

DWR NEWS | *People*

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Keeping A Record of The State Water Project

(Left to Right) Bulletin 132's team with past issues of the bulletin include Lorna Wilson, Margaret Gentzel, Therese Tynan, and (sitting) Lauren Muscatine



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Trials Begin on Stockton Deep Water Ship Channel Aeration

DEMONSTRATION PROJECT

By Don Strickland

If someone collapsed from lack of oxygen, you'd probably apply emergency techniques that include mouth-to-mouth resuscitation. But, how would you breathe new life into a seven-mile long oxygen-deficient section of a major California river – an "impaired zone" that can inhibit passage of migrating salmon?

Testing got underway in early September on a DWR-managed program which hopes to correct this situation.

Here's the problem: between May and November, when low flows and warmer temperatures occur, a dredged section of the San Joaquin River known as the Stockton Deep Water Ship Channel often runs low in dissolved oxygen, particularly in the last seven miles as it approaches the Port of Stockton Turning Basin.

Several factors combine to create low dissolved oxygen (DO) levels in the water. First, you have the aforementioned seasonal low flow rates. Then, you have the presence of oxygen-demanding substances and the introduction of nutrients which promote algae growth. Finally, there's the configuration of the deep water channel itself: 500-foot wide

and 35-foot deep, it is considerably larger than the undredged upper part of the river. When the river gets to the channel, it slows down and decomposing algae settles and decays, further reducing oxygen concentrations.

In efforts to find a solution, DWR is adapting a "U-tube" technology long used in small aquaculture applications to introduce oxygen into fish-farming ponds.

Robert Pedlar of DWR's Bay-Delta Office is the project's supervising engineer. "Even though the Stockton project employs some complicated-looking equipment," he said. "It's a very simple process that relies on standard principles of gas dissolving in liquid under pressure."

Two wells 200 feet deep have been drilled on Rough and Ready Island, about 100-feet from the river's edge. Pump assemblies outfitted with fish screens, located nearby in the San Joaquin River, pump oxygen deficient water from the channel to the wells or "U-tubes."

DWR supervising engineer Robert Pedlar describes the aeration facility to Water Education Foundation tour participants.

Each U-tube assembly has a center conductor pipe 20-inches in diameter inside a 30-inch outer casing. Water pumped from the San Joaquin River travels down the center pipe as oxygen gas is injected. As it moves downward, increasing pressure causes the gas to dissolve into the water. The process of dissolving the oxygen into the water is nearly complete by the time the oxygen-enriched water gets to the bottom of each well. Then it makes a u-turn and heads back to the surface through the outer well casing before flowing into the river through a 200-foot long discharge diffuser submerged 15-feet below the channel surface.

During a planned two-year study period, the project will test the basic theory that providing 10,000 pounds of oxygen per day to the channel will have an appreciable effect on overall DO levels. "We know the demonstration project alone won't completely solve the waterway's low DO problem," said **Russ Grimes**, a senior project director with Jones & Stokes, the Sacramento-based environmental company that's been working with DWR to develop the aeration system. "This system, however, does present one of the most tangible approaches to mitigating the Deep Water Ship Channel's low DO concentration."

Other steps being considered or implemented to improve the situation include managing river flow, and reducing the discharge of oxygen demanding substances and nutrients from upstream wastewater treatment plants and agricultural drainage. However, "the nutrients that contribute to algae growth also contribute to the ecological productivity which supports Delta fisheries. So adding oxygen with the U-tube system rather than simply reducing nutrient load is expected to help Delta fish," said **Paul Marshall** a Principal Engineer in DWR's Bay Delta Office.

As far as the project team knows, the only other large U-tube facility in the country is on the Tombigbee River in Alabama. But the Stockton operation is unique because it's the only one located on a tidally-influenced estuary. That's a plus because the tides will help circulate the U-tube oxygen-enriched water. "We couldn't practically build and maintain a massive underwater distribution system in the channel anyway due to the fact that large cargo ships move through the channel on a regular basis," said Pedlar.

The San Joaquin River project is costing approximately \$3.5 million plus estimated operating costs of \$200 thousand per year. It's funded under Proposition 13 and originated from the recommendations of a CALFED assessment study. After the two-year demonstration period,

Pedlar and his team will consider several alternatives: pursue further study or seek permitting as a permanent system.

"Right now, DWR has ownership of the facility along with spending authority," said Pedlar. "But, when our testing is complete, the Department is looking to turn it over to local interests who will assume responsibility for its operation."

This project is the culmination of more than four years of study by numerous stakeholders and scientists who have collaborated to select the most appropriate technology. The design of the demonstration system has used as a basis a conceptual design furnished by HDR, Inc., of Omaha, Nebraska, and Jones & Stokes. The final design was prepared by the Department's Division of Engineering (**Joe Barron, III**, Senior Engineer, Engineering Project Manager) and the construction contracting, administration and management provided by the Sacramento Project Headquarters Office (**Jim Peddy**, previous Chief, Sacramento Project Headquarters, **Brian DePuy**, Chief, Sacramento Project Headquarters, **John Berringer**, Project Administrator, Construction Manager Supervisor, **William Sutcliffe**, Construction Supervisor I, Construction Inspector). Monitoring support has been provided by the Division of Planning and Local Assistance (**Bob Nozuka**, Supervising Engineer, **Gina Goff**, Environmental Scientist). Cooperation and project support has been provided by the Division of Environmental Services (**Rich Breuer**, Environmental Program Manager I, Chief of Environmental Water Quality Estuarine Studies Branch, **Darryl Kaff**, Senior Control Engineer, Supervisor). The Bay-Delta Office (**William McLaughlin**, Senior Engineer, Project Engineer) has been responsible for administering, coordinating and guiding implementation of the project. ■

(Top photo) Left to Right: DWR project team members Ajay Dev, Robert Pedlar, Russ Grimes (Jones & Stokes), William Sutcliffe, and William McLaughlin discuss the facility testing plan.



(Bottom photo) Overhead view of facility control room, u-tube head works, and oxygen supply system.

