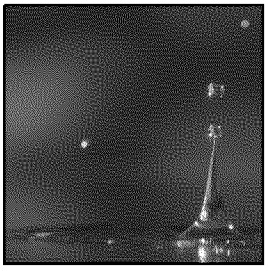

Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

December 13, 2006

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Division of Water Rights
December 2006

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STATE WATER RESOURCES CONTROL BOARD

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

WATER QUALITY CONTROL PLAN

FOR THE
SAN FRANCISCO BAY/
SACRAMENTO-SAN JOAQUIN
DELTA ESTUARY

DECEMBER 13, 2006

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- Numerous interested parties that have provided suggestions and input on draft documents

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2006 - 0098

ADOPTION OF THE AMENDED WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY

WHEREAS:

1. The State Water Resources Control Board (State Water Board) is responsible for the regulation of activities and factors that may affect the quality of the waters of the state. (Wat. Code, §§ 13000, 13001.)

2. The State Water Board has undertaken a proceeding under its water quality authority to amend the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) adopted in 1978 and amended in 1991 and in 1995.

3. The State Water Board commenced this proceeding on September 29, 2006 by issuing a notice of public hearing for Consideration of an Amended Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, to commence on November 13, 2006. The draft amended Bay-Delta Plan and accompanying appendices, including environmental documentation, accompanied the Notice of Public Hearing.

4. Prior to commencing this proceeding, the State Water Board conducted a series of workshops in 2004 and 2005 to receive information on specific topics addressed in the Bay-Delta Plan. The State Water Board sent notice of all workshops to all parties who indicated an interest in receiving notice.

5. The amended Bay-Delta Plan consists of four volumes, including the Plan, Appendix 1 (Plan Amendment Report), Appendix 2 (Referenced Documents), and Appendix 3 (Response to Comments).

6. The amended Bay-Delta Plan was prepared under a program certified at California Code of Regulations, title 14, section 15251(g) as meeting the requirements of Public Resources Code section 21080.5. Accordingly, the amended Bay-Delta Plan with its appendices constitutes adequate environmental analysis to satisfy the requirements of the California Environmental Quality Act (CEQA) at Public Resources Code section 21000, et seq.

7. The State Water Board has considered all of the oral and written comments that were submitted and, in accordance with the State Water Board's regulations (Cal. Code Regs., tit. 23, § 3779), has prepared responses to the comments containing significant environmental points as well as responding to some other comments. The Plan and Appendix 1 of the Plan have been revised in response to the comments received from the interested parties, and Appendix 3 of the Plan has been added to respond to the comments.

8. The Bay-Delta Plan supplements the other water quality control plans that cover the Bay-Delta Estuary. Together they include all necessary elements of water quality control plans in accordance with Water Code sections 13241 and 13242 and federal requirements.

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9. The Bay-Delta Plan will be reviewed periodically in compliance with Water Code section 13240 and federal Clean Water Act section 303(c) (33 U.S.C., § 1313(c).).

10. The amended Bay-Delta Plan will become effective after it is approved by the Office of Administrative Law (OAL). The water quality standards (as defined under the federal Clean Water Act) in the Plan also will be submitted to the U. S. Environmental Protection Agency (U.S. EPA) in accordance with the federal Clean Water Act (33 U.S.C., § 1251, et seq.). To the extent that any water quality standards, as defined, are amended, those standards would require U.S. EPA approval before the amended versions go into effect. In the view of the State Water Board, however, there are no substantive amendments to any water quality standards in the amended Bay-Delta Plan. Other portions of the Bay-Delta Plan, such as the program of implementation, are to be submitted to U.S. EPA as part of the continuing planning process, but do not require approval. The State Water Board does not concede that it is required under the federal Clean Water Act to submit all parts of this Plan to the U.S. EPA for approval. In the view of the State Water Board, the objectives for flow and operations are not subject to U.S. EPA approval, and are provided to U.S. EPA for its consideration as a matter of state/federal comity.

THEREFORE BE IT RESOLVED THAT THE STATE WATER BOARD:

1. Adopts the amended Bay-Delta Plan in accordance with Water Code section 13170, including Appendices 1, 2, and 3.

2. Authorizes the State Water Board staff to submit the amended Bay-Delta Plan to OAL and to U.S. EPA.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on December 13, 2006.

AYE: Tam M. Doduc
Arthur G. Baggett, Jr.
Charles R. Hoppin
Gary Wolff, P.E., Ph.D.

NO: None

ABSENT: None

ABSTAIN: None

Song Her
Clerk to the Board

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TABLE OF CONTENTS

LIST OF APPENDICES iii

LIST OF FIGURES iii

LIST OF TABLES iii

ACRONYMS AND ABBREVIATIONS iv

Chapter I. Introduction 1

A. Background 1

B. Purpose and Applicability 3

C. Legal Authority 4

D. Emerging Issues 5
1. Pelagic Organism Decline 5
2. Climate Change 5
3. Delta and Central Valley Salinity 6
4. San Joaquin River Flows 6

Chapter II. Beneficial Uses 8

Chapter III. Water Quality Objectives 10

A. Water Quality Objectives for Municipal and Industrial Beneficial Uses 10

B. Water Quality Objectives for Agricultural Beneficial Uses 11

C. Water Quality Objectives for Fish and Wildlife Beneficial Uses 11

Chapter IV. Program of Implementation 22

A. Implementation Measures within State Water Board Authority 22
1. Delta Outflow Objective 23
2. River Flows: Sacramento River at Rio Vista 23
3. River Flows: San Joaquin River at Airport Way Bridge, Vernalis 23
4. Export Limits 26
5. Delta Cross Channel Gates Operation 26
6. Salinity Control 26

ED_000733_PSTs_00022282-00007

B. Measures Requiring a Combination of State Water Board Authorities and Actions by Other Agencies 27
1. Southern Delta Agricultural Salinity Objectives 27
2. San Joaquin River Dissolved Oxygen Objective 32
3. Narrative Objective for Salmon Protection 33
4. Narrative Objective for Brackish Tidal Marshes of Suisun Bay 34
5. Numeric Objectives for Suisun Marsh 35

C. Recommendations to Other Agencies 35
1. Review and modify, if necessary, existing commercial and sport fishing regulations 36
2. Reduce illegal harvesting 36
3. Reduce the impacts of introduced species on native species in the Estuary 36
4. Improve hatchery programs for species of concern 37
5. Expand the gravel replacement and maintenance programs for salmonid spawning habitat 37
6. Evaluate alternative water conveyance and storage facilities of the SWP and CVP in the Delta 38
7. Develop an experimental study program on the effects of pulse flows on fish eggs and larvae in the Delta 38
8. Implement actions needed to restore and preserve marsh, riparian, and upland habitat in the Delta 38
9. Suisun Marsh soil and channel water salinity objectives 39
10. San Joaquin River Spring Flow Objectives 40
11. San Joaquin River Pulse Flow Objectives 40

D. Monitoring and Special Studies Program 41

E. Other Studies conducted by agencies that may provide information relevant to future proceedings 45
1. Delta Cross Channel Gate 45
2. Potential New Municipal and Industrial Objectives 45
3. Pelagic Organism Decline 45
4. Suisun Marsh 46

ED_000733_PSTs_00022282-00008

LIST OF APPENDICES

Appendix 1: Plan Amendment Report, Appendix 1 to the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (bound separately)
Appendix 2: Referenced Documents, Appendix 2 to the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (bound separately)
Appendix 3: Response to Comments, Appendix 3 to the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (bound separately)

LIST OF FIGURES

Figure 1: Bay-Delta Estuary……..……...2
Figure 2: Sacramento Valley Water Year Hydrologic Classification……18
Figure 3: San Joaquin Valley Water Year Hydrologic Classification……...19
Figure 4: NDOI and Percent Inflow Diverted……...20
Figure 5: Bay-Delta Estuary Monitoring Stations……48

LIST OF TABLES

Table 1: Water Quality Objectives for Municipal and Industrial Beneficial Uses…..12
Table 2: Water Quality Objectives for Agricultural Beneficial Uses……13
Table 3: Water Quality Objectives for Wildlife and Beneficial Uses……...14
Table 4: Number of Days When Maximum Daily Average Electrical Conductivity of 2.64 mmhos/cm must be Maintained at Specified Location……...21
Table 5: Interim San Joaquin River Pulse Flows Objectives……..……25
Table 6: San Joaquin Valley 60-20-20 Water Year Hydrologic Classification Numeric Indicators……25
Table 7: Water Quality Compliance and Baseline Monitoring……..……43

ED_000733_PSTs_00022282-00009

ACRONYMS AND ABBREVIATIONS

AFRP	Anadromous Fish Restoration Program
Board	State Water Resources Control Board
BOD	Biochemical Oxygen Demand
BPA	Basin Plan Amendment
CALFED	aka California Bay Delta Authority
CALFED OPS	CALFED Water Operations Management Team
CBDA	California Bay Delta Authority
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DBP	Disinfection by-product
DCC	Delta Cross Channel
DFG	California Department of Fish and Game
DO	Dissolved Oxygen
DWR	California Department of Water Resources
DWSC	Deep Water Ship Channel
EC	electrical conductivity
EMP	Environmental Monitoring Program
IEP	Interagency Ecological Program
MAF	million acre-feet
mg/L	milligram(s) per liter
mmhos/cm	millimhos per centimeter
NDOI	Net Delta Outflow Index
NOAA Fisheries	National Marine Fisheries Service
POD	Pelagic Organism Decline
ppt	parts per thousand
Regional Water Board	Regional Water Quality Control Board
ROD	Record of Decision
SDIP	South Delta Improvements Program
SDWA	South Delta Water Agency
SFSU	San Francisco State University
SJRA	San Joaquin River Agreement
SJRGA	San Joaquin River Group Authority
SLDMWA	San Luis Delta-Mendota Water Authority
SMCG	Suisun Marsh Charter Group
SMPA	Suisun Marsh Preservation Agreement
SMSCP	Suisun Marsh Salinity Control Project
SRCD	Suisun Resource Conservation District
SWC	State Water Contractors
SWP	State Water Project
State Water Board	State Water Resources Control Board
TAF	thousand acre-feet
TMDL	Total Maximum Daily Load

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UC DAVIS	University of California Davis
UDWA	Urban Drinking Water Agency
USBR	United States Bureau of Reclamation
USCOE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VAMP	Vernalis Adaptive Management Plan
WQCP	Water Quality Control Plan

References within the text use the above acronyms and abbreviations.

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BAY-DELTA PLAN

Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

Chapter I. Introduction

A. Background

The San Francisco Bay/Sacramento-San Joaquin River Delta Estuary (Bay-Delta Estuary or Estuary) (Figure 1) is important to the natural environment and economy of California. The watershed of the Bay-Delta Estuary provides drinking water to two-thirds of the State's population and water for a multitude of other urban uses, and it supplies some of the State's most productive agricultural areas, both inside and outside of the Estuary. The Bay-Delta Estuary itself is one of the largest ecosystems for fish and wildlife habitat and production in the United States. Historical and current human activities (e.g., water development, land use, wastewater discharges, introduced species, and harvesting), exacerbated by variations in natural conditions, have degraded the beneficial uses of the Bay-Delta Estuary, as evidenced by the declines in populations of many biological resources of the Estuary. Most recently, populations of Delta smelt and other pelagic organisms have exhibited significant declines, leading to investigations as to the possible causes of the degradation of the health of the Delta.

The State Water Resources Control Board (State Water Board) has previously adopted water quality control plans and policies to protect the water quality and to control the water resources that affect the beneficial uses of the Bay-Delta Estuary. These plans and policies were adopted consistent with section 13000 et seq. of the California Water Code and pursuant to the authority contained in section 13170. This plan supersedes the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary adopted in May 1995 (1995 Bay-Delta Plan or 1995 Plan) as well as the preceding plans that the 1995 Plan superseded. The State Water Board periodically will review this plan pursuant to Water Code section 13240 to ensure that it provides reasonable protection for the designated beneficial uses.[1] The State Water Board's measures to implement this plan will consist of the regulation of existing water rights, regulatory measures to protect water quality, and recommendations to other entities.

Appendix 1 of this plan, titled "Plan Amendment Report," explains the State Water Board's considerations in developing this Water Quality Control Plan. Appendix 1 provides the reasoning for any changes to the 1995 Plan, as well the environmental

[1] The federal Clean Water Act, at section 303 (c), also requires a review of federal "standards," as defined in the Act, contained in state water quality control plans. (33 U.S.C. § 1313 (c).) The review under section 13240 ordinarily is combined with a review of any federal standards in a state water quality control plan.

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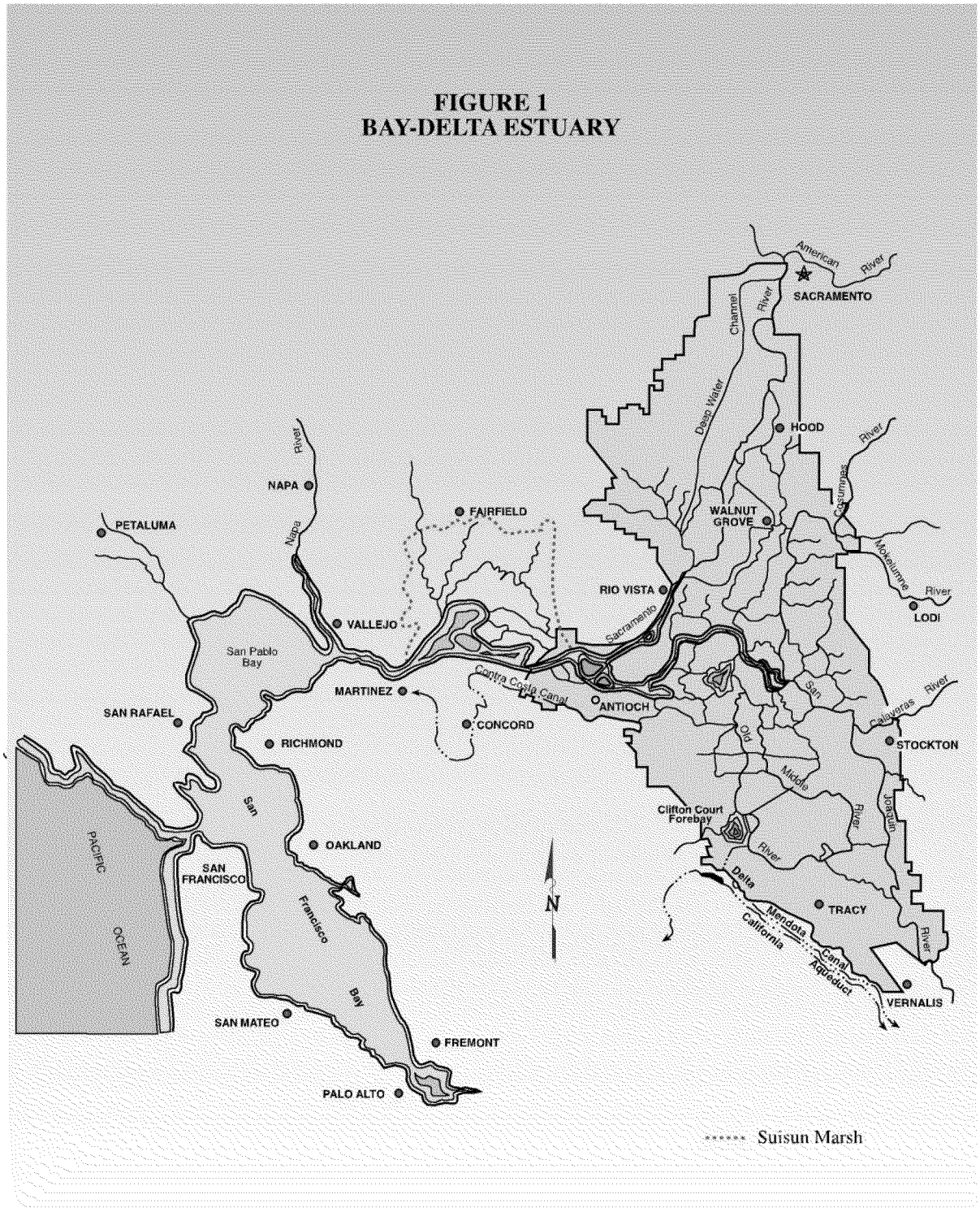
FIGURE 1
BAY-DELTA ESTUARY
American River
SACRAMENTO
Deep Water Channel
HOOD
Cosumnes River
WALNUT GROVE
Mokelumne River
LODI
Napa River
NAPA
PETALUMA
FAIRFIELD
RIO VISTA
Sacramento
VALLEJO
San Pablo Bay
MARTINEZ
Contra Costa Canal
ANTIOCH
CONCORD
SAN RAFAEL
RICHMOND
San Joaquin River
STOCKTON
Old
Middle
Clifton Court Forebay
OAKLAND
SAN FRANCISCO
PACIFIC OCEAN
San Francisco Bay
N
Delta Mendota Canal
California Aqueduct
TRACY
VERNALIS
SAN MATEO
FREMONT
PALO ALTO
Suisun Marsh

analysis for those changes. Documents used to develop this amendment of the 1995 Plan are listed in Appendix 2, titled "Referenced Documents". Appendix 3, titled "Responses to Comments," contains the State Water Board's responses to comments received in conjunction with the public hearing held to solicit feedback on this plan.

