

July 2024 – Project Monitoring Updates

This document contains the updates provided by each project from the July quarterly monitoring cycle. Any projects not included in this document have either reached completion of their project, not yet started the project, or not provided an update this quarter.

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Innovation in Water Challenge (2021)

No project updates this quarter.

Breakthrough 1 (2021)

AIoT Enabling Autonomous Waste Catchments

Operational technology and middleware detailed design for the first trial is complete. This will screen, transfer, and implement the commands produced by the AI. We are now building underway with the pre-construction phase of the trial (H&S, Contracts, Test planning). AI models are complete they are now being productionised.

Alternative approaches to phosphorus removal at rural wastewater treatment works

ALT-P is progressing successfully in line with the agreed plan. We have moved forward significantly over the past quarter having completed all site trials on work package 1 (Electrocoagulation, EC) and work package 2 (natural coagulants, NC) and moved into the site testing period with work package 3 (reactive media). We are now working through our dissemination plans. This includes presenting at the European Wastewater Management conference in Manchester in early July and making arrangements for ALT-P Day in September 2024. During the past quarter we have been able to host site sessions for water companies, outside of our immediate consortium, at both United Utilities (WP1 and 2) and Southern Water (WP3) sites. The site visits have received positive feedback and helped others understand how they will support the realisation of benefits from the ALT-P outcomes. Through discussions with water companies we understand that some are already going to full scale implementation with EC and are using our project to fully inform their approach to operation and maintenance. UU have also started working with the Environment Agency (EA) and Natural England (NE) to get approval for dosing NC at scale. Both the EA and NE are requesting additional verification information.

Catchment Systems Thinking Cooperative (CaSTCo)

30+ partners sponsored by Ofwat, including water companies, local communities, technical experts, academics, NGOs and UK regulators, are collaboratively building a standardised national framework of integrated environmental monitoring methods like citizen science, low-cost monitoring, real-time monitoring and modelling, and producing data to combine and visualise as insightful information, driving improved decision-making and better actions and outcomes for water and people.

Fair Water (Transforming Customers' Lives: Integrated Pathways to Fair and Sustainable Water)

The project has made significant progress on two key elements.

1. In May and June ten households were installed with point-of-use water sensors on 40+ appliances, and these have started the process of collecting the much-needed household water use data. Water use data over the first few weeks will provide a baseline for each household, with which the effect of the planned interventions in the coming weeks and months can be compared. Additional sensor installations are scheduled over the coming months to reach a total of 50 households.

2. In mid-June, the base-lining survey on water use perceptions was delivered (email and postal) to selected households, which will provide a second strand of base-line data, complimenting that from the households with in-home sensors.

Flexible Local Water Supply Schemes

The pilot is testing the commercial viability of using multi-use abstraction licences and package water treatment plans to supply business customers and help solve water resource needs. The pilot will unlock a number of commercial, technical and regulatory blockers associated with market access for small, local water supplies.

Project Zero (FKA Water neutrality at NAV sites)

In the last quarter, we published the results for Site 2 and actively disseminated our findings by attending six conferences and engaging in numerous one-on-one meetings with regulators, water companies, housing developers amongst other stakeholders. We estimate reaching approximately 500-1,000 individuals face-to-face and Social Media reach: Impressions: 15202 Likes:805 Repost: 23 We have commenced the deployment of smart metering for Site 2 and initiated discussions on data management and insights. A slight delay occurred as we explored collaboration with our internal team for the smart metering rollout, aiming to find efficiencies and save resources. We are preparing to publish our economic modelling analysis for Site 2 and the NAV insights report soon. In terms of open data, we are aligning our efforts with the STREAM initiative and working internally to bring this project to fruition. Our engagement in risk mitigation continues to grow, with plans to update regulators post-election. Additionally, we are finalising legal agreements with new project partners, Southern Water and Urban & Civic. Although these negotiations have caused some delays, we are committed to catching up on any lost time and advancing our project objectives efficiently.

