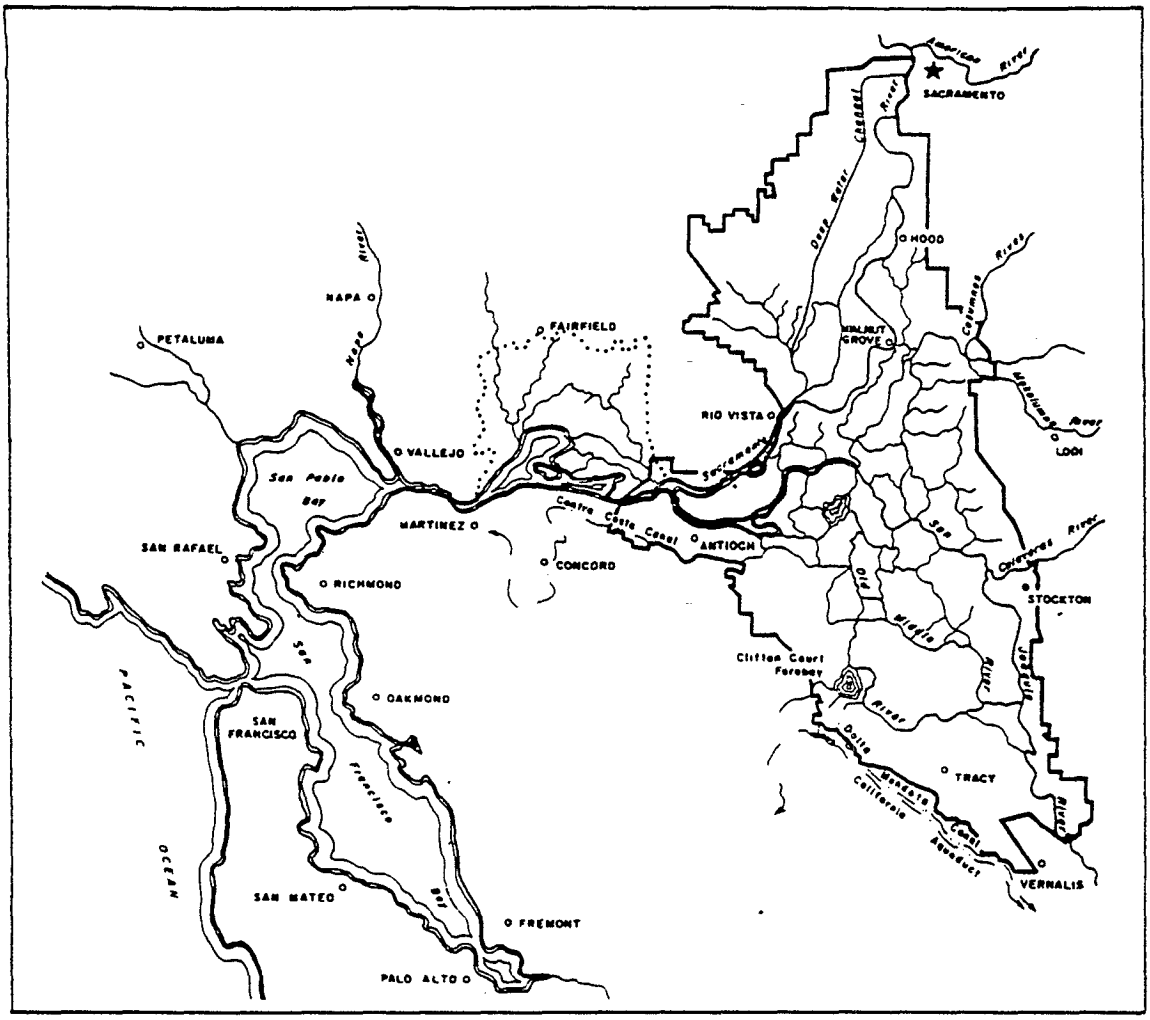

DRAFT

WATER QUALITY CONTROL PLAN

for the

San Francisco Bay/ Sacramento-San Joaquin Delta Estuary

DECEMBER 1994

STATE WATER RESOURCES CONTROL BOARD

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

F-000158

F-000158

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LIST OF ABBREVIATIONS

BOD	biochemical oxygen demand
cfs	cubic feet per second
F	Fahrenheit
MAF	million acre-feet
mg/l	milligram(s) per liter
mmhos/cm	millimhos per centimeter
ppt	parts per thousand
TAF	thousand acre-feet

LIST OF ACRONYMS

CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DFA	California Department of Food and Agriculture
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
FED	Federal Ecosystem Directorate
IEP	Interagency Ecological Program
MOU	Memorandum of Understanding
NMFS	National Marine Fisheries Service
RWQCB	Regional Water Quality Control Board
SCS	U.S. Soil Conservation Service
SJVDP	San Joaquin Valley Drainage Program
SMPA	Suisun Marsh Preservation Agreement
SRCD	Suisun Resource Conservation District
SWP	State Water Project
SWRCB	State Water Resources Control Board
USBR	U.S. Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

BAY-DELTA PLAN

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

CHAPTER I. INTRODUCTION

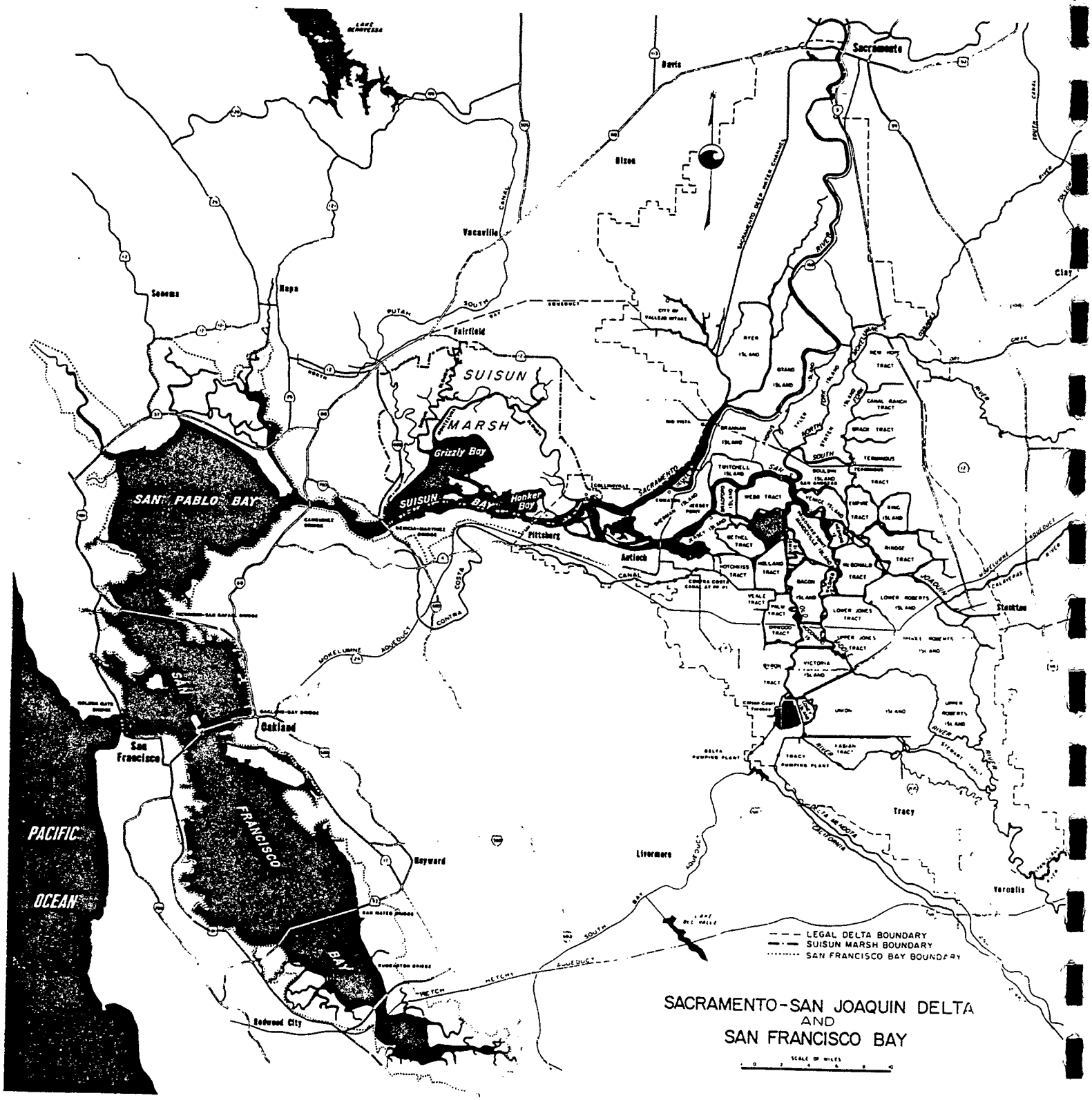
The San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Estuary or Estuary) (Figure 1) is important to the natural environment and economy of California. The watershed of the Bay-Delta Estuary provides drinking water to two-thirds of the State's population and water for a multitude of other 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. However, the combination of historical and current human activities (e.g., water development, land use, wastewater discharges, introduced species, harvesting), and variations in natural conditions has degraded the beneficial uses of the Bay-Delta Estuary, as evidenced by the declines in the populations of many biological resources of the Estuary.

The State Water Resources Control Board (SWRCB) has previously adopted water quality control plans and policies to protect the water quality and to control the water resources which affect the beneficial uses of the Bay-Delta Estuary. These plans and policies have been adopted consistent with section 13000 et seq. of Division 7 of the California Water Code (Stats. 1969, Chapter 482) and pursuant to the authority contained in section 13170 (Stats. 1971, Chapter 1288). The SWRCB finds and declares that this water quality control plan represents an element of a comprehensive management approach to the protection of beneficial uses in the Estuary.

The SWRCB finds further that this water quality control plan shall be reviewed at least every three years to ensure that it adequately protects beneficial uses. This plan supersedes both the Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh, adopted August 1978 (1978 Delta Plan), and the Water Quality Control Plan for Salinity for the San Francisco Bay/Sacramento-San Joaquin Delta, adopted May 1991 (1991 Bay-Delta Plan). This plan also supersedes any regional water quality control plan for the same waters to the extent of any conflict. Full implementation of this plan by the SWRCB will occur through the adoption of a water right decision.

Documentation of the SWRCB's considerations in developing this water quality control plan is contained in the appendix, titled "Environmental Report, Appendix to Water Quality Control Plan for the San Francisco Bay-Sacramento San Joaquin Delta".

Figure 1
BAY-DELTA ESTUARY



A. Purpose and Scope

The purpose of this plan is to establish water quality control measures which contribute to the protection of beneficial uses in the Bay-Delta Estuary. 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 designated beneficial uses and the water quality objectives established to protect them are called water quality standards under the terminology of the federal Clean Water Act.

