

STAFF REPORT

STOCKTON DEEP WATER SHIP CHANNEL DISSOLVED OXYGEN BASIN PLAN AMENDMENT CONTROL PROGRAM – STATUS REPORT ON RECONSIDERATION OF THE PROHIBITION OF DISCHARGE, ALLOCATIONS AND IMPLEMENTATION PROVISIONS

Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel

The San Joaquin River (SJR) experiences regular periods of low dissolved oxygen (DO) in the Stockton Deep Water Ship Channel (DWSC) from the City of Stockton downstream to Disappointment Slough, located about 12 miles downstream of Stockton. These conditions can be harmful to aquatic life and are in violation of the water quality objectives (WQOs) for DO in the DWSC. In January 1998, the State Water Resources Control Board adopted a Clean Water Act Section 303(d) list identifying the DO impairment in the SJR. The dissolved oxygen impairment was also listed in the 1999 Regional Toxic Hot Spot Cleanup Plan as well as in the 2000 CALFED Record of Decision as an Ecosystem Restoration Program (ERP) directed action.

From 1999-2001, numerous monitoring and research studies were undertaken to better understand the causes of the DO impairment. From these studies three main factors were identified that contribute to the DO impairment. They are:

- Loads of oxygen demanding substances from upstream sources that react by numerous chemical, biological, and physical mechanisms to remove dissolved oxygen from the water column in the DWSC.
- DWSC geometry which impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.
- Reduced flow through the DWSC which impacts mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand in the DWSC is increased.

Basin Plan Amendment and TMDL

In January 2005, the Central Valley Water Board adopted a Basin Plan Amendment and a phased Total Maximum Daily Load (TMDL) designed to address DO impairment in the DWSC. These went into effect on 27 February 2007, after they were approved by US EPA. The Basin Plan Amendment contains a prohibition that would proscribe the discharge of oxygen-demanding substances into the DWSC, and a Control Program to address factors that contribute to the impairment.

The purpose of the Control Program is to achieve compliance with DO water quality objectives in the Stockton DWSC. The Control Program assigned load allocations and recommended implementation provisions. As part of a phased approach, the prohibition, the load allocations, and the recommended implementation measures were to be reconsidered by the Central Valley Water Board by December 2009.

Reconsideration was to be based on the results of required oxygen demand and precursor studies, along with a record of the prevailing DO conditions in the DWSC.

Status of Revision of Allocations

The TMDL takes a phased approach to address the need to gather additional information on certain source and linkages to the DO impairment (studies), while at the same time making improvements to DO conditions in the DWSC (implementation provisions).

In Phase I of the TMDL, specific oxygen demand and precursor studies were required to be completed by December 2008 to identify and quantify the following:

- Sources of oxygen demanding substances and their precursors in the DO TMDL source area;
- Growth or degradation mechanisms of these oxygen demanding substances as they move through the source area to the Stockton DWSC;
- The impact of these oxygen demanding substances on DO concentrations in the Stockton DWSC under a range of environmental conditions and considering the effects of chemical, biological, and physical mechanisms that add or remove DO from the water column in the DWSC.

In 2003, stakeholders who participated on the SJR DO TMDL Steering Committee began developing a proposal to undertake specific studies in the upstream source area (Mossdale to Mud and Salt Slough) to identify and quantify the sources of oxygen demanding substances and their fate and transport as they moved downstream toward the DWSC. These studies, identified as the Upstream Studies, began in 2004 and were completed in June 2008. The studies took longer than anticipated, due to equipment problems during the first year and a funding issue with CALFED in 2006-2007. However, one benefit to the delay in completing the studies was that a third year of studies was completed. This third year was a critically dry year, which provided invaluable data under low flow conditions (the two previous years were wet years).

Though the studies conducted from 2004-2008 generated information on a large portion of the source area, they did not provide an understanding of how upstream sources impact DO downstream in the DWSC. The upstream section of the SJR near Vernalis is non-tidal, with dischargers mostly represented by nonpoint sources. Downstream of Mossdale, the river conditions differ greatly. The river is tidally influenced, the flow is split at the Head of Old River, and the largest point source discharge occurs approximately 3 miles upstream of the DWSC from the City of Stockton's Regional Wastewater Control Facility. Because of these differences, a separate set of studies was proposed to identify and quantify the impact that oxygen demanding substances have on DO in the DWSC.