Safe Smart Systems

Our solution concept continues to be developed in preparation for testing with operational users in September. Within our innovation area, we expect our first users to be provided enhanced insight on operational performance with the ability to select the optimum

operating regime. Users will also have the capability to implement certain regimes remotely.

Transforming the Energy Balance of Wastewater Treatment

Thames Water plan to commission their anaerobic pilot plant in July/August 2024, following on with testing for organic removal and effluent degassing. This pilot will be a cutting-edge plant and the first of its kind for monitoring and control of anaerobic treatment processes able to operate on whole sewage flow at ambient temperatures in the UK. In the coming months, we will push the technological boundaries of wastewater treatment to transform the energy balance of wastewater treatment in the UK. Dwr Cymru Welsh Water are conducting trials on their anaerobic plant, with monitoring provided by DCWW and also the University of South Wales. These trials have provided valuable information on the control and operation of anaerobic wastewater systems in the UK. The University of South Wales are progressing further and are close to finishing their trials on nutrient removal/recovery methods to support selection of adsorbents and defining main parameters for the nutrient plant design. All of the learnings from the research performed by Dwr Cymru Welsh and the University of South Wales have now been integrated into the plan for the Thames Water Pilot study. We anticipate that in the coming months the UK water industry will start to see the progress we are making on 'Transforming the energy balance of wastewater treatment'. Through our collaborative networks we will disseminate the findings to establish crucial design and operational parameters for the UK.

Triple Carbon Reduction

The Triple Carbon Reduction demonstration plant delivery to site is underway. MABR has been operational since September and different operational conditions are being explored to stabilise the process and prepare it for integration with the electrolyser, which is due for delivery next quarter.

Breakthrough 2 (Catalyst) (2021/2022)

A HERU for Screenings

The Heru 125 is built, and final modifications are being made before the unit is delivered to the Severn Trent Resource and Recovery Centre at Spernal. Commissioning is scheduled for July, and the trial for the pyrolysis of screenings is due to commence by the end of July '24.

Catalysing a NET-ZERO future

A comprehensive review of target organisms has been completed, alongside their mechanisms and attributes towards N₂O reduction, growth rates and availability. Materials Transfer Agreement between Cranfield and Microvi was executed and the process of shipping over biocatalyst to Cranfield for lab testing of two different biocatalysts is completed. The modifications needed on the pilot unit have been implemented and phase three is now completed. Microorganisms that produce less N₂O or consume N₂O have been identified and tested and batch-tested, with lab-scale continuous tests to follow. Simultaneously, the pilot plant is being amended to allow required stages (anoxic, aerobic) to take place and monitoring probes are being selected.

Defusing the nitrate timebomb

A 4R Nitrate tool was developed in 2023 and tested against a simple trial catchment, but this revealed an issue with the underlying MODFLOW software contaminant transport model. There is also an issue with the 4R nitrate model related to run-off from impermeable areas and movement of nitrate in this water. We should be able to fix the later in-house. Unfortunately, lack of modelling resource has also meant that we have not been able to fix either, although we are working hard to complete. Scenario testing will follow, and we are running a short online workshop with project stakeholders to develop and agree these scenarios prior to modelling. The Test and Itchen MODFLOW6 and 4R models have been agreed for use to test the approach with the EA and the main water company sponsors. To calibrate the model we have put together a calibration dataset with timeseries and spatial time slice maps of observed nitrate concentrations in groundwater and surface water across the model area. Porewater profile data has also been collected to calibrate 4R nitrate.

Tap Water Forensics

Phase 2 – Sampling and data generation. For the samples completed genomic sequencing has progressed well. The proposed novel experiment will also assess if controlled contamination representing ingress at various chlorine concentrations and overall contact times can also be detected using genomic sequencing. We are waiting to secure third-party research provider resource for this work.

The Use of Sub-Seasonal Forecasting to Improve Operational Decision Making

The project has successfully reached the end of Phase 2, involving the development of eight water demand models and three wastewater alarm volume models. The Met Office has undertaken a methodical approach following Phase 1 of the project, the data collation

and exploration phase, to build and verify models. The project is currently in its 3rd Phase, that is focusing on the fine tuning of the developed operational services throughout the one-year trial period. Both the water demand and wastewater trial services are live and sending forecast reports to all Partners twice a week. To enhance the understanding and ensure the correct interpretation of the service outputs, the Met Office has developed training material which will be delivered to all Partners at customized one-to-one sessions. The development of the services will continue throughout the one-year trial period.

