4 Affected Environment and Environmental Consequences

Organized by environmental resource category, Chapter 4, "Affected Environment and Environmental Consequences," provides an integrated discussion of the affected environment (including regulatory and environmental settings) and environmental consequences (including direct, indirect, and cumulative impacts and mitigation measures) associated with implementation of the Proposed Action and alternatives.

4.1 Approach to the Environmental Analysis

4.1.1 CEQA and NEPA Requirements

The State CEQA Guidelines explain that the environmental analysis for an EIR must evaluate impacts associated with the project and identify mitigation for any potentially significant impacts. All phases of a proposed project, including development and operation, are evaluated in the analysis. Section 15126.2 of the State CEQA Guidelines states:

> An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environmental shall be clearly identified and described, giving due consideration to both the short-term and long-term effects. The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, and human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected.

An EIR must also discuss inconsistencies between the proposed project and applicable general plans and regional plans (State CEQA Guidelines Section 15125[d]).

An EIR must describe any feasible measures that could minimize significant adverse impacts, and the measures are to be fully enforceable through permit conditions, agreements, or other legally binding instruments (State CEQA Guidelines Section

15126.4[a]). Mitigation measures are not required for effects that are found to be less than significant.

The Council on Environmental Quality (CEQ) regulations for implementing NEPA specify that a Federal agency preparing an EIS must consider the effects of the proposed action and alternatives on the environment; these include effects on ecological, aesthetic, historical, and cultural resources and economic, social, and health effects. Environmental effects include direct, indirect, and cumulative effects (defined below in Sections 4.1.2 and 4.1.3). An EIS must also discuss possible conflicts with the objectives of Federal, State, regional, and local land use plans, policies, or controls for the area concerned; energy requirements and conservation potential; urban quality; the relationship between short-term uses of the environment and long-term productivity; and irreversible or irretrievable commitments of resources. An EIS must identify relevant, reasonable mitigation measures that are not already included in the proposed action or alternatives that could avoid, minimize, rectify, reduce, eliminate or compensate for the project's adverse environmental effects. (40 Code of Federal Regulations [CFR] 1502.14, 1502.16, 1508.8.)

The following discussions present the organization and general assumptions used in the environmental analysis contained in this EIR/EIS. The reader is referred to the individual technical sections regarding specific assumptions, methodology, and significance criteria (thresholds of significance) used in the analysis.

4.1.2 Section Contents and Definition of Terms

The environmental setting, impacts, and mitigation measures have been prepared using NEPA terminology (affected environment, environmental consequences [generally], and mitigation measures). Chapter 4 is organized into the following issue areas:

- Section 4.2, Delta Water Resources
- Section 4.3, Delta Fisheries and Aquatic Resources
- Section 4.4, Earth Resources: Geology, Soils, and Seismicity
- Section 4.5, Local Hydrology and Water Quality
- Section 4.6, Terrestrial Biological Resources
- Section 4.7, Land Use
- Section 4.8, Agriculture
- Section 4.9, Transportation and Circulation
- Section 4.10, Air Quality
- Section 4.11, Noise
- Section 4.12, Utilities and Service Systems
- Section 4.13, Hazardous Materials
- Section 4.14, Visual Resources
- Section 4.15, Recreation
- Section 4.16, Cultural Resources
- Section 4.17, Paleontological Resources
- Section 4.18, Socioeconomic Effects
- Section 4.19, Environmental Justice
- Section 4.20, Growth-Inducing Effects

- Section 4.21, Summary of Impacts, including subsections:
  - Less-than-Significant Effects
  - Adverse Environmental Effects That Cannot be Reduced to a Less-Than-Significant Level
  - Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity
  - Irreversible and Irretrievable Commitments of Resources

Sections 4.2 through 4.20 follow the same general format:

"**Affected Environment**" consists of two subsections: Regulatory Setting and Environmental Setting, which include the following information:

- **Regulatory Setting** identifies the plans, policies, laws, and regulations that are relevant to each topical section and describes permits and other approvals necessary to implement the project. As noted above, the EIR/EIS needs to address possible conflicts between CCWD's Proposed Action or alternatives and the objectives of Federal, State, regional, or local formally adopted land use plans, policies, or controls for the area. Alternatives 1, 2, and 3 would include components in both Contra Costa County and San Joaquin County, and components of Alternative 4 (Desalination Alternative) would be located within the spheres of influence of Pittsburg and Concord, as well as in unincorporated areas of Contra Costa County. Therefore, this subsection summarizes or lists the potentially relevant policies and objectives of the Contra Costa County General Plan, the San Joaquin County General Plan, the City of Pittsburg General Plan, and the City of Concord General Plan.
- **Environmental Setting** provides an overview of the existing physical environmental conditions in the area that could be affected by implementation of the Proposed Action or alternatives (i.e., the "affected environment") in accordance with State CEQA Guidelines Section 15125 and NEPA regulations (40 CFR 1502.15).

"**Environmental Consequences and Mitigation Measures**" identifies the impacts of the project on the environment, in accordance with State CEQA Guidelines Sections 15125 and 15143 and NEPA regulations (40 CFR 1502.16). The following discussions are included in this subsection:

- **Methods and Assumptions** describes the methods, process, procedures, and/or assumptions used to formulate and conduct the impact analysis.
- **Significance Criteria** provides the criteria used in this document to define the level at which an impact would be considered significant in accordance with CEQA and NEPA. Significance criteria (sometimes called "thresholds of significance") used in this EIR/EIS are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; and regulatory standards of

Federal, State, and local agencies. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of the context and the intensity of its effects.

- Project impacts are organized into two categories: **Direct and Indirect Impacts** and **Cumulative Impacts**. Direct impacts are those that are caused by the action and occur at the same time and place. Indirect effects are reasonably foreseeable consequences that may occur at a later time or at a distance that is removed from the project area, such as growth-inducing effects and other effects related to changes in land use patterns, population density, or growth rate, and related effects on the physical environment. A cumulative impact is an impact that would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

The impacts are listed numerically and sequentially throughout each section. An impact statement precedes the discussion of each impact and provides a summary of the impact. The discussion that follows the impact statement includes the analysis on which a conclusion is based regarding the level of impact. Impact conclusions are made using the significance criteria described above and include consideration of the "context" of the action and the "intensity" (severity) of its effects in accordance with NEPA guidance (40 CFR 1508.27).

The level of impact of the Proposed Action and alternatives is determined by comparing estimated effects with baseline conditions. Under CEQA, the environmental setting (as defined above) normally represents "existing" baseline conditions. Under NEPA, the No-Action Alternative (expected future conditions without the project) is the baseline against which the effects of a proposed action and action alternatives are compared. As described in Section 3.3 in Chapter 3, the NEPA No-Action Alternative includes several projects that would affect Delta water supply and/or water quality and that are not a part of existing conditions. In addition, existing and future baseline conditions are assumed to differ in several respects with regard to water project operations; these differences are reflected in the analysis of effects of the Proposed Action and alternatives on Delta water resources and fisheries under existing and future conditions. For existing conditions, the current level of demand for water supply and current Delta infrastructure are assumed. For future conditions, 2020 levels of demand and some additional Delta projects and changes in infrastructure are assumed.

Existing conditions include:

- current levels of demand for CCWD and for the State Water Project (SWP) and the Central Valley Project (CVP);
- current CCWD infrastructure, including a maximum diversion rate of 250 cubic feet per second (cfs) at Old River pump station; and

- existing Delta infrastructure and operations (maximum 6,680-cfs diversion rate at Banks Pumping Plant, temporary agricultural barriers in the Delta).

Future condition assumptions include:

- 2020 levels of demand for CCWD and for SWP and CVP;
- reasonably foreseeable changes to CCWD infrastructure, including expansion of Old River pump station capacity to 320 cfs, implementation of the CALFED Old River and Rock Slough Water Quality Improvement Projects, and implementation of the East Bay Municipal Utility District (EBMUD) Freeport Intertie; and
- implementation of reasonably foreseeable Delta Projects, including the SDIP (permanent operable barriers and increase in Banks Pumping Plant capacity to 8,500 cfs) and the EBMUD Freeport Project.

Modeling assumptions are described in detail in Appendix C-2, “Water Resources Methodology.”

For Sections 4.2, “Delta Water Resources,” and 4.3, “Delta Fisheries and Aquatic Resources,” the Proposed Action and alternatives are compared with both existing conditions and the No-Action Alternative to satisfy the intent of both CEQA and NEPA. For all other topics, conditions under the No-Action Alternative are considered to be substantively equivalent to existing conditions.

Alternative-specific analyses are conducted to evaluate each potential impact on the existing environment. This assessment also specifies why impacts are found to be significant, potentially significant, or less than significant, or why there is no environmental impact. A significant impact is defined for CEQA purposes as a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project. A potentially significant impact is one that, if it were to occur, would be considered a significant impact; however, the occurrence of the impact is uncertain. A potentially significant impact is treated as if it were a significant impact in terms of mitigation. A less-than-significant impact is one that would not result in a substantial adverse change in the physical environment.

- ► **Mitigation Measures** are presented where feasible to avoid, minimize, rectify, reduce, or compensate for significant and potentially significant impacts of the project, in accordance with the State CEQA Guidelines (Section 15126.4) and NEPA regulations (40 CFR 1508.20). Each mitigation measure is identified numerically to correspond with the number of the impact being mitigated by the measure. There are no mitigation measures proposed when the impact is determined to be “less than significant.” Where sufficient feasible mitigation is not available to reduce impacts to a less-than-significant level, the impacts are identified as remaining “significant and unavoidable.”

4.1.3 Cumulative Impact Analysis

4.1.3.1 Definition of Cumulative Impacts

Cumulative impacts are defined in the State CEQA Guidelines (Section 15355) as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." A cumulative impact occurs from "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor, but collectively significant, projects taking place over a period of time." Consistent with State CEQA Guidelines Section 15130[a], the discussion of cumulative impacts in this EIR/EIS focuses on significant and potentially significant cumulative impacts.

The NEPA regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions over time and differ from indirect impacts (40 CFR 1508.8). They are caused by the incremental increase in total environmental effects, when the evaluated project is added to other past, present, and reasonably foreseeable future actions.

4.1.3.2 Methodology

To identify the projects to be analyzed in the evaluation of cumulative impacts, Section 15130(b) of the State CEQA Guidelines recommends:

- the list approach, which entails listing past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency; or

- the projection approach, which uses a summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document that has been adopted or certified, which described or evaluated regional or area-wide conditions contributing to the cumulative impact.

The approach and geographic scope of the cumulative impact evaluation vary depending on the resource area being analyzed. The "Cumulative Impacts" subsection for each resource topic begins with a summary of the approach and the geographic area relevant to that topic. For most resource areas, the list approach is used. The list of potentially relevant projects consists of major regional water resources projects and local development and transportation projects. The regional water resources projects are mainly relevant to the cumulative impact analysis for water-based topics (Sections 4.2, "Delta Water Resources" and 4.3, "Delta Fisheries and Aquatic Resources"), although some could affect other resources that may also be affected with implementation of the Proposed Action or a project alternative, particularly during the construction period (e.g., air quality, transportation and circulation, recreation, and aesthetics). Therefore, the relevance of each of the listed projects was considered during the cumulative impact analysis for each topic; however, only the projects found to potentially contribute to cumulative impacts in combination with the Proposed Action or alternatives are discussed under that topic.

For the Delta-wide water-related issues addressed in Sections 4.2 and 4.3, the analysis of cumulative impacts was based partly on estimation of anticipated future cumulative conditions (the NEPA No-Action Alternative) established through a system-wide hydrologic and operations modeling process. A detailed description of the modeling assumptions and methods is presented in detail in Appendix C2, "Water Resources Modeling Methodology Report." Because not all reasonably foreseeable future projects can be incorporated into the modeling described in Appendix C2, however, the cumulative impact analysis for these topics is also qualitative.

Regional Water Resources Projects
Following are the major past, present, and future water resources projects or programs that may have effects similar to those of the Proposed Action and alternatives. Many of these programs and projects are in the early planning and feasibility stages and have not been adopted in any planning document or official plan beyond programmatic environmental documents, and many do not have a schedule for environmental compliance or project implementation or any secured funding source. It is highly unlikely that all of these projects will be implemented. Such projects are not sufficiently defined to be considered "reasonably foreseeable," and discussion of specific effects of such projects and programs would be speculative. However, they are listed here along with other projects that are better defined and considered reasonably foreseeable, and they were considered in the cumulative impact analysis because of the inherently interrelated nature of major water resources programs in California and because numerous public scoping comments questioned the relationship between the Proposed Action and such projects. The CCWD/CALFED Old River and Rock Slough Water Quality Improvement Projects are part of the No-Action Alternative, described in Section 2.4.1, "CCWD Water Quality Projects/Actions," and are expected to improve CCWD's water quality by reducing agricultural drainage near CCWD's Old River and Rock Slough intakes.

- CCWD Ten Year Capital Improvement Program (CIP) and CCWD Water Treatment Plant Master Plan – Included in the Ten Year CIP is the CCWD Water Treatment Plant Master Plan, which prioritizes short- and long-term capital improvement projects at CCWD's Bollman Water Treatment Plant (WTP) and Randall-Bold WTP. These and other potential projects under the CIP are intended to renew or replace old facilities or systems, improve solids handling, increase treatment capacity, and improve water treatment processes. (Contra Costa Water District 2003a.)

- CALFED Old River Water Quality Improvement Project – This project involved constructing a new pump station to provide a longer outfall for the agricultural drainage from Byron Tract into Old River, near CCWD's Old River Intake. The purpose of the project is to improve the quality of water (with respect to salinity, organic carbon, turbidity, nutrients, and pathogens) diverted at CCWD's existing Old River intake structure.

- CALFED Rock Slough Water Quality Improvement Project – This project moved the discharge 2 miles from its previous location to an area on the south side of Veale Tract, where local currents convey the drainage farther away from Rock Slough. The purpose of the project is to improve the quality of the water (with respect to salinity, organic carbon, turbidity, nutrients, and pathogens) diverted at CCWD's Pumping Plant No. 1 at Contra Costa Canal (west of Rock Slough).

- CALFED/CCWD Los Vaqueros Reservoir Expansion Project – The expansion of Los Vaqueros Reservoir is a potential future Delta project currently in the feasibility phase. An Initial Alternatives Information Report, an interim planning document in the development of a Federal Feasibility Report and EIS for the Los Vaqueros Expansion Investigation, was released in fall 2005. Public scoping was conducted in January 2006. Reclamation is the lead agency under NEPA and, in conjunction with CCWD (the lead agency under CEQA), will prepare a joint EIS/EIR for the Los Vaqueros Reservoir Expansion Project. The Draft EIS/EIR and Feasibility Report are anticipated to be completed in 2007. This anticipated project could affect some of the same resources as the Proposed Action. The project definition has some uncertainty; size of the expanded reservoir, location and number of intakes in the Delta, and its operations are uncertain. However, considerable interest in this potential project and consideration of the cumulative impacts of the Proposed Action together with the project was raised during public scoping for the Alternative Intake Project. To the extent possible, this EIR/EIS analyzes and discloses cumulative impacts of the possible expansion of Los Vaqueros Reservoir. The resource areas with the greatest potential to be affected by the combined effects of both projects are Delta water resources and fisheries; therefore, potential cumulative impacts of Los Vaqueros expansion are addressed in those sections of the EIR/EIS.

- CALFED Delta Improvements Projects – The CALFED Delta Improvements Package (DIP) Implementation Plan put forth by CALFED on August 12, 2004 includes numerous actions to increase water supply reliability, improve water quality, protect important fish species, and maintain the integrity of the levee system in the Delta. Water supply, water quality, and environmental protection actions included in the DIP and considered to be reasonably foreseeable are those actions assumed in water resources modeling for the Alternative Intake Project and presented in Appendix C2, "Water Resources Modeling Methodology Report, including CALFED's South Delta Improvements Program (SDIP) and Environmental Water Account (EWA) described below.

- CALFED South Delta Improvements Program – This program includes providing for more reliable long-term export capability by the SWP and CVP, protecting local diversions, and reducing impacts on San Joaquin River salmon by: (1) constructing a permanent fish barrier at the head of Old River, (2) constructing up to three permanent operable barriers in south Delta channels, (3) channel dredging and extending some agricultural diversions in the southern Delta, and (4) increasing diversion capability of Clifton Court Forebay to 8,500 cfs. Generally, the permanent barriers would be located at the existing locations of the temporary barriers, except at the head of Old River, where the barrier would be located approximately 100 feet downstream of the existing site, and the Grant Line site, which would be approximately 5 miles downstream of the existing temporary barrier. The SDIP component nearest to the potential location of Alternative Intake Project facilities is the proposed barrier located on Middle River, east of Victoria Canal (less than 5 miles from the proposed intake site on Victoria Canal). Construction would last approximately two construction seasons and could be completed by the end of 2008 or beginning of 2009. (Marshall, pers. comm., 2005.) This project could contribute to cumulative effects on Delta water quality, hydraulics, hydrodynamics; fisheries; and aesthetics and recreation, as well as other construction-related effects, and is included as a reasonably foreseeable project in water resources modeling for the Alternative Intake Project (Appendix C2, "Water Resources Modeling Methodology Report").

- CALFED Environmental Water Account – This project is intended to protect fish of the Bay-Delta estuary at no uncompensated water cost to the EWA project's water users by acquiring water assets and storing and conveying the assets through the CVP and SWP facilities at times when pumping is reduced in the Delta to protect sensitive fish. EWA agencies also acquire water either for direct environmental use, or to repay CVP and SWP contractors whose supplies would have otherwise been interrupted by actions taken to benefit fish. This project, in association with the Alternative Intake Project, could contribute to cumulative effects on Delta water quality and hydrodynamics, and is included as a reasonably foreseeable project in water resources modeling for the Alternative Intake Project (Appendix C2, "Water Resources Modeling Methodology Report").

- CALFED Ecosystem Restoration Program – This program includes all projects authorized, funded, and permitted (even if not constructed) to date, particularly in the Delta, that are focused on recovering at-risk native species dependent on the Delta, Suisun Bay, and San Francisco Bay; minimizing the downward population trends of native species that are not listed; protecting and restoring functional habitat types in the Bay-Delta estuary and its watershed for ecological and public values; preventing the establishment of additional nonnative invasive species and reducing the negative ecological and economic impacts of established nonnative species in the Bay-Delta estuary; and improving and/or maintaining water and sediment quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed. Projects could contribute to cumulative effects on Delta water quality, hydraulics, and hydrodynamics and to construction-related effects. Many projects have been implemented and are part of the affected environment.

- CALFED Drinking Water Program – This program includes all projects completed to date and the water quality-related actions in the DIP. Drinking water quality projects in addition to those in the DIP are the Central Valley drinking water policy project (possible basin plan amendment in 2009), nonpoint source grants, and the ultraviolet light and multiple disinfectants project. This program could contribute to cumulative effects on Delta water quality and drinking water, but the future projects are not considered to be reasonably foreseeable and are too speculative to analyze.

- Freeport Regional Water Project – This project is intended to meet future drinking water needs in the central Sacramento County area and supplement EBMUD's water supply during future drought periods through the construction of a new intake on the Sacramento River near Freeport, a new pipeline to convey water east to the Folsom South Canal, a future water treatment plant in Sacramento County, and facilities to transport water for EBMUD from the southern end of the Folsom South Canal to the existing EBMUD Mokelumne Aqueducts to convey water to the EBMUD service area. The project is authorized, funded, and has completed all major environmental compliance steps and is scheduled for implementation in 2010. This project is reasonably foreseeable, could contribute to cumulative effects on Delta water quality and hydrodynamics, and is included in the water resources modeling for the Alternative Intake Project along with the CCWD-EBMUD Intertie that was part of the Freeport Regional Water Project settlement agreement[1] (Appendix C2, "Water Resources Modeling Methodology Report").

- Rock Slough Fisheries Mitigation Actions – As described in Section 2.5, "Other Related Delta Actions/Projects," in Chapter 2, the CVPIA includes a requirement for Reclamation to develop and implement a program to mitigate fishery impacts resulting from the operation of the Contra Costa Canal Pumping Plant No. 1. This program may include a fish screen at Rock Slough, modified operations, or other measures to mitigate fishery impacts. Because of the uncertainty of the timing and form that this mitigation program might take, it is not included as a reasonably foreseeable project in the water resources modeling for the Alternative Intake Project. However, potential effects are discussed qualitatively in Section 4.3.

- CCWD Contra Costa Canal Encasement Project – CCWD is pursuing the Contra Costa Canal Encasement Project to protect and improve water quality in the unlined Contra Costa Canal from nonpoint source degradation, as described in Section 2.4, "CCWD Comprehensive Water Quality Strategy," in Chapter 2. The project entails modifying the unlined portion of the canal by replacing the existing canal with a buried pipeline within Reclamation's right-of-way or immediately adjacent to it. Improvements in water quality will result in reduced formation of regulated DBPs in drinking water. The project will also improve water operations of the CVP and SWP because the project area includes a water quality compliance location at Pumping Plant No. 1 (reducing local degradation allows the export projects to use less water to meet existing water quality requirements). Construction is anticipated to start in September 2007and will be completed within 5 years. Because this project is still in the preliminary design phase, it is not included in the water resources modeling for the Alternative Intake Project; however, but its anticipated effects are discussed qualitatively in Sections 4.2 and 4.3.

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[1] As settlement of disputes regarding the Freeport Regional Water Project (FRWP), CCWD, the Freeport Regional Water Authority (FRWA), EBMUD, and Sacramento County Water Agency (SCWA) entered into an agreement in January 2004 that provides for the wheeling of up to 3,200 af annually of CCWD's water through the FRWA and EBMUD facilities into the Los Vaqueros Reservoir. See Section 2.5.3 for a full description.

Development Projects
A substantial number of planned local and regional development and transportation projects may have effects that could interact with those of the Proposed Action or alternatives. These are projects that are planned to occur within San Joaquin County, where Victoria Island is located, or that are planned to occur in CCWD's service area or in nearby areas. Most of these projects are located in or near the sites of facilities for the Desalination Alternative. The projects were identified using information obtained from county and city planning documents, review of Delta Protection Commission annual reports, and CCWD planning reports. These projects are listed in Appendix F1, "Local Development Projects Considered in Cumulative Impact Analysis."

4.1.4 Resources Eliminated from Detailed Analysis

The State CEQA Guidelines provide for the identification and elimination from detailed study the issues that are not significant or that have been covered by prior environmental review (Pub. Res. Code 21002.1). The NEPA regulations provide similar provisions (40 CFR 1501.7 [a][3]).

During initial scoping with the public and governmental agencies, and based on information obtained through literature review, agency correspondence, consultations, and field data collection, the following were identified as resources that would not experience any potential environmental impacts resulting from the Proposed Action or any of the alternatives. Accordingly, these resources are not addressed further in this EIR/EIS, but are identified below with a brief explanation as to why impacts to each resource are not anticipated, as required by CEQA and NEPA.

4.1.4.1 Mineral Resources

The Proposed Action and alternatives would not affect any known sand, gravel, natural gas, gold, or silver areas or result in the loss of availability of any known mineral resource. In addition, the project would not interfere with any existing commercial mining activity. No oil and gas operations exist in the study areas. Potential project facilities associated with the Proposed Action or any alternative do not fall within any areas identified by the Contra Costa County (2005) or San Joaquin County (1992) General Plans as mineral resource areas. Therefore, no impacts to mineral resources would occur and no further evaluation is included in this EIR/EIS. Geology and soils (including peat), however, are addressed in Section 4.4, "Earth Resources: Geology, Soils, and Seismicity."

4.1.4.2 Population and Housing

The Proposed Action and alternatives would not directly or indirectly result in population growth through the provision of new homes, new businesses, or in any other manner. In addition, the project would not displace existing housing or people such that replacement housing would be required to be constructed elsewhere. Therefore, no significant effects would occur and no further discussion is warranted. The potential for growth-inducing effects, however, is considered, as required under CEQA, in Section 4.20, "Growth-Inducing Effects."

4.1.4.3 Public Services (fire and police protection, schools, parks, and other public facilities)

As described above, the Proposed Action and alternatives would not directly or indirectly result in population growth. Therefore, the project would not increase long-term demand for public services, including fire and police protection, additional schools, parks, and other public facilities, that would necessitate the construction of new or altered government service facilities. No further evaluation of this impact is included in this EIR/EIS; however, fire and police services are discussed in Section 4.12, “Utilities and Service Systems,” to the extent that the project could temporarily disrupt emergency access during construction.

4.2 Delta Water Resources

This section discusses surface water hydrology, hydrodynamics, water quality, and water supply in the Delta and upstream. The section focuses on each alternative's potential effects to CCWD's delivered water quality, Central Valley Project (CVP) and State Water Project (SWP) Delta export supplies, water quality at key intakes and monitoring locations in the Delta, and local agricultural water supplies in the south Delta. Regulations and programs governing water quality and surface water supplies in the Delta are also discussed.

Local hydrology, water quality, drainage, flooding potential, and groundwater within the immediate vicinity of the project sites, and localized construction-related impacts, are discussed in Section 4.5, "Local Hydrology and Water Quality."

4.2.1 Affected Environment

4.2.1.1 Regulatory Setting

Delta water supplies are subject to numerous Federal, State, and local regulations, many of which affect water supply through water quality standards and "take" limits established for threatened and endangered fish species. Consequently, Delta water supply regulations are linked to water quality regulations and Federal Endangered Species Act (ESA) considerations. Environmental regulations, including the ESA, are discussed in detail in Section 4.3, "Delta Fisheries and Aquatic Resources."

The regulatory framework for Delta water resources is primarily discussed in the context of water quality regulations and Delta operating rules, which both have a substantial influence on Delta hydrodynamics and water quality. Regulations that focus primarily on levees, such as the Federal Emergency Management Agency (FEMA) floodplain management and flood insurance programs, and U.S. Army Corps of Engineers (USACE) and State Reclamation Board jurisdiction of levee structures, are generally not discussed because the project would not adversely affect levee systems. Regulations that address primarily localized construction-related project effects on water resources (i.e., Clean Water Act [CWA] permits for fill placement in waters and wetlands, stormwater discharge, and water quality certification) are presented in Section 4.5, "Local Hydrology and Water Quality."

Drinking Water Treatment Regulations

Federal Safe Drinking Water Act

The Safe Drinking Water Act was established to protect the quality of waters actually or potentially designated for drinking use, whether from above ground or underground sources. Contaminants of concern in a domestic water supply are those that either pose a health threat or in some way alter the aesthetic acceptability of the water. Primary and secondary maximum contaminant levels (MCLs) are established for numerous constituents of concern including turbidity, total dissolved solids (TDS), chloride, fluoride, nitrate, priority pollutant metals and organic compounds, selenium, bromate, trihalomethane and haloacetic acid precursors, radioactive compounds, and gross radioactivity. As a domestic water supplier, CCWD must follow requirements established by the Safe Drinking Water Act and its associated amendments.

Federal Surface Water Treatment Rule

The Federal Surface Water Treatment Rule is implemented by the California Surface Water Treatment Rule, which satisfies three specific requirements of the Safe Drinking Water Act by: (1) establishing criteria for determining when filtration is required for surface waters; (2) defining minimum levels of disinfection for surface waters; and (3) addressing *Cryptosporidium, Giardia lamblia*, *Legionella*, *E. coli*, viruses, turbidity, and heterotrophic plate count by setting a treatment technique. A treatment technique is set in lieu of an MCL for a contaminant when it is not technologically or economically feasible to measure that contaminant. The Surface Water Treatment Rule applies to CCWD activities.

Federal Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rule and Long-Term 1 and Long-Term 2 Enhanced Surface Water Treatment Rule

The Stage 1 Disinfectants and Disinfection Byproducts Rule establishes maximum residual disinfectant level goals and maximum residual disinfectant levels for chlorine, chloramines, and chlorine dioxide. It also establishes maximum contaminant level goals and MCLs for total trihalomethanes, five haloacetic acids, chlorite, and bromate. The primary purpose of the Long-Term 1 Enhanced Surface Water Treatment Rule is to improve microbial control, especially for *Cryptosporidium.*

Water systems that use surface water and conventional filtration treatment are required to remove specified percentages of organic materials, measured as total organic carbon (TOC), which may react with disinfectants to form disinfection byproducts (DBPs). Removal is to be achieved through a treatment technique (e.g., enhanced coagulation or enhanced softening), unless the system meets alternative criteria. The Stage 1 Disinfectants and Disinfection Byproducts Rule applies to CCWD activities.

The U.S. Environmental Protection Agency (EPA) adopted the Stage 2 Microbial and Disinfection Byproducts Rules in January 2006. The Rules include both the Stage 2 Disinfectants and Disinfection Byproducts Rule and Long-Term 2 Enhanced Surface Water Treatment Rule. These rules include revised and new requirements such as requiring water systems to meet DBP MCLs at each monitoring site in the distribution system rather than averaging multiple sites. The rules also contain a risk-targeting approach to better identify monitoring sites where customers are exposed to high levels of DBPs. The rules include new requirements for treatment efficacy and *Cryptosporidium* inactivation/removal, as well as new standards for DBPs, disinfectants, and potential contaminants.

The overall goal of this group of regulations is to balance the risks from microbial pathogens with those from carcinogenic DBPs. As domestic water suppliers, CCWD and its wholesale customers must follow the requirements of these rules.

California Department of Health Services Drinking Water Regulations
In California, the Department of Health Services (DHS) is the primary agency responsible for drinking water regulations. DHS must adopt standards at least as stringent as the Federal standards, but may regulate contaminants to more stringent standards than EPA or develop additional standards. The regulations cover more than 150 contaminants, including microorganisms, particulates, inorganics, natural organics, synthetic organics, radionuclides, and DBPs. California DHS has additional regulations beyond those developed by EPA. The numerous and increasingly stringent regulations promulgated by EPA and DHS since the Safe Drinking Water Act was enacted are summarized in Table 4.2-1.

Water Supply and Water Quality Regulations

Federal Clean Water Act
CWA is the country's primary surface water protection legislation. By employing a variety of regulatory and non-regulatory tools, including establishing water quality standards, issuing permits, monitoring discharges, and managing polluted runoff, CWA aims to restore and maintain the chemical, physical, and biological integrity of surface waters to support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." EPA is the Federal agency with primary authority for implementing regulations adopted pursuant to CWA, and has delegated the State of California as the authority to implement and oversee most of the programs authorized or adopted for CWA compliance.

Under CWA Section 303(d) and California's Porter-Cologne Water Quality Control Act of 1969, the State of California is required to establish beneficial uses of State waters and to adopt water quality standards to protect those beneficial uses. Section 303(d) establishes the total maximum daily load (TMDL) process to assist in guiding the application of State water quality standards, requiring the states to identify streams whose water quality is "impaired" (affected by the presence of pollutants or contaminants) and to establish the TMDL or the maximum quantity of a particular contaminant that a water body can assimilate without adverse effect.

Both the Delta and Suisun Bay have been identified as impaired for numerous constituents (including dioxin compounds, selenium, dissolved oxygen, and electrical conductivity), as listed on the combined and most recent 303(d) listed impaired water bodies by the Central Valley and San Francisco Bay Regional Water Quality Control Boards (RWQCBs). Construction and operation of proposed project facilities would need to be conducted within the constraints established by this law.

