Greater Cambridge Chalk Stream Project

December 2025 Project Update

I hope you all had a Merry Christmas and a Happy New Year.

As we reflect on the end of 2025, I would like to begin by saying a sincere thank you to everyone who has contributed to the Greater Cambridge Chalk Stream Project this year, particularly the volunteers who have stepped forward to support our new weekly water quality monitoring programme.

Thank you to all the volunteers who attended training and are now participating in our weekly monitoring. The data you have helped to generate is already proving to be highly insightful and extremely valuable, clearly evidencing some of the most significant pressures affecting chalk streams across Greater Cambridge. Your efforts are genuinely appreciated, especially as we have worked through a small number of technical challenges with new equipment. Your patience and perseverance have been exemplary.

Citizen Science water quality monitoring training day. (ARU, 2025)

Launching weekly water quality monitoring

The end of 2025 marked an exciting milestone for the project, as weekly citizen science water quality monitoring formally began across all of our case study sites.

All probes were calibrated using Hanna Instruments methodologies for pH, electrical conductivity, turbidity and dissolved oxygen. Two of the four probes calibrated successfully across all parameters. The remaining two initially failed to stabilise at 100 percent dissolved oxygen saturation, despite successfully completing 0 percent calibration using the supplied zero-oxygen solution. Laboratory inspection confirmed that both instruments required replacement dissolved oxygen caps, which were replaced quickly by Hanna Instruments. This was a minor issue, but it highlights why rigorous calibration, checking and quality control are essential when working close to ecological thresholds.

We also trialled lower-cost flow measurement equipment. Field testing showed this equipment was not fit for purpose, particularly under variable flow conditions typical of chalk streams. We are therefore reverting to our original specification, and volunteer teams will be equipped with Valeport 801 flow meters, which, while more expensive, are reliable and proven in chalk-stream environments.

What the early data is already telling us

Although this monitoring programme is still in its early stages, the data collected between October and December 2025 already reveals clear and consistent patterns.

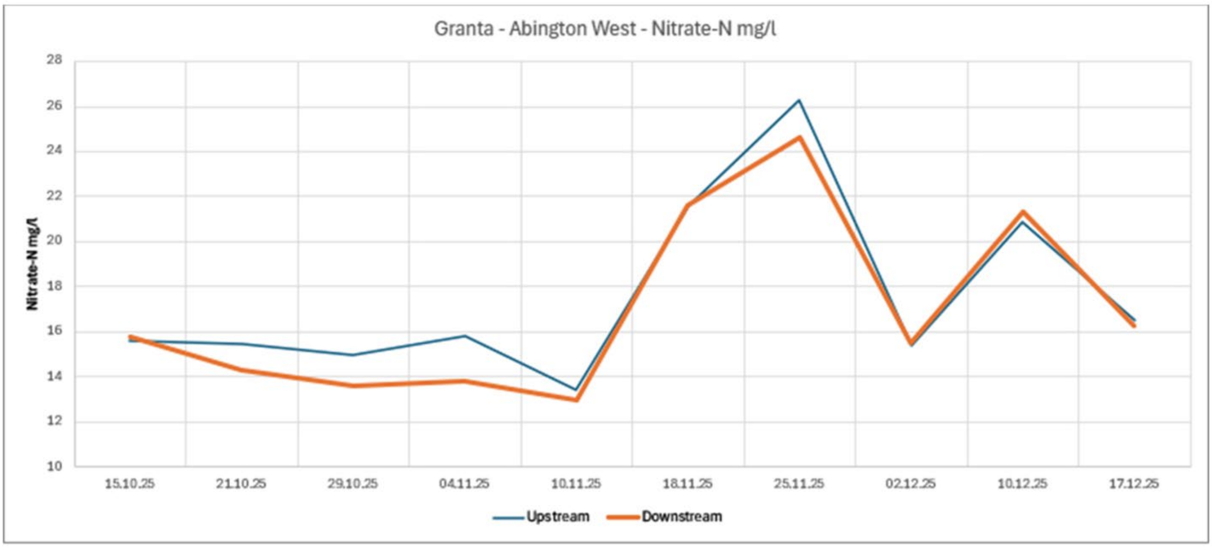
Nutrients, rainfall and catchment pressures

One of the most striking findings is the magnitude and persistence of nitrate enrichment, particularly at rural South Cambridgeshire sites.

