Investigation of $\delta^{18}\text{O}$ and $\delta^2\text{H}$ in the Namoi River catchment - surface water/groundwater interactions

Martin S Andersen¹, Karina Meredith², Wendy Timms¹, R Ian Acworth¹

1 School of Civil and Environmental Engineering, UNSW, Sydney, Australia
2 ANSTO, Institute for Environmental Research, NSW, Australia

OBJECTIVE
To use naturally occurring stable water isotopes ($\delta^{18}\text{O}$ and $\delta^2\text{H}$) to understand river aquifer exchange.

METHOD
Rainfall, surface water and groundwater samples were collected in the Namoi Valley (Fig. 1) for $\delta^{18}\text{O}$ and $\delta^2\text{H}$ analysis at various times between 1998 and 2007. At one site along the Namoi River two multilevel observation wells were installed near a groundwater abstraction bore to study the effects of abstraction near the river. All water samples were sent to CSIRO Land and Water in Adelaide, SA for analysis by Isotope Ratio Mass Spectrometry (IRMS). Reported precision of the isotope ratios was 0.15‰ VSMOW for $\delta^{18}\text{O}$ and 1.0‰ VSMOW for $\delta^2\text{H}$.

RESULTS
The rainfall samples defines the Local Meteoric Water Line (LMWL - Fig. 2) which is only marginal above the World Meteoric Water Line (WMWL). Most of the groundwater samples are grouped in a dense cluster along this line indicating a rainwater source. The relative depleted nature of the groundwater samples indicate the regional recharge is mainly from heavy depleted rainfall events. In contrast, surface waters, particularly from the Namoi River, plot along the Local Evaporation Line (LEL - Fig. 2) due to substantial evaporative fractionation.

CONCLUSION
This field study demonstrates that $\delta^{18}\text{O}$ and $\delta^2\text{H}$ measurements of surface water and groundwater samples are valuable for understanding hydrological processes such as recharge and river aquifer interactions within semi-arid catchments.

FUNDING
Cotton Catchment Communities CRC

MORE INFORMATION
Martin S Andersen: m.andersen@wrl.unsw.edu.au
School of Civil & Environmental Engineering
UNSW SYDNEY 2052 Australia
http://www.connectedwaters.unsw.edu.au