

## **GROUNDWATER REPLENISHMENT SYSTEM SUMMARY**

### **ORANGE COUNTY WATER DISTRICT AND ORANGE COUNTY SANITATION DISTRICT**

#### **Contribution to the well-being of people and communities**

The Groundwater Replenishment (GWR) System is the largest water purification and reuse project of its kind in the world. The new system increases Orange County's water independence by providing a locally controlled, drought-proof supply of safe, high quality water. The GWR System can generate enough pure water to meet the needs of 500,000 people. GWR System purified water is higher quality than all state and federal drinking water standards and has water quality similar to distilled water.

The Orange County Water District (OCWD) has an international reputation of industry leadership and innovation that has contributed to solving many of the world's water challenges by serving as an example for the utilization of innovative technologies.

#### **Resourcefulness in planning and solving design challenges**

The GWR System is a unique example of two separately governed public agencies partnering together to build a project that met each others different needs. Because this project helps solve water supply challenges in the State of California as well as the Western United States region, significant funding support was provided by both the state and federal government. Numerous agencies, including the California State Water Resources Control Board and the Department of Water Resources assisted in the development of the project.

When creating the world's largest water purification facility, challenges are inevitable and need to be solved using innovative approaches. The design of the treatment plant had to be located on a space-limited site in Fountain Valley, CA. Newer technologies like microfiltration were incorporated to reduce the overall carbon footprint of the site. Water quality was the highest concern during the development of the treatment design. The use of reverse osmosis technology assured a near distilled water quality. In addition, ultraviolet light with hydrogen peroxide was added as to remove trace organics that may pass through the reverse osmosis process. The water quality, performance and operation of the new facility are monitored by an innovative process control system. Use of the Emerson Delta V control system reduces operation and maintenance costs by using open, interoperable bus technologies typically used in the manufacturing industry.

#### **Pioneering in the use of materials and methods**

The GWR System uses the latest water treatment technologies and its structures were designed to accommodate solar power. With 86 million gallons per day (mgd) of microfiltration capacity preceding 70 mgd of reverse osmosis treatment, it is the largest purification plant of its kind in the world. A commitment to energy was reflected in the mechanical design as well. Variable frequency drives, which control the frequency of the electrical power supplied to the motors allowing the pumps to operate more efficiently, were used on all major pumping facilities as an energy savings measure.

#### **Innovations in Construction**

Construction innovations included techniques that helped reduce costs and impacts on local residences. Careful attention to minimize construction impacts was a major concern and focus of the design and construction team. To reduce vibration and sound, cast-in-place drilled concrete piles were used on roughly 3,500 piles throughout the GWR System plant site. This technique eliminated pounding pre-cast concrete piles, which resulted in both reduced vibration/noise and lower overall costs.

Sound attenuation was incorporated through use of sound paneling, sound blankets, strict hours of operation, and consistent community outreach (including a telephone hotline, monthly construction tours and weekly newsletter updates) with the neighbors.

### **Impact on Physical Environment**

The GWR System takes a valuable resource and through an advanced purification process creates a new source of water for an arid region. Not only does the GWR System provide a reliable, drought-proof source of pure water for Orange County, it reduces saltwater intrusion into the groundwater basin and reduces the amount of wastewater discharged to the ocean. In fact, its creation will delay, possibly indefinitely, the need for the Orange County Sanitation District to build another ocean outfall pipe.

Additionally, the project uses about half the energy needed to import water from Northern California and the Colorado River to Southern California.

A number of environmental groups, including the Surfrider Foundation, Orange County Coastkeeper, Sierra Club, and Earth Resource Foundation are in support of the project. The GWR System has won several environmental awards including the 2005 Governor's Environmental and Economic Leadership Award, which is the State of California's highest environmental honor, the 2004 Flex Your Power energy efficiency award, 2002 U.S. Environmental Protection Agency Environmental Achievement Award, and most recently the 2008 Orange County Coastkeeper's Award.

### **Beneficial effects of the project, including aesthetic value**

In addition to preventing seawater intrusion and providing a drought-proof water supply for Orange County, the GWR System provides numerous benefits.

- **Reliability/Drought-Proof Benefits.** The GWR System water supply can be consistently produced in both wet and dry years and it provides supply security to Orange County during future droughts, enabling OCWD to better manage its groundwater basin.
- **Water Quality/Salinity Reduction Benefit.** Due to the high purity of the GWR System product water, the Orange County groundwater basin's overall water quality will improve resulting in reduced impacts and costs for the residents within the OCWD service area.
- **Financial Advantage.** The GWR System will produce high-quality water by purifying wastewater for approximately \$550 per acre-foot. Future projections show the cost of imported water to continue to increase and increase at a faster rate than GWR System water. Imported water and desalinated water costs are already more expensive than local GWR System water.
- **Technological Advancement.** The state-of-the-art purification process used in the GWR System can be replicated in other arid coastal regions of the world to address the looming global water crisis. The GWR System has already been replicated on a smaller scale in Singapore, and other parts of the world are looking at GWR System technologies to satisfy their water needs. Hundreds of engineers, scientists, elected officials and water experts from around the world have visited OCWD to learn about the project.