example of 565 µS on the 26th January 2025 reflecting the proximity of the beck to road wash off. Conductivity levels in effluent release are even higher for example 802 µS from an overflow on the Batts CSO on the 9th June 2025.

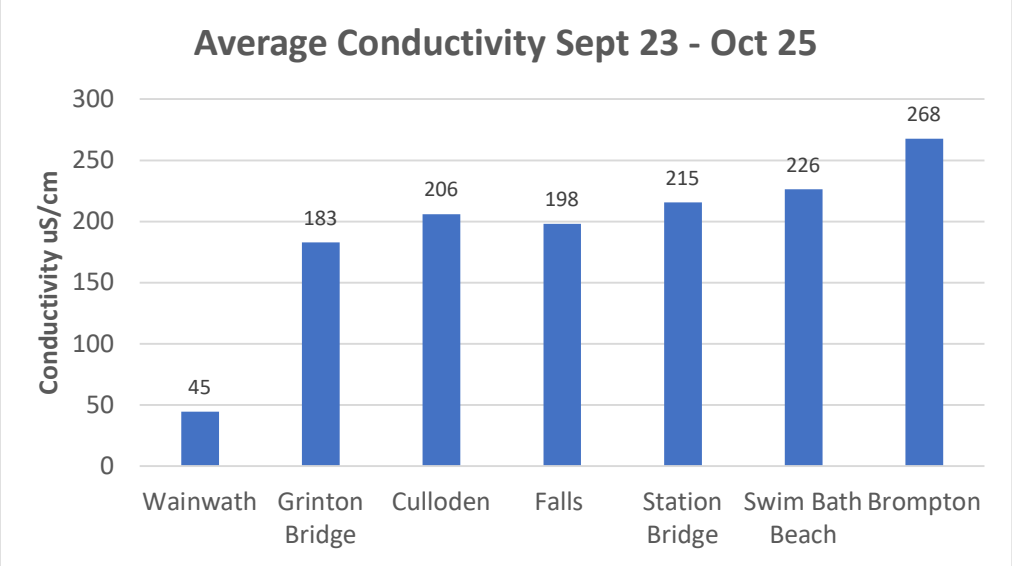

Figure 3. Conductivity levels at standard sampling points of the river Swale.

Turbidity.

Turbidity measures the amount of particulate matter in water which can reflect suspended organic and inorganic matter. These may have many origins in and correlate with both natural and other causes including breakdown of plant material, algal growth and silt disturbed by the river flow. Turbidity also correlates with pollution particularly effluent and can be a measure of discharges. As the Swale is a fast-flowing river with rapid changes in level it is not a very reliable measure of pollution. It does, nevertheless, show a profile along the river similar to conductivity and other measurements with high levels at points of pollution indicators.