Unlocking digital twins

We're excited to report that the project is moving forward smoothly. We now have access to detailed location data about the water systems from Thames Water and Severn Trent. Our team has turned this data into formats that our computer models can easily understand. This information has helped us improve our model of Severn Trent's network, and we're making sure the model is flexible enough to work with other systems too. We're building a special tool to help with this, and we'll be sharing it publicly. This tool will make it easier for others to create their own "digital twin" models of water systems. We're on schedule to complete the final stage of the project, which will allow us to create a visual representation of the water network. This visualisation will be easy to use and adapt for different purposes. (Please note: We will be sharing the tool and instructions on how to use it, but the specific data about the water systems will be kept confidential.)

Water Quality As A Service Treatment 2 Tap

Progressing with insights, validation and completion of water quality sensor roll out. All water quality sensors are now receiving data and providing the insights required to validate our operating theories and models. We are also making progress with the resolving connection issues with the high frequency pressure sensors, used to detect leaks and bursts. To that extent, we've identified as issues with lid materials blocking signals and battery installation. Our plans are well underway to be able to answer the question of how we can scale this as an ongoing business model. We will be exploring this via a Sprint with industry experts at the NWG Innovation Festival at Newcastle Racecourse from 8th to 11th July

Breakthrough 2 (Transform) (2021/2022)

CHP exhaust carbon capture and utilisation (CECCU)

The design of the Carbon Capture Machine is substantially complete including CHP interfaces. Most long lead time items are delivered and in storage awaiting construction. The design of the base is currently under review, further surveys and investigations are in procurement, with design assurance ongoing. Trial specification is in development, and we are currently working with a Severn Trent framework contractor for the deployment of the Technology at Derby waste water treatment works.

Enabling Water Smart Communities

This quarter has seen a step change in progress and delivery. We have:

- Updated our governance operating model to ensure the right level of control, reducing the potential for a bottle necks for decision making.
- Developed and implemented technical steering groups for our enabling action projects, allowing faster industry wide challenge and feedback on deliverables, as well as dissemination outside of the immediate project team.
- Kicked off our tranche 1 enabling action projects (looking to deliver innovation to take 10 out of 65 enabling actions needed to support delivery of water smart communities) including onboarding of partners and third parties.
- Undertaken an initial review of the original 65 enabling actions (identified through our discovery phase) and bid outcomes to identify additional areas for development. As a result tranche 2 enabling action workstreams have been identified and are being scoped into projects.
- New engagement plan developed to ensure our Independent Programme Board are kept updated.
- Continuation of academic workstreams completing workshops, interviews and case studies around community engagement and practices with WSC's.
- Set up the monitoring and evaluation workstream to review and monitor project outputs against bid outcomes.
- Developed a Transition Strategy looking to ensure longevity of the project outcomes beyond its end date.

The above information is project updates we are happy to share externally, however please can you clarify if this is supposed to be more of a external communication that needs to be self explanatory. I.e. we will need to ensure the wording is understandable to anyone that picks it up and not full of project jargon.

Managing background leakage

Managing Background Leakage is advancing from Phase B to Phase C. Phase B showed a lot of variation in the amount of background leakage on water company assets (mains and communication pipes) and customer side (losses from underground supply pipes and internal plumbing) in different DMAs, from zero in DMA netA2 to 89.1% in DMA netD1, of the Minimum Night Flow level (computed as an average over the time of the field work). Ten DMA's was a small data set and it is difficult to draw any reliable conclusions. For this reason, during Phase C the field work will be carried out in 15 DMAs, and the rolling average leakage values will be observed to see whether there are any trends to note. Phase C will also try new methods of estimating customer night consumption in order to provide a more reliable estimate of total loss in a DMA. Phase B has indicated that even with the goal of deploying Stop.Watch loggers to every service connection there are practical issues that stop us from achieving 100% coverage. Therefore, some degree of data infilling is needed. In Phase C we will examine different methods using a scaled back level of logging along with other methods to find a practical and economic method for future surveys on completion of the current project.