B. Purpose and Applicability

This plan establishes water quality objectives for which implementation can be fully accomplished only if the State Water Board assigns some measure of responsibility to water right holders and water users to mitigate for the effects on the designated beneficial uses of their diversions and use of water. Like all water quality control plans, this plan consists of: (1) beneficial uses to be protected; (2) water quality objectives for the reasonable protection of beneficial uses; and (3) a program of implementation for achieving the water quality objectives. Together, the beneficial uses and the water quality objectives established to reasonably protect the beneficial uses are called water quality standards under the terminology of the federal Clean Water Act.

For the geographic area of the Bay-Delta Estuary, this plan is complementary to the other water quality control plans adopted by the State and Regional Water Quality Control Boards (Regional Water Boards) and State policies for water quality control adopted by the State Water Board. This plan provides reasonable protection for the Estuary's beneficial uses that require control of salinity (caused by saltwater intrusion, municipal discharges, and agricultural drainage) and water project operations (flows and diversions). This plan supersedes the regional water quality control plans to the extent of any conflict between this plan and the regional water quality control plans. The other plans and policies establish water quality objectives and requirements for parameters such as toxic chemicals, bacterial contamination, and other parameters which have the potential to impair beneficial uses or cause nuisance.

Most of the objectives in this plan are being implemented by assigning responsibilities to water right holders because the parameters to be controlled are primarily impacted by flows and diversions. This plan, however, is not to be construed as establishing the responsibilities of water right holders. Nor is this plan to be construed as establishing the quantities of water that any particular water right holder or group of water right holders may be required to release or forego to meet the objectives in this plan. The State Water Board will consider, in a future water rights proceeding or proceedings, the nature and extent of water right holders' responsibilities to meet these objectives. If necessary after a water rights proceeding, this plan will be amended to reflect any changes that may be needed to ensure consistency between the plan and the water right decision.

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C. Legal Authority

The State Water Board has prepared this Water Quality Control Plan under the Porter-Cologne Water Quality Control Act. The Regional Water Boards have primary responsibility for formulating and adopting water quality control plans for their respective regions (Wat. Code § 13240), but the State Water Board also is authorized, under Water Code section 13170, to adopt water quality control plans in accordance with the provisions of section 13240 *et seq*[2]. When the State Water Board adopts a water quality control plan, it supersedes regional water quality control plans for the same waters to the extent of any conflict. (Wat. Code § 13170.)

This plan includes an environmental report prepared in compliance with Public Resources Code section 21080.5. The Secretary for Resources has certified the State Water Board's basin planning program as meeting the requirements of Public Resources Code section 21080.5. (Cal. Code Regs. tit. 14, § 15251(g).) Section 21080.5 authorizes state agencies acting under a certified program to assess the environmental effects of their actions within the decision-making document instead of in a separate environmental impact report or negative declaration.

a. <u>Program of Implementation</u>. A program of implementation for achieving water quality objectives shall include, but not be limited to: (1) a description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private; (2) a time schedule for the actions to be taken; and (3) a description of surveillance to be undertaken to determine compliance with the objectives. (Wat. Code, § 13242.)

b. <u>U.S. Environmental Protection Agency Approval of This Plan</u>. After adopting this Water Quality Control Plan, the State Water Board will submit this plan to the U.S. Environmental Protection Agency (USEPA) for approval under the federal Clean Water Act. (33 U.S.C. section 1251 et seq.) To the extent that this plan addresses matters outside the scope of the Clean Water Act, this plan will be provided to the USEPA for its consideration as a matter of State/federal comity. The State Water Board does not concede that it is required under the Clean Water Act to submit all parts of this plan to the USEPA. Assuming the USEPA has authority under the Clean Water Act to approve the objectives for flow and operations, the State Water Board believes that the USEPA could not adopt standards for these parameters under the Clean Water Act.[3] If the USEPA attempted to adopt such standards, it could fundamentally interfere with the State's water allocation authority under section 101(g) of the Clean Water Act.[4]

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[2] The State Water Board also has authority to adopt State policy for water quality control under Water Code section 13140.

[3] The State Water Board reserves its arguments regarding the USEPA's authority to adopt standards for flow and operations, including standards for salinity intrusion. The State Water Board's legal comments regarding the USEPA's authority are set forth in the State Water Board's comments on the USEPA's January 6, 1994 draft standards, which were provided to the USEPA on March 11, 1994.

[4] The Supreme Court, in *PUD No. 1 of Jefferson County v. Washington Dep't of Ecology* (1994) 114 S.Ct. 1900, upheld a state's ability to impose an instream flow requirement under Clean Water Act section 401 to protect fish habitat which had been designated as a beneficial use in a water quality standard under Clean Water Act section 303. In reaching this result, the

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D. Emerging Issues

This Water Quality Control Plan is primarily a planning document that serves to identify the water quality objectives and the beneficial uses to be protected. At the time of this 2006 update to the Plan there are a number of emerging issues that this Plan either does not currently regulate or may not fully regulate because circumstances and scientific knowledge are changing. Those emerging issues are identified here. In addition to the activities described in the *Program of Implementation Chapter*, the State Water Board will immediately begin a process to evaluate and prioritize water quality control planning activities to address the following emerging issues:

1. Pelagic Organism Decline (POD)
2. Climate Change
3. Delta and Central Valley Salinity
4. San Joaquin River Flows

The State Water Board will conduct these planning activities in conjunction with the Delta Vision Process to develop a sustainable use and protection plan for the Delta, Suisun Bay, and Suisun Marsh. The Delta Vision Process, an interagency effort and outgrowth of the Little Hoover Commission's review of CALFED, was just commencing at the time of this Bay-Delta Plan update. Consistent with this process, the State Water Board recognizes that planning for and management of the Delta's multiple uses, resources, and ecosystem should occur in cooperation with elected officials, government agencies, stakeholders, academia, and affected Delta and California communities.

1. Pelagic Organism Decline

There is a marked decline in numerous pelagic fishes in the Sacramento-San Joaquin Delta Estuary and Suisun Bay. Currently, the Interagency Ecological Program (IEP), through its POD work team, is conducting studies to evaluate the potential causes of these declines. Some of the possible causes that are being considered include invasive species, water project operations, and toxins. The results of the POD studies will be available in 2007. At that time, the State Water Board will review the study results and may amend portions of this Plan to improve habitat conditions in the Estuary.

2. Climate Change

A growing body of information suggests that climate change could result in: (1) sea level rise that would adversely impact levees, water quality, and conveyance of water supplies through the Delta; (2) decreased snowmelt in the Sierra Nevada that

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Supreme Court rejected arguments based on Clean Water Act section 101(g) that water quantities could not be regulated under the Clean Water Act. The Supreme Court pointed out that in sufficient flows can cause water quality violations, and that reduced habitat caused by low flows may constitute pollution. The Court's narrow interpretation of section 101(g) allows regulation of water users by a state to prevent their having an adverse effect on water quality, but does not go so far as to allow a fundamental interference by the USEPA with a state's water allocation authority.

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would reduce effectiveness of existing water storage facilities; (3) increased rainfall that could exacerbate flooding; and (4) adverse biological effects from changes in flow and water quality. Water quality control planning must begin to address these possible effects. Future State Water Board activities therefore should be responsive to the impacts of climate change and provide timely response and guidance to water resources agencies, consistent with the Water Quality Control Plan, as they submit plans and requests to process applications for water conveyance facilities and flow control structures such as the current South Delta Improvements Project or potential future conveyance structures such as a Delta peripheral canal.

3. Delta and Central Valley Salinity

A joint State and Regional Board Workshop on Central Valley salinity issues held in January 2006 resulted in broad stakeholder support for development of a Salinity Management Plan for the Central Valley and Delta (Salinity Management Plan) to protect beneficial uses of both surface waters and ground waters. Development and full implementation of the Salinity Management Plan is expected to take 40 to 50 years and to reduce economic hardship related to managing salinity. The State Water Board will develop regulations and provide regulatory encouragement to ensure that infrastructure is developed that improves and maintains Central Valley and Delta salinity while providing certainty to local and regional planners, municipalities, agriculture, water suppliers, food processors, and others.

The State Water Board will continue to coordinate updates of the Bay-Delta Plan with on-going development of this comprehensive Salinity Management Plan. As part of this larger planning effort, the State Water Board has issued a public notice of a workshop to be held in January 2007 to review: (1) the salinity requirements of the beneficial uses of water in the southern Delta; (2) the causes of salt loading in the southern Delta; (3) practices that could reduce salt loading from Delta sources; (4) flow and salt load reduction measures to implement the salinity objectives; and (5) the timeline for implementation of these measures. The State Water Board intends to develop and manage a study of salinity in the southern Delta as part of this effort. This process could result in amendments to the Bay-Delta Plan, further changes in water rights, or changes in both the Bay-Delta Plan and water rights.

4. San Joaquin River Flows

Data submitted by fisheries agencies suggest that various fish species within the Delta and San Joaquin River basin have not shown significant signs of recovery since adoption of the San Joaquin River Spring Flow and Pulse Flow objectives in the 1995 Plan and the implementation of the Spring Flow objectives in D-1641. Some species have shown significant declines. The San Joaquin River flow objectives are not changed in the 2006 Plan due to a lack of scientific information on which to base any changes.[5] While the Department of Fish and Game (DFG)

[5] The Program of Implementation for the Pulse Flow Objectives is amended in the 2006 Plan to allow for staged implementation of the objectives by conducting the Vernalis Adaptive Management Plan (VAMP) until 2011. These changes are consistent with the current implementation of the objectives since 2000 pursuant to D-1641.

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recommended changes to the objectives, those recommendations were based on modeling that had not yet been completed. In addition, other parties also recommended changes to the objectives that were not substantiated by sufficient scientific information. In recognition of the species recovery concerns within the San Joaquin River basin and the Delta, the State Water Board will schedule a workshop after revisions are completed to DFG's San Joaquin River salmon escapement model in response to peer review (anticipated for summer of 2007) to receive additional information concerning the model and its findings and other scientific information concerning the San Joaquin River flow objectives. The State Water Board may receive additional information concerning implementation of the objectives in response to concerns raised by the Department of Interior (DOI) and others. Based on information received during the workshop, the State Water Board may amend the Bay-Delta Plan objectives, the Program of Implementation for those objectives, and/or make changes in water rights. If adequate information is not available to support changes to the objectives, the State Water Board may direct the completion of additional studies and analyses.

In response to concerns raised by DFG and others concerning the interim San Joaquin River Pulse Flow objectives being implemented as part of the Vernalis Adaptive Management Plan (VAMP) experiments, prior to the workshop, the State Water Board recommends that parties to the San Joaquin River Agreement (SJRA) conduct a peer review of the VAMP study design. The State Water Board requests that the peer review analyze whether the experimental flows are providing adequate protection for San Joaquin River and Delta species and whether changes should be made to the experimental design to ensure that adequate information is obtained from the experiment on which to base long term objectives. The State Water Board requests that the parties to the SJRA present the findings of the peer review to the State Water Board during its workshop.

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Chapter II. Beneficial Uses

A water quality control plan must establish beneficial uses. (Wat. Code § 13050(j).) Beneficial uses serve as a basis for establishing water quality objectives. The beneficial uses to be protected were established in the 1978 Delta Plan and the 1991 Bay-Delta Plan. Since all of the beneficial uses exist and there were no requests for changes in the beneficial uses, these uses are carried over in this plan from earlier plans, including the 1995 Plan. The beneficial uses protected by this plan are presented below.

Municipal and Domestic Supply (MUN) – Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

Industrial Service Supply (IND) – Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Industrial Process Supply (PRO) – Uses of water for industrial activities that depend primarily on water quality.

Agricultural Supply (AGR) – Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Ground Water Recharge (GWR) – Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

Navigation (NAV) – Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

Water Contact Recreation (REC-1) – Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.

Non-Contact Water Recreation (REC-2) – Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion is reasonably possible. These include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

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Shellfish Harvesting (SHELL) – Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g. clams, oysters, and mussels) for human consumption, commercial or sports purposes.

Commercial and Sport Fishing (COMM) – Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Warm Freshwater Habitat (WARM) – Uses of water that support warm water ecosystems including, but not limited to, preservation of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Freshwater Habitat (COLD) – Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancements of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Migration of Aquatic Organisms (MIGR) – Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.

Spawning, Reproduction, and/or Early Development (SPWN) – Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Estuarine Habitat (EST) – Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g. estuarine mammals, waterfowl, shorebirds).

Wildlife Habitat (WILD) – Uses of water that support estuarine ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Rare, Threatened, or Endangered Species (RARE) – Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under State or federal law as being rare, threatened, or endangered.

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Chapter III. Water Quality Objectives

A water quality control plan must contain such water quality objectives as are needed to ensure the reasonable protection of beneficial uses and the prevention of nuisance. (Wat. Code, § 13241.) The State Water Board must consider, in establishing water quality objectives:

- The past, present, and probable future beneficial uses of water;
- The environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- The water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region;
- The need to develop and use recycled water. (Wat. Code, § 13241.)

Flow and water project operations are within the scope of objectives that can be adopted in a water quality control plan under the Porter-Cologne Water Quality Control Act.

This chapter establishes water quality objectives which, in conjunction with the water quality objectives for the Bay-Delta Estuary that are included in other State Water Board adopted water quality control plans and in water quality control plans for the Central Valley and San Francisco Bay Basins, when implemented, will: (1) provide for reasonable protection of municipal, industrial, and agricultural beneficial uses; (2) provide reasonable protection of fish and wildlife beneficial uses at a level which stabilizes or enhances the conditions of aquatic resources; and (3) prevent nuisance. These water quality objectives are established to attain the highest quality of water that is reasonable, considering all the demands being made on waters in the Estuary.

