

ITEM: 17

SUBJECT: Public Workshop on the Development of a Basin Plan Amendment to Establish a Total Maximum Daily Load (TMDL) for Dissolved Oxygen in the San Joaquin River

BOARD ACTION Discussion and direction for staff

BACKGROUND In the first few miles of the Stockton Deep Water Ship Channel (DWSC) downstream from the City of Stockton, the San Joaquin River experiences regular violations of the water quality objectives for dissolved oxygen (DO) 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) included this impairment on its Clean Water Act (CWA) Section 303(d) list and ranked it as a high priority for correction. To address this impairment, the Central Valley Regional Water Quality Control Board (CVRWQCB) must develop a Total Maximum Daily Load (TMDL) and a program of implementation and incorporate them into the Basin Plan. Also, the SWRCB Water Right Decision 1641 instructed the CVRWQCB to develop a TMDL for this particular impairment.

ISSUES Staff has developed a TMDL and program of implementation that includes the following findings and policies:

Total Maximum Daily Load

A number of studies have identified three main factors contributing to this DO impairment:

- Loads of oxygen demanding substances from upstream sources react by various mechanisms in the DWSC to reduce DO concentrations
- DWSC geometry intensifies the impact of these various reaction mechanisms such that net oxygen demand exerted in the DWSC is increased
- Reduced flow through the DWSC increases the residence time for these various reaction mechanisms, further increasing net oxygen demand exerted in the DWSC

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.

Wasteload and Load Allocations

Thirty percent of the loading capacity apportioned to sources of oxygen demanding substances is allocated as a wasteload to the City of Stockton RWCF, primarily for its discharge of ammonia. Seventy percent of the

loading capacity apportioned to sources of oxygen demanding substances is allocated as a load to sources of algae and its precursors upstream of the DWSC. Current science is insufficient to determine the relative contribution from other wastewater, stormwater, and agricultural sources.

There is also insufficient science at this time to support detailed wasteload or load allocations to specific point and non-point sources of oxygen demanding substances and their precursors. As such, this proposed Basin Plan Amendment implements a phased TMDL that will require completion of the scientific studies needed. 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 Section 13267 letters, General Waste Discharge Requirements, or modifications to NPDES permits, as needed, to require completion of required studies
- Develop more detailed wasteload and load allocations to sources of oxygen demanding substances and their precursors, based on the information obtained from these studies

#### 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 mitigation 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
- Recommend that agencies responsible for existing DWSC geometry evaluate and mitigate the impact on oxygen demand loading capacity to an amount less than that apportioned to these factors in the TMDL

The following actions are proposed to ensure that mitigation 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 amend current water right permits for activities that reduce flow through the DWSC to require that impacts on oxygen demand loading capacity be evaluated and mitigated to less than the amount apportioned to those factors in the TMDL
- SWRCB should require 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 mitigate impacts on oxygen demand loading capacity to less than that apportioned to those factors 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

The staff report for this informational CVRWQCB workshop provides the technical, policy, and CEQA documentation for the proposed amendment to the Basin Plan needed to incorporate this TMDL and phased program of implementation. The first two sections of the staff report, including the proposed Basin Plan language, are attached. The full staff report can be accessed on the CVRWQCB website at: [http://www.swrcb.ca.gov/rwqcb5/programs/tmdl/sjr\\_do/index.html](http://www.swrcb.ca.gov/rwqcb5/programs/tmdl/sjr_do/index.html)

The CVRWQCB will consider a resolution to adopt these proposed modifications (including any changes resulting from comments received at this workshop) at a subsequent public hearing at a regularly scheduled CVRWQCB meeting.

Mgmt. Review \_\_\_\_\_  
Legal Review \_\_\_\_\_

**22/23 April 2004**  
**Central Valley Regional Water Quality Control Board, Sacramento Office**

## **1. Introduction**

### **1.1. Executive Summary**

This draft staff report has been prepared in support of a Central Valley Regional Water Quality Control Board (CVRWQCB) workshop to be held at their regularly scheduled meeting on April 22 or 23, 2004. The report is a draft description of what will be proposed for adoption at a subsequent public hearing before the CVRWQCB, tentatively scheduled for July 8 or 9, 2004. Staff will make any needed revisions to this draft report and basin plan amendment in response to comments from peer reviewers and the public, prior to consideration for adoption of a revised version of this report. The revised report and proposed BPA will be made available for further public comment prior to the public hearing before the CVRWQCB.

