

Case study  
#13  
January 2025

ResilienTogether is a Defra-funded project that aims to build a Smart Catchment to enhance flood resilience. Our Innovation Case Studies showcase new and creative approaches to building a smarter, more resilient catchment.

## SuDS attenuation monitoring

Installation of a gauging station on an attenuation pond outlet.

Figure 1 & 2. (Right) Portable gauging station installed by RDN



### ResilienTogether

ResilienTogether is creating a Smart Catchment, through use of innovative technologies and techniques, to reduce flood risk to people and places, enhance the water environment in the Pix Brook catchment and improve community resilience in the face of climate change.

The project is achieving this through a close-knit partnership that collaborate to deliver six inter-related work packages. This case study comes from the Flow Monitoring Work Package which aims to enhance the flow monitoring and telemetry network to improve understanding of flows within the catchment and establish near real-time flow monitoring.

### Challenge

The Fairfield Attenuation Pond retains overland flow from a neighbouring housing developing before flowing into the Pix Brook. ResilienTogether is seeking to understand if flood risk and water quality benefit could be gained through installation of an automated smart SuDS device. However, there is limited understanding of how the pond currently influences catchment flows.

In research literature, there has also been limited investigation into the impact and effectiveness of SuDS, including attenuation ponds. There is limited real-world research on the hydrological benefits of SuDS and the long-term benefits and performance of SuDS. Without a theoretical or a practical understanding of how the pond influences flow, safe installation of an automated smart SuDS device cannot be achieved.

Further to this, another development is being built in Fairfield. If the selected SuDS features are not installed correctly, the development could increase surface water flows. A better understanding on the efficacy of local installation of attenuation ponds is needed to understand the true impact of such development on flood risk.

### Innovative Solution

In March 2024, a portable gauging station was retrofitted on the Fairfield Attenuation Pond outlet to provide data on level of water retention over time. Using the level data and the integrated v-notch weir as a fixed parameter, calculations were made to derive the discharge flow rate.

This flow data is being used to understand how the Fairfield Attenuation Pond operates and contributes to flows. This learning will help inform the suitability of installing a smart SuDS device.

The data can also be utilised for research purposes to investigate gaps in knowledge around the effectiveness and benefits of attenuation ponds. Other available data to researchers includes upstream and downstream river level data, pond dimensions, outfall arrangements and the impermeable area served.

### Benefits

#### 1. Understanding SuDS contribution to the catchment

By measuring flow, ResilienTogether can understand how the attenuation pond contributes to flows in the catchment.

#### 2. Toward reducing flood risk

Improving the management of the SuDS feature and installation of smart SuDS devices can help us understand the influence of the attenuation pond on flow and allow us to reduce flood risk downstream.

#### 3. Building the evidence base

Through collection of data, ResilienTogether can contribute to wider international research around the operation, effectiveness and benefits of attenuation ponds.

The following research gaps have been identified by ResilienTogether and should be investigated.

## Catchment specific research topics

### Evaluating the Impact of the Fairfield Attenuation Pond on Pix Brook Catchment Dynamics:

This research aims to investigate how the Fairfield attenuation pond influences the hydrological behaviour of the Pix Brook catchment, and the River Ivel that it feeds. The focus will be on understanding how the pond (and its control devices) alters key catchment dynamics. This includes flow input into the watercourse, rainfall retention time and lag, and relationship to peak flows. It is also worth noting any potential increase in risk at downstream 'pinch points' such as culvert and structure inlets, canonised or engineered reaches of watercourse. As well as, how other downstream outfalls/inputs of surface water flow from development and Waste Water Recycling Centre's act in concert to affect catchment flow.

### A Literature Review of Market-Available Technologies for Monitoring and Automated Operation of Attenuation Ponds:

This literature review will focus on identifying and evaluating current and emerging technologies that can transform traditional attenuation ponds and their control devices into smart SuDS systems. Monitoring technologies and automated operation will be investigated, and the benefits in terms of lifetime costs on maintenance and asset performance. Planting and innovation in landscaping techniques may also be considered smart, as may smart/telemetry-based interventions that could be delivered off-site at critical points in the receiving watercourse network to influence the ponds behaviour and performance.



Figure 3. Fairfield Attenuation Pond

## General research topics

### Real-World Hydrological Performance:

The hydrological benefits of SuDS, including attenuation ponds, are often modelled under idealised conditions. However, real-world variables such as unexpected rainfall patterns, soil compaction, and incomplete infiltration lead to discrepancies between modelled (theoretical) and actual performance. There is a need for more research on how ponds, and permitted discharge rates and control arrangements, perform under extreme weather events or varying climate conditions to better reflect their practical utility in flood risk management.

### Long-Term Performance vs. Design Expectations:

While the theoretical benefits of SuDS attenuation ponds (e.g., stormwater attenuation, water quality improvement, biodiversity enhancement) are well-documented, there is a lack of long-term studies that assess how these systems perform in practice over extended periods, and the precise nature of the impacts of controlled flow on the downstream network over time and in a range of rainfall events. Many existing studies focus on short-term benefits, but the real-world efficiency of attenuation ponds can diminish due to sediment build-up, maintenance neglect, and ecological changes over time.

## Toby Jones



*"Monitoring the performance of attenuation SuDS in developments is crucial for verifying their effectiveness in managing stormwater and mitigating flood risk.*

*"With surface water flow becoming an increasing risk, we need to understand how our infrastructure is actually performing once installed."*

## Use Our Learning

We encourage and offer our learning to be adapted and used across the country by Lead Local Flood Authorities and other organisations who are seeking to monitor and understand the effects of sustainable drainage.

If you want to hear more, please contact [ResilienTogether.project@Centralbedfordshire.gov.uk](mailto:ResilienTogether.project@Centralbedfordshire.gov.uk) or visit our website <https://resilientogether.org.uk/>