

ITEM:	6
SUBJECT:	Amendments to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins for the Control of Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel
BOARD ACTION	Consideration of a Resolution to Adopt Proposed Basin Plan Amendment
BACKGROUND	<p>The proposed Basin Plan Amendment is based upon the approach presented at the 23 April 2004 workshop with additional modifications made in response to scientific peer review, public, and Regional Board comments. The proposed amendment and the <i>Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC)</i> contained therein have the following elements:</p> <ul style="list-style-type: none"> • Total Maximum Daily Load (TMDL), which includes apportioning of responsibility to the three causative factors and allocations of oxygen demanding substances and their precursors • Conditional prohibition of discharge • Requirements for completion of scientific studies needed to identify and quantify the impact of sources of oxygen demanding substances and their precursors • Recommendations to agencies responsible for DWSC geometry and reduced DWSC flow to address the impact of existing and future projects on the dissolved oxygen impairment • Estimates of costs to comply with the control program <p>The preface to the 24 May 2004 Draft Final Staff Report, describing changes made since the 23 April 2004 Draft, and the first two sections of the staff report, including the proposed Basin Plan language, are attached. The full staff report and appendices are available on our web site at: http://www.swrcb.ca.gov/rwqcb5/programs/tmdl/sjr_do/index.html</p> <p>Implementation of the TMDL is phased to allow time for: i) control measures to be implemented to address the impacts of DWSC geometry and reduced DWSC flow, and ii) studies to be conducted to better understand the sources and linkages of oxygen demanding substances and their precursors to the dissolved oxygen impairment. This Basin Plan Amendment includes a conditional prohibition of discharge for oxygen demanding substances and their precursors, effective December 2011, to address any remaining impairment. Based on the outcome of control measures and studies, however, the Regional Board will reconsider the terms of this prohibition and control program by December of 2009.</p>
ISSUES	Following is a summary of significant changes from the April 2004 draft report incorporated into the proposed Basin Plan language and the 24

May 2004 Draft Final Staff Report:

- A prohibition of discharge was added, conditioned upon attainment of minimum flows and dissolved oxygen objectives, applicable if the discharge is not subject to other regulations implementing the control program. This satisfies the Regional Board's obligation to address the impairment by controlling discharges, while at the same time, allowing time to implement measures to address non-load related contributing factors before implementing the prohibition.
- The concept of net oxygen demand has been clarified and apportioning of responsibility has been stated alternately as responsibility for reducing excess net oxygen demand (ENOD). This change addressed numerous comments received from dischargers of oxygen demanding substances and their precursors.
- Per Regional Board authority under Porter Cologne, Section 13267, the U.S. Army Corps of Engineers will be required to submit a technical report that identifies and quantifies the DWSC impacts on dissolved oxygen.
- The load allocation to non-point sources was reduced from 70 to 60 percent of the total loading capacity to allow for a 10 percent reserve for unknown sources and impacts, and known or new sources that have insignificant impact. This reserve provides not only for uncertainties and cumulative insignificant impacts, it also allows for, and controls the impact of growth on the impairment.
- Dates by which various actions must be taken have been appended to proposed Basin Plan language.

Based on prior work performed by the Dissolved Oxygen TMDL Steering Committee and in response to the ongoing development of this TMDL and the control program in the proposed Basin Plan Amendment, a number of responsible parties have already begun developing a plan of specific actions to address the dissolved oxygen impairment. These parties, however, have expressed concern that the proposed TMDL and control program are premature and should not be adopted before stakeholder plans are implemented. The phased TMDL approach in the proposed Basin Plan Amendment specifically allows time for the development and execution of such plans. Regional Board staff therefore believes that the Basin Plan Amendment, adopted as proposed, will provide the ongoing regulatory incentive to ensure continued progress to fix the long-standing dissolved oxygen impairment in the DWSC.