#### 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) 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 phased 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

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 react by various mechanisms in the DWSC to reduce DO concentrations

- DWSC geometry intensifies the impact of these various reaction mechanisms such that net oxygen demand exerted in the DWSC is increased
- Reduced flow through the DWSC increases the residence time for these various reaction mechanisms, further increasing net oxygen demand exerted in the DWSC

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.

#### Wasteload and Load Allocations

As proposed, thirty percent of the loading capacity apportioned to sources of oxygen demanding substances is allocated as a wasteload to the City of Stockton RWCF. Seventy percent of the loading capacity apportioned to sources of oxygen demanding substances is allocated as a load to sources of algae and its precursors upstream of the DWSC. Current science is insufficient to determine the relative contribution from other wastewater, stormwater, and other agricultural sources.

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 detailed wasteload or load allocations to specific point and non-point sources of oxygen demanding substances and their precursors. As such, this proposed Basin Plan Amendment implements a phased TMDL that will require completion of the scientific studies needed to obtain the information needed for more detailed allocations and eventual implementation of mitigation 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, General Waste Discharge Requirements, or modifications to NPDES permits, as needed, to require completion of required studies
- Develop more detailed wasteload and load allocations to sources of oxygen demanding substances and their precursors, based on the information obtained from these studies

#### 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 mitigation 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
- Recommend that agencies responsible for existing DWSC geometry evaluate and mitigate the impact on oxygen demand loading capacity to an amount less than that apportioned to these factors in the TMDL

The following actions are proposed to ensure that mitigation 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 amend current water right permits for activities that reduce flow through the DWSC to require that impacts on oxygen demand loading capacity be evaluated and mitigated to less than the amount apportioned to those factors in the TMDL
- SWRCB should require 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 mitigate impacts on oxygen demand loading capacity to less than that apportioned to those factors 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

This staff report is in support of an informational CVRWQCB workshop only. The CVRWQCB will consider a resolution to adopt these proposed modifications (including any changes resulting from public comments) at a subsequent public hearing at a regularly scheduled CVRWQCB meeting.

## **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 begins with a description of the alternatives analysis process that was used for selecting the preferred alternative 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 involved in the CEQA review process.
- Section 8 provides a bibliography of citations to reports and literature used in this report.

**This staff report is in support of an informational workshop only and does not propose specific action to be taken by the CVRWQCB at this time.**

## **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) and information to support these changes.

The Basin Plan consists of five chapters. The proposed Basin Plan amendment consists of additions and modifications to Chapters 4 and 5 only. This section provides a summary of the proposed amendments to the Basin Plan in the order in which they appear in the Basin Plan. The proposed language modifications are presented in ~~strikeout~~, underline mode in Section 2.2.

#### **Basin Plan Chapter I: Introduction**

Chapter I of the Basin Plan contains a description of the planning area and the major hydrologic features of the basin. The Basin Plan area is subdivided into two major watershed delineations: the Sacramento River and the San Joaquin River watersheds.

This Basin Plan amendment does not propose any modifications, deletions, or additions to Chapter I of the Basin Plan.

## **Basin Plan Chapter II: Existing and Potential Beneficial Uses**

The Basin Plan designates beneficial uses for specific water bodies in the Sacramento and San Joaquin River drainage basins. Beneficial use designations determine the level of protection that a water body receives since water quality objectives must be set to protect the most sensitive beneficial uses.

This Basin Plan amendment does not propose any modifications, deletions, or additions to the designated beneficial uses contained in the current version of the Basin Plan. Those beneficial uses in the DWSC that are impaired by low DO are summarized in Section 4.2

## **Basin Plan Chapter III: Water Quality Objectives**

Water quality objectives are defined in CWC Section 13050(h) as “... *the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.*” In setting water quality objectives the CVRWQCB must consider the requirements of CWC Section 13241, State and federal anti-degradation policies, and other factors. The existing Basin Plan DO water quality objectives applicable to the DWSC are described in further detail in Section 4.2.