The water quality objectives in this plan apply to waters of the San Francisco Bay system and the legal Sacramento-San Joaquin Delta, as specified in the objectives. Unless otherwise indicated, water quality objectives cited for a general area, such as for the southern Delta, are applicable for all locations in that general area and compliance locations will be used to determine compliance with the cited objectives. Tables 1, 2, and 3 contain the water quality objectives for the protection of municipal and industrial, agricultural, and fish and wildlife beneficial uses, respectively.

A. Water Quality Objectives for Municipal and Industrial Beneficial Uses

The water quality objectives in Table 1 provide reasonable protection of the beneficial uses MUN, IND, and PRO, from the effects of salinity intrusion. These municipal and industrial objectives also provide protection for the beneficial uses of REC-1, REC-2, and GWR. These objectives are unchanged from the 1995 Bay-Delta Plan.

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B. Water Quality Objectives for Agricultural Beneficial Uses

The water quality objectives in Table 2 provide reasonable protection of the beneficial use AGR, from the effects of salinity intrusion and agricultural drainage in the western, interior, and southern Delta. These objectives are unchanged from the 1991 Bay-Delta Plan.

C. Water Quality Objectives for Fish and Wildlife Beneficial Uses

The water quality objectives in Table 3 provide reasonable protection of fish and wildlife beneficial uses in the Bay-Delta Estuary including EST, COLD, WARM, MIGR, SPWN, WILD, and RARE. Protection of these fish and wildlife beneficial uses also provides protection for the beneficial uses of SHELL, COMM, and NAV. The parameters to be regulated under Table 3 are dissolved oxygen, salinity (expressed as electrical conductivity), Delta outflow, river flows, export limits, and Delta Cross Channel gate operation. Information available in 1995 indicated that, unlike water quality objectives for parameters such as dissolved oxygen, temperature, and toxic chemicals, which have threshold levels beyond which adverse impacts to the beneficial uses occur, there were no defined threshold conditions that could be used to set objectives for flows and project operations. Instead, available information indicated that a continuum of protection exists. Based on that information, higher flows and lower exports provided greater protection for the bulk of estuarine resources up to the limit of unimpaired conditions. Therefore, these objectives were set based on a subjective determination of the reasonable needs of all the consumptive and nonconsumptive demands on the waters of the Estuary. After completion of the POD studies, the State Board will review the study results and may consider amending this Plan to improve water quality protections for fish and wildlife in the Estuary.

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Table 1
Water Quality Objectives For Municipal and Industrial Beneficial Uses

COMPLIANCE LOCATIONS	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT)	WATER YEAR TYPE [2]	TIME PERIOD	VALUE
Contra Costa Canal at Pumping Plant #1 ***-or-*** *San Joaquin River at Antioch Water Works Intake*	*C-5 (CHCCC06)* *D12 (near) (RSAN007)*	*Chloride (Cl^-)*	*Maximum mean daily 150 mg/L Cl^- for at least the number of days shown during the calendar year. Must be provided in intervals of not less than two weeks duration. (Percentage of calendar year shown in parenthesis)*	*W* *AN* *BN* *D* *C*		*No. of days each calendar year ≤150 mg/L Cl^-* *240 (66%)* *190 (52%)* *175 (48%)* *165 (45%)* *155 (42%)*
Contra Costa Canal at Pumping Plant #1 ***-and-*** *West Canal at mouth of Clifton Court Forebay* ***-and-*** *Delta-Mendota Canal at Tracy Pumping Plant* ***-and-*** *Barker Slough at North Bay Aqueduct Intake* ***-and-*** *Cache Slough at City of Vallejo Intake [3]*	*C-5 (CHCCC06)* *C-9 (CHWST0)* *DMC-1 CHDMC004* *--- (SLSAR3)* *C-19 (SLCCH16)*	*Chloride (Cl^-)*	*Maximum mean daily (mg/L)*	*All*	*Oct-Sep*	*250*

Table 1 Footnotes:

[1] River Kilometer Index station number.
[2] The Sacramento Valley 40-30-30 water year hydrologic classification index (see Figure 2) applies for determinations of water year type.
[3] Cache Slough objective to be effective only when water is being diverted from this location.

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Table 2
Water Quality Objectives For Agricultural Beneficial Uses

COMPLIANCE LOCATIONS	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
WESTERN DELTA						
Sacramento River at Emmaton	*D-22 (RSAC092)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Jul 1*	*0.63*
				BN	*Jun 20*	*1.14*
				D	*Jun 15*	*1.67*
				C	*----*	*2.78*
San Joaquin River at Jersey Point	*D-15 (RSAN018)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Aug 15*	*----*
				BN	*Jun 20*	*0.74*
				D	*Jun 15*	*1.35*
				C	*----*	*2.20*
INTERIOR DELTA						
South Fork Mokelumne River at Terminous	*C-13 (RSMKL08)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Aug 15*	*----*
				BN	*Aug 15*	*----*
				D	*Aug 15*	*----*
				C	*----*	*0.54*
San Joaquin River at San Andreas Landing	*C-4 (RSAN032)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC (mmhos/cm)*		*0.45 EC April 1 to date shown*	*EC from date shown to Aug 15 [4]*
				W	*Aug 15*	*----*
				AN	*Aug 15*	*----*
				BN	*Aug 15*	*----*
				D	*Jun 25*	*0.58*
				C	*----*	*0.87*
SOUTHERN DELTA						
San Joaquin River at Airport Way Bridge, Vernalis **-and-** *San Joaquin River at Brandt Bridge site* **-and-** *Old River near Middle River* **-and-** *Old River at Tracy Road Bridge*	*C-10 (RSAN112)* *C-6 (RSAN073)* *C-8 (ROLD69)* *P-12 (ROLD59)*	*Electrical Conductivity (EC)*	*Maximum 30-day running average of mean daily EC (mmhos/cm)*	*All*	*Apr-Aug* *Sep-Mar*	*0.7* *1.0*
EXPORT AREA						
West Canal at mouth of Clifton Court Forebay **-and-** *Delta-Mendota Canal at Tracy Pumping Plant*	*C-9 (CHWST0)* *DMC-1 (CHDMC004)*	*Electrical Conductivity (EC)*	*Maximum monthly average of mean daily EC (mmhos/cm)*	*All*	*Oct-Sep*	*1.0*

Table 2 Footnotes:

[1] River Kilometer Index station number.

[2] Determination of compliance with an objective expressed as a running average begins on the last day of the averaging period. The averaging period commences with the first day of the time period for the applicable objective. If the objective is not met on the last day of the averaging period, all days in the averaging period are considered out of compliance.

[3] The Sacramento Valley 40-30-30 water year hydrologic classification index (see Figure 2) applies for determinations of water year type.

[4] When no date is shown, EC limit continues from April 1.

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Table 3
WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

COMPLIANCE LOCATIONS	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
DISSOLVED OXYGEN						
San Joaquin River between Turner Cut & Stockton	*(RSAN050-RSAN061)*	*Dissolved Oxygen (DO)*	*Minimum DO (mg/L)*	*All*	*Sep-Nov*	*6.0*
SALMON PROTECTION						
			narrative	*Water quality conditions shall be maintained, together with other measures in the watershed, sufficient to achieve a doubling of natural production of chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law.*		
SAN JOAQUIN RIVER SALINITY						
San Joaquin River at and between Jersey Point and Prisoners Point [4]	*D-15 (RSAN018)* **-and-** *D-29 (RSAN038)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC(mmhos/cm)*	*W,AN,BN, D*	*Apr-May*	*0.44 [5]*
EASTERN SUISUN MARSH SALINITY[6]						
Sacramento River at Collinsville **-and-** *Montezuma Slough at National Steel* **-and-** *Montezuma Slough near Beldon Landing*	*C-2 (RSAC081)* *S-64 (SLMZU25)* *S-49 (SLMZU11)*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location*	*All*	*Oct* *Nov-Dec* *Jan* *Feb-Mar* *Apr-May*	*19.0* *15.5* *12.5* *8.0* *11.0*
WESTERN SUISUN MARSH SALINITY[6]						
Chadbourne Slough at Sunrise Duck Club **-and-** *Suisun Slough, 300 feet south of Volanti Slough* **-and-** *Cordelia Slough at Ibis Club* **-and-** *Goodyear Slough at Morrow Island Clubhouse* **-and-** *Water supply intakes for waterfowl management areas on Van Sickle and Chipps islands*	*S-21 (SLCBN1)* *S-42 (SLSUS12)* *S-97 (SLCRD06)* *S-35 (SLGYR03)* *No locations specified*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location*	*All but deficiency period* *Deficiency period [7]*	*Oct* *Nov* *Dec* *Jan* *Feb-Mar* *Apr-May* *Oct* *Nov* *Dec-Mar* *Apr* *May*	*19.0* *16.5* *15.5* *12.5* *8.0* *11.0* *19.0* *16.5* *15.6* *14.0* *12.5*
BRACKISH TIDAL MARSHES OF SUISUN BAY						
			narrative	*Water quality conditions sufficient to support a natural gradient in species composition and wildlife habitat characteristic of a brackish marsh throughout all elevations of the tidal marshes bordering Suisun Bay shall be maintained. Water quality conditions shall be maintained so that none of the following occurs: (a) loss of diversity; (b) conversion of brackish marsh to salt marsh; (c) for animals, decreased population abundance of those species vulnerable to increased mortality and loss of habitat from increased water salinity; or (d) for plants, significant reduction in stature or percent cover from increased water or soil salinity or other water quality parameters.*		

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Table 3 (continued)
WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

COMPLIANCE LOCATIONS	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
DELTA OUTFLOW						
		Net Delta Outflow Index (NDOI) [8]	*Minimum monthly average [9] NDOI(cfs)*	*All*	*Jan*	*4,500 [10]*
				All	*Feb-Jun*	*[11]*
				W,AN	*Jul*	*8,000*
				BN		*6,500*
				D		*5,000*
				C		*4,000*
				W,AN,BN	*Aug*	*4,000*
				D		*3,500*
				C		*3,000*
				All	*Sep*	*3,000*
				W,AN,BN,D	*Oct*	*4,000*
				C		*3,000*
				W,AN,BN,D	*Nov-Dec*	*4,500*
				C		*3,500*
RIVER FLOWS						
Sacramento River at Rio Vista	*D-24 (RSAC101)*	*Flow rate*	*Minimum monthly average [12] flow rate (cfs)*	*All*	*Sep*	*3,000*
				W,AN,BN,D	*Oct*	*4,000*
				C		*3,000*
				W,AN,BN,D	*Nov-Dec*	*4,500*
				C		*3,500*
San Joaquin River at Airport Way Bridge, Vernalis	*C-10 (RSAN112)*	*Flow rate*	*Minimum monthly average [13] flow rate (cfs) [14]*	*W,AN*	*Feb-Apr 14*	*2,130 or 3,420*
				BN,D	*and*	*1,420 or 2,280*
				C	*May 16-Jun*	*710 or 1,140*
				W	*Apr 15-*	*7,330 or 8,620*
				AN	*May 15 [15]*	*5,730 or 7,020*
				BN		*4,620 or 5,480*
				D		*4,020 or 4,880*
				C		*3,110 or 3,540*
				All	*Oct*	*1,000 [16]*
EXPORT LIMITS						
		Combined export rate [17]	*Maximum 3-day running average (cfs)*	*All*	*Apr 15- May 15 [18]*	*[19]*
				All	*Feb-Jun*	*35% Delta inflow [22]*
			Maximum percent of Delta inflow diverted [20] [21]	*All*	*Jul-Jan*	*65% Delta inflow*
DELTA CROSS CHANNEL GATES CLOSURE						
Delta Cross Channel at Walnut Grove	*—*	*Closure of gates*	*Closed gates*	*All*	*Nov-Jan*	*[23]*
					Feb-May 20	*----*
					May 21- Jun 15	*[24]*

Table 3 Footnotes:

[1] River Kilometer Index station number.

[2] Determination of compliance with an objective expressed as a running average begins on the last day of the averaging period. The averaging period commences with the first day of the time period of the applicable objective. If the objective is not met on the last day of the averaging period, all days in the averaging period are considered out of compliance.

[3] The Sacramento Valley 40-30-30 Water Year Hydrologic Classification Index (see Figure 2) applies unless otherwise specified.

[4] Compliance will be determined at Jersey Point (station D15) and Prisoners Point (station D29).

[5] This standard does not apply in May when the best available May estimate of the Sacramento River Index for the water year is less than 8.1 MAF at the 90% exceedance level. [Note: The Sacramento River Index refers to the sum of the unimpaired runoff in the water year as published in the California Department of Water Resources' (DWR) Bulletin 120 for

ED_000733_PSTs_00022282-00026

the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total unimpaired inflow to Oroville Reservoir; Yuba River at Smartville; and American River, total unimpaired inflow to Folsom Reservoir.]

[6] An exceedance of any of these objectives at a time when it is established through certification by the entity operating the Suisun Marsh Salinity Control Gates that the Gates are being operated to the maximum extent shall not be considered a violation of the objective.

[7] A deficiency period is: (1) the second consecutive dry water year following a critical year; (2) a dry water year following a year in which the Sacramento River Index (described in footnote 5) was less than 11.35; or (3) a critical water year following a dry or critical water year. The determination of a deficiency period is made using the prior year's final Water Year Type determination and a forecast of the current year's Water Year Type; and remains in effect until a subsequent water year is other than a Dry or Critical water year as announced on May 31 by DWR and U.S. Bureau of Reclamation (USBR) as the final water year determination.

[8] Net Delta Outflow Index (NDOI) is defined in Figure 4.

[9] For the May-January objectives, if the value is less than or equal to 5,000 cfs, the 7-day running average shall not be less than 1,000 cfs below the value; if the value is greater than 5,000 cfs, the 7-day running average shall not be less than 80% of the value.

[10] The objective is increased to 6,000 cfs if the best available estimate of the Eight River Index for December is greater than 800 TAF. [Note: The Eight River Index refers to the sum of the unimpaired runoff as published in the DWR Bulletin 120 for the following locations: Sacramento River flow at Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River flow at Smartville; American River, total inflow to Folsom Reservoir; Stanislaus River, total inflow to New Melones Reservoir; Tuolumne River, total inflow to Don Pedro Reservoir; Merced River, total inflow to Exchequer Reservoir; and San Joaquin River, total inflow to Millerton Lake.]

[11] The minimum daily Delta outflow shall be 7,100 cfs for this period, calculated as a 3-day running average. This requirement is also met if either the daily average or 14-day running average EC at the confluence of the Sacramento and the San Joaquin rivers is less than or equal to 2.64 mmhos/cm (Collinsville station C2). If the best available estimate of the Eight River Index (described in footnote 10) for January is more than 900 TAF, the daily average or 14-day running average EC at station C2 shall be less than or equal to 2.64 mmhos/cm for at least one day between February 1 and February 14; however, if the best available estimate of the Eight River Index for January is between 650 TAF and 900 TAF, the Executive Director of the State Water Board shall decide whether this requirement applies. If the best available estimate of the Eight River Index for February is less than 500 TAF, the standard may be further relaxed in March upon the request of the DWR and the USBR, subject to the approval of the Executive Director of the State Water Board. The standard does not apply in May and June if the best available May estimate of the Sacramento River Index (described in footnote 5) for the water year is less than 8.1 MAF at the 90% exceedance level. Under this circumstance, a minimum 14-day running average flow of 4,000 cfs is required in May and June. Additional Delta outflow objectives are contained in Table 4.

[12] The 7-day running average shall not be less than 1,000 cfs below the monthly objective.