Mgmt. Review _____
Legal Review _____

**8 July 2004, Central Valley Regional Water Quality Control Board Regular Meeting
1001 I Street, Sacramento, CA 95814**

Preface

This version of the staff report incorporates changes to the April 2004 *Public Review Draft Staff Report* in response to: peer reviewer comments; written comments received prior to 14 May 2004; and oral comments made at a 23 April 2004 information workshop before the Central Valley Regional Water Quality Control Board. Following is a summary of the changes made from the April 2004 *Public Review Draft Staff Report*. Changes have been made throughout the staff report. Emphasis however, has been placed here on summarizing the changes made to the proposed Basin Plan language:

- Prohibition of Discharge- A conditional prohibition that is tied to attainment of objectives and minimum flows. The changes were made to the proposed Basin Plan language and in section 4.6 of the staff report.
- Excess Net Oxygen Demand- The concept of net oxygen demand has been clarified and apportioning of responsibility has been stated alternately as responsibility for reducing excess net oxygen demand (ENOD). The changes were made to the proposed Basin Plan language and in section 4.4 of the staff report.
- Allocations- The load allocation to non-point sources was reduced from 70 percent to 60 percent of the total loading capacity to allow for a 10 percent reserve for unknown sources and impacts, and known or new sources, which have insignificant impact. The changes were made to the proposed Basin Plan language and in section 4.5 of the staff report.
- Redundant Basin Plan Language Removed- Items previously numbered 4, 5, and 6 have been removed from the *Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC)* (Control Program) in the proposed Basin Plan language because the language was already noted for inclusion in other portions of the Basin Plan.
- Completion of Studies- Items 1 and 2 in the Control Program portion of the proposed Basin Plan language in the of the April 2004 *Public Review Draft Staff Report* have been consolidated into one action item in the revised Basin Plan Language.
- Waste Load Allocations- Explicit waste load allocations for existing and new point sources are described in a new item 2 in the Control Program portion of the proposed Basin Plan language.
- Requirements for Water Quality Certifications- Explicit requirements regarding projects that require a Clean Water Act Section 401 Water Quality Certification have been moved from the *Control Action Considerations of the Central Valley Regional Water Board* section to a new item 3 in the Control Program portion of the proposed Basin Plan language.
- Requirements for U.S. Army Corps of Engineers- The U.S. Army Corps of Engineers will be required to submit a technical report that identifies and quantifies the DWSC impacts on dissolved oxygen. The changes were added to a new item 4 in the Control Program portion of the proposed Basin Plan language and in section 4.6.4 of the staff report.
- Compliance Dates- Dates by which various actions need to be taken have been appended to proposed Basin Plan language in the Control Program.

- Other Dates- Item 3 in the proposed Basin Plan language of the April 2004 *Public Review Draft Staff Report* has been revised as a new item 6 to include a date by which allocations and implementation provisions of the Control Program will be reviewed.
- Maximum Allowable Level- Item 8 of the Control Program has been added to indicate that the established allocations and implementation provisions represent a maximum allowable level for the purpose of addressing the dissolved oxygen impairment only.
- Economics- The economic analysis in section 5.5 of the staff report has been updated, as has the summary of costs presented in the proposed Basin Plan language to account for changes in the Control Program.
- Other minor changes- A number of other minor changes have been made to the proposed Basin Plan language and throughout the staff report.

The *April 2004 Public Review Draft Staff Report* was preceded by a March 2004 draft, which was submitted for technical peer review to faculty at the University of California, Berkeley

This report provides the technical and policy basis for a Central Valley Regional Water Quality Control Board hearing to consider adoption of this control program.

Acknowledgements

We wish to acknowledge the following people and organizations for their contribution to the technical basis for this report:

- Chris Foe, with the Central Valley Regional Water Quality Control Board, for initiating and guiding the DO TMDL stakeholder process and much of the technical work underlying this report.
- The numerous members of the Dissolved Oxygen TMDL Steering Committee, for the extensive time and resources that went into overseeing the technical studies and development of their TMDL implementation plan.
- The numerous individual investigators who worked and collaborated on the completed and ongoing studies into the sources and linkages of the dissolved oxygen impairment.
- The California Bay-Delta Authority (formerly CALFED) for their past and pending financial and administrative support for many of the technical studies.
- The University of California, Davis, Department of Land Air and Water Resources for their technical support and generous access to pre-published data.

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1 Introduction

1.1 Executive Summary

This draft final staff report supports a Central Valley Regional Water Quality Control Board (CVRWQCB) hearing to be held at their regularly scheduled meeting on July 8 or 9, 2004.