This plan provides the component of a comprehensive management package for the protection of the Estuary's beneficial uses that involves salinity (from saltwater intrusion and agricultural drainage) and water project operations (flows and diversions), as well as a dissolved oxygen objective. This plan supplements other water quality control plans adopted by the SWRCB and regional water quality control boards (RWQCB), and State policies for water quality control adopted by the SWRCB, relevant to the Bay-Delta Estuary watershed. These other plans and policies establish water quality standards and requirements for parameters such as toxic chemicals, bacterial contamination, and other factors which have the potential to impair beneficial uses or cause nuisance.

Water quality control policies and plans relevant to the protection of beneficial uses of the Bay-Delta Estuary include: (1) Statement of Policy With Respect to Maintaining High Quality Waters in California (SWRCB Resolution No. 68-16); (2) State Policy for Water Quality Control (adopted by motion on July 6, 1972); (3) Water Quality Control Policy for Enclosed Bays and Estuaries (SWRCB Resolution No. 74-43); (4) Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling (SWRCB Resolution No. 75-58); (5) Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (adopted by the SWRCB on September 18, 1975); (6) Policy With Respect to Water Reclamation in California (SWRCB Resolution No. 77-1); (7) Sources of Drinking Water Policy (SWRCB Resolution No. 88-63); (8) Pollutant Policy Document for the San Francisco Bay/Sacramento-San Joaquin Delta (SWRCB Resolution No. 90-67); (9) Water Quality Control Plan, San Francisco Bay Basin; and (10) Water Quality Control Plans, Central Valley Basin.

Coordination of resource management decisions is necessary to protect the Bay-Delta Estuary, and to achieve regulatory consistency and certainty, in a manner which minimizes impacts on the State's economy and water resources. Therefore, the Governor's Water Policy Council of the State of California (Council) and the Federal Ecosystem Directorate (FED), comprised of State and federal resource agencies, have entered into a Framework Agreement. The purpose of the agreement is to establish a comprehensive program for coordination and communication between the Council and the FED regarding environmental protection and water supply dependability in the Bay-Delta Estuary and its watershed. The agreement identifies three areas where both State and federal interests and responsibilities are

interrelated, and coordination and cooperation are particularly important: (1) formulation of water quality standards for the Estuary; (2) improved coordination of federal and State water project operations with regulatory requirements; and (3) development of a long-term solution to fish and wildlife, water supply reliability, flood control, and water quality problems in the Bay-Delta Estuary. This water quality control plan addresses the first of the three areas identified in the agreement.

This plan establishes reasonable controls on the factors which have been identified as likely contributors to the declines in aquatic resources in the Bay-Delta Estuary through the establishment of water quality objectives and, for actions outside the authority of the SWRCB, recommendations to other agencies. Consistent with the intent of the State Legislature, as expressed in Water Code section 13000, in the Porter-Cologne Water Quality Control Act, these objectives and recommendations are intended to attain the goal of the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible. Effects of implementation of this plan must be evaluated over the next several years as a necessary first step in determining if further balancing of competing needs is appropriate.

This water quality control plan, in conjunction with RWQCB plans, other SWRCB plans and policies, the program established under the Framework Agreement, and activities recommended to other agencies in this plan, provides a coordinated and comprehensive ecosystem approach to protection of the beneficial uses of the Bay-Delta Estuary.

B. Background

Regulation of the Bay-Delta Estuary has occurred through the adoption of water right decisions, water quality control policies, and water quality control plans. A brief summary of the principal decisions, policies, and plans relevant to the Estuary is provided below.

In February 1961, the State Water Rights Board (predecessor to the SWRCB) adopted Water Right Decision 990, which approved water rights for the federal Central Valley Project (CVP). The Board did not attach specific water quality standards as terms and conditions of the CVP permits; however, it did reserve jurisdiction to impose such requirements in the future.

The development of water quality standards for the Delta began with the adoption of agricultural salinity standards as terms and conditions of Water Right Decision 1275, which approved water rights for the State Water Project (SWP) in May 1967. In response to the concern by the Secretary of the Interior that existing standards for the Delta did not adequately protect municipal, industrial, agricultural, and fishery uses, the SWRCB (newly created by the amalgamation of the State Water Rights Board and the State Water Quality Control Board) adopted a water quality control policy for the Delta through Resolution 68-17 in 1968. This policy supplemented a water quality control policy for the Delta that was

developed by the Central Valley RWQCB and adopted by the SWRCB in June 1967. In accordance with a commitment made in Resolution 68-17 to supplement the salinity standards, the SWRCB adopted Water Right Decision 1379 (D-1379) in July 1971. D-1379, which required the CVP and the SWP to meet standards for non-consumptive fish and wildlife uses in addition to agricultural, municipal, and industrial consumptive uses, was stayed by action of the court in October 1971 as a result of litigation.

In 1971, the RWQCBs adopted, and the SWRCB approved, interim water quality control plans for the 16 planning basins in the State, including the Delta and Suisun Marsh. These regional water quality control plans marked the completion of the first phase of a comprehensive statewide planning effort. Subsequently, long-term standards for the Delta and Suisun Marsh were established in the regional plans for the Sacramento-San Joaquin Delta Basin and the San Francisco Bay Basin, which were approved by the SWRCB in 1975 and 1976, respectively. Meanwhile, in April 1973, the SWRCB adopted a water quality control plan, through Resolution 73-16, which supplemented the State water quality control policies for the Delta.

In August 1978, the SWRCB exercised its reservation of jurisdiction over the water right permits for the CVP and the SWP by adopting Water Right Decision 1485 (D-1485). At the same time, the SWRCB adopted the 1978 Delta Plan. Together, the 1978 Delta Plan and D-1485 revised existing standards for flow and salinity in the Delta's channels and ordered the Bureau of Reclamation (USBR) and the Department of Water Resources (DWR) to meet these standards by either reducing pumping, releasing water stored in upstream reservoirs, or both. To address the continuing uncertainty associated with possible future project facilities and the need for additional information on the Estuary's ecosystem, the SWRCB committed to reviewing the 1978 Delta Plan in 10 years.

In July 1987, the SWRCB began proceedings to reexamine water quality objectives for the Bay-Delta Estuary and consider how water right permits would be modified to meet the new objectives. In May 1991, the SWRCB adopted the 1991 Bay-Delta Plan with objectives for salinity, dissolved oxygen, and temperature. The 1991 Bay-Delta Plan was subsequently submitted to the U.S. Environmental Protection Agency (USEPA) for approval. In September 1991, the USEPA approved all of the salinity objectives for municipal, industrial, and agricultural beneficial uses, and the dissolved oxygen objective for fish and wildlife beneficial uses. The USEPA stated that the other fish and wildlife objectives were disapproved because of their failure to protect estuarine habitat and other designated fish and wildlife beneficial uses. As required under federal regulations (40 CFR 131.22) when a state does not adopt changes in standards recommended by the USEPA upon notification of approval or disapproval of a state's standards, the USEPA initiated promulgation of water quality standards for the Bay-Delta Estuary. In January 1994, the USEPA published draft standards for the Estuary in the Federal Register (59 Fed. Reg. 813).

In March 1994, the SWRCB commenced proceedings to review the effective requirements of the 1978 and 1991 Bay-Delta plans. This plan is the result of those proceedings.

C. Legal Authority

1. General. The SWRCB has prepared this water quality control plan under the Porter-Cologne Water Quality Control Act of 1969, as amended (Porter-Cologne Act). (Wat. Code §13000 et seq.) The RWQCBs have the primary responsibility for formulating and adopting water quality control plans for their respective regions (Wat. Code §13240), but the SWRCB also is authorized, under Water Code section 13170, to adopt water quality control plans in accordance with the provisions of section 13240 et seq[1]. The SWRCB's authority includes but is not limited to waters for which water quality standards are required by the federal Clean Water Act. (Wat. Code §13170) When the SWRCB 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) Before adopting a water quality control plan pursuant to section 13170, the SWRCB must consider all relevant management agency agreements which are intended to protect a specific beneficial use of water. (Wat. Code §13170.1)

A water quality control plan consists of a designation or establishment for the waters within a specified area of the beneficial uses to be protected, water quality objectives, and a program of implementation. (Wat. Code §13050(j)) A discussion of the legal authority pertaining to each component follows.

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

3. 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) At the least, the SWRCB must consider, in establishing objectives, the beneficial uses, the environment of the hydrographic unit, the water quality that could be achieved, economic considerations, the need for housing, and the need to develop and use recycled water. (Wat. Code §13241)

The Central Valley and San Francisco Bay RWQCBs have adopted water quality objectives for many properties and characteristics of the Bay-Delta Estuary. In most cases, the SWRCB does not wish to supersede those objectives. Therefore, the SWRCB's Bay-Delta plans historically established or amended primarily objectives for which implementation includes regulation of water diversion and use[2]; i.e., situations in which water supply activities affect

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

[2] Some of the Bay-Delta objectives require water quality regulation as well as water supply regulation.

water quality. Until the SWRCB adopted the 1991 Bay-Delta Plan, the Bay-Delta plans contained objectives only for salinity, flow, and water project operations. This plan amends or carries over the objectives for salinity, temperature, and dissolved oxygen in the 1991 Bay-Delta Plan, and includes objectives for flow and water project operations in the Bay-Delta Estuary.

The objectives for flow and water project operations amend objectives in the 1978 Delta Plan. The SWRCB did not amend these objectives in the 1991 Bay-Delta Plan, but it specifically retained the option of revising these objectives later. Although most water quality control plans do not regulate flow or water project operations, 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 Act.

The State water quality law encompasses a broad scope of parameters that can be regulated using water quality objectives[3]. A water quality objective is defined under State law as "the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area." (Wat. Code §13050(h)) "Quality of the water" is defined as the "chemical, physical, biological, bacteriological, radiological, and other properties and characteristics of water which affect its use." (Wat. Code §13050(g))

Several features of these definitions support the establishment under State law of objectives for flow and project operations. Water quality, as defined, includes physical properties and characteristics of water which affect its use. (Wat. Code §13050(g)) In the Bay-Delta Estuary, the rate and quantity of flow, the direction of flow, and the operations of the water projects, including their export pumping, are physical properties or characteristics of the water. These parameters have a very great impact on the beneficial uses of the Estuary. A water quality objective sets limits on the water's characteristics, so as to reasonably protect the beneficial uses of the water. (Wat. Code §13050(h))

The intent of the Porter-Cologne Act and contemporaneous statutory enactments was to coordinate the control of water quality and water rights under State law. The legislative history indicates that water quality regulation should be comprehensive and should not stop with water quality impairment that is caused by discharges of waste. Including objectives for flow or water project operations in a water quality control plan adopted under the Water Code is consistent with the legislative intent. Several sections of the Water Code were added or amended to address the need to consider the effects on water quality of water diversions and use. Water Code section 174 (enacted by Stats. 1967, Ch. 284) combines the State's water quality and water rights functions in the SWRCB.

