

## Groundwater Recharge for Orange County, California

**B**rown and Caldwell is playing key roles on the consultant team that has won successive contracts for predesign, design and construction of a treatment plant and pipeline delivery system for California's largest groundwater recharge system. The scale of the \$350-million recharge project is unprecedented anywhere in the world.



**B R O W N   A N D  
C A L D W E L L**

**Brown and Caldwell will contribute a two-part pump station that will direct flows of tertiary-treated water uphill to the spreading basins as well as into the injection wells of the saltwater intrusion barrier at the coast.**

### B A C K G R O U N D

Nature has endowed Orange County, Calif., with a huge groundwater basin that supplies 75 percent of the water required by more than two million people. But the aquifer has long been overdrawn and it is vulnerable to seawater intrusion. Moreover, years of intensive agriculture irrigation have contaminated it with excessive levels of total dissolved solids.

Now, the Orange County Water District (OCWD) has embarked on a joint project with the Orange County Sanitation District (OCSD) to recharge the aquifer with highly purified, tertiary-treated wastewater. After completion of the third phase, as much as 115 million gallons per day (mgd) will be pumped to infiltration basins via a 66- to 78-inch-diameter pipeline and up to 70 mgd

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will be pumped to the seawater intrusion barrier. The first phase of the system will add 75,000 acre-feet of water per year to the aquifer—enough to serve 200,000 families.

The pipeline to serve the infiltration basins will follow the course of the Santa Ana River to basins 14 miles inland from new treatment facilities. To be built near OCWD's existing seawater intrusion barrier, the new treatment plant will provide tertiary treatment, including microfiltration, reverse osmosis and ultraviolet disinfection.

## RESPONSIBILITIES

The Groundwater Replenishment System is slated to achieve full capacity in 2020, and Brown and Caldwell is playing key roles in permitting, design and construction.

### Permitting

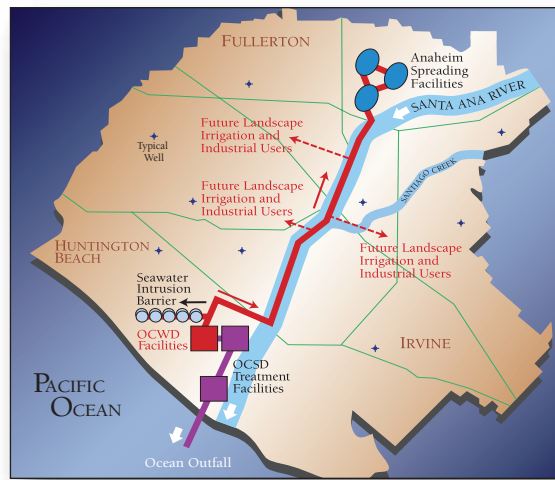
Much of the early timeline of the project has been consumed with permitting and other issues related to laying large-diameter pipe along the course of the Santa Ana River, which traverses a complex expanse of urban and suburban neighborhoods. Commercial and residential communities border the river channel, and city streets or state highways cross it every mile or so. Because the pipeline will be installed within levee banks, on property owned by the County Flood Control District, flood-control issues have come into play. The Army Corps of Engineers also is concerned about preserving the integrity of the levees and channel modifications.

Because Brown and Caldwell's responsibilities include design and construction-support services for most of the pipeline, we have been largely responsible for permitting issues related to it.

### Design and Construction

The plan calls for designing and constructing the pipeline in three sections, and Brown and Caldwell is responsible for designing two of these and for providing engineering services during construction. Pipeline construction is scheduled to begin in summer 2002.

Another major Brown and Caldwell contribution—a two-part pump station—will direct flows of tertiary-treated water uphill to the spreading basins as well as into the injection wells of the saltwater intrusion barrier at the coast. The pump stations will have firm first phase capacities of 55 mgd and 40 mgd, respectively.



**A 14-mile pipeline will extend from new Orange County Water District treatment facilities to spreading basins in Anaheim, Calif. The new facilities will provide tertiary treatment, including microfiltration, reverse osmosis and ultraviolet disinfection.**

Other Brown and Caldwell responsibilities include designing the junction structure that will receive effluent from OCSD and screen debris from it before it flows to OCWD's tertiary treatment facility. We also are providing the ultraviolet element of the tertiary treatment system, which will assure pathogen-free effluent and oxidize the trace contaminant NDMA. And a Brown and Caldwell-designed packed tower will aerate the effluent, raising the pH by converting bicarbonate to carbon dioxide.

### Asset Management

Because of the size and complexity of the new system and the requirement for highly reliable operation, OCWD and OCSD have asked the design team to develop supporting business systems. Brown and Caldwell is taking the lead in developing a comprehensive, integrated asset management system. It will integrate maintenance management, accounting and financial reporting, purchasing and stores, and other systems to help managers make the best-informed decisions possible.

This will be one of the most advanced infrastructure asset management systems in the United States. When complete, it will support asset management decisions at all levels, including normal maintenance procedures and timing, capital refurbishments and asset replacement. It also will strengthen long-range capital planning and assure the continuing viability of the Groundwater Replenishment System.

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CALDWELL**