Background

The San Joaquin River experiences regular periods of low dissolved oxygen (DO) concentrations in the first few miles of the Stockton Deep Water Ship Channel (DWSC) downstream from the City of Stockton. These conditions often violate the water quality objectives for DO in the DWSC as contained in the *Water Quality Control Plan for the Central Valley-Sacramento River and San Joaquin River Basins* (Basin Plan). In January 1998, the State Water Resources Control Board (SWRCB) first adopted a Clean Water Act (CWA) Section 303(d) list that identified this impairment and ranked it as a high priority for correction.

Inclusion on this list initiated the need under the CWA for the CVRWQCB to develop a Total Maximum Daily Load (TMDL) that identifies the factors contributing to the DO impairment and apportions responsibility for correcting the problem. It also initiated the need under the Porter-Cologne Water Quality Control Act to develop a program of implementation for the TMDL consisting of actions that the CVRWQCB will take to implement this TMDL and to bring the impaired reach of the DWSC into compliance with the Basin Plan DO objectives. The TMDL and program of implementation must be incorporated as an amendment to the Basin Plan to satisfy both of these requirements. In addition, the SWRCB Water Right Decision 1641 instructed the CVRWQCB to develop a TMDL for this impairment before they would take further water rights actions to implement the DO water quality objectives.

This staff report provides the technical and policy foundation for a proposed amendment to the Basin Plan needed to incorporate the San Joaquin River DO TMDL and a program of implementation. It also documents the process by which the TMDL and program of implementation were developed in compliance with the California Environmental Quality Act (CEQA) and other applicable state and federal laws and policies. This draft Basin Plan amendment includes the findings and policies described below.

Total Maximum Daily Load and Apportioning

A number of studies performed in recent years have identified three main factors contributing to this DO impairment:

- 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 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 impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.

The capacity of the DWSC to assimilate oxygen demand exerted by incoming loads of oxygen demanding substances is a function of flow rate through the DWSC and temperature. Based on equitability and other considerations, this TMDL apportions loading capacity (pounds of oxygen demand exerted in the DWSC per day) less a margin of safety in equal amounts to each of the three main contributing factors. A forty percent margin of safety is imposed on the total loading capacity to account for flow measurement error and technical uncertainty. The responsibility for reducing the excess net oxygen demand exerted in the DWSC is also apportioned equally to the three main contributing factors.

Wasteload and Load Allocations

Thirty percent of the loading capacity apportioned to sources of oxygen demanding substances is allocated as a wasteload allocation to the City of Stockton Regional Wastewater Control Facility (RWCF). Sixty percent of the loading capacity apportioned to sources of oxygen demanding substances is allocated as a load allocation to non-point sources of algae and its precursors upstream of the DWSC. Ten percent is allocated as a reserve for unknown sources and impacts, and known or new sources that have insignificant impact, including waste load allocations for point sources (other than the RWCF) set at their corresponding effluent limitations applicable on 12 July 2004. The following figure summarizes the apportioning and allocations of loading capacity and responsibility for addressing excess net oxygen demand.

Loading Capacity and Responsibility	40 % Margin of Safety (to account for uncertainty in linkages and flow measurement)	
	20% Flow (to account for factors that reduce flow)	
	20 % Channel Geometry (to account for geometry of the Stockton Deep Water Ship Channel)	
	20 % Loads	30 % Waste Load Allocation for City of Stockton Regional Wastewater Control Facility
		60 % Load Allocation as a gross allotment to non-point sources of algae and its precursors
10% Reserve for unknown or insignificant impacts		

Although there is adequate scientific understanding to support a general apportionment of loading capacity to the three main contributing factors, there is inadequate understanding at this time to support more detailed wasteload or load allocations to specific point and non-point sources of oxygen demanding substances and their precursors.

Actions Addressing Sources of Oxygen Demanding Substances and their Precursors

To address loads of oxygen demanding substances and their precursors, this proposed Basin Plan Amendment will require completion of the scientific studies needed to obtain the information for more detailed allocations and eventual implementation of alternate measures by those responsible for the various sources. This will be achieved by the CVRWQCB taking the following actions:

- Require submission of a study plan from entities responsible for the various sources of oxygen demand by February 2005. Studies must identify: i) sources of oxygen demanding substances, ii) their transformation between sources and DWSC, and iii) their conversion to oxygen demand in the DWSC by December 2008
- Issue California Water Code (CWC) Section 13267 letters, Waste Discharge Requirements, or NPDES permits, as needed, to require completion of required studies
- A conditional prohibition of discharge is tied to the attainment of dissolved oxygen objectives and minimum flows that will assure that the needed additional studies are conducted and that increased discharges of oxygen demanding substances and their precursors are identified and restricted until they can be addressed by detailed allocations.
- The Regional Board will review allocations and implementation provisions based on the results of the oxygen demand and precursor studies and the prevailing dissolved oxygen conditions in the DWSC by December 2009

Actions Addressing Non-Load Related Contributing Factors

The two non-load related contributing factors (DWSC geometry and reduced flows through the DWSC) are not loads of a substance for which mass or concentration limits can be assigned. Instead, these factors reduce the capacity of the DWSC to assimilate loads of oxygen demanding substances (loading capacity).

The following actions are proposed to ensure that alternate measures are implemented to reduce the impact of DWSC geometry on loading capacity to less than the amount apportioned to this factor in the TMDL. The proposed Basin Plan amendment will:

- Require future projects that increase the cross-sectional area of the DWSC geometry to evaluate and fully mitigate potential impacts on oxygen demand loading capacity in the DWSC when obtaining CWA Section 401 Water Quality Certifications
- Require, pursuant to California Water Code § 13267, the United States Army Corps of Engineers to evaluate their impacts on the impairment
- Recommend that the United States Army Corps of Engineers reduce the impacts of the existing DWSC geometry on net oxygen demand loading capacity to an amount less than that apportioned to DWSC geometry

The following actions are proposed to ensure that measures are implemented to reduce the impact of activities that reduce flow through the DWSC on oxygen demand loading capacity to less than the amount apportioned to these factors in the TMDL. The proposed Basin Plan amendment will recommend:

- SWRCB should consider amending current water right permits for activities that reduce flow through the DWSC to require that impacts on oxygen demand loading capacity be evaluated and reduced to less than the amount apportioned to reduced flow in the TMDL
- SWRCB should consider requiring evaluation and full mitigation of the potential impacts of future water right permits or water transfer applications on reduced flow and oxygen demand loading capacity in the DWSC
- Agencies responsible for existing water resources facilities projects in the watershed that potentially reduce flow through the DWSC should evaluate and reduce the impacts to less than the amount apportioned to reduced flow in the TMDL
- Agencies responsible for future water resources facilities projects in the watershed that potentially reduce flow through the DWSC, and that are not otherwise subject to CWA Section 401 Water Quality Certifications, should evaluate and fully mitigate the potential impacts of their projects on oxygen demand loading capacity in the DWSC

1.2 Organization of Basin Plan Amendment Staff Report

This Basin Plan Amendment staff report begins with a presentation of the proposed Basin Plan language changes for incorporating the TMDL and program of implementation and a discussion of how it relates to applicable CVRWQCB and SWRCB policies. This is followed by a more detailed description of the different elements of the TMDL and program of implementation, and ends with documentation of the process by which the conclusions of this report were reached in compliance with the California Environmental Quality Act and other applicable laws and policies. The report is organized into the following eight sections:

- Section 1 provides an executive summary of the Basin Plan Amendment and outlines the organization of this staff report.
- Section 2 begins with a summary of the proposed changes to the various Basin Plan chapters, followed by specific wording modifications to the Basin Plan language.
- Section 3 provides a review of the existing CVRWQCB and SWRCB policies that pertain to this Basin Plan amendment.
- Section 4 provides a detailed presentation of the TMDL elements and the preferred alternative approach for wasteloads and load allocations and a program of implementation for the TMDL.
- Section 5 provides a description of the alternatives analysis process followed by some technical and economic analysis of the preferred alternative.
- Section 6 contains documentation of the required functionally equivalent CEQA review.
- Section 7 provides a description of public participation in the CEQA review process.
- Section 8 provides a bibliography of citations to reports and literature used in this report.

2 Proposed Amendments to the Basin Plan

2.1 Summary of Proposed Amendments

The purpose of this Basin Plan amendment is to update the Basin Plan to incorporate a TMDL and program of implementation addressing the DO impairment in the San Joaquin River. The Basin Plan amendment staff report presents the needed Basin Plan language (revisions, deletions, and/or additions in strikeout underline mode) in Section 2.2. The Basin Plan consists of five chapters. The proposed Basin Plan amendment consists of additions and modifications to only Chapters IV.