National Leakage Research and Test Centre (NLRTC)

We are now embarking on the detailed design phase of the project with our project partners. This includes developing the centre specification into a design we can use for the purpose of tendering the construction. We are also engaging with the local authority to discuss planning permission.

Breakthrough 3 (Catalyst) (2022/2023)

Artificial Intelligence for Algal Monitoring

We are actively receiving monthly water samples from four distinct water companies, each contributing samples from different reservoirs. Occasionally, we received samples from two other companies. To date, we have gathered a total of 682 samples. These samples are being utilized to construct a dataset aimed to train our model. Currently, this dataset comprises 11,937 image files, predominantly from winter samples. Since starting the project, I have produced a full draft of chapter 1 for my thesis. I have also been on a lab visit to Wessex Water, along with Sonia (the project research technician), to understand how samples are processed, how algal data is stored, and how the project produced model could be effectively utilised. Additionally, I have had meetings with Anglian Water about the model as well as discussions about notable community changes within their

catchment. This led to discussions about the benefits of predictive modelling from the dataset produced by the project. I am currently testing different CNNs in order to learn more about model architectures/structures and the subsequent influences on the accuracy for image classification. This work will also go towards a review of current CNNs and applications for microalgal classification and enumeration.

Dark Fibre 2

Building upon the success of Dark Fibre 1, our current project aims to address the remaining challenges, demonstrate scalability, and instill industry confidence. As we conclude the planning and design phase, we are poised to enter the pilot installation stage. All trial locations have been confirmed, and Focus Sensors is diligently assessing costs related to ordering the fibre circuits. Concurrently, site visits are underway to evaluate internet connectivity at the designated Indus unit locations. Collaboratively, Focus Sensors and Sicom have engaged with fibre providers to ensure comprehensive coverage across rural, urban, and strategic trunk routes connecting population centres.

Hydro Powered Smart Meter

We have moved from the Discovery phase into the Alpha prototype phase. We evaluated all 4 of the concepts within the Discovery phase, and we held an in person workshop in which we have evaluated and rationalized the 4 concepts, reducing these to 2 concepts to move forward with within the Alpha prototype phase.

Universal Access Point for Water (UAP4W)

No update provided.

Using science and nature to end sewer misery

Following an April 2024 kick-off, we are progressing well against the agreed milestones and deliverables. The project team have worked to create a second-level plan which all project partners are working collaboratively to progress. We are in the process of determining the appropriate lab tests to quickly test various formulations of the product and determine an optimum formulation for field tests. We are currently developing both the GEL and Spray In Place, as two product options. Once we have determined optimum formulations and application methods, we can begin to test these in both a lab test rig for short-term efficacy, and a field test rig for long-term efficacy.

Water efficiency in faith and diverse communities

We are still in the implementation of campaigns phase. We have received positive feedback on our first behaviour change campaign linked to faith called "reviving the sunnah" launched in March 2024. In addition, we have recently procured a "wudu" water

saving device which will be testing for the first time. We also are making good progress in developing the second behavior change campaign linked to culture driven by key "influencers" focused on cooking practices related to rice washing and re-use of starchy water which we plan to launch in late July. The campaign period will continue until September. We are also planning to hold a Young innovators panel workshop in July linking water use practices connected to faith and culture and find new ways to save water in the communities. We will be able to share more in the next quarterly update.