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[3] State law differs from federal law in this respect. While objectives can be adopted under State law for all parameters that affect water quality, the federal Clean Water Act does not authorize the USEPA to adopt criteria (the equivalent of objectives under State law) for the rate of flow of water, salinity intrusion caused by water diversion and use, or water project operations.

Concurrent with combining the State's water quality and water right functions, the Legislature linked water rights and water quality proceedings by enacting Water Code section 1258. (Stats. 1967, Ch. 284) Two years later, the Porter-Cologne Act was enacted, establishing the current water quality regulatory framework. (Stats. 1969, Ch. 482) The Porter-Cologne Act also added new sections, and amendments to existing sections, which apply to water rights regulation. Sections 1242.5 and 1243.5 were added; sections 1257 and 1258 were amended. Water Code section 1258 was amended to its current form, which requires the SWRCB to consider terms and conditions implementing water quality control plans when it acts on water right applications. Water Code section 1257, as amended, requires the SWRCB, in considering water right applications, to consider the relative benefit to be derived from all beneficial uses of the water concerned, including any uses specified to be protected in any relevant water quality control plan. Water Code section 1242.5 was added, authorizing the SWRCB to approve appropriation by storage of water to be released for the purpose of protecting or enhancing the quality of other waters. Water Code section 1243.5 was added, requiring the SWRCB to take into account when it decides how much water is available for appropriation, if it is in the public interest, the amounts of water needed to remain in the source for protection of beneficial uses. The section provides that beneficial uses include any uses specified to be protected in any relevant water quality control plan.

4. **Program of Implementation.** 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)

5. **USEPA Approval of This Plan.** After adopting this water quality control plan, the SWRCB will submit this plan to the USEPA for approval under the federal Clean Water Act (33 U.S.C. section 1251 et seq.). If the USEPA approves this plan and finds that it provides protection for the beneficial uses equivalent to the protections provided by the criteria adopted by the USEPA, the USEPA will be able to withdraw the standards it has adopted[4]. If the USEPA withdraw its standards, the objectives and beneficial use designations in this plan that are water quality standards within the meaning of the Clean Water Act will be California's water quality standards for purposes of the Clean Water Act.

Even though the SWRCB will submit this plan to the USEPA for approval, the SWRCB does not concede that it is required under the Clean Water Act to submit all parts of this plan to the USEPA. In the view of the SWRCB, the objectives for flow and operations are not subject to USEPA approval, but the USEPA may disagree. Assuming the USEPA has

[4] The preamble to USEPA's December 15, 1993 proposed rule for Bay-Delta standards states that "it is EPA's longstanding policy that the federal regulations will be withdrawn if a State adopts and submits standards that in the Agency's judgment meet the requirements of the Act." (59 Fed. Reg. 813, January 6, 1994)

authority under the Clean Water Act to approve these objectives, the SWRCB believes that the USEPA could not adopt standards for these parameters under the Clean Water Act[5]. 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.

Further, any concerns that USEPA's approval of standards will enhance its regulatory authority are unfounded. The USEPA's approval of this water quality control plan will not give the USEPA authority to enforce the plan's flow, operations, and salinity intrusion objectives. The USEPA's authority directly to enforce water quality standards is limited to requiring permits for discharges from point sources to navigable waters; all other enforcement of standards is left to the states. (See 33 U.S.C. §1342) None of the flow, operations, and salinity intrusion objectives in this plan can be attained by regulating discharges from point sources.

This does not mean that the USEPA lacks other regulatory authority. The USEPA's regulatory authority to protect beneficial uses is independent of the existence of water quality standards. Under Clean Water Act section 404, the USEPA has authority to veto permits for the discharge of dredged or fill material into navigable waters. With this authority, the courts have allowed the USEPA to veto dredge and fill permits for projects that will result in adverse effects on beneficial uses, even when the construction itself will not directly cause the adverse effects. (See Riverside Irrigation District v. Andrews (1985) 758 F.2d 508; United States v. Akers (1986) 785 F.2d 814; James City County v. Environmental Protection Agency (1993) 12 F.3d 1330, cert. denied 115 S.Ct. 87, 63 U.S.L.Week 3258 (1994)) Thus, even in the absence of federal standards for flow and operations, the USEPA could impact the construction of new Delta facilities and their operations.

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

CHAPTER II. BENEFICIAL USES

The waters of the Bay-Delta Estuary serve a multitude of beneficial uses, both within the Estuary and throughout the State. Historically, these beneficial uses have been classified under three broad categories: municipal and industrial, agricultural, and fish and wildlife.

This chapter sets forth the designated beneficial uses for the Bay-Delta Estuary. These uses, and a summary of each, are presented below. These uses are unchanged from the 1991 Bay-Delta Plan.

Municipal and Domestic Supply (MUN) includes usual uses in community or military water systems and domestic uses from individual water supply systems.

Industrial Service Supply (IND) includes uses which do not depend primarily on water quality such as mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Industrial Process Supply (PROC) includes process water supply and all uses related to the manufacturing of products.

Agricultural Supply (AGR) includes crop, orchard, and pasture irrigation, stock watering, support of vegetation for range grazing, and all uses in support of farming and ranching operations.

Groundwater Recharge (GWR) is natural or artificial recharge for future extraction for beneficial uses and to maintain salt balance or halt saltwater intrusion into freshwater aquifers.

Navigation (NAV) includes commercial and naval shipping.

Water Contact Recreation (REC-1) includes all recreational uses involving actual body contact with water, such as swimming, wading, waterskiing, skin diving, surfing, sport fishing, uses in therapeutic spas, and other uses where ingestion of water is reasonably possible.

Non-Contact Water Recreation (REC-2) includes recreational uses which involve the presence of water but do not require contact with water, such as picnicking, sunbathing, hiking, beachcombing, camping, pleasure boating, tidepool and marine life study, hunting, and aesthetic enjoyment in conjunction with the above activities as well as sightseeing.

Shellfish Harvesting (SHELL) is the collection of shellfish such as clams, oysters, abalone, shrimp, crab, and lobster for either commercial or sport purposes.

Ocean Commercial and Sport Fishing (COMM) is the commercial collection of various types of fish and shellfish, including those taken for bait purposes, and sport fishing in ocean, bays, estuaries, and similar non-freshwater areas.

Warm Freshwater Habitat (WARM) provides a warmwater habitat to sustain aquatic resources associated with a warmwater environment.

Cold Freshwater Habitat (COLD) provides a coldwater habitat to sustain aquatic resources associated with a coldwater environment.

Fish Migration (MIGR) provides a migration route and temporary aquatic environment for anadromous or other fish species.

Fish Spawning (SPWN) provides a high quality aquatic habitat especially suitable for fish spawning.

Estuarine Habitat (EST) provides an essential and unique habitat that serves to acclimate anadromous fishes (salmon, striped bass) migrating into fresh or marine water conditions, and provides for the propagation and sustenance of a variety of fish and shellfish, numerous waterfowl and shore birds, and marine mammals.

Wildlife Habitat (WILD) provides a water supply and vegetative habitat for the maintenance of wildlife.

Preservation of Rare and Endangered Species (RARE) provides an aquatic habitat necessary, at least in part, for the survival of certain species established as being rare and endangered species.

CHAPTER III. WATER QUALITY OBJECTIVES

This chapter establishes water quality objectives which, in conjunction with the water quality objectives for the Bay-Delta Estuary that are included in other SWRCB-adopted water quality control plans and in the water quality control plans for the Central Valley and San Francisco Bay basins, when implemented, will: (1) ensure the reasonable protection of municipal, industrial, and agricultural beneficial uses; (2) protect 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 water quality which is reasonable, considering all demands being made on the waters of the Estuary.

The water quality objectives in this plan apply to the waters of the San Francisco Bay system and the legal Sacramento-San Joaquin Delta, as specified by the 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 are included for the reasonable protection of the beneficial uses, MUN, IND, and PROC, 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 1991 Bay-Delta Plan.

B. Water Quality Objectives for Agricultural Beneficial Uses

The water quality objectives in Table 2 are included for the reasonable protection of the beneficial use, AGR, from the effects of salinity intrusion and agricultural drainage in the western, interior, and southern Delta. With the exception of the effective date of the salinity objectives for the southern Delta stations on Old River, these objectives are unchanged from the 1991 Bay-Delta Plan.

C. Water Quality Objectives for Fish and Wildlife Beneficial Uses

The objectives for the protection of fish and wildlife beneficial uses are established for the following parameters: dissolved oxygen, salinity (expressed as electrical conductivity), Delta outflow, river flows, export limits, and Delta Cross Channel gate operation. 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 are no clearly defined threshold conditions which can be used to set objectives for flows and project operations. Instead, the available information indicates that a continuum of protection exists. Higher flows and lower exports provide greater protection for the bulk of estuarine resources up to the limit of unimpaired conditions. Therefore, these objectives must be set based on a subjective determination of the reasonable needs of all of the consumptive and nonconsumptive demands on the waters of the Estuary.

The water quality objectives in Table 3 are included for the reasonable protection of the following beneficial uses: EST, COLD, WARM, MIGR, SPWN, WILD, and RARE. These fish and wildlife beneficial uses also provide protection for the beneficial uses of SHELL, COMM, and NAV. The objectives in Table 3, together with the program of implementation and the requirements of other water quality control plans and policies, provide comprehensive protection for the fish and wildlife beneficial uses in the Estuary. These objectives replace the objectives for fish and wildlife in the 1978 Delta Plan and 1991 Bay-Delta Plan.

A dissolved oxygen objective is included to protect fall-run salmon migration in the lower San Joaquin River. This objective is unchanged from the 1991 Bay-Delta Plan.

Salinity objectives for the lower San Joaquin River are included to protect striped bass spawning habitat. Salinity objectives for the managed portions of the Suisun Marsh are included for the protection of channel and soil water salinities which affect the vegetative composition of the marshlands. These objectives are based on standards in D-1485 and the Suisun Marsh Preservation Agreement (SMPA) among the DWR, USBR, Department of Fish and Game (DFG), and Suisun Resource Conservation District (SRCD).. A narrative objective for the brackish tidal marshes of Suisun Bay is included to protect the remnant tidal marshes.

Delta outflow objectives are included for the protection of estuarine habitat for anadromous fishes and other estuarine-dependent species. Sacramento and San Joaquin river flow objectives are included to provide attraction and transport flows for the upstream and downstream migrations of various life stages of anadromous fishes. A narrative objective for salmon protection is included to ensure increased production of salmon.