Table 4.2-1
Federal and State Drinking Water Regulations

Regulation	Year Promulgated	Contaminants
National Interim Primary Drinking Water Regulations	1975–1981	Inorganics, Organics, Physical, Radioactivity, Bacteriological
National Secondary Drinking Water Regulations	1979	Various Inorganics, Color, Corrosivity, Odor, Foaming Agents
Phase I Standards	1987	Volatile Organic Compounds (VOCs)
Phase II Standards	1991	VOCs, Synthetic Organics Compounds (SOCs), Inorganics Compounds (IOCs)
Phase V Standards	1992	VOCs, SOCs, IOCs
Surface Water Treatment Rule	1989	Microbiological and Turbidity
Total Coliform Rule	1989	Microbiological
Lead and Copper Rule	1991 / 2003	Lead, Copper
Drinking Water Source Assessment and Protection Program	1996	Source Water Protection
Information Collection Rule	1996	Microbiological and Disinfectants / Disinfection Byproducts (D/DBPs)
Stage 1 Disinfectants/Disinfection Byproducts Rule	1998	D/DBPs, Precursors
Interim Enhanced Surface Water Treatment Rule	1998	Microbiological, Turbidity
Unregulated Contaminant Monitoring Rule	1999	Organics, Microbiological
Radionuclides Rule	2000	Radionuclides
Arsenic Rule	2001	Arsenic
Filter Backwash Rule	2002	Microbiological, Turbidity
Long Term 1 Interim Enhanced Surface Water Treatment Rule	2002	Microbiological, Turbidity
Drinking Water Candidate Contaminant List	2003	Chemical, Microbiological
Stage 2 Microbial and Disinfection Byproducts Rules	2006	Microbiological and Disinfectants / Disinfection Byproducts (D/DBPs)

Porter-Cologne Water Quality Control Act of 1969
The Porter-Cologne Water Quality Control Act of 1969 complements and establishes the State policies subject to CWA; it also established the State Water Resources Control Board (SWRCB) and nine RWQCBs. SWRCB is the primary State agency responsible for protecting the quality of the State's surface and groundwater supplies, but much of its daily implementation authority is delegated to the nine RWQCBs.

The Victoria Island/Bryon Tract project site is under the jurisdiction of the Central Valley RWQCB, Region 5 (California Regional Water Quality Control Board 1998). The Desalination Alternative project sites are under the jurisdiction of the San Francisco RWQCB, Region 2 (California Regional Water Quality Control Board 1995).

SWRCB Water Rights Decisions and Water Quality Control Plans
Many of the permit terms and conditions contained in the Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh (WQCP) and water rights decisions implementing the WQCP have substantial influence on Delta operations, flows, water quality, and ecosystem functions. The SWRCB adopts WQCPs to establish standards to protect beneficial uses in the Delta. The SWRCB Water Rights Division has primary regulatory authority over water supplies and issues permits for water rights specifying amounts, conditions, and construction timetables for diversion and storage facilities. Decisions implement the objectives adopted in the WQCPs and reflect water availability, recognizing prior rights and flows needed to preserve instream uses, such as water quality and fish habitat, and whether the diversion is in the public interest.

1995 Water Quality Control Plan and D-1641
The current WQCP in effect in the Delta is the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (1995 WQCP), which superseded the Water Quality Control Plan for Salinity (adopted in May 1991) and the Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh (adopted in August 1978). The 1995 WQCP identifies (1) beneficial uses of the Delta 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.

The 1995 WQCP was developed as a result of the December 15, 1994, Bay-Delta Accord, which committed the CVP and SWP to new Delta habitat objectives. The new objectives were adopted by amendment in 1995 through a Water Rights Decision (D-1641) for CVP and SWP operations. One key feature of the 1995 WQCP was the estuarine habitat ("X2") objectives for Suisun Bay and the western Delta. The X2 objective requires specific daily or 14-day surface electrical conductivity (EC) criteria, or 3-day averaged outflow requirements to be met for certain numbers of days each month, February through June.

These requirements were designed to provide improved shallow water habitat for fish species in the spring. Other new elements of the 1995 WQCP included export-to-inflow ratios intended to reduce entrainment of fish at the export pumps, Delta Cross Channel gate closures, minimum Delta outflow requirements, and San Joaquin River EC and flow standards.

Municipal and Industrial Water Quality Objectives
In the 1978 WQCP, SWRCB set two objectives to provide reasonable protection for municipal and industrial (M&I) beneficial uses of Delta waters from the effects of salinity intrusion. The first objective established a year-round maximum mean daily chloride concentration measured at five Delta intake facilities, including CCWD's Pumping Plant No. 1, of 250 milligrams/liter (mg/L) for the reasonable protection of municipal beneficial uses. This objective was consistent with EPA's secondary MCL for chloride of 250 mg/L, and is based only on aesthetic (taste) considerations. The second objective established a maximum mean daily chloride concentration of 150 mg/L (measured at either Pumping Plant No. 1 or the San Joaquin River at the Antioch water works intake) for the reasonable protection of industrial beneficial uses (specifically manufacture of cardboard boxes by Gaylord Container Corporation in Antioch). This requirement is in effect for a minimum of 155-240 days each calendar year, depending on the water year type.

In the 1991 WQCP, SWRCB reviewed the water quality objectives for M&I use contained in the 1978 WQCP, and reviewed potential new objectives for trihalomethanes (THM) and other DBPs, including bromides. SWRCB concluded that technical information regarding THMs and other DBPs was not sufficient to set a scientifically sound objective. Accordingly, SWRCB continued the existing objectives for chloride concentration, and until more information is developed regarding these constituents, set a water quality goal for bromides of 0.15 mg/L (150 micrograms per liter [µg/L]). SWRCB also noted that the 150 mg/L chloride objective was maintained in part because it provides ancillary protection for other M&I uses in the absence of objectives for THMs and other DBPs. These objectives remained unchanged in the 1995 WQCP. As of 2005, no drinking water objectives exist in the Delta that are specifically tied to the protection of public health.

The SWRCB is currently conducting a Periodic Review of the 1995 WQCP. As part of this review, the SWRCB is considering specific drinking water quality objectives, such as a bromide objective, that would help reduce the formation of DBPs during water treatment. A draft plan is anticipated in early 2006.

Central Valley RWQCB Drinking Water Policy Development
The Central Valley RWQCB is currently developing a Central Valley Drinking Water Policy that may lead to regulations limiting the discharge of bromide, organic carbon, pathogens, and other drinking water constituents of concern. RWQCB adopted a resolution in July 2004 (Resolution No. R5-2004-0091), supporting development of the policy. Technical studies are due for completion in 2007. Basin Plan amendments incorporating elements of the drinking water policy could be completed by 2009.

CCWD's CVP Contract
In 2005, CCWD entered into a 40-year renewal of its contract with Reclamation for the delivery of as much as 195,000 acre-feet (af) of water per year for M&I and agricultural uses in the CCWD service area (Bureau of Reclamation 2005, Contract No. I75r-3401A-LTR1). CVP water delivered under the contract may be diverted at Rock Slough and Old River intakes and may be diverted any time of year.

CCWD's Los Vaqueros Project Water Right (Permit No. 20749)
Under this water right, water may be diverted from Old River to Los Vaqueros Reservoir from November through June during excess conditions in the Delta. The conditions that define what water is excess, and therefore available for diversion by CCWD, are further defined for the Los Vaqueros Project in SWRCB Decision 1629 (D-1629):

> No diversion is authorized that would adversely affect the operation of the Central Valley Project or State Water Project under permits and licenses for the Projects in effect on the date of this Order. An adverse effect shall be deemed to result from permittee's diversion at any time the United States Bureau of Reclamation and the Department of Water Resources have declared the Delta to be in balanced water conditions under the Coordinated Operations Agreement or at any other time that such diversion would directly or indirectly require the Central Valley Project or the State Water Project to release water from storage or to reduce their diversion or rediversion of water from the Delta to provide or assure flow in the Delta required to meet any application provision of State or Federal law.

CCWD's operations are governed in part by three biological documents: (a) 1993 National Oceanic & Atmospheric Administration (NOAA) Fisheries Biological Opinion for winter-run Chinook salmon, (b) 1993 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for delta smelt, and (c) 1994 Memorandum of Understanding between DFG and CCWD regarding the Los Vaqueros Project. The biological opinions specify the following:

- **No-Fill Period:** CCWD will avoid filling Los Vaqueros Reservoir for 75 days each spring. The default no-fill period is March 15 through May 31.
- **No-Diversion Period:** CCWD will avoid Delta diversions for 30 days each spring, concurrent with part of the no-fill period. The default no-diversion period is the month of April.
- **Emergency Storage:** The no-fill and no-diversion restrictions are in effect only when Los Vaqueros Reservoir is above emergency storage levels. Emergency storage is defined as 70,000 af in below-normal, above-normal, and wet years, and 44,000 af in dry and critical years.
- **X2 Restrictions:** Los Vaqueros Reservoir may be filled when X2 is west of Chipps Island in February through May, and Collinsville in January, June, and December. X2 restrictions on filling in December only exist when adult delta smelt are present at the Old River intake.

CCWD's Mallard Slough Water Right
CCWD has a license and a permit for diversions at Mallard Slough for up to 26,780 af annually. However, Mallard Slough diversions are unreliable most of the year because of high salinity in the San Joaquin River at the point of diversion. Because of this high salinity, CCWD's actual diversions at Mallard Slough have been only about 3,000 af/year on average.

Local Regulations

The project area is located within both San Joaquin and Contra Costa Counties. The Contra Costa County, San Joaquin County, City of Concord, and City of Pittsburg general plans include general policies to protect water quality, water supply, water resources, and watersheds (Contra Costa County 2005; San Joaquin County 1992; City of Concord 2005; City of Pittsburg 2004). There are no specific local requirements that are pertinent to this analysis.

4.2.1.2 Environmental Setting

This section describes the existing conditions for hydrology and water quality associated with the Delta and CCWD operations. Hydrologic variables of concern include Delta inflow and outflow, exports and local diversions, and associated Delta hydrodynamic conditions in the vicinity of the Proposed Action's new alternative intake (Victoria Canal), existing intakes (Old River, Rock Slough, and Mallard Slough), and at other key locations in the Delta or upstream. The focus of the water quality setting is on existing conditions as they relate to the range of seasonal and water year-type variability in Delta water quality conditions for drinking water (and other M&I uses), agricultural, and aquatic ecosystem beneficial uses. This section also describes water supply operations associated with Delta exports and deliveries, and local south Delta agricultural diversions.

Delta Overview

The San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) Estuary is located at the confluence of California's two major river systems, the Sacramento River and San Joaquin River, and San Francisco Bay. The Delta was formally defined in the Delta Protection Act of 1959 (California Water Code Section 12220). The legal Delta encompasses an area of approximately 851,000 acres (of which approximately 135,000 acres consist of waterway, marshland, or other water surfaces) bordered by the Cities of Sacramento, Stockton, Tracy, and Pittsburg.

The Delta is a hydrologically complex region of interlacing channels, marshland, and islands (see Exhibit 4.2-1). The Delta has been reclaimed into more than 60 islands and tracts, interlaced with about 700 miles of waterways. About 520,000 acres are devoted to farming. An approximately 1,100-mile network of levees protects the reclaimed land, most of which lies near or below sea level, from flooding. Some of the island interiors are as much as 25 feet below sea level. Water flowing into the Delta is used for urban and agricultural use, recreation, navigation, and wildlife and fisheries. The Delta provides drinking water for about 23 million Californians.

Delta Hydrology

Water movement in the Delta responds to four primary forcing mechanisms: (1) freshwater inflows draining to the ocean; (2) Delta exports and diversions; (3) operation of water control facilities such as dams, export pumps, and flow barriers; and (4) the regular tidal movement of seawater into and out of the Delta. In addition, winds, tides, and salinity behavior within the Delta generate a number of secondary currents, which, while of low velocity, are of considerable significance with respect to transporting contaminants and mixing different sources of water.

Changes in flow patterns within the Delta, whether caused by export pumping, winds, atmospheric pressure, flow barriers, tidal variations, inflows, or local diversions can influence water quality at drinking water intakes. Exhibit 4.2-1 depicts the key Delta islands, waterways, M&I intakes, and water control facilities that influence Delta hydrology.

Delta Inflow

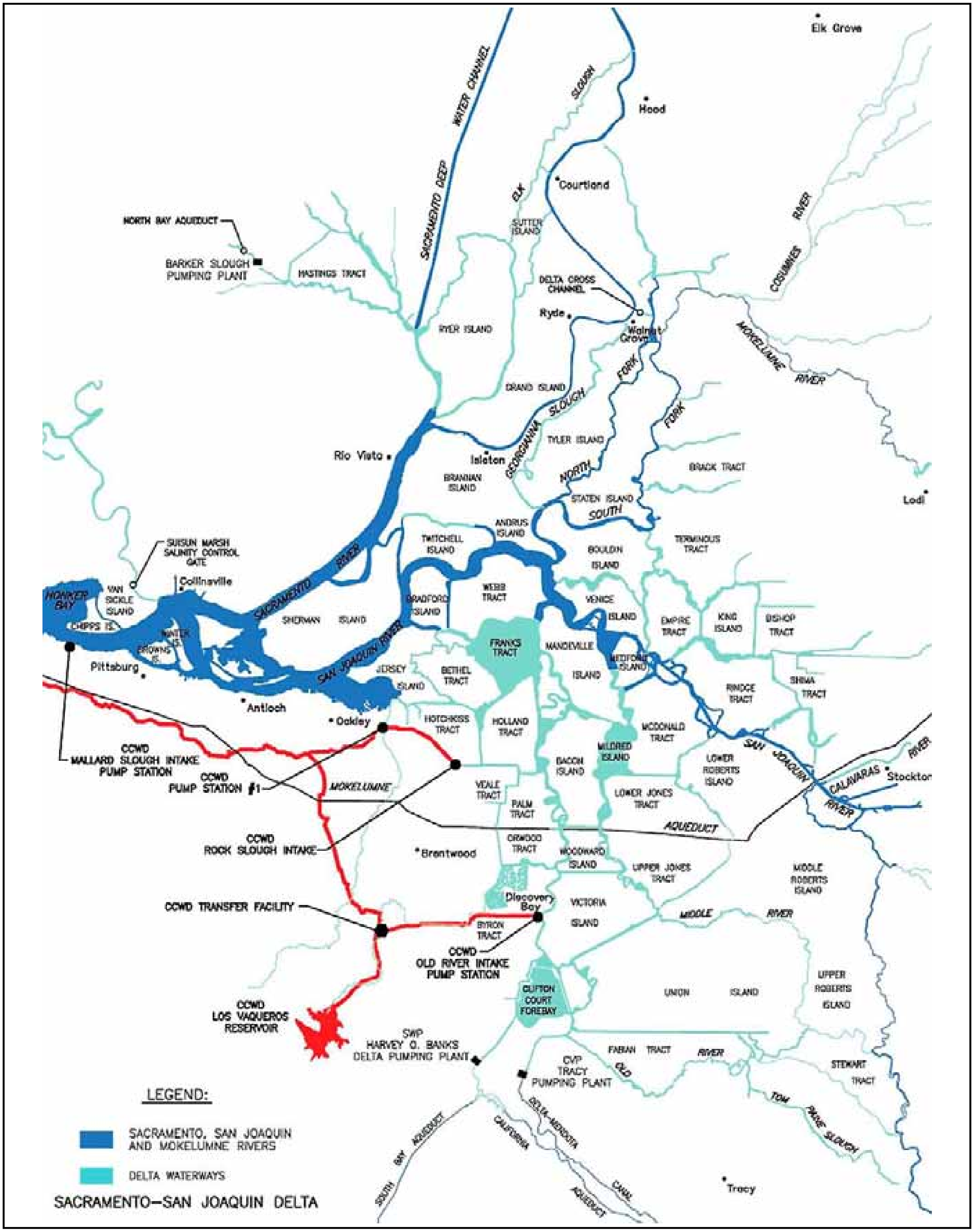
Freshwater inflow to the Delta is derived primarily from the Sacramento and San Joaquin rivers. However, additional flows also arrive via the eastside tributaries, namely the Mokelumne, Calaveras, and Cosumnes Rivers (see Exhibit 4.2-1). From the north, the Sacramento River, including flows via the Yolo Bypass, provides approximately 80% of the fresh water draining into the Delta. From the south, the San Joaquin River contributes another 15% of the inflow to the Delta, with the balance of 5% from the eastside tributaries (e.g., Mokelumne and Cosumnes Rivers) (Delta Protection Commission 2000).

Delta Outflow

Water flowing into the Delta is either diverted by direct Delta diverters, exported by the CVP or SWP pumps in the south Delta, or flows through San Francisco Bay to the Pacific Ocean. The water that flows out through the San Francisco Bay to the Pacific Ocean is known as “Delta outflow.” Delta outflow and tidal action are the primary factors controlling water quality in the Delta. Freshwater flows provide a barrier against seawater intrusion, and can be strategically managed through various physical barriers and water management operations. When Delta outflow is low, seawater can intrude farther into the Delta, affecting salinity and bromide concentrations at drinking water intakes. On average, local users withdraw about 10% of the Delta inflow, CVP and SWP withdraw about 30% for export, 20% of the Delta inflow is required for salinity control, and the remaining 40% provides outflow to the San Francisco Bay ecosystem in excess of minimum identified requirements and needs (CALFED 2000).

Delta Exports and Diversions

The CVP and SWP are the two exporters of Delta water and the largest users of Delta water. Water is exported through facilities located at Clifton Court Forebay, the Tracy Pumping Plant, and the North Bay Aqueduct (see Exhibit 4.2-1). Local agencies such as CCWD, private entities, and agricultural users also operate their own diversion programs, using their own local diversion infrastructure. There are an estimated 1,800 agricultural diversions in the Delta. Additional major diversion facilities within the legal boundary of the Delta are proposed by the City of Stockton (Stockton Delta Water Supply Project) in the east Delta and the Freeport Regional Water Authority (Freeport Regional Water Project) on the Sacramento River. Because both the CVP and SWP convey water in the Sacramento River and the Delta, facility operations are coordinated based on the Coordinated Operating Agreement between Reclamation and the California Department of Water Resources (DWR), the Bay-Delta Plan Accord, and many other agreements. CVP and SWP exports have a direct effect on hydrology, water levels, and water quality, especially in the south Delta.



Source: CCWD Data

Sacramento-San Joaquin Delta

EXHIBIT 4.2-1

The CVP and SWP divert and export about 3,350 thousand acre-feet per year (TAF/yr) from the Tracy Pumping Plant (Bureau of Reclamation 2005), and about 3,500 TAF/yr from the Banks Pumping Plant (Bureau of Reclamation and California Department of Water Resources 2005). By comparison, CCWD's average annual diversions are about 125 TAF/yr. CVP and SWP water diversion rates and operations can affect the flow distributions in Delta channels and reduce the quantity and quality of freshwater entering San Francisco Bay (California Department of Water Resources 2005).

Central Valley Project

The CVP, administered by Reclamation, stores and transports water from the Sacramento and San Joaquin Rivers for irrigation uses in the Central Valley, as well as municipal uses in CCWD's service area and elsewhere. The CVP is composed of some 20 reservoirs with a combined storage capacity of more than 11 million acre-feet (MAF), 11 power plants, and more than 500 miles of major canals and aqueducts. Authorized project purposes include flood control; navigation; provision of water for irrigation and domestic uses; fish and wildlife protection, restoration, and enhancement; and power generation. The Tracy Pumping Plant, the CVP's primary diversion facility in the south Delta, has a capacity of 4,600 cubic feet/second (cfs).

State Water Project

The SWP is operated and maintained by DWR and consists of 17 pumping plants, eight hydroelectric power plants, 32 reservoirs and storage facilities, and more than 660 miles of aqueducts and pipelines. The SWP serves more than two-thirds of the State's population and approximately 600,000 acres of irrigated farmland in the Feather River area, San Francisco Bay Area, San Joaquin Valley, southern California, and central California coast. The SWP provides water supply to contracting agencies and project purposes also include flood control, recreation, fish and wildlife enhancements, power generation, and salinity control within the Delta. The SWP Banks Pumping Plant supplies water for the South Bay Aqueduct and the California Aqueduct, with an installed capacity of 10,300 cfs. Under current operational constraints, inflow to Clifton Court, the forebay to Banks Pumping Plant, is generally limited to a maximum of 6,680 cfs, except between December 15 and March 15, when exports can be increased by 33% of San Joaquin River inflow (if greater than 1,000 cfs). The SWP also pumps water from Barker Slough into the North Bay Aqueduct for use in the Bay Region. The North Bay Aqueduct supplies SWP water to northeastern San Francisco Bay and Napa Valley. (CALFED 2000.) Combined water deliveries from these two facilities have ranged from 1.4 MAF in dry years to almost 4.0 MAF in wet years.

Joint Operations for Hydrology, Water Quality, and Ecosystem Requirements

Reclamation and DWR operate the CVP and SWP according to their water rights permits and a suite of other governing laws, regulations, and agreements that have been developed to ensure compliance with specific hydrology, water quality, and ecosystem requirements. CVP and SWP operations are adjusted to meet Delta flow and water quality standards by increasing releases of stored water in project reservoirs to repel encroaching tidal salinity and provide freshwater into the southern Delta channels, or altering specific facility operations such as export pumping or gate positions. SWRCB Water Rights Decision-1641 and Order WR 2001-05 contain the current water right requirements for Reclamation and DWR to implement the WQCP flow and water quality objectives. The Coordinated Operations Agreement defines how Reclamation and DWR share their joint responsibility to meet Delta water quality standards and meet the water demands of senior water right holders. The Coordinated Operations Agreement defines the Delta as being in either “balanced water conditions” or “excess water conditions.” Balanced conditions exist when it is agreed by the SWP and the CVP that releases from upstream reservoirs plus unregulated natural flow approximately equal the water supply needed to meet Sacramento Valley in-basin uses, plus exports. Excess conditions exist when upstream reservoir releases plus unregulated natural flow exceed Sacramento Valley in-basin uses, plus exports. Under excess conditions, Delta outflow exceeds the flow required to meet the water quality and flow standards. Typically, the Delta may be in balanced water conditions from June through November, and in excess water conditions from December through May.

Depending on specific conditions of the fisheries populations and presence in the Delta each year, CVP/SWP exports can be restricted on a seasonal basis pursuant to biological opinions issued by the National Marine Fisheries Service (NMFS) and USFWS.

Delta Agricultural Diversions

The vast majority of Delta land is agricultural (about 538,000 acres) and is considered among the most highly productive land in the world. Agricultural irrigation dominates local water use in the Delta, with more than 4,000 cfs of surface water diversions used to irrigate crops during peak summer months. This is similar in magnitude to CVP exports from the Delta in summer. In addition to irrigation use, water is also diverted by agricultural users to leach accumulated salts from fields and is then pumped back into the Delta. There are more than 1,800 agricultural users operating their own diversion programs that divert a total of about 1 MAF annually.

Delta Hydrodynamics

Delta hydrodynamic processes consist of the physical effects of tidal action, freshwater inflows, channel geometry, and the movement of water in Delta channels. Movement of water and salinity in the Delta is complex and can vary greatly both temporally and spatially. Tidal changes strongly influence Delta channel conditions twice daily by changing water surface elevation, current velocity, and flow direction. Water levels, or stages, vary greatly during each tidal cycle. Tidal effects are more intense in the western Delta, but even in the central Delta water surface elevations can vary by more than 5 feet during one tidal cycle. Tidal range is about 3.8 feet at the Rock Slough intake and about 3.5 feet at the Old River intake (Contra Costa Water District 1998).

Tidal action also influences channel velocities throughout the Delta, such that during the non-winter stormflow seasons, velocities can range from -2 feet per second (fps) to more than +3 fps (with negative figures indicating upstream flood tide flow). Tidal effects are not uniform from day to day. There is a distinct pattern of tidal variations within a lunar month. The tidal range is greatest during “spring” tides and smallest during “neap” tides. This adds a net “tidal outflow” component to daily Delta outflow estimates.

Delta Flows

The flow of water in Old River at Bacon Island is often used as an indicator of hydraulic conditions in the south Delta. Average monthly flow is generally towards the south over the long-term because of the influence of the CVP and SWP pumps in the south Delta (CALFED 2000). Flows average about -3,500 cfs (negative indicates flow directed toward the south) during August, and range from -1,100 to -100 cfs in April. Average monthly flow is always south (negative) in dry and critical water years. The hydrodynamic conditions are also influenced by the seasonal installation of temporary barriers for water level control.

Measured flows in Victoria Canal are not currently available[1]; however, modeling confirms the pattern of positive and reverse flows in Middle River and Victoria Canal are generally similar to Old River on a seasonal basis because the channels are all subject to the same hydrodynamic forces of San Joaquin River inflow from the head of Old River, tidal influence in the central Delta, and reverse flow influence of the CVP/SWP exports.

Delta Water Levels

Water levels in the south Delta area are influenced in varying degrees by natural tidal fluctuation, San Joaquin River flow, CVP and SWP pumping, local agricultural diversions, local agricultural drainage return flows, channel capacities, siltation and dredging, and regulatory constraints. These factors affect water levels at some local diversion points. South and central Delta farmers have a major interest in maintaining Delta water levels so that their siphons (and in some cases, pumps), installed at fixed elevations in the Delta, can continue to be used for irrigation diversions. When CVP and SWP are exporting water, water levels in local channels can be drawn down, particularly during low-water years. DWR has been addressing these issues by installing temporary seasonal barriers at several Delta locations; as noted above, permanent operable facilities are being evaluated as part of CALFED's South Delta Improvements Program (SDIP) (Bureau of Reclamation and DWR 2005).

Delta Water Quality

This section describes key Delta water quality constituents as well as their spatial and temporal variability, with an emphasis on CCWD's existing and proposed intake locations. The Delta is a source of water for municipal, agricultural, recreational, and industrial uses as well as a major habitat area for important species of fish and aquatic organisms. The Delta water quality discussion below focuses on municipal use (drinking water) because it is the beneficial use with the most stringent water quality needs (particularly for salinity). The water quality impacts analysis includes an analysis of water quality impacts to all beneficial uses including agricultural and fisheries. The primary drinking water quality constituents of the Delta related to the Proposed Action concern salinity[2], including bromide and chloride. The water quality impacts analysis

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1 The U.S. Geological Survey has established a flow and EC monitoring station in Victoria Canal, but data for this site are not yet available.

2 Salinity is a measure of the amount of salts in the water including chloride and bromide. Chloride anion concentration and electrical conductivity (EC) are commonly used measurements of salinity. Linear relationships between chlorides and EC in Delta water have been developed from measured data. These

focuses on salinity (measured as electrical conductivity and chlorides) as an indicator of Delta water quality because salinity is the Delta water quality constituent most likely to be affected by shifts in the timing and location of pumping in the Delta. Salinity is also the constituent for which the most monitoring data and calibrated Delta modeling tools exist.

Delta Drinking Water Quality Constituents of Concern

The Delta and its tributaries are key surface water sources of drinking water for the majority of Californians. The continued availability of high-quality water supplies from the Delta is crucial to maintain municipal drinking water supplies, agricultural production, and other important water-dependent industries. CCWD obtains its water exclusively from the Delta. CCWD's source water quality ultimately influences the quality of its treated water and its ability to meet drinking water standards and CCWD water quality objectives.

Delta Salinity (Chlorides and Bromides)

Salinity is both a health and an aesthetic (taste) issue for drinking water. High salinity adversely affects drinking water taste, landscape irrigation, and industrial and manufacturing processes. Salinity is particularly problematic because it is not removed through conventional drinking water treatment processes. CCWD has a water quality delivery objective of 65 mg/L chloride and a source water quality goal of 50 µg/l bromide, which are both frequently exceeded at CCWD's existing Delta intakes, especially in late summer and fall, and during dry periods.

As a common constituent in seawater, bromide is present in the Delta primarily from tidal exchange and is therefore typically at higher concentrations in the western Delta. Other sources of bromide can include agricultural discharge and groundwater. Seasonally high bromide levels increase DBP formation, including bromate, trihalomethane, and haloacetic acid formation, which limit the chlorine and ozone doses that may be applied at CCWD's water treatment plants. High bromide levels are of particular concern during late summer/fall and during drought years, when salt water intrusion into the Delta at CCWD intakes generally increases.

Based on a study by the California Urban Water Agencies, CCWD established a source water quality objective of 50 µg/L bromide at its intakes to meet bromate regulations for treated water. Exhibit 4.2-2 shows that Delta bromide concentrations at CCWD intakes are well above this level most of the time. A bromide concentration of 50 µg/L corresponds to a chloride concentration of approximately 20 mg/l based on measured

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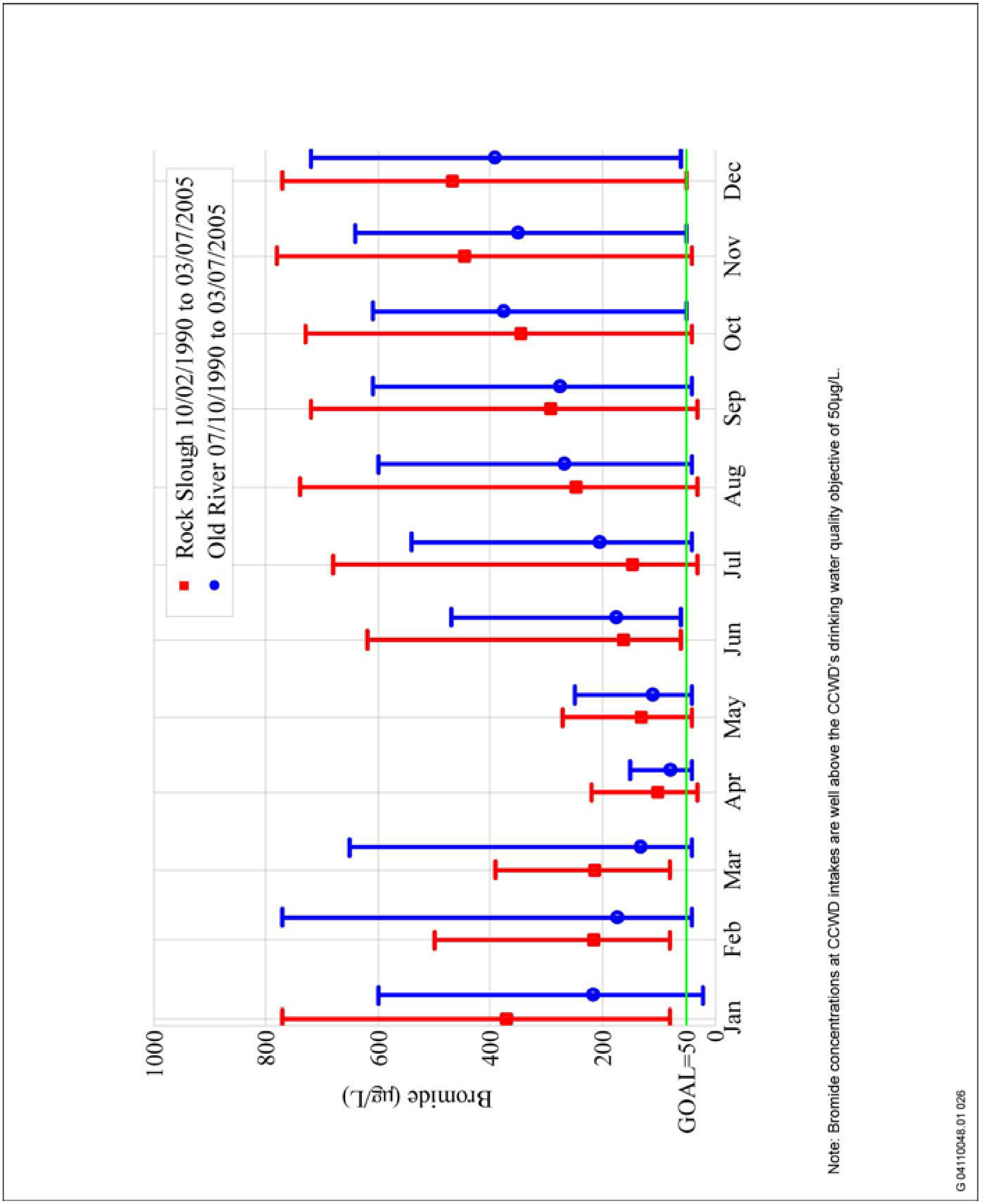
relationships differ depending on whether the main source of salinity in the water is agricultural drainage or seawater. Linear relationships between chloride and bromide, and bromide and EC, have also been developed from measured data and also differ depending on the source of the salinity. As much as possible, data are presented in this document in the form in which they were originally collected or modeled, to minimize the introduction of inaccuracies. When conversions have been made, an established Chloride to EC conversion developed by CCWD and DWR is used. As such, chloride, bromide, and EC data are presented throughout the document and EC is frequently used as an indicator of chloride and bromide concentrations.