A proposal to complete the last of the required studies, identified as the Downstream Studies, was developed in 2007 and approved in August 2008 (see Table 1 for brief summary of required studies). The Downstream Studies are needed to understand how

oxygen demanding substances and their precursors impact DO levels once they enter the tidal section of the SJR starting at Mossdale (near Manteca) and moving through the DWSC. The proposed funding source for the studies is Proposition 13 bond money. In December 2008, the Governor imposed a mandatory freeze on all projects using general obligation bonds because of the declining state of the economy. The contract is approved and on hold until money from bond sales is allocated to the project. At this time, staff has no clear indication when funds will be made available and released to initiate the second set of the required studies.

During the next phase of the TMDL (Phase II), findings from the required studies are to be used to re-evaluate and revise, as necessary, the prohibition, load allocations and implementation measures. Without the completion of the Downstream Studies, staff does not have the necessary information to understand how oxygen demanding substances from the source area impact DO in the Stockton DWSC. If the Downstream Studies are not completed, load allocations could be revised but would have to be based on limited information that was collected from the Upstream Studies.

Table 1. Brief Summary of Required Oxygen Demand & Precursor Studies

Oxygen Demand & Precursor Studies	Study Requirements from the Basin Plan Amendment		
	Sources of ODS ¹ & precursors	Growth/degradation mechanisms – source area to DWSC	Impact of ODS ¹ in DWSC under range of conditions
Upstream Studies SJR Basin to Mossdale (near Manteca) 2004-2007 (\$6.8M)	Monitoring for ODS ¹ /precursors Isotope tracer of ODS ¹ Data entered into WARMF ² model	Isotope characterization of ODS ¹ Linkage study with algae and zooplankton; grazing effects on algae levels Data entered into WARMF ² model	
Downstream Studies (<i>proposed</i>) Mossdale to DWSC (Stockton to Disappointment Slough) (\$2.9M)	Continued WQ monitoring in SJR mainstem Focused Ag drain study (Orestimba Creek)	Zooplankton dynamics and grazing effects on algae in DWSC	WQ monitoring and data collection in DWSC Measuring algal productivity, rate processes, and DO response curves.
	Add new data to WARMF ² ; Update Link-Node Model/connect to WARMF ² ; Upgrade WARMF ² model interface to aid development of revised load allocations.		
¹ ODS is oxygen demanding substances			
² WARMF is a Watershed Analysis Risk Management Framework (model)			

Status of Implementation Provisions

Since approval of the TMDL in 2007, implementation actions within the TMDL source area have occurred. Most notable is the addition of two nitrifying biotowers and engineered wetlands at the Stockton Regional Wastewater Control Facility to reduce

their ammonia discharge to the SJR. Other measures completed include the construction of an aeration facility in the DWSC to improve DO conditions.

In 2003, the SJR DO TMDL Steering Committee developed a Proposed Implementation Plan that recommended the construction of an aeration system that could be used to meet interim DO objectives in the DWSC while long-term TMDL implementation plans were developed. In 2004 an aeration feasibility study was undertaken, and by 2008 a Demonstration Aeration Dissolved Oxygen Facility was constructed. The aeration facility is a two-year demonstration project to evaluate the aerator's effectiveness at increasing DO levels into the Channel.

The Demonstration Aeration Dissolved Oxygen Facility was constructed at the west end of Rough and Ready Island at the Port of Stockton and is currently operated and maintained by the Department of Water Resources (DWR). The first year of the demonstration began in June 2008 and ended in late September 2008. Due to the bond freeze, bond funds were not available for operation during the summer of 2009. However, funds were made available in August and the aerator was operated briefly in September and October 2009. The aerator is currently funded by Proposition 13 since it is a demonstration project; however, the demonstration phase is anticipated to end by December 2010. Staff from DWR will be present during the information item to provide a brief presentation on the preliminary results from the first year of the demonstration.

At this time, there is uncertainty if the aerator will be operated after the demonstration phase is complete. No organization has stepped forward to assume responsibility of the operation and maintenance of the aerator. In April 2004, a signed letter of intent was sent to the Regional Board from the State Water Contractors, the Port of Stockton and the San Luis and Delta Mendota Water Authority and the San Joaquin Valley Drainage Authority indicating their commitment in executing a funding agreement between them and other interested parties that would be used to support the long-term operation of an aerator. The intent of the funding agreement was contingent upon the permitting, designing and installing of an aerator. The aerator was completed in 2008 but to staff's knowledge there has not been any funding agreement executed nor has any operating entity been developed.