No modifications to the Basin Plan DO water quality objectives are proposed as part of this Basin Plan Amendment. If future studies provide information supporting a modification to the DO water quality objectives, a decision can be made by the CVRWQCB at that time as to whether to undertake the Basin Plan amendment that would be required to modify the objectives.

## **Basin Plan Chapter IV: Implementation**

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 changes to this chapter of the Basin Plan are summarized below under the headings where they appear. These changes 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 subheading 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 subheading entitled “*Control Action Considerations of the Central Valley Regional Water Board*” this Basin Plan amendment proposes to add a description of how the CVRWQCB

will require future DWSC and water resources projects, which need CWA Section 401 Water Quality Certifications, to evaluate and fully mitigate the potential impact of these projects on oxygen demand loading capacity in the DWSC.

#### 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)].

Subheading “*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 an item under this subheading, which recommends that the SWRCB use its water rights authority to assign responsibilities for mitigating the impact on oxygen demand loading capacity to existing and future activities that reduce flow through the DWSC.

Subheading “*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 mitigate the impact of proposed and existing water resources projects on oxygen demand loading capacity in the DWSC.

This Basin Plan amendment is adding a new subheading entitled “*Recommended for Implementation by Other Agencies – Stockton Deep Water Ship Channel.*” A new item will be added under this subheading recommending that those agencies responsible for the DWSC geometry evaluate and mitigate its potential impact on DO conditions in the DWSC.

#### 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 sources controls for agricultural discharges, an estimate of costs and a discussion of the potential funding sources are included under a new subheading, entitled “*Control Program for Dissolved Oxygen in the Stockton Deep Water Ship Channel.*”

## **Basin Plan Chapter V: Surveillance and Monitoring**

CWC Section 13242 requires that a program of implementation for achieving water quality objectives include a description of the surveillance to be undertaken to determine compliance with those objectives. For Basin Plan water quality objectives these descriptions are contained in Chapter V. Surveillance and Monitoring.

As described in detail in Section 4.6 of this report, a phased approach is being proposed for this TMDL and program of implementation. This phased approach provides time for additional scientific and modeling studies to improve our understanding of the linkages between the various contributing factors and the DO impairment. This proposed Basin Plan Amendment adds a description of the goals and schedule of the various studies being allowed for by this phased approach under the Special Studies sub-heading of Chapter V.

### **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" add new paragraph item #12 on page IV-21:*

12. 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 Stockton Deep Water Ship Channel (DWSC) must 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.

*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 amend water right permits for existing activities that reduce flow through the DWSC to require that the associated impacts on oxygen demand loading capacity be evaluated and mitigated to less than the amount apportioned to flow impacts in the *Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the DWSC.*
2. The State Water Board should require 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.

*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 mitigate their impacts on oxygen demand loading capacity in the DWSC to less than the amount apportioned to flow factors 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 impacts on 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 evaluate the impacts of the existing DWSC geometry on oxygen demand loading capacity in the DWSC and mitigate these impacts 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 dissolved oxygen TMDL and program of implementation is to achieve compliance with the Basin Plan dissolved oxygen water quality objectives in the DWSC.

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

- Loads of oxygen demanding substances from upstream sources react by various mechanisms in the DWSC to reduce DO concentrations
- The DWSC geometry intensifies the impact of these various reaction mechanisms such that net oxygen demand exerted in the DWSC is increased
- Reduced flow through the DWSC increases the residence time for these various reaction mechanisms, further increasing net oxygen demand exerted in the DWSC

Based on equitability and other considerations, this TMDL apportions total oxygen demand loading capacity, less a margin of safety, in equal amounts to these three main contributing factors.

Loading capacity (LC) is given by the equation:

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

where  $DO_{sat}$  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;  $Q_{DWSC}$  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, in units of pounds of 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, will be allocated to point and non-point sources of oxygen demanding substances and their precursors in the dissolved oxygen TMDL source area as follows:

- 30% as a wasteload allocation for the City of Stockton Regional Wastewater Control Facility
- 70% as a load allocation to sources of algae and/or precursors in the watershed.