Source: CCWD Data

CCWD Intake Water Quality - Bromide
Minimum, Maximum, and Average Measured Values (MWQI Data)

EXHIBIT 4.2-2

data from the Delta. Data from this exhibit is from the Municipal Water Quality Investigations (MWQI), a DWR-run sampling program.

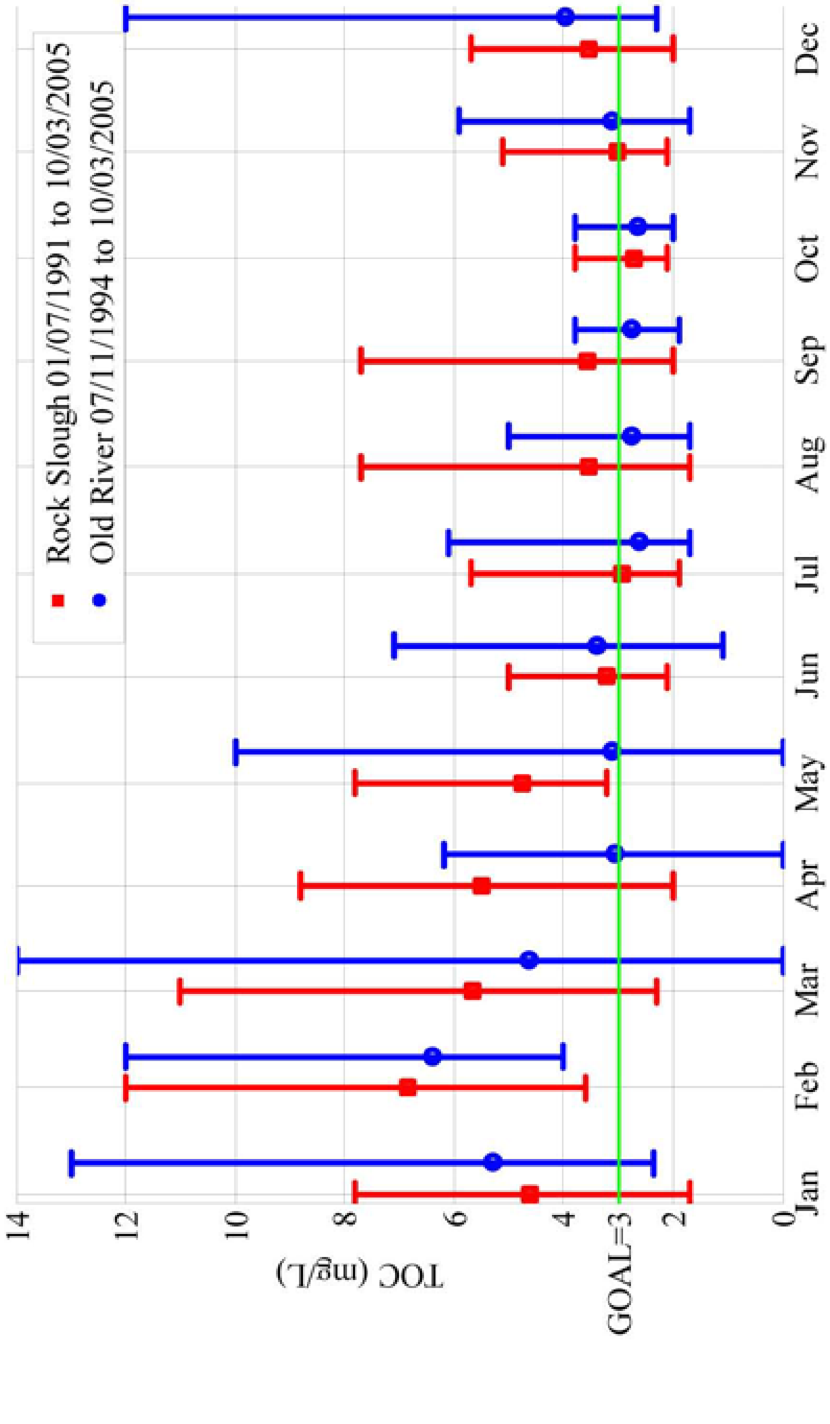
Delta Organic Carbon
Organic carbon is also a DBP precursor that causes problems in drinking water treatment. Drinking water regulations specify a required level of reduction for organic carbon based on source water concentrations. Organics react with chlorine to form trihalomethanes (THMs) and haleoacetic acids (HAAs). As a result, CCWD and many other agencies treating Delta water have changed to ozone disinfection. Increased levels of organic carbon in Delta water require increased ozone dosages in the disinfection process at CCWD's two water treatment plants, potentially resulting in increased levels of bromate in treated water. Thus, organic carbon and bromide concerns are inextricably linked through drinking water treatment processes.

Organic carbon in the Delta originates from several sources including runoff from agricultural and urban land, drainage water pumped from Delta islands that have soils with high organic matter, runoff and drainage from wetlands, wastewater discharges, and primary production in Delta water bodies (California Department of Water Resources 2003). TOC is a commonly used measurement of organic carbon in water, including organic carbon from particulate matter such as plant residues and dissolved organic carbon.

High organic carbon concentrations at CCWD's intakes typically occur in winter (see Exhibit 4.2-3), but can cause problems throughout the year. CCWD's water quality objective for organic carbon is frequently exceeded. Delta monitoring and intensive studies of organic carbon dynamics cover a relatively recent time period, and there are insufficient data to identify whether any long-term (i.e., decadal and longer) concentration trends are occurring (California Department of Water Resources 2003).

Spatial and Temporal Variability of Delta Salinity
Delta salinity concentrations result from a combination of daily tidal action; freshwater Delta inflows (which are affected by reservoir operations and upstream reservoirs); and associated Delta outflow available to repel the tidal salt water intrusion, in-Delta pump operations, in-Delta agricultural drainage, San Joaquin River inflow and salinity, municipal wastewater discharges, urban runoff, and other influences. Changing Delta demands and regulations have also affected Delta salinity conditions.

CCWD's existing intakes are located in the western Delta, where the effects of seawater intrusion are most pronounced. Salinity at CCWD intakes can vary substantially over the course of a year. Generally, CCWD's intakes experience relatively fresh conditions in late winter and early spring, and salinity increases in summer and fall as conditions become drier and regulatory standards governing Delta operations shift. This pattern can vary substantially depending on hydrology. Exhibit 4.2-4 shows variations in chlorides at CCWD's Old River intake over the course of several recent years. Note that in dry years (2001 and 2002) salinity begins to increase substantially in July. In wetter years, the increase in salinity occurs closer to September. This is the result of precipitation patterns, demand patterns, and Delta operational standards (e.g., salinity standards, outflow



Note: Organic carbon concentrations at CCWD intakes are frequently above the CCWD water quality objective of 3 mg/L.

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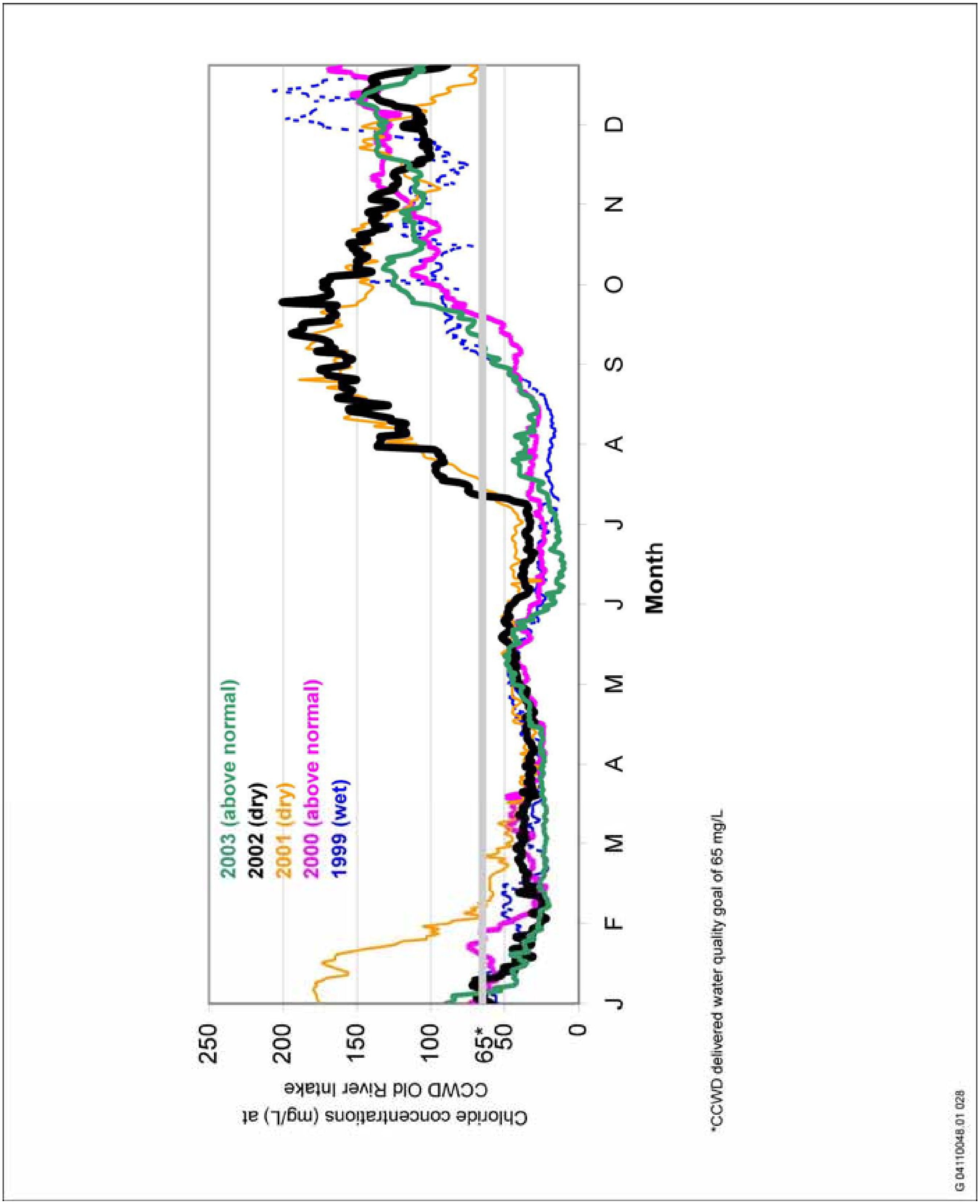
Source: CCWD Data

CCWD Intake Water Quality - Total Organic Carbon
Minimum, Maximum, and Average Measured Values (CCWD Data)

EXHIBIT 4.2-3



Source: CCWD Data

Chloride Concentrations at CCWD's Old River Intake

EXHIBIT 4.2-4

standards) that change based on water year type[3]. This has important operational implications for CCWD. When water at CCWD's Old River intake exceeds 65 mg/L chloride, CCWD must blend water diverted from the Old River intake with water released from Los Vaqueros Reservoir to lower the salinity and meet its water quality objectives.

Because of the complex hydrodynamics in the Delta, salinity also varies greatly spatially. In the south Delta, winter salinity is most influenced by agricultural runoff, while fall salinities tend to be primarily influenced by seawater intrusion. Hydrodynamics in the south Delta and the movement of salts is also influenced by the flows resulting from inflows, export pumping, seasonal agricultural barriers, and the position of the Delta Cross Channel gates. In combination, these factors result in notable differences in water quality, particularly salinity, at CCWD's Old River intake location and Victoria Canal. Appendix C-1, "Delta Water Quality Monitoring Data," contains additional data collected in Victoria Canal and other parts of the Delta showing the temporal and spatial variability of Delta water quality and differences in water quality between Old River and Victoria Canal. These data also demonstrate that CCWD's primary intake at Old River is subject to greater salinity concentrations, on average, over the entire period of July through December than in Victoria Canal; although there are times (generally in spring) when salinity is lower in Old River (see Exhibit 4.2-5). Middle River is the primary water source for Victoria Canal. Middle River is more strongly influenced by Sacramento River flow, particularly when the Delta Cross Channel gates are open, and is less vulnerable to seawater intrusion than Old River.

Trends in Chloride Concentrations at CCWD Intakes

Salinity at CCWD's intakes during late summer and early fall has increased over historical conditions, particularly in the 1990s. Exhibit 4.2-6 shows monthly average chlorides at CCWD's Rock Slough intake[4] for the fall months of September, October, and November from 1960 to present and the best-fit line.

Average annual salinity at CCWD' intakes shows a recent rising trend that is caused by the recent rise in fall salinity. (See Appendix C-1, "Delta Water Quality Monitoring Data," for plots of historical salinity at Rock Slough Intake for all months and as an annual average.)

There are many reasons for these increases in fall salinity. California water demands on the Delta have grown substantially since the 1970s. California experienced a prolonged drought between 1987 and 1992. There have been important regulatory changes in the Delta that have changed the timing of export pumping and the outflow and salinity requirements that must be met by Delta operators. These regulatory changes include:

- 1992 Central Valley Project Improvement Act,
- 1994 Bay-Delta Accord,

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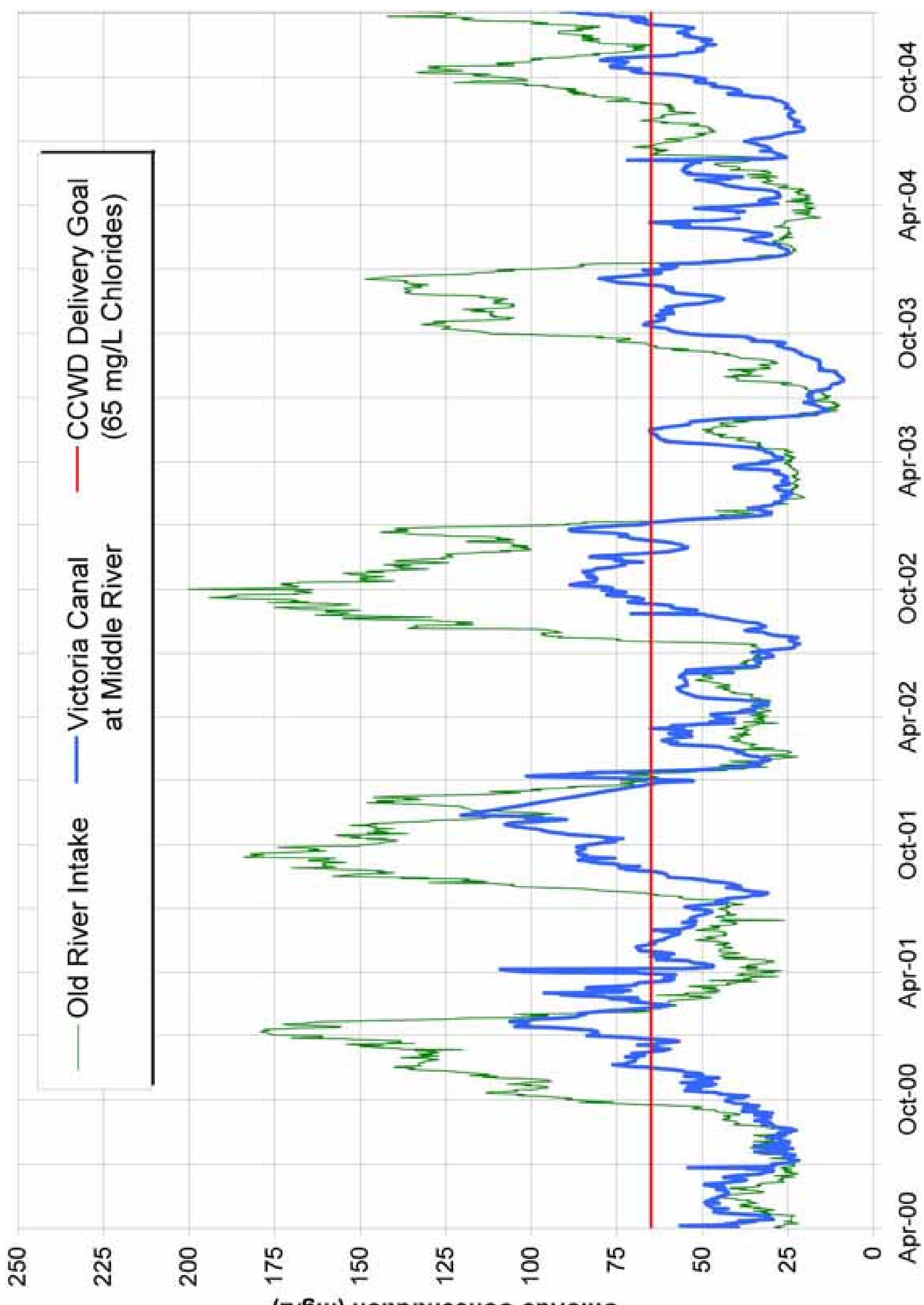
[3] Delta outflow standards in fall, for example, differ by year type.

[4] Water quality data from Rock Slough are also indicative of chloride trends at CCWD's Old River intake and are available for a longer period of record.

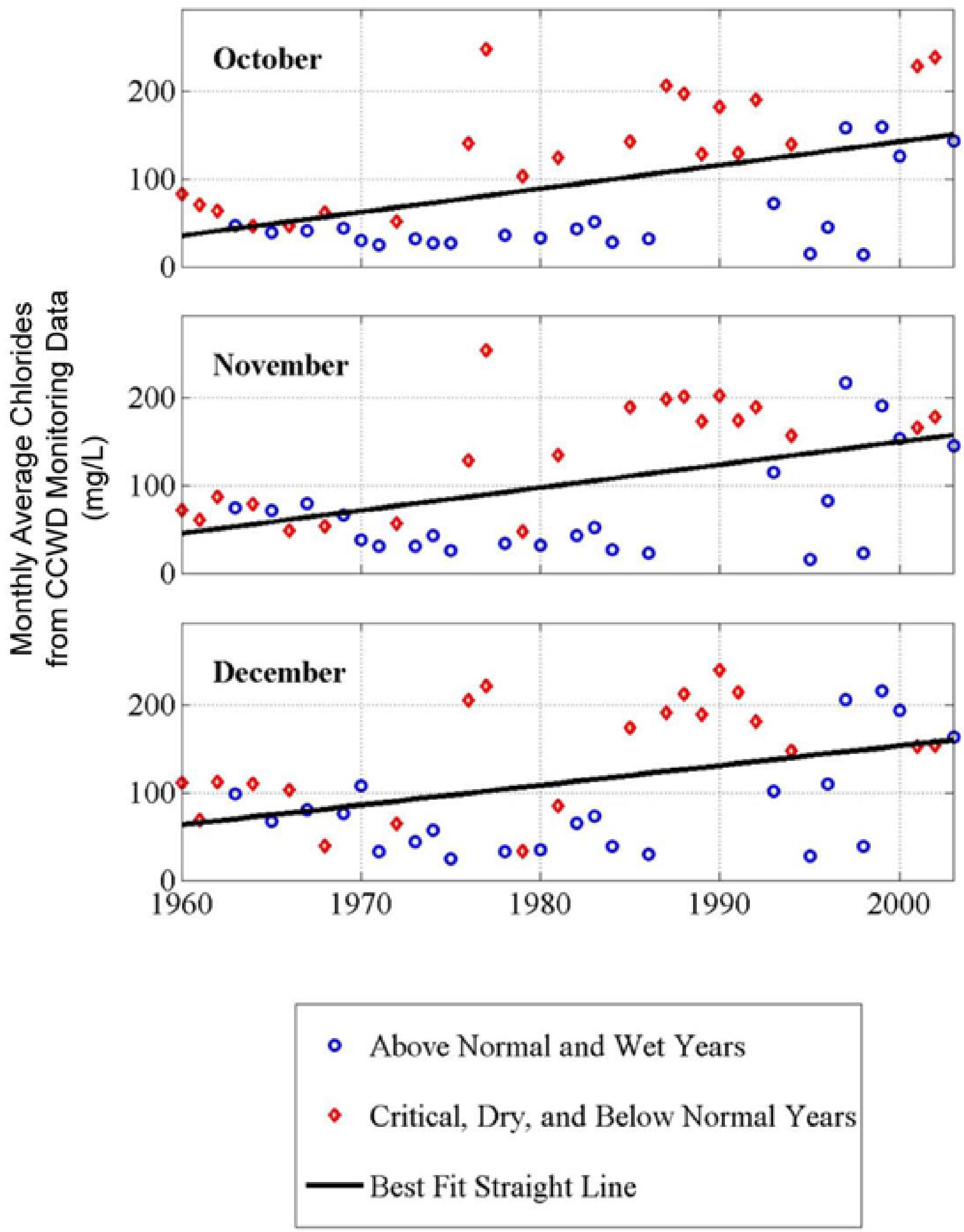


Note: Water quality is better in Middle River and Victoria Canal than in Old River during summer and fall.

Source: CCWD Data

Comparison of Chloride Concentrations at Old River Intake Versus Victoria Canal

EXHIBIT 4.2-5



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Source: CCWD Data

Historical Fall Salinity at CCWD's Rock Slough Intake

EXHIBIT 4.2-6

EDAW

- 1995 Water Quality Control Plan and SWRCB Water Rights Decision D-1641, and
- other changes, including fishery protection measures related to the Federal Endangered Species Act and CALFED's Environmental Water Account that have led to shifts in Delta pumping from spring to fall to minimize pumping effects on special-status fish species.

Delta operators must balance the competing needs for water supply, fishery protection, and drinking water quality while operating within the Delta regulatory framework. These competing needs and management goals in the Delta have increased fall salinities at CCWD intakes. These salinity increases generally remain within the Delta's regulatory standards, but frequently exceed CCWD's Board-adopted water quality objectives.

4.2.2 Environmental Consequences

4.2.2.1 Methods and Assumptions

Water quality monitoring data and computer modeling was used to aid in the evaluation of potential effects of the Proposed Action and alternatives on Delta water resources and to quantify potential project benefits. Water quality monitoring data are summarized in Appendix C-1, "Delta Water Quality Monitoring Data." Descriptions of the models used, the modeling methodology, and key assumptions are provided in Appendix C-2, "Water Resources Modeling Methodology Report." Summaries of the analysis and modeling results are provided below. More detailed results are provided in Appendices C-3, "CALSIM II Modeling;" C-4, "DSM2 Delta Modeling;" and C-5, "CCWD Operations Modeling." Modeling results in electronic format are also available from CCWD upon request.

Evaluating the potential project effects requires an understanding of how CCWD could operate under each of the alternatives. Computer modeling was used to simulate CCWD project operations under each of the project alternatives, including the No-Action Alternative, and potential project effects were analyzed based on these operational patterns. This section describes potential CCWD operations under each alternative, compares use of intakes by alternative, and estimates the resulting CCWD delivered water quality.

Computer modeling for this project utilizes historical California hydrology data to represent the variety of historically accurate weather and hydrologic patterns, including wet periods and droughts, under which the project would be operated. Depending on the type of model used and the purpose of the analysis, either a 16-year (1976–1991) or a 73-year (1922–1994) period of hydrologic record was used as input. Each model run represents a constant level of development (2001 for the existing case and 2020 for the future case), so that performance of the No-Action Alternative and other alternatives could be evaluated under both existing and future conditions. This requires assuming constant land use patterns, regulatory environments, water demands, etc., over the modeling period. Historic Delta operations are not used in the modeling; rather the historic hydrologic data are used in conjunction with modeled operations to represent either existing or future conditions. Therefore, when a specific modeled year is described in the text, only the hydrologic conditions for that year correspond to the historical record and the operations described are model results. For modeling purposes, "existing conditions" refers to modeling runs based on current Delta facilities and demands. "Future conditions" refers to modeling runs based on forecasted 2020 Delta demands and reasonably foreseeable Delta projects and facilities. The base case refers to without-project conditions.

4.2.2.2 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines and CEQA requirements and thresholds that have been used in other Delta projects. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect related to Delta water resources if it would:

- result in substantial water quality changes that would adversely affect beneficial uses;
- violate existing water quality standards or otherwise substantially degrade water quality;
- reduce surface water elevations in the Delta to a level that would not support existing land uses or planned land uses for which permits have been granted; or
- result in substantial adverse effects on operations or substantial decreases in water deliveries for Delta water users, including the SWP, the CVP, City of Stockton, and Delta agricultural diverters, as measured by significant changes in carryover storage [5], timing or rate of river flows, or Delta water quality.

The water quality impacts and benefits analysis focuses on salinity (measured as electrical conductivity and chlorides) as an indicator of Delta water quality because salinity is the Delta water quality constituent most likely to be affected by shifts in the timing and location of pumping in the Delta. Salinity is also the constituent for which the most monitoring data and calibrated Delta modeling tools exist.

4.2.2.3 Changes to CCWD Operations

Changes in CCWD Delivered Water Quality

The Proposed Action and Alternatives 2 and 3 would allow CCWD to access better water quality during key periods (particularly late summer, early fall, and drought periods) and deliver it to Los Vaqueros Reservoir or the CCWD service area through the Old River conveyance system. This would enable CCWD to protect and improve the quality of water it delivers to its customers. Alternative 4 would provide improved water quality through desalination of Mallard Slough water. Table 4.2-2 quantifies and compares the expected water quality improvements. Results in Table 4.2-2 are presented in chlorides,

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[5] Carryover storage is the water that remains in a reservoir after demands on the reservoir have been met. Agencies typically maintain carryover storage as protection for low water availability during dry years.

but would be indicative of overall salinity changes in CCWD delivered water quality, including bromide. Although salinity, particularly its components chloride and bromide, is the primary drinking water constituent of concern for this project, the operational flexibility created by all of the project alternatives would allow CCWD to manage operations in response to other water quality constituents of concern, such as organic carbon. For example, in the past, CCWD has responded to events in the Delta that affected constituents other than salinity by shifting diversions between intakes. Most recently in June 2004, in response to the levee break on Jones Tract, CCWD temporarily ceased diversions at the Old River intake and used the Rock Slough intake because of water quality concerns associated with the levee break. In the future, as the ability to monitor, detect, and predict spikes in organic carbon in the Delta improves, all of the project alternatives would enable CCWD to better respond through operational changes at intakes along with adjustments at the treatment plants.

Table 4.2-2
CCWD Delivered Chloride Performance Would Improve under Project Alternatives

Alternative	Delivered Chloride Performance (% of time delivered water meets 65 mg/L Cl goal)	Average Delivered Chloride (mg/L)	Longest Duration of Delivered Chloride > 65 mg/L (# of consecutive months)
Existing			
Base	87%	54	14
Alternatives 1 & 2	96%	46	6
Alternative 3	96%	45	6
Alternative 4*	93%	52	12
Future			
Base	86%	55	16
Alternatives 1, 2, & 3	95%	46	10
Alternative 4*	90%	53	15

Source: CCWD (see Appendix C-5, “CCWD Operations Modeling,” for additional detail)
* Alternative 4 would provide treated water of 65 mg/L chlorides or better to the Bollman Water Treatment Plant service area at all times. Statistics presented here indicate deliveries to the Randall-Bold Water Treatment Plant treated water service area and untreated water customers (approximately 70% of all deliveries).

During extended multiyear droughts (3 or more years), when available water in Los Vaqueros Reservoir for blending is exhausted, CCWD would have to deliver water directly from its Delta intakes to customers. Table 4.2-3 compares the water quality available at CCWD’s Old River intake and at the proposed alternative intake location during prolonged drought periods, based on modeling results. This table presents the maximum salinity CCWD would deliver to customers over the 73-year modeled hydrologic period for each project alternative.

Table 4.2-3
CCWD Maximum Delivered Chloride Concentrations

Alternative	Maximum Delivered Chlorides (mg/L)
Base (existing and future cases)	250
Alternatives 1, 2, & 3 (existing and future cases)	125
Alternative 4 Desalination (existing and future cases)*	250

Source: CCWD (see Appendices C-4, "DSM2 Delta Modeling," and C-5, "CCWD Operations Modeling," for additional detail)

* Alternative 4 would provide treated water of 65 mg/L chlorides or better to the Bollman Water Treatment Plant service area at all times. Maximum delivered chlorides presented in this table indicate deliveries to the Randall-Bold Water Treatment Plant treated water service area and untreated water customers (approximately 70% of all deliveries).

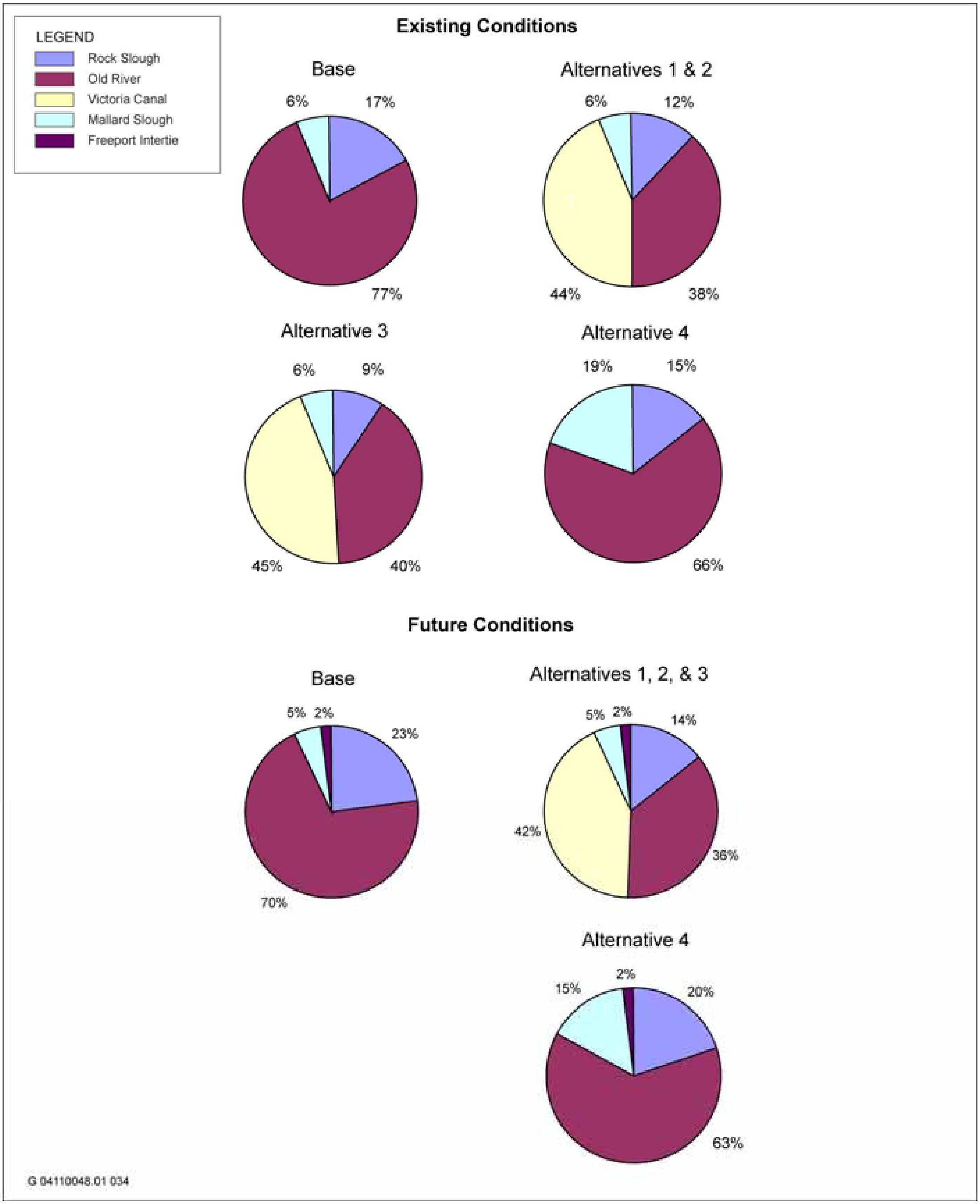
The Proposed Action and alternatives would also provide important water quality benefits that are not as readily quantified through operational modeling. These include improved operational flexibility to operate around Delta emergencies (such as levee failures) and health benefits to CCWD's customers. Health benefits are primarily from reduced disinfection byproducts (see Section 1.4.2, "Delta Water Quality," for further details).