The Porter-Cologne Water Quality Control Act requires that basin plans consist of beneficial uses, water quality objectives and a program of implementation for achieving those water quality objectives [CWC Section 13050(j)]. Chapter IV of the Basin Plan describes considerations and specific actions the CVRWQCB will take to implement the water quality objectives. A number of proposed changes to this chapter of the Basin Plan are summarized below under the headings where they appear in the Basin Plan. The specific Basin Plan language revisions are presented in Section 2.2. and describe specific actions the CVRWQCB will take to implement the DO TMDL.

The Nature of Control Actions Implemented by the Regional Water Board

This section of Chapter IV includes two subsections that describe the SWRCB and CVRWQCB policies, agreements, prohibitions, guidance, and other restrictions or requirements to which CVRWQCB implementation actions must conform.

Under the heading entitled "*Control Action Considerations of the State Water Board*" this Basin Plan amendment proposes to add a description of Water Right Decision 1641, which was adopted in December 1999 and revised in March 2000 by SWRCB Order WR 2000-02. Also included is a brief statement describing how Water Right Decision 1641 directed the CVRWQCB to prepare a TMDL before the SWRCB would take any further water rights action to implement the DO objectives.

Under the heading entitled "*Control Action Considerations of the Central Valley Regional Water Board*" and subheading "*Regional Water Board Prohibitions*", this Basin Plan amendment proposes to add a prohibition of discharge that is conditioned upon attainment of dissolved oxygen objectives in the DWSC and minimum flows in the DWSC portion of the San Joaquin River in the vicinity of Stockton.

Actions Recommended for Implementation by Other Entities

Consistent with the Porter-Cologne Water Quality Control Act, the Basin Plan may identify control actions recommended for implementation by agencies other than the CVRWQCB [Water Code Section 13242(a)].

The heading "*Recommended for Implementation by the State Water Board*" contains recommendations to the SWRCB about specific water quality and water rights actions that would assist in the implementation of the water quality objectives in the Basin Plan. This Basin Plan amendment is adding two items under this subheading, which recommend that the State Water

Board: 1) consider amending water right permits for existing activities that reduce flow through the DWSC to require that the associated impacts on net oxygen demand loading capacity be evaluated and their impacts reduced to less than the amount apportioned to flow impacts; and 2) consider requiring evaluation and full mitigation of the potential impacts of future water right permits or water transfer applications on reduced flow and net oxygen demand loading capacity in the DWSC.

The heading "*Recommended for Implementation by Other Agencies - Water Resources Facilities*" contains recommendations for other agencies to consider as part of their planning and operation of various water resources facilities in the Sacramento and San Joaquin River basins. This Basin Plan amendment adds an item under this subheading recommending that all federal, state, and local agencies responsible for water resources facilities, which may reduce flow through the DWSC, evaluate and: 1) reduce the impact of existing water resources projects on net oxygen demand loading capacity in the DWSC to less than the amount apportioned to the reduced flow contributing factor; and 2) fully mitigate the potential impact of future water resources projects on net oxygen demand loading capacity in the DWSC.

This Basin Plan amendment adds a new subheading entitled *Stockton Deep Water Ship Channel* under the heading "*Recommended for Implementation by Other Agencies.*" This new item recommends that the United States Army Corps of Engineers reduce the impact of the DWSC geometry on DO conditions in the DWSC to less than the amount apportioned to that contributing factor in the TMDL.

Actions and Schedule to Achieve Water Quality Objectives

This heading under Chapter IV provides a description of specific actions the CVRWQCB will implement to achieve the Basin Plan Water Quality Objectives. This Basin Plan amendment is adding a new subheading entitled "*Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC).*" Numerous items will be added under this subheading to provide necessary background and to describe the TMDL and specific actions that make up the program of implementation.

Estimated Costs of Agricultural Water Quality Control Programs and Sources of Financing

Water code section 13141 requires that prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program and identification of sources of funding be included in the Basin Plan. As this Basin Plan amendment involves evaluation of impacts and potential source controls for agricultural discharges, an estimate of costs and a discussion of the potential funding sources are included under the heading "*Estimated Costs of Agricultural Water Quality Control Programs and Sources of Financing*", under a new subheading, "*Control Program for Dissolved Oxygen in the Stockton Deep Water Ship Channel.*"

2.2 Proposed Amendments

The following are the proposed language modifications to the Basin Plan. Deletions are indicated as strike-through text (~~deleted text~~) and additions are shown as underlined text (added text). All italics text (*Notation Text*) is included to locate where the modifications will be made in the Basin Plan.