Objectives for export limits are included to protect the habitat of estuarine-dependent species by reducing the entrainment of various life stages by the major export pumps in the southern Delta. An objective for closure of the Delta Cross Channel gates is included to reduce the diversion of aquatic organisms into the interior Delta where they are more vulnerable to entrainment by the major export pumps and local agricultural diversions.

TABLE 1 **WATER QUALITY OBJECTIVES FOR MUNICIPAL AND INDUSTRIAL BENEFICIAL USES**

COMPLIANCE LOCATION	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)* **-or-** *D-12 (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*	*No. of days each Calendar Year < 150 mg/l Cl^-*	*240 (66%)*
				AN		*190 (52%)*
				BN		*175 (48%)*
				D		*165 (45%)*
				C		*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)* **-and-** *C-9 (CHWST0)* **-and-** *DMC-1 (CHDMC004)* **-and-** *—— (SLBAR3)* **-and-** *C-19 (SLCCH16)*	*Chloride (Cl^-)*	*Maximum mean daily (mg/l)*	*All*	*Oct-Sep*	*250*

[1] River Kilometer Index station number.
[2] The Sacramento Valley 40-30-30 water year hydrologic classification index (see page 20) applies for determinations of water year type.
[3] The Cache Slough objective to be effective only when water is being diverted from this location.

TABLE 2 **WATER QUALITY OBJECTIVES FOR AGRICULTURAL BENEFICIAL USES**

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT)	WATER YEAR TYPE [2]	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 [3]*
				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 [3]*
				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 [3]*
				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 [3]*
				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 [4]* **-and-** *Old River at Tracy Road Bridge [4]*	*C-10 (RSAN112)* **-and-** *C-6 (RSAN073)* **-and-** *C-8 (ROLD69)* **-and-** *P-12 (ROLD59)*	*Electrical Conductivity (EC)*	*Maximum 30-day running average of mean daily EC (mmhos/cm)*	*All*	*Apr-Aug* **-or-** *Sep-Mar*	*0.7* **-or-** *1.0*
			If a three-party contract has been implemented among the DWR, USBR, and SWDA, that contract will be reviewed prior to implementation of the above and, after also considering the needs of other beneficial uses, revisions will be made to the objectives and compliance/monitoring locations noted, as appropriate.			
EXPORT AREA						
West Canal at mouth of Clifton Court Forebay **-and-** *Delta-Mendota Canal at Tracy Pumping Plant*	*C-9 (CHWST0)* **-and-** *DMC-1 (CHDMC004)*	*Electrical Conductivity (EC)*	*Maximum monthly average of mean daily EC (mmhos/cm)*	*All*	*Oct-Sep*	*1.0*

[1] River Kilometer Index station number.
[2] The Sacramento Valley 40-30-30 water year hydrologic classification index (see page 20) applies for determinations of water year type.
[3] When no date is shown, EC limit continues from April 1.
[4] The EC objectives shall be implemented at this location by December 31, 1997

TABLE 3	WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES					
COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER (RK) [1])	PARAMETER	DESCRIPTION (UNIT)	WATER YEAR TYPE [2]	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 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 between *Jersey Point and Prisoners Point*	*D-15 (RSAN018)* **-and-** *D-29 (RSAN038)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average [3] of mean daily EC (mmhos/cm)*	*All*	*Apr-May*	*0.44 [4]*
EASTERN SUISUN MARSH SALINITY						
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						
Chadbourne Slough at Chadbourne Road **-and-** *Cordelia Slough at Cordelia Goodyear Ditch* **-and-** *Goodyear Slough at Morrow Island Clubhouse* **-and-** *Suisun Slough, 300 feet south of Volanti Slough* **-and-** *Water supply intakes for waterfowl management areas on Van Sickle and Chipps islands*	*S-21 (SLCBN1)* *S-97 (SLCRD06)* *S-35 (SLGYR03)* *S-42 [5] (SLSUS12)* *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*	*Oct* *Nov-Dec* *Jan* *Feb-Mar* *Apr-May*	*19.0* *15.5* *12.5* *8.0* *11.0*
				Deficiency period [6]	*Oct* *Nov* *Dec-Mar* *Apr* *May*	*19.0* *16.5* *15.6* *14.0* *12.5*
BRACKISH TIDAL MARSHES OF SUISUN BAY						
			narrative			*[7]*

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

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT)	WATER YEAR TYPE [2]	TIME PERIOD	VALUE
DELTA OUTFLOW						
		Delta Outflow Index (DOI) [8]	*Minimum monthly average [9] DOI (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 [20]*	*[21]*
			Maximum percent of 14-day running average [18]	*All*	*Feb-Jun*	*35% Delta inflow [22]*
			Delta inflow diverted [19]	*All*	*Jul-Jan*	*65% Delta inflow [23]*
DELTA CROSS CHANNEL GATES CLOSURE						
Delta Cross Channel at Walnut Grove	—	*Closure of gates*	*Close gates*	*All*	*Nov-Jan*	*[24]*
					Feb-May 20	-----
					May 21- Jun 15	*[25]*

Table 3 Footnotes

[1] River Kilometer Index station number.

[2] The Sacramento Valley 40-30-30 water year hydrologic classification index (see page 20) applies except for the objectives for the San Joaquin River at Vernalis, in which case the San Joaquin Valley 60-20-20 water year hydrologic classification index (see page 21) applies.

[3] Determination of compliance with an objective having a 14-day running average begins on the 14th day. If the objective is not met on the 14th day, all 14 days are considered out of compliance.

[4] This standard does not apply in May when the May Sacramento River Index is less than 8.1 MAF at the 90% exceedence level. [Note: The Sacramento River Index refers to the sum of the unimpaired runoff in the water year as published in the DWR Bulletin 120 for 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.]

[5] The effective date for objectives for this station is October 1, 1997.

[6] 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 was less than 11.35; or (3) a critical water year following a dry or critical water year.

[7] 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.

[8] Delta Outflow Index (DOI) is described on page 22.

[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 December's Eight River Index is greater than 800,000 acre-feet. 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 maximum daily or 14-day running average electrical conductivity at the confluence of the Sacramento and the San Joaquin rivers is less than 2.64 mmhos/cm (Collinsville station C2). The above standard for March may be relaxed upon the recommendation of the operations group established under the Framework Agreement, if the Eight River Index for February is less than 500 TAF. Disputes will be resolved by the CALFED policy group. The above standard does not apply in May and June if DWR's May estimate of the Sacramento River Index is less than 8.1 MAF at the 90% exceedence 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 A on page 23.

[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.

[14] The higher flow objective applies when the 2 ppt (measured as 2.64 mmhos/cm surface salinity) isohaline (X2) is west of Chipps Island.

[15] This time period may be varied based on real-time monitoring. One 4-week period, or two separate 2-week periods, should be scheduled to coincide with fish migration in San Joaquin River tributaries and the Delta. The time period for these flows will be determined by the operations coordination group established under the Framework Agreement.

[16] Plus an additional 28,000 acre-feet pulse/attraction flow during all water year types as needed to bring flows up to a monthly average of 2,000 cfs, except for a critical year following a critical year. The pulse flow will be scheduled by the operations group established under the Framework Agreement.

[17] Combined export rate consists of the combined export rates of the Harvey O. Banks Pumping Plant (SWP) and the Tracy Pumping Plant (CVP).

[18] Percent of Delta inflow diverted is described on page 22. The 14-day averaging period is reduced to a 3-day period when the Delta is in balanced conditions as defined in the 1986 Coordinated Operations Agreement.

[19] The percent Delta inflow diverted values can be varied either up or down. Variations are authorized if agreed to by the operations group established under the Framework Agreement and provided that there is no net water cost compared to the unmodified percentages over the water year. Such variations may result from recommendations of agencies for protection of fish resources, including actions taken pursuant to the State and federal Endangered Species Act. Disputes within the Operations Group will be resolved by the CALFED policy group. Any agreement on proposed variations will be effective immediately and will be presented to the Executive Director of the SWRCB. If the Executive Director does not object to the proposed variations within 10 days, the variations will remain in effect.

[20] This time period may need to be varied based on real-time monitoring. One 4-week period, or two separate 2-week periods, should be scheduled to coincide with fish migration in San Joaquin River tributaries and the Delta. The time period for these export limits will be determined by the operations group established under the Framework Agreement.

[21] Maximum export rate is 2,000 cfs or 100% of San Joaquin River flow at Vernalis, whichever is greater.

[22] If the January Eight River Index (described in footnote 10) is less than or equal to 1.0 MAF, the export limit for February is 45% of Delta inflow. If the January Eight River Index is between 1.0 MAF and 1.5 MAF, the export limit for February will be set by the operations coordination group established under the Framework Agreement within the range of 35% to 45%. Disputes within the Operations Group will be resolved by the CALFED policy group. If the January Eight River Index is greater than 1.5 MAF, the February export limit is 35% of Delta inflow.

[23] In December and January, exports may be reduced to 50% of Delta inflow through the process set forth in footnote 19.

[24] For the November-January period, close Delta Cross Channel gates up to a total of 45 days. The timing and duration of the gate closure will be determined by the operations coordination group established under the Framework Agreement.

[25] For the May 21-June 15 period, Delta Cross Channel gates may be closed for four consecutive days each week excluding weekends.

FOOTNOTE 2 FOR TABLES 1, 2, AND 3

Sacramento Valley
Water Year Hydrologic Classification

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

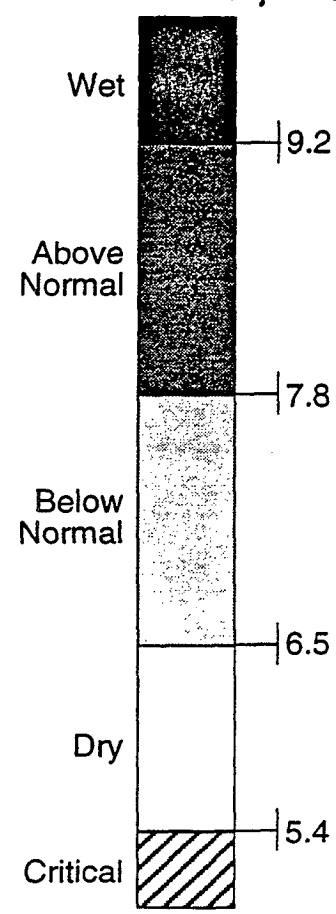
INDEX = 0.4 * X + 0.3 * Y + 0.3 * Z

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

YEAR TYPE [2]
All Years for All Objectives



[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.

