

In December 2008, the city of Clovis, Calif., will bring a state-of-the-art sewage treatment and water reuse facility (STWRF) online to support future development in the northwest and southeast outer reaches and northeast urban centers of this bedroom community near Fresno, Calif. The 16-acre plant site is on a former almond grove and will help offset the declining supply of groundwater needed to support anticipated planned unit developments and irrigation use in existing areas.

A Neighbor-Friendly Plant

The \$40-million design-build-operate (DBO) project should draw attention for its advanced technologies and alternative project delivery method. The 2.8-million-gal-per-day (mgd) first phase, with two equal-sized subsequent phases, is only the second Central Valley municipal wastewater treatment plant to receive a permit from the Regional Water Quality Control Board within the past 20 years.

In Clovis, demands on the supply of groundwater led to a five-year initiative to plan, negotiate with regulators and procure the facility, according to Steve White, P.E., a Clovis city engineer. Recycled water could account for 5% of the city's mix of sources by 2010 and 13% by 2020. More importantly, reuse will decrease groundwater consumption from 28% to 18% and retain reserve for drought emergencies.

"Related contracts beyond the scope of the first phase could bring our city's total investment up to \$150 million," White said. "All of the plant and future expansions will be funded by developers and direct users."

By Steve London

A Single-Source *Delivery*



WEDCO LBX Series closed vessel UV reactors.

A municipality chooses DBO method to deliver sewage treatment and water reuse options

The city foresees the recycled water as a supplement to a sustainable potable supply. Less groundwater used for irrigation will reserve more for the potable supply, White said, and recycled water dedicated solely to irrigation also represents a drought-proof source.

Related projects not covered by the DBO contract included construction of force mains, two lift stations, a recycled water pump station and other infrastructure improvements. The process train includes a membrane bioreactor (MBR) that integrates biological treatment with membrane filtration solids separation; a low-energy ultraviolet (UV) disinfection system; a patented, two-stage solids reduction process; and a level of automation control and remote monitoring that requires only four staff members to operate the plant during the normal one-shift workday.

Measures that will make the STWRF neighbor friendly are evident in the reduced physical presence, fully covered flow through various stages, advanced odorous air treatment and monitoring around the perimeter that collectively contribute to a subdued environmental footprint. These features, in combination with the landscaping, perimeter walls and Prairie-Style architecture of the administration building, will make the plant compatible with the planned neighboring context. On the operational side, the solids reduction technology will mean less volume destined for agricultural land application and likely the elimination of landfill usage. Fewer solids will also require less truck traffic through the developed area.

"This is the first tertiary treatment plant in California completed by the DBO method," White said. "The single-source alternative also overcame the crazy conditions of the capital market to finance the project. CH2M HILL offered us that single source for a complete turnkey project and operation at an extremely competitive price. Like so many communities, this facility is necessary for the city's future development. It will produce the highest-quality water used exclusively to irrigate in and around Clovis."

Clovis is laced with thirsty rights-of-way, school district grounds and other public green tracts that can use the irrigation water. Another option is a trade with the Fresno Irrigation District that has been a source for a new surface water treatment plant that went online in 2004, White said. Regardless, the volume of recycled effluent will never satisfy total demand—even when fully built out.

The turnkey contract covered the initial phase of the three-stage plant that will have an ultimate 8.4-mgd annual average capacity. The second phase will double the capacity and is likely to coincide with the renewal for the operating contract. The third 2.8-mgd phase is too far into the future to project an anticipated timetable, according to White.

The consolidated responsibilities for design, construction and operations influenced several major elements of the plant. Because CH2M HILL would directly operate the plant on a long-term basis, life-cycle reliability and operating costs—especially those related to energy—were among the factors taken into account when selecting the plant's systems.

"When it was let for bid, the city gave us some flexibility but specified some operational equipment, such as UV disinfection, and wanted maximum assurance that neighbors could not see, smell or hear the plant," said Steve Patterson, P.E., of CH2M HILL, the engineering manager for the project. "Odor control was a primary concern that led us to cover everything on site to make this plant a good neighbor."

Selecting the Right Options

Although the city of Clovis treats its potable water with chlorine, the permit for the new sewage plant prohibited the discharge of any chemically treated effluent. Several options were considered over two years of negotiations before the city selected UV for the plant's process chain and earned approval. The WEDECO LBX Series closed vessel UV reactor, supplied by ITT Water & Wastewater, was selected after objective analysis. Although initially higher in cost than the medium-pressure UV system, the WEDECO low-pressure, high-output lamps will use one-third the amount of comparable energy, resulting in a projected savings of approximately 200 kW of power, Patterson said.

The MBR was not dictated by the city, but the system was equally justified by a life-cycle analysis over 10 years of operation, according to Patterson. Although membranes are higher in initial cost than other options, they offered CH2M HILL better opportunity for automation, reduced facility size and more odor control. Unlike most wastewater treatment plants where the UV operates within exposed channels, the STWRF pumps the wastewater through the vessels in a fully enclosed piped system.

New Advantages

The patented sludge reduction system can reduce the amount of biosolids by 90% and is the largest application yet to a California plant. The unique process is a two-step system that first involves physical separation using 250-micron screens—10 times finer than most others—to trap untreated organic material that passed through the upline process. The second step relies on a biological stage that works much like a mini-digester. Once again, the application to the plant was based on life-cycle considerations that will translate fewer truckloads of sludge to haul from the plant to land application sites or other disposal locations.

The odor control over the physical enclosure of the treatment stream will be enhanced further by a two-stage process. In the first stage, the foul air is passed through the membrane aeration system. In the second stage, foul air is directed to a non-chemical biofilter that uses organic compost media (wood chips) to treat any residual odor. The foul air passes up from the bottom through 4 ft of media used in this premium final treatment system whose performance can be monitored around the plant perimeter.

The level of automation allows the plant to operate with one four-man shift daily. The shift is backed up during off hours by a SCADA that takes the plant's pulse 24/7 to ensure a quick response to any problems. The system provides



CH2M HILL the capability to remotely run and troubleshoot the plant via a laptop or central station in addition to simultaneous monitoring by the city.

Development in the city of Clovis is no longer in a stranglehold with the opening of this new facility. The project clearly demonstrates many advancements that have reached the market in wastewater treatment systems and the increasing emphasis on reuse. The city is committed to bringing the quality groundwater back into balance after being strained by decades of use and more recent agricultural chemical infiltration. Relied on since 1913, the aquifer lost more than 100 ft due to overdrafts in the past 50 years. Recycled water will help some by providing a drought-immune supplemental source. [www](#)

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