[13] Partial months are averaged for that period. For example, the flow rate for April 1-14 would be averaged over 14 days. The 7-day running average shall not be less than 20% below the flow rate objective, with the exception of the April 15-May 15 pulse flow period when this restriction does not apply.

[14] The water year classification will be established using the best available estimate of the 60-20-20 San Joaquin Valley Water Year Hydrologic Classification (see Figure 3) at the 75% exceedance level. The higher flow objective applies when the 2-ppt isohaline (measured as 2.64 mmhos/cm surface salinity) is required to be at or west of Chipps Island.

[15] This time period may be varied based on real-time monitoring. One pulse, or two separate pulses of combined duration equal to the single pulse, should be scheduled to coincide with fish migration in San Joaquin River tributaries and the Delta. The USBR will schedule the time period of the pulse or pulses in consultation with the USFWS, the NOAA Fisheries, and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement. The schedule is subject to the approval of the Executive Director of the State Water Board.

[16] Plus up to an additional 28 TAF pulse/attraction flow during all water year types. The amount of additional water will be limited to that amount necessary to provide a monthly average flow of 2,000 cfs. The additional 28 TAF is not required in a critical year following a critical year. The pulse flow will be scheduled by the DWR and the USBR in consultation with the USFWS, the NOAA Fisheries and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

ED_000733_PSTs_00022282-00027

[17] Combined export rate for this objective is defined as the Clifton Court Forebay inflow rate (minus actual Byron-Bethany Irrigation District diversions from Clifton Court Forebay) and the export rate of the Tracy pumping plant.

[18] This time period may be varied based on real-time monitoring and will coincide with the San Joaquin River pulse flow described in footnote 15. The DWR and the USBR, in consultation with the USFWS, the NOAA Fisheries and the DFG, will determine the time period for this 31-day export limit. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[19] Maximum export rate is 1,500 cfs or 100% of the 3-day running average of San Joaquin River flow at Vernalis, whichever is greater. Variations to this maximum export rate may be authorized if agreed to by the USFWS, the NOAA Fisheries and the DFG. This flexibility is intended to result in no net water supply cost annually within the limits of the water quality and operational requirements of this plan. Variations may result from recommendations of agencies for protection of fish resources, including actions taken pursuant to the State and federal Endangered Species Act. Any variations will be effective immediately upon notice to the Executive Director of the State Water Board. If the Executive Director does not object to the variations within 10 days, the variations will remain in effect. The Executive Director of the State Water Board is also authorized to grant short-term exemptions to export limits for the purpose of facilitating a study of the feasibility of recirculating export water into the San Joaquin River to meet flow objectives.

[20] Percent of Delta inflow diverted is defined in Figure 4. For the calculation of maximum percent Delta inflow diverted, the export rate is a 3-day running average and the Delta inflow is a 14-day running average, except when the Central Valley Project or the State Water Project (SWP) is making storage withdrawals for export, in which case both the export rate and the Delta inflow are 3-day running averages.

[21] The percent Delta inflow diverted values can be varied either up or down. Variations are authorized subject to the process described in footnote 19.

[22] If the best available estimate of the Eight River Index (described in footnote 10) for January is less than or equal to 1.0 MAF, the export limit for February is 45% of Delta inflow. If the best available estimate of the Eight River Index for January is greater than 1.5 MAF, the February export limit is 35% of Delta inflow. If the best available estimate of the Eight River Index for January is between 1.0 MAF and 1.5 MAF, the DWR and the USBR will set the export limit for February within the range of 35% to 45%, after consultation with the USFWS, the NOAA Fisheries and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[23] For the November-January period, close Delta Cross Channel gates for a total of up to 45 days. The USBR will determine the timing and duration of the gate closure after consultation with the USFWS, the NOAA Fisheries and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[24] For the May 21-June 15 period, close the Delta Cross Channel gates for a total of 14 days. The USBR will determine the timing and duration of the gate closure after consultation with the USFWS, the NOAA Fisheries and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement. Gate closures shall be based on the need for the protection of fish. The process for approval of variations shall be similar to that described in footnote 19.

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FIGURE 2

Sacramento Valley Water Year Hydrologic Classification

Year classification shall be determined by computation of the following equation:

$$\textbf{INDEX} = 0.4 * X + 0.3 * Y + 0.3 * Z$$

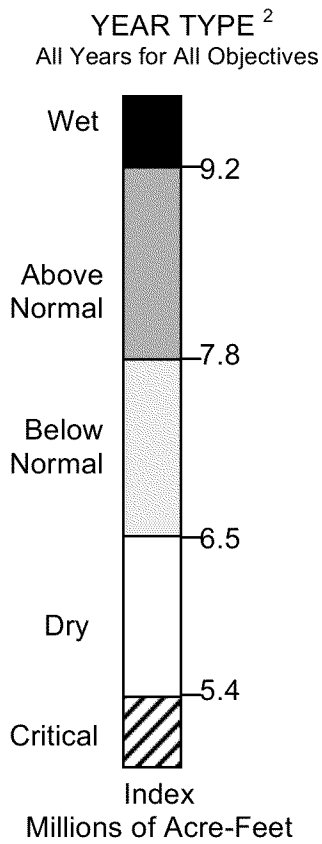
Where:

X = Current year's April – July Sacramento Valley unimpaired runoff

Y = Current October – March Sacramento Valley unimpaired runoff

Z = Previous year's index[1]

The Sacramento Valley unimpaired runoff for the current water year (October 1 of the preceding calendar year through September 30 of the current calendar year), as published in California Department of Water Resources Bulletin 120, is a forecast of the sum of the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River at Smartville; American River, total inflow to Folsom Reservoir. Preliminary determinations of year classification shall be made in February, March, and April with final determination in May. These preliminary determinations shall be based on hydrologic conditions to date plus forecasts of future runoff assuming normal precipitation for the remainder of the water year.



Classification	Index Millions of Acre-Feet (MAF)
Wet.....	Equal to or greater than 9.2
Above Normal.....	Greater than 7.8 and less than 9.2
Below Normal.....	Equal to or less than 7.8 and greater than 6.5
Dry.....	Equal to or less than 6.5 and greater than 5.4
Critical.....	Equal to or less than 5.4

1 A cap of 10.0 MAF is put on the previous year's index (Z) to account for required flood control reservoir releases during wet years.

2 The year type for the preceding water year will remain in effect until the initial forecast of unimpaired runoff for the current water year is available.

ED_000733_PSTs_00022282-00029

FIGURE 3

San Joaquin Valley Water Year Hydrologic Classification

Year classification shall be determined by computation of the following equation:

INDEX = 0.6 * X + 0.2 * Y + 0.2 * Z

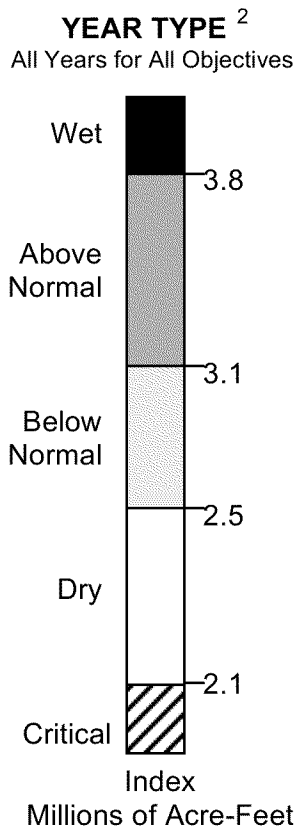
Where: X = Current year's April – July San Joaquin Valley unimpaired runoff

Y = Current October – March San Joaquin Valley unimpaired runoff

Z = Previous year's index[1]

The San Joaquin Valley unimpaired runoff for the current water year (October 1 of the preceding calendar year through September 30 of the current calendar year), as published in California Department of Water Resources Bulletin 120, is a forecast of the sum of the following locations: Stanislaus River, total flow to New Melones Reservoir; Tuolumne River, total inflow to Don Pedro Reservoir; Merced River, total flow to Exchequer Reservoir; San Joaquin River, total inflow to Millerton Lake. Preliminary determinations of year classification shall be made in February, March, and April with final determination in May. These preliminary determinations shall be based on hydrologic conditions to date plus forecasts of future runoff assuming normal precipitation for the remainder of the water year.

Classification	Index Millions of Acre-Feet (MAF)
Wet.....	Equal to or greater than 3.8
Above Normal.....	Greater than 3.1 and less than 3.8
Below Normal.....	Equal to or less than 3.1 and greater than 2.5
Dry.....	Equal to or less than 2.5 and greater than 2.1
Critical.....	Equal to or less than 2.1



1 A cap of 4.5 MAF is put on the previous year's index (Z) to account for required flood control reservoir releases during wet years.

2 The year type for the preceding water year will remain in effect until the initial forecast of unimpaired runoff for the current water year is available.

FIGURE 4

NDOI and PERCENT INFLOW DIVERTED [1]

The NDOI and the percent inflow diverted, as described in this figure, shall be computed daily by the DWR and the USBR using the following formulas (all flows are in cfs):

NDOI = DELTA INFLOW - NET DELTA CONSUMPTIVE USE - DELTA EXPORTS

PERCENT INFLOW DIVERTED = (CCF + TPP) ÷ DELTA INFLOW

where *DELTA INFLOW = SAC + SRTP + YOLO + EAST + MISC + SJR*

SAC = Sacramento River at Freeport mean daily flow for the previous day; the 25-hour tidal cycle measurements from 12:00 midnight to 1:00 a.m. may be used instead.

SRTP = Sacramento Regional Treatment Plant average daily discharge for the previous week.

YOLO = Yolo Bypass mean daily flow for the previous day, which is equal to the flows from the Sacramento Weir, Fremont Weir, Cache Creek at Rumsey, and the South Fork of Putah Creek.

EAST = Eastside Streams mean daily flow for the previous day from the Mokelumne River at Woodbridge, Cosumnes River at Michigan Bar, and Calaveras River at Bellota.

MISC = Combined mean daily flow for the previous day of Bear Creek, Dry Creek, Stockton Diverting Canal, French Camp Slough, Marsh Creek, and Morrison Creek.

SJR = San Joaquin River flow at Vernalis, mean daily flow for the previous day.

where *NET DELTA CONSUMPTIVE USE = GDEPL - PREC*

GDEPL = Delta gross channel depletion for the previous day based on water year type using the DWR's latest Delta land use study.[2]

PREC = Real-time Delta precipitation runoff for the previous day estimated from stations within the Delta.

and where *DELTA EXPORTS* [3] *= CCF + TPP + CCC + NBA*

CCF = Clifton Court Forebay inflow for the current day.[4]

TPP = Tracy Pumping Plant pumping for the current day.

CCC = Contra Costa Canal pumping for the current day.

NBA = North Bay Aqueduct pumping for the current day.

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1 Not all of the Delta tributary streams are gaged and telemetered. When appropriate, other methods of estimating stream flows, such as correlations with precipitation or runoff from nearby streams, may be used instead.

2 If up to date channel depletion estimates are available they shall be used. If these estimates are not available, DAYFLOW channel depletion estimates shall be used.

3 The term "Delta Exports" is used only to calculate the NDOI. It is not intended to distinguish among the listed diversions with respect to eligibility for protection under the area of origin provisions of the California Water Code.

4 Actual Byron-Bethany Irrigation District withdrawals from Clifton Court Forebay shall be subtracted from Clifton Court Forebay inflow. (Byron-Bethany Irrigation District water use is incorporated into the GDEPL term.)

ED_000733_PSTs_00022282-00031

Table 4. Number of Days When Maximum Daily Average Electrical Conductivity of 2.64 mmhos/cm Must Be Maintained at Specified Location

Number of Days When Maximum Daily Average Electrical Conductivity of 2.64 mmhos/cm Must Be Maintained at Specified Location [a]																	
PMI[b] (TAF)	Chipps Island (Chipps Island Station D10)					PMI[b] (TAF)	Port Chicago (Port Chicago Station C14) [d]					PMI[b] (TAF)	Port Chicago (Port Chicago Station C14)[d]				
	FEB	MAR	APR	MAY	JUN		FEB	MAR	APR	MAY	JUN		FEB	MAR	APR	MAY	JUN
≤ 500	0	0	0	0	0	**0**	0	0	0	0	0	**5250**	27	29	25	26	6
750	0	0	0	0	0	**250**	1	0	0	0	0	**5500**	27	29	26	28	9
1000	28[c]	12	2	0	0	**500**	4	1	0	0	0	**5750**	27	29	27	28	13
1250	28	31	6	0	0	**750**	8	2	0	0	0	**6000**	27	29	27	29	16
1500	28	31	13	0	0	**1000**	12	4	0	0	0	**6250**	27	30	27	29	19
1750	28	31	20	0	0	**1250**	15	6	1	0	0	**6500**	27	30	28	30	22
2000	28	31	25	1	0	**1500**	18	9	1	0	0	**6750**	27	30	28	30	24
2250	28	31	27	3	0	**1750**	20	12	2	0	0	**7000**	27	30	28	30	26
2500	28	31	29	11	1	**2000**	21	15	4	0	0	**7250**	27	30	28	30	27
2750	28	31	29	20	2	**2250**	22	17	5	1	0	**7500**	27	30	29	30	28
3000	28	31	30	27	4	**2500**	23	19	8	1	0	**7750**	27	30	29	31	28
3250	28	31	30	29	8	**2750**	24	21	10	2	0	**8000**	27	30	29	31	29
3500	28	31	30	30	13	**3000**	25	23	12	4	0	**8250**	28	30	29	31	29
3750	28	31	30	31	18	**3250**	25	24	14	6	0	**8500**	28	30	29	31	29
4000	28	31	30	31	23	**3500**	25	25	16	9	0	**8750**	28	30	29	31	30
4250	28	31	30	31	25	**3750**	26	26	18	12	0	**9000**	28	30	29	31	30
4500	28	31	30	31	27	**4000**	26	27	20	15	0	**9250**	28	30	29	31	30
4750	28	31	30	31	28	**4250**	26	27	21	18	1	**9500**	28	31	29	31	30
5000	28	31	30	31	29	**4500**	26	28	23	21	2	**9750**	28	31	29	31	30
5250	28	31	30	31	29	**4750**	27	28	24	23	3	**10000**	28	31	30	31	30
≤ 5500	28	31	30	31	30	**5000**	27	28	25	25	4	**>10000**	28	31	30	31	30

[a] The requirement for number of days the maximum daily average EC (EC) of 2.64 mmhos per centimeter (mmhos/cm) must be maintained at Chipps Island and Port Chicago can also be met with maximum 14-day running average EC of 2.64 mmhos/cm, or 3-day running average NDOIs of 11,400 cfs and 29,200 cfs, respectively. If salinity/flow objectives are met for a greater number of days than the requirements for any month, the excess days shall be applied to meeting the requirements for the following month. The number of days for values of the PMI between those specified in this table shall be determined by linear interpolation.

[b] PMI is the best available estimate of the previous month's Eight River Index. (Refer to Footnote 10 for Table 3 for a description of the Eight River Index.)

[c] When the PMI is between 800 TAF and 1000 TAF, the number of days the maximum daily average EC of 2.64 mmhos/cm (or maximum 14-day running average EC of 2.64 mmhos/cm, or 3-day running average NDOI of 11,400 cfs) must be maintained at Chipps Island in February is determined by linear interpolation between 0 and 28 days.

[d] This standard applies only in months when the average EC at Port Chicago during the 14 days immediately prior to the first day of the month is less than or equal to 2.64 mmhos/cm.