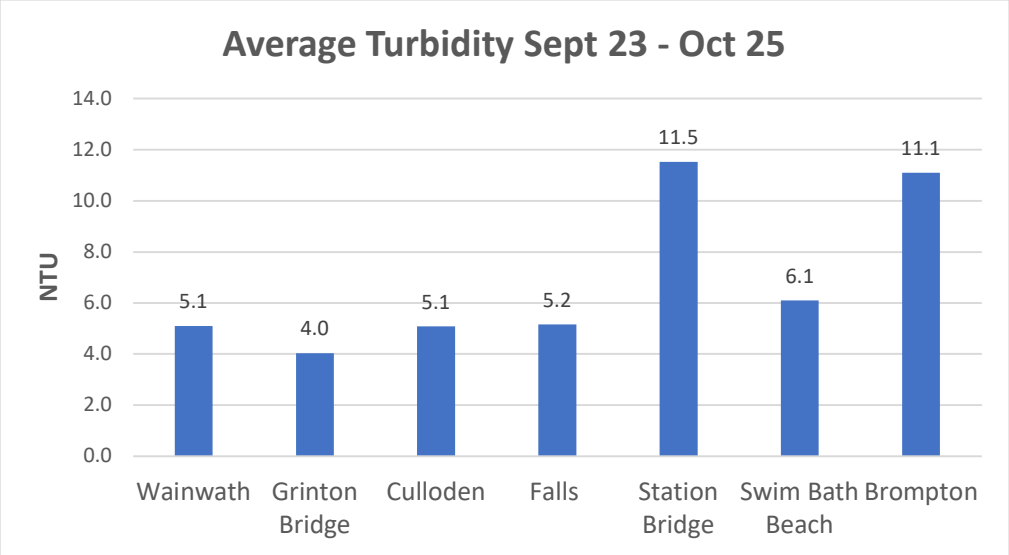

Figure 4. Turbidity levels at standard sampling points of the river Swale.

Phosphate.

Phosphate arises from natural sources and agricultural processing but also from urban use such as detergents. It is at high levels in effluent and in polluted water and has major impacts on the environment by encouraging algal and microbial growth. Levels of phosphate are indicative of pollution and levels in natural waters are monitored and controlled by the Environment Agency. The Water Framework Directive specifications for good ecological status of phosphate depend on the alkalinity of the water and the altitude of the site. Given the location and conditions of the Swale an annual mean concentration of less than 0.077 mg per litre is required for high water quality.

Average levels in the river Swale measured by SoS have been above this limit in 50% of samples from Brompton which receives impact of various effluent discharges. Only two locations, Wainwath and Culloden, have a very high-quality rating of average phosphate levels below 0.024 mg per litre as shown below in Figure 5.

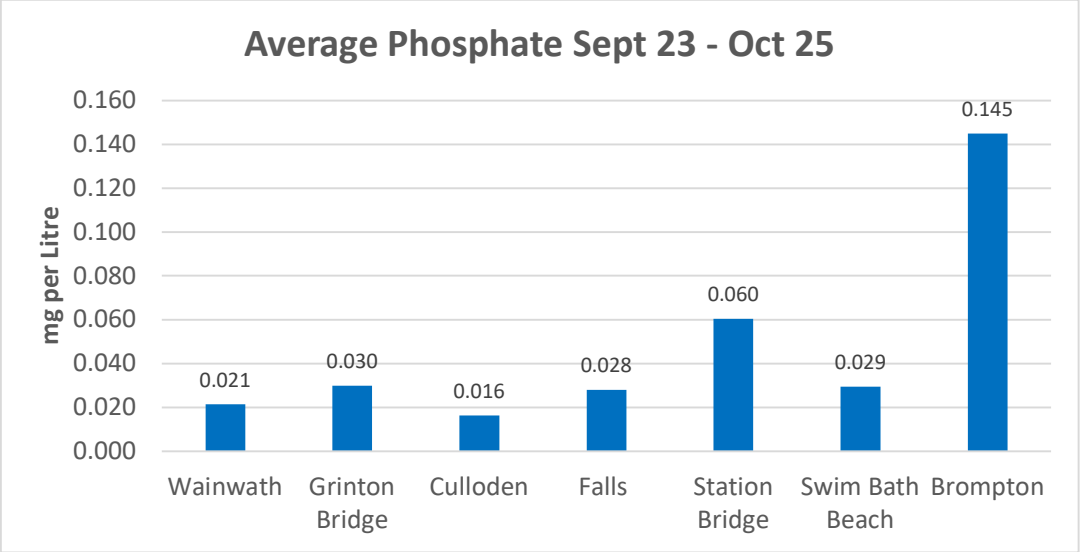

Figure 5. Phosphate levels at standard sampling points of the river Swale.

Ammonia.

Ammonia is strongly associated with pollution being a common feature of sewage and levels are typically high in effluent. Levels below 0.3 mg per litre are considered as high ecological status for the river Swale. This is achieved in the average from all sample sites, however more than 37% of samples from Station Bridge and Brompton exceeded this limit indicating the variability and fluctuations present.