Changes in CCWD Facility Operations

The project would entail changes in both the timing and location of CCWD diversions. More water would be pumped in some years with a resulting reduction in pumping of water in other years. Alternatives 1, 2, and 3 would not increase CCWD Delta diversions on an average annual basis. Alternative 4, Desalination Alternative, would increase CCWD Delta diversions by a small amount because of losses in the desalination process. The following sections describe the seasonal and annual shifts in CCWD diversions and the shifts in use of CCWD's intakes with project implementation. Exhibit 4.2-7 shows the differences in overall use of CCWD intakes by volume for each of the action alternatives under existing and future conditions. CCWD would continue to use its existing intakes at Mallard Slough, Rock Slough, and Old River under all alternatives. Under the Proposed Action and Alternatives 2 and 3, CCWD would add a new intake in Victoria Canal, modifying Old River diversions greatly, Rock Slough diversions moderately, and Mallard Slough diversions not at all. CCWD would, on average, divert an equivalent amount of water from Old River and the proposed alternative intake each year. Under Alternative 4, Mallard Slough diversions would be increased, with a commensurate decrease in Rock Slough and Old River diversions.

Seasonal Shifts in CCWD Operations

During winter and spring, the salinity at CCWD's Old River intake is generally lower than the salinity in Victoria Canal (see Exhibit 4.2-5). In late summer, as salinities in the Delta begin to rise, Victoria Canal salinity generally becomes lower than Old River salinity and remains lower until Delta outflow increases and Delta salinity improves (usually about December).



Source: CCWD Modeling Data

CCWD Simulated Average Annual Diversions by Intake (Existing and Future Conditions)

EXHIBIT 4.2-7

This seasonal variation in salinity between Old River and Victoria Canal provides the opportunity for a seasonal shift in CCWD operations. The Proposed Action and Alternatives 2 and 3 would result in CCWD using the Old River intake predominantly in winter and spring and using the proposed alternative intake on Victoria Canal, instead of the Old River intake, in summer and fall. In addition, because the salinity at the proposed Victoria Canal intake would be lower than that in Old River when the proposed intake would be used, fewer Los Vaqueros Reservoir releases would be needed to blend source water to reach the CCWD delivered water quality objective of 65 mg/L chloride. With less stored water needed to meet the CCWD delivered chloride objective, less pumping would be required during winter and spring to refill the reservoir in many years. This would result in a slight shift in the timing of CCWD diversions from spring to fall (on the order of about 10 TAF average), but the average annual quantity of water diverted would not change.

Tables 4.2-4 through 4.2-8 show the simulated average monthly CCWD diversions combined and by intake (Rock Slough, Old River, Mallard Slough, and Victoria Canal) over the entire 1922–1994 simulation period for the base case and each project alternative. Under the Proposed Action, total CCWD diversions would decrease in December through July and increase in August through November (see Table 4.2-4). Rock Slough and Old River diversions would decrease under all alternatives compared to the base case (see Tables 4.2-5 and 4.2-6, respectively). Mallard Slough diversions would remain unchanged under Alternatives 1, 2, and 3, but would be higher under Alternative 4, Desalination Alternative (see Table 4.2-8). More detailed operational modeling results are included in Appendix C-5, "CCWD Operations Modeling."

Table 4.2-4
Total (All Intakes) CCWD Monthly Average Diversion (TAF)

	Existing Conditions				Future Conditions		
		Change from Base				Change from Base	
Month	Base Case	Alt. 1 & 2	Alt. 3	Alt. 4	Base Case	Alt. 1, 2, & 3	Alt. 4
Oct	6.2	1.9	1.8	1.9	7.5	2.2	-0.9
Nov	6.2	1.4	1.4	0.5	7.5	0.7	-1.2
Dec	11.3	-0.2	-0.2	-0.1	15.6	-0.1	0.0
Jan	9.0	-1.6	-1.6	-1.0	10.0	-0.7	-1.2
Feb	11.7	-3.1	-3.2	-0.6	14.4	-4.1	-0.9
Mar	11.9	-2.5	-2.1	-0.8	14.9	-3.4	-1.1
Apr	3.5	-1.1	-1.0	-0.6	4.2	-1.0	-0.4
May	12.0	-0.1	0.0	0.0	14.9	0.1	0.7
Jun	22.8	-1.4	-1.5	-0.1	27.2	-1.4	2.4
Jul	19.6	-1.5	-1.8	-0.3	23.4	-1.5	3.5
Aug	14.1	3.0	3.0	1.3	17.2	3.2	2.3
Sep	6.8	5.7	.7	2.7	9.0	6.3	0.0
Totals	**135.1**	**0.5***	**0.5***	**2.9****	**165.8**	**0.3***	**3.2****

Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail)
* The minor differences in average annual diversion between the base, Alternatives 1 and 2, and Alternative 3 are caused by differences in Los Vaqueros Reservoir storage at the end of the study period and differences in evaporation from Los Vaqueros Reservoir due to differing storage levels throughout the study period. These three alternatives meet the same service area demand.
**Alternative 4 includes an additional 20% diversion for all water treated with desalination to account for the desalination waste stream.

Table 4.2-5
Rock Slough Intake Monthly Average Diversions (TAF)

Month	Existing Conditions				Future Conditions		
	Base Case	Change from Base			Base Case	Change from Base	
		Alt. 1 & 2	Alt. 3	Alt. 4		Alt. 1, 2, & 3	Alt. 4
Oct	0.3	-0.2	-0.2	-0.3	1.0	-0.8	-0.3
Nov	0.5	-0.1	-0.1	0.0	0.6	-0.2	0.0
Dec	1.6	-0.8	-1.3	0.0	0.3	-0.2	0.0
Jan	0.6	-0.5	-0.5	-0.3	1.5	-0.9	-0.3
Feb	1.9	-1.3	-1.6	-0.5	2.2	-1.1	-0.3
Mar	1.1	-0.6	-0.7	-0.1	1.8	-0.8	-0.2
Apr	0.2	-0.1	-0.1	-0.1	0.5	-0.3	-0.2
May	0.0	0.0	0.0	0.0	0.2	0.1	-0.2
Jun	10.0	-0.7	-1.2	-0.4	14.1	-0.7	-0.2
Jul	4.7	-1.9	-3.2	-0.8	6.5	-3.3	-1.0
Aug	1.3	0.4	-0.8	-0.1	4.4	-2.1	-0.2
Sep	1.1	-1.0	-1.1	-0.4	4.6	-3.6	-1.0
Totals	**23.3**	**-6.8**	**-10.8**	**-3.0***	**37.7**	**-13.9**	**-3.9***

Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail)
* Alternative 4 includes an additional 20% diversion for all water treated with desalination to account for the desalination waste stream.

Table 4.2-6
Old River Intake Monthly Average Diversions (TAF)

Month	Existing Conditions				Future Conditions		
	Base Case	Change from Base			Base Case	Change from Base	
		Alt. 1 & 2	Alt. 3	Alt. 4		Alt. 1, 2 & 3	Alt. 4
Oct	5.8	-4.3	-4.3	-1.4	6.4	-5.8	-2.1
Nov	5.5	-4.5	-4.5	-1.7	6.7	-5.9	-2.3
Dec	9.1	-6.2	-5.8	-1.5	11.4	-8.3	-0.7
Jan	7.4	-5.0	-5.0	-1.8	7.4	-5.3	-1.0
Feb	8.2	-4.1	-4.2	-0.6	10.6	-6.1	-0.6
Mar	8.9	-2.5	-2.0	-0.8	11.4	-3.8	-1.3
Apr	1.9	-1.0	-1.0	-0.5	2.3	-0.7	-0.5
May	10.9	-1.7	-1.6	-0.3	13.6	-1.7	-0.2
Jun	12.3	-1.7	-1.6	0.0	12.6	-1.4	-0.1
Jul	14.9	-5.8	-5.1	-0.7	16.8	-5.4	-0.4
Aug	12.8	-10.3	-9.2	-1.4	12.7	-7.6	-1.3
Sep	5.7	-5.3	-5.3	-1.6	4.5	-4.0	-1.7
Totals*	**103.4**	**-52.4**	**-49.6**	**-12.3***	**116.4**	**-56.0**	**-12.2***

Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail)
* Alternative 4 includes an additional 20% diversion for all water treated with desalination to account for the desalination waste stream.

Table 4.2-7 Victoria Canal Intake Monthly Average Diversions (TAF)							
	Existing Conditions				Future Conditions		
		Change from Base				Change from Base	
Month	Base Case	Alt. 1 & 2	Alt. 3	Alt. 4	Base Case	Alt. 1, 2, & 3	Alt. 4
Oct	0.0	6.3	6.3	0.0	0.0	8.8	0.0
Nov	0.0	6.1	6.1	0.0	0.0	6.8	0.0
Dec	0.0	6.8	6.9	0.0	0.0	8.5	0.0
Jan	0.0	3.9	3.9	0.0	0.0	5.7	0.0
Feb	0.0	2.4	2.6	0.0	0.0	3.2	0.0
Mar	0.0	0.7	0.7	0.0	0.0	1.1	0.0
Apr	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May	0.0	1.6	1.6	0.0	0.0	1.7	0.0
Jun	0.0	1.1	1.5	0.0	0.0	0.8	0.0
Jul	0.0	6.1	6.5	0.0	0.0	7.2	0.0
Aug	0.0	12.8	13.0	0.0	0.0	13.0	0.0
Sep	0.0	12.0	12.0	0.0	0.0	13.7	0.0
Totals	**0.0**	**59.8**	**61.1**	**0.0**	**0.0**	**70.5**	**0.0**
Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail)							

Table 4.2-8 Mallard Slough Intake Monthly Average Diversions (TAF)							
	Existing Conditions				Future Conditions		
		Change from Base				Change from Base	
Month	Base Case	Alt. 1 & 2	Alt. 3	Alt. 4	Base Case	Alt. 1, 2, & 3	Alt. 4
Oct	0.1	0.0	0.0	3.5	0.1	0.0	1.5
Nov	0.2	0.0	0.0	2.3	0.2	0.0	1.1
Dec	0.6	0.0	0.0	1.4	0.6	0.0	0.8
Jan	1.0	0.0	0.0	1.0	1.0	0.0	0.2
Feb	1.5	0.0	0.0	0.7	1.5	0.0	0.0
Mar	1.8	0.0	0.0	0.2	1.8	0.0	0.2
Apr	1.4	0.0	0.0	0.0	1.4	0.0	0.4
May	1.1	0.0	0.0	0.3	1.1	0.0	1.0
Jun	0.4	0.0	0.0	0.3	0.4	0.0	2.8
Jul	0.1	0.0	0.0	1.0	0.1	0.0	4.9
Aug	0.0	0.0	0.0	2.8	0.0	0.0	4.0
Sep	0.0	0.0	0.0	4.7	0.0	0.0	2.5
Totals	**8.2**	**0.0**	**0.0**	**18.2***	**8.2**	**0.0**	**19.4***
Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail) * Alternative 4 includes an additional 20% diversion for all water treated with desalination to account for the desalination waste stream.							

Shifts in Use of CVP Water

Because CCWD's Los Vaqueros Project water rights are restricted during certain periods each year, the shift in the timing of CCWD pumping also results in a slight change in the water right that CCWD diverts under. Exhibit 4.2-8 shows the breakdown of average annual CCWD diversions by three separate water rights (Reclamation-CCWD CVP contract, CCWD's Los Vaqueros Project water rights, or CCWD's Mallard Slough water rights) for the base case and each project alternative. Table 4.2-9 presents CCWD average annual water diversions by water rights for the entire 73-year simulation period under both existing and future conditions.

Table 4.2-9
CCWD Average Annual Water Diversions (TAF) by Water Rights Type

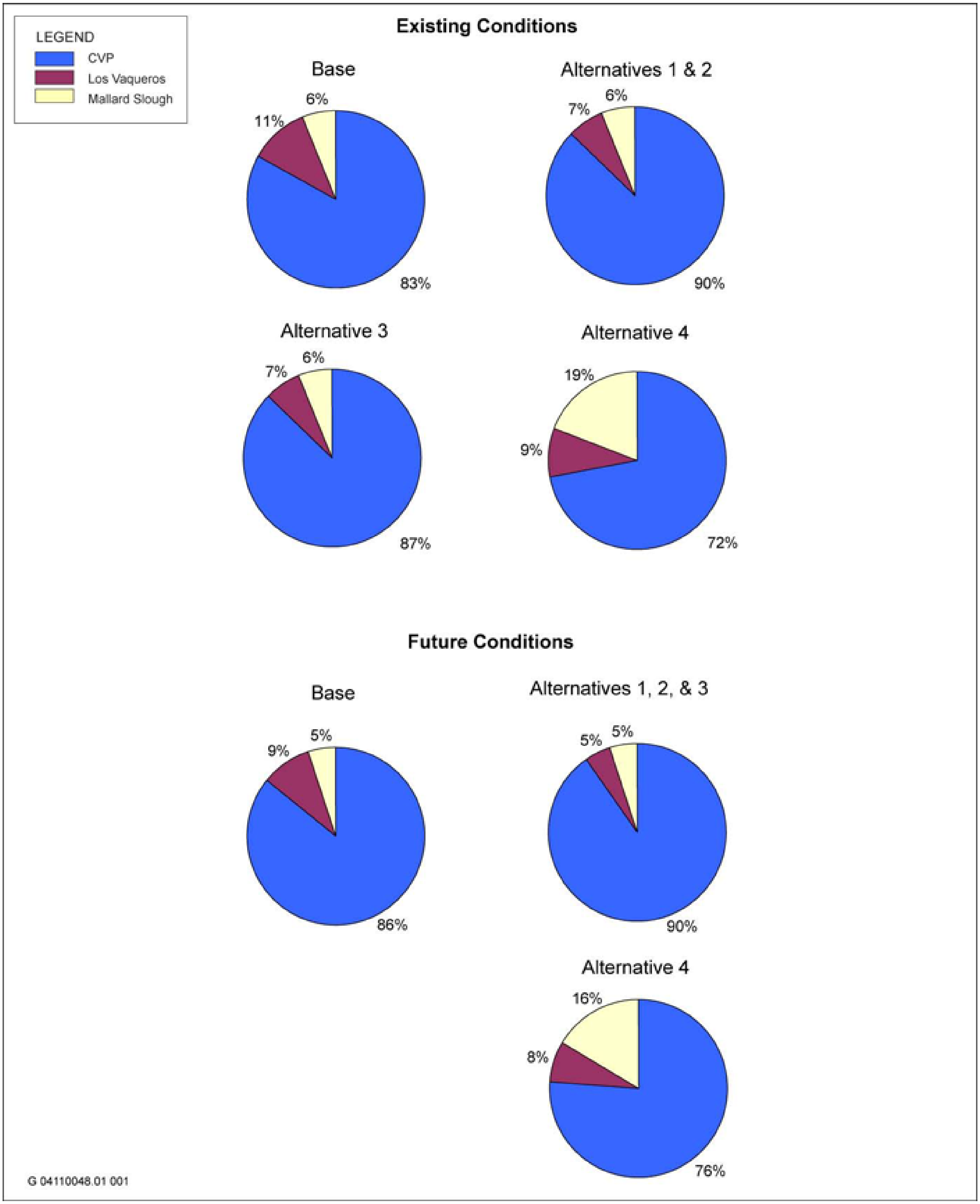
	CVP	Los Vaqueros	Mallard Slough	Total Diversions
Existing Base	112.2	14.5	8.4	135.1
Existing Alternative 1 & 2	118.4	8.8	8.4	135.6
Existing Alternative 3	118.2	9.0	8.4	135.6
Existing Alternative 4*	99.2	12.2	26.6	138.0
Future Base	142.4	15.0	8.4	165.8
Future Alternatives 1, 2, & 3	150.0	7.7	8.4	166.1
Future Alternative 4*	128.6	12.7	27.7	169.0

* Under Alternative 4, CCWD would shift about 10 TAF of diversions to the Mallard Slough intake to provide desalinated water to CCWD customers. This analysis assumes that all the additional water required at Mallard Slough would be diverted under existing or expanded CCWD Mallard Slough water rights. Another possibility is that CCWD and Reclamation would add Mallard Slough as a point of diversion under CCWD's CVP contract, and CCWD would divert CVP water in years when CCWD exhausts its existing Mallard Slough water rights. This assumption would slightly change the results shown above by about 5 TAF of CVP water/year on average but would still result in a net reduction in CVP water usage from the base case.
Source: CCWD Operational Modeling Data (see Appendix C-2)

Tables 4.2-10 and 4.2-11 present CCWD average annual water diversions by water rights during major dry periods within the 73-year simulation period under existing and future conditions, respectively. The changes in seasonal timing result in a minor increase in CCWD water use under, and well within, its CVP contract and water rights amounts, and does not result in any adverse effects on the CVP, as described in Section 4.2.2.5.

Shifts in CCWD Annual Diversions

The amount of water delivered to customers by CCWD under either existing or future conditions would remain unchanged compared to each of the project alternatives. Thus, the simulated average annual diversions by CCWD are essentially the same under each project alternative for existing and future conditions, except Alternative 4 because of losses in the desalination process, as discussed above (see Exhibit 4.2-4). However, the Proposed Action would result in some slight shifts in diversions from year to year, as illustrated in Table 4.2-12, caused by changes in the operation of Los Vaqueros Reservoir.



Source: CCWD Modeling Results

CCWD Simulated Diversions by Water Type (% of Total Diversions)

EXHIBIT 4.2-8

EDAW

Table 4.2-10
Simulated Changes in CCWD Diversions by Water Type[1] and Water Rights over Dry Periods (existing conditions)

Water Year Type[1]	Base Case (TAF)			Change from Base Case: Alternatives 1 & 2 (Change from Base Case in TAF)			Change from Base Case: Alternative 3 (Change from Base Case in TAF)			Change from Base Case: Alternative 4 (Change from Base Case in TAF)		
	CVP	LV	Mal	LV	CVP	Mal	LV	CVP	Mal	LV	CVP	Mal
1924 (C)	94	0	0	0	2	0	0	2	0	0	-44	46
1925 (D)	153	6	9.2	0	10	0	4	11	0	0	-13	17
1926 (D)	132	8	4.6	1	15	0	-6	17	0	0	-14	17
Cumulative	**379**	**14**	**13.8**	**1**	**27**	**0**	**-2**	**30**	**0**	**0**	**-71**	**80**
1929 (C)	113	0	0	7	3	0	7	2	0	0	-11	26
1930 (D)	121	8	2.3	0	9	0	2	7	0	0	-5	21
1931 (C)	129	0	0	0	-25	0	0	-24	0	0	-59	45
1932 (D)	166	0	2.3	0	17	0	0	22	0	0	-5	15
1933 (C)	106	14	0	-5	13	0	-3	9	0	2	-8	23
1934 (C)	132	11	0	-11	-13	0	-11	-13	0	0	-40	23
Cumulative	**767**	**33**	**4.6**	**-9**	**4**	**0**	**-5**	**3**	**0**	**2**	**-128**	**153**
1976 (C)	91	0	11.5	0	16	0	0	15	0	0	-16	33
1977 (C)	132	0	0	0	-18	0	0	-18	0	0	-47	46
Cumulative	**223**	**0**	**11.5**	**0**	**-2**	**0**	**0**	**-3**	**0**	**0**	**-63**	**79**
1987 (D)	98	8	9.2	-2	19	0	-2	19	0	0	-11	26
1988 (C)	135	0	2.3	8	-10	0	3	-6	0	0	-6	21
1989 (D)	113	8	0	0	15	0	2	16	0	0	-26	26
1990 (C)	142	0	4.6	0	-24	0	0	-29	0	0	-43	32
1991 (C)	145	0	0	0	-10	0	0	-6	0	0	-30	35
1992 (C)	145	0	4.6	0	1	0	0	0	0	0	-21	26
Cumulative	**778**	**16**	**20.7**	**6**	**-9**	**0**	**3**	**-6**	**0**	**0**	**-137**	**166**

[1] Water Type includes water diverted under CCWD's Los Vaqueros Project water right (LV), CVP contract water (CVP), and water diverted under CCWD's Mallard Slough water right (Mal).
Source: CCWD Operational Modeling

Table 4.2-11
Simulated Changes in CCWD Diversions by Water Type[1] and Water Rights over Dry Periods (future conditions)

Water Year Type[1]	Base Case (TAF)			Change from Base Case					
				Alternatives 1 & 2 (Change from Base Case in TAF)			Alternative 4 (Change from Base Case in TAF)		
	CVP	LV	Mal	LV	CVP	Mal	LV	CVP	Mal
1924 (C)	130	0	0	0	-3	0	0	-40	46
1925 (D)	189	10	9.2	-9	7	0	0	-14	20
1926 (D)	171	11	4.6	-1	-23	0	0	-11	17
Cumulative	**490**	**21**	**13.8**	**-10**	**-19**	**0**	**0**	**-65**	**83**
1929 (C)	137	0	0	8	0	0	0	-20	26
1930 (D)	149	10	2.3	0	-9	0	0	-18	23
1931 (C)	174	0	0	0	-8	0	0	-43	46
1932 (D)	200	0	2.3	0	13	0	0	-3	15
1933 (C)	128	21	0	-4	17	0	0	-10	23
1934 (C)	178	0	0	0	-26	0	0	-37	26
Cumulative	**966**	**31**	**4.6**	**4**	**-13**	**0**	**0**	**-131**	**159**
1976 (C)	119	0	11.5	0	13	0	0	-30	37
1977 (C)	177	0	0	0	-24	0	0	-41	46
Cumulative	**296**	**0**	**11.5**	**0**	**-11**	**0**	**0**	**-71**	**83**
1987 (D)	118	10	9.2	-3	20	0	0	-12	26
1988 (C)	158	0	2.3	0	-6	0	0	-4	21
1989 (D)	156	10	0	0	5	0	0	-42	26
1990 (C)	174	0	4.6	0	-13	0	0	-25	32
1991 (C)	180	0	0	0	1	0	0	-29	35
1992 (C)	179	0	4.6	0	-1	0	0	-21	26
Cumulative	**965**	**20**	**20.7**	**-3**	**6**	**0**	**0**	**-133**	**166**

[1] Water Type includes water diverted under CCWD's Los Vaqueros Project water rights (LV), CVP contract water (CVP), and water diverted under CCWD's Mallard Slough water rights (Mal).
Source: CCWD Operational Modeling

Table 4.2-12
Change in CCWD Average Total Diversions (TAF) by Water-Year Type

Existing Conditions				
Water Year Type*	Base Case	Change from Base		
		Alternatives 1 & 2	Alternative 3	Alternative 4
Wet	139.6	-6.3	-6.2	-0.6
Above Normal	144.6	-0.4	0.7	-0.2
Below Normal	139.1	-0.9	0.8	3.8
Dry	126.7	14.1	12.8	9.2
Critical	125.1	-2.4	-2.9	4.4

Future Conditions			
Water Year Type	Base Case	Change from Base	
		Alternatives 1, 2, & 3	Alternative 4
Wet	168.2	-3.3	0.5
Above Normal	177.2	-2.6	-1.9
Below Normal	168.0	-0.3	3.5
Dry	159.9	9.5	6.4
Critical	157.9	-2.0	5.9

Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail)
* Water (hydrologic) Year Type based on Sacramento Valley 40-30-30 Index.

Most notably, the Proposed Action would provide CCWD with better intake water quality in fall of most years, thus requiring less blending water to be released from Los Vaqueros Reservoir to meet the delivered water quality goal of 65 mg/L chloride. This would allow CCWD to enter critically dry periods with comparatively more storage in the Reservoir, which would eliminate or postpone the exhaustion of stored blending water supply during these periods. By extending blending capability at such times, CCWD would minimize diversions from the Delta in critically dry periods.

Reduction in Use of Rock Slough Intake

Changes in use of the Rock Slough intake are of interest from a fisheries perspective because the Rock Slough intake is currently unscreened. During public scoping, fisheries agencies requested that project alternatives include a plan that could reduce the need for pumping during critical fish periods at the unscreened Rock Slough intake. Alternatives 1, 2, and 3 would relocate a large portion of Rock Slough pumping to Old River or Victoria Canal. Part of the reason for this shift is that reducing the amount of diversions needed to fill Los Vaqueros Reservoir in some years frees up pumping capacity at the Old River intake for direct deliveries to the CCWD service area. Under existing conditions modeling, Alternatives 1 and 2 would result in approximately a 29% (7 TAF/year) reduction in base case Rock Slough pumping, corresponding to the diversions at Victoria Canal. Alternative 3, which would seek to immediately increase the permitted capacity of the Old River Intake and the alternative intake to a combined 320 cfs, while keeping CCWD's total permitted capacity from all intakes combined the same, would reduce Rock Slough pumping by about 45% (11 TAF/yr) from the base case under existing conditions. Similar levels of reduced Rock Slough usage would be observed for these alternatives under future conditions. Table 4.2-13 shows the simulated average annual diversions from Rock Slough and its percentage of total CCWD diversions.

Table 4.2-13
Average Rock Slough Diversions and Changes in Diversions

	Average Rock Slough Diversion (TAF/year)	Rock Slough Usage (percent of total CCWD diversion)	Change in Rock Slough Usage (Compared with Base)
Existing			
Base Case	23.3	17%	-
Alternatives 1 & 2	16.5	12%	-29%
Alternative 3	12.5	9%	-46%
Alternative 4	20.3	15%	-13%
Future			
Base Case	37.7	23%	-
Alternatives 1, 2, & 3	23.8	14%	-37%
Alternative 4	33.8	20%	-10%
Source: CCWD (see Appendix C-5, "CCWD Operations Modeling," for additional detail)			

4.2.2.4 No-Action Alternative

Under the No-Action Alternative, no new facilities would be constructed, and CCWD would continue operating its existing facilities to deliver the highest quality water available subject to regulatory and physical constraints at its existing three intakes. The No-Action Alternative would not change CCWD operations in a way that would have a direct or indirect effect on water supply, water quality, or water levels for other Delta water users and would not considerably contribute to any adverse cumulative water resource effects. Operational modeling results indicate that under the No-Action Alternative, CCWD's ability to meet its delivered chloride objective under future conditions would decrease in comparison with existing conditions (see Table 4.2-2). Average delivered salinity would increase, and the periods during which CCWD cannot meet its Board-adopted delivery goals would be more frequent and of longer duration.

4.2.2.5 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

IMPACT 4.2-a (Alternative 1)	***Long-term Changes in Delta Water Supplies.*** *The Proposed Action would rely on CCWD's existing CVP and Los Vaqueros Project water supply, but would shift the timing of some CCWD diversions year to year. Analysis shows that the effects of the Proposed Action on SWP and CVP water supplies would be negligible and undetectable in real project operations, and would not affect the water supplies of the CVP, SWP, or other Delta users. This direct impact would be* ***less than significant.***

The Proposed Action would use CCWD's existing water supplies and would not substantially change CCWD's average annual Delta diversions. The Proposed Action would shift the timing of some CCWD diversions year to year because of differences in Los Vaqueros Reservoir operations. Under the Proposed Action, CCWD would divert water within the terms of its existing CVP contract, Los Vaqueros Project water rights, and Mallard Slough water rights. As described previously in Section 4.2.1.1, "Regulatory

Setting," CCWD's rights to divert water from the Delta are limited in a way that integrates CCWD's operations with the coordinated operation of the CVP and SWP and protects other water supply interests from potential adverse impacts. Therefore, by operating within the terms of its CVP contract and water rights permits, CCWD cannot have a water supply impact on any party other than the CVP and SWP contractors. The Proposed Action would affect CCWD's diversions of CVP water and Los Vaqueros Project water rights water; it would not change CCWD's diversions at Mallard Slough.

Potential water supply impacts of the Proposed Action were examined separately for the two basic outflow conditions of the Sacramento-San Joaquin Delta: excess and balanced.

Water Supply Impacts during Excess Conditions in the Delta

Under excess conditions in the Delta, surplus water is available to CCWD after all environmental protection and water quality regulations have been met. During excess conditions, changes in Delta outflow resulting from CCWD pumping changes do not result in an adverse impact to the water supply of any legal water user in California because outflow needs for water quality and environmental regulations have been met, and excess water is available for CCWD and other Delta users. Furthermore, The Proposed Action would generally result in a slight reduction in CCWD diversions during excess conditions and a slight increase in CCWD CVP diversions during balanced conditions. The Proposed Action would not affect the water supply of any other Delta user as a result of changes in diversions under excess conditions in the Delta.

Water Supply Impacts during Balanced Conditions in the Delta

CCWD is able to divert CVP water under both balanced and excess conditions. Balanced conditions in the Delta can occur at any time of the year, but generally occur during late spring, summer, and fall. Delta balanced conditions can exist in winter during very dry years. During balanced conditions, Delta inflow and exports are controlled to meet the SWRCB water quality protection requirements, the needs of in-Delta diverters, and CVP/SWP exports from the Delta. Therefore, changes in timing of CCWD pumping that increase pumping during balanced conditions must be offset by increased inflow or reduced exports. Because CCWD diverts water under its CVP contract during balanced conditions, increased inflow could be provided through CVP upstream storage facilities, such as Shasta and Folsom Reservoirs, or decreased exports could occur at CVP pumping facilities in the south Delta. Such decisions are made by CVP operators and are generally made to optimize CVP overall operations.

The potential impacts on CVP or SWP water supply due to changes in CCWD operations were evaluated using CALSIM II and CCWD operational modeling, as described in Appendix C-2, "Water Resources Modeling Methodology Report." The analysis shows that even under conservative storage operations assumptions, changes caused by CCWD operations under the Proposed Action would be very small and would not affect CVP/SWP operations or deliveries. Additional detail on the analysis and results is provided below.

The analysis assumes that any changes in storage resulting from changes in CCWD diversion patterns under balanced conditions would affect upstream storage at CVP's

Shasta Reservoir. Any change (reduction or increase) in CCWD diversions from the base case that occurs during balanced conditions was assumed to result in an equal and opposite change (increase or reduction) in Shasta Reservoir storage. This is both a reasonable operational scenario and a conservative approach given the storage and temperature requirements for Shasta Reservoir. The approach is conservative because it assigns the entire change in storage to Shasta Reservoir whereas the change in storage would likely be spread to multiple CVP and SWP storage reservoirs depending on operator decisions, and, therefore, the change for each reservoir would be smaller than the total used in this analysis.