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FOOTNOTE 2 FOR TABLE 3

San Joaquin Valley
Water Year Hydrologic Classification

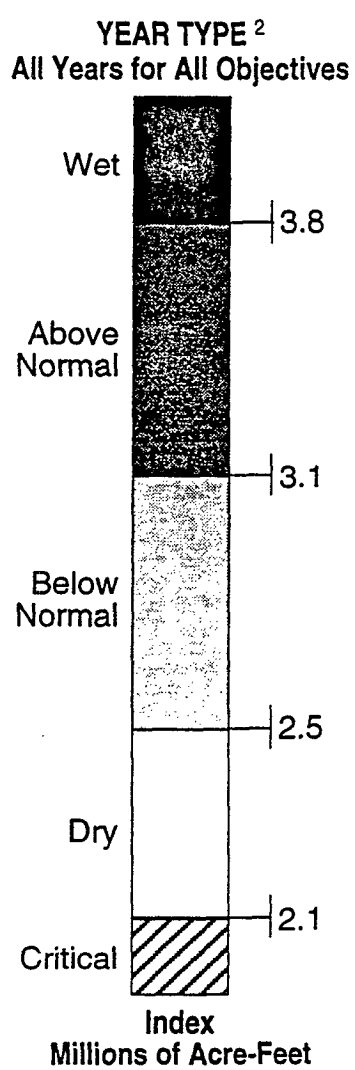
Year classification shall be determined by computation of the following equation:

INDEX = 0.4 * X + 0.3 * Y + 0.3 * 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 45 MAF is placed 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.

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FOOTNOTES 8 AND 18 FOR TABLE 3

DELTA OUTFLOW INDEX (DOI) and PERCENT INFLOW DIVERTED[1]

The Delta Outflow Index (DOI) and the percent inflow diverted, as described in this footnote, shall be computed daily by the California Department of Water Resources (DWR) and the United States Bureau of Reclamation using the following formulas (all flows are in cubic feet per second [cfs]):

DOI = 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.[2]
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.[3]
PREC	=	Real-time Delta precipitation runoff for the previous day estimated from stations within the Delta.

and where *DELTA EXPORTS = CCF + TPP + CCC*

CCF	=	Clifton Court Forebay inflow for the current day.
TPP	=	Tracy Pumping Plant pumping for the current day.
CCC	=	Contra Costa Canal 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 Calaveras River has been moved from the MISC parameter in DAYFLOW to the EAST parameter.

3 The DWR is currently developing new channel depletion estimates. If these new estimates are not available, DAYFLOW Table 4 channel depletion estimates shall be used.

FOOTNOTE 11 FOR TABLE 3

TABLE A
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 (continuous recorder at Port Chicago)					PMI [b] (TAF)	Port Chicago (continuous recorder at Port Chicago)				
	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 electrical conductivity (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 Delta outflows of 11,400 cfs and 29,200 cfs, respectively.

[b] PMI is the previous month's Eight River Index. (Refer to Footnote 10 for Table 3 for a description of the Eight River Index.) Intermediate PMI values are determined by linear interpolation.

[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 Delta outflow of 11,400 cfs) must be maintained at Chipps Island in February is determined by linear interpolation between 0 and 28 days.

CHAPTER IV. PROGRAM OF IMPLEMENTATION

The program of implementation consists of three general components: (1) measures within the SWRCB's authority which implement the water quality objectives; (2) recommendations to other agencies to achieve objectives and improve fish and wildlife habitat conditions; and (3) a monitoring program. The specific actions identified within these components include time schedules for implementation, if appropriate. If no time schedule is included, implementation should be immediate.

The DWR and the USBR have an ongoing responsibility to implement the municipal and industrial, and agricultural objectives pursuant to D-1485. As discussed above, these objectives are unchanged in this plan. The DWR and the USBR will continue to implement these objectives for now, but the SWRCB may reallocate responsibility for these objectives, as well as the new fish and wildlife objectives, in a water right proceeding that will be conducted after this plan is adopted. In the water right proceeding, the SWRCB will consider the responsibilities of all of the water right holders who divert water from the watershed of the Bay-Delta Estuary. The DWR and the USBR also are required by D-1485 to implement the fish and wildlife objectives in the 1978 Delta Plan.

A. Implementation Measures Within the SWRCB's Authority

Implementation of the water quality objectives for the protection of the beneficial uses set forth in this plan will be achieved through both completion of a water right proceeding which will allocate responsibility for meeting the objectives among water right holders and implementation of water quality control measures through waste discharge requirements or other means within the SWRCB's authority.

1. **Implementation of Objectives Through Water Right Actions.** The SWRCB will initiate a water right proceeding following adoption of this water quality control plan. The water right proceeding will address changes in implementation of the water supply-related objectives in this plan through the amendment of water rights under the authority of the SWRCB. The water supply-related objectives include those for Delta outflow, river flows, export limits, the Delta Cross Channel gates, and salinity control for the protection of municipal and industrial supply, agricultural supply, and fish and wildlife (such as those for the Suisun Marsh and the San Joaquin River between Jersey Point and Prisoners Point). The water right decision, which is anticipated before June 1998, will allocate responsibility for meeting the objectives among water right holders in the Bay-Delta Estuary watershed and establish terms and conditions in appropriate water right permits.

Not later than three years following adoption of this plan, the SWRCB will allocate responsibility for meeting the San Joaquin River flow objectives, together with other measures in the watershed sufficient to meet the narrative salmon protection objective, among the water right holders in the watershed. The USBR shall provide these flows, in accordance with the biological opinion for Delta smelt, during this three-year period. These flows are

interim flows and will be reevaluated as to timing and magnitude, up or down, within the next three years. During the three-year period, decisions by the Federal Energy Regulatory Commission (FERC) or other regulatory orders may increase flows to the Estuary required of upstream water users. These flows will be considered by the SWRCB in its allocation of responsibility among the water right holders in the watershed during the water right proceeding.

2. Implementation of Objectives Through Water Quality and Water Right Actions. The water quality objectives for southern Delta agricultural salinity and San Joaquin River dissolved oxygen will be implemented through a combination of water quality control and water right actions, as described below.

Southern Delta Agricultural Salinity Objectives. Elevated salinity in the southern Delta is caused by low flows and discharges of land-derived salts, primarily from agricultural drainage. Implementation of the objectives will be accomplished through the release of adequate flows to the San Joaquin River and control of saline agricultural drainage to the San Joaquin River and its tributaries. Implementation of the agricultural salinity objectives for the two Old River sites shall be phased in so that compliance with the objectives is achieved by December 31, 1997.

This plan's objectives for flows in the San Joaquin River at Vernalis are expected to contribute to achieving the salinity objectives in the southern Delta. Presently, the USBR is responsible for meeting Vernalis salinity objectives through the release of water from New Melones Reservoir, as required under Water Right Decision 1422. Additional releases from other reservoirs may be required through ongoing FERC proceedings. Implementation of the SWRCB's Nonpoint Source Management Plan, adopted in 1988, and recommended activities of the multi-agency San Joaquin Valley Drainage Program (SJVDP), addressed below under "Recommendations to Other Agencies", will also contribute to achieving the salinity objectives. These source control measures will decrease the need for releases of water from New Melones. The SWRCB will evaluate implementation measures for the southern Delta agricultural salinity objectives in the water right proceeding.

San Joaquin River Dissolved Oxygen Objective. Factors which contribute to low levels of dissolved oxygen in the lower San Joaquin River include: the Stockton Sewage Treatment Plant; upstream sources of biochemical oxygen demand (BOD); the deepened Stockton ship channel; the commercial use of the dead-end portion of the ship channel; the enlarged turning basin at the Port of Stockton; and low river flows in the fall. Feasible measures to implement the dissolved oxygen objective in this plan include: (1) regulating the effluent discharged from the Stockton Sewage Treatment Plant and other upstream discharges that contribute to the BOD load; (2) investigating mechanical or chemical methods to oxygenate the water at critical points along the river channel; (3) providing adequate flows in the San Joaquin River; and (4) installing barriers at locations (e.g., head of Old River) to increase flows in the river past Stockton. Wastewater discharges to the river are currently regulated by the Central Valley RWQCB. This plan's objectives for flows in the San

Joaquin River at Vernalis are expected to contribute to achieving the dissolved oxygen objective. Specific changes in water rights by the SWRCB and water quality actions by the RWQCBs contribute to implementation of the dissolved oxygen objective.

B. Recommendations to Other Agencies

The SWRCB intends to implement the water quality objectives in this plan, as described above. However, some actions that can be taken to further implement the objectives in this plan and contribute to the protection of beneficial uses of the Bay-Delta Estuary are within the authorities of other agencies. Therefore, the SWRCB is making recommendations to other agencies to ensure a comprehensive, ecosystem approach to the protection of beneficial uses in the Bay-Delta Estuary.

The recommendations to other agencies are divided into two categories:
(1) recommendations to achieve the water quality objectives in this plan; and
(2) recommendations to improve habitat conditions for estuarine-dependent species. More detailed information on the following recommendations is included in the environmental report which supplements this plan, titled "Environmental Report, Appendix to Water Quality Control Plan for the San Francisco Bay-Sacramento San Joaquin Delta".

1. Recommendations to Achieve Water Quality Objectives. The principal water quality objectives that will be met by the actions of other entities are the objectives for salinity in the southern Delta for the protection of agricultural uses. Because agricultural drainage in the San Joaquin Valley is a significant source of salts to the upper Estuary, the SWRCB recommends the following actions for implementing the southern Delta salinity objectives:

a. Implement the recommendations of the SJVDP's 1990 document, "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley" according to the 1991 document, "A Strategy for Implementation of the Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley". In December 1991, the USBR, U.S. Fish and Wildlife Service (USFWS), U.S. Soil Conservation Service (SCS), U.S. Geological Survey (USGS), DWR, DFG, Department of Food and Agriculture (DFA), and SWRCB signed a Memorandum of Understanding (MOU) for the implementation of the multi-agency SJVDP's recommended plan for the management of agricultural subsurface drainage on the westside San Joaquin Valley. This MOU outlines agreements made among the agencies to implement the SJVDP's 1990 document, "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley" according to the 1991 document, "A Strategy for Implementation of the Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley", in which the MOU is presented. Implementation of the management measures identified in these documents, including measures for reducing salt loads in the San Joaquin River and for achieving southern Delta salinity objectives, contributes to the protection of beneficial uses in the Bay-Delta Estuary. Although some of the measures are currently underway, further implementation is necessary

to achieve the goals of the program. The SWRCB makes the following recommendations regarding salinity management, as described in the 1991 report:

- Source Control. Source control consists mainly of on-farm improvements in the application of irrigation water to reduce the source of deep percolation. Source control also includes land retirement in which irrigation is ceased in areas which: overlay shallow ground water with elevated selenium levels, have soils that are difficult to drain, contribute disproportionately to drainage problems, or have low economic returns. Source control will reduce the amount of drainage water produced.