Discharge Prohibition

The TMDL states the Board is to review the discharge prohibition in the TMDL by December 2009. This prohibition on the discharge of oxygen demanding substances and their precursors into waters tributary to the DWSC portion of the SJR takes effect after 31 December 2011, unless DO objectives in the DWSC are being met. The prohibition is not in effect when the net daily flow in the DWSC near the vicinity of Stockton is greater than 3,000 cfs, because low DO conditions do not develop when net river flows are 3,000 cfs or greater.

This prohibition does not apply to a discharger if it is regulated by a waiver of waste discharge requirements or an NPDES permit, if the waiver or permit implements either the Basin Plan Amendment's *Control Program for Factors Contributing to the DO Impairment in the Stockton DWSC* or which includes a finding that the discharge will

have no reasonable potential to cause or contribute to a negative impact on DO in the DWSC.

The Control Program includes the following components to implement the TMDL:

- Point and nonpoint sources of oxygen demanding substances and their precursors in the TMDL source area are required to perform oxygen demand and precursor studies by December 2008; *Status*: partially completed, Downstream studies remain.
- 401 water quality certifications are required to evaluate and fully mitigate their impacts on DO conditions for future projects that increase the cross-sectional area of the DWSC or future water projects that reduce flow through the DWSC; *Status*: 401 Permittees such as the Port of Stockton and other parties are complying with the Control Program.
- The US Army Corps of Engineers (USACE) was required to submit a technical report on various mechanisms by which oxygen demanding substances are converted to oxygen demand and the impact that the DWSC has on re-aeration by 31 December 2006; *Status*: On 02 January 2007, USACE sent numerous documents to the Regional Board related to DO levels in the DWSC during the previous deepening project (1984-1990). USACE stated they do not have the authorization or funding to conduct additional studies or produce new reports.
- Waste load allocations of oxygen demanding substances are set for NPDES-permitted discharges at a corresponding effluent limitation applicable on 28 January 2005 and permit conditions for new or expanded point source discharges including NPDES and Stormwater are based on the discharger demonstrating that the discharge will have no negative impact on the DO in the DWSC. *Status*: NPDES Permittees such as the City of Stockton and other parties are complying with the Control Program.
- Regional Board requires compliance with waste load allocations and load allocations, and development of alternate measures to address non-load related factors by 31 December 2011.

As mentioned above, point and non-point sources were to undertake studies required to be completed by 2008 as a condition of the Control Program. It is likely that these required studies will not be completed before January 2012, since the proposal for the Downstream Studies outlines a 3 year study length. Thus, even though the delay of the studies was due to funding and other issues, it appears likely that the prohibition of discharge will go into effect for these parties (when triggered). The aerator, if overseen by an operating entity, could be used as a means to increase DO in the DWSC to help meet the DO objective and potentially keep the prohibition from being triggered.

Prevailing Dissolved Oxygen Conditions in the DWSC

One of the conditions under which the TMDL was to be reconsidered in December 2009 was the prevailing DO conditions in the DWSC. DO levels in the Stockton DWSC can vary by day, season, and year, and are controlled by a number of factors such as water temperature, channel depth, tidal mixing, river flow, and various chemical and biological

mechanisms than can add or reduce DO in the water column. Prevailing conditions through the DWSC can be demonstrated using data from three primary sources:

DWR's California Data Exchange Center (CDEC) Rough and Ready Island (RRI) Continuous DO Meter (P8) - Frequency: Hourly from 1983-2002, every 15 minutes from 2002-present. Real-time data allows staff the ability to monitor DO conditions on a daily basis.

DWR's Dissolved Oxygen Run Boat Cruises at 14 locations in the Stockton DWSC - Frequency: Twice a month from June-December (at a minimum, August – November) since 1983. Data collected has been used to portray the spatial extent of the DO sags in the DWSC.

DWR's Monitoring Points on 4 Navigational Aids/Lights (NA40, NA42, NA43, and NA48) in the Stockton DWSC - Frequency: Every 15 minutes since 2007. Data from the monitoring points combined with data from CDEC RRI meter are used by DWR to generate monthly plots of dissolved oxygen conditions in the Stockton DWSC. These plots are the most comprehensive representation of monthly dissolved oxygen conditions in the Stockton DWSC from Turner Cut to Stockton.