At Linton Pocket Park, nitrate-N concentrations consistently exceeded the project's chalk stream ecological benchmark of <1.0 mg L^{-1} as N, with many samples recording concentrations several times higher, and extreme storm-related peaks reaching over 25 mg L^{-1} in late November. Concentrations at this level are far beyond those associated with healthy chalk stream ecosystems and are known to drive macrophyte community change and reduce habitat suitability for sensitive chalk stream invertebrates.

At Abington, both East and West sites show similarly elevated nitrate-N concentrations. Typical values were consistently well above the <1.0 mg L^{-1} as N benchmark, with repeated storm-driven peaks exceeding 25 mg L^{-1} during late November rainfall events. These elevated concentrations are consistent upstream and downstream, indicating a catchment-scale signal rather than a localised discharge.

Taken together, these patterns provide strong evidence consistent with diffuse agricultural nutrient inputs being mobilised during rainfall events and entering the chalk stream network. The magnitude and persistence of nitrate enrichment indicate that existing interception, buffering and mitigation measures within the South Cambridgeshire landscape are currently insufficient to protect chalk stream ecological function.



Weekly nitrate-N concentrations at Abington

Urban chalk streams and contrasting signals

In contrast, the Cambridge urban sites show a different but equally important pattern.

At Hobson's Brook, nitrate-N concentrations were generally lower than at rural sites but still consistently exceeded the chalk stream benchmark, typically ranging between 5 and 10 mg L^{-1} as N, with occasional peaks following rainfall. Short-lived ammonia and ammonium spikes were observed, including an upstream ammonia-N concentration of approximately 0.9 mg L^{-1} in mid-November, indicating episodic urban pollution inputs likely linked to surface runoff, drainage infrastructure or misconnections.

At Cherry Hinton Brook, nitrate-N concentrations were relatively consistent and well above the chalk stream benchmark, generally between 8 and 13 mg L^{-1} as N. Downstream phosphate-P concentrations increased at several sampling points, reaching 0.17 mg L^{-1} as P in mid-November, suggesting additional nutrient inputs within the urban reach superimposed on an already enriched baseline.

At Coldham's Brook and the East Cambridge Main Drain, nitrate-N concentrations fluctuated widely around and above the chalk stream benchmark, with dilution events temporarily reducing concentrations and rainfall events driving sharp increases. Ammonia-N concentrations exceeded 0.5 mg L^{-1} on several occasions, particularly within the East Cambridge Main Drain, highlighting systems dominated by urban drainage dynamics rather than stable chalk groundwater control.

Continuous logging: revealing hidden dynamics

The 24-hour temperature and total dissolved solids (TDS) loggers are already transforming our understanding of how these systems function.

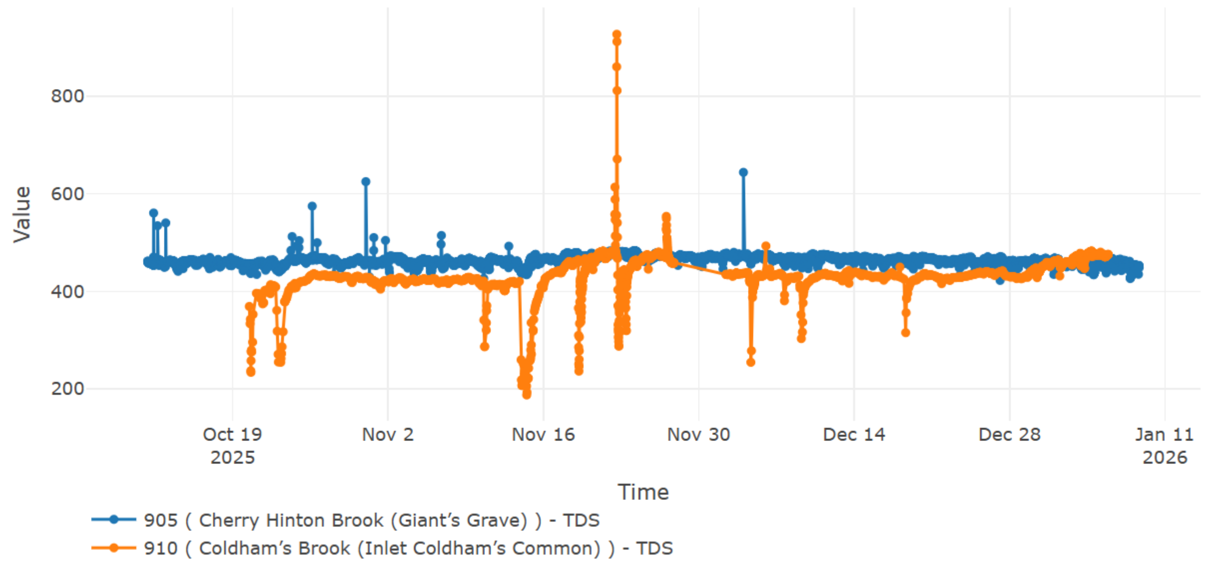
Urban sites show rapid TDS fluctuations of several hundred milligrams per litre during rainfall events, clearly demonstrating first-flush pollution pulses followed by rapid dilution. These short-duration events would be completely missed by weekly grab sampling alone.