  The Central Valley RWQCB should continue its efforts, with the technical support of the SCS and the DWR, to achieve additional source control on agricultural lands in the San Joaquin Valley. In addition to the SWRCB, the DWR, USBR, and SCS should execute their commitments to support demonstration projects for source control. The DFA should execute its commitment to conduct research on the selection of irrigation methods and crops for water and salt management.

- Drainage Reuse. Drainage reuse is a planned system of drainage water reuse on progressively more salt-tolerant plants. Drainage reuse will concentrate salts and trace elements for easier containment and safe disposal.

  The ongoing and planned research and demonstration projects to develop drainage reuse technologies, and drainage treatment and disposal technologies, should continue and be completed. These projects include: DWR funding research on the impacts of reuse on wildlife; DFG conducting field studies on the impacts of reuse on wildlife; DFG and USFWS evaluating the potential impacts of agroforestry plantation on wildlife; continued DFA and SCS testing and demonstrating agroforestry and the use of halophyte plants; DFA providing quality control and coordination of demonstration projects; SCS assisting farmers to plan, design, and manage drainage reuse programs; and USGS providing technical assistance and analysis regarding ground water and effluent storage to effect reuse of drainage water.

- Evaporation Systems. Evaporation systems consist of drainage water evaporation ponds planned for storage and evaporation of drainage water. Currently, evaporation ponds are the only means available for storage and disposal of drainage water in much of the San Joaquin Valley.

  The agencies committed to implementing the programs regarding evaporation systems should continue or initiate the identified activities. These activities include: DWR and USFWS funding, and DFG and USFWS conducting, studies on the impacts of evaporation ponds on wildlife; DWR supporting

demonstration projects of evaporation pond design improvements; DFG continuing to coordinate work with the Central Valley RWQCB, which is responsible for ensuring that ponds conform to the applicable water quality control plan; USBR funding demonstration projects for new or improved evaporation pond technologies; and SCS working with farmers to develop and evaluate pond design and management criteria. In implementing their programs, the DWR, USFWS, and DFG should include field testing and demonstration projects to avoid or minimize wildlife hazards.

- Ground Water Management. Ground water management is planned pumping from deep within the semi-confined aquifer in places where near-surface water tables can be lowered and the water pumped is of suitable quality for irrigation or wildlife habitat.

  The activities that are identified in the MOU should be implemented. These activities include: DWR development of a monitoring program; USGS hydrologic analyses required to implement demonstration projects to test ground water management; SCS technical assistance to local agencies and farmers in the development and demonstration of on-farm high water table management; and USBR development of a program to encourage ground water management through incentives provided by water transfers.

- Institutional Measures. Institutional measures include tiered water pricing, improved scheduling of water deliveries, water transfers and marketing, and formation of regional drainage management organizations to aid in implementing other recommendations of the SJVDP.

  The agencies committed to supporting institutional changes necessary to implement the SJVDP recommendations should continue or initiate the identified activities. These activities include: DWR actions to encourage and support methods such as tiered water pricing and water marketing; USBR initiation of trial arrangements for funding drainage projects; and USFWS assistance in drafting comprehensive legislation to authorize and fund the SJVDP's drainage management plan. The SWRCB has committed to participate in a study of the use of an environmental recovery fund and price controls in water markets.

- Discharges to the San Joaquin River. Controlled and limited discharges of agricultural drainage water to the San Joaquin River must occur in a manner that meets water quality objectives. This may be best accomplished by coordinating the release of drainage water with higher flows in the river during the winter and spring periods when more dilution water is available. Adequate coordination may require the execution of agreements with dischargers, waste discharge requirements that restrict the discharge of drainage water to the

river, or time-specific waste discharge prohibitions. Furthermore, the actions of dischargers in isolating and transporting agricultural drainage water must contribute to the needs of fish and wildlife.

The agencies committed to implementing actions related to the drainage water discharge to the San Joaquin River should continue or initiate the activities identified by the SJVDP. These activities include: completion of the five-year interagency effort by the San Joaquin River Management Program (established and funded by the State Legislature, and led by the DWR) to develop a plan which includes management of agricultural drainage to the river; DWR and USBR real-time salt monitoring program for the river (with the cooperation of the Central Valley RWQCB); USGS investigations of surface water and ground water interaction to evaluate the quantity, quality, and timing of ground water contributions to the river; DFG and USFWS monitoring of the effects of implementing discharge controls to the river on fish and wildlife; and USBR planning for the San Luis Unit which could contribute substitute water supply and provide water control facilities needed to convey drainage water to the San Joaquin River downstream of the confluence with the Merced River. The SWRCB, with the support and cooperation of appropriate entities, is willing to investigate the concept of a discharger with high productivity soils purchasing another discharger's waste load allocation, once developed, in the San Joaquin River basin.

In addition to the planned measures identified by the SJVDP, these agencies and the affected water districts should consider taking advantage of winter flood flows to remove salts from low-lying areas in the San Joaquin Valley, either as part of a flood control program or pursuant to a permit from the SWRCB to appropriate water during high flow events. Also, the operators of wetlands receiving new water from the USBR under the Central Valley Project Improvement Act (CVPIA) should participate in real-time management of their discharges to ensure that they do not cause violation of water quality objectives. If funding is needed for further work on salt discharge management, the Central Valley RWQCB could seek a grant under Clean Water Act section 319(h).

- Out-of-Valley Disposal of Salts. Inadequate drainage, and accumulating salts and trace elements, are increasingly persistent problems in many parts of the San Joaquin Valley. These drainage problems threaten water quality, agriculture, fish and wildlife, and public health. Ultimately, it will be necessary for the in-basin management of salts to be supplemented by the disposal of salts outside of the San Joaquin Valley for protection of these beneficial uses to continue.

The USBR should reevaluate alternatives for completing a drain to discharge salts from agricultural drainage outside of the San Joaquin Valley and pursue appropriate permits. This evaluation should include the development of information on the potential effects on fish and wildlife habitat and populations in the receiving waters, and the physical and economic feasibility of the various alternatives.

2. Recommendations to Improve Habitat Conditions. There are numerous actions that 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.

The funding of these activities is expected to require a substantial financial commitment. Approximately 60 million dollars per year over the next three years should be allocated for this purpose. A portion of the funds needed for these activities will come from a prioritization of existing programs. Additional funds will be secured through a combination of federal and State appropriations, user fees, and other sources, as required. An open process including water users groups, State and federal agencies, and environmental interests will determine precise priorities and financial commitments for the implementation of these activities. The SWRCB expects that the detailed process for prioritizing and funding these activities will be developed before March 31, 1995.

a. Reduce losses of all life stages of fishes to unscreened water diversions. Unscreened agricultural, municipal, and industrial water diversions entrain large numbers of eggs, larvae, and juvenile fishes in the Sacramento and San Joaquin river watersheds and the Delta.

To provide better protection for aquatic resources in the Bay-Delta Estuary, the National Marine Fisheries Service (NMFS) should continue its work on requirements for unscreened diversions on the Sacramento River. In addition, the NMFS, USFWS, and DFG should institute a program to evaluate water diversions within the San Joaquin River and the Delta. To reduce entrainment in the rivers and the Delta, these agencies should assess whether: (1) changes in the timing of diversions could be made to avoid peak concentrations of all life stages of fishes; and (2) changes in the management of water uses would be feasible to avoid entraining large numbers of fish. 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) give their recommendations on changes in points of diversion to the SWRCB for consideration in a water right proceeding. The SWRCB may use its authority to allow inspections of diversion facilities in cases where the other agencies are unable to obtain access.

This program should include the collection of data regarding the size and approach velocity of diversions, and the proximity of fish to the diversions when they are operating. The responsible agencies should complete the following actions by the dates indicated:

June 1996	Develop performance criteria for diversions (e.g., screen types and sizes, approach velocities, etc.).
June 1996	Develop testing specifications to assess if diversions are having an unreasonable effect on fish.
June 1996	Develop incentives to encourage diverters to consolidate and relocate diversions to the least environmentally sensitive locations.
June 1997	Notify diverters of the performance criteria (requirements) for their diversions and a time schedule for completing the requirements.
June 1997	Develop a monitoring program to be implemented upon installation of entrainment control devices.
June 1999	Develop necessary environmental documentation and require installation of entrainment control devices at the highest priority diversions.
June 2004	Develop necessary environmental documentation and require installation of entrainment control devices at selected lower priority diversions.

b. Reduce entrainment by, and improve fish survival at, the SWP and CVP export facilities. Despite the presence of screens at the diversions of the SWP and CVP in the southern Delta, substantial fish mortality is associated with the operations of these facilities.

The DWR and the USBR, in consultation with the DFG, USFWS, and NMFS, should evaluate and implement all feasible measures and programs to reduce entrainment and mortality of fish salvaged at the facilities of the Harvey O. Banks and Tracy pumping plants. 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) predator control at the SWP and CVP intakes. The SWRCB will

consider requiring implementation of these measures and programs in the water right proceeding following adoption of this plan.

c. Review and modify, if necessary, existing commercial and sport harvesting regulations. Current levels of sport and commercial fishing may be contributing to reduced fish populations.

The DFG, Fish and Game Commission, Pacific Fisheries Management Council, and NMFS 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; (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; and (3) seek changes in trawling methods used by the commercial shrimp industry to reduce the incidental take of other aquatic species, either through an agreement with the industry or through regulations.

d. Reduce illegal harvesting. Illegal harvesting, which has a certain but unquantified impact on fisheries of the Bay-Delta Estuary, is particularly of concern for striped bass and chinook salmon. The DFG estimates that poaching claims about 500,000 undersized striped bass and an uncounted number of salmon annually.

The DWR and the DFG should expand the current illegal harvest enforcement program. Additionally, the DFG should develop and implement an educational program to curb poaching of fishery resources.

e. Evaluate the effectiveness of barriers as a means of improving fish survival in the Delta. The USBR currently operates the Delta Cross Channel gates to meet standards adopted by the SWRCB and other agencies. The use of additional gates or other barriers in other Delta channels shows promise for helping to improve the survival of certain fish species, especially chinook salmon and steelhead trout. However, the effectiveness of such barriers, including the effects on other species and water quality in the central Delta, requires further evaluation.

The DWR and the USBR, in consultation with the DFG, the USFWS and the NMFS, should: (1) test the use of barriers at the head of Old River and at other strategic locations within the lower San Joaquin River and Delta as a means of improving survival of migrating chinook salmon in the spring and fall; and (2) evaluate the advisability of closing Georgiana Slough by using either a physical barrier or an acoustic barrier. The barriers should be constructed if it is determined that they are effective and will neither harm other species, such as Delta smelt, nor have other significant adverse effects on the environment. If construction of barriers makes compliance with the water quality objectives in this water quality control plan

problematic, the DWR or the USBR should request a change in this water quality control plan.

f. 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 is not clear.

