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OPTiMA
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THE UNIVERSITY OF MELBOURNE

Optimising long term river water quality monitoring

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Understanding how river water quality changes over space and time and identifying the drivers behind these changes is a key component of managing waterways and conserving the biodiversity that rivers support[1]. However the interpretation of river water quality data is challenged by infrequent sample collection and sparse spatial coverage of sampling sites[2]. We aim to develop methods to optimise the collection and interpretation of long-term river water quality data, with a focus on the waterways managed by our partner organisation Melbourne Water.

Research questions

Three key research questions have been identified:

1. How can the spatial and temporal structure of long-term monitoring programs be optimised, balancing the competing needs of different water quality parameters and analysis types?
2. How can water quality be reliably predicted at locations and times where sample data is unavailable?
3. What are the key drivers of long-term water quality? Can this knowledge be used to improve future monitoring programs and direct management interventions aimed at maintaining water quality?

Together these questions will provide the understanding required to improve analysis of the existing historical dataset and optimise the collection of future monitoring data within practical delivery constraints.

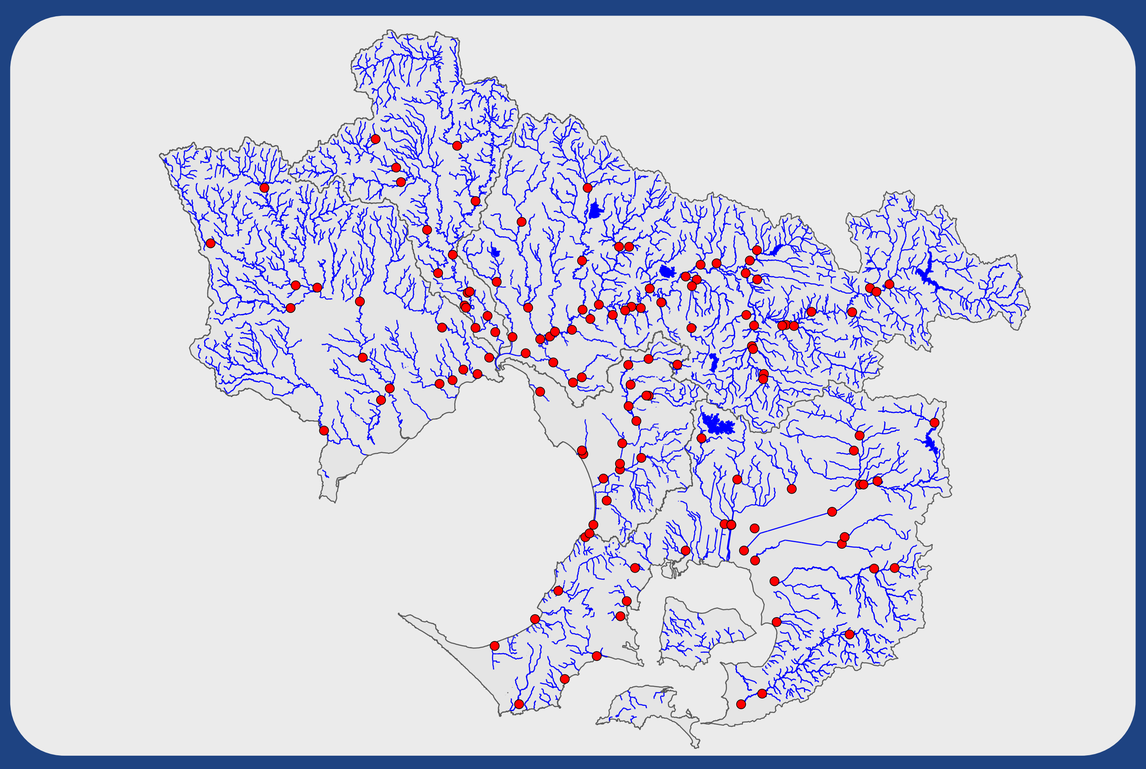

Figure 1: The stream network (blue lines) of the Melbourne Region (Port Phillip and Westernport catchments) with long-term waterway sampling locations (red circles). There are 134 sites to cover a stream network 25,000 km in length.

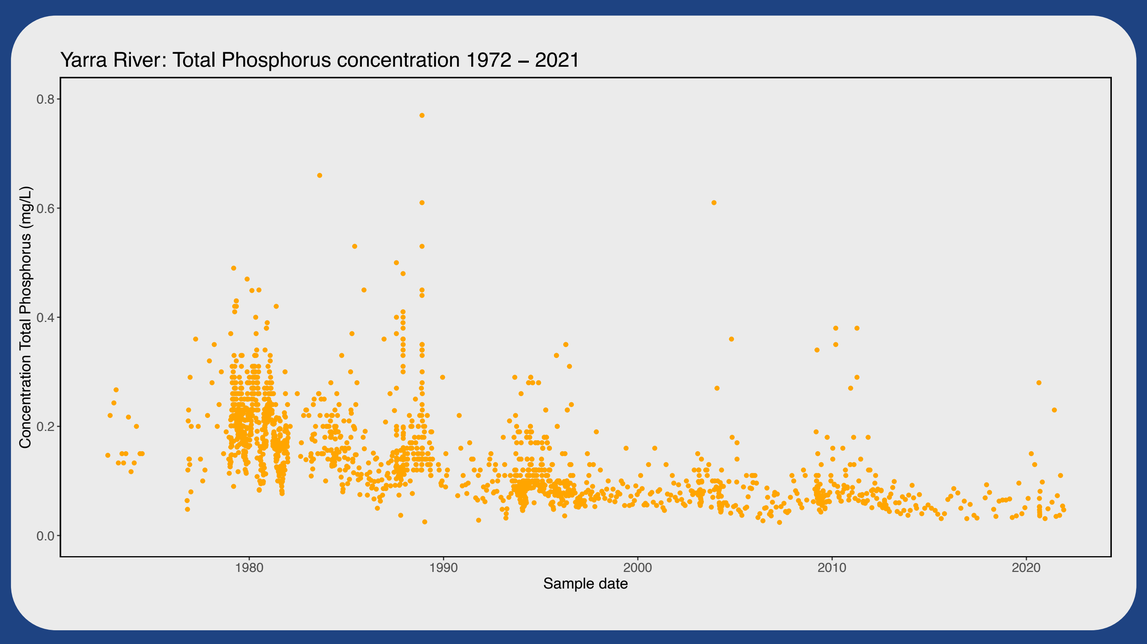

Figure 2: A typical timeseries of concentration data collected from a long-term waterway water quality monitoring network. Features shown here typical of such data sets include high variability, outliers, irregularities in sampling frequency and apparent trends over time

Project methodology

The project will involve the development and interrogation of spatio-temporal models that relate water quality parameters to key drivers such as flow, land use and geology. Different model types such as geostatistics (kriging), generalised linear models and neural networks will be assessed. The leading models will be used to assess the relative influence of covariates to identify key influences on water quality parameters. This knowledge will be used to extend existing data sets for the prediction of water quality "at any place, at any time."

Melbourne Water
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FOR FURTHER INFORMATION
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2. Myers, D. N., Ludtke, A. S., 2017, Progress and Lessons Learned from Water-Quality Monitoring Networks, in: Chemistry and Water: The Science Behind Sustaining the World's Most Crucial Resource (S. Ahuja, ed.), pp. 23-120.

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