Such first-flush conductivity responses are commonly associated with urban surface runoff and drainage inputs, rather than groundwater-derived chalk chemistry.

In contrast, chalk-fed springheads such as Giant's Grave show remarkable chemical stability. TDS values remain tightly constrained, typically varying by less than ±10–20 mg/L, even during rainfall. Temperature data show similarly stable patterns, reflecting strong groundwater control.

This contrast allows us to clearly distinguish between surface-driven pollution pathways and groundwater-dominated chalk systems, providing essential evidence for targeted mitigation design.

To strengthen this evidence base further, the project will be installing additional 24-hour temperature and total dissolved solids (TDS) loggers at Linton Pocket Park and Abington on 20th January 2026. These loggers will capture storm-driven pollution pulses, dilution events and low-flow thermal stress at these rural chalk stream sites, complementing the weekly citizen science monitoring and providing a clearer picture of catchment-scale pressures.



24-hour TDS traces comparing urban stream and chalk springheads

Springheads, groundwater sources and downstream interpretation

Giant's Grave is the chalk springhead that feeds Cherry Hinton Brook, while Nine Wells is the chalk springhead that feeds Hobson's Brook. These springheads represent the groundwater source points for their respective chalk streams and provide a critical baseline against which downstream water quality changes can be interpreted.

The contrasting behaviour observed in the continuous logger data reflects this connectivity. At both Giant's Grave and Nine Wells, TDS and temperature remain tightly constrained, demonstrating strong and stable groundwater control. In contrast, downstream reaches of Cherry Hinton Brook and Hobson's Brook show far greater variability, reflecting the cumulative influence of surface runoff, urban drainage inputs, channel modification and reduced buffering capacity under low-flow conditions.

This upstream–downstream comparison is fundamental to the project's approach. By pairing springhead reference conditions with downstream monitoring, the project can clearly distinguish between pressures originating within the chalk aquifer and those introduced by land use, infrastructure and catchment processes further downstream.

Dissolved oxygen: a system under pressure

Across sites, daytime dissolved oxygen concentrations generally ranged between 6.5 and 8.5 mg/L, corresponding to 60–75 percent saturation at temperatures of 10–13°C.

While these values may appear acceptable at first glance, they are below optimal levels for chalk stream fauna, particularly when considered alongside high nutrient concentrations. In nutrient-enriched systems, biological oxygen demand increases, raising the risk of night-time oxygen depletion, which is not captured by daytime spot measurements. Daytime dissolved oxygen values may underestimate ecological stress, as night-time minima are typically lower in nutrient-enriched systems.

At several sites, including Abington and Hobson's Brook, dissolved oxygen values dropped close to 6 mg/L during autumn sampling. In chalk streams, repeated exposure to such conditions can significantly impair fish recruitment and reduce sensitive invertebrate populations.