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Chapter IV. Program of Implementation

The Porter-Cologne Water Quality Control Act states that a water quality control plan consists of a designation or establishment of beneficial uses to be protected, water quality objectives, and program of implementation needed for achieving water quality objectives. (Wat. Code, § 13050(j).) The implementation program shall include, but not be limited to:

1. A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private;
2. A time schedule for the actions to be taken; and
3. A description of surveillance to be undertaken to determine compliance with the objectives. (Wat. Code, § 13242.)

This program of implementation for the Water Quality Control Plan for the Bay Delta Estuary consists of five general components: (1) implementation measures within State Water Board authority; (2) measures requiring a combination of State Water Board authorities and actions by other agencies; (3) recommendations to other agencies; (4) a monitoring and special studies program; and (5) other studies that are being conducted by other entities but may provide information relevant to future proceedings. The specific actions identified within these components include time schedules for implementation, if appropriate. No time schedule is included for actions that have already been implemented.

Currently, the water right permits of the DWR and USBR include terms and conditions that define their responsibilities to implement the municipal and industrial, agricultural, and fish and wildlife objectives. In the future, the State Water Board may amend this program of implementation, take action in a water right proceeding or proceedings to change the water right responsibilities of the DWR, the USBR, and other water right holders to implement these objectives, or take other actions that implement the objectives.

A. Implementation Measures within State Water Board Authority

Under its water rights and water quality authority, the State Water Board will continue, as necessary and appropriate, to determine the contributions from water right permit and license holders needed to implement the objectives in this Plan. Water right responsibilities may be assigned by conducting a water right proceeding at which the Board will take into consideration the requirements of the Public Trust Doctrine and the California Constitution, article X, section 2. The State Water Board will also continue, as necessary and appropriate, to use its Clean Water Act section 401 water quality certification authority to implement objectives in this Plan, and may take other actions under its water quality authority to implement objectives in this Plan. The following water quality objectives are currently, or may in the future be, implemented in whole or in part using water rights authority:

ED_000733_PSTs_00022282-00033

1. Delta Outflow
2. River Flows: Sacramento River at Rio Vista
3. River Flows: San Joaquin River at Airport Way Bridge, Vernalis
4. Export Limits
5. Delta Cross Channel Gates Operation
6. Salinity

The first five are flow-based objectives that rely upon water rights authorities to implement. Salinity, though a water quality objective, is still implemented, in part, through the State Water Board's water rights authority.

The State Water Board may require compliance with these objectives in stages or may shift responsibility for meeting an objective among water right holders and other entities based on evidence it receives in a water right proceeding or in a water quality proceeding.

1. Delta Outflow Objective
The Delta Outflow Objective is to be implemented through water right actions. It requires a minimum amount of outflow, measured in cubic feet per second (cfs) as defined in footnote 11 of Table 3. The permits and license of the DWR and the USBR are conditioned to establish responsibilities to ensure that the Delta Outflow Objective is met on an interim basis until the State Water Board adopts a water right decision or order that assigns permanent responsibility for meeting the Delta Outflow Objective. This water right decision or order would follow a water right proceeding after a request for such a proceeding by the DWR or USBR.

2. River Flows: Sacramento River at Rio Vista
This objective is to be implemented through water right actions. The permits and license of the DWR and the USBR are conditioned to establish responsibilities to ensure that the flow objectives at Rio Vista on the Sacramento River are met on an interim basis until the State Water Board adopts a decision that assigns permanent responsibility for meeting the Sacramento River at Rio Vista flow objectives. This water right decision would follow a water right proceeding after a request for such a proceeding by the DWR or USBR.

3. River Flows: San Joaquin River at Airport Way Bridge, Vernalis
This objective is to be implemented through water right actions. This plan includes a time schedule for completing implementation. Flow objectives for the San Joaquin River at the Airport Way Bridge near Vernalis have been established for three time periods:

- Spring flow objectives, February through April 14 and May 16 through June;
- Spring pulse flow objectives, April 15 through May 15; and
- Fall pulse flow objectives in October

ED_000733_PSTs_00022282-00034

The USBR is assigned responsibility under its water right permits, on an interim basis until the Board assigns permanent responsibility, to ensure that all of these objectives are met. During the Spring pulse flow period in April and May while the SJRA[6] is in effect, however, the experimental target flows in the VAMP will be implemented in lieu of the Spring flow objectives for the April-May period. After the SJRA terminates or adequate information is otherwise received, the State Water Board may review or consider amending the objectives in a water quality proceeding or may immediately conduct a water right proceeding to decide how to assign responsibility for implementing these objectives.

Additional data and scientific analyses are needed to either support or modify the current spring flow objectives. These data and analyses are described in the 'Recommendations to Other Agencies' section of this chapter. In addition, as indicated in the Emerging Issues section of Chapter 1, the State Water Board will conduct a workshop after revisions are made in response to peer review of DFG's San Joaquin River salmon escapement model (anticipated for summer of 2007) to receive information and conduct detailed discussions regarding the various San Joaquin River flow objectives. Following the workshop, the State Water Board may make changes to the objectives, the program of implementation for the objectives, and/or water rights. The State Water Board may also direct additional studies to determine flow needs on the San Joaquin River.

The staged implementation of the Spring pulse flow objectives, with the first stage consisting of variations on the objectives, allows additional scientific investigation into flow needs on the San Joaquin River during the pulse flow period. In the first stage of implementation, the USBR and other parties are conducting a 12-year study referred to as the Vernalis Adaptive Management Plan (VAMP). The VAMP is designed to protect juvenile chinook salmon migrating down the San Joaquin River and to evaluate the effects of varying the San Joaquin River flow and the State Water Project (SWP) and Central Valley Project (CVP) water exports at times when the head of Old River flow barrier[7] is restricting the flow of water into Old River, on the survival of marked juvenile chinook salmon migrating through the Sacramento-San Joaquin Delta.

The VAMP study has been ongoing for seven years, but the study has not yet yielded conclusive results regarding needed changes to the Spring pulse flow objectives. The completed study will provide critical data about flow needs on the San Joaquin River during the Spring pulse flow period.

Until no later than December 31, 2011, or until the SJRA is terminated or adequate information is otherwise received, if earlier, the following interim Spring pulse flows may be implemented on the San Joaquin River at Vernalis during the 31-day April

[6] The SJRA is a settlement agreement among numerous parties to the water rights hearing resulting in D-1641 to meet the San Joaquin River portions of various flow-dependent water quality objectives in the 1995 Plan.
[7] The purpose of the head of Old River barrier is to reduce the downstream movement of juvenile San Joaquin River chinook salmon into the southern Delta via Old River where fish mortality increases due to predation and higher levels of exposure to export facilities and agricultural diversions.

ED_000733_PSTs_00022282-00035

and May[8] pulse period in order to obtain additional scientific information concerning flow needs on the San Joaquin River during the pulse flow period. The target flow should be based on the existing flow, as defined in table 5.

Table 5. Interim San Joaquin River Pulse Flows

Existing Flow[9] (cfs)	Target Flow (cfs)
0-1999	2,000
2,000-3,199	3,200
3,200-4,449	4,450
4,450-5,699	5,700
5,700-6,999	7,000
7,000 or greater	Existing Flow

Table 6 contains the numeric indicators for the San Joaquin Valley 60-20-20 Water Year Hydrologic Classification.[10] During years when the sum of the current year's 60-20-20 numeric indicator and the previous year's 60-20-20 numeric indicator is seven (7) or greater, target flows should be one step higher than those required in table 5. The licensee is not required to meet the target flow during years when the sum of the numeric indicators for the current year and the previous two years is four (4) or less.

Table 6. San Joaquin Valley 60-20-20 Water Year Hydrologic Classification Numeric Indicators

SJR Basin 60-20-20 Classification	60-20-20 Indicator
Wet	5
Above Normal	4
Below Normal	3
Dry	2
Critical	1

Certain water right holders in the San Joaquin Basin are authorized under their water right licenses to provide the experimental flows specified in the SJRA until

[8] The timing of the 31-day pulse flow is to be determined by the San Joaquin River Technical Committee (SJRTC). The SJRTC is composed of technical experts appointed by the parties to the SJRA to implement the VAMP experiment and other technical activities that its members deem appropriate to meet the goals of the SJRA.

[9] "Existing flows" will be determined by the SJRTC. Existing flow is defined as the forecasted flows in the San Joaquin River at Vernalis during the pulse flow period that would exist absent the SJRA or water acquisitions, including but not limited to the following:

- Tributary minimum instream flows pursuant to Davis-Grunsky, Federal Energy Regulatory Commission, or other regulatory agency orders existing on the date of this agreement;
- Water quality or scheduled fishery releases from New Melones Reservoir;
- Flood control releases from any non-federal storage facility required to be made during the pulse flow period pursuant to its operating protocol with the U.S. Army Corps of Engineers in effect when the SJRA is executed;
- Uncontrolled spills not otherwise recaptured pursuant to water right accretions (less natural depletions) to the system; and/or
- Local runoff.

[10] The classification method for the 60-20-20 San Joaquin Valley Water Year Classification Index is provided in Figure 3.

ED_000733_PSTs_00022282-00036

December 31, 2011, or until the SJRA is terminated, whichever occurs first. After the SJRA terminates or adequate information is otherwise received to support changes, the State Water Board will use the information gained from the VAMP study and other pertinent information to determine what, if any, changes are needed to the pulse flow objectives. The State Water Board will then make any appropriate changes to the Water Quality Control Plan and after a water right proceeding will assign, as appropriate, long-term responsibility for meeting the pulse flow objectives to water right holders whose water diversions impact the flow of water.

4. Export Limits
These objectives are to be implemented through water right actions. The water right permits and licenses of the DWR and the USBR are conditioned upon meeting the objectives for export pumping.

5. Delta Cross Channel Gates Operation
This objective is to be implemented through water right actions. The USBR, as the owner and operator of the Gates, is solely responsible under its water right permits and licenses for implementing the Delta Cross Channel Gates Closure objectives.

6. Salinity Control
Salinity objectives are implemented through a mix of water right actions (flow) and salinity control measures depending on the location and beneficial use affected. Salinity objectives and their implementation fall into the following broad categories:

i. Municipal and Industrial Uses: This objective is to be implemented through a combination of water right actions and other actions, depending on the location at which the objective applies. The water right permits and licenses of the DWR and the USBR currently are conditioned upon implementation of chloride objectives to protect municipal and industrial uses. The salinity objectives at Contra Costa Water District's Pumping Plan No. 1 on Rock Slough, however, are being implemented in part through flows provided by the DWR and the USBR on Old River at the head of Rock Slough and in part through infrastructure improvements that reduce water quality degradation caused by localized drainage into Rock Slough.

ii. Fish and Wildlife in Suisun Marsh: This objective is to be implemented through water right actions because the salinity levels are determined by flows and control structure operations. The water right permits and licenses of the DWR and the USBR currently are conditioned upon implementation of the numeric salinity objectives for Suisun Marsh at stations S-21, and S-42 (Figure 5). Due to evidence showing a potential for the objectives at stations S-97 and S-35 to cause harm to the beneficial uses they are intended to protect, the State Water Board in Decision 1641 (D-1641) did not require that DWR and USBR attain the objectives at stations S-97 and S-35. Implementation of the salinity objectives at these two stations is discussed in section B.5.

ED_000733_PSTs_00022282-00037

iii. Fish and Wildlife in the San Joaquin River: This objective is to be implemented through water right actions. The water right permits and licenses of the DWR and the USBR currently are conditioned upon implementation of the San Joaquin River salinity objective to protect fish and wildlife uses.

iv. Agriculture in the Western Delta, Interior Delta, and Export Area: These objectives are to be implemented through water right actions. The water right permits and licenses of the DWR and the USBR currently are conditioned upon implementation of the Western Delta, Interior Delta, and Export Area salinity objectives to protect agricultural uses.

v. Agriculture in the Southern Delta: The water rights of the DWR and the USBR are conditioned upon implementation of the southern Delta salinity objectives to protect agricultural beneficial uses. Implementation of salinity objectives in the southern Delta requires a mix of salt load control and flow related measures. It is therefore discussed in section B of the Program of Implementation: 'Measures Requiring a Combination of State Water Board Authorities and Actions by Other Agencies.'

B. Measures Requiring a Combination of State Water Board Authorities and Actions by Other Agencies

Implementation of the following water quality objectives will require water rights and water quality measures by the State Water Board, in concert with actions taken by other agencies:

Implementation of these objectives can be accomplished through a combination of the following: dilution flows, regulation of water diversions, pollutant discharge controls, best management practices to control the amount of waste produced, and improvements in water circulation. In addition to describing the actions taken, or to be taken, by the State Water Board, this section describes the actions taken, and that should be taken, by other agencies to implement these objectives. The State Water Board will use its authority, as needed and appropriate, under section 13165 of the California Water Code to require that studies are conducted.

1. Southern Delta Agricultural Salinity Objectives

Elevated salinity in the southern Delta is caused by various factors, including low flows; salts imported to the San Joaquin Basin in irrigation water; municipal discharges; subsurface accretions from groundwater; tidal actions; diversions of water by the SWP, CVP, and local water users; channel capacity; and discharges from land-derived salts, primarily from agricultural drainage. These salinity objectives currently are implemented through a mix of water right actions and salinity control. The water rights of the USBR are conditioned upon implementation of the salinity objectives on the San Joaquin River at Vernalis and the water rights of DWR

ED_000733_PSTs_00022282-00038

and USBR are conditioned upon implementation of the salinity objectives at the other three southern Delta stations (San Joaquin River at Brandt Bridge, Old River at Middle River and Old River at Tracy Road Bridge (interior southern Delta stations)). Salinity objectives on the San Joaquin River at Vernalis are also being implemented through non-water right actions, including the San Joaquin River Salinity Control Program in the Central Valley Regional Water Quality Control Board's (Regional Water Board) Water Quality Control Plan for the Sacramento and San Joaquin River Basins. In October of 2005, the State Water Board approved an Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. The amendment consists of a Control Program for Salt and Boron Discharges into the Lower San Joaquin River and other actions to implement salinity objectives in the SJR at Vernalis. The salt and boron basin plan amendment includes implementation measures and a timeline for implementation of salt load allocations.

The salinity objectives at Vernalis can be attained by releasing dilution water from New Melones and other sources, completing a drain to remove the salts generated by agricultural drainage and municipal discharges from the San Joaquin Valley, and conducting measures in the San Joaquin Valley such as the measures discussed below for controlling salinity in the interior southern Delta. The salinity objectives for the interior southern Delta can be implemented by measures that include state regulatory actions, state funding of projects and studies, regulation of water diversions, pollutant discharge controls, improvements in water circulation, and long-term implementation of best management practices to control saline discharges.

State Regulatory Actions

i. The State Water Board has conditioned the water rights of some water right holders on the presence of dilution flows. Currently, the water rights of USBR are conditioned upon implementation of the Vernalis objectives, and the water rights of USBR and DWR are conditioned upon implementation of the interior southern Delta objectives. The State Water Board could also require releases from other non-SWP/CVP reservoirs after notice and an opportunity for a hearing. In lieu of some water releases, water right holders such as USBR and DWR could use measures that affect circulation of water in the southern Delta (including permanent operational gates).

ii. The Central Valley Regional Water Board shall impose discharge controls on in-Delta discharges of salts by agricultural, domestic, and municipal dischargers.

iii. The Central Valley Regional Board shall implement the Total Maximum Daily Load (TMDL) for the San Joaquin River at Vernalis, develop and adopt a basin plan amendment and TMDL for areas upstream of Vernalis, and implement the TMDL and Water Quality Control Plan to reduce salinity and other pollutants reaching the southern Delta.

