

Tim Fletcher, Matthew Burns, Hugh Duncan, Geoff Vietz, Mike Sammonds, Jasper Kunapo, Marion Urrutiaguier, Heather Graham & Jérémie Bonneau.

This project will aim to develop objectives for hydrology from the scale of individual sites (e.g. an allotment or a stormwater control measure) through to the whole-of-catchment scale.

Outcomes for waterway management: Tools and frameworks to assist policy development and implementation around managing flow regimes in Melbourne's waterways

Details: Hydrology is a primary driver of waterway health, influencing water quality, physical channel form, habitat availability and flooding. Many of Melbourne Water's activities depend on a strong understanding of the hydrology of streams and how important aspects of flow regimes can be managed to protect environmental values, the community from flooding, and public assets from damage. This project aims to deliver an integrated suite of research to help Melbourne Water to protect and restore flow regimes to support healthy streams. The research is based on three underpinning research questions (see Figure 1):

1. **What should the flow regime look like in a given stream?** Being able to estimate the natural (pre-development) flow of a given stream is fundamental to managing the health of that waterway, however, there are many situations where this is extremely difficult.
2. **How can we best manage flows in the urban context?** Managing the flow regime in the urban context is extremely difficult, both for low flows and for high flows. Primarily among the challenges is the extrapolation of site-scale outcomes to the catchment-scale, such as peak flow response and the fate of infiltrated water.
3. **What is the ecological response to alternative flow regimes?** We know from studies that a natural flow regime is the most likely to deliver a healthy stream and that a highly modified flow regime will be very unlikely to support a healthy stream. What we do not know – and yet which is so vital to our management efforts – is how far we might be able to deviate from natural and yet still support a healthy stream ecosystem.

The ultimate aim of the project is to develop a framework for protecting and restoring flow regimes that will support healthy stream ecosystems. This framework will allow us to predict the optimal scales and arrangements of SCMs. The framework will outline how to model SCMs in a way that takes into account their location in the catchment. For example, a rainwater tank high in the catchment that overflows to the local stormwater network that then connects to a larger waterway downstream. There is a delay in the time taken for the tank overflow to reach the waterway and this has implications for attempts to mimic natural flow regimes. The framework will describe how to best take into account such flow timing.

With the framework developed, we will use modelling to identify the optimal scales and arrangements of SCMs. This work will be validated against the empirical data analysis describe above. We will answer important questions, such as: 1) where in the catchment should we place small-scale rain-gardens and 2) should we build few large-scale SCMs vs. many small-scale SCMs? The framework will discuss the advantages/disadvantages of different modelling techniques (e.g. using MUSIC, SOURCE, custom models, etc.). In answering important questions about scale, we will provide recommendations for

SCM placement and design in greenfield and retrofit situations, to inform policy instruments such as Regional Plans and Precinct Structure Plans.