Groundwater levels and compounding pressure on chalk streams

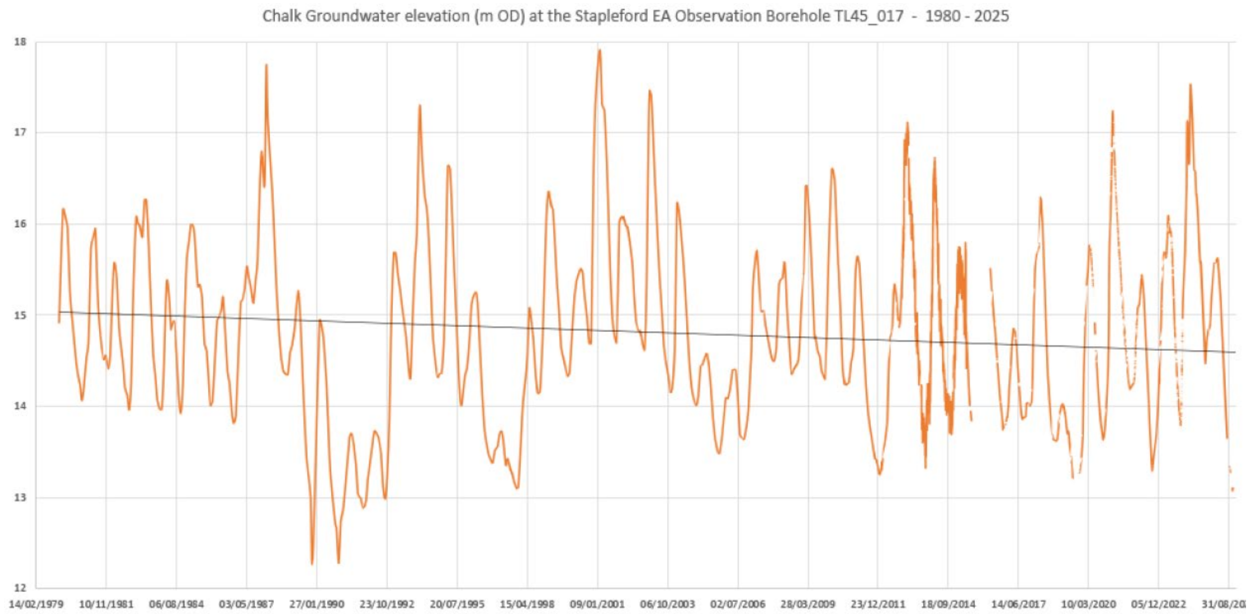
These water quality results must also be viewed in the context of persistently low groundwater levels throughout much of the year.

Long-term chalk groundwater records from EA observation boreholes show that groundwater levels across the region have frequently remained below long-term averages, reducing baseflow contribution to chalk streams. Although short-term recharge events occur, lower groundwater heads reduce the buffering capacity of the system.

Lower groundwater levels exacerbate water quality pressures by:

- Reducing dilution of nutrients and pollutants
- Increasing temperature sensitivity during low-flow periods
- Allowing fine sediment to settle rather than be flushed
- Increasing the ecological impact of nutrient enrichment

In effect, the same pollution load causes greater ecological harm when groundwater levels are low. The water quality signals we are now recording therefore represent compounded stress, where hydrological pressure and pollution interact rather than operate independently.



Long-term chalk groundwater levels with recent period highlighted (Boreham, 2025)

No single parameter explains the observed ecological pressure; rather, it is the interaction of nutrients, low flows, fine sediment and episodic pollution that defines current chalk stream condition.

Sediment, erosion and urban morphology

Working with Keele University, the project has identified bank erosion as a primary source of fine sediment in Cambridge's urban chalk streams.

The lack of bank-stabilising vegetation, combined with dense over-shading and dominance of species such as bramble and ivy, is allowing fine material to enter the channel. This sediment is raising bed levels, smothering gravels and filling pore spaces, reducing oxygen exchange and habitat quality.

Without addressing these bank-scale processes, in-channel restoration alone cannot succeed. The data now clearly supports a shift toward integrated bankside and in-channel interventions.

A detailed sediment and geomorphology report by Keele University, focusing specifically on Cherry Hinton Brook, is currently in preparation and will be published in late January 2026, highlighting the sources, pathways and ecological impacts of fine sediment within this urban chalk stream.

Dr Tory Milner, Keele University sampling Cherry Hinton Brook

What this means for chalk stream flora and fauna

The conditions recorded across the monitoring network sit well outside the tolerance ranges of many chalk stream specialists.

Brown trout and spawning success

Brown trout eggs incubate within gravel redds and require clean, well-oxygenated gravels. Fine sediment infiltration reduces oxygen supply, while dissolved oxygen concentrations consistently below 8 mg/L increase egg mortality. Elevated nutrients further increase microbial oxygen demand within gravels. Under these combined pressures, recruitment failure can occur even where adult fish remain present.

Brook lamprey

Brook lamprey larvae rely on stable, well-oxygenated fine sediments. Excessive inputs of unstable, nutrient-rich sediment from eroding banks can smother larval habitat, reduce interstitial flow and impair survival. The source and quality of sediment therefore matters, not just its presence.

Riverflies, including blue-winged olive

Riverflies such as blue-winged olive are highly sensitive to nutrient enrichment, fine sediment and oxygen instability. The nitrate concentrations now being recorded, particularly storm-driven peaks, are within the range known to shift invertebrate communities toward more pollution-tolerant species, reducing food availability for fish and disrupting chalk stream food webs.