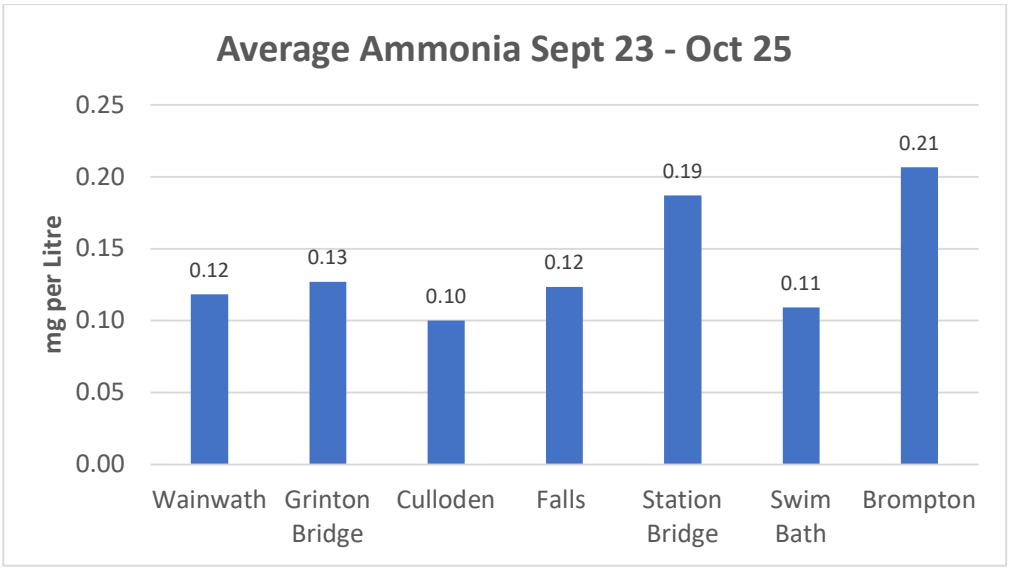

Figure 6. Ammonia levels at standard sampling points of the river Swale.

Coliforms and *E. coli*.

Bacteria levels are a key indicator of pollution in water. Coliforms represent a diverse range of species some of which may be pathogenic and cause disease. *E. coli* is a specific and well recognized species. Not all *E. coli* are pathogenic but some strains are enterotoxigenic causing severe intestinal infections. Recording these in the river Swale provides a good indication of its safety and of locations where effluent is introduced.

Average levels of coliform bacteria for the Swale sampling locations are shown in Figure 7 and indicate that all exceed the recommended level for safe bathing water of 1,000 per 100 ml. Samples from Station Bridge and Brompton are particularly high at over 5,000 and 13,000 coliforms per 100 ml respectively.