Under the Chapter IV heading: "Control Action Considerations of the State Water Board" add the following two paragraphs to item #13 page IV-10

In December 1999 the State Water Board adopted, and in March 2000 per Order WR 2000-02 revised, Water Right Decisions 1641. This decision amended certain water rights by assigning responsibilities to water right holders to help meet flow objectives intended to implement the water quality objectives contained in the 1995 Bay-Delta Plan.

Rather than taking any water right action to meet the dissolved oxygen objectives in the 1995 Bay-Delta Plan, the State Water Board directed the Regional Water Board to first prepare a TMDL to achieve the dissolved oxygen objectives and implement it.

Under the Chapter IV heading: "Control Action Considerations of the Central Valley Regional Water Board" and subheading "Regional Water Board Prohibitions", add new paragraph item #7 on page IV-26:

7. Dissolved Oxygen in the Stockton Deep Water Ship Channel(DWSC)

The discharge of oxygen demanding substances or their precursors into waters tributary to the DWSC portion of the San Joaquin River is prohibited after 31 December 2011 when net daily flow in the DWSC portion of the San Joaquin River in the vicinity of Stockton is less than 3,000 cubic feet per second, unless dissolved oxygen objectives in the DWSC are being met.

Any increase in the discharge of oxygen demanding substances or their precursors into waters tributary to the DWSC portion of the San Joaquin River is prohibited after 12 July 2004.

These prohibitions do not apply if the discharge is regulated by a waiver of waste discharge requirements, or individual or general waste discharge requirements or NPDES permits, which implement the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel or which include a finding that the discharge will have no significant negative impact on the dissolved oxygen impairment in the DWSC.

These prohibitions will be reconsidered by the Regional Board by December 2009 based on:

- a) the results of the oxygen demand and precursor studies required in the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel
- b) the prevailing dissolved oxygen conditions in the DWSC

Under the Chapter IV heading: "Recommended for Implementation by the State Water Board" add new sub-heading and items on page IV-28:

Dissolved Oxygen in the Stockton Deep Water Ship Channel (DWSC)

1. The State Water Board should consider amending water right permits for existing activities that reduce flow through the DWSC to require that the associated impacts on net oxygen demand loading capacity be evaluated and their impacts reduced to less than the amount apportioned to the reduced DWSC flow contributing factor in the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.

2. The State Water Board should consider requiring evaluation and full mitigation of the potential impacts of future water right permits or water transfer applications on reduced flow and net oxygen demand loading capacity in the DWSC.

Under the Chapter IV heading: "Recommended for Implementation by Other Agencies" and subheading: "Water Resources Facilities" add new item #3 & #4 on page IV-29:

3. Agencies responsible for existing water resources facilities that reduce flow through the Stockton Deep Water Ship Channel (DWSC) should evaluate and reduce their impacts on net oxygen demand loading capacity in the DWSC to an amount less than that apportioned to the reduced DWSC flow contributing factor in the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.

4. Agencies responsible for future water resources facilities projects, which potentially reduce flow through the DWSC, should evaluate and fully mitigate the potential negative impacts on net oxygen demand loading capacity in the DWSC.

Under the Chapter IV heading: "Recommended for Implementation by Other Agencies" add sub-heading and paragraph item #1 on page IV-30:

Stockton Deep Water Ship Channel (DWSC)

1. The U.S. Army Corps of Engineers should reduce the impacts of the existing DWSC geometry on net oxygen demand loading capacity to an amount less than that apportioned to DWSC geometry per the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.

Under the Chapter IV heading: "Actions and Schedule to Achieve Water Quality Objectives" add a new sub-heading and the following paragraphs beginning on page IV-37:

Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC) (Regional Water Board Resolution No. R5-2004-0xxx)

The purpose of this control program is to implement a dissolved oxygen TMDL to achieve compliance with the Basin Plan dissolved oxygen water quality objectives in the DWSC. The numeric targets for this TMDL are the existing dissolved oxygen water quality objectives.

