

# Project Twin Streams: Water Quality

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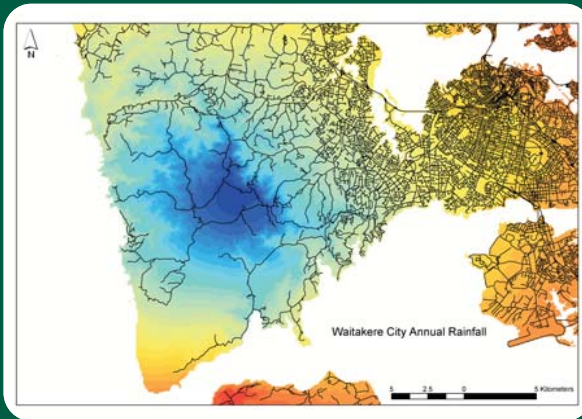
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## DATA REVIEW

The Project Twin Streams catchment contains the Oratia and Opanuku streams and is located in Waitakere City, Auckland, NZ. A comprehensive investigation of hydrology and hydrochemistry developed a conceptual understanding of the catchment that supported model-builds.



Average annual rainfall in the Waitakere City (1950 to 1980)



## AIM

Investigate water quality in the Oratia and Opanuku streams using numerical methods.

## TASKS

Develop hydrological and hydrochemical models:

- Review pertinent data
- Map impervious surfaces
- Perform calibration

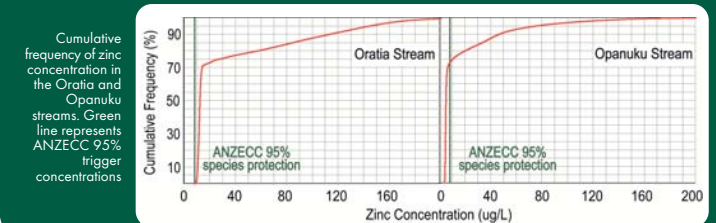
Estimate concentration and load of the contaminants:

- Total suspended solids (TSS), total nitrogen (TN), total phosphorus (TP), total copper (Cu), total zinc (Zn).

## RESULTS

Peak flow was 33% larger in the Oratia as a result of its more urban nature. The concentration in the baseflow influenced the frequency of compliance to environmental guidelines for TSS and TP, which were similar to healthy-ecosystem values. TSS was consistently elevated during low flows in the Oratia while the maximum TSS was highest in the Opanuku. These results suggest that the source of TSS was limited in the more urbanised Oratia. The difference in the transport mechanisms and flow volumes averaged out and the catchments transported a similar annual TSS load. TN conformed to guideline concentrations for the majority of the time.

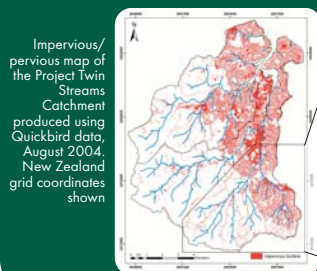
The Zn concentration in the Opanuku complied to guideline concentrations 72% of the time while in the Oratia it exceeded guidelines. The Oratia transported twice as much Zn (2000 kg/yr) as the Opanuku.



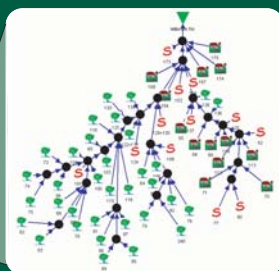
## DATA MODELLING

Data were manipulated to describe impervious surfaces (Ikonos), stream reaches, land uses, catchment boundaries, rainfall, evapotranspiration, discharge and water quality.

The software MUSIC was used to simulate the hydrology and hydrochemistry of the Oratia and Opanuku streams.



Impervious/pervious map of the Project Twin Streams Catchment produced using Quickbird data, August 2004, New Zealand grid coordinates shown



Node structure of the Oratia hydrological and hydrochemical model



**Landcare Research**  
**Manaaki Whenua**

## CONCLUSIONS

TSS and nutrients conformed to healthy ecosystem guideline concentrations in both streams, as did Zn in the Opanuku. Zn exceeded guideline concentrations in the Oratia most of the time.

The large amount of metals transported by the streams highlights the necessity of the Waitakere City Council's efforts to reduce the concentrations and load of metal contaminants in urban stormwater. Further monitoring should be done as part of a long-term, outcome-focused management strategy to ensure the usefulness of future studies and their data. Models are now being used to test the impact of various stormwater management strategies and macro-invertebrate data are being collated as a step towards integrating the modelling of water quality and ecology.



Stenoperla stonefly are an indicator of good water & habitat quality. They are found in the headwaters of the Project Twin Streams catchments.