ED_000733_PSTs_00022282-00039

iv. The State Water Board will conduct a workshop in January 2007 to commence proceedings to receive information and conduct detailed discussions regarding the southern Delta salinity objectives, the causes of salinity in the southern Delta, measures to implement salinity objectives for southern Delta agriculture, and other factors. The proceedings following the workshop may result in water right and/or water quality actions.

State Funding of Programs

i. The State Water Board has various financial assistance programs under which it can contribute funding for programs that will help meet the salinity objectives or to improving understanding about salinity conditions in the southern Delta (primarily the San Joaquin River upstream of Vernalis). To date, it has funded tens of millions of dollars worth of projects and studies for such programs. The State Water Board provides funds through the State Revolving Fund Loan Program, the Agricultural Drainage Loan Program, the Agricultural Drainage Management Loan Program, Proposition 13, 40, and 50 grant funding through the Nonpoint Source Pollution Control Programs and Watershed Protection Programs.

Current Projects and Actions by Other Agencies

The following projects may assist in meeting the southern Delta salinity objectives by reducing high salinity drainage to the San Joaquin River; improving circulation in the southern Delta; and supplementing flows through recirculation. All or a portion of these projects are being funded through the above referenced programs. Each of these projects, described below, should be pursued by the identified agencies. If successful, these projects and the actions they contain could make additional regulatory measures by the State Water Board and the Central Valley Regional Water Board unnecessary.

i. Grasslands Bypass Project: The Grasslands Bypass Project manages discharges of agricultural drainage water from 97,000 acres in the Grasslands Watershed. The purpose of the project is to prevent discharges of water containing high levels of selenium to wildlife refuges and wetlands in the San Joaquin Valley, but it has reduced the load of salts by 39 percent (from 187,300 tons to 113,600 tons) from pre-project conditions through various management measures including sump management, recycled tail and tile water programs, on-farm tile and tail water management, and various source control measures. The Grassland Areas farmers, USBR, the Central Valley Regional Water Board, and other agencies should continue to evaluate the various management measures in the Grasslands Bypass Project and should continue to implement those measures that are effective in reducing salinity and selenium discharges to the San Joaquin River.

ED_000733_PSTs_00022282-00040

ii. West Side Regional Drainage Plan: The West Side Regional Drainage Plan evolved from the Grasslands Bypass Project as a long-term solution to eliminate discharges to the San Joaquin River of drainage water from irrigated agriculture containing high amounts of selenium, salt and other constituents. The plan uses the following practices:

a) Reduction of drainage volumes by using source control/efficient water management techniques such as replacing furrow irrigation with micro-irrigation technology and lining unlined delivery canals;
b) Recirculation of tailwater on primary irrigation lands;
c) Collection and reuse of tile drainage water on halophytic croplands to concentrate drainage;
d) Installation and pumping of groundwater wells in strategic locations to eliminate groundwater infiltration into tile drains; and
e) Treatment and disposal of remaining drainage water through reverse osmosis, evaporation and disposal or reuse of salts.

When fully implemented, the parties implementing the plan expect to assure achievement of the salinity objectives at Vernalis and reduce the frequency of exceedances of objectives at Brandt Bridge by 71 percent over a 73-year hydrology. They expect to complete the plan by 2010. Stakeholder parties to the Westside Regional Drainage Plan should continue work to implement the various practices discussed above to achieve the goal of zero discharges to the San Joaquin River from the Grasslands area by 2010.

iii. San Luis Unit Feature Reevaluation Project: USBR currently is evaluating seven alternatives as part of the San Luis Unit Feature Reevaluation Project to provide drainage service to the San Luis Unit of the CVP. This project would reduce discharges to the San Joaquin River and sustain long-term agricultural production on drainage-impacted lands. The alternatives under consideration include: on-farm, in-district drainage reduction actions; federal facilities to collect and convey drain water to regional reuse facilities; and some level of land retirement. Additional options under consideration include options for in-valley disposal of drain water, ocean disposal, and Delta disposal. USBR's preferred alternative is an in-valley/land retirement alternative, and would involve treatment of drain water through reverse osmosis and selenium biotreatment before disposal in evaporation basins. USBR expects implementation to help reduce saline discharges to the lower San Joaquin River.

iv. Central Valley Project Improvement Act (CVPIA) Land Retirement Program: USBR and Westland's Water District are implementing land retirement projects under the CVPIA Land Retirement Program and under settlement agreements in drainage-impacted areas of the San Luis Unit of the Joaquin Valley. The projects will reduce the volume of subsurface drain water discharged to the San Joaquin River.

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v. San Joaquin River Real-time Water Quality Management Program: The San Joaquin River Real-time Water Quality Management Program is a project by DWR, USBR, and United States Geological Survey (USGS) that uses telemetered stream stage and salinity data and computer models to simulate and forecast water quality conditions along the lower San Joaquin River. The main objective of the project is to control and time the releases of wetland and agricultural drainage to coincide with periods when dilution flow is sufficient to meet Vernalis salinity objectives.

DWR, DFG, University of California Davis (UC Davis), and other parties are undertaking various projects to determine whether there are wetlands management practices that can improve water quality in the San Joaquin River and conditions for wildlife. Wetlands discharges may account for more than nine percent of the total salt load in the San Joaquin River at Vernalis. The research is focused on coordinating the release of high salinity wetlands discharges to the river at times when assimilative capacity is available. DFG, USFWS, and USBR in coordination with CALFED, DWR, UC Davis, and other appropriate parties should diligently pursue completion of research to determine opportunities for improving wetlands management for the benefit of wildlife and water quality. Any cost effective and reasonable opportunities to improve water quality through improved wetlands management without adversely impacting fish and wildlife should be implemented as soon as practicable.

vi. South Delta Improvements Program: DWR and USBR propose to construct permanent tidal gates in the southern Delta as part of the South Delta Improvements Program (SDIP). DWR and USBR expect that the gates project will assist in achieving the salinity objectives at the two Old River compliance measurement locations by improving water circulation in the southern Delta. Currently, DWR and USBR expect the project to be operational in the spring of 2009.

vii. Delta-Mendota Canal Recirculation: Several agencies and water districts are considering releasing water from the Delta-Mendota Canal to the San Joaquin River to meet water quality objectives at Vernalis. Water Right D-1641 requires USBR to conduct such a study. However, other agencies including DWR have also been involved in assessing this alternative. USBR in coordination with other agencies should complete the recirculation analyses and assess the feasibility of using recirculation to meet southern Delta salinity objectives. If recirculation is cost effective and does not have significant unavoidable impacts to water quality, fish and wildlife, water supplies, and other beneficial uses of water, USBR and/or other agencies should implement a recirculation project to meet and/or supplement the southern Delta salinity objectives.

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Recommended Projects, Studies, and Actions:

The following recommended projects, studies, and actions will provide information that can be used during subsequent updates of the Water Quality Control Plan and water rights proceedings to implement the Plan:

i. Central Valley Salinity Committee and Salinity Study Task Force: At a January of 2006 joint workshop, the State Water Board and Central Valley Regional Water Board established a Salinity Committee to address salinity issues in the Central Valley. The Committee will establish a Salinity Study Task Force to evaluate the impact of salinity on water resources and develop a viable salinity management plan; sponsor a follow-up joint State Water Board/Regional Water Board salinity workshop to receive comments on the salinity management plan; conduct meetings to gather additional public input; contract for preparation of an economic study of salinity impacts and the social and economic consequences of not implementing a viable salinity management program; and sponsor a conference that will highlight the major salinity-related issues and their statewide impacts.

ii. Southern Delta Salinity Objectives: There is a need for an updated independent scientific investigation of irrigation salinity needs in the southern Delta (similar to the investigation on which the current objectives are based). The scientific investigation should address whether the agricultural beneficial uses in the southern Delta would be reasonably protected at different salinity levels, whether management practices are available that would allow for protection of the beneficial uses at a higher salinity level in the channels of the southern Delta, and whether such management practices are technically and financially feasible. The investigation could address the feasibility of providing an alternative method of delivering fresh water to agricultural water users in the southern Delta. The scientific investigation must be specific to the southern Delta. The State Water Board will conduct a workshop to discuss this subject in January 2007.

2. San Joaquin River Dissolved Oxygen Objective

D-1641 directs the Central Valley Regional Water Board to establish a TMDL to address the dissolved oxygen (DO) impairment in the San Joaquin River. In November of 2005, the State Water Board approved an Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. The amendment, approved by the Office of Administrative Law in August 2006, consists of a Control Program for Factors Contributing to the DO impairment in the Stockton Deep Water Ship Channel (DWSC) and other actions to implement DO objectives in the DWSC portion of the San Joaquin River. The DO basin plan amendment includes implementation measures and a timeline for implementation for both the 1995 Plan DO objective and the DO objective in the Water Quality Control Plan for the Sacramento River Basin and the San Joaquin River Basin.

ED_000733_PSTs_00022282-00043

The Central Valley Regional Water Board should continue to implement the recently adopted DO TMDL. Further, the United States Army Corps of Engineers (USCOE) and other agencies and parties that contribute to the DO impairment should complete the measures recommended by the Central Valley Regional Water Board in the basin plan amendment. In addition, the responsible entities should complete their investigations into the feasibility of operating an aeration facility in the Stockton DWSC to assist in achieving the objectives. If the pilot project and other information demonstrates that permanent installation and operation of aeration devices is feasible and would not have immitigable adverse impacts on fish, wildlife, water quality and other resources, DWR, CALFED, and the other implementing agencies should pursue operation of such a facility with operating assistance from the State Water Contractors (SWC), the Port of Stockton, San Luis Delta-Mendota Water Authority (SLDMWA), the San Joaquin River Group Authority (SJRGA), and other appropriate agencies.

DWR and USBR should continue to expeditiously pursue installation of a permanent operable gate (barrier) at the head of Old River or equivalent measures to assist in achieving the DO objective.

3. Narrative Objective for Salmon Protection

D-1641 assigned responsibility to the USBR and DWR to comply with the river flow and operational objectives for fish and wildlife. These objectives help protect salmon migration through the Bay-Delta Estuary. D-1641 did not require separate actions to implement the narrative objective for salmon because the State Water Board expects that implementation of the numeric flow-dependent objectives and other non-flow measures will implement this objective.

The narrative objective for salmon protection in the Delta is consistent with the anadromous fish doubling goals of the CVPIA. Under the Anadromous Fish Restoration Program (AFRP), State, federal and local entities are continuing to implement programs within and outside the Delta geared towards achieving the CVPIA anadromous fish doubling goals.

The State Water Board intends to invite DFG, NOAA Fisheries, and other agencies monitoring the progress of the salmon doubling effort to present to the Board the results from ongoing studies, fishery improvement programs, and any recommendations for a specific numeric objective at subsequent workshops every two years starting from the date of the adoption of this Plan. The State Water Board will consider monitoring results when determining whether numeric objectives either should replace or augment the narrative objective. The Board may use the information it receives to modify the objective in future proceedings.

Actions by parties other than the State Water Board are required to implement the narrative objective for salmon protection if implementation of the flow-dependent objectives does not achieve the objective. Other agencies are implementing the

ED_000733_PSTs_00022282-00044

following actions. These actions not only benefit the salmonids while they are in the Estuary, but also help improve habitat for other species.

i. Through the CVPIA, Section 3406 (b) 21, Anadromous Fish Screen Program, the USBR, USFWS, and other participating agencies should continue to work towards the implementation of new screening facilities on diversions in the Bay-Delta Estuary to reduce losses of fish in all life stages to unscreened water diversions. In evaluating Delta diversions, these agencies should: (1) decide where screens are needed; (2) consider whether diversion points should be relocated or consolidated; and (3) provide their recommendations on changes in points of diversion to the State Water Board for consideration in a water rights proceeding.

ii. The DWR and the USBR, in consultation with the DFG, USFWS, and NOAA Fisheries, should continue to evaluate and implement all feasible measures and programs to reduce entrainment and mortality of fish salvaged at the Skinner Fish Protection Facility (Banks Pumping Plant) and the Tracy Fish Collection Facility (Tracy Pumping Plant). These measures should include: (1) monitoring entrainment on a real-time basis to identify periods of peak susceptibility of various species; (2) coordinating operations of the two diversions, including interchangeable pumping, to reduce combined losses; (3) increasing screening efficiency; (4) improving fish salvage and handling; and (5) controlling predators at the SWP and CVP intakes.

4. Narrative Objective for Brackish Tidal Marshes of Suisun Bay

In the 1995 Plan, the State Water Board recommended that DWR convene a Suisun Marsh Ecological Work group (SEW) consisting of representatives from various State, federal and private agencies and other interested parties. The SEW was assigned eight tasks, one of which was to determine a numeric objective to replace the narrative objective for tidal brackish marshes of Suisun Bay. However, the SEW was unable to determine a single numeric objective for the tidal marshes. In 2001 the Suisun Marsh Charter Group (SMCG[11]) was formed to develop a plan to balance the competing needs in Suisun Marsh. The SMCG is currently preparing a Programmatic Environmental Impact Statement/Environmental Impact Report (PEIS/EIR) for the Habitat Management, Preservation, and Restoration Plan for the Suisun Marsh (Suisun Marsh Plan). In the preparation of the Suisun Marsh Plan, the principal Suisun Marsh agencies are evaluating Plan alternatives with a tidal wetland habitat restoration component ranging from 3,000 to 36,000 acres.

State Water Board staff will use the results of the final PEIS/EIR and the resulting Suisun Marsh Plan during the next Water Quality Control Plan update to determine whether and how to convert the narrative objective to a numeric objective for the Brackish Tidal Marshes.

[11] The SMCG Principle Agencies include Suisun Resource Conservation District, DFG, DWR, USBR, CBDA, NMFS and USFWS.

ED_000733_PSTs_00022282-00045

5. Numeric Objectives for Suisun Marsh
State Water Board staff will use the results of the final PEIS/EIR and the resulting Suisun Marsh Plan currently being prepared by the Suisun Marsh Charter Group (SMCG), to determine in a future plan amendment whether the objectives at stations S-97 and S-35 should be amended or deleted. The objectives at stations S-97 and S-35 may be amended and/or implemented in stages, as appropriate, and shall be implemented no later than either January 1, 2015, or an earlier date, if a further review of these objectives does not determine that they are not needed.

The objectives for water supply intakes for waterfowl management areas on Van Sickle and Chipps islands, which have no locations specified, may be amended and/or implemented in stages, and shall be implemented no later than January 1, 2015 if a further review of these objectives does not determine that they are not needed. Other measures to control Suisun Marsh soil and channel water salinities are discussed in section C9.

C. Recommendations to Other Agencies

Consistent with the Porter-Cologne Water Quality Control Act, this Water Quality Control Plan identifies control actions recommended for implementation by agencies other than the State Water Board. Actions are recommended both for the attainment of water quality objectives and to obtain additional information on the effects of flow and water quality on beneficial uses.

Numerous actions can be taken, in addition to establishing and implementing water quality objectives for the Bay-Delta Estuary, to improve fish and wildlife beneficial uses in the Estuary. These actions involve improvements to habitat conditions both inside and outside of the Estuary, many of which are under the authorities of other agencies, as well as studies needed to better understand the effects of flow and water quality on beneficial uses.

There is an ongoing effort by State agencies, the federal government, and agricultural, urban, and environmental interests to identify, fund, and implement, as warranted, measures to address the broader non-flow-related range of factors potentially affecting water quality and habitat in the Bay-Delta Estuary. Potential measures under consideration by these entities include those that would be implemented outside of the Estuary itself. These efforts, in connection with the other measures to implement the objectives in this plan, are among the ongoing programs to provide better protection for the beneficial uses that depend on the Bay-Delta Estuary.

The State Water Board will use its authority, as needed and appropriate, under section 13165 of the California Water Code to require that the following actions and studies be conducted.

ED_000733_PSTs_00022282-00046

1. Review and modify, if necessary, existing commercial and sport fishing regulations

Current levels of sport and commercial fishing may be contributing to reduced fish populations in the Bay-Delta Estuary. Since the implementation of the 1995 Plan, the Fish and Game Commission was granted authority over all state managed bottom trawl fisheries not managed under a federal fishery management plan or state fishery management plan. (Fish & Game Code, § 8841.) This authority ensures the sustainable management of resources, protects the health of ecosystems, and assists in the orderly transition to sustainable gear types when bottom trawling is incompatible with these goals.

The DFG, California Fish and Game Commission, Pacific Fisheries Management Council, and NOAA Fisheries should take the following actions within their respective authorities: (1) develop and implement a fisheries management program to provide short-term protection for aquatic species of concern through seasonal and area closures, gear restrictions to reduce capture and mortality of sub-legal fish, and other appropriate means; and (2) review immediately, and then at least every two years, and modify, if necessary, existing harvest regulations to ensure that they adequately protect aquatic species.

2. Reduce illegal harvesting

Illegal harvesting has a certain but un-quantified impact on fisheries of the Bay-Delta Estuary. The DWR and the DFG should expand the current illegal harvest enforcement program. Additionally, the DFG should continue to develop and implement educational programs to curb poaching of fishery resources.

3. Reduce the impacts of introduced species on native species in the Estuary

The intentional and accidental introduction of non-native species has caused major changes in the composition of aquatic resources in the Bay-Delta Estuary; however, the exact impacts of existing introduced species on native species in the Estuary are not clear. The impact of introduced species is being investigated as a potential cause of the POD. The results of the ongoing POD studies may provide insight into the reasons for the decline, and provide the scientific basis for actions that can be taken to reverse the trend.

Until the results from the POD studies are made available, other programs are being implemented by other agencies to lessen the propagation of invasive species. The National Invasive Species Act of 1996 established various programs intended to decrease the propagation of invasive species into waters of the U.S. and to prevent the spread of aquatic nuisance species. These programs include the Ballast Water Management Demonstration Program and the Aquatic Nuisance Species Program and allows for State Invasive Species Management Plans to be created independent of federal action. Under the National invasive Species Act of 1996, the DFG, USFWS, and NOAA Fisheries should continue to pursue programs to determine the impacts of introduced species, including striped bass, on the native aquatic resources of the Estuary, and the potential benefits of control measures. The DFG

ED_000733_PSTs_00022282-00047

should also continue its efforts under the Fish and Game Code sections 6430-6439, enacted in 1992, concerning introduced species.. Additionally, the California Fish and Game Commission should deny all requests for the introduction of new aquatic species into the watershed of the Bay-Delta Estuary unless it finds, based on strong, reliable evidence, that an introduction will not have deleterious effects on native species.

4. Improve hatchery programs for species of concern

Existing fish hatcheries are operated in order to provide mitigation for the loss of stream spawning and rearing habitat due to the construction of large dams. As noted by NOAA Fisheries in the Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan (OCAP), the viability of natural fish populations has been compromised due to the operation of hatcheries, as the hatchery fish are not isolated from the natural systems. Hatchery fish, while increasing the abundance of fish numbers, often result in increased harvesting pressure on natural fish stocks. Additionally the hybridization between hatchery and natural fish stocks has caused deterioration of the natural population.

To assist in the management of natural fish stocks, Congress has mandated that all federal and federally funded salmon and steelhead hatcheries implement a marking program on the fish they release to visually distinguish between hatchery and natural stock. DFG, NOAA Fisheries, and USFWS should continue to: (1) carefully examine and periodically re-examine the role and contribution of existing hatchery production for various fish species (e.g., chinook salmon, steelhead trout), including a consideration of the need for genetic diversity and maintaining the integrity of different salmon runs and (2) evaluate strategies for improving the survival of hatchery fish, before and after release, including diet and pre-release conditioning, selection of the life stage and size of fish to be released, timing releases relative to the presence or absence of other species, and using multiple release locations.

5. Expand the gravel replacement and maintenance programs for salmonid spawning habitat

The presence of dams on the major tributaries of the Delta blocks the movement of gravel eroding from upstream areas and causes fine sediments to infiltrate the remaining gravels. Reduction in the riverbed gravels required for salmonid spawning limits the success of chinook salmon and steelhead trout reproduction in the watershed of the Bay-Delta Estuary.

Under the AFRP, and other gravel replacement and maintenance programs, the DWR, the USBR, and other agencies that currently conduct gravel replacement and spawning habitat improvement programs on the Sacramento and San Joaquin River systems should continue and, where possible, increase their efforts in the reaches where salmonids are likely to spawn.

ED_000733_PSTs_00022282-00048

6. Evaluate alternative water conveyance and storage facilities of the SWP and CVP in the Delta

The current water diversion facilities of the CVP and the SWP in the southern Delta adversely impact fish populations. These facilities or alternative facilities are needed to meet water supply demands in areas south and west of the Delta. Various alternatives have been identified to minimize impacts to fish while meeting water supply demands. The proposed alternatives include construction of a water diversion intake on the Sacramento River equipped with state-of-the-art fish screens, isolated and through-Delta water conveyance facilities, and new water storage facilities within and south of the Delta. The DWR and USBR should continue their efforts to develop alternative water conveyance and storage facilities in the Delta, and should evaluate these alternatives and their feasibility and take action as necessary to minimize impacts to fish.

7. Develop an experimental study program on the effects of pulse flows on fish eggs and larvae in the Delta

The magnitude of freshwater outflow passing through the Delta affects the geographic distribution of many planktonic fish eggs and larvae. The egg and larval stages of many fish species occur in the Delta during a relatively short period of time in the spring (April-June). When there is high freshwater outflow, the planktonic eggs and larvae are moved downstream into Suisun Bay where they are less susceptible to entrainment at the SWP and CVP diversions and at other diversion points within the Delta. Absent high freshwater flows, pulse flows can be used to move the eggs and larvae downstream into Suisun Bay. To improve the efficiency of water used for this purpose, it would be helpful to experimentally quantify the magnitude and duration of pulse flows needed to move a substantial proportion of fish eggs and larvae into Suisun Bay.

DWR and USBR should conduct experiments to investigate and evaluate the biological benefits of pulse flows to move planktonic fish eggs and larvae into Suisun Bay. These experiments, which should be conducted as soon as feasible, should: (1) include flows from both the Sacramento and San Joaquin Rivers; (2) include real-time biological monitoring to determine the most favorable times for the pulse flows and the effects of the pulse flows on the eggs and larvae; (3) determine whether short-term pulse flows have a lasting benefit or whether, when outflows are reduced after a pulse flow, the larval fish are drawn back into interior Delta areas; and (4) take into account base flows and availability of water supplies. The experiments should be designed so that they can be used to refine potential pulse flow requirements in the future.

8. Implement actions needed to restore and preserve marsh, riparian, and upland habitat in the Delta

Most of the historical fish and wildlife habitat in the Delta has been eliminated or disturbed. In the Delta, less than 100,000 acres of the total 738,000 acres remains as marsh, riparian, and upland habitat. The remainder of the area is highly altered due to conversion to agricultural land, industrial and urban development, and actions

ED_000733_PSTs_00022282-00049

for flood control and navigation, such as dredging channels and riprapping banks. Furthermore, many of the alterations that have already occurred require extensive ongoing maintenance, which also disrupts fish and wildlife habitat. Restoration of fish and wildlife habitat in the Delta would benefit many species of the Bay-Delta Estuary.

State and federal agencies should require, to the extent of their authorities, habitat restoration in the Delta as a condition of approving projects. For example, the Delta Protection Commission, in all of its actions under the Delta Protection Act of 1992 (Pub. Resources Code § 29700 *et seq.*) that provide for the coordination of local land use decisions in the Delta, should continue to implement and support programs such as the Delta Mercury TMDL Collaborative (AB 2901), the Lower Bypass Collaborative/Management Plan and the Delta-wide Conservation Easement Concept. The DFG, when it considers approving stream alterations, and the DFG, USFWS, and NOAA Fisheries, when they consider projects that affect endangered species, should consider habitat requirements. The USCOE should consider habitat requirements in connection with applications for permits under Clean Water Act section 404. Within their authorities, these agencies should provide for: (1) levee setback requirements; (2) reductions in the depth of selected Delta channels, by using either dredge material from navigational channels or natural infill, to restore more productive shallows and shoals; (3) conversion of low-lying Delta islands to habitat areas; and (4) other habitat enhancement measures. The State Water Board will consider habitat requirements where needed to meet water quality standards under the Clean Water Act when approving section 401 certifications.

9. Suisun Marsh soil and channel water salinity objectives

In addition to the formation of the SEW discussed above, the 1995 Plan recommended three measures to be implemented to control Suisun Marsh soil and channel water salinities. The first measure, calling for continuation of the actions identified for implementation in the Suisun Marsh Preservation Agreement (SMPA), is included in the Revised Suisun Marsh Preservation Agreement executed on June 25, 2005. The Suisun Marsh Charter Group is evaluating two additional actions that may be added to the SMPA in a future amendment. The second measure, calling for a study to determine the relationship between channel water salinity and soil water salinity under alternative management practices, was completed in 2001 by DWR as part of the Comprehensive Review of Suisun Marsh Monitoring Data, 1985-1995. The third measure, requiring that DWR, USBR, DFG, and Suisun Resource Conservation District (SRCD), together with the property owners in Suisun Marsh, to employ a watermaster, has been accomplished through implementation of the Water Manager Program under the Revised SMPA.

In June of 2005, SRCD, DWR, USBR, and DFG signed the Revised SMPA. This agreement funded the Water Manager Program to help coordinate and improve water management practices on individual private managed wetlands throughout the Marsh. The duties of the Water Managers include:

ED_000733_PSTs_00022282-00050

- promote and encourage wetland management activities, including flooding, draining and circulation, so that they occur at the appropriate critical times of the year to produce desired wildlife habitats.

- provide technical support in the field to answer questions and educate landowners on beneficial management techniques.

- protect and enhance endangered species habitat, manage water application, and provide new scientific information pertaining to common management activities.

- supervise and coordinate the portable pump program to ensure proper maintenance and operation of the pumps.

- assist landowners in planning yearly maintenance and enhancement projects.

- additional activities may include assisting DFG on water management of State owned property, assisting in yearly salt marsh harvest mouse monitoring, California clapper rail surveys, and inspections of levees during storms to identify damages and assist in flood fight coordination.

10. San Joaquin River Spring Flow Objectives
The DFG, USFWS, and NOAA Fisheries, in coordination with the IEP and other interested parties, should compile information and conduct specific studies to determine whether and what changes should be made to the Spring Flow Objectives to protect San Joaquin River chinook salmon and steelhead, pelagic organisms (see the POD section for additional information concerning these studies) and other applicable fish and wildlife species. These entities also should conduct analyses to determine whether it is appropriate to revise the methodology for determining when the higher spring flow objectives apply, to better reflect hydrological conditions within the San Joaquin River Basin. In addition, these entities should conduct modeling to determine the water costs of the various flow proposals and the sustainability of such proposals given current water storage capacities and consumptive use needs within the San Joaquin River Basin. These entities should present any available information from such studies during the State Water Board's workshop on the San Joaquin River flow issues.

11. San Joaquin River Pulse Flow Objectives
DWR, in cooperation with parties to the SJRA, should establish procedures to install the head of Old River barrier at flows in excess of 5,000 cfs during the pulse flow period to further increase the survival of out-migrating San Joaquin River chinook salmon smolts and to provide additional data for the VAMP experiment.

In addition, parties to the SJRA should conduct a peer review of the VAMP study design to determine whether changes may be needed to the study to obtain

ED_000733_PSTs_00022282-00051

necessary data points and to ensure the protection of San Joaquin River and Delta species. This peer review should be conducted prior to the State Water Board's workshop on San Joaquin River flow issues, anticipated for summer of 2007. Conclusions from the peer review should be presented during the workshop. If the findings of the peer review indicate that changes may be needed to water rights implementing the VAMP study, parties to the SJRA may file a petition to change their water rights with the State Water Board.[12] Alternatively, the State Water Board could undertake its own proceeding to make changes to water rights, the objectives, and/or the program of implementation for the objectives.

D. Monitoring and Special Studies Program

This Plan requires, and the permits and license of the DWR and the USBR include conditions for, a monitoring program to provide baseline information and determine compliance with water quality objectives. This Plan also requires, and the permits of DWR and USBR include conditions for, special studies that will (1) evaluate the response of the aquatic habitat and organisms to the objectives; and (2) increase understanding of the large-scale characteristics and functions of the Estuary ecosystem to better predict system-wide responses to management options.

The monitoring and special studies program, also known as the Environmental Monitoring Program (EMP) is predicated on the ongoing monitoring efforts of the IEP. IEP member agencies include the State Water Board, DFG, USGS, NOAA Fisheries, USCOE, USEPA, DWR, and the USBR. The program is coordinated with the CBDA and UC Davis to minimize duplication and facilitate the exchange of data.

Table 4 of the 1995 Plan (now Table 7), established a preliminary compliance and baseline monitoring program. Condition 11 (e) on page 149 of D-1641 required the DWR and the USBR to complete an assessment of the EMP every three years to evaluate whether the goals of the monitoring program were being attained. This review was completed in 2003 and based on the conclusions of the review, several changes to the EMP were proposed that were considered to be functionally equivalent to the existing program. IEP participants developed a more appropriate compliance and baseline monitoring program. The new program contains Geographic Information System (GIS) coordinates for each monitoring and baseline station. In addition the modifications will: 1) enhance continuous monitoring at key locations to better measure the temporal variability in the system; 2) enhance shallow water monitoring to better measure the spatial variability in the system; 3) reduce the tidal spring-neap bias that occurs in the current program; 4) improve the quality assurance and quality control of the program by providing continuous monitoring data that can be used as crosschecks against discrete or periodic sampling data; and 5) improve employee safety.

[12] The State Water Board could then determine whether changes would also be needed to the Plan and undertake proceedings to make any necessary changes.

ED_000733_PSTs_00022282-00052

Prior to the release of the 1995 Plan, the IEP had been conducting a special studies program including the 20mm delta smelt survey and the juvenile salmon and delta fishes abundance and distribution sampling. These studies emphasize understanding the ecological responses of species of special concern to water project operations resulting from implementation of this Plan. Other ongoing studies, such as the Bay shrimp and crab abundance and distribution sampling, and the Bay salinity monitoring, enhance knowledge of how the Estuary responds to factors other than the operational impacts of water development facilities.

Since the release of the 1995 Plan, various State and federal agencies and interested parties developed a near-real-time monitoring program managed by the Water Operations Management Team (WOMT) to assist the CALFED Ops group acting pursuant to the Principles for Agreement. The State and federal agencies should continue to conduct a process like the CALFED Ops process to ensure that the SWP and CVP operations developed to comply with the Plan are as efficient as possible.