Annual changes in Shasta Reservoir storage were summed cumulatively for each year during periods when Shasta Reservoir was below the flood control release level, based on the assumption that small changes in storage could accumulate and carry over from year to year until the reservoir is spilled for flood control. The cumulative changes were then examined in the years when Shasta Reservoir storage was at or below 1.9 MAF at the end of September in the base case. The 1.9-MAF storage level at the end of September is an important indicator level for reservoir storage related to the CVP's ability to maintain river water temperature for winter-run Chinook salmon (an ESA-listed species) the following year, especially if the following year is dry. CVP operations at Shasta Reservoir are subject to a winter-run Chinook salmon biological opinion with requirements to maintain downstream Sacramento River water temperatures. Results were also examined using a 1-MAF criterion for evaluation and are presented in Appendix C-3, "CALSIM II Modeling." Storage at or below 1 MAF at the end of September represents a critical level for the CVP, at which significant changes in storage could adversely affect project operations in the following year and future years.

Evaluating the results using the 1-MAF criterion yielded the same basic results and conclusions as the 1.9-MAF criterion. Evaluating the changes in CVP storage at these storage levels assesses how project alternatives could affect water supply during periods when Shasta Reservoir and CVP and SWP supplies are most vulnerable to changes in the system. Tables 4.2-14 and 4.2-15 summarize estimated changes in Shasta Reservoir storage in years in which total base-case storage is at or below 1.9 MAF at the end of September under existing conditions and future conditions, respectively. Results for the entire 73-year simulation period are presented in Appendix C-3, "CALSIM II Modeling."

Out of the 73-year model simulation period[6], Shasta Reservoir storage was at or below 1.9 MAF at the end of September during the base case for 13 years under existing conditions and for 13 years under future conditions. Under existing conditions, the Proposed Action increased storage slightly in 6 years and decreased storage slightly in 7 years. Under future conditions, the Proposed Action increased storage slightly in 8 of these years and decreased storage slightly in 5 of these years. In addition to considering individual years, accumulated storage through dry periods can be examined. There are four distinct dry periods in the 73-year model simulation period. Of the four periods

[6] Delta operational modeling uses precipitation and inflows from a 73-year (1922-1993) hydrologic period to simulate a range of hydrologic conditions (see Appendix C-2, "Water Resources Modeling Methodology Report."

under existing conditions, simulation results for the Proposed Action show a decrease in accumulated Shasta Reservoir storage at the end of one of the periods (1924–1926), an increase in the accumulated storage at the end of one of the periods (1987–1992), and two dry periods where the accumulated end-of-year storage was essentially unchanged from the base case (1929–1934 and 1976–1977). Under future conditions, simulation results for the Proposed Action show an increase in accumulated storage at the end of each of the dry periods.

Table 4.2-14
Simulated Accumulated Changes in Shasta Reservoir Storage over Dry Periods under Existing Conditions with the Proposed Action[1]

Year (Water Year Type[2])	Base End-of-September Shasta Reservoir Storage (TAF)	Accumulated Change in Shasta Reservoir Storage, 1.9-MAF Criterion[3] (TAF)
1924 (C)	592	-10.8
1925 (D)	1,924	-19.9
1926 (D)	1,754	-39.0
Cumulative		**-39.0**
1929 (C)	1,905	-3.5
1930 (D)	2,116	- - -
1931 (C)	643	14.7
1932 (D)	1,045	-3.1
1933 (C)	812	-12.5
1934 (C)	603	0.2
Cumulative		**+ 0.2**
1976 (C)	2,829	- - -
1977 (C)	674	-0.2
Cumulative		**-0.2**
1987 (D)	2,153	- - -
1988 (C)	1,589	16.4
1989 (D)	2,463	- - -
1990 (C)	1,903	17.2
1991 (C)	1,341	26.6
1992 (C)	841	26.3
Cumulative		**+ 26.3**

Notes:
[1] Alternative 2 (Indirect Route) has the same operations and results as the Proposed Action
[2] Water (hydrologic) Year Type based on Sacramento Valley 40-30-30 Index
D – Dry
C – Critical
[3] The 1.9-MAF storage level at the end of September is an important indicator level for reservoir storage related to the CVP's ability to maintain river water temperature for winter-run Chinook salmon (an ESA-listed species) the following year, especially if the following year is dry.
[4] "- - -" indicates that storage in Shasta Reservoir is greater than 1.9 MAF at the end of the water year. Because changes in storage above this criterion are not anticipated to affect CVP operations, they are not included in the accumulated changes.

Table 4.2-15
Simulated Accumulated Changes in Shasta Reservoir Storage over Dry Periods under Future Conditions with the Proposed Action[1]

Year (Water Year Type[2])	Base End-of-September Shasta Reservoir Storage (TAF)	Accumulated Change in Shasta Reservoir Storage, 1.9-MAF Criterion[3] (TAF)
1924 (C)	599	-13.7
1925 (D)	1,924	-12.7
1926 (D)	1,764	12.9
Cumulative		**+ 12.9**
1929 (C)	1,823	-5.3
1930 (D)	2,054	- - -
1931 (C)	612	12.9
1932 (D)	927	-0.7
1933 (C)	681	-12.4
1934 (C)	561	13.2
Cumulative		**+ 13.2**
1976 (C)	2,732	- - -
1977 (C)	584	14.8
Cumulative		**+ 14.8**
1987 (D)	2,122	- - -
1988 (C)	1,587	10.7
1989 (D)	2,341	- - -
1990 (C)	1,744	16.3
1991 (C)	1,179	14.9
1992 (C)	865	16.5
Cumulative		**+ 16.5**

Notes:
1 Alternative 2 (Indirect Pipeline Alternative) and Alternative 3 (Modified Operations Alternative) have the same future case operations and results as the Proposed Action.
2, 3 See Notes for Table 4.2-11.

The modeling results suggest that the Proposed Action could result in both decreases and increases in Shasta Reservoir storage; however, these changes are very small relative to the total size of the reservoir (10–40 TAF compared to 4,552 TAF). Most of the changes are less than 1% of the total reservoir storage. Consider that the evaporative losses from Shasta Reservoir in calendar year 2004 were about 94 TAF, and evaporative losses in summer can exceed 15 TAF (Bureau of Reclamation 2006). The changes caused by the Proposed Action would not be large enough to change CVP or SWP operations or deliveries. This is especially true given the fact that, as described earlier, these very minor changes in storage would likely be spread to multiple CVP and SWP storage reservoirs and would be undetectable. Delta operations are not exact. Delta outflow, for example, is difficult to measure and can have a margin of error on the order of several thousand cfs. Changes in storage that would be caused by the Proposed Action would be well within the operational buffer of flows and storage in which the Delta is operated. Given the modeling results and these considerations, the impacts of the Proposed Action on CVP and SWP operations and deliveries would be less than significant.

IMPACT 4.2-b (Alternative 1)	***Long-term Changes in Delta Water Quality that Cause Violations of Delta Water Quality Standards.*** *The modeling analysis shows that there would be no significant changes in water quality at Jersey Point, Rock Slough, and other key Delta stations that would result in the violation of water quality standards or require significant changes to CVP/SWP operations to avoid water quality violations at those stations. Therefore, this direct impact would be* ***less than significant.***

While CCWD would not, on average, divert additional water from the Delta under the Proposed Action, changes in the timing and location of CCWD's Delta diversions would occur with project implementation and were analyzed to determine whether they could affect water quality conditions in the Delta. To assess potential effects on Delta water quality, results of CCWD operations modeling were input into the DSM2 water quality model, and estimated salinity concentrations were compared at key Delta locations under each alternative.

The shifts in location and timing of CCWD diversions in the central Delta would be very small relative to total and net Delta outflow. Table 4.2-16 summarizes the percentage changes in EC at Collinsville, Chipps Island, Emmaton, Jersey Point, and Rock Slough. Collinsville and Chipps Island are important Delta salinity locations because D-1641 specifies that, from February through June, X2 must be west of Collinsville and must additionally be west of Chipps Island or Port Chicago for a certain number of days each month, depending on the previous month's Eight River Index[7]. D-1641 specifies that there are three ways to comply with the X2 standard: (1) the daily average EC at the compliance point is less than or equal to 2.64 microsiemens per centimeter (µS/cm), (2) the 14-day average EC is less than or equal to 2.64 µS/cm, or (3) the 3-day average Delta outflow is greater than or equal to the corresponding minimum outflow. The simulations show that the Proposed Action would not result in any changes in salinity or Delta outflow that would affect compliance with the X2 standard.

D-1641 also sets agricultural water quality standards to be met between April and August for Jersey Point and Emmaton. The minor changes in salinity caused by the Proposed Action would not affect compliance with water quality objectives at these Delta locations. D-1641 also specifies M&I water quality objectives to be met at the Contra Costa Canal at Pumping Plant No. 1. The simulations show that the Proposed Action would not alter the salinity of the water entering Rock Slough enough to influence compliance with water quality objectives (see Table 4.2-16 and Appendix C-4, "DSM2

[7] The Eight River Index is defined in D-1641 as the sum of the unimpaired runoff as published in DWR Bulletin 120 for the following locations: Sacramento River at Bend Bridge near Red Bluff, Feather River (total inflow to Oroville Reservoir), Yuba River 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).

Delta Modeling"). None of the average salinity increases in the modeling exceed 6.5 µS/cm EC or 1% during the required compliance periods.

Table 4.2-16
Simulated Percent Changes in Average Monthly Electrical Conductivity under the Proposed Action

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Existing Conditions												
Chipps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Collinsville	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.3
Jersey Point	0.2	-0.2	-0.1	-0.1	0.0	-0.1	-0.2	0.3	0.6	0.4	0.3	0.8
Emmaton	0.0	0.0	0.2	0.2	0.0	0.1	0.1	-0.3	-0.4	-0.2	-0.1	0.4
Rock Slough	0.7	0.3	0.5	0.3	0.1	0.1	0.1	0.3	0.6	0.5	0.3	0.7
Future Conditions												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Chipps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Collinsville	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.2
Jersey Point	0.2	-0.4	-0.4	0.0	0.0	0.0	-0.1	0.3	0.4	0.5	0.4	0.6
Emmaton	0.0	-0.1	0.2	0.0	0.0	0.1	0.0	-0.3	-0.3	-0.1	0.0	0.1
Rock Slough	0.5	0.1	0.4	0.3	0.0	0.2	0.2	0.3	0.6	0.8	0.6	0.5

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)

The modeling analysis indicates that there would be no changes in X2 or in the salinity at Delta water quality compliance locations that would result in either violations of water quality standards at those locations or substantial changes to project operations to avoid water quality violations at those locations. Therefore, this direct impact would be less than significant.

IMPACT 4.2-c (Alternative 1)

Long-term Changes that Result in Substantial Water Quality Degradation that Would Adversely Affect Beneficial Uses or Substantially Change Delta Users' Operations. *Modeling results show that water quality changes caused by the Proposed Action would be too small to adversely affect Delta diversions or other beneficial uses. Therefore, this indirect impact would be* ***less than significant.***

Water quality standards, by themselves (as evaluated above in Impact 4.2-b [Alternative 1]), are not a sufficient means of determining whether a significant effect would occur. Significance also depends on whether the Proposed Action would otherwise substantially degrade water quality, adversely affecting beneficial uses or the operations of other Delta users. In order to evaluate this potential impact, salinity changes at the location of Delta diversions in the south and central Delta caused by the Proposed Action were simulated and analyzed.

4.2 Delta Water Resources

Delta exports and diversions that could potentially be affected by changes in water quality resulting from implementation of the Proposed Action include CVP exports at the Tracy Pumping Plant, SWP exports at the Banks Pumping Plant, the City of Stockton diversions at Empire Tract under the proposed Delta Water Supply Project, and agricultural diversions such as those by members of the South Delta Water Agency or Central Delta Water Agency. As described above, the 16-year DSM2 modeling shows that salinity changes (positive and negative) in the south and central Delta caused by the Proposed Action, as measured by EC at key locations, would be very small and likely undetectable in the field. The small magnitude of the changes in Delta water quality associated with the Proposed Action is not surprising because changes in CCWD pumping under the Proposed Action would be very small. The Proposed Action would relocate up to 250 cfs of diversions during portions of the year. Combined CVP and SWP exports, by comparison, can exceed 10,000 cfs while Delta outflow ranges from 3,000 cfs to over 100,000 cfs. The results are summarized in Table 4.2-17. Sites evaluated included:

- Tracy Pumping Plant – CVP diversions;
- Clifton Court Forebay – SWP diversions;
- Empire Tract – proposed City of Stockton intake location;
- Middle River at Victoria Canal – an indicator of central Delta water quality and the water quality reaching Victoria Island agricultural siphons; and
- San Joaquin River at Brandt Bridge, Old River near Tracy Road Bridge, and Old River – compliance locations for D-1641 agricultural water quality standards.

The long-term average of the daily average increases in salinity over the 16-year simulation period was less than 4 μS/cm EC and 1% at all locations in all cases. The largest monthly average salinity increases caused by the Proposed Action at these locations never exceeded 5% of the total salinity under existing or future conditions, and only rarely exceeded 3%. (The value of 3% is not in itself significant; it is used here merely because it is an approximation of the magnitude of the monthly maximum increases.) These changes, which are all less than 9 μS/cm EC over a long-term monthly average (see Table 4.2-17 and Appendix C-4, "DSM2 Delta Modeling"), are too small to affect operations from a water quality perspective, would be undetectable in the field, and would be imperceptible to Delta users. Note that these changes are based on monthly operations modeling; actual operations are adjusted on a daily basis.

Table 4.2-18 shows simulated detailed monthly percentage changes in water quality at Clifton Court Forebay. Table values represent the magnitude of changes in the central and south Delta.

Table 4.2-17 Simulated Salinity Changes at Specific Delta Diversion Locations under the Proposed Action (existing conditions)			
Delta Diversion	**Long-term (16 yr) Daily Average Change in Salinity (and Percent Change)**	**Maximum Monthly Average Change in Salinity (and Percent Change)**	**Number of Months (out of 192) in which the Monthly Average Increase Exceeded 3%**
Tracy Pumping Plant	2.5 µS/cm EC (0.4%)	16 µS/cm EC (2.7%)	1
Clifton Court Forebay	2.7 µS/cm EC (0.5%)	22 µS/cm EC (4.1%)	1
Proposed Stockton Intake Location	0.6 µS/cm EC (0.1%)	13 µS/cm EC (3.3%)	1
Middle River at Victoria Canal	0.7 µS/cm EC (0.1%)	16 µS/cm EC (3.4%)	1
Old River near Tracy Road Bridge	0.5 µS/cm EC (0.1%)	7 µS/cm EC (0.7%)	0
Old River at Middle River	0.2 µS/cm EC (0.0%)	5 µS/cm EC (0.7%)	0
San Joaquin River at Brandt Bridge	0.0 µS/cm EC (0.0%)	1 µS/cm EC (0.1%)	0
Future Conditions			
Delta Diversion	**Long-term (16 yr) Daily Average Change in Salinity (and Percent Change)**	**Maximum Monthly Average Change in Salinity (and Percent Change)**	**Number of Months (out of 192) in which the Monthly Average Increase Exceeded 3%**
Tracy Pumping Plant	2.7 µS/cm EC (0.4%)	25 µS/cm EC (3.4%)	1
Clifton Court Forebay	3.5 µS/cm EC (0.6%)	26 µS/cm EC (3.3%)	3
Proposed Stockton Intake Location	0.6 µS/cm EC (0.1%)	9 µS/cm EC (2.2%)	0
Middle River at Victoria Canal	0.8 µS/cm EC (0.1%)	8 µS/cm EC (1.7%)	0
Old River near Tracy Road Bridge	2.9 µS/cm EC (0.4%)	25 µS/cm EC (3.1%)	1
Old River at Middle River	1.1 µS/cm EC (0.2%)	16 µS/cm EC (3.1%)	1
San Joaquin River at Brandt Bridge	-0.1 µS/cm EC (0.0%)	0 µS/cm EC (0.0%)	0
Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)			

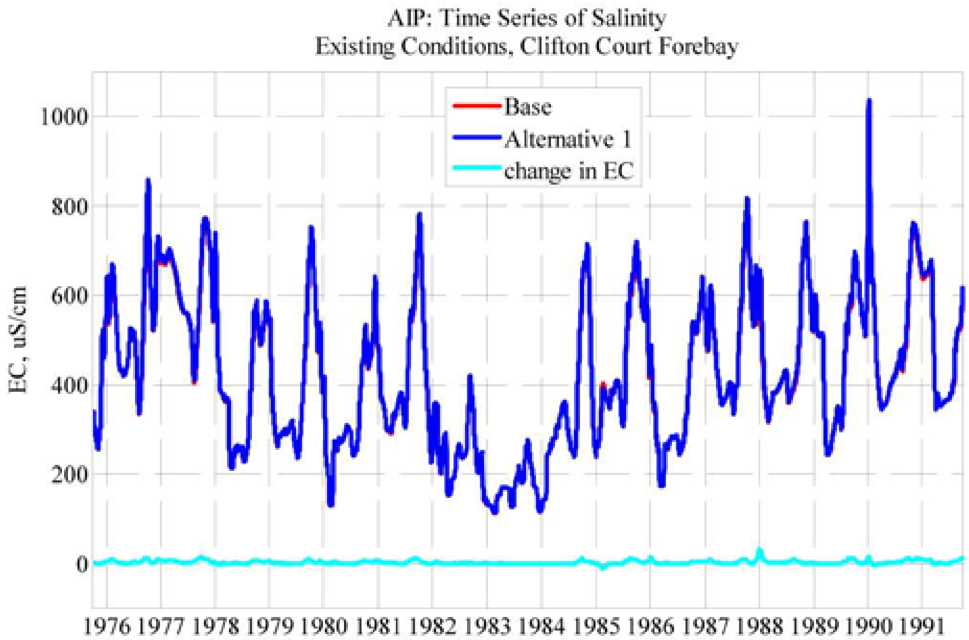
Exhibit 4.2-9 provides a time series of EC values over the 16-year simulation period for existing and future conditions. Appendix C-4, "DSM2 Delta Modeling," provides similar tables for existing and future conditions for each of the intake locations listed above.

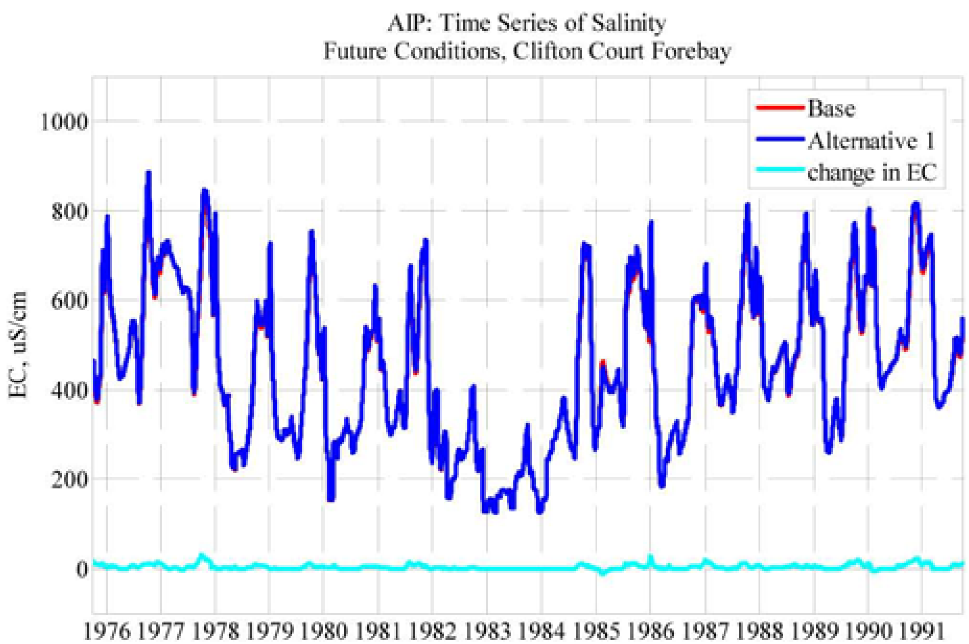
The simulations indicate that there would be no changes in water quality at the Tracy, Banks, or Stockton intake locations or in the south or central Delta that would be substantial or even detectable, would adversely affect any beneficial uses of the water, or would be likely to result in operational changes at Delta intakes. For these reasons, this impact would be less than significant.

Table 4.2-18
Percent Differences in Monthly Average EC Values for Clifton Court Forebay
([Proposed Action – Existing Base]/Existing Base)

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1976	0.3	-0.1	0.3	0.9	1.4	0.8	0.2	0.1	0.3	0.8	0.7	1.6
1977	0.9	0.4	1.2	1.0	0.8	0.9	0.9	0.5	0.1	0.4	1.1	2.1
1978	1.6	1.2	0.5	0.1	0.0	0.1	0.0	0.5	0.1	0.0	0.4	1.1
1979	1.2	0.8	0.6	0.7	0.3	0.2	0.2	0.0	0.0	-0.2	0.5	1.3
1980	0.7	0.4	1.0	0.3	0.1	1.4	0.3	-0.1	0.0	0.0	0.3	0.9
1981	1.0	0.7	0.9	1.2	0.5	0.3	0.2	0.1	0.0	0.8	1.4	1.5
1982	0.7	0.2	0.0	0.6	0.8	0.2	0.0	0.0	0.1	0.3	0.3	0.4
1983	-0.1	0.0	0.6	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3
1985	1.0	0.6	0.3	-0.4	-2.3	-1.1	-0.2	0.0	0.0	0.8	1.4	1.5
1986	0.8	0.4	1.2	2.1	0.1	-0.1	0.4	0.2	0.0	-0.1	-0.4	0.1
1987	0.7	0.7	0.7	0.9	1.2	0.5	0.2	0.1	0.0	0.2	0.7	1.4
1988	0.7	0.1	2.2	4.1*	1.4	0.7	0.5	0.3	0.3	1.1	2.0	1.3
1989	0.2	0.0	0.1	0.0	-0.1	0.0	0.0	0.1	0.0	0.6	1.6	1.9
1990	0.8	0.1	0.7	0.7	-0.6	-0.4	0.0	0.2	0.2	0.8	0.9	1.9
1991	1.1	1.3	1.5	1.2	1.2	0.2	0.1	0.2	0.1	0.7	1.1	1.7
Average	0.7	0.4	0.7	0.8	0.3	0.2	0.2	0.1	0.1	0.4	0.8	1.3
W	0.4	0.1	0.5	0.7	0.2	0.0	0.1	0.1	0.0	0.1	0.0	0.5
AN	1.2	0.8	0.7	0.2	0.1	0.7	0.2	0.2	0.0	0.0	0.3	1.0
BN	1.2	0.8	0.6	0.7	0.3	0.2	0.2	0.0	0.0	-0.2	0.5	1.3
D	0.7	0.5	0.5	0.4	-0.2	-0.1	0.1	0.0	0.0	0.6	1.3	1.6
C	0.8	0.4	1.2	1.6	0.8	0.4	0.4	0.2	0.2	0.8	1.2	1.7

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling")
Notes:
W = wet; D = dry
AN = above normal; C = critical
BN = below normal
Positive values represent a salinity increase from base case; negative values represent a salinity decrease from base case.
* January 1988 increase in salinity is caused by an operational change under the Proposed Action that is probably unrealistic and an artifact of monthly operational decisions being analyzed using a daily time-step model.





Note: AIP=Alternative Intake Project

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Source: CCWD DSM2 Delta Modeling Data (see Appendix C-4)

Time Series of Salinity – Clifton Court Forebay (Existing and Future Conditions)

EXHIBIT 4.2-9

IMPACT 4.2-d (Alternative 1)	***Long-term Changes in Delta Water Levels.*** *Modeling analysis shows that water-level effects would be too small to adversely affect any beneficial uses or reduce water elevations in the south and central Delta to a level that would not support existing or planned and approved land uses. Therefore, this impact would be* ***less than significant.***

South Delta Water Agency farmers have a major interest in maintaining south Delta water levels so that their siphons (and, in some cases, pumps), installed at fixed elevations in the southern Delta, can continue to make local diversions for agricultural irrigation. For the purposes of this analysis, a significant water level impact is defined as a reduction in surface water elevations in the Delta to a level that would not support existing land uses or planned land uses for which permits have been granted.

To evaluate water level effects, modeling results were examined for sites in the vicinity of the proposed alternative intake and at the four monitoring locations identified in the CVP/SWP Joint Point of Diversions Water Level Response Plan. The 16-year DSM2 hydrodynamic modeling results indicate that the effects of the Proposed Action on water level would be very small (virtually imperceptible) at these south Delta locations. Table 4.2-19 (and Appendix C-4, "DSM2 Delta Modeling") summarizes the changes in water level at lower-low tide. South Delta agricultural irrigation users are primarily concerned with the water level at low-low tide because that is the minimum water surface elevation they experience.

Table 4.2-19
Simulated Water Level Changes in the South and Central Delta under the Proposed Action

Location	Long-term Average Change in Water Level*	Maximum 15-min Change in Water Level at Low-Low Tide
Middle River at Howard Road Bridge		
Existing	0.00 feet	-0.02 foot
Future	0.00 feet	-0.01 foot
Old River at Tracy Road Bridge		
Existing	0.00 feet	-0.02 foot
Future	0.00 feet	-0.02 foot
Doughty Cut		
Existing	0.00 feet	-0.02 foot
Future	0.00 feet	-0.02 foot

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling")
*15-min timestep data averaged over 16-year simulation period.

The modeling shows that at lower-low tide, the maximum decrease in stage caused by the Proposed Action would never exceed 0.02 foot. Changes in water level would often be zero and would sometimes be positive (i.e., water surface elevation is shown to increase as a result of changes in the timing of CCWD diversions). The average long-term change in water level is zero. These small changes would not affect the ability of agricultural diverters in the south and central Delta to divert water. They would also not affect the ability of Reclamation and DWR to comply with the Joint Point of Diversion Water Level Response Plan.

The largest reduction in water surface level caused by the Proposed Action would occur at CCWD's proposed point of diversion in Victoria Canal. The modeling shows that the maximum 15-minute change in water level at low-low tide would be 0.03 foot (0.36 inch) (see Table 4.2-20, below, and Appendix C-4, "DSM2 Delta Modeling,"). The long-term average change in water level in Victoria Canal would be zero.

Table 4.2-20
Simulated Water Level Changes in Victoria Canal under the Proposed Action

Location	Long-term Average Change in Water Level*	Maximum 15-min Change in Water Level at Low-Low Tide
Proposed Intake Location		
Existing	0.00 feet	-0.02 foot
Future	0.00 feet	-0.03 foot
West end of Victoria Canal		
Existing	0.00 feet	-0.02 foot
Future	0.00 feet	-0.02 foot
East end of Victoria Canal		
Existing	0.00 feet	-0.02 foot
Future	0.00 feet	-0.02 foot

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling")
*15-minute timestep data averaged over 16-year simulation period.

The simulations show that water level changes in Victoria Canal and at key central and south Delta locations caused by the Proposed Action would be virtually imperceptible and immeasurable (less than 0.5 inch). A change in water surface elevation of this magnitude would not affect the ability of local water users to divert water for their beneficial uses. Therefore, this impact would be less than significant.

Cumulative Impacts

To evaluate cumulative impacts on water resources, reasonably foreseeable projects with defined operations have been incorporated into this analysis to the extent possible. By combining CCWD's operations modeling and analysis with larger system-wide models (e.g., CALSIM II), future cumulative conditions with and without the Proposed Action have been estimated, quantified, and evaluated.

For the purposes of this analysis, a cumulative impact is defined as a substantial contribution to a significant adverse cumulative effect on Delta water resources (water supply, water quality, and/or water level).

Water Supply

There are several reasonably foreseeable projects that would contribute to a cumulative increase in the water supply demands on the Delta, including the South Delta Improvements Program (SDIP) (Stage 2 includes increasing Banks Pumping Plant capacity to 8,500 cfs), the Freeport Regional Water Project, and the Stockton Delta Water Supply Project. The Proposed Action is a water quality project and not a water supply project, unlike the projects listed above. The Proposed Action would not change CCWD's demands or the average annual amount of water that CCWD diverts from the Delta (see Table 4.2-6). It would increase CCWD's operational flexibility and shift the timing of diversions in ways that could be beneficial for Delta water supplies. For example, under the Proposed Action, CCWD's Delta diversions would be slightly less in critical water years, which are the most important water years to maintain or increase Delta water supply (see Table 4.2-7). Consequently, the Proposed Action would not considerably contribute to a cumulative adverse impact on available Delta water supplies, or the amount of that supply that Delta water users can divert and put to beneficial use. Rather, the Proposed Action would improve CCWD's operational flexibility and ability to respond to changing Delta water quality conditions by providing an additional Delta location from which CCWD can divert water. By improving CCWD's access to Delta water of better quality, the Proposed Action would enable CCWD to more consistently maintain adequate emergency supplies in Los Vaqueros Reservoir. For these reasons, the Proposed Action would provide slight benefits to other Delta water users, especially during drought periods (see Table 4.2-12). This would be true under both existing and future conditions.

Water Quality

Current and probable future projects such as the Freeport Regional Water Project, the SDIP, and the Sacramento Regional Wastewater Treatment Plant 2020 Master Plan, which would increase wastewater discharges to the Sacramento River, could contribute to cumulative effects on water quality at CCWD intakes. These projects could adversely affect CCWD's water quality-based operations. The Proposed Action would improve the quality of water delivered to CCWD customers (see Table 4.2-2 for summary of water quality benefits provided by the Proposed Action), especially when considered together with the Contra Costa Canal Encasement Project, the CCWD-EBMUD Freeport Intertie, and the Old River and Rock Slough Water Quality Improvement Projects. These projects have all been incorporated into the quantitative modeling for the Alternative Intake Project analysis, with the exception of the proposed Contra Costa Canal Encasement Project, which is still in the planning phase and is not readily incorporated into quantitative modeling[8].

Modeling results were used to evaluate the potential cumulative changes in Delta water quality in the future with and without the Proposed Action. Table 4.2-21, below, shows the cumulative change in average Delta salinity at key locations caused by the reasonable foreseeable projects; and changes in Delta demands and operations without the Proposed Action; and the modeled cumulative change in water quality with the Proposed Action under future conditions. These results are based on conservative modeling assumptions to disclose the greatest potential effects of the Proposed Action.

[8] The proposed Contra Costa Canal Encasement Project would replace a portion of the earth-lined Contra Costa Canal with a pipeline. This would improve water quality at CCWD's Rock Slough intake by reducing the seepage of high-salinity groundwater and other contaminants into the Contra Costa Canal. This seepage effect is not represented in Delta water quality models because it occurs within Reclamation facilities, so the project would help make actual conditions at Rock Slough intake more consistent with what is modeled. The effect of the seepage is generally noticeable only when Rock Slough pumping is very low or zero.