Using information from the sources listed above, the Stockton DWSC had several episodes of low DO that violated the water quality objective during the months of May through October (2009). Most of the low values measured were just under the water quality objective. The lowest value occurred in May (2.5 mg/L) at NA48, which is located immediately downstream of the confluence of the SJR and the Stockton DWSC. Table 2 provides the lowest DO values recorded in the DWSC from May-October 2009. January through April and November through December had no measured DO values below the water quality objective.

Table 2. Lowest DO Values in the Stockton DWSC for May-October 2009

Month	WQO	Monitoring Station and DO value (mg/L)				
		Downstream			Upstream	
		NA 40	NA 42	RRI (P8 compliance point)	NA43	NA 48 (Confluence with SJR)
May	5.0 mg/L	4.3	4.6	4.7	4.2	2.5
June	5.0 mg/L	4.9	4.9	4.8	4.4	3.2
July	5.0 mg/L	4.9	5.1	4.9	4.3	3.7
August	5.0 mg/L	5.2	5.3	5.1	4.5	4.3
September	6.0 mg/L	4.6	4.8	5.0*	4.5	3.6
October	6.0 mg/L	5.1	5.0	6.6*	5.1	5.5

Numbers in **bold** indicate DO readings above the WQO. *Aerator in operation when sample collected.

A comparison of 2009 low DO values from Rough and Ready Island (RRI) against previous years indicates that the severity of the low DO episodes is lessening. Although the water quality objective is still not being met at all times, dissolved oxygen values have improved in the Channel.

Next Steps in the TMDL

Staff has been diligently following the completion of the required studies including the development of the contract for the Downstream Studies. Unfortunately, circumstances outside the control of staff (e.g., funding delays and bond freeze) have caused the Basin Plan Amendment timeline for the reconsideration of the prohibition of discharge, load allocations and implementation provisions to be missed.

Contingency Plan for Studies. Bond sales have resumed since the December 2008 freeze and staff is hopeful that the Downstream Studies will be funded before the end of the 2009 fiscal year. However, if funding has not been made available by the end of the fiscal year then staff proposes to investigate the use of other measures to get the studies completed by the non-point and point sources such as issuing 13267 letters and/or modifying WDRs and NPDES permits as directed in the Basin Plan Amendment. In the event that Proposition 13 funding becomes available before other funding measures have been implemented during the 2010 fiscal year, staff will pursue the completion of the studies using bond funds since both the Interagency Agreement and contract are already approved and ready to be executed.

Contingency Plan for Prohibition. Another issue is the looming prohibition of discharge in January 2012. As discussed, if the studies are not complete by 2012 (which is most likely), and the TMDL remains as it is now, it appears that the prohibition of discharge will go into effect, if triggered. Staff will schedule a stakeholder meeting in early 2010 to discuss two specific issues: how stakeholders intend to comply with the prohibition of discharge and if a Basin Plan Amendment should be initiated to make changes to the Control Program.

Responsible parties need to evaluate their options on how to respond to the prohibition of discharge. These parties may choose to execute a funding agreement to operate the aerator to help avoid violations of the DO objective. However, no matter what option(s) stakeholders choose, staff needs to understand how the stakeholders are planning to comply with the prohibition of discharge.

Another issue that will be discussed at the stakeholder meeting is if the Control Program should be modified or not. Staff will evaluate input provided and will determine if a CEQA scoping meeting should be scheduled.

Some of the alternatives that could be proposed at a CEQA scoping meeting would be to make no changes to the Basin Plan or initiating a Basin Plan Amendment to revise the Control Program. Options could be to change dates related to the delayed completion of the studies and/or revise the Control Program with interim allocations based solely on the information obtained from the Upstream Studies. Staff's caveat is that basin planning can be a lengthy process. Even if a Basin Plan Amendment is initiated, it may take several years, and thus may not be completed before the prohibition of discharge goes into effect. Thus, it is important for responsible parties to take a two pronged approach, including actions so that they will be able to comply with the prohibition.

The low DO problem has always been a very broad and far reaching issue, thus stakeholders may contribute other ideas at our stakeholder meeting(s) on the best course of action they may be willing to take to address the upcoming prohibition of discharge and compliance with the Control Program.