

Challenging Pipeline Project Expands Recycled Water System

By Nancy Ku, Psomas

Fifty miles east of San Francisco, the City of Antioch, CA, and the Delta Diablo Sanitation District are undertaking a major expansion of the district's existing recycled water distribution system into the City of Antioch. The expansion into Antioch will replace the existing landscape watering supply, which currently depends on potable water, as well as set up a foundation for future industrial or other possible uses.

This project comes at a time when California is entering the fourth year of a drought. The city has proposed water rationing, potentially requiring a 15% cut back in water use. Expanding the recycled water distribution system into Antioch will reduce demand on potable water, reduce treated wastewater discharges into the Sacramento-San Joaquin River Delta and provide a drought-resistant water source.

The pipeline portion of the project, now under construction, presented the district and project engineers with numerous challenges that were successfully overcome, from permitting and funding through design and construction.

System Expansion

The district's existing recycled water distribution system consists of a 12.8 mgd facility that supplies recycled water to two Calpine power generation plants, a golf course and several parks within the nearby City of Pittsburg.

This initial expansion phase into the City of Antioch is establishing the backbone pipeline to provide recycled water to four city parks, street medians, and the Lone Tree Golf Course. Future phases will use the backbone pipeline to expand the system to serve other park sites. In addition to more than 30,000 feet of pipeline on major thoroughfares in Antioch, the project includes a 1.1 million gallon reservoir and pump station at the golf course.

Funding, Permitting Issues

The project has received American Recovery and Reinvestment Act (ARRA) stimulus funding, in addition to zero percent interest loans and state grant funds.

The district needed a Preliminary Funding Commitment (PFC) notice from the State Water Resources Control Board that everything was in order to receive ARRA funds. The PFC review process involved a stringent review of the district's financial capacity to show credit worthiness. In addition, there were a number of other extensive and challenging steps in the PFC review process to ensure compliance with all necessary requirements for ARRA funding.

As one of the first projects designated to receive ARRA funds, the district was at the forefront in terms of helping to establish and meet funding procedures and requirements. This uncharted territory presented challenges during design. When the federal





Jack and bore construction was used to cross beneath W. Antioch Creek on W. 10th Street. The top of the pipe is about 16 feet below grade.

economic stimulus funding idea came out, there was no guidance as to how to comply. For instance, what does “shovel ready” or “Buy American” mean? The district had to include a number of assumptions in its specifications to get documents out to bid on schedule. Fortunately, they had a good working relationship with the State Water Resources Control Board Division of Financial Assistance, which administers ARRA funds. Through teamwork with the Financial Assistance Division, the district was able to issue clarifications during the bid period and addendums thereafter. As a consequence, certain specifications were changed at the last minute to replace certain sole-sourced items that did not meet the Buy American requirement.

ARRA funds for construction were not available until a recycled water permit was in place. Complicating matters, the expansion of the district’s recycled water distribution system puts them in the unique position of serving two cities that are regulated by two different Regional Water Quality Control Boards. This requires two separate recycled water permits. The City of Pittsburg falls under a Regional Water Quality Control Board that has issued a permit allowing recycled water use.

Unfortunately, the regional board covering Antioch did not have similar permitting requirements in place for recycled water. This regional board finally ruled that any recycled water users must follow a newly adopted statewide permit. Construction started in August 2009, yet the district did not receive its statewide permit for recycled water use until the end of January 2010.

Project Design, Construction Challenges

The recycled water distribution project featured a number of unique and challenging design elements, including sliplining over 6,900 feet of an abandoned raw water line with fusible PVC pipe; crossing the East Bay Municipal Utility District aqueducts and protection slab at two separate locations; coordinating with a major highway widening project; crossing more than 200 utilities; and constructing under a tee box at an active golf course.

- **Innovative technology:** More than 6,900 feet of an existing abandoned 18” raw water line was sliplined with fusible PVC pipe. This approach was taken to maximize pipeline capacity, meet the required pressure rating and ensure structural integrity. Construction proceeded smoothly, with two installation methods employed: 1) fusing and pulling 240 feet of pipe at once and 2) fusing and pulling 40 feet at a time. The first method worked well until the staging area got too far from the insertion pit location; then workers switched to the second method.

- **Aqueduct Crossings:** One of the project challenges was selecting a construction method to cross the East Bay Municipal Utility District aqueducts, which occur in a congested utility corridor. The district evaluated four options—directional drilling, jack and bore, open cut, and pilot tube-guided boring. The open-cut method was originally proposed for this project, since the utility district had approved it for use on a previous Psomas project. This time, however, the utility district was mandating a number of requirements for open-cut construction that would have been very disruptive to the community. Finally, pilot tube-guided boring was the decided upon method to cross the first of the two aqueduct corridors.

- **Major highway widening:** Another challenge was a major highway-widening project in the design phase that was within the project area. The district did not learn of the extent of highway widening impacts to the pipeline alignment until construction had already started. The district and project designers tried to incorporate into the plans the new pipeline alignment that would be necessary due to the highway widening, but property acquisitions required for widening could not be completed within the pipeline construction schedule. A change order incorporated tie-ins for future relocation of the recycled water pipeline. By installing the tie-ins, highway-widening contractors will be able

do their work and not impact existing recycled water service.

- **More than 200 utility crossings:**

With over 200 utility crossings, it was not going to be possible to pothole all utilities during the design phase to determine their exact location for pipeline alignment. Engineers had to determine what was most cost effective by posing the question: “Which utility would have the most severe consequences if hit by the contractor?”

The engineers decided to have the potholing subconsultant pothole gas lines 4” and larger, all primary electrical lines, high-pressure oil and fuel lines,



The project includes construction of a 1.1 million gallon reservoir and pump station at the golf course.

and the aqueducts. Many other utility locations and depth could be inferred. Although Psomas tried to get complete information from the utility companies, including holding onsite visits, this was not always possible. For example, during construction, it was discovered that an AT&T vault was in fact oriented 90 degrees off from what showed on the plans. The original design would have had the pipeline going right through the box. The contractor ended up having to install a 12’ deep pipe beneath the box. In the end, the contractor was responsible for potholing all utilities.

- **Active golf course:** The expansion project called for constructing a 95-foot diameter pre-stressed concrete tank buried under a tee box at an active golf course. This presented many site constraints,

including the close proximity of a second tee box and a large oak tree adjacent to the excavation site. Another challenge was minimizing impacts to golf course activity during and after construction.

The initial expansion phase of the Delta Diablo Sanitation District’s recycled water distribution system is set for completion by July 2010. It cannot come too soon. Projects like these represent the future of responsible water resource management in California and across the nation. **WW**

About the Author: Nancy Ku, an Assistant Project Manager with Psomas’ Walnut Creek office, has nearly a decade of diversified experience in the planning and design of water, recycled water and wastewater infrastructure and treatment facility projects. She served as the project engineer for the Delta Diablo Sanitation District/City of Antioch Recycled Water Project.



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