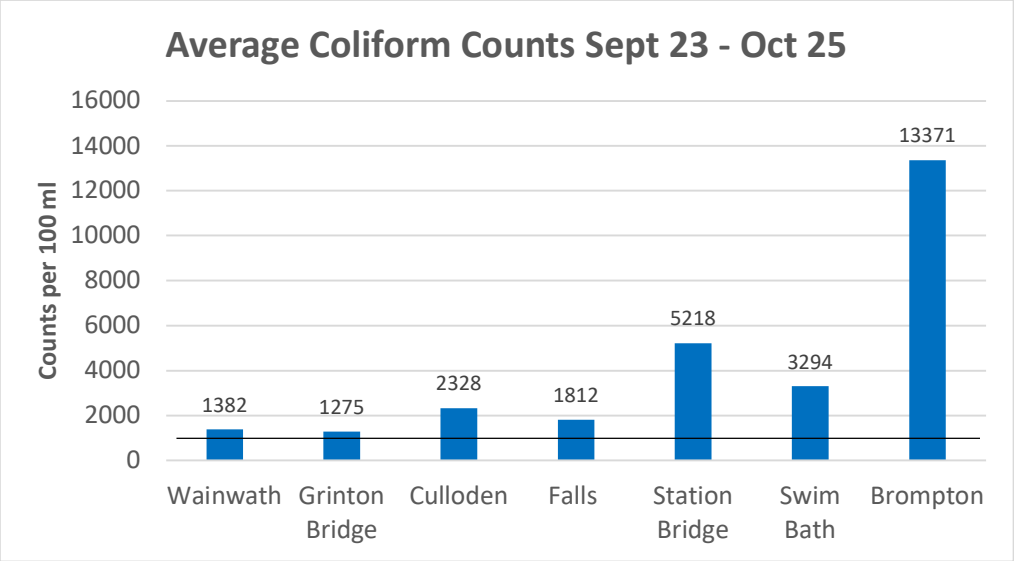

Figure 7. Coliform levels at standard sampling points of the river Swale.

Additional analyses.

As well as routine sampling from the river Swale SoS has also sampled from tributaries and from effluent discharges. These give a broader view of the river and of pollution sources.

Tributaries sampled include ones at Wainwath, Hudswell beck, Gilling West beck, Colburn beck, Skeeby beck and at Catterick. Levels of pollutants in these vary but in some samples were elevated including readings of 30,000 coliforms per 100 ml at Gilling West, 11,000 in Colburn beck and 3,750 in Skeeby beck. Samples at other times for these locations were within the recommended limits indicating variable inputs of effluent and, potentially, agricultural releases.

More detailed analyses were conducted on effluent samples from the Richmond treatment plant at Easby. Results of four separate analyses are summarised in Table 3 indicating consistently high levels of ammonia, phosphate, coliforms and *E. coli*. Although these will be diluted in the river flow they will contribute to levels downstream, particularly at Brompton.

Table 3. Sample results from Richmond Treatment Works effluent outflow.

Sampling Date	Ammonia mg per litre	Phosphate mg per litre	Total Bacteria Counts/100mL	Total Coliform Counts/100mL
08/08/25	7.04	16.0	600,000	520,000
20/08/25	34.4	7.16	590,000	540,000
26/08/25	33.8	19.2	640,000	490,000
06/09/25 Petrifilm			212,000 Coliform	154,000 *E. coli*

Identification of coliform colonies was conducted by DNA analysis and indicated a predominance of *E.coli* but also presence of *Klebsiella pneumoniae*, *Acinetobacter baumanni* and *Citrobacter freundi* – all of which are potentially pathogenic. Furthermore, *Acinetobacter baumanni* is often associated with antibiotic resistance.

Further studies at the University of Sunderland indicated that bacteria resistant to β lactam, sulphonamide and tetracycline antibiotics were present in samples though the river course with some high levels in upper stretches suggesting local release from agricultural sources.

Invertebrate monitoring.

A separate initiative to sample river invertebrates between spring and autumn generated further data on river health and allowed for a correlation with chemical and microbiological results. Methods followed protocols used nationally by the River Fly Partnership and targeted larvae as indicators of good quality water.

Summary.

Analysis of over 200 samples has generated more than 1,500 analyses and data points and provided a profile of water quality along the river from source to Brompton. Overall results indicate that higher reaches of the river generally have good water quality but urban stretches show an increase in pollution indicators, both chemical and microbiological.

Effluent released into the river from storm overflows and treatment plants has high levels of phosphate, ammonia and coliform bacteria including potential pathogens and indicates that there is no alleviating treatment applied. Dilution will occur in the river, but locations downstream show high levels and poor water quality.

Some indications suggest pollution from occasional agricultural discharges are also a hazard to the river including antibiotic resistant bacteria and some high levels of phosphate. The river has some stretches with promise for bathing water status but others with potentially hazardous content. Issues with infrastructure of the sewage system and agricultural practices both contribute to the river and require attention to ensure its long-term health.