Spring Whalley, Hawkes, Paisley, Trigg (WHPT) macroinvertebrate surveys undertaken in 2025 have already provided valuable insight into the condition of chalk stream invertebrate communities across the project sites. A full WHPT report, incorporating both spring and autumn survey results, will be published in late January 2026, allowing seasonal comparison of sensitive chalk stream taxa and strengthening interpretation of the water quality and sediment evidence.

Chalk stream plants

Chalk stream flora are adapted to clear, low-nutrient water. Elevated nutrients, turbidity pulses and low-flow conditions favour filamentous algae and nutrient-tolerant macrophytes, reducing habitat quality and altering channel function. Mean Trophic Rank surveys undertaken alongside the chemical monitoring already confirm this shift.

Eroding, unvegetated banks are also poor habitat for water voles, which depend on stable, vegetated margins. Re-establishing bankside and in-channel vegetation will therefore deliver multiple benefits for biodiversity, water quality and channel stability.

The Mean Trophic Rank surveys undertaken by Anglia Ruskin University reinforce this chemical evidence, showing macrophyte communities dominated by nutrient-tolerant species and confirming the ecological consequences of nutrient enrichment.

Demonstration sites and upcoming works

From February 2026, restoration works will begin on the Cambridge urban chalk stream demonstration sites. These projects will pilot interconnected channel and bankside approaches, explicitly designed to test whether integrated methods can deliver measurable improvements that can be scaled up across the city.

Works will take place on:

- Cherry Hinton Brook
- Coldham’s Common
- Hobson’s Brook

A Cherry Hinton Brook and Coldham’s Common walk-and-talk event will take place at the end of January 2026 (dates to be confirmed), providing an opportunity to explain what works are planned and how they directly respond to the monitoring evidence.

Plans for Linton Pocket Park and Abington Recreation Ground are now complete, with works scheduled for late summer 2026. These sites will function as rural chalk stream case studies, complementing the urban demonstration sites.

Partnerships, funders and thanks

We would like to extend our sincere thanks to our funders, whose continued support has been instrumental in allowing the project to develop at pace and with scientific rigour:

- **Cambridgeshire & Peterborough Combined Authority**

- **Anglian Water** through the **Get River Positive** programme
- **Cambridge Water** through the **PEBBLE** and **WINEP** programmes
- **Big Chalk**
- **Cambridge City Council**

We would also like to thank **Anglia Ruskin University**, who have coordinated the citizen science monitoring programme, delivered excellent training and provided ongoing support.

We are extremely grateful to **Dr Steve Boreham**, **Dr Mike Foley**, and **Dr Tory Milner**, whose expertise and independent datasets provide essential benchmarking and quality assurance.

A full update on the Shardelowes Farm Regenerative Farming demonstration site will be included in the next newsletter, outlining progress, learning and how land management interventions link directly to water quality and chalk stream resilience.

Patchwork Education Village pond creation work party

Patchwork Education Village freshwater ponds

The educational freshwater ponds with dipping platforms have been progressing well, led by a stoic community effort from staff and pupils at Patchwork Education Village in Abington Woods. The dipping platforms are now complete, providing safe and accessible learning spaces, while pond profiling and lining works are ongoing to ensure appropriate depth variation, water retention and long-term ecological function. Native freshwater pond plants will be planted shortly, helping to establish diverse marginal and aquatic habitats that support invertebrates, amphibians and wider biodiversity. Thank you to Debbie for leading this work and never giving up. Local primary school children and the wider community will be very lucky to have such a high-quality freshwater learning and wildlife resource right on their doorstep.

Clarifying water quality reporting and thresholds for continuity

In the October 2025 newsletter, a range of water quality figures and thresholds were referenced from different sources as part of the project's early, exploratory phase. While this helped to provide broader context, we recognise that it may have created some uncertainty around parameter naming, reporting units and how thresholds should be interpreted.

As the project has now moved fully into delivery, analysis and evidence-led reporting, all water quality interpretation going forward will be explicitly aligned with the Greater Cambridge Chalk Stream Project Water Quality Monitoring Plan and the Pre-Project Baseline Report. These documents define the project's agreed parameters, methods and ecological rationale and remain the authoritative framework for assessment.