ED_000733_PSTs_00022282-00053

Table 7. Water Quality Compliance and Baseline Monitoring

Station Number[1]	Station Description[2]	Latitude[3]	Longitude[3]	Cont. Rec.[4]	Cont. Multi-para-meter[5]	Disc. Physical Chemical[6]	Disc. Phyto-plankton[7]	Discr. Zoo-plankton[8]	Discrete Benthos[9]
C2 Ñ	Sacramento River @ Collinsville	38.07395	-121.85010	*					
C3A ø	Sacramento River @ Hood	38.36772	-121.52051		*	*	*	*	
C4 Ñ	San Joaquin River @ San Andreas Ldg.	38.10319	-121.59128	*					
C5 Ñ	Contra Costa Canal @ Pumping #1	37.99520	-121.70244	*					
C6 Ñ	San Joaquin River @ Brandt Bridge site	37.86454	-121.32270	*					
C7 ø	San Joaquin River @ Mossdale Bridge	37.78604	-121.30666		*				
C8 Ñ	Old River near Middle River	37.82208	-121.37517	*					
C9 z	West Canal at mouth of CCForebay Intake	37.8218	-121.55275						*
		37.83075	-121.55703		*	*	*	*	
C10 z	San Joaquin River near Vernalis	37.67575	-121.26500						
		37.69734	-121.26472		*	*	*	*	
C13 Ñ	Mokelumne River @ Terminous	38.11691	-121.49888	*					
C14 Ñ	Sacramento River @ Port Chicago	38.05881	-122.02607	*					
C19 Ñ	Cache Slough @ City of Vallejo Intake	38.29687	-121.74784	*					
D4 ø	Sacramento River above Point Sacramento	38.06214	-121.81792			*	*	*	*
D6 ø	Suisun Bay @ Bulls Head Pt. near Martinez	38.04427	-122.11764			*	*	*	*
D6A ø	Suisun Bay @ Martinez	38.02762	-122.14052		*				
D7 ø	Grizzly Bay @ Dolphin near Suisun Slough	38.11708	-122.03972	*		*	*	*	*
D8 ø	Suisun Bay off Middle Point near Nichols	38.05992	-121.98996			*	*	*	
D9 ø	Honker Bay near Wheeler Point	38.07245	-121.93923	*		*	*		
D10 z	Sacramento River @ Chipps Island	38.04288	-121.92011		*	*			
		38.04631	-121.91829					*	
D11 ø	Sherman Island near Antioch	38.04228	-121.79951	*		*	*		
D12 z	San Joaquin River @ Antioch Ship Canal	38.01770	-121.80273		*	*			
		38.02162	-121.80638					*	
D15 Ñ	San Joaquin River @ Jersey Point	38.05190	-121.68927	*					
D16 ø	San Joaquin River @ Twitchell Island	38.09690	-121.66912					*	*
D19 ø	Frank's Tract near Russo's Landing	38.04376	-121.61477	*		*	*	*	
D22 z	Sacramento River @ Emmaton	38.08406	-121.73912	*					
		38.08453	-121.73914					*	
D24 z	Sacramento River below Rio Vista Bridge	38.15891	-121.68721		*	*			
		38.15550	-121.68113						*
D26 ø	San Joaquin River @ Potato Point	38.07667	-121.56696			*	*	*	
D28A ø	Old River near Rancho Del Rio	37.97038	-121.57271			*	*	*	*
		37.96980	-121.57210	*					

D29 Ñ	San Joaquin River @ Prisoners Point	38.05793	-121.55736	*					
…….. ø		38.05793	-121.55736			*	*	*	
D41 ø	San Pablo Bay near Pinole Point	38.03016	122.37287			*	*	*	*
D41A ø	San Pablo Bay near mouth of Petaluma R.	38.08472	-122.39067			*	*	*	*
DMC1 z	Delta-Mendota Canal at Tracy Pump. Plt.	37.78165	-121.59050		*				
P8 ø	San Joaquin River @ Buckley Cove	37.97815	-121.38242			*	*	*	*
P8A ø	San Joaquin River @ Rough and Ready Island	37.96277	-121.36587		*				
P12 Ñ	Old River @ Tracy Road Bridge	37.80493	-121.44929	*					
MD10 ø	Disappointment Slough near Bishop Cut	38.04229	-121.41935			*	*	*	
S21 Ñ	Chadbourne Slough @ Sunrise Duck Club	38.18476	-122.08315	*					
S35 ø	Goodyear Slough @Morrow Island Clubhouse	38.1181	-112.09580	*					
S42 z	Suisun Slough 300' south of Volanti Slough	38.18053	-122.04696	*		*	*		
		38.18027	-122.04779					*	
S49 Ñ	Montezuma Slough near Beldon Landing	38.18686	-121.97080	*					
S64 Ñ	Montezuma Slough @ National Steel	38.12223	-121.88800	*					
S97 ø	Cordelia Slough @ Ibis Club	38.15703	-122.11378	*					
NZ032 ø	Montezuma Slough, 2nd bend from mouth	38.16990	-122.02112					*	
SLBAR3 Ñ	Barker Sl. at No. Bay Aqueduct (SLBAR3)	38.27474	-121.79499	*					
--- Ñ	Sacramento R. (I St. Bridge to Freeport) (RSAC155)	38.589 to 38.45585	-121.504 to -121.50302	*					
--- ø	San Joaquin R. (Turner Cut to Stockton) (RSAN050-RSAN061)	37.99746 to 37.95242	-121.44435 to -121.31750	*					
--- ø	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island			*					

■Compliance monitoring station øBaseline monitoring station ●Compliance and baseline monitoring station

Footnotes for Table 7

[1] All stations with compliance monitoring component are identified by historical "interagency" station numbers as given in State Water Board D-1641 (2000) and Water Right Decision 1485 (1978). Modified station ID numbers (e.g. C3A) identify baseline stations near historical stations.

[2] All stations with a compliance monitoring component retain their historical "interagency" station descriptions as given in State Water Board D-1641 (2000) and D-1485 (1978). Baseline stations with modified station ID numbers (e.g. C3A) have modified station descriptions.

[3] Coordinates are geographic North American Datum 1983 and have been verified to be accurate for 1:24,000 scale mapping.

[4] Continuous recording (every 15 minutes) of water temperature, electrical conductivity (EC), and/or dissolved oxygen. For municipal and industrial intake chloride objectives, EC can be monitored and converted to chloride concentration.

[5] Continuous, multi-parameter monitoring (recording every 1 to 15 minutes with telemetry capabilities) includes the following variables: water temperature, EC, pH, dissolved oxygen, turbidity, chlorophyll *a* fluorescence, tidal elevation, and meteorological data (air temperature, wind speed and direction, solar radiation).

[6] Discrete physical/chemical monitoring is conducted on a year-round, near-monthly basis that alternates between spring and neap tides and includes the following variables: macronutrients (inorganic forms of nitrogen, phosphorus and silicon), total suspended solids, total dissolved solids, total particulate and dissolved organic nitrogen and carbon, chlorophyll *a*, pH, dissolved DO, EC (specific conductance), turbidity, secchi depth, and water temperature. In addition, on-board continuous recording is conducted intermittently for the following variables: water temperature, dissolved oxygen, electrical conductivity, turbidity, and chlorophyll *a* fluorescence.

[7] Discrete sampling for phytoplankton enumeration or algal pigment analysis is conducted on a year-round, near-monthly basis that alternates between spring and neap tides.

[8] Tow or pump sampling for zooplankton, mysids, and amphipods is conducted on a year-round, near-monthly basis that alternates between spring and neap tides.

[9] In water years 2004 and 2005, replicated benthos and sediment grab samples are taken quarterly (every three months) and during special studies; more frequent monitoring sampling resumes in water year 2006.

ED_000733_PSTs_00022282-00055

E. Other Studies conducted by agencies that may provide information relevant to future proceedings

The following studies are currently in progress and are being completed by other agencies independent of State Water Board action. Upon completion, the State Water Board may use the information provided by these studies to amend portions of this Plan.

1. Delta Cross Channel Gate

In the fall of 2000, the CALFED Bay Delta Program and the IEP began investigating the costs and benefits associated with re-operating the Delta Cross Channel (DCC) gate to address water quality and fisheries concerns. These studies have been delayed due to lack of funding and staffing problems. When completed, the Board expects the CALFED Bay Delta Program multidisciplinary studies to address the multi-purpose aspects of DCC gate operation (balancing the beneficial uses of fisheries, water quality, water supply and flood control), and provide evidence for future amendments to the DCC objective.

2. Potential New Municipal and Industrial Objectives

Further understanding of the chemical reactions which form disinfection by-products (DBPs) is required before water quality objectives for bromides and organic carbon can be set. However, USEPA may require compliance with new federal drinking water standards as soon as 2012. The preferred methods for developing this information are collaborative processes such as the CALFED Drinking Water Quality Program (DWQP), which includes the Central Valley Drinking Water Policy. DWR, CALFED, and the Central Valley Regional Water Board are planning to complete development of the Central Valley Drinking Water Policy by 2009. This work may include development of bromide objectives and other constituents for the Central Valley Drinking Water Policy. After the Drinking Water Policy is completed, the State Water Board may convene a workshop to receive comments as to whether there is a need for objectives in the Bay-Delta Plan for bromides and organic carbon.

3. Pelagic Organism Decline

The IEP formed a POD work team to evaluate the potential causes of the marked declines in numerous pelagic fishes in the Sacramento-San Joaquin Delta Estuary and Suisun Bay. This multi-agency effort has produced a work plan that provides an overview of the problem, and a description of the studies used to examine some of the suspected causes of the decline.

In order to better understand the results of the POD studies, the IEP has created a conceptual model of the decline. The model is based on three general factors that may be acting individually or in concert to lower pelagic productivity. The three main suspected factors are: toxins, invasive species and water project operations. The POD studies were designed to provide insight into the reasons for the decline and to set the scientific basis for future work, with the eventual goal of narrowing down the causes of the decline and determining what actions can be taken to reverse the

ED_000733_PSTs_00022282-00056

trend. The proposed studies represent an interdisciplinary, multi-agency effort including staff from DFG, DWR, USBR, USEPA, USGS, CBDA, San Francisco State University and UC Davis. The proposed work falls into three general types: (1) an expansion of existing monitoring (five expanded surveys); (2) ongoing studies (19 studies); and (3) new studies (15 studies).

The program will be run by the existing IEP Pelagic Organisms Decline Project Work Team to develop, direct, review and analyze the results of the effort. The program will yield a range of products and deliverables including management briefs, publications and reports, web-based monitoring data, and presentations at conferences, workshops and meetings.

In February 2006, the CBDA provided an independent review of the initial results of the 2005 IEP POD Workplan and the 2005 IEP POD Synthesis Report entitled *Review Panel Report: San Francisco Estuary Sacramento-San Joaquin Delta Interagency Ecological Program on Pelagic Organism Decline*. The report provides perspectives on data synthesis presented and makes recommendations for improvements in analyzing, interpreting and defining appropriate context for future IEP POD-oriented investigations.

The expected completion date for the POD studies is 2007. Once the study results have been compiled; the State Water Board will ask the IEP to make a presentation of findings to the State Water Board at a subsequent workshop. Study results will be considered in the ongoing Plan review, and may be used to determine whether changes should be made to existing Water Quality Objectives, i.e. adding flexibility to the Delta Outflow Objective or the Delta Export Limits Objective. After the initial presentation to the State Water Board, the IEP shall give the State Water Board updates of current studies and new findings at subsequent workshops on an annual basis. The IEP presentations to the State Water Board shall continue until the next review of this Plan. The information collected by the State Water Board may be used to modify the water quality objectives in this Plan in the future.

4. Suisun Marsh

In 2001, the SMCG was formed to resolve issues of amending the SMPA, obtain a Regional General Permit, implement the Suisun Marsh Levee Program, and recover endangered species. The broader purpose of the SMCG is to develop and agree on a long-term implementation plan. The SMCG principal agencies are USFWS, USBR, DFG, DWR, Suisun Resource Conservation District, and NOAA Fisheries. The proposed Suisun Marsh Plan would be consistent with the goals and objectives of the Resources Agency's Bay-Delta Program, and would balance them with the SMPA, federal and State Endangered Species Acts and other management and restoration programs within the Suisun Marsh in a manner responsive to the concerns of all stakeholders and based upon voluntary participation of private landowners. In March 2006, the Plan was undergoing California Environmental Quality Act (CEQA)/National Environmental Policy Act review. The final CEQA document will be released in December 2008. The State Water Board will use the

ED_000733_PSTs_00022282-00057

final Suisun Marsh Plan and the analysis in the final CEQA document in its next periodic review to determine what amendments, if any, to make to Suisun Marsh soil and channel water salinity objectives, and the narrative objective for brackish tidal marshes of Suisun Bay.

ED_000733_PSTs_00022282-00058

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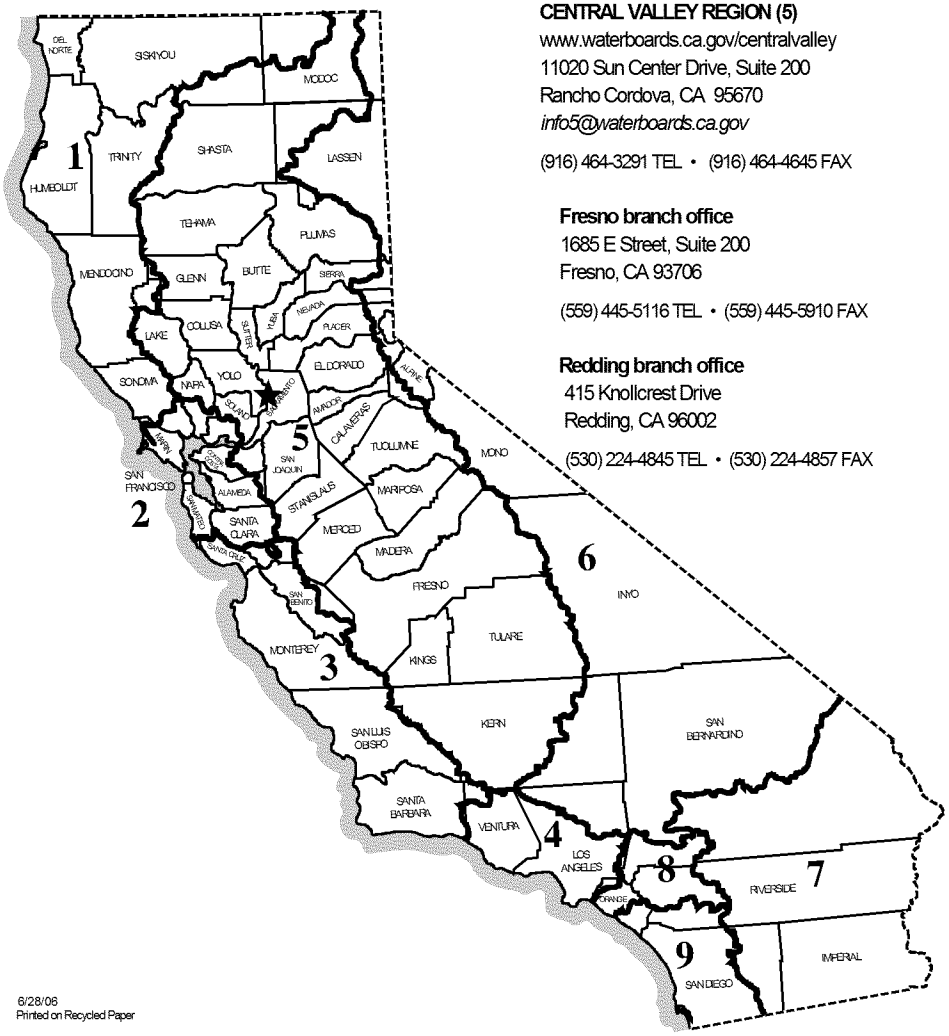

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