



## The Complexities of Surface and Groundwater Interactions

**Speaker:** **Dr Hugh Middlemis, Senior Principal, Aquaterra**

The complexity of surface and groundwater interaction has traditionally resulted in an approach based on simplifying assumptions. Engineers have usually taken a "top down" approach of concentrating on the surface processes, which involve fast hydrologic response times, and not analysing the slower sub-surface processes in much detail. Hydrogeologists have usually taken a "bottom up" approach, which simplifies the surface water process and concentrates on dealing with the longer term sub-surface processes. Neither approach is ideal.

How long will we persist with this highly limited approach? How long before we start to develop fully integrated predictive tools?

For example, the modelling that has been undertaken to date for the Murray-Darling Basin Plan is largely empirical and piecemeal. It relies on 35 different surface and groundwater models, with groundwater-stream linkages invoked in a quite superficial and iterative rather than integrated way. The surface water models in particular are essentially of the same type, and are basically water accounting tools with a high degree of empirical conceptualisation of key catchment processes. The groundwater models have a more hydraulic character, but still represent surface water processes in a very simple way. In order to build up a picture of the entire water balance in the Basin, it has been necessary to manually exchange flows between the different surface models as well as make an independent assessment of the surface water recharge to the groundwater models and baseflows from groundwater systems to rivers and streams. Closing the water balance is therefore difficult and uncertain due to the need to estimate important processes such as recharge and baseflows.

Technology and data has now improved to the extent that we can consider taking a fully integrated approach that represents the full-cycle of hydrological processes, along with related hydraulics, operational rules and empirical learnings. This presentation provides a simple framework for conceptualising the key surface water and groundwater interactions, explores some of the issues and implications of current practice, and presents some examples of recent successes where interactions have been represented in detail.

### Speaker Biography:

Hugh Middlemis is Senior Principal at Aquaterra's Adelaide office, responsible for leadership in groundwater modelling. Hugh is a civil engineer with a masters degree in hydrology and hydrogeology. He is one of Australia's leading groundwater modelling specialists, with more than 20 years international experience in the field, including recent experience on the Tasmanian Sustainable Yields project, and developing flow and solute transport models for several highly developed catchments in south-eastern Australia that have survived the rigours of independent review. Hugh is principal author of the MDBC Groundwater Flow Modelling Guidelines, and was awarded a Churchill Fellowship in 2004 to benchmark them against international best practice.

**Tuesday 22<sup>nd</sup> March 2011**

**Time:** 5:30pm for 6:00pm

Drinks & nibbles from 5:30pm

**Venue:** Engineers Australia Auditorium  
Ground Floor  
8 Thomas St, CHATSWOOD

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