The DFG, the USFWS, and the NMFS should: (1) 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; and (2) determine where ballast water can be released without posing a threat of infestation or spread of aquatic nuisance species and limit the release of ballast water to those areas (by new legislation, if needed). The DFG should also: (1) continue its efforts under the Fish and Game Code sections 6430-6439 concerning introduced species, enacted in 1992; and (2) consider preparing a comprehensive management plan under the federal Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (U.S.C. §§4701-4751) to obtain technical and financial assistance to eliminate the environmental, public health, and safety risks associated with aquatic nuisance 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.

g. Improve hatchery programs for species of concern. Hatchery production of various fish species that use the Bay-Delta Estuary serves to: mitigate the loss of stream spawning and rearing habitat due to the construction of dams; mitigate increasing harvesting pressure; and provide short-term support for various species until other programs to improve fish survival in the Estuary and its watershed are implemented. Because hatchery production compromises genetic diversity and often results in increased harvesting pressure on natural fish stocks, it should complement, not substitute, measures to improve the natural production and survival of fish species.

The DFG, the NMFS, and the USFWS should: (1) carefully examine and periodically reexamine the role and contribution of existing hatchery production for various fish species (e.g., chinook salmon, steelhead trout, striped bass) and experimental hatchery programs (e.g., Delta smelt), including a consideration of the need for genetic diversity and maintaining the integrity of different salmon runs; (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; and (3) with the USBR, take steps to rehabilitate the Coleman Fish Hatchery, and to construct, if advisable, the Keswick Hatchery on the Sacramento River and a hatchery in the San Joaquin River watershed.

h. Minimize losses of salmon and steelhead due to flow fluctuations. Releases of water from the dams on most of the rivers tributary to the Delta can influence the locations where chinook salmon and steelhead trout spawn. Higher flows in the reaches below a dam can lead to spawning at locations in the riverbed that may be dewatered by subsequent reduced flows before the eggs hatch. These reductions in flow can strand fry in side channels and shallow backwaters that are isolated from the main river channel. While short-term increases in flow from storms often cannot be avoided, flow fluctuations due to scheduled releases of water can be managed to reduce adverse impacts on downstream fisheries.

The DFG, the USFWS, and the NMFS, in consultation with the DWR and the USBR, should: (1) evaluate the impoundment releases upstream of the Delta, considering factors that include the allowable size of flow reductions, appropriate ramping rates for increasing or decreasing flows, and flood control operations; (2) make recommendations, where appropriate, for changes in the operations of those impoundments to minimize adverse impacts on fishes caused by flow fluctuations; and (3) where appropriate, seek agreements from dam operators or make recommendations to the SWRCB for necessary changes in the water rights of these facilities.

i. Expand the gravel replacement and maintenance programs for salmonid spawning habitat. The construction of dams on the major tributaries of the Delta has blocked the movement of gravel eroding from upstream areas and has caused sediments to infiltrate the remaining gravels. Reduction in the availability of 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.

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.

j. 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.

Consistent with the Framework Agreement regarding a long-term Bay-Delta Estuary solution, the agreement's signatory agencies should: (1) evaluate the feasibility,

biological impacts and benefits, and likely operational criteria of various alternatives to the current water diversion facilities in the southern Delta; and (2) based on the evaluation, develop a project(s) that will meet the dual goals of minimizing impacts to aquatic resources while providing a reasonable supply of water for export.

k. 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 outflows, the eggs and larvae tend to remain in the Delta. Short-term artificial increases in 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.

The DWR and the 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) involve flows released 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. If results of the experiments were obtained soon enough, they could be used to refine potential pulse flow requirements in a water right decision implementing this water quality control plan.

l. Implement actions needed to restore and preserve marsh, riparian, and upland habitat in and upstream of the Delta. Most of the historical fish and wildlife habitat in the Delta and throughout the Central Valley has been eliminated or disturbed. The construction of dams for water storage on nearly all of the Bay-Delta Estuary's tributary streams and the conversion of natural habitat to croplands eliminated significant amounts of habitat for species in the Central Valley. 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 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 and upstream of the Delta would benefit many species of the Bay-Delta Estuary.

State and federal agencies should require, to the extent of their authority, habitat restoration in the Delta and upstream of 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 (Public Resources Code section 29700 et seq.) which provides for the coordination of local land use decisions in the Delta, should: (1) consider the need to restore and preserve marsh, riparian, and upland habitat in the Delta; and (2) include provisions, in its regional land use plan, for disapproving projects that would have significant adverse effects on remaining habitat and require enhancement of disturbed habitat as a condition of allowing development. The DFG, when it considers approving stream alterations, and the DFG, USFWS, and NMFS, when they consider projects that affect endangered species, should consider habitat requirements. The U.S. Army Corps of Engineers should consider habitat requirements in connection with applications for permits under Clean Water Act section 404. The Federal Emergency Management Agency should consider habitat requirements in establishing flood insurance requirements and levee standards. Within their authorities, these agencies should provide for: (1) levee setback requirements; (2) improvements in the productivity of aquatic areas throughout the Central Valley; (3) 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; (4) conversion of low-lying Delta islands to habitat areas; and (5) other habitat enhancement measures. The SWRCB will consider habitat requirements where needed to meet water quality standards under the Clean Water Act when approving section 401 certifications. Additionally, responsible governmental agencies and private parties should institute programs to increase riverine cover in the Bay-Delta Estuary watershed, if demonstrated to be effective in lowering water temperatures by providing shading.

m. Implement temperature control measures to reduce adverse impacts on salmon and steelhead. Cool water temperatures are important for the successful spawning, egg incubation, and juvenile rearing of chinook salmon and steelhead trout in rivers of the Central Valley. Water temperature is primarily influenced by seasonal changes in ambient air temperatures, the temperature of water released from rim reservoirs, and agricultural drainage return flows.

The USBR should, as soon as possible, implement the proposal for constructing a temperature curtain at Shasta Reservoir, which will permit the selective withdrawal of water from various locations within the water column while continuing to generate hydroelectric power. Additionally, the operators of other rim reservoirs should evaluate the impacts of their operations on downstream water temperatures and take actions to correct any significant adverse impacts on salmonid survival due to temperature. The SWRCB will consider incorporating appropriate temperature

standards into water right permits of rim reservoir operators. The Central Valley RWQCB should evaluate best management practices that could be implemented to reduce the impact of agricultural drainage return flows on the temperature of Central Valley rivers.

n. Implement measures to appropriately control Suisun Marsh soil and channel water salinities, including actions identified in the SMPA. The objectives for the Suisun Marsh in this plan regulate salinity in the channels of the marsh for the purpose of providing irrigation water for the managed wetlands that will bring soil water salinities into the range capable of supporting the plants characteristic of a brackish marsh. Four entities, the DWR, the DFG, the USBR, and the SRCD, negotiated and signed the SMPA, which proposes changes in the salinity objectives for Suisun Marsh in certain dry and critical water years. The SMPA objectives, like the objectives adopted for the Suisun Marsh in the 1978 Delta Plan, would regulate channel water salinity. The soil water salinity, which is not directly regulated, depends upon the irrigation practices used by the various property owners of the managed wetlands in the Suisun Marsh. To provide more consistent protection for the managed wetlands in Suisun Marsh and the species these wetlands support, management practices should be used that will promote adequate soil salinity levels. With more uniform water distribution, it may be possible to protect the beneficial uses of water more efficiently than under current practices.

The DWR, USBR, DFG, and SRCD should: (1) continue the actions, including facility plans, identified for implementation of the SMPA; (2) conduct a study to determine the relationship between channel water salinity and soil water salinity under alternative management practices (including an assessment of whether the current channel water salinity objectives are needed to support the beneficial uses and whether different water quality objectives, including soil water salinity objectives, would provide equivalent or better protection for the beneficial uses if favorable management practices also are used); and (3) employ, together with the property owners in the Suisun Marsh, a watermaster to direct the timing and amounts of water diverted in the marsh to ensure that the water is used efficiently and the protection of beneficial uses is maximized. Additionally, pursuant to Public Resources Code section 9962, the SRCD should oversee and enforce water management plans for achieving water quality objectives for salinity in the Suisun Marsh. If possible, the watermaster should be employed under the provisions of Part 4, Division 2 of the Water Code (Wat. C. §§4000-4407), under which the parties could negotiate an agreement that includes the property owners in the marsh. The agreement should determine the rights to the use of water from the channels of the Suisun Marsh among the various claimants, and should specify rules for managing the water in the marsh to maximize the salinity control benefits of the water. To be valid, the agreement would have to be recorded in the office of the county recorder for Solano County, in which the Suisun Marsh is situated. Alternatively or conjunctively, the parties to the SMPA and the San Francisco Bay Conservation and Development Commission should establish a

Suisun Marsh watermaster to help implement water management plans on private seasonal wetlands (i.e., managed diked wetlands).

Additionally, the DWR should convene a Suisun Marsh Ecological Work Group, consisting of representatives of the SWRCB, DWR, DFG, USBR, USFWS, National Biological Survey, SRCD, Ducks Unlimited, California Waterfowl Association, National Audubon Society, and California Native Plant Society. The work group will: (1) evaluate the beneficial uses and water quality objectives for the Suisun Bay and Suisun Marsh ecosystem; (2) assess the effects on Suisun Bay and Suisun Marsh of the water quality objectives in this plan and the federal Endangered Species Act biological opinions; (3) identify and analyze specific public interest values and water quality needs to preserve and protect the Suisun Bay/Suisun Marsh ecosystem; (4) identify studies to be conducted that will help determine the types of actions necessary to protect the Suisun Bay area, including Suisun Marsh; (5) perform studies to evaluate the effect of deep water channel dredging on Suisun Marsh channel water salinity; and (6) perform studies to evaluate the impacts of urbanization in the Suisun Marsh on the marsh ecosystem.

C. Monitoring Program

The monitoring program will provide physical, chemical, and biological data needed to: (1) determine compliance with the water quality objectives established in this plan; (2) maintain a consistent, long-term record of trends in estuarine water quality and the abundance and distribution of phytoplankton, zooplankton, aquatic invertebrate, and fish populations; (3) develop and improve predictive tools used to evaluate the effects of the SWP, CVP, and other factors; and (4) continue the evaluation and modification of sampling gear, equipment, technology, and methods applicable to this monitoring effort. Additionally, this monitoring program will allow for: (1) special studies necessary to understanding the mechanisms which control populations of key fishes and aquatic invertebrates in the Estuary; (2) detection of introduced organisms in a timely manner; (3) development of the baseline data required to evaluate the need and effectiveness of future mitigation and restoration efforts; and (4) collection of information needed by water project operators and fisheries agencies to meet the dual goals of aquatic resource protection and water supply reliability. The monitoring program established in this plan will be coordinated with both Interagency Ecological Program (IEP) and non-IEP monitoring activities, such as the San Francisco Estuary Institute's San Francisco Estuary Regional Monitoring Program and the monitoring activities associated with the CVPIA, to minimize duplication and facilitate the exchange of data.