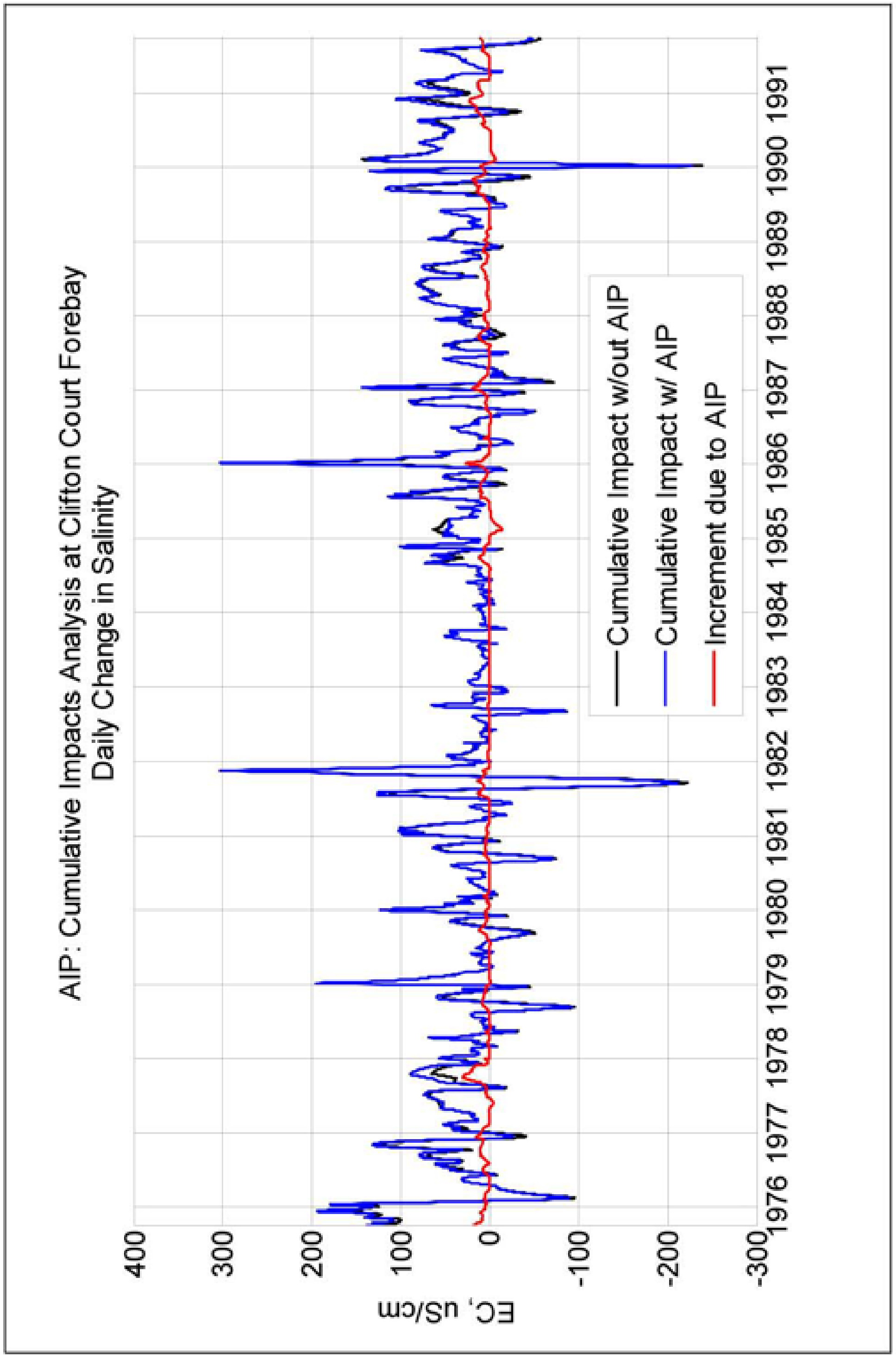
Table 4.2-21 Long-Term (16-year) Daily Average Cumulative Change in Salinity (and percent change) Compared to Existing Base Case due to Alternative 1			
Delta Location	**Cumulative Change without Alternative 1 (uS/cm EC)**	**Cumulative Change with Alternative 1 (uS/cm EC)**	**Incremental Change due to Alternative 1 (uS/cm EC)**
Jersey Point	52 (11%)	55 (11%)	3 (0%)
Old River at Rock Slough	30 (8%)	32 (9%)	2 (0%)
Tracy Pumping Plant	31 (8%)	34 (8%)	3 (0%)
Clifton Court Forebay	26 (7%)	29 (8%)	4 (1%)
Proposed Stockton Intake	15 (6%)	15 (6%)	1 (0%)
Middle River at Victoria Canal	7 (2%)	7 (2%)	1 (0%)

Table 4.2-21 shows that the Proposed Action would not considerably contribute to long-term cumulative changes in Delta water quality. Even over short periods, the Proposed Action would not considerably contribute to cumulative changes in Delta water quality, as illustrated in Exhibit 4.2-10, which shows the daily average modeling results for Clifton Court Forebay over the 16-year period. Changes from the Proposed Action would not considerably contribute to the overall cumulative changes in water quality.

In summary, cumulative changes in water quality at other Delta intakes in the future are on the order of 30 μS/cm EC in terms of a long-term average change. The Proposed Action would not considerably contribute to the cumulative changes in Delta water quality expected in the future at these locations. The Proposed Action would not considerably contribute to changes in water quality at Jersey Point, Rock Slough, and other key Delta stations that would violate any water quality standards or significantly adversely affect the beneficial uses of other Delta water users. Nor would the Proposed Action considerably contribute to cumulative changes in water quality that would adversely affect the operations of other Delta users including the CVP, SWP, City of Stockton, Central Delta Water Agency, and South Delta Water Agency.

Water Levels

Water levels are an important issue for agricultural diverters in the south and central Delta. The SDIP is a future Delta project with the greatest potential to affect Delta water levels. The draft EIS/EIR for SDIP was released for public comment on November 10, 2005. The SDIP would install permanent operable barriers in the Delta to maintain minimum water levels for agricultural diversions and would include some spot dredging in the vicinity of siphons. Its later phase would also include increasing pumping capacity at Banks Pumping Plant to 8,500 cfs. Reclamation and DWR have also recently implemented a Water Level Response Plan pursuant to SWRCB D-1641 to address channel water level concerns in the south Delta downstream from the temporary barriers. If Delta landowners are unable to divert an adequate quantity of water because CVP and SWP facilities are being used to transfer water under Joint Points of Diversion (JPOD) or water transfer programs, the plan requires the agencies to employ either temporary or



Note: AIP=Alternative Intake Project

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Source: CCWD DSM2 Delta Modeling Data (see Appendix C-4)

Daily Average Modeling Results for Clifton Court Forebay

EXHIBIT 4.2-10

permanent solutions. Temporary actions include installing and operating portable pumps at or near the affected diversion. Permanent actions include localized dredging near the affected diversion and/or modifying or relocating the diversion.

The cumulative impact of the SDIP and other future Delta projects is difficult to predict because of uncertainties in future operations of DWR's physical barriers in the Delta. If the permanent operable barriers are operated to maintain and improve water levels for central and south Delta farmers, there would be a cumulative benefit to water levels. Modeling analysis for the Proposed Action under future conditions assumed the presence of permanent operable barriers operated using DWR's plan C barrier operation, and increased pumping at Banks Pumping Plant to 8,500 cfs. The SDIP EIS/EIR included slightly different barrier operations that were also examined as part of the analysis for the Alternative Intake Project. It is assumed that the future Delta water levels will be within the range defined by the assumptions made for the analysis of the future conditions and No-Action Alternative, presented above. Modeling analysis shows that water level changes in Victoria Canal and at key central and south Delta locations due to the Proposed Action under both temporary barriers (existing conditions runs) and permanent operable barriers (future conditions runs) are all small (less than 0.05 foot), are sometimes positive (that is, increase water level elevation) and would be imperceptible in the field (see Tables 4.2-16 and 4.2-17). Therefore, the Proposed Action would not considerably contribute to any significant cumulative water level impact in the Delta.

Los Vaqueros Reservoir Expansion Project
The expansion of Los Vaqueros Reservoir is a potential future Delta project currently in the feasibility phase; an Initial Alternatives Information Report, an interim planning document in the development of a Federal Feasibility Report for the Los Vaqueros Expansion Investigation, was released in fall 2005. The project definition allows for some uncertainty including size of the expanded reservoir, location and number of intakes in the Delta, and its operations. The following information is provided to be as responsive as possible to concerns raised by stakeholders during scoping for the Alternative Intake Project:

As described in the Notice of Preparation (issued January 2006), the Los Vaqueros Reservoir Expansion Project has two primary objectives and one secondary objective:

Primary Objectives:

1. Use an expanded Los Vaqueros Reservoir to develop replacement water supplies for a fisheries protection program such as the long-term Environmental Water Account (EWA) program or an equivalent program, if the cost of water provided from an expanded reservoir is found to be less than the cost of water from other sources for continued implementation of that program.

2. Increase water supply reliability for water providers within portions of the San Francisco Bay Area including those served by the South Bay Aqueduct (SBA), principally to help meet municipal and industrial water demands during drought periods, with a focus on enlarging Los Vaqueros Reservoir.

4.2 Delta Water Resources

Secondary Objective:

3. To the extent possible through the pursuit of the water supply reliability and environmental water objectives, improve the quality of water deliveries to M&I customers in the San Francisco Bay Area.

The ongoing EIS/EIR and Feasibility Report will evaluate specific project alternatives. Preliminary analysis of the expanded reservoir operations and detailed results for operating scenarios under consideration were published in the Planning Report (April 2004). These operating scenarios were developed to meet the project objectives and considered various combinations of reservoir intake capacities up to 1,750 cfs combined, and reservoir sizes up to 500,000 af.

The Planning Report found that an expanded Los Vaqueros Reservoir would not affect:

- SWP and CVP deliveries;
- CVP's capability to meet its obligations, including temperature requirements in the upper Sacramento River;
- recreation opportunities; or
- power production.

The Planning Report found that an expanded Los Vaqueros Reservoir would change Delta water levels by less than 0.1 foot near proposed intakes and even less at agricultural diversion locations. Therefore, there would be no significant effect on water levels for current Delta users. Similarly, river velocities would change less than 0.1 foot per second at locations near intakes, having no effect on scour or other factors affecting local water users, nor adverse effects on fish or aquatic habitat within the Sacramento and San Joaquin River systems. The Planning Report also found that the impact on water quality would be minor (less than 5% or 5 mg/L chlorides change in Delta water quality) because the use of CCWD CVP contract water would be limited to amounts that would not significantly increase Delta water quality.

Additional operations modeling will be completed and the assumptions and results will be published in the Draft Los Vaqueros Reservoir Expansion Project EIS/EIR anticipated in December 2006. The Draft EIS/EIR will include specific documentation of the potential future operations of the Alternative Intake Project. An expanded reservoir project may increase total diversions at the combined intakes at Old River and the Alternative Intake Project intake. The effects of such changes in timing and quantity of diversions will be addressed in the Draft Los Vaqueros Reservoir Expansion Project EIS/EIR.

Based on the available information in the Planning Report and studies completed to date, it does not appear that the Los Vaqueros Reservoir Expansion Project and the Proposed Action would result in significant cumulative effects on Delta water supplies, quality, or levels.

Climate Change
Climate change could also contribute to future changes in Delta resources. Exactly what form future climate change will take is not considered reasonably foreseeable and is difficult to quantitatively incorporate into the Proposed Action's cumulative analysis. However, it remains a timely concern for Delta stakeholders. Thus, the following information is provided along with some discussion regarding how the Proposed Action could help CCWD respond to climate change.

A recent report by DWR, *Climate Change Impacts on the Sacramento-San Joaquin Delta* (DWR 2006), suggests that climate change could adversely affect Delta resources through several mechanisms including:

- **Shifts in precipitation patterns**. Warmer air temperatures are expected to shift the timing and form – rain or snow – of winter precipitation. Less snowpack would lead to less spring runoff. These shifting precipitation and runoff patterns would affect reservoir operations and Delta exports. These shifts in precipitation and runoff patterns could also adversely affect Delta water quality and could require greater reservoir releases to meet Delta water quality standards.

- **Changes in crop evapotranspiration rates**. Increases in evapotranspiration rates could affect the amount of water needed for agricultural uses, increasing water supply demands on the Delta.

- **Sea level rise**. Higher Delta water levels could threaten Delta levees. Sea level rise could also increase seawater intrusion into the Delta adversely affecting Delta water quality. Increased saltwater intrusion from the ocean could also require increased freshwater releases from upstream reservoirs to maintain compliance with Delta water quality standards.

By providing an additional Delta location from which CCWD can divert water, the Proposed Action would improve CCWD's operational flexibility and ability to respond to changing Delta conditions. The Proposed Action would also enable CCWD to more consistently maintain adequate emergency supplies in Los Vaqueros Reservoir, which would improve CCWD's ability to respond to a Delta emergency. Whether changes in Delta conditions are caused by future Delta projects or climate change, the Proposed Action would enable CCWD to better respond and adapt to them, without adversely affecting other Delta users.

Mitigation Measures
No mitigation is required.

4.2.2.6 Alternative 2, Indirect Pipeline Alternative

Because the CCWD operations under Alternatives 1 and 2 would be the same, the direct, indirect, and cumulative impacts of Alternative 2 would be the same as those described above for the Proposed Action. The impacts of Alternative 2 on Delta water resources, including water quality, water supply, and water level, would be less than significant. No mitigation is required.

4.2.2.7 Alternative 3, Modified Operations Alternative

Under Alternative 3, CCWD would shift some pumping from Rock Slough to the screened alternative intake at Victoria Canal and divert up to 320 cfs through the Old River conveyance system using a combination of the existing 250-cfs Old River intake and the proposed 250-cfs alternative intake. This change from the existing maximum diversion of 250 cfs at the existing Old River intake would enable CCWD to relocate as much as half of the current Rock Slough diversions to the screened Old River conveyance system in the near-term. Rock Slough would continue to provide a portion of CCWD's supply but would be used less frequently in the near-term than under the Proposed Action. Mallard Slough operations would be similar under both alternatives. There would be no increase in CCWD's average total annual quantity diverted because CCWD customer demands would not change.

Under future conditions, Alternative 3 would be operated in the same manner as the Proposed Action because in the future case under all alternatives, capacity at Old River Pump Station is assumed to increase to 320 cfs, consistent with the CCWD Future Water Supply Implementation EIR (Contra Costa Water District 1998). Therefore, the analysis below addresses Alternative 3 under existing conditions only.

Direct and Indirect Impacts

IMPACT 4.2-a (Alternative 3)

Long-term Changes in Delta Water Supplies. *Alternative 3 would rely on CCWD's existing CVP and Los Vaqueros Project water supplies, but would shift the timing of some CCWD diversions year to year. Analysis shows that the effects of Alternative 3 on SWP and CVP water supplies would be negligible and undetectable in real project operations, and would not affect the water supplies of the CVP, SWP, or other Delta users. This direct impact would be* ***less than significant.***

Alternative 3 would use CCWD's existing water supplies and would not increase CCWD's average annual Delta diversions. It would shift some of the timing of CCWD diversions year to year because of differences in Los Vaqueros Reservoir operations. Under Alternative 3, as with the Proposed Action, CCWD would divert water within the terms of its existing CVP contract, Los Vaqueros Project water rights, and Mallard Slough water rights. Alternative 3 would shift CCWD's diversions of CVP water and Los Vaqueros Project water rights water. It would not change CCWD's diversions at Mallard Slough.

Water Supply Impacts during Excess Conditions in the Delta

During excess conditions in the Delta, changes in Delta outflow resulting from CCWD pumping changes do not adversely affect the water supply of any legal water user in California because outflow needs for water quality and environmental regulations have been met and excess water is available for CCWD and other Delta users. Furthermore, Alternative 3 would generally result in a slight reduction in CCWD diversions during excess conditions and a slight increase in CCWD's CVP diversions during balanced conditions. Alternative 3 would not affect the water supply of any other Delta users as a result of changes in CCWD diversions during excess conditions.

Water Supply Impacts during Balanced Conditions in the Delta

Impact 4.2-a (Alternative 1) and Appendix C-2, "Water Resources Modeling Methodology Report," describe the approach for evaluating effects of project alternatives on CVP and SWP water supplies. Table 4.2-22 summarizes simulated cumulative annual changes in Shasta Reservoir storage in years in which the base case storage is at 1.9 MAF. As previously explained, these reservoir storage levels are important indicators of periods when significant changes to storage could adversely affect CVP and SWP operations.

Table 4.2-22
Simulated Accumulated Changes in Shasta Reservoir Storage over Dry Periods under Existing Conditions with Alternative 3

Water Year Type[1]	Base End-of-September Shasta Storage (TAF)	Accumulated Change in Shasta Storage, 1.9-MAF Criterion[2] (TAF)
1924 (C)	592	-8.9
1925 (D)	1,924	-18.6
1926 (D)	1,754	-41.5
Cumulative		**-41.5**
1929 (C)	1,905	-2.2
1930 (D)	2,116	- - -
1931 (C)	643	16.9
1932 (D)	1,045	-6.1
1933 (C)	812	-11.2
1934 (C)	603	1.5
Cumulative		**+ 1.5**
1976 (C)	2,829	- - -
1977 (C)	674	-0.3
Cumulative		**-0.2**
1987 (D)	2,153	- - -
1988 (C)	1,589	12.4
1989 (D)	2,463	- - -
1990 (C)	1,903	17.8
1991 (C)	1,341	24.2
1992 (C)	841	23.9
Cumulative		**+ 23.9**

Notes:
[1, 2,] See Notes 2, 3, and 4 for Table 4.2-11.

Out of the 73-year model simulation period, Shasta Reservoir storage was at or below 1.9 MAF at the end of September in the base case during 13 years under existing conditions. Alternative 3 would increase storage slightly in 6 of these years and decrease storage slightly in 7 of these years.

In addition to considering individual years, accumulated storage through drought or dry periods can be examined. There are four multi-year drought/dry periods in the 73-year hydrologic study period. Of the four periods, simulated results for Alternative 3 showed a decrease in accumulated Shasta Reservoir storage at the end of one of the periods (1924-1926), an increase in accumulated storage at the end of one of the periods (1987-1992), and two dry periods where the accumulated end-of-year storage was essentially unchanged from the base case (1929–1934 and 1977–1978).

The modeling results suggest that Alternative 3 could result in both decreases and increases in Shasta Reservoir storage. However, all of the changes would be very small relative to the size of the reservoir (10-40 TAF compared to 4,600 TAF). Most of the changes are less than 1% of the total reservoir storage. Consider that the evaporative losses from Shasta Reservoir in calendar year 2004 were about 94 TAF and evaporative losses in summer can exceed 15 TAF (Bureau of Reclamation 2006). The changes caused by Alternative 3 would not be large enough to change CVP or SWP operations or deliveries. This is especially true given the fact that, as described earlier, these very minor changes in storage would likely be spread to multiple CVP and SWP storage reservoirs and would be undetectable. Delta operations are not exact. Delta outflow, for example, is difficult to measure and can have a margin of error on the order of several thousand cfs. Changes in storage that would be caused by Alternative 3 would be well within the operational buffer of flows and storage in which the Delta is operated. Given the modeling results and these considerations, the impacts of Alternative 3 on CVP and SWP operations and deliveries would be less than significant.

IMPACT 4.2-b (Alternative 3)

Long-term Changes in Delta Water Quality that Cause Violations of Delta Water Quality Standards. *Analysis shows that there would be no significant changes in water quality at Jersey Point, Rock Slough, and other key Delta stations that would result in the violation of water quality standards or require significant changes to CVP/SWP operations to avoid water quality violations at those stations. Therefore, this direct impact would be* ***less than significant.***

The changes in salinity associated with Alternative 3 at the D-1641 water quality compliance locations are shown in Table 4.2-23.

Table 4.2-23
Simulated Percent Changes in Average Monthly Electrical Conductivity under Alternative 3 and Existing Conditions

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chipps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Collinsville	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.3
Jersey Point	0.2	-0.2	-0.1	-0.1	0.0	-0.1	-0.2	0.3	0.6	0.4	0.3	0.7
Emmaton	0.0	0.0	0.2	0.1	0.0	0.1	0.1	-0.3	-0.4	-0.2	-0.1	0.4
Rock Slough	0.6	0.3	0.5	0.3	0.1	0.1	0.1	0.3	0.6	0.5	0.3	0.6

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)

The modeling analysis indicates that there would be no significant changes in the position of X2 or salinity at Jersey Point, Emmaton, or Rock Slough that would violate water quality standards at those locations or cause significant changes to project operations to avoid water quality violations at those locations. Similar to the Proposed Action, Alternative 3 would not cause an average monthly increase in salinity of more than 1% at any of these locations in the simulations. For these reasons, this impact would be less than significant.

IMPACT 4.2-c (Alternative 3)	***Long-term Changes that Result in Substantial Water Quality Degradation that Would Adversely Affect Beneficial Uses or Substantially Change Delta Users' Operations.*** *Modeling results show that water quality changes caused by Alternative 3 would be too small to adversely affect Delta diversions or other beneficial uses. Therefore, this indirect impact would be* ***less than significant.***

The changes in simulated salinity caused by Alternative 3 at key south and central Delta locations are summarized in Table 4.2-24 (and Appendix C-4, "DSM2 Delta Modeling"). These changes are of the same very small magnitude as those described above for the Proposed Action.

Table 4.2-24
Simulated Salinity Changes at Specific Delta Diversion Locations under Alternative 3 and Existing Conditions

Location	Long-term (16 yr) Daily Average Change in Salinity (and Percent Change)	Maximum Monthly Average Change in Salinity (and Percent Change)	Number of Months (out of 192) in Which the Monthly Average Increase Exceeded 3%
Tracy Pumping Plant	2.5 µS/cm EC (0.4%)	15 µS/cm EC (3.6%)	1
Clifton Court Forebay	2.6 µS/cm EC (0.5%)	14 µS/cm EC (2.6%)	0
Proposed Stockton Intake Location	0.6 µS/cm EC (0.1%)	8 µS/cm EC (2.0%)	0
Middle River at Victoria Canal	0.6 µS/cm EC (0.1%)	10 µS/cm EC (2.1%)	0
Old River near Tracy Road Bridge	0.5 µS/cm EC (0.1%)	7 µS/cm EC (0.7%)	0
Old River at Middle River	0.2 µS/cm EC (0.0%)	5 µS/cm EC (0.7%)	0
San Joaquin River at Brandt Bridge	0.0 µS/cm EC (0.0%)	1 µS/cm EC (0.1%)	0

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)

The modeling analysis shows that there would be no changes in water quality in the south and central Delta that would be substantial or even detectable, would adversely affect any beneficial uses of the water, or would be likely to result in operational changes at Delta intakes. For these reasons, this impact would be less than significant.

IMPACT 4.2-d (Alternative 3)	***Long-term Changes in Delta Water Levels.*** *Modeling analysis shows that water-level effects would be too small to adversely affect any beneficial uses or reduce water elevations to a level that would not support existing land uses. Therefore, this impact would be* ***less than significant.***

Changes caused by Alternative 3 would be very similar to those caused by the Proposed Action. Tables 4.2-25 and 4.2-26 summarize the changes in water level at lower-low tide and the changes in water level at the intake location on Victoria Canal, respectively. As described for the Proposed Action, the DSM2 modeling results indicate that average 15-minute water level decreases in Victoria Canal and at key central and south Delta locations caused by Alternative 3 would be very small (less than 0.25 inch at most) and virtually imperceptible. The long-term average change would be zero. Changes in water surface elevations of this magnitude would not affect the ability of local water users to divert water for beneficial use. For this reason, this impact would be less than significant.

Table 4.2-25
Simulated Water Level Changes in the South Delta under Alternative 3 and Existing Conditions

Location	Long-term Average Change in Water Level*	Maximum 15-min Change in Water Level at Low-Low Tide
Middle River at Howard Road Bridge	0.00 foot	-0.02 foot
Old River at Tracy Road Bridge	0.00 foot	-0.02 foot
Doughty Cut	0.00 foot	-0.02 foot

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)
*15-minute timestep data averaged over 16-year simulation period.

Table 4.2-26
Simulated Water Level Changes in Victoria Canal under Alternative 3 and Existing Conditions

Location	Long-term Average Change in Water Level*	Maximum 15-min Change in Water Level at Low-Low Tide
Proposed Intake Location	0.00 feet	-0.02 foot
West end of Victoria Canal	0.00 feet	-0.02 foot
East end of Victoria Canal	0.00 feet	-0.02 foot

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)
*15-minute timestep data averaged over 16-year simulation period.

Cumulative Impacts

The cumulative impacts of Alternative 3 would be identical to those described for the Proposed Action because the CCWD operations would be the same under future conditions for those alternatives. Alternative 3 would not considerably contribute to any cumulatively considerable impact related to water resources.

Mitigation Measures

No mitigation is required.

4.2.2.8 Alternative 4, Desalination Alternative

Under Alternative 4, CCWD would shift about 10 TAF of diversions to the Mallard Slough intake to provide desalinated water to CCWD customers. Diversions at Mallard Slough would increase up to a total of 125–132 cfs to meet the capacity of the Bollman Water Treatment Plant. The new desalination facility would be expected to operate during periods when the salinity is most elevated at CCWD's existing Delta intakes. These periods are typically from September through December but may be extended during drier years. Diversions at the existing Rock Slough and Old River intakes would decrease, but CCWD's overall diversions from the Delta would increase by 3 TAF per year, on average, because of the saline concentrate generated by the desalination process. CCWD's diversions would remain within CCWD's total CVP contract allocation.

Direct and Indirect Impacts

IMPACT 4.2-a (Alternative 4)	***Long-term Changes in Delta Water Supplies.*** *The modeling analysis shows that, although CCWD's Delta diversions would slightly increase under the Desalination Alternative, the effects of Alternative 4 on SWP and CVP water supplies would be negligible and undetectable in real project operations. This direct impact would be* ***less than significant.***

Alternative 4, Desalination Alternative, is different from the other project alternatives in that it would relocate a portion of CCWD diversions to Mallard Slough in the western Delta (about 10 TAF/year on average) and increase CCWD's total Delta diversions by about 3 TAF/year on average because of the saline concentrate that is a byproduct of the desalination process.

Water Supply Impacts during Excess Conditions in the Delta

Alternative 4 would increase CCWD's use of its existing Mallard Slough water right by about 10 TAF/year with a commensurate decrease in use of CVP water diverted at CCWD's Rock Slough and Old River intakes, and water diverted under the Los Vaqueros water rights at the Old River intake.

Alternative 4 also would slightly increase CCWD's total average annual diversions by about 3 TAF/year because of water losses in the desalination process and saline concentrate disposal. This increase could be accommodated by either existing or expanded Mallard Slough water rights or by adding Mallard Slough as a point of diversion for CVP water.

This slight shift in use of the Mallard Slough water right and potential increase of the water right is very small relative to the total outflow in the western Delta (ranging from 3,000 to 100,000 cfs depending on hydrologic conditions) and would not affect other Delta users. Appendix C-4, "DSM2 Delta Modeling," provides tables illustrating the shift in water rights use under this Alternative.

Water Supply Impacts during Balanced Conditions in the Delta

The increased use of Mallard Slough water rights would decrease CCWD's use of CVP contract water overall. Tables 4.2-27 and 4.2-28 summarize estimated cumulative annual changes in Shasta Reservoir storage in years in which the base storage is at 1.9 MAF or below at the end of September under existing and future conditions, respectively. Out of the 73-year model simulation period, the Shasta Reservoir base storage was at or below 1.9 MAF at the end of September during 15 years under existing conditions and 15 years under future conditions. In all years, Alternative 4 operations increased storage slightly. The modeling assumes that all the additional water required at Mallard Slough would be diverted under existing or expanded CCWD Mallard Slough water rights.

Table 4.2-27
Simulated Accumulated Changes in Shasta Reservoir Storage over Dry Periods under Alternative 4 and Existing Conditions

Water Year Type[1]	Base End-of-September Shasta Reservoir Storage (TAF)	Accumulated Change in Shasta Reservoir Storage, 1.9-MAF Criterion[2] (TAF)
1924 (C)	592	70.2
1925 (D)	1,924	78.9
1926 (D)	1,754	82.3
Cumulative		**+82.3**
1929 (C)	1,905	12.1
1930 (D)	2,116	- - -
1931 (C)	643	65.1
1932 (D)	1,045	67.8
1933 (C)	812	74.6
1934 (C)	603	101.6
Cumulative		**+101.6**
1976 (C)	2,829	- - -
1977 (C)	674	52.9
Cumulative		**+52.9**
1987 (D)	2,153	- - -
1988 (C)	1,589	16.1
1989 (D)	2,463	- - -
1990 (C)	1,903	67.4
1991 (C)	1,341	90.1
1992 (C)	841	105.2
Cumulative		**+ 105.2**

Notes:
[1, 2] See Notes 2, 3, and 4 for Table 4.2-11.

Another possibility is that CCWD and Reclamation would add Mallard Slough as a point of diversion under CCWD's CVP contract, and CCWD would divert CVP water in years when CCWD exhausts its existing Mallard Slough water rights. This assumption would slightly change the modeling results by about 5 TAF of CVP water/year on average, but would still result in a net reduction in CVP water usage from the base case and a slight overall increase in CVP carryover storage.

Even with the slight increase in CCWD diversions in the western Delta due to saline concentrate from the desalination process, these changes would not be large enough to change CVP and SWP operations or deliveries. This is especially true given the fact that, as described earlier, changes in storage would likely be spread to multiple CVP and SWP storage reservoirs. Given the modeling results and these considerations, the impacts of Alternative 4 on water supply and CVP and SWP operations and deliveries would be less than significant.

Table 4.2-28
Simulated Accumulated Changes in Shasta Reservoir Storage over Dry Periods under Alternative 4 and Future Conditions

Water Year Type[1]	Base End-of-September Shasta Reservoir Storage (TAF)	Accumulated Change in Shasta Reservoir Storage, 1.9-MAF Criterion[2] (TAF)
1924 (C)	599	77.2
1925 (D)	1,924	87.9
1926 (D)	1,764	93.4
Cumulative		**+ 93.4**
1929 (C)	1,823	17.7
1930 (D)	2,054	- - -
1931 (C)	612	67.4
1932 (D)	927	69.4
1933 (C)	681	76.0
1934 (C)	561	106.6
Cumulative		**+ 106.6**
1976 (C)	2,732	- - -
1977 (C)	584	59.0
Cumulative		**+ 59.0**
1987 (D)	2,122	- - -
1988 (C)	1,587	11.6
1989 (D)	2,341	- - -
1990 (C)	1,744	67.6
1991 (C)	1,179	92.5
1992 (C)	865	108.7
Cumulative		**+ 108.7**

Notes:
[1, 2] See Notes 2, 3, and 4 for Table 4.2-11.

IMPACT 4.2-b (Alternative 4)

Long-term Changes in Delta Water Quality that Cause Violations of Delta Water Quality Standards. *Modeling analysis shows that there would be no significant changes in water quality at Jersey Point, Rock Slough, and other key Delta stations that would result in the violation of water quality standards or require significant changes to CVP/SWP operations to avoid water quality violations at those stations. Therefore, this direct impact would be* ***less than significant.***

The changes in salinity associated with Alternative 4 at the D-1641 compliance locations are shown in Table 4.2-29. At the X2 compliance locations, the simulations show that Alternative 4 would increase long-term monthly average salinity by a maximum of about 15-20 μS/cm EC (2–3% of the total base case average salinities) in late summer and early fall. The changes in water quality at Emmaton would also follow a similar seasonal pattern, although the magnitudes of the increases would be even smaller (all less than 10 μS/cm EC). Alternative 4 would very slightly improve water quality at Jersey Point throughout the year. The only changes to water quality at Rock Slough would also be very slight improvements, peaking at less than 5 μS/cm EC in winter.

Table 4.2-29
Simulated Percent Changes in Average Monthly Electrical Conductivity under Alternative 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Existing Conditions												
Chipps	-0.2	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.0
Collinsville	-0.5	-0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	-0.1
Jersey Point	-1.2	-1.1	-0.4	-0.1	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.6
Emmaton	-0.9	-0.5	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.3	0.3	-0.1
Rock Slough	-0.8	-0.7	-0.1	0.0	0.0	0.0	-0.2	-0.1	-0.1	0.0	0.0	-0.4
Future Conditions												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Chipps	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0
Collinsville	-0.4	-0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.0
Jersey Point	-0.8	-0.9	-0.3	0.0	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.3
Emmaton	-0.6	-0.4	0.0	0.0	0.0	0.0	0.3	0.3	0.4	0.3	0.3	-0.1
Rock Slough	-0.5	-0.6	-0.3	0.1	0.0	-0.1	-0.2	-0.1	-0.1	0.0	0.0	-0.2

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)

The modeling shows that there would be no significant changes in X2 or salinity at Jersey Point, Emmaton, or Rock Slough that would violate any water quality standards at those locations or cause significant changes to project operations to avoid water quality violations at those locations. In many cases, Alternative 4 would decrease salinity at these locations. For these reasons, this impact would be less than significant.