Water industry printfrastructure (WIP)

The WIP project is on schedule with the agreed plan. In the past quarter we have successfully completed the demonstration of both the concrete and polymer printing systems and are ready to progress with the testing of printed assets, carbon assessments and our commercialisation studies. Over seventy visitors attended our concrete printing demonstration at Wigan WwTW from organisations including Scottish Water, Sellafield, Anglian Water and Ofwat. Many more joined the online sessions provided during the two weeks of printing. More information can be found via the following LinkedIn articles:

- [United Utilities](#)
- [Changemaker3D](#)
- [Scottish Water](#)

Water Literacy

The Water Literacy Programme is making great progress. The programme is on track in relation to the project plan with delivery of the regional pilot planned for August 2024. The Creative agency is currently underway with pulling all the detail together and the pilot will be commencing in the next quarter. We have now signed off the Water Literacy brand concept which has brought the programme to life with the tone, narrative, look and feel.

Water Net Gain

WNG conducted four stakeholder engagement workshops with sellers (farmers and landowners) and buyers (water industry). This will shape the contract and trading mechanism development in the next phase. The project will also start the developing the pond design, looking at physical pond design as well as technological features.

Breakthrough 3 (Transform) (2022/2023)

Biopolymers in the circular economy (BICE)

The BICE project is delivering to the agreed schedule. In the past quarter we have focused on the design of our biopolymer extraction systems and how they will be implemented at the Blackburn site. Teams from RHDHV and Cellvation have visited site with United Utilities Engineers to gain a more detailed understanding of site restrictions and how power, water and wastewater can be provided to the individual systems. We have also started discussions with advisory member organisations (those that have agreed to help us with information but not provide funding into the project) regarding the analysis requirements and characteristics they would expect from biopolymers supplied into their production processes. We have discussed opportunities with both Hempel (Crown Paints) and Unilever as a means of gauging how best to enter these biopolymer markets. As a means of understanding the levels of characterisation analysis required to achieve our desired project outcomes we have completed a workshop on "the history of biopolymers" during which a wide range of organisations gathered to discuss the work they have completed to date. Discussions within the workshop have led to the development of a list of analysis targeting specific markets and also helping us start to develop our strategies for end of waste status.

Designer Liner 2

The Designer Liner project will deliver a lining solution fit for a 21st century potable network. The project partners have discussed and agreed on the project requirements which have been further quantified. NCC and BCI are underway with down-selecting the materials and lining processes for initial screening.

Mainstreaming nature-based solutions to deliver greater value

Mainstreaming Nature-Based Solutions (MNbS) is a collaborative partnership working to overcome barriers to the adoption of NbS at a landscape scale. We are currently in the first phase of work which involves identifying, verifying, and prioritising barriers preventing scale and actions to address them and we are on track for successful delivery. The scope, objectives, and plan for each workstream has been agreed and initial evidence gathering has begun to understand the current state of the NbS landscape. The headline objectives for each workstream are:

- Understand how to form and sustain collaborative partnerships to mainstream NbS.
- Develop a Total Value Framework and guidelines to appropriately value NbS in the decision-making process.
- Enable NbS through evidence-based changes to policy and regulation.

- Understand the investment models that enable NbS to thrive.
- Increase efficiency and reduce transaction costs for collaboration, funding, planning, designing, implementing, and maintaining NbS.

Alongside workstream activity we are engaging regional stakeholders to understand local contexts and priorities. We are also developing a Theory of Change, decision-making framework, and stakeholder engagement strategy, including communications and branding. Our next key milestone is completion of a briefing note on the current state of the NbS landscape at the end of September 2024.

Net Zero Hub

Construction has continued at pace throughout the last quarter. Commissioning activities are in progress, as per the planned sequence. Actilayer technology is now installed on ASP 3 (complete with UV lighting) and on ASP 4, and now enters a performance testing phase. The impact will be measured through the emissions monitoring plan. Training and handover discussions for operational teams is underway, as well as the development of the design manual for the retrofitting of these technologies.

Stream 2: Unlocking Innovation through Open Data

We have been preparing for and releasing our Day-1 version of Stream – the enduring open data platform for all things water data. We've used all the feedback and information we have learned from the MVP and beyond to go live on schedule in April, with new functionality and new datasets. Our progress is being managed around 4 key themes: Technology, Use Case & Data sets, Eco System and Process

Breakthrough 4 (2023/2024)

Breakthrough 4 projects are currently in the process of being set up. Quarterly updates will be available once projects have started.