The monitoring program established in this plan is divided into three elements: (1) water quality monitoring; (2) biological monitoring; and (3) estuarine research. A general description of each element is presented below. The monitoring program will be implemented through the water right decision.

1. Water Quality Monitoring. The water quality monitoring program consists of compliance monitoring and baseline monitoring. The goal of compliance monitoring is to ensure compliance with the water quality objectives established by this plan. The goals of baseline (surveillance) monitoring are to: (1) continue long-term monitoring of trends or changes in water quality to determine if water quality objectives for the Estuary are adequate; (2) identify meaningful changes in any significant water quality parameters potentially affecting the designated beneficial uses; and (3) determine impacts of SWP and CVP operations on beneficial uses so operational modifications can be formulated. Compliance monitoring also supports the goals of the baseline monitoring program. Table 4 presents a summary of the water quality compliance and baseline monitoring requirements, including station locations and the monitoring component which applies to each station. Table 5 lists the water quality monitoring parameters measured by three types of monitoring efforts and the associated sampling frequencies. The discrete monitoring, which includes sampling of physical, chemical, and biological parameters, is conducted monthly. The multi-parameter monitoring involves continuous recordings of physical and chemical parameters, including chlorophyll *a*. The on-board recording monitoring involves sampling physical and chemical parameters by taking vertical and horizontal profiles at and between stations, respectively, by boat. Figure 2 shows the locations of the monitoring stations on a map of the Estuary.

Table 4. Water Quality Compliance and Baseline Monitoring

Station Number		Station Description	Cont. Rec.[1]	Physical/ Chemical	Multi-parameter	Phyto-plankton	Zoo-plankton	Benthos
C2	■	Sacramento River @ Collinsville	*					
C3	▲	Sacramento River @ Greens Landing		*	*	*		
C4	■	San Joaquin River @ San Andreas Ldg.	*					
C5	■	Contra Costa Canal @ Pumping Plant #1	*					
C6	■	San Joaquin River @ Brandt Bridge site	*					
C7	▲	San Joaquin River @ Mossdale Bridge			*			
C8	■	Old River near Middle River	*					
C9	•	West Canal at mouth of CCForebay Intake				*		*
C10	•	San Joaquin River near Vernalis		*		*		
C13	■	Mokelumne River @ Terminous	*					
C19	■	Cache Slough @ City of Vallejo Intake	*					
D4	▲	Sacramento River above Point Sacramento		*		*	*	*
D6	▲	Suisun Bay @ Bulls Head Pt. nr. Martinez		*	*	*	*	*
D7	▲	Grizzly Bay @ Dolphin nr. Suisun Slough		*		*	*	*
D8	▲	Suisun Bay off Middle Point near Nichols		*		*	*	
D10	•	Sacramento River @ Chipps Island			*		*	
D12	•	San Joaquin River @ Antioch Ship Canal			*		*	
D15	■	San Joaquin River @ Jersey Point	*					
D16	▲	San Joaquin River @ Twitchell Island					*	*
D22	•	Sacramento River @ Emmaton					*	
D24	•	Sacramento River below Rio Vista Bridge			*			*
D26	▲	San Joaquin River @ Potato Point		*		*	*	
D28A	▲	Old River near Rancho Del Rio		*	*	*	*	*
D29	■	San Joaquin River @ Prisoners Point	*					
D41	▲	San Pablo Bay near Pinole Point		*		*		*
D41A	▲	San Pablo Bay nr. mouth of Petaluma R.						*
DMC1	•	Delta-Mendota Canal at Tracy Pump. Plt.			*			
P8	▲	San Joaquin River @ Buckley Cove		*	*	*	*	*
P12	■	Old River @ Tracy Road Bridge	*					
MD10	▲	Disappointment Slough near Bishop Cut		*		*	*	
S21	■	Chadbourne Slough @ Chadbourne Road	*					
S35	■	Goodyear Sl. @ Morrow Is. Clubhouse	*					
S42	•	Suisun Slough 300' so. of Volanti Slough	*				*	
S49	■	Montezuma Slough near Beldon Landing	*					
S64	■	Montezuma Slough @ National Steel	*					
S97	■	Cordelia Slough @ Cordelia Slough Ditch	*					
NZ032	▲	Montezuma Slough, 2nd bend from mouth					*	
NZ080	▲	San Joaquin River, 549 meters upstream of light 26					*	

(continued)

■ Compliance monitoring station ▲ Baseline monitoring station • Compliance and baseline monitoring station

Table 4. Water Quality Compliance and Baseline Monitoring (continued)

Station Number	Station Description	Cont. Rec.[1]	Physical/ Chemical	Multi-parameter	Phyto-plankton	Zoo-plankton	Benthos
--- ■	Sacramento R. (I St. Bridge to Freeport) (RSAC155)	*					
--- ■	San Joaquin R. (Turner Cut to Stockton) (RSAN050-RSAN061)	*					
--- ■	Barker Sl. at No. Bay Aqueduct (SLBAR3)	*					
--- ■	Water supply intakes for waterfowl management areas on Van Sickle Island and Chipps Island	*					

■ Compliance monitoring station ▲ Baseline monitoring station • Compliance and baseline monitoring station

1 Continuous recorder only (EC, DO, and/or temperature) for purpose of compliance. For municipal and industrial intake chlorides objectives, EC can be monitored and converted to chlorides.

Table 5. Water Quality Monitoring Parameters and Sampling Frequencies

Parameter	Discrete Sites (monthly sampling)	Multi-Parameter Sites (continuous)	On-Board Recording (vertical and horizontal profiles)
Water Column Depth	*		
Secchi	*		
Nutrient series (inorganic and organic N-P)	*		
Phytoplankton	*		
Zooplankton	*		
Benthos	*		
Water Temperature	*	*	*
Dissolved Oxygen	*	*	*
Electrical Conductivity	*	*	*
Turbidity	*	*	*
Chlorophyll *a*	*	*	*
Wind Speed and Direction		*	
Solar Radiation		*	
Air Temperature		*	
Stage		*	

Figure 2
STATE WATER RESOURCES CONTROL BOARD
BAY-DELTA ESTUARY
MONITORING STATIONS

DWG NO 3459

2. Biological Monitoring. The biological monitoring element consists of sampling fishes, shrimps, and crabs in the Estuary. While this element focuses on obtaining information on selected species of importance, data on all species encountered will be recorded. Sampling efforts will target species that are either of recreational, commercial, or ecological importance, listed as threatened or endangered, or have the potential of being listed. Examples of target species, and their groupings, are listed in Table 6.

Table 6. Examples of Target Species

Special Status Species	Economically Important Species	Estuary Dependent Native Species
Chinook salmon Delta smelt Sacramento splittail Longfin smelt	Striped bass Pacific herring American shad Dungeness crab	White sturgeon Green sturgeon Starry flounder *Crangon franciscorum* *Crangon nigricauda* Tule perch

A summary of the biological monitoring program is presented in Table 7. The responsible parties will continue current IEP biological monitoring and, if necessary, will refine the monitoring program to meet the water quality objectives of this plan.

3. Special Studies. In addition to the routine water quality monitoring and routine biological monitoring elements described above, a special studies element is included to generate information which is critical to long-term estuarine management and protection decision-making. This studies shall include:

- Assessing the effectiveness of the water quality objectives in this plan.
- Improving the interpretation of the results of the routine, long-term water quality and biological monitoring programs by conducting appropriate gear evaluations and collecting supplemental, more detailed information on such topics as species habitat use and geographical distribution.
- Determining the physical and biological mechanisms and factors which control the populations of estuarine organisms, including factors that may or may not be regulated by the SWRCB, such as unscreened diversions, pesticide pollution, legal and illegal fishing, and introduced species.
- Evaluating the contribution that habitat restoration efforts, such as development of riparian vegetation and restoration of tidal marshes, can make to overall health of the Estuary.

- Understanding the Estuary's hydrodynamics through field measurements and mathematical model development.

Table 7: Biological (Fish, Shrimp, and Crab) Monitoring

Survey	Habitat Sampled	Comments
Summer Tow Net	Pelagic: Marine, Estuarine, and Freshwater	Source of data for striped bass 38 mm index.
Fall Midwater Trawl	Pelagic: Marine, Estuarine, and Freshwater	Provides data used for YOY indices of a number of species.
Delta Outflow/S.F. Bay Study	Pelagic and Demersal: Marine, Estuarine, and Freshwater	Samples areas downstream of Fall Midwater Trawl with midwater trawl and all areas with otter trawl. Provides data used for indices of estuarine dependent species.
Adult Striped Bass	---	Tagging will be done every other year. Creel census will be done every year. Provides data for adult population estimates.
Adult Sturgeon	---	Tagging will be done for three years out of every five-year period. Creel census will be done every year. Provides data for adult population estimates.
Resident Freshwater Species	Pelagic and Inshore: Freshwater	Will be done in years that adult striped bass tagging is not done.
Ring Net	Demersal and Inshore: Marine	Provides index for various *Cancer* crabs.
Salmon Trawl Survey	Freshwater and Estuarine: Pelagic	Collects abundance and survival information on fry and smolts.
Salmon Beach Seine	Freshwater and Estuarine: Inshore	Collects abundance and distribution information on fry and smolts.

Habitat descriptions:

Freshwater = < 2 ppt salinity
Estuarine = 2-15 ppt salinity
Marine = 15-33 ppt salinity
Demersal = bottom and near bottom
Pelagic = midwater to surface
Inshore = depths < 1 meter

The special studies element will examine a broad enough subset of the estuarine biota to evaluate the effects of implementing the water quality objectives of this plan on the overall estuarine ecosystem. The program development process described below should be used as the vehicle for determining the species and types of studies that should be addressed by the program.

There is a substantial amount of studies being conducted in the Estuary, much of it funded by the DWR, the USBR, and their water contractors through the IEP. The interagency approach to identifying and carrying out studies to address the purposes and target species described above should continue. The structure and function of the IEP provide water contractors, fishing and environmental groups, and agency regulatory, planning, and operations staff access to IEP study plans through the IEP's Management Advisory Group. The IEP's technical teams (Project Work Teams) are designed to include non-agency scientific and technical staff as appropriate and useful.

The potential number of studies suggested by the broadly stated areas of inquiry listed above is large. It is, therefore, clear that all questions of interest cannot be addressed and that the process of properly prioritizing special studies is a critical component of the special studies element. Priorities should be developed in close cooperation with other resource agencies through the IEP planning process. The IEP's annual workplan, describing the proposed research for the current and subsequent years, and the reasoning behind the choice of proposed study topics, is an effective vehicle for documenting and communicating planned studies. This planning process should allow for the timely processing, analysis, and reporting of the data collected.

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