IMPACT 4.2-c (Alternative 4)

Long-term Changes that Result in Substantial Water Quality Degradation that would Adversely Affect Beneficial Uses or Substantially Change Delta Users' Operations. *Modeling results show that water quality changes caused by the Desalination Alternative would be too small to adversely affect Delta diversions or other beneficial uses and, on average, would be slightly beneficial. Therefore, this indirect impact would be* ***less than significant.***

The changes in simulated water quality caused by Alternative 4 would consist of negligible increases and very slight decreases in salinity at key locations in the south and central Delta, as summarized in Table 4.2-30 (and Appendix C-4, "DSM2 Delta Modeling"). The change in salinity at Delta diversion locations would be, on average, a very slight improvement in water quality. The maximum monthly average increase in salinity due to Alternative 4 would not exceed 1% of the total no-project salinity. There would be no changes in water quality in the south and central Delta that would be substantial, would adversely affect beneficial use of the water, or would be likely to result in operational changes at Delta intakes. Therefore, this impact would be less than significant.

Table 4.2-30
Simulated Salinity Changes under Alternative 4 at Specific Delta Diversion Locations

Location	Long-term (16 yr) Daily Average Change in Salinity (and Percent Change)	Maximum Monthly Average Increase in Salinity (and Percent Change)	Number of Months (out of 192) in Which the Monthly Average Increase Exceeded 1%
Existing Conditions			
Tracy Pumping Plant	-0.2 µS/cm EC (-0.5%)	4 µS/cm EC (0.7%)	0
Clifton Court Forebay	-0.4 µS/cm EC (-0.1%)	3 µS/cm EC (0.4%)	0
Proposed Stockton Intake Location	-0.3 µS/cm EC (-0.1%)	2 µS/cm EC (0.6%)	0
Middle River at Victoria Canal	-0.1 µS/cm EC (0.0%)	3 µS/cm EC (0.8%)	0
Old River near Tracy Road Bridge	0.0 µS/cm EC (0.0%)	1 µS/cm EC (0.1%)	0
Old River at Middle River	0.1 µS/cm EC (0.0%)	2 µS/cm EC (0.2%)	0
San Joaquin River at Brandt Bridge	-0.0 µS/cm EC (0.0%)	0 µS/cm EC (0.01%)	0
Future Conditions			
Location	**Long-term (16 yr) Daily Average Change in Salinity (and Percent Change)**	**Maximum Monthly Average Increase in Salinity (and Percent Change)**	**Number of Months (out of 192) in Which the Monthly Average Increase Exceeded 1%**
Tracy Pumping Plant	-0.2 µS/cm EC (0.0%)	6 µS/cm EC (0.8%)	0
Clifton Court Forebay	-0.3 µS/cm EC (-0.1%)	6 µS/cm EC (0.8%)	0
Proposed Stockton Intake Location	-0.3 µS/cm EC (0.0%)	3 µS/cm EC (0.7%)	0
Middle River at Victoria Canal	-0.1 µS/cm EC (0.0%)	5 µS/cm EC (0.8%)	0
Old River near Tracy Road Bridge	-0.2 µS/cm EC (0.0%)	6 µS/cm EC (0.8%)	0
Old River at Middle River	-0.1 µS/cm EC (0.0%)	4 µS/cm EC (0.7%)	0
San Joaquin River at Brandt Bridge	0.0 µS/cm EC (0.0%)	3 µS/cm EC (0.3%)	0

Source: CCWD (see Appendix C-4, "DSM2 Delta Modeling," for detailed modeling results)

IMPACT 4.2-d (Alternative 4)

Long-term Changes in Delta Water Levels. *Modeling analysis shows that water-level effects would be too small to adversely affect any beneficial uses or reduce water elevations to a level that would not support existing land uses. Therefore, this impact would be* ***less than significant.***

DSM2 modeling results indicate that the long-term average water level changes in key central and south Delta locations and Victoria Canal would be zero (see Tables 4.2-31 and 4.2-32). The maximum change at low tide would be 0.01 foot. Alternative 4 would relocate CCWD diversions to the western Delta and would not be expected to have significant effects on central and south Delta water levels. This impact would be less than significant.

Table 4.2-31 Simulated Water Level Changes in the South Delta under Alternative 4		
Location	**Long-term Average Change in Water Level**	**Maximum Change in Water Level at Low-Low Tide**
Middle River at Howard Road Bridge		
Existing	0.00 feet	-0.01 foot
Future	0.00 feet	-0.01 foot
Old River at Tracy Road Bridge		
Existing	0.00 feet	-0.01 foot
Future	0.00 feet	-0.01 foot
Doughty Cut		
Existing	0.00 feet	-0.01 foot
Future	0.00 feet	-0.01 foot
Source: CCWD (see Appendix C-4, “DSM2 Delta Modeling,” for detailed modeling results)		

Table 4.2-32 Simulated Water Level Changes in Victoria Canal under Alternative 4		
Location	**Long-term Average Change in Water Level**	**Maximum Change in Water Level at Low-Low Tide**
Proposed Intake Location		
Existing	0.00 feet	-0.01 foot
Future	0.00 feet	-0.01 foot
West end of Victoria Canal		
Existing	0.00 feet	-0.01 foot
Future	0.00 feet	-0.01 foot
East end of Victoria Canal		
Existing	0.00 feet	-0.01 foot
Future	0.00 feet	-0.01 foot
Source: CCWD (see Appendix C-4, “DSM2 Delta Modeling,” for detailed modeling results)		

Cumulative Impacts

The cumulative analysis under the Proposed Action gives a full description of the projects that were included in the cumulative analysis for the Proposed Action and Alternatives, including Alternative 4.

Water Supply

The Alternative Intake Project is a water quality project, not a water supply project. It would not change CCWD’s demands. Alternative 4 would result in a slight increase in CCWD’s Delta diversions due to losses in the desalination process. This increase in diversions would be on the order of 3 TAF/yr on average, a portion of which would be returned to the Delta as concentrate discharge. A change on this scale would not be detectable in Delta outflow and would not adversely affect any other Delta water supplies or considerably contribute to any potential cumulative impacts on Delta water supplies. Alternative 4 would increase CCWD’s operational flexibility and ability to respond to Delta emergencies by providing the capability to desalinate Delta water at CCWD’s

Mallard Intake, creating a slight benefit to other Delta users by reducing diversions from the central Delta during critical periods.

Water Resources
Table 4.2-33 shows the cumulative changes in salinity at key Delta locations. Alternative 4 would not considerably contribute to an adverse cumulative effect on water quality.

Table 4.2-33
Long-Term (16-year) Daily Average Cumulative Change in Salinity (µS/cm EC) (and percent change) Compared to Existing Base Case Due to Alternative 4

Delta Location	Cumulative Change without Alternative 4	Cumulative Change with Alternative 4	Incremental Change due to Alternative 4
Jersey Point	52 (11%)	49 (11%)	3 (0%)
Old River at Rock Slough	30 (8%)	29 (8%)	1 (0%)
Tracy Pumping Plant	31 (8%)	31 (8%)	0 (0%)
Clifton Court Forebay	26 (7%)	27 (7%)	0 (0%)
Proposed Stockton Intake	15 (6%)	14 (6%)	0 (0%)
Middle River at Victoria Canal	7 (2%)	7 (2%)	0 (0%)

Water Levels
Alternative 4 would relocate a significant portion of CCWD diversions to the western Delta and would not be expected to have a significant effect on Delta water levels. Modeling analysis shows that water level changes in Victoria Canal and at key central and south Delta locations due to Alternative 4 under both temporary barriers (existing conditions runs) and permanent operable barriers (future conditions runs) would be small (less than 0.01 foot), would sometimes be positive (that is, increase water level elevation), and would be imperceptible in the field (see Tables 4.2-16 and 4.2-17). Therefore, it is concluded that the Alternative 4 would not considerably contribute to any significant cumulative water level impact in the Delta.

Mitigation Measures
No mitigation is required.

4.3 Delta Fisheries and Aquatic Resources

Common and sensitive Delta fisheries resources that occur or potentially occur at the proposed project site (Victoria Canal/Old River) and the Desalination Alternative project sites (Mallard Slough) are discussed in this section, along with potential impacts on these resources. The assessment was based primarily on extensive fishery data compiled from studies and monitoring reports prepared by the California Department of Fish and Game (DFG), U.S. Fish and Wildlife Service (USFWS), and California Department of Water Resources (DWR); the Vernalis Adaptive Management Plan (VAMP) San Joaquin River salmon survival studies; and others. A fishery and aquatic resources impact assessment was performed to evaluate the potential effects of construction and operation of the Proposed Action on fish and macroinvertebrates inhabiting Victoria Canal and the Bay-Delta estuary. The evaluation combined the results of hydrologic modeling with Delta fisheries data on seasonal abundance and distribution of key life history stages to assess operational impacts as described below. This section summarizes more extensive fisheries data and analyses contained in Appendix E-1, "Action Specific Implementation Plan," of the EIR/EIS, which provides the requisite information for the National Marine Fisheries Service (NMFS), USFWS, and DFG to make findings regarding fisheries effects as required by the Federal Endangered Species Act (ESA), Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA), California Endangered Species Act (CESA), and Natural Community Conservation Planning Act (NCCPA), consistent with CALFED's Multi-Species Conservation Strategy (MSCS).

4.3.1 Affected Environment

4.3.1.1 Regulatory Setting

Many Delta fisheries and aquatic resources in California are protected and/or regulated by a variety of laws and policies.

Federal Regulations

Endangered Species Act

Pursuant to the Federal ESA, USFWS and NMFS have authority over projects that may result in take of a Federally listed species. Under ESA, the definition of "take" is to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." USFWS has also interpreted the definition of "harm" to include significant habitat modification that could result in take. If there is a likelihood that a project would result in take of a Federally listed species, either an incidental take permit, under Section 10(a) of ESA, or a Federal interagency consultation, under Section 7 of ESA, is required.

Critical Habitat
The south and central Delta, Sacramento River, and the Bay-Delta estuary serve as a migration corridor for anadromous salmonids, which have been listed for protection under the California and/or Federal ESA. Listed salmonids that would potentially occur seasonally in the Delta include winter-run Chinook salmon, spring-run Chinook salmon, and steelhead trout. The Sacramento River and Bay-Delta estuary (but not the south and central Delta in the project area) are areas designated as critical habitat by NMFS for winter-run and spring-run Chinook salmon. In 2005, NMFS identified the Sacramento and San Joaquin rivers and the Delta, including the south and central Delta, as critical habitat for Central Valley steelhead. The Bay-Delta estuary, including the south and central Delta, has been designated as critical habitat by USFWS for delta smelt.

Magnuson-Stevens Fishery Conservation and Management Act – Essential Fish Habitat
The Delta, San Francisco Bay, Suisun Bay, and the western Delta have been designated as Essential Fish Habitat (EFH) by the Pacific Fisheries Management Council (PFMC) to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries such as Pacific salmon. The amended MSFCMA, also known as the Sustainable Fisheries Act (Public Law 104-297), requires all Federal agencies to consult with the Secretary of Commerce (National Oceanic and Atomospheric Administration [NOAA]/NMFS) on activities or proposed activities authorized, funded, or undertaken by that agency that may adversely affect EFH of commercially managed marine and anadromous fish species. The EFH provisions of the Sustainable Fisheries Act are designed to protect fishery habitat from being lost due to disturbance and degradation. The act requires that EFH must be identified for all species Federally managed under PFMC. PFMC is responsible for managing commercial fisheries resources along the coasts of California, Oregon, and Washington. Three fisheries management plans all cover species that occur in the project area and could be affected by the Proposed Action, and include the entire San Francisco Bay-Delta estuary (which would include Victoria Canal) as EFH for species as follows:

- Pacific Salmon Fishery Management Plan: spring-, fall-, late fall-, and winter-run Central Valley Chinook salmon (Pacific salmon),
- Coastal Pelagic Fishery Management Plan: northern anchovy and Pacific sardine, and
- Pacific Groundfish Fishery Management Plan: starry flounder.

State Regulations

California Endangered Species Act
Pursuant to CESA and Section 2081 of the Fish and Game Code, a permit from DFG is required for projects that could result in the take of a State listed threatened or endangered species. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species, but the definition does not include "harm" or "harass," as the Federal act does. As a result, the threshold for take under CESA is higher than that under ESA.

California Fish and Game Code Section 1602 - Streambed Alteration
Diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream or lake in California that supports wildlife resources are subject to regulation by DFG, pursuant to Section 1602 of the California Fish and Game Code. The regulatory definition of stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports wildlife, fish, or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. DFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

Fully Protected Species under the Fish and Game Code
Protection of fully protected species is described in four sections of the Fish and Game Code that list 37 fully protected species (Fish and Game Code Sections 3511, 4700, 5050, and 5515). These statutes prohibit take or possession at any time of fully protected species. DFG is unable to authorize incidental take of fully protected species when activities are proposed in areas inhabited by those species. DFG has informed non-Federal agencies and private parties that they must avoid take of any fully protected species in carrying out projects.

Natural Community Conservation Plan Act
This act authorizes the Natural Community Conservation Plan program, which is designed to use an ecosystem approach to conserve natural communities at the ecosystem scale while accommodating compatible land use.

Regional Habitat Conservation Plans
Regional habitat conservation plans (HCPs) consistent with Federal and State special-status species protections have been established for terrestrial species only and do not consider fish and other aquatic species.

Action Specific Implementation Plan
An Action Specific Implementation Plan (ASIP) is a project-level environmental document meant to ensure that projects implementing CALFED Program actions are in compliance with all CALFED regulatory requirements, including the ecosystem and recovery goals. An ASIP should provide all of the information necessary for obtaining authorizations under the ESA, CESA, and NCCPA in a single document. The Proposed Action is a part of CALFED's overall Delta Improvements Package and, therefore, CCWD has prepared an ASIP in conformance with regulatory guidance for preparing ASIPs (see EIR/EIS Appendix E-1, "Action Specific Implementation Plan"). The Alternative Intake Project ASIP has been developed to be consistent with the species goals, prescriptions, and conservation measures in the MSCS for covered species affected by the Proposed Action, but does not tier off of any of the CALFED programmatic documents; this ASIP is a stand-alone, project-specific document.

4.3.1.2 Environmental Setting

Ecological Overview

The Delta provides habitat to a diverse assemblage of resident and migratory fish and other freshwater and estuarine organisms. The biological environment is a complex community of plants and animals inhabiting various regions of the Bay-Delta estuary. This section summarizes information available on the aquatic resources inhabiting the Bay-Delta estuary, and specifically the south Delta adjacent to the proposed CCWD intake structure and fish screen, including phytoplankton, zooplankton, benthic macroinvertebrates, and common fish populations. The estuary and Delta provide habitat for a variety of resident and migratory fish species, several of which have been listed for protection under the State and/or Federal ESA, including delta smelt, winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead. The Delta has been designated as critical habitat for delta smelt and Central Valley steelhead and as EFH by NMFS for managed species including Pacific salmon. As a result of the sensitivity and importance of aquatic habitat within the Delta, this section provides additional information specifically focusing on these sensitive and protected species and their habitat.

Phytoplankton

Phytoplankton are small photosynthetic plants that form the base of the estuarine food web. Phytoplankton are of prime importance to the ecology of the Bay-Delta estuary because of their position at the base of the food web. The seasonal abundance (standing crop) of copepods, cladocerans, and other pelagic herbivores closely follows the seasonal cycle of phytoplankton abundance in the estuary. Juvenile survival and growth of many fish species, such as striped bass and threadfin shad, within the Delta and elsewhere within the estuary largely depends on the quality and quantity of phytoplankton and/or associated zooplankton available as a direct or indirect food resource. A 10-fold decrease in chlorophyll concentrations in Suisun Bay has occurred since 1986. This decrease is associated with, and may be the result of, the introduction of the Asian clam (*Corbula amurensis*). These recent trends have raised questions about the ability of phytoplankton production in the Bay-Delta estuary to support zooplankton production.

Zooplankton

Zooplankton are microscopic and macroscopic animals that are planktonic (free-floating) or weak swimming fish and invertebrates. Zooplankton, the primary consumers within the estuary, are at the center of the estuary food web and therefore are not only important to lower trophic levels upon which they feed (phytoplankton, detritus), but also to the higher trophic levels for which they serve as prey (fish and macroinvertebrates). Zooplankton include herbivores, which forage mainly on phytoplankton, and detritivores that feed on detritus and microbes. Zooplankton are primarily suspension feeders. Zooplankton include small macroinvertebrates such as calanoid copepods and cladocerans but also include fish and macroinvertebrate eggs and larvae, including delta smelt larvae, threadfin shad, striped bass eggs and larvae, crabs, and bay shrimp. The abundance and distribution of zooplankton vary substantially within the estuary in response to seasonal cycles and environmental factors such as salinity gradients and river flow and tidal currents. In the low-salinity regions of the Delta, the primary zooplankton are calanoid copepods (*Eurytemora affinis* and *Acartia clausi*) and the opossum shrimp (*Neomysis mercedis*). The cladocerans (*Daphnia pulex* and *D. parvula*) and calanoid copepods (*Diaptomus* spp. and *Limnocalanus macrurus*) are the primary zooplankton species occurring within the freshwater portions of the Delta. A number of zooplankton species have been introduced into the estuary (Kimmerer 1998) through ballast water discharges from commercial shipping and have impacted native species inhabiting the estuary.

Benthic and Epibenthic Macroinvertebrates

Within the estuary, benthic macroinvertebrates typically live within the top 12 inches of sediment on the Bay-Delta floor. Epibenthic macroinvertebrates typically live on the sediment surface. Within the Delta, benthic and epibenthic species include bay shrimp, opossum shrimp, amphipods, polychaetes, oligochaetes, and clams. A recently introduced clam species (*Corbula amurensis*) has rapidly expanded its geographic distribution and abundance within Suisun Bay and the Delta (Thompson and Peterson 1998) and has achieved sufficiently high population abundance that feeding (clams are filter feeders) has significantly altered the abundance of phytoplankton and zooplankton within the estuary. Characteristics of the benthic and epibenthic macroinvertebrate community are influenced by a variety of physical and water quality conditions that occur within the estuary, the most important being flow velocities, substrate characteristics, and salinity gradients (Thompson et al. 2000).

Many of the more common benthic species that inhabit the estuary are not native to the region but have been transported and introduced into the estuary through the discharge of ballast water from commercial ships, or on the shells of oysters brought from the East Coast for commercial farming in the late 19th century (Carlton 1979). Today, over 40% of the individuals comprising the benthic community in a given area of the estuary can be nonindigenous species (Carlton 1979; Cohen 2000). Many of these introduced species may serve ecological functions similar to native species that they may have displaced; however, some species may be detrimental to the aquatic ecosystem of the estuary. All but two of the benthic mollusks (i.e., oysters, clams) inhabiting the Delta are introduced. Within the Delta, one of the dominant mollusks, the Asiatic clam (*Corbicula fluminea*), is intolerant of saline waters.

Fish

Fish species may utilize the south and central Delta and other regions of the estuary for any or all of their life history stages. They may have planktonic, epibenthic (demersal), and pelagic (open water) life histories. The majority of fish species (e.g., delta smelt, threadfin shad, striped bass, gobies, etc.) inhabiting the estuary have planktonic larval stages; as plankton, they feed on zooplankton and in some cases, phytoplankton. Many of these species forage on plankton during the larval and early juvenile life stages, and then as juveniles and adults become more selective predators and feed on large invertebrates and fish. Demersal fish such as sturgeon, gobies, sculpin, and striped bass are planktivorous as larvae but begin to feed on epibenthic invertebrates and fish as juveniles. Many smaller fish, including delta smelt and threadfin shad, are planktivorous throughout their lives.

4.3 Delta Fisheries and Aquatic Resources

The fish community inhabiting the Bay-Delta estuary is diverse and dynamic (Table 4.3-1). Abundance of the species may fluctuate substantially within and among years (Baxter et al. 1999) in response to both population dynamics and environmental conditions. Life-history strategies and habitat requirements also vary substantially among species within the fish community. The Alternative Intake Project ASIP contains substantially more detailed information on Delta fish communities and aquatic habitat function and use (see EIR/EIS Appendix E-1, "Action Specific Implementation Plan").

Special-status Fish Species

The Bay-Delta estuary and the Delta serve as habitat for a variety of special-status fish species, several of which have been listed for protection under the Federal and/or California ESA (Table 4.3-2). Any of these species can be found in the south or central Delta.

The following is a brief discussion of the status, life history, and factors affecting population abundance, and status of the protected fish species that seasonally inhabit the Delta in the vicinity of the proposed CCWD intake structure and fish screen project site. Although fall-run/late-fall-run Chinook salmon, northern anchovy, Pacific sardine, and starry flounder have not been listed for protection under either the California or Federal ESA, they are included as part of this discussion of the Delta fishery community because of EFH designations covering these species.

Delta Smelt

Delta smelt are listed as a threatened species under both the California and Federal ESAs. There is an emergency petition to USFWS to relist delta smelt as endangered. Delta smelt are endemic to the Sacramento-San Joaquin Delta estuary and inhabit the freshwater portions of the Delta, Sacramento and San Joaquin rivers, and the low-salinity portions of Suisun Bay.

Substantial declines in delta smelt abundance indices in recent years, as well as declines in other pelagic fish species, have led to widespread concerns regarding the factors adversely affecting the pelagic fish community inhabiting the Bay-Delta estuary. In response to the marked decline in the pelagic fish community, USFWS, DFG, and other interested parties have recently expanded and intensified efforts to monitor delta smelt and other fish species, as well as to increase the level of effort focused on data analysis of the population dynamics of delta smelt and other pelagic fish species. A number of recent and ongoing analyses have focused on identifying the factors potentially influencing the status and abundance of delta smelt and other pelagic fish species within the estuary in the past several years.

Table 4.3-1
Fish Species Inhabiting the Delta Potentially Affected by Construction or Operation of the Proposed Action

Common Name	Scientific Name
Pacific lamprey*	*Lampetra tridentate*
River lamprey*	*Lampetra ayersi*
White sturgeon*	*Acipenser transmontanus*
Green sturgeon*	*Acipenser medirostris*
American shad	*Alosa sapidissima*
Threadfin shad	*Dorosoma petenense*
Central Valley steelhead*	*Oncorhynchus mykiss*
Chum salmon	*Oncorhynchus keta*
Chinook salmon (winter, spring, fall, and late-fall runs)*	*Oncorhynchus tshawytscha*
Longfin smelt*	*Spirinchus thaleichthys*
Delta smelt*	*Hypomesus transpacificus*
Wakasagi	*Hypomesus nipponensis*
Northern anchovy*	*Engraulis mordax*
Pacific sardine*	*Sardinops sagax*
Starry flounder*	*Platichthys stellatus*
Hitch*	*Lavinia exilicauda*
Sacramento blackfish*	*Orthodon microlepidotus*
Sacramento splittail*	*Pogonichthys macrolepidotus*
Hardhead*	*Mylopharodon conocephalus*
Sacramento pikeminnow*	*Ptychocheilus grandis*
Fathead minnow	*Pimephales promelas*
Golden shiner	*Notemigonus chrysoleucas*
Common carp	*Cyprinus carpio*
Goldfish	*Carassius auratus*
Sacramento sucker*	*Catostomus occidentalis*
Black bullhead	*Ameiurus melas*
Brown bullhead	*Ameiurus nebulosus*
Yellow bullhead	*Ameiurus natalis*
White catfish	*Ameiurus catus*
Channel catfish	*Ictalurus punctatus*
Western mosquitofish	*Gambusia affinis*
Rainwater killfish	*Lucania parva*
Striped bass	*Morone saxatilis*
Inland silverside	*Menidia beryllina*
Bigscale logperch	*Percina macrolepida*
Bluegill	*Lepomis macrochirus*
Redear sunfish	*Lepomis microlophus*
Green sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gluosus*
White crappie	*Pomoxis annularis*
Black crappie	*Pomoxis nigromaculatus*
Largemouth bass	*Micorpterus salmoides*
Smallmouth bass	*Micropterus dolomieui*
Bigscale logperch	*Percina macrolepida*
Tule perch*	*Hysterocarpus traski*
Threespine stickleback*	*Gasterosteus aculeatus*
Yellowfin goby	*Acanthogobius flavimanus*
Chameleon goby	*Tridentiger trigonocephalus*
Prickly sculpin*	*Cottus asper*

* indicates a native species

Source: DFG unpublished data

Table 4.3-2
Special-status Fish Species of Interest for the Alternative Intake Project

Common Name	Scientific Name	Listing Status[2]			Designated Habitat
		USFWS	NMFS	DFG	
Winter-run Chinook salmon	*Oncorhynchus tshawytscha*	--	FE	SE	Critical Habitat
Central Valley spring-run Chinook salmon	*Oncorhynchus tshawytscha*	--	FT	ST	Critical Habitat
Central Valley fall/late fall-run Chinook salmon	*Oncorhynchus tshawytscha*	--	FSC	CSC	--
Pacific Salmon[1]	--	--	--	--	Essential Fish Habitat[3]
Central Valley steelhead	*Oncorhynchus mykiss*	--	FT	CSC	Critical Habitat
Delta smelt	*Hypomesus transpacificus*	FT	--	ST	--
Longfin smelt	*Spirinchus thaleichthys*	FSC	--	CSC	--
Green sturgeon	*Acipenser medirostris*	--	FP	CSC	--
River lamprey	*Lampetra tridentate*	FSC	--	CSC	--
Hardhead	*Mylopharcodon concephalus*	--	--	CSC	--
Sacramento splittail	*Pogonichthys macrolepidotus*	FSC	--	CSC	--
Northern anchovy	*Engraulis mordax*	--	--	--	Essential Fish Habitat[4]
Pacific sardine	*Sardinops sagax*	--	--	--	Essential Fish Habitat[4]
Starry flounder	*Platichthys stellatus*	--	--	--	Essential Fish Habitat[5]

Notes:

1 Pacific salmon includes winter-run, spring-run, and fall/late fall-run Chinook salmon.

2 Listing Status:

U.S. Fish and Wildlife Service (USFWS) Federal Listing Categories
FE Endangered (legally protected)
FT Threatened (legally protected)
FP Proposed (legally protected)
FSC Federal Species of Concern (no formal protection)

California Department of Fish and Game (DFG) State Listing Categories
SE Endangered (legally protected)
ST Threatened (legally protected)
CSC California Species of Special Concern (no formal protection)

3 Covered under the amended MSFCMA.

4 Covered under the Coastal Pelagic Fishery Management Plan.

5 Covered under the Pacific Coast Groundfish Fishery Management Plan.

Sources: Data Compiled by EDAW in 2005

USFWS and DFG continue to evaluate the available scientific information regarding the status of delta smelt and the performance of various management actions designed to improve protection, reduce mortality, and enhance habitat quality and availability for delta smelt within the estuary (USFWS 2002). Furthermore, additional measures have been taken since the beginning of 2005 to aide in determining the magnitude of entrainment at the CVP and SWP intakes, such as the Delta Smelt Larval Survey conducted by DFG to monitor and provide additional information on delta smelt abundance and distribution within the Delta, and the vulnerability of delta smelt to entrainment at the SWP and CVP pumps (DFG 2005).

Life History

Delta smelt is a short-lived estuarine species endemic to the Sacramento-San Joaquin estuary. Juvenile and adult delta smelt typically inhabit open waters of the central Delta and Suisun Bay, including the area in the vicinity of the proposed CCWD intake and fish screen site. Delta smelt inhabit shallow-water areas; however, juvenile and adult delta smelt are also known to occur within the deeper channel areas (Hanson, unpublished data). Juvenile and adult delta smelt are generally found in the lower reaches of the Sacramento River downstream of Rio Vista, the San Joaquin River downstream of Mossdale, and within Suisun Bay where salinity typically ranges from approximately 2 to 7 ppt (3,000 to 7,000 µS/cm).

During winter, adult delta smelt migrate upstream into the freshwater channels and sloughs of the central Delta and lower reaches of the Sacramento and San Joaquin rivers to prepare for spawning. Spawning occurs between January and July; peak spawning occurs during April through mid-May (Moyle 2002). Spawning occurs in shallow edge waters within the Delta channels and sloughs, such as Cash, Lindsay, and Barker sloughs, and the lower reaches of the Sacramento River. Delta smelt have adhesive eggs, which are broadcast over the bottom and other hard substrate, including rocks, woody material, and aquatic vegetation (Wang 1986). Eggs remain attached to the substrate during the 12-14 day incubation period. After hatching, the larval delta smelt drift (planktonic) with river and tidal currents. Larval delta smelt feed on zooplankton during spring and early summer. As the larval and early juvenile delta smelt grow, they are distributed farther downstream within low-salinity habitats of the central Delta and Suisun Bay, where they continue to rear through summer and fall (Moyle 2002; Dege and Brown 2004).

Status

Juvenile and adult delta smelt are most abundant within the south Delta in the vicinity of the Proposed Action during fall, winter, and spring, as reflected in SWP and CVP fish salvage records. Juvenile and adult delta smelt do not typically inhabit the south Delta during summer when water temperatures exceed approximately 25°C (77°F) (Mager et al. 2004). Adult delta smelt potentially spawn within the Delta and the lower reaches of the Sacramento and San Joaquin river systems during late winter and spring. Delta smelt larvae occur within the Delta during spring. As a result of their life history and geographic distribution, delta smelt may occur seasonally within Victoria Canal as larvae, juveniles, and adult life stages.

Data from the DFG 20-mm Delta Smelt Surveys shows that 2004-2005 densities in Rock Slough, Old River, and Victoria Canal are relatively low compared to densities throughout the 1995-2005 period of the survey, with zero densities for smelt recorded at both the Old River and Rock Slough sampling stations for 2005. Data from the 2005 Delta Smelt Larval Surveys, an additional survey implemented by DFG starting in 2005 to more closely monitor the presence and fluctuations of the delta smelt population, showed that delta smelt represented 1% of the total catch for all stations (stations are the same as surveyed for the 20-mm Delta Smelt Surveys) based on a catch-per-unit effort ratio, highlighting the concern of the decline in smelt population when contrasted with historical abundance data. Catch data from the 2005 DSLS showed that no delta smelt were sampled at the Old River, Middle River, Rock Slough, and Victoria Canal survey sites.

Winter-run Chinook Salmon

Winter-run Chinook salmon are listed as an endangered species under both the California and Federal ESA. NMFS has recently proposed downgrading the listing status of winter-run Chinook salmon from endangered to threatened status under the Federal ESA.

Life History

Winter-run Chinook salmon are an anadromous species spending 1–3 years within the ocean before migrating upstream into the Sacramento River to spawn. Juvenile winter-run salmon (smolts) migrate downstream through the lower reaches of the Sacramento River, Delta, Suisun Bay, and San Francisco Bay during winter and early spring (December through May) as they migrate from the freshwater spawning and juvenile rearing areas into the coastal marine waters of the Pacific Ocean. Juvenile winter-run Chinook salmon may migrate from the Sacramento River into the central Delta, passing into the Delta through the Delta Cross-Channel, Georgiana Slough, or Three Mile Slough during their downstream migration.

Status

Juvenile winter-run Chinook salmon may migrate from the Sacramento River into the central Delta during their downstream migration; the central Delta serves as a temporary foraging area and migration pathway during the winter and early spring migration period. The occurrence of juvenile winter-run Chinook salmon within the central Delta would be expected during late fall through early spring when water temperatures within the Delta would be suitable for juvenile winter-run Chinook salmon migration.

