In-Situ Inc.
Innovations in Water Monitoring
Application Note

Southern California Meets Water Demands and Controls Saltwater Intrusion

Groundwater recharge program uses Level TROLL® 500 Instruments to monitor project efficiency

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Application

Due to increasing water demands, decreasing supplies of imported water, and recurring drought conditions, state and local governments are expanding or developing groundwater replenishment or recharge systems. These systems divert highly treated wastewater, which is typically discharged into the ocean or local surface waters, into natural storage areas. The reclaimed waters, once purified, are injected into seawater intrusion barriers, piped to recharge areas, or discharged to surface waters and eventually diverted to groundwater basins. Water management agencies aim to meet future water demands, protect against droughts, and preserve high-quality groundwater through innovative, cost-effective, and environmentally sensitive basin management practices for the benefit of residents and businesses.

Managing growing water demand

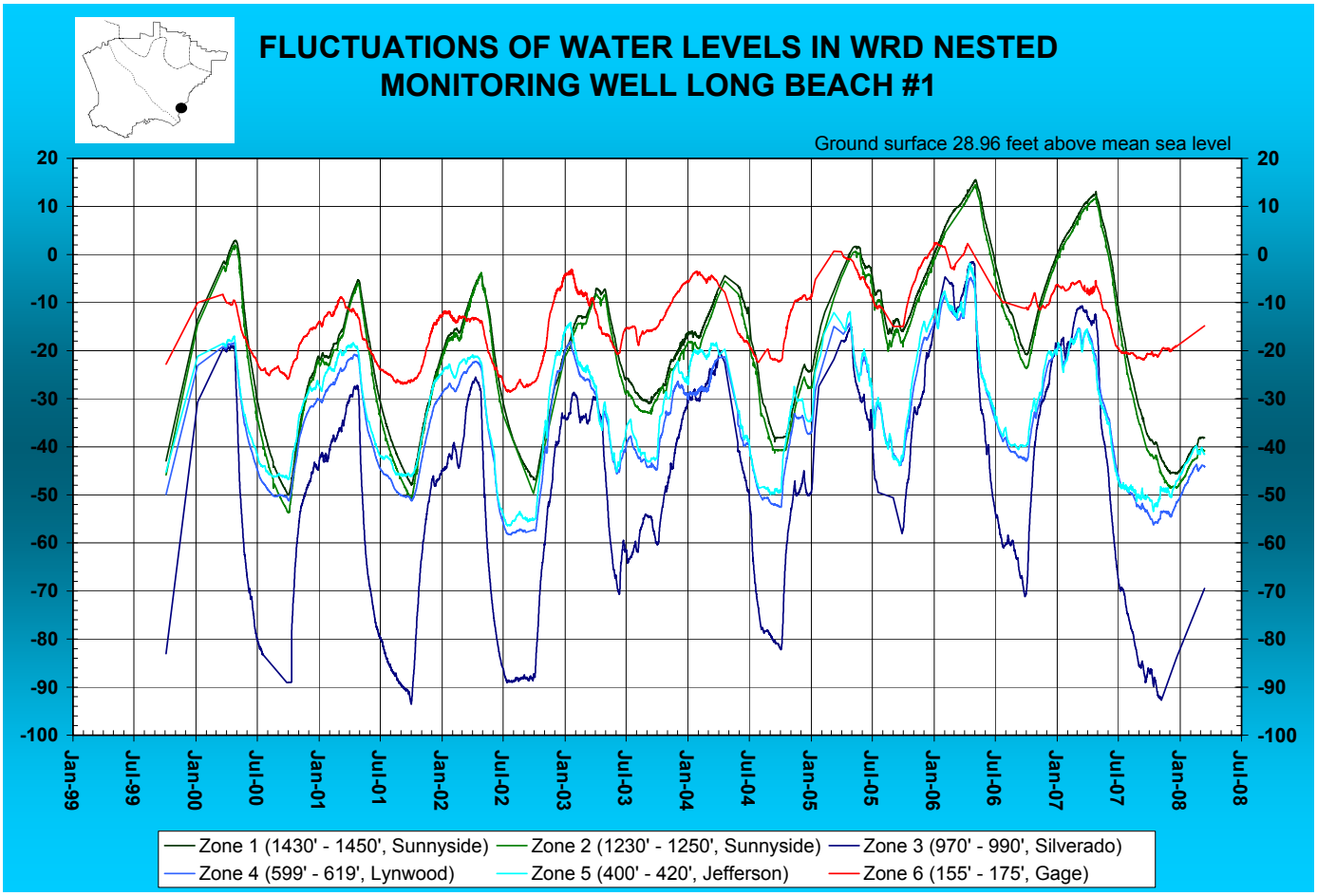
California is home to numerous groundwater recharge projects. Other states have implemented similar projects to supplement water supplies including Arizona, Georgia, Nevada, Texas, Florida, and Virginia. The existing and future limitations of water resources in Southern California have prompted more efficient management of water supplies in the Central and West Coast Basins (CWCB).