The dissolved oxygen impairment in the DWSC is caused by the following three main contributing factors:

- 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.
- Geometry of the DWSC that 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 impacts various mechanisms that add or remove dissolved oxygen from the water column, such that net oxygen demand exerted in the DWSC is increased.

For the purpose of this control program, net oxygen demand is defined as the combined impact of all

chemical, biological, and physical mechanisms that add or remove dissolved oxygen from the water column.

This TMDL apportions the net oxygen demand loading capacity (less the margin of safety) in equal amounts to the three main contributing factors. Net oxygen demand loading capacity (LC) is given by the equation:

$$LC = \{DO_{sat} - DO_{obj}\} \times Q_{DWSC} \times 5.4$$

The responsibility for reducing the excess net oxygen demand exerted in the DWSC (plus the margin of safety) is also apportioned equally to the three main contributing factors. Excess net oxygen demand (ENOD) is given by the equation:

$$ENOD = \{DO_{obj} - DO_{meas}\} \times Q_{DWSC} \times 5.4$$

In the above equations DO_{sat} is the saturation dissolved oxygen concentration, which is itself a function of water temperature, in milligrams per liter; DO_{obj} is the applicable Basin Plan dissolved oxygen objective in milligrams per liter; DO_{meas} is the measured dissolved oxygen concentration in the DWSC in milligrams per liter. Q_{DWSC} is the net daily flow rate through the DWSC in cubic feet per second; and 5.4 is a unit conversion factor that provides LC or ENOD, in units of pounds of net oxygen demand per day in the DWSC.

A margin of safety equal to 40% of the total loading capacity will be reserved for flow measurement error and technical uncertainty and not apportioned to any of the factors contributing to the impairment.

One-third of the total loading capacity, less the margin of safety [$1/3 \times (LC - MOS)$], and one-third of the responsibility for of the excess net oxygen demand plus the margin of safety [$1/3 \times (ENOD + MOS)$], is allocated to point and non-point sources of oxygen demanding substances and their precursors in the dissolved oxygen TMDL source area as follows:

- a) 30% as a wasteload allocation for the City of Stockton Regional Wastewater Control Facility.
- b) 60% as a load allocation to non-point sources of algae and/or precursors in the watershed.
- c) 10% as a reserve for unknown sources and impacts, and known or new sources that have insignificant impact.

For the purpose of this control program, non-point source discharges are discharges from irrigated lands.

Irrigated lands are lands where water is applied for producing crops and, for the purpose of this control program, includes, but is not limited to, land planted to row, field, and tree crops, as well as commercial nurseries, nursery stock production, managed wetlands and rice production.

For the purpose of this control program, oxygen demanding substances and their precursors are any substance or substances that consume, have the potential to consume, or contribute to the growth or formation of substances that consume or have the potential to consume oxygen from the water column.

The source area for loads of oxygen demanding substances and their precursors being addressed by this TMDL includes the SJR watershed that drains downstream of Friant Dam and upstream of the confluence of the San Joaquin River and Disappointment Slough, with the exception of the western slope of the Sierra Nevada foothills above the major reservoirs of New Melones Lake on the Stanislaus, Don Pedro Reservoir on the Tuolumne, Lake McLure on the Merced, New Hogan Reservoir on the Calaveras, Comanche Reservoir on the Mokelumne, and those portions of the SJR watershed that fall within Mariposa, Tuolumne, Calaveras, and Amador Counties.

Measures will also need to be implemented to reduce the impact of both the DWSC geometry and reduced flow through the DWSC to less than one-third each of the total loading capacity (less the margin of safety).

The Regional Water Board will take the following actions, as necessary and appropriate, to implement this TMDL:

1. The Regional Water Board will use its authority under California Water Code § 13267 (or alternately by Waste Discharge Requirements and NPDES permits) to require that entities responsible for point and non-point sources of oxygen demanding substances and their precursors within the TMDL source area perform the following studies by December 2008. These studies must identify and quantify:
 - a) sources of oxygen demanding substances and their precursors in the dissolved oxygen TMDL source area
 - b) growth or degradation mechanisms of these oxygen demanding substances in transit through the source area to the DWSC

- c) the impact of these oxygen demanding substances on dissolved oxygen concentrations in the DWSC under a range of environmental conditions and considering the effects of chemical, biological, and physical mechanisms that add or remove dissolved oxygen from the water column in the DWSC

A study plan describing how the above will be addressed must be submitted to Regional Water Board staff by February 2005. The study plan and studies may be conducted by individual responsible entities or in collaboration with other entities.