For consistency and scientific robustness, results are reported using standard Environment Agency and UKTAG-compatible units, but interpreted against chalk stream-specific ecological benchmarks, rather than generic river standards. Chalk streams are naturally groundwater-dominated, stable and nutrient-poor systems, and are therefore more sensitive to enrichment and physical disturbance than most other river types. The benchmarks adopted by the project reflect this sensitivity and are drawn from peer-reviewed chalk stream research, including work referenced within the Monitoring Plan.

In practical terms, this means that phosphorus is reported consistently as Phosphate-P (Soluble Reactive Phosphorus, mg L^{-1} as P) when using reagent-based field or laboratory methods, nitrate as Nitrate-N (mg L^{-1} as N) with a project benchmark of <1.0 mg L^{-1} as N, and dissolved oxygen reported in both mg L^{-1} and percent saturation. Where alternative analytical methods or external datasets are used for comparison, this is stated clearly alongside the results.

Flow is reported as a contextual parameter, measured as point velocity (m s^{-1}) using Valeport 801 electromagnetic flow meters. Flow data are used to support interpretation of water quality, sediment behaviour and habitat function, particularly under low-flow conditions, rather than as a fixed threshold.

This clarification does not alter the findings reported previously. Instead, it reflects the project's progression from baseline exploration into a coherent, standardised and chalk-stream-appropriate reporting framework, ensuring transparency, scientific rigour and continuity as the evidence base grows.

The parameter table below summarises the reporting units and indicative chalk stream benchmarks that will be used consistently across the project. These benchmarks are intended as an interpretive ecological framework, not regulatory compliance limits, providing context for understanding how measured values relate to chalk stream function and sensitivity.

Chalk stream water quality parameters and ecological benchmarks used in this project:

Parameter	Reporting unit	Ecological benchmark / interpretation
pH	pH units	Stable, slightly alkaline, typically **~7.2–8.3**. Chalk groundwater buffering should result in low variability; sudden deviation indicates runoff, pollution inputs or altered biogeochemical conditions.
Phosphate-P (SRP)	mg L^{-1} as P	**< 0.05**. Chalk streams are highly sensitive to phosphorus enrichment; concentrations above this are associated with macrophyte community change and increased algal growth.
Nitrate-N	mg L^{-1} as N	**< 1.0**. Project ecological benchmark for chalk streams; exceedance indicates nutrient enrichment likely to affect macrophytes, invertebrates and ecosystem function.
Ammonia-N (NH_3/NH_4^+)	mg L^{-1} as N	**< 0.05 (background / low risk)**. Chalk streams are highly sensitive to ammonia; short-duration spikes above this indicate episodic pollution inputs and elevated ecological risk.
Dissolved oxygen	mg L^{-1} and % saturation	**> 8 mg L^{-1} and > 80%**. Sustained or night-time reductions below this level increase stress on salmonids and sensitive invertebrates, particularly under low-flow conditions.
Water temperature	°C	**< 20°C sustained**. Chalk streams are naturally cool and stable; prolonged elevation increases metabolic stress and reduces oxygen availability.
Turbidity	NTU / FNU	**< 5–10 (interpretive)**. Used as an indicator of fine sediment and light limitation rather than a fixed compliance limit; persistent elevation indicates sediment stress.
Electrical conductivity	µS cm^{-1}	**Stable groundwater-dominated range**. Diagnostic indicator of groundwater control; rapid increases indicate surface runoff or pollution inputs.
Deposited fine sediment	g m^{-2}	**Trend-based indicator**. Increasing deposition indicates rising risk to gravels, interstitial oxygen exchange, invertebrates and fish spawning habitat.
Flow velocity	m s^{-1}	**Typically ~0.05–0.60 m s^{-1}**, depending on habitat type. Used as contextual information rather than a fixed threshold.
E. coli / coliforms	CFU mL^{-1}	**Low background expected; interpreted contextually**. Screening indicator of bacterial loading using Petrifilm methodology; interpreted alongside rainfall, land use and drainage pathways.

In closing and looking ahead

Without the data our volunteers are generating, we would not be able to identify these issues, understand their mechanisms, or design realistic, functional and sustainable long-term solutions.

This project is now demonstrating, clearly and unequivocally, that evidence must come before intervention, and that chalk stream recovery depends on understanding the whole system, from catchment to springhead.

In our next newsletter, we will outline future funding, long-term plans and options for continuing and scaling the project, ensuring that the evidence base now being built can support sustained chalk stream recovery across Greater Cambridge.

Thank you for being part of that work.

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Water vole latrine, Coldham's Brook. (ARU, 2025)