Further study of the sources and linkages of oxygen demanding substances and their precursors, however, is required before detailed wasteload and load allocations can be developed for specific sources.

Other point and non-point sources of these substances may also be identified in these studies.

Mitigation 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 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 in Mariposa, Tuolumne, Calaveras, and Amador Counties.

The Regional Water Board will take the following actions to implement this TMDL and attain the Basin Plan dissolved oxygen water quality objectives in the DWSC.

1. Water quality studies must be completed no later than December 2008 by the entities responsible for the various point and non-point sources of oxygen demanding substances and their precursors within the TMDL source area. These studies must identify and quantify:
  - a) Sources of oxygen demanding substances and their precursors
  - b) Growth or degradation mechanisms of these oxygen demanding substances in transit to the DWSC
  - c) The impact of these oxygen demanding substances on dissolved oxygen concentrations in the DWSC
2. The Regional Water Board will use its authority under Porter-Cologne Water Quality Act Section 13267 (or alternately by General Waste Discharge Requirements and NPDES permits) as needed to require that the above studies be completed by December 2008. A study plan describing how the information needs 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.
3. The Regional Water Board will develop detailed wasteload and load allocations to sources of oxygen demanding substances and their precursors, based on the findings of these studies and dissolved oxygen conditions in the DWSC at that time.
  4. As stated in Basin Plan Chapter IV sub-heading “Control Action Considerations of the Central Valley Regional Water Board” 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 Stockton Deep Water Ship Channel (DWSC) must 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
  5. As stated in Basin Plan Chapter IV sub-heading “Recommended for Implementation by the State Water Board”:
    - a) The State Water Board should amend water right permits for existing activities that reduce flow through the DWSC to require that the associated impacts on oxygen demand loading capacity be evaluated and mitigated to less than the amount apportioned to flow factors in this control program.
    - b) The State Water Board should require 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.
  6. As stated in Basin Plan Chapter IV sub-heading “Recommended for Implementation by Other Agencies” the U.S. Army Corps of Engineers should evaluate the impacts of the existing DWSC geometry on oxygen demand loading capacity in the DWSC and mitigate these impacts to an amount less than that apportioned to DWSC geometry in this control program.
  7. As stated in Basin Plan Chapter IV sub-heading “Recommended for Implementation by Other Agencies – Water Resources Facilities”:
    - a) Agencies responsible for existing water resources facilities that reduce flow through the Stockton Deep Water Ship Channel (DWSC) should evaluate and mitigate their impacts on oxygen demand loading capacity in the DWSC to less than the amount apportioned to flow factors in this control program.
    - b) Agencies responsible for future water resources facilities projects that potentially reduce flow through the DWSC should evaluate and fully mitigate the potential impacts on oxygen demand loading capacity in the DWSC.
  8. The Regional Water Board may consider alternate mitigation 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.

*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 dissolved oxygen TMDL and program of implementation requires agricultural and municipal dischargers to perform various studies. The total estimated cost of the studies to be performed as part of the phased TMDL is approximately \$15.6 million.

Although dischargers have the ultimate responsibility for funding these studies, nearly \$14.4 million of funding has been arranged through the California Bay-Delta Authority from Proposition 13 and 50 bond funds. An additional \$1.2 million is being provided from various watershed stakeholders.

The cost of control or mitigation measures that will eventually be required to address the impacts of the various sources of oxygen demanding substances and their precursors cannot be estimated until the studies have been completed and allocations have been established. The costs for compliance with these allocations will be the responsibility of the various dischargers.

Estimating costs for mitigation of existing and future potential impacts from projects that affect DWSC geometry and reduced flow through the DWSC would be speculative until further work on selection of alternative mitigation measures is completed. Construction and operation costs of these mitigation measures would be the responsibility of the facility/project owner

*Under the Chapter V, at the end of heading:  
“Special Studies” add new paragraph and items on  
page V-2:*

As required by the San Joaquin River dissolved oxygen phased TMDL and program of implementation, special studies are required to identify and quantify:

- a) Sources of oxygen demanding substances and their precursors
- b) Growth or degradation mechanisms of these oxygen demanding substances in transit to the DWSC
- c) The impact of these oxygen demanding substances on dissolved oxygen concentrations in the DWSC