2. The Regional Board establishes the following waste load allocations:
 - a) The waste load allocations of oxygen demanding substances and their pre-cursors for all NPDES-permitted discharges, except for the City of Stockton Regional Wastewater Control Facility, are initially set at the corresponding effluent limitations applicable on 12 July 2004.
 - b) Waste load allocations and permit conditions for new or expanded point source discharges in the SJR Basin upstream of the DWSC, including NPDES and stormwater, will be based on the discharger demonstrating that the discharge will have no significant negative impact on the dissolved oxygen impairment in the DWSC.
3. The Regional Water Board will require any project that requires a Clean Water Act Section 401 Water Quality Certification from the Regional Water Board, and that has the potential to impact dissolved oxygen conditions in the DWSC, to evaluate and fully mitigate those impacts. This includes, but is not limited to:
 - a) Future projects that increase the cross-sectional area of the DWSC
 - b) Future water resources facilities projects that reduce flow through the DWSC
4. The Regional Water Board will require, pursuant to California Water Code § 13267, the United States Army Corps of Engineers to submit by 31 December 2006 a technical report identifying and quantifying:
 - a) the chemical, biological, and physical mechanisms by which loads of substances

- into, or generated within the DWSC, are converted to oxygen demand
- b) the impact that the Stockton Deep Water Ship Channel has on re-aeration and other mechanisms that affect dissolved oxygen concentrations in the water column
5. The Regional Water Board may consider alternate measures, as opposed to direct control, of certain contributing factors if these measures adequately address the impact on the dissolved oxygen impairment and do not degrade water quality in any other way.
6. The Regional Board will review allocations and implementation provisions based on the results of the oxygen demand and precursor studies and the prevailing dissolved oxygen conditions in the DWSC by December 2009.
7. The Regional Water Board will require compliance with waste load allocations and load allocations for oxygen demanding substances and their precursors, and development of alternate measures to address non-load related factors by 31 December 2011.
8. The established allocations and implementation provisions represent a maximum allowable level for the purpose of addressing the dissolved oxygen impairment in the DWSC. The Regional Board may take other, more restrictive, actions affecting the contributing factors to this impairment as needed to protect other beneficial uses or to implement other water quality objectives.

Under the Chapter IV heading: "Estimated Costs of Agricultural Water Quality Control Programs and Potential Sources of Financing" add new sub-heading and items on page IV-38:

San Joaquin River Dissolved Oxygen Control Program

The Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel (DWSC) requires agricultural and municipal dischargers to perform various studies. The total estimated cost of the studies to be performed as part of this control program is approximately \$15.6 million. The preferred alternative also includes a prohibition of discharge if water quality objectives are not achieved by 31 December 2011. The estimated cost to cease discharge of water from irrigated lands ranges from \$95 to \$133 million per year. The estimated cost to provide minimum flows that would remove the need for the prohibition is approximately \$37 million dollars per year to eliminate the impairment through provision of purchased water. The cost of construction of an aeration device of adequate capacity to eliminate the impairment, in conjunction with point source load reductions already required, is estimated to be \$10 million, with yearly operation and maintenance costs of \$200,000 per year.

Potential funding sources:

1. Proposition 13 includes \$40 million in bond funds to address the dissolved oxygen impairment in the DWSC. Approximately \$14.4 million of this \$40 million has been identified to fund the oxygen demanding substance and precursor studies. An additional \$1.2 million is being provided from various watershed stakeholders. Approximately \$24 million of Proposition 13 are available to pay for projects such as the design and construction of an aeration device.

2. The State Water Contractors, Port of Stockton, San Luis and Delta Mendota Water Authority, San Joaquin Valley Drainage Authority, and the San Joaquin River Group Authority have proposed to develop an operating entity for an aeration device and have indicated their commitment to execute a funding agreement among themselves and other interested parties, (subject to ultimate approval of respective governing boards) that would provide the mechanism to support operation of a permanent aerator at a cost expected to be in the annual range of \$250,000 to \$400,000.

Attachment 1: Staff Report Preface, Executive Summary, and Proposed Basin Plan Language from *'Amendments to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins for the Control of Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel'*