

## About Schlumberger Water Services

We offer innovative groundwater solutions through professional expertise to meet the advancing technological requirements of today's professionals.

Schlumberger's Water Services division specializes in assessing, developing, and managing groundwater resources using some of the finest, advanced and cost-effective technologies available today.

Whether you're looking for field-scale data collection, data management, modeling, or resource decision-making solutions, our teams of specialists are here to help you address all your groundwater projects safely and efficiently.

## Applied Technologies:

- Real-time TD-Diver\*
- TD and CTD-Divers\*
- Ultra low-power GSM telemetry system
- HydroManager\*
- Real-time Flowmeters
- Automatic data collection system

## Real-time Groundwater Monitoring Investigation

Perth, Australia



Suspending Divers into wells for continuous monitoring.

### Highlights:

- Real-time groundwater monitoring system developed and deployed to monitor and manage water resources
- Diver dataloggers used to automatically register groundwater levels and temperature
- Data obtained from real-time flow meters, TD and CTD-Divers transmitted to the HydroManager data management system
- Collected well data can be used to create 3D numerical models to observe groundwater flow patterns and over time capture seasonal variations

### Background

60% of Perth's drinking water is supplied by the Gngangara Mound. This water reserve also supports a peri-urban horticultural industry and provides water for use in private and public parks and gardens. Dry weather conditions and limited rainfall are putting pressure on its reserves, which has raised concerns in the community regarding the level of water use and water management practices.

Schlumberger Water Services, in partnership with the Department of Water and CSIRO, are currently working with the local community on a real-time monitoring system that will acquire groundwater level and groundwater quality measurements so that strategic water resource management decisions can be made.

### Challenges

In an effort to understand the area's limited groundwater resources and make more informed water management decisions the following questions need to be addressed:

- 1) How much water is being used now and throughout the various seasons?
- 2) Who are the primary users?
- 3) Should water-use restrictions be implemented? When? Who is affected?
- 4) Is water quality affected by over-use (saltwater intrusion)?
- 5) Does the current level of abstraction have an affect on groundwater-dependent ecosystems?

Addressing such questions poses a real challenge for stakeholders. The real-time monitoring system will reduce this uncertainty and make the required data available for decision-makers to better manage water resources in the Gngangara area.

# Case Study: Real-time Groundwater Monitoring Investigation

## Solution

A real-time monitoring system was implemented by the project team to continuously acquire, transmit and process groundwater level and quality data. Through the investigation it was determined the real-time monitoring system should include the following components:

- Real-time flow meters
- Real-time TD-Diver
- TD and CTD-Divers
- GSM telemetry system
- Automatic data collection system
- HydroManager

## Flow Meters

Real-time flow meters are designed to measure the volume of water abstracted on a continuous basis at intermittent levels - in this case, every hour. Flow meters were installed on abstraction bores adjacent to five monitoring wells, on five horticultural properties.

## Water Level Monitoring

Groundwater levels, temperature and conductivity measurements were obtained by TD and CTD-Divers placed in the catchment area. These probes continuously take intermittent measurements from the monitoring wells. The data is routinely downloaded by connecting a laptop to a direct read cable at the wellhead. This data will be useful to monitor the long term trends of water-use and can be used to identify the intrusion of seawater. A real-time TD-Diver was ten deployed at a monitoring well to provide an hourly read of water level measurements.

The ultra-low power GSM telemetry system put in place enables the collection of data from Divers without requiring any equipment at the surface of the well.

## Data Management

Once the data was obtained from the real-time flow meters, TD and CTD-Divers it was transmitted to the HydroManager data management system.

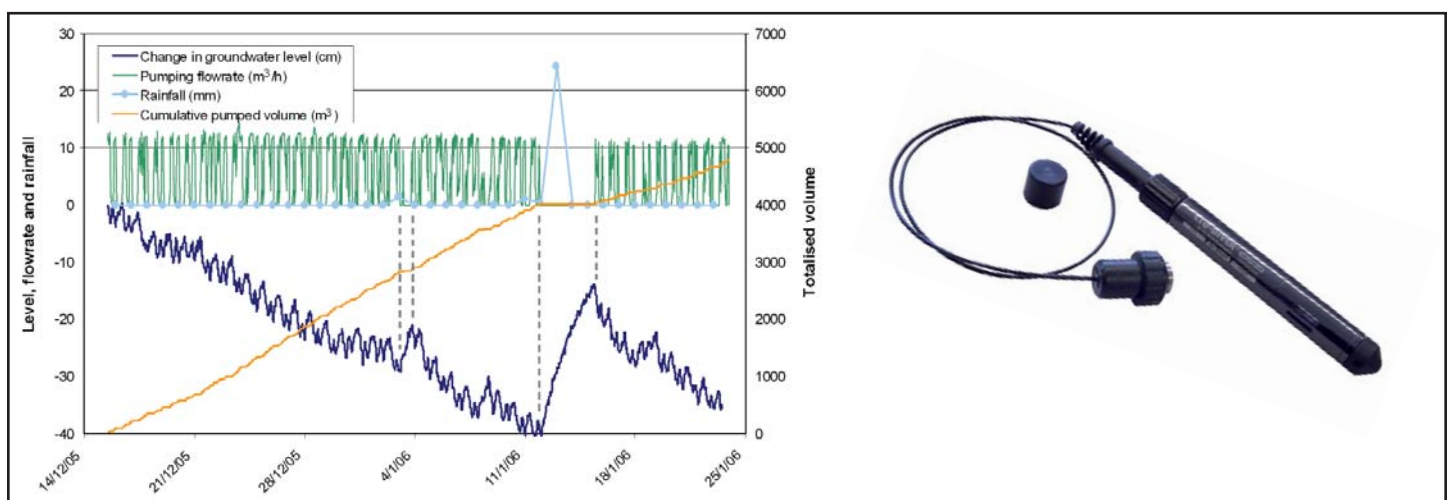
HydroManager is a web-based information management system that provides centralized and secure access to water resource data. It also provides a firm foundation for historical and current data collection and storage. Users have the ability to access and share data remotely, while also tracking the project in real-time for accurate and up-to-date project management.

## 3D Numerical Modeling

From the well data collected, 3D numerical models can be created to observe groundwater flow patterns and over time can capture seasonal variations and additional measurements. These additional measurements will improve the understanding of the hydrogeologic conditions of the area and enable water conservation decisions to be made with certainty.

## Results

The Gngarara Mound real-time monitoring project will enable the quantification of groundwater usage, localized impacts of abstraction and water use patterns. The information collected will also be used to identify and develop seasonal water conservation strategies.



Divers were deployed as part of the the real-time monitoring system to obtain the substantial water level and water quality data needed to better manage resources.