As the regional groundwater management agency for two of the most used groundwater basins in the State of California, the Water Replenishment District (WRD) plays an integral role in overall water resource management in southern Los Angeles County. As the population of the region continues to increase, it becomes even more important to maximize the use

WRD's MF/RO/UV Recycled Water Treatment Plant for Saltwater Barrier Well Injection

of both imported and recycled or local water sources available to the WRD. The potential for drought and uncertain availability of imported supplies mean that this resource has become increasingly needed as a replenishment source.

The WRD manages groundwater for nearly four million residents in 43 cities of southern Los Angeles County. The 420-square-mile (1,088 km^2) service area uses about 250,000 acre-feet (308,370,500 m^3)



of groundwater per year, which equates to nearly 40 percent of the total demand for water. The WRD ensures that a reliable supply of high-quality groundwater is available through its clean water projects, water supply programs, and effective management principles.

WRD purchases water for artificial recharge to the CWCB. Natural recharge occurs but is insufficient to maintain groundwater levels at current adjudicated groundwater pumping rates. Artificial recharge occurs by spreading, by allowing percolation in forebay recharge basins, and by injecting recycled water into seawater intrusion barriers along the coastal margins. Types of water used for artificial recharge include imported and recycled water. Use of recycled water for artificial recharge is regulated and conducted under several permits that require extensive monitoring and demonstration of protection of public health.

Meeting regulations, maintaining supply

To meet requirements of the California Water Code Section 60300, WRD hydrogeologists and engineers closely monitor groundwater levels to manage resources. Hydrogeologists monitor groundwater levels from a network that consists of about 220 WRD and USGS installed monitoring wells at 48 locations throughout the District and is supplemented by existing groundwater production wells.

Permittees are also required to determine the first arrival of recycled water and specific travel-times to key monitoring and production wells (3-month, 6-month, 2-year, and 5-year). Computer models and simulations are used to predict travel times, but data are required to validate predictions. Sampling programs collect key data; however, capturing the "slugs" or "fronts" of new water types is challenging and requires frequent labor-intensive sampling and expensive analytical testing.

WRD staff track groundwater levels throughout the year by measuring the depth to water in monitoring wells and production wells. For example, in 2005/2006, water levels rose up to 11 feet (3.35 m) in some parts of the basin and fell up to 21 feet (6.4 m) in other parts of the basin. But, overall water levels rose 1.3 feet on average, which led to a gain in groundwater storage of 12,000 acre-feet (14,800,000 m^3).

Groundwater levels are used to determine when additional replenishment water is required, and they are used to calculate storage changes. Groundwater levels also can indicate possible source areas for

saltwater intrusion and can show the effectiveness of the seawater barrier injection wells along the coast.

Simplifying data collection

Water quality samples from the monitoring wells are collected twice a year. Currently, 100 wells are equipped with In-Situ® Inc. Level TROLL® 500 Instruments that collect water level data every six hours. WRD field staff also measure water levels in all monitoring wells a minimum of four times per year.

The primary purpose of level monitoring is to meet statutory responsibility and to maintain groundwater availability. The Level TROLL 500 Instruments log level/pressure data and provide the WRD with accurate results, automated data logging, and flexible communications.

By using Level TROLL 500 Instruments to automatically collect data, WRD staff reduce trips to the field. The Level TROLL 500 Instruments can accumulate more data than would be possible for WRD staff to collect. Increased monitoring capacity improves data resolution, which allows the WRD to see and interpret nuances in annual fluctuations and pumping patterns.

The WRD uses data from the Level TROLL 500 Instruments to generate compliance reports and to keep people informed. WRD's web-based GIS site (http://gis.wrd.org) allows hydrogeologists and engineers to see the latest data for each well in the District.

Planning for the future

The WRD plans to install In-Situ Inc. Aqua TROLL® 200 Instruments, which measure conductivity, level, and temperature. The Aqua TROLL 200 can be deployed at key locations to monitor one or more indicator constituents. Hydrogeologists may be able to determine the movement of slugs and fronts of different water types by observing real-time changes in conductivity. This would decrease the frequency of costly sampling events.

By using both Level TROLL 500 and Aqua TROLL 200 devices, WRD staff could record and characterize

Spreading imported water from the Metropolitan Water District of Southern California.

a system of aquifers and differentiate flow system boundaries while recording reliable and timely information to control water resources in local recharge basins. Using Aqua TROLL 200 devices to automatically log specific conductivity every six hours would likely provide a specificity of front arrival not realized by monthly sampling.

Telemetry is being evaluated for feasibility and future need. The WRD doesn't generally make decisions based on real-time water level data, so timeliness has not been an issue. The WRD first selected In-Situ Inc. products in 1998. Starting with the HERMIT® 3000, the WRD now uses the latest generation of Level TROLL Instruments and continues to install the most up-to-date equipment as new wells are completed.

References

Barone, J. May 2008. Better Water. *Discover*.

Water Replenishment District of Southern California: Engineering Survey and Report. June 15, 2007. www.wrd.org/pdf_files/2007_ESR_Final_Report_Web.pdf