Although the majority of adult winter-run Chinook salmon migrate upstream within the mainstem Sacramento River, there is a probability, although low, that adults may migrate into the central Delta. The occurrence of adult winter-run Chinook salmon within the central Delta, although expected to be very low, would be limited to the winter and early spring period of adult upstream migration.

Central Valley Spring-run Chinook Salmon

Spring-run Chinook salmon are listed as a threatened species under both the California and Federal ESAs.

Life History
Spring-run Chinook salmon are an anadromous species, spawning in freshwater and spending a portion of their life cycle within the Pacific Ocean. Adult spring-run Chinook salmon migrate upstream into the Sacramento River system during spring, but are sexually immature. Adult spring-run Chinook salmon hold in deep cold pools within the rivers and tributaries over the summer prior to spawning. Spawning occurs during late summer and early fall (late August through October). A portion of the fry appears to migrate downstream soon after emerging where they rear within the lower river channels, and potentially within the Delta, during winter and spring. After emergence, a portion of the spring-run Chinook salmon fry remain resident in the creeks and rear for a period of approximately one year. The juvenile spring-run Chinook salmon that remain in the creeks migrate downstream as yearlings primarily during late fall, winter, and early spring with peak yearling migration occurring in November (Hill and Weber 1999). The downstream migration of both spring-run Chinook salmon fry and yearlings during late fall and winter typically coincides with increased flow and turbidity associated with winter stormwater runoff.

Status
Adult and juvenile spring-run Chinook salmon primarily migrate upstream and downstream within the mainstem Sacramento River. Juvenile spring-run Chinook salmon may migrate from the Sacramento River into the central Delta during their downstream migration and may also use the central Delta as a temporary foraging area and migration pathway during the winter and early spring migration period. The occurrence of juvenile spring-run Chinook salmon within the Delta would be expected to occur during late fall through early spring when water temperatures within the Delta would be suitable for juvenile spring-run Chinook salmon migration.

Although the majority of adult spring-run Chinook salmon migrate upstream within the mainstem Sacramento River, there is a probability, although low, that adults may migrate into the central Delta. The occurrence of adult spring-run Chinook salmon within the central Delta, although expected to be very low, would be limited to the late winter and spring period of adult upstream migration.

Central Valley Steelhead
Central Valley steelhead have been listed as a threatened species under the Federal ESA. Steelhead are not listed for protection under the California ESA.

Life History
Central Valley steelhead, like Chinook salmon, are anadromous. Adult steelhead spawn in freshwater and the juveniles migrate to the Pacific Ocean where they reside for a period of years before returning to the river system to spawn. Steelhead that do not migrate to the ocean, but spend their entire life in freshwater, are known as resident rainbow trout.

Adult steelhead migrate upstream during fall and winter (September through approximately February), with steelhead migration into the upper Sacramento River typically occurring during fall and adult migration into lower tributaries typically occurring during late fall and winter. Spawning typically occurs during winter and spring (December–April), with the majority of spawning activity occurring during January and March. Unlike Chinook salmon that die after spawning, adult steelhead may migrate downstream after spawning and return to spawn in subsequent years.

Downstream migration of steelhead smolts typically occurs during late winter and early spring (January–May), as reflected in the seasonal occurrence in CVP and SWP fish salvage. The seasonal timing of downstream migration of steelhead smolts may vary in response to a variety of environmental and physiological factors including changes in water temperature, changes in stream flow, and increased turbidity resulting from stormwater runoff.

Status

Juvenile steelhead migrate from the upstream spawning and rearing areas through the Delta, Suisun Bay, and San Francisco Bay during the winter and early spring migration period. Steelhead do not spawn within the Delta; however, juvenile steelhead may temporarily forage within the south and central Delta during emigration and hence they would be present within the vicinity of CCWD intake structure and fish screen during the seasonal migration period. The occurrence of juvenile steelhead within the Delta would be expected during the winter and early spring migration period, when water temperatures within the Delta would be suitable for juvenile steelhead migration.

Although the majority of adult steelhead migrate upstream within the mainstem Sacramento River, adult steelhead migrate through the central Delta into the Mokelumne and Consumnes rivers and would be present seasonally within the vicinity of the proposed CCWD intake structure and fish screen. The occurrence of adult steelhead within the central Delta would be limited to the winter and early spring period of adult upstream migration.

Pacific Salmon (including Fall-run and Late Fall-run Chinook Salmon)

Fall-run Chinook salmon are the most abundant species of Pacific salmon inhabiting the Sacramento and San Joaquin river systems. Fall-run Chinook salmon are not listed for protection under either the California or Federal ESA, but are a California Species of Special Concern and a Federal Species of Concern. In addition to fall-run Chinook salmon, the group of Pacific salmon is comprised of late fall-run Chinook salmon (which are not listed under either the California or Federal ESA), spring-run Chinook salmon, and winter-run Chinook salmon, which are discussed above. Although fall-run and late fall-run Chinook salmon are not listed for protection under the ESA, they are included in this analysis because they occur seasonally within the central Delta within the area identified as EFH for Pacific salmon.

In 1998, NMFS proposed that Central Valley fall-run and late fall-run Chinook salmon be listed under the Federal ESA as a threatened species. Based upon further analysis and public comment, NMFS decided that fall-run and late fall-run Chinook salmon did not warrant listing but should remain a Federal Species of Concern for further analysis and evaluation.

Life History
Fall-run Chinook salmon are anadromous, with spawning and juvenile rearing occurring within freshwater rivers and streams and juvenile and adult rearing occurring within coastal marine waters. Adult fall-run Chinook salmon migrate from the coastal marine waters upstream through San Francisco Bay, Suisun Bay, and the Delta during late summer and early fall (approximately late July–early December). Adult fall-run Chinook salmon migrate up rivers to areas characterized by suitable spawning conditions, which include the availability of clean spawning gravels, cold water (less than 56° F), and relatively high water velocities. Fall-run Chinook salmon spawning is similar to that of other Chinook salmon with the creation of redds where eggs are deposited and incubate. A portion of the fry population migrate downstream soon after emergence, where they rear within the lower river channels; the Delta, including the area adjacent to the proposed CCWD intake structure and fish screen location; and Suisun Bay during spring. A small proportion of the fall-run Chinook salmon juveniles may, in some systems, rear through summer and fall, migrating downstream during the fall, winter, or early spring as yearlings.

Late fall-run Chinook salmon have a similar life history as described for other Pacific salmon, but migrate into rivers later in fall and spawn in December and January.

Status
Adult and juvenile Chinook salmon primarily migrate upstream and downstream within the mainstem Sacramento, San Joaquin, and Mokelumne rivers, and therefore both adult and juvenile Chinook salmon migrate through central Delta channels. Juvenile Chinook salmon, particularly in the fry stage (fish generally 1.5 to 3 inches in length), may rear within the Delta and Suisun Bay, foraging along channel and shoreline margins and lower velocity backwater habitats. The occurrence of juvenile fall-run Chinook salmon within the central Delta would be expected to occur during late winter (fry) through early spring (smolts), when water temperatures within the central Delta would be suitable for juvenile Chinook salmon migration. The seasonal occurrence of juvenile Chinook salmon (all runs) observed within CVP and SWP fish salvage reflects the seasonal distribution of Pacific salmon within the CCWD project area. The occurrence of adult fall-run Chinook salmon within the south Delta in the vicinity of the proposed CCWD intake structure and fish screen would be limited to the fall period (primarily September-December) of adult upstream migration.

Other Special-Status Species

Green Sturgeon
The green sturgeon is a Federal Candidate for listing as a threatened species and a California Species of Special Concern. San Francisco Bay, San Pablo Bay, Suisun Bay, and the Delta support the southernmost reproducing population of green sturgeon. Indirect evidence indicates that green sturgeon spawn mainly in the Sacramento River in March through July, peaking from mid-April to mid-June. Juveniles migrate to sea before 2 years of age, primarily during summer and fall. The occurrence of green sturgeon in fishery sampling and CVP/SWP fish salvage is extremely low and therefore has not been used to represent the seasonal period of juvenile movement through the Delta. They

remain near estuaries at first but may migrate considerable distances as they grow larger (State Water Resources Control Board 1999).

Longfin Smelt
The longfin smelt, a Federal Species of Concern and a California Species of Special Concern, is a small, planktivorous fish found in several Pacific coast estuaries. Longfin smelt can tolerate a broad range of salinity concentrations, ranging from freshwater to seawater. Spawning occurs in fresh-to-brackish water over sandy-gravel substrates, rocks, or aquatic vegetation. In the Bay-Delta Estuary, the longfin smelt life cycle begins with spawning in the lower Sacramento and San Joaquin rivers, the Delta, and freshwater portions of Suisun Bay. Spawning may take place as early as November and may extend into June, with the peak spawning period occurring from February to April. The eggs are adhesive, and after hatching, the larvae are carried downstream by freshwater river flow to nursery areas in the lower Delta and Suisun and San Pablo bays. Adult longfin smelt are found mainly in Suisun, San Pablo, and San Francisco Bays, although their distribution is shifted upstream in years of low outflow (State Water Resources Control Board 1999). The seasonal occurrence of longfin smelt in CVP and SWP salvage is considered to be representative of the seasonal periods when juvenile and adult longfin smelt would be in the vicinity of the proposed CCWD intake structure and fish screen.

Like delta smelt, longfin smelt spawn adhesive eggs in river channels of the eastern Estuary and have larvae that are carried to nursery areas by freshwater outflow; otherwise, the two species differ substantially. A measurable portion of the longfin smelt population consistently survives into a second year. During the second year of life, they inhabit the San Francisco Bay and, occasionally, the Gulf of the Farallones. Therefore, longfin smelt are often considered anadromous (State Water Resources Control Board 1999).

Sacramento Splittail
The Sacramento splittail is a Federal Species of Concern and a California Species of Special Concern. The Sacramento splittail is a large minnow endemic to the Bay-Delta Estuary. Although the Sacramento splittail is generally considered a freshwater species, the adults and sub-adults have an unusually high tolerance for saline waters (up to 18 ppt [24,000 µS/cm]) for a member of the minnow family. Spawning, which seems to be triggered by increasing water temperatures and day length, occurs over beds of submerged vegetation in slow-moving stretches of water (such as flooded terrestrial areas and dead-end sloughs). Adults spawn from February through May in the Delta, upstream tributaries, Napa Marsh, Napa and Petaluma rivers, Suisun Bay and Marsh, and the Sutter and Yolo bypasses. Hatched larvae remain in shallow, weedy areas until they move to deeper offshore habitat later in summer. Young splittail may occur in shallow and open waters of the Delta and San Pablo Bay, but they are particularly abundant in the northern and western Delta (State Water Resources Control Board 1999). The seasonal occurrence of juvenile splittail in CVP and SWP fish salvage is representative of the periods when juvenile splittail would potentially inhabit the region of the south Delta in the vicinity of the proposed CCWD intake structure and fish screen.

River Lamprey

The river lamprey is a Federal Species of Concern and a California Species of Special Concern. The river lamprey has been captured mostly in the upper portion of the Sacramento-San Joaquin estuary and its tributaries in California. The ammocoetes, transforming adults, and newly transformed adults have been collected in plankton nets in Suisun Bay, Montezuma Slough, and Delta sloughs (DFG unpublished data). The presence of river lamprey in collections made above dams, such as upper Sonoma Creek, indicate that some river lamprey may spend their entire life in fresh water. The adults are parasitic in California rivers; the most common prey are herring and salmon. River lampreys can apparently feed in either salt or fresh water.

Northern Anchovy

Northern anchovy is managed under the Coastal Pelagic Species Fishery Management Plan, and ranges from Cape San Lucas, Baja California, to Queen Charlotte Island, British Columbia. It is one of the most prolific fish in terms of numbers and biomass along the northeastern coastal waters of the Pacific Ocean. There are three subpopulations with the northern subpopulation only occurring in the estuary. This species can be the most abundant species in San Francisco Bay, constituting 85% of all fish. Northern anchovy eggs have been observed in Suisun Bay during summer, as seawater intruded up the river. An individual anchovy can spawn 2 to 3 times a year. Postlarvae swim near the surface and are most abundant in San Francisco Bay and San Pablo Bay. As the salt wedge moves up to the estuary in summer, anchovy larvae can be found in Suisun Bay and the lower Delta. The juveniles use inshore bays and estuaries as their nursery ground, while the offshore waters are adult recruitment areas. Given the typical salinity gradient in the Delta, it is highly unlikely that northern anchovy would be found in Victoria Canal.

Pacific Sardine

Pacific sardine is managed under the Coastal Pelagic Species Fishery Management Plan, and is a schooling pelagic species distributed from northern Mexico to southeastern Alaska. Each year, beginning in their second summer, sardines migrate northwards early in summer and travel south again in fall. They form large schools (up to 10 million individuals) and are often associated with anchovy. Main spawning areas are off the coast of southern California. Similar to northern anchovy, there are three stocks, with the northern stock entering the estuary. Given the typical salinity gradient in the Delta, it is highly unlikely that Pacific sardine would be found in Victoria Canal.

Starry Flounder

Covered under the Pacific Coast Groundfish Management Plan, starry flounder occur from the coast off Santa Barbara to Alaska. They occur over sand, mud, and gravel bottoms in coastal ocean waters, bays, sloughs, and even fresh water. Starry flounder are one of the most numerous fishes in San Francisco Bay and can occur in Old River. Small starry flounder eat mostly worms and small crustaceans. As they grow, they eat progressively more crabs, clams, and fish. Males spawn at the end of their second year and females in their third year. The spawning season extends from November through February with greatest activity in December and January.

4.3.2 Environmental Consequences

4.3.2.1 Methods and Assumptions

A fishery and aquatic resources impact assessment was performed to evaluate the potential effects of construction and operation of the Proposed Action on fish and macroinvertebrates inhabiting Victoria Canal and the Bay-Delta estuary. The impact analysis for fishery and aquatic resources was based on consideration of: (1) construction activities and the area anticipated to be disturbed, (2) existing habitat conditions in the project area, (3) known or presumed occurrence of protected species near the existing CCWD intakes and the proposed intake location in Victoria Canal, and (4) hydrologic modeling combined with biological information on screening efficiencies and fish distribution and densities to evaluate and minimize fish entrainment and impingement mortality. This section summarizes the methods used in the analysis; see Appendix E-1, "Action Specific Implementation Plan," for a detailed description of methods and assumptions.

The CVP is operated in compliance with two key biological opinions (NMFS 2004, USFWS 2005a) on the long-term CVP and SWP Operations Criteria and Plan (OCAP). CCWD operates its system in accordance with several other biological documents (NOAA Fisheries 1993, USFWS 1993, DFG and CCWD 1994, USFWS 2005b). To comply with NEPA, CEQA, and ASIP requirements, analyses of CVP and CCWD operations in the Alternative Intake Project EIR/EIS and ASIP focus on all direct, indirect, and cumulative effects associated with the Proposed Action. Any biological impacts associated with existing and future CVP and SWP operations not affected by the Proposed Action, however, have already been addressed in the referenced OCAP biological opinions, are not part of the Proposed Action, and are not evaluated in the EIR/EIS or ASIP as part of the Proposed Action.

The evaluation of potential fishery and aquatic resource impacts is based, in part, on hydrologic modeling results describing water diversion operations over a range of environmental/hydrologic conditions (see EIR/EIS Appendix C, "Hydrology and Water Quality," for full details on the modeling methodology and results). The seasonal timing and magnitude of water diversions from the Delta may affect aquatic species directly through entrainment and/or impingement, or indirectly through changes in hydrologic conditions and aquatic habitat. Hydrologic modeling results provide the technical foundation for assessing adverse effects of diversion operations on fish species and their habitat within the Bay-Delta estuary. The assessment relies on a comparative analysis of operational and resulting environmental conditions within the estuary under assumed baseline operations and with the Proposed Action (including both existing conditions and future cumulative conditions).

Results of modeling[1] for a 72-year hydrologic period were used to investigate the potential effects of the Proposed Action on habitat conditions supporting fish and macroinvertebrates within the Delta. Comparative analysis of monthly hydrologic

[1] CALSIM II, DSM2, and the CCWD Solver Model were used to model the Proposed Action and alternatives. See EIR/EIS Appendix C-2 for a complete description of modeling methodology.

modeling results between the baseline conditions and the project alternatives for current level of demand and future level of demand (2020) was conducted to assess changes in potential entrainment and impingement losses. Modeling output evaluated as part of the fisheries analysis included:

- water diversion export operations at the SWP Banks Pumping Plant and CVP Tracy Pumping Plant, as well as local CCWD diversions at the Rock Slough intake, Old River intake, and the proposed alternative intake in Victoria Canal;
- hydrologic conditions in the Delta, as reflected by calculations of Georgiana Slough flows, Delta cross-channel flows, total Delta inflow and outflow, and Yolo Bypass flows;
- river flows including Sacramento River flow, Mokelumne River inflow to the Delta, Calavaras River flows, San Joaquin River flow at Vernalis, and San Joaquin River inflow to the Delta;
- export/inflow ratio; and
- location of the 2-part-per-thousand salinity isohaline (X2).

Compliance with the existing biological documents for the Los Vaqueros Project[2] is included as part of the Proposed Action and all other alternatives. Hydrologic modeling using CALSIM II for existing and future conditions includes operations to meet terms of the biological opinions. With the Proposed Action, CCWD will operate consistent with these existing biological opinions to minimize fisheries impacts during spring. The biological opinions specify:

- **No-Fill Period**: CCWD will avoid filling Los Vaqueros Reservoir for 75 days each spring. The default no-fill period is March 15 through May 31.
- **No-Diversion Period**: CCWD will avoid Delta diversions for 30 days each spring, concurrent with part of the no-fill period. The default no-diversion period is the month of April.
- **Emergency Storage**: The no-fill and no-diversion restrictions are in effect only when Los Vaqueros Reservoir is above emergency storage levels. Emergency storage is defined as 70,000 acre-feet in below-normal, above-normal, and wet years, and 44,000 acre-feet in dry and critical years.
- **X2 Restrictions**: Los Vaqueros Reservoir may be filled when X2 is west of Chipps Island in February through May, and Collinsville in January, June, and December. X2 restrictions on filling in December only exist when adult delta smelt are present at the Old River intake.

[2] CCWD's operations are governed in part by three biological documents: (a) 1993 NOAA Fisheries Biological Opinion for winter-run Chinook salmon, (b) 1993 USFWS Biological Opinion for Delta smelt, and (c) 1994 Memorandum of Understanding between DFG and CCWD regarding the Los Vaqueros Project.

CCWD has worked with the fisheries agencies annually since Los Vaqueros Project operations were initiated to adaptively manage the timing of the no-fill/no-diversion period. The operational rules described above were developed before the fish screen at the Old River pump station went into service in 1998. Since then, monitoring has demonstrated that the Old River fish screen is working well and protecting fish as designed. CCWD continues to work with the fisheries agencies on an annual basis to develop plans to implement the no-fill/no-diversion periods to more effectively protect fish from April through June.

The impact analysis below discusses both: 1) potential short-term impacts associated with construction activities, and 2) potential long-term impacts associated with facility operations. The analysis evaluates the potential direct, indirect, and cumulative impacts to fishery and aquatic resources resulting from implementation of the Proposed Action. Cumulative impacts are embodied in the analysis of monthly hydrologic modeling results (see EIR/EIS Appendix C, "Hydrology and Water Quality") and therefore are included in analyses conducted for future conditions.

4.3.2.2 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect related to Delta fisheries and aquatic resources if it would:

- directly or indirectly reduce the growth, survival, or reproductive success of individuals of species listed, or proposed for listing, as threatened or endangered under the California or Federal ESAs;
- directly or indirectly reduce the growth, survival, or reproductive success of substantial portions of candidate species populations, or Species of Special Concern, or regionally important commercial or game species; or
- reduce the quality and quantity of important and/or unique habitat for fish species or their prey that would adversely impact the ability of the species to successfully reproduce and maintain self-supporting populations.

4.3.2.3 No-Action Alternative

The No-Action Alternative would result in no changes to the existing facilities or their operations. Diversions would continue as they have in the past, primarily from the Old River intake, which is equipped with a state-of-the-art positive barrier fish screen, and from the existing Rock Slough diversion point, which is unscreened. Fish entrainment and impingement losses would continue to occur as they have in the past based on the relative use of each of the intakes and the densities of various fish species and lifestages in the area that would be vulnerable to direct losses resulting from diversion operations. Under future levels of CCWD demand, however, there would be an expected increase in direct losses from the Old River and Rock Slough intakes. No additional impacts would occur to special-status species or their habitats.

The CVPIA includes a requirement for Reclamation to develop and implement a program to mitigate for fishery impacts resulting from the operation of the Contra Costa Canal Pumping Plant No. 1.[3] This program may include a fish screen at Rock Slough, modified operations, or other measures to mitigate fishery impacts. The timing and elements of the program, and any environmental requirements associated with it, are highly uncertain and no funding has been appropriated for its implementation. For the purposes of modeling future conditions, this analysis has conservatively assumed that there is no fish screen at Rock Slough. If a fish screen were to be installed, modeling results would predict lower entrainment losses at the Rock Slough Intake and the potential for new impingement losses. This would reduce some of the entrainment benefits the modeling analysis predicts resulting from the Proposed Action's reductions in Rock Slough pumping (see Section 4.3.2.4 below).

4.3.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

Construction of the positive barrier fish screen and intake structure associated with the Proposed Action is anticipated to result in temporary, localized changes in fishery habitat in the immediate vicinity of the Proposed Action on Victoria Canal. Construction of the intake would occur within a cofferdam, which contributes substantially to a reduction and avoidance of potential construction-related adverse impacts to water quality and fishery habitat. Installation of the cofferdam and excavation as part of site preparation would, however, result in temporary localized increases in turbidity and suspended sediment concentrations and may expose fish and macroinvertebrates to underwater sound pressure levels (e.g., noise) that may temporarily affect the behavior and local distribution of fish and macroinvertebrates in the immediate vicinity of the construction site. Installation and dewatering the cofferdam would also increase risks that fish may be trapped and stranded within the cofferdam during dewatering. These short-term localized construction-related impacts to fishery resources and their habitat are described below.

Operation of the proposed water intake structure has the potential to directly and indirectly affect fishery resources and aquatic habitat within Victoria Canal and the Bay-Delta estuary through (1) entrainment or impingement of fish eggs and larvae that are not effectively excluded from the diversion by the positive barrier fish screen, and (2) changes in hydrologic conditions within various portions of the estuary as a result of Proposed Action water diversions, and the potential for resultant changes to flows and other hydrologic conditions affecting quality and availability of habitat for fish and other aquatic resources inhabiting the estuary. These potential adverse impacts of water diversion operations on fish and aquatic resources are discussed below.

Table 4.3-3 summarizes potential effects on fish.

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[3] P.L 102-575 Sec 3406(b)(5)

Table 4.3-3
Summary of Potential Effects on Fish Species by Project Element

Project Element	Mechanism for Effect (D = Direct; I = Indirect)	Location/Area of Effect	Life History Stage	Timing/Duration
Install cofferdam, fish screen, and intake	Modification of 2.23 acres of aquatic habitat and function (D)	Victoria Canal at new intake site; 2.23 acres	All life stages	Permanent
	Noise from pile driving (D)	Victoria Canal 1,000 ft upstream and downstream of new intake site	Juveniles and Adults	Up to 60 days
	Sediment resuspension, turbidity, and contamination; and/or chemical spill (D)	Victoria Canal 1,000 ft upstream and downstream of new intake site	All life stages	Up to 60 days
	Fish mortality from dewatering behind cofferdam (D)	Behind cofferdam at new intake site	All life stages, but primarily juveniles	One time, species and life history stage dependent on timing of cofferdam construction.
	Fish mortality if cofferdam overtopped; fish rescue implemented (D)	Behind cofferdam at new intake site	All life stages, but primarily juveniles	Exposure during floods only; unknown
Remove cofferdam	Divers, resuspension of sediments, turbidity, and contaminants (D)	Victoria Canal 1,000 ft upstream and downstream of new intake site	All life stages, but primarily juveniles	Up to 30 days
Re-operate diversions with new Victoria Canal intake	Net reduction in entrainment and impingement mortality at CCWD intakes (D, I)	Cumulative at proposed Victoria Canal, Old River, and Rock Slough intake sites	Juvenile salmonid migration; delta smelt eggs, larvae, juveniles, and adults; early life stages of most fish	Permanent, but operations are always modifiable
	Modification of hydraulic conditions at fish screen and potential predation (D, I)	Proposed Victoria Canal, Old River, and Rock Slough intake sites	All life stages	Permanent, but operations are always modifiable
	Modification of hydraulic conditions throughout the Delta (D, I)	Central and south Delta, primarily near CCWD intakes	All life stages	Permanent, but operations are always modifiable
Periodic maintenance dredging	Sediment resuspension, turbidity, and contamination; and/or chemical spill (D)	Victoria Canal 1,000 ft upstream and downstream of new intake site	All life stages, but primarily juveniles	Up to 30 days on an as-needed basis, but may be necessary only once every 7 or more years based on Old River intake

IMPACT 4.3-a (Alternative 1)

Intake Construction and Increased Sedimentation, Turbidity, and Contaminants. *In-water construction activities would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Victoria Canal at the construction site, which could increase exposure to various life stages and species of fish. The suspended sediment, turbidity, and other contaminant concentrations and duration of exposure to fish are expected to be below levels that cause adverse effects. The potentially adverse effects would be temporary and localized in the immediate vicinity of the new intake. These impacts on fishery habitat and aquatic resources would be* ***less than significant****.*

To provide additional depth for the fish screen, excavation may be required in Victoria Canal in the immediate vicinity of the intake in an area up to 50,000 square feet to depths within 1-2 feet of the existing channel bottom. The need for excavation would be determined during final design based on the results of the field data. Pre-construction excavation and cofferdam construction would temporarily increase turbidity levels within a localized area of Victoria Canal. The area temporarily affected by sedimentation and turbidity is expected to be approximately 500 feet wide and 500 feet long, varying in size and shape depending on tidal conditions and the channel width (based on experience at recently constructed fish screens within the Sacramento River). It has been conservatively assumed that the impact could affect habitat up to 1,000 feet upstream or downstream of the intake site on Victoria Canal. These effects would occur during the approximately 60-day period at the beginning of construction and during the specified work window, when construction activity may disturb sediments and increase turbidity during construction, or during any maintenance dredging, which is expected to be minimal and infrequent.

Construction activity would increase exposure of various life stages and species of fish to temporary turbidity, suspended sediment, and potentially other contaminant increases. Migration of Chinook salmon and steelhead through the construction area may be affected through a behavioral change and avoidance of areas with elevated contaminant concentrations, depending on the seasonal period when site preparation and installation/removal of the cofferdam occurs. Site preparation and installation of the cofferdam is most likely to occur during lower managed flow periods in late spring, summer, or early fall; these are seasonal periods when the likelihood of adverse effects to Chinook salmon and steelhead migration and critical habitat is substantially reduced. Resident fish species inhabiting Victoria Canal and the Bay-Delta estuary are frequently exposed to naturally occurring increased suspended sediment concentrations, typically have high tolerance, and would be able to avoid temporary, localized exposure to a suspended sediment plume, thereby reducing the risk of adverse impacts.

A substantial body of scientific information exists regarding the response of juvenile and adult Chinook salmon, steelhead, and other fish and macroinvertebrates to elevated suspended sediment concentrations and turbidity (Hanson et al. 2004). Wilber and Clarke (2001), Clark and Wilber (2000), Newcombe and Jensen (1996), Burton (1985), Gregory and Levings (1996), Johnston (1981), Newcombe and MacDonald (1991), Newell et al. (1998), O'Connor et al. (1976), Peddicord et al. (1976), Peddicord and McFarland (1978), Servizi and Martens (1991), Sherk (1971), Sherk et al. (1974, 1975), Sigler et al. (1984), Stern and Stickle (1978), Whitman et al. (1982), and other investigators have synthesized and reviewed the available scientific information on the effects of suspended sediments on various species and life stages of fish and macroinvertebrates. Phillips (1970) reported reduced feeding activity by adult Chinook salmon exposed to suspended sediment concentrations of 25 mg/l over a 4-hour exposure period. Newcombe and Flagg (1983) reported 50% mortality for juvenile Chinook salmon after a 36-hour exposure to volcanic ash at a concentration of 9,400 mg/l. Newcombe and Flagg (1983) also reported that adult Chinook salmon experienced no mortality or apparent adverse effects after a 24-hour exposure to volcanic ash at a suspended sediment concentration in excess of 39,000 mg/l.

The extensive body of information available on suspended sediment and turbidity effects on various life stages of Chinook salmon and many other fish and macroinvertebrate species has been used in determining potential impacts to aquatic species inhabiting Victoria Canal and other areas within the estuary. The potential for adverse effects resulting from suspended sediment and/or turbidity exposure is a dose response that varies depending on the magnitude of the concentration of sediments, the duration of exposure, the type of material, the species and life stage of the organism, and other factors.

The suspended sediment and turbidity concentrations and duration of exposure for Chinook salmon, steelhead, and other species to conditions within Victoria Canal during construction of the proposed intake structure and fish screen are expected to be below levels reported in the literature that cause adverse effects. The potentially adverse effects would be temporary and localized. This impact would be less than significant. Nonetheless, mitigation measures are proposed to further minimize this effect.

IMPACT 4.3-b (Alternative 1)	**Underwater Sound Pressure Impact from Cofferdam Installation.** *During installation of the cofferdam, exposure of sensitive fish to underwater sound pressure levels may result in behavioral avoidance or migration delays for Chinook salmon, delta smelt, and other fish species. This temporary impact would be* ***less than significant****.*

Installation of the cofferdam may be performed using either a vibration hammer and/or percussion hammer, depending on substrate conditions. Information from the scientific literature and through field observations at other construction sites within the Bay-Delta estuary indicates that exposure of sensitive fish species to underwater sound pressure levels exceeding approximately 180 decibels (dB) may result in sublethal or lethal effects. Exposure of sensitive fish to underwater sound pressure levels exceeding approximately 160 dB may result in behavioral avoidance or migration delays. Because Victoria Canal serves as the migration corridor for juvenile and adult Chinook salmon migrating to and from San Joaquin River tributaries and also serves as seasonal habitat for delta smelt (DFG 2005), installation of the cofferdam may need to be conducted when populations of special-status species in Victoria Canal are low or by using techniques that minimize sound pressure impacts to the extent feasible. This impact would be less than significant, but mitigation is proposed to further minimize potential effects.

IMPACT 4.3-c (Alternative 1)

Potential Chemical Spill During Construction. *Various hazardous materials, such as gasoline, oil, grease, concrete, and a variety of other chemicals and substances, would be used during construction of the Proposed Action. These materials could be harmful to fishery and aquatic resources if a construction-related chemical spill releases such materials into the aquatic environment. This impact would be* ***potentially significant.***

Gasoline, oil, grease, concrete, and a variety of other chemicals and substances would be used during construction of the Proposed Action. Installation of the cofferdam provides a number of environmental benefits for reducing the potential risk of exposure to elevated concentrations of suspended sediments and these types of chemicals typically used during construction. Nonetheless, the major construction activities could result in a chemical spill that could be a potentially significant adverse effect to special-status species and their habitats.

Chemical spills at the pipeline under-crossing of Old River are highly unlikely as the pipeline is proposed to be buried at least 50 feet below Old River under the micro-tunneling option and 5-10 feet below Old River with the over-the-levee option. There would be a minimal risk of impact to fish.

IMPACT 4.3-d (Alternative 1)

Potential Fish and Macroinvertebrate Stranding During Dewatering of the Cofferdam. *Dewatering of the cofferdam associated with intