Memorandum

Date:	March 4, 2014
To:	Jeff Wingfield Director Environmental, Government & Public Affairs Port of Stockton 2201 W. Washington Street Stockton, CA 95203
From:	Michael Wingfield Project Manager ICF International
Subject:	**2013 Port of Stockton Dock 20 Aerator Operations, Maintenance and Cost Summary**

Introduction

On May 7, 2012, the *Agreement for Funding & Operation of Dissolved Oxygen Aeration Facility* (the Agreement) was executed in which the Port of Stockton (Port) and other stakeholders in the San Joaquin River Dissolved Oxygen (DO) Control Program expressed their commitment to fund the operation and maintenance of the Stockton Deep Water Ship Channel (DWSC) Aeration Facility located at Dock 20 at the Port.

In 2013 the Aeration Facility was operated periodically on behalf of all parties signatory to the Agreement for the intended purpose of meeting the Central Valley Basin Plan water quality objectives[1] for DO at all times. This report provides a summary of DO conditions in the DWSC, all operations and maintenance of the Aeration Facility that occurred January 1, 2013 through December 31, 2013 and the cost allocation for all parties signatory to the Agreement.

Maintenance and System Improvements

In preparation for 2013 aerator operations staff performed a general inspection of the facility and checked all system components for wear and proper function. Lubricant levels and conditions were also checked. No deficiencies were noted at that time. However, daily inspections during operations revealed the need for several small repairs including the replacement of the air supply hose to the air burst tank (lines A and B) and replacement of a leaking fill valve on the LOX tank.

Repairs to the DO meters were completed prior to 2013 operations. They included renovation of the Line B discharge DO probe, replacement of the Line B intake DO probe, replacement of the Line B

[1] 5.0 milligrams per liter (mg/L) December through August, 6.0 mg/L September through November

discharge DO display panel, and renovation of the Line A discharge DO display panel. It is suspected that the failure of the display panels was in part due to sun damage. To prevent similar future occurrences the panels are now covered when not in use.

The Port also contracted with Global Diving and Salvage, Inc. who performed an inspection of the fish screens, diffuser, and all other underwater hardware to ensure proper function and structural integrity. Immediately prior to the inspection all valves on the air burst system were activated. The divers documented minor soft growth over much of the fish screens however flow was not impeded and the air burst system was operating effectively. No damage, excessive wear, or other deficiencies were identified and the screens were cleaned by hand at the end of the inspection.

The intake and discharge DO probes were calibrated prior to each start of the system during the operational period.

Ambient Dissolved Oxygen Monitoring

DO is monitored daily using data provided by DWR. The data are collected at the RRI station and are published on the California Data Exchange Center (CDEC) website in 15-minute increments. Data collected at RRI can be viewed at http://cdec.water.ca.gov/cgi-progs/queryF?RRI. The DO sampling device is maintained and calibrated by DWR staff on a weekly basis.

DO concentrations in the DWSC stayed above the objective for most of the year. Similar to 2012, DO dropped below the objective in September when the higher DO objective (6.0 mg/L) took effect. Episodes of DO concentrations below the objective were limited to the month of September and no aeration was needed during other months. RRI DO data and facility operational status for September 2013 are shown in Figure 1 below.

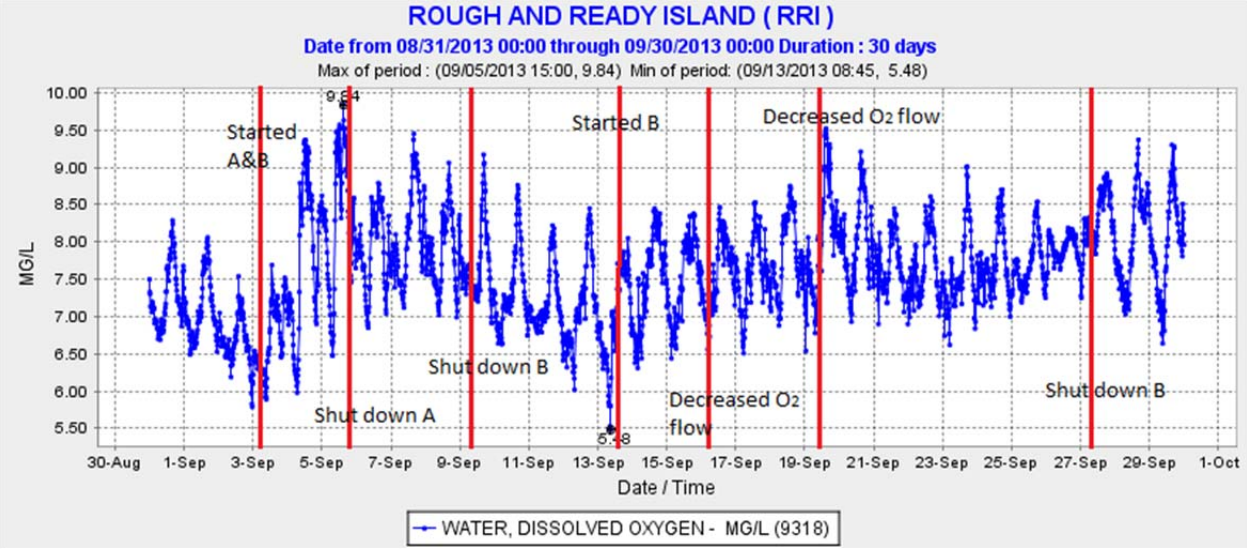

Figure 1. Rough and Ready Island 15-minute Dissolved Oxygen Data—September 2013

Facility Monitoring

During periods of operation the facility is inspected daily during the work week to check for potential problems and ensure proper function. Gages and meters are checked to confirm proper function and normal readings. The systems are checked for any signs of wear or damage that could affect performance. Operational data are logged during all periods of operation including intake and discharge DO concentrations, water flow and pressure, oxygen flow and pressure, and liquid oxygen tank level and pressure.

Facility Operations and Dissolved Oxygen Inputs

The facility was operated as needed to meet the water quality objective. In order to operate efficiently, the facility was turned on and off as conditions warranted, and the response in the DWSC was monitored. Accurately forecasting the mass of the DO deficit in the DWSC is not feasible and a practical trial-and-error approach continues to be implemented to determine appropriate oxygen inputs. Due to variable conditions in the DWSC the ideal water and oxygen flow rates needed to maintain DO above the water quality objective fluctuate. Therefore, the process of monitoring and adjusting oxygen inputs is ongoing during periods of operation.

During 2012 operations the DO meters used to measure intake and discharge DO were being repaired and were unavailable for use. As such the mass of daily DO inputs was calculated using the measured gas/water ratios and oxygen flow rates, and transfer efficiencies documented during the testing of the facility. Since that time the DO meters were repaired and DO inputs for 2013 were calculated using the measured DO increment and equation 3 from *Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Aeration Facility Project Final Report*.

Oxygen capacity (lb/day) = 28.317 lb/cf x (lb /4.536 x 10^5 mg) x 86,400 sec/day x DO increment (mg/l) x water flow (cfs)

= 5.4 x DO increment (mg/l) x water flow (cfs)

Operational data was recorded once per day. The facility was not monitored on weekends so daily DO inputs for days occurring on weekends were assumed to be the same as the previous Friday. Table 1 provides a summary of the periods of operation and the estimated oxygen inputs.

Table 1. Dock 20 Aerator Operations Data—2013

Date	Duration (hours)	Water Flow (cfs)[1]	O_2 Flow (scfh)	Gas/Water Ratio (%)	Added DO Increment (mg/L)	Estimated O_2 Input (lbs/day)
9/3	14	45	5,500	3.4	31.7	4,422
9/4	24	45	5,500	3.4	29.8	7,241
9/5	16.5	45	5,500	3.4	29.8	4,973
9/5	7.5	25	2,750	3.1	29.8	1,256
9/6	24	25	2,750	3.1	30.4	4,104
9/7	24	25	2,750	3.1	30.4	4,104
9/8	24	25	2,750	3.1	30.4	4,104
9/9	9	25	2,750	3.1	30.6	1,547
9/13	10.75	25	3,000	3.3	31.2	1,884
9/14	24	25	3,000	3.3	31.2	4,212
9/15	24	25	3,000	3.3	31.2	4,212
9/16	14	25	3,000	3.3	30.4	2,391
9/16	10	25	2,500	2.8	24.1	1,354
9/17	24	25	2,500	2.8	24.2	3,267
9/18	24	25	2,500	2.8	24.8	3,348
9/19	9.25	25	2,500	2.8	24.9	1,294
9/19	14.75	25	2,000	2.2	22.9	1,898
9/20	24	25	2,000	2.2	23.3	3,146
9/21	24	25	2,000	2.2	23.3	3,146
9/22	24	25	2,000	2.2	23.3	3,146
9/23	24	25	2,000	2.2	23.2	3,132
9/24	24	25	2,000	2.2	23.9	3,227
9/25	24	25	2,000	2.2	23.6	3,186
9/26	24	25	2,000	2.2	23.2	3,132
9/27	7.75	25	2,000	2.2	23.8	1,036

cfs = cubic feet per second
scfh = standard cubic feet per hour
lbs = pounds
[1] 25 cfs = one pump in operation, 45 cfs = both pumps

Cost Allocation

Total costs for 2013 were lower than those for 2012. Expenditures for maintenance and repairs were higher however that was offset by a reduction in bulk oxygen rates (negotiated by the Port) and fewer days of operation. Table 2 shows the costs by component and Table 3 shows the breakdown of contributions by each stakeholder.

Table 2. Operations Costs—2013

Operations Component	Cost
Technical services, including daily DO monitoring and onsite maintenance and operation	$22,265.00
Bulk liquid oxygen	$6,068.18
Electric utility	$11,083.13
Maintenance and repairs	$9,090.56
Total	$48,506.87

Table 3. Stakeholder Funding Allocations—2013

Stakeholder	Contribution
Port of Stockton—33.33%	$16,167.34
San Joaquin River Group—25.00%	$12,126.72
San Luis & Delta-Mendota Water Authority and San Joaquin Valley Drainage Authority—25.00%	$12,126.72
State Water Contractors—16.67%	$8,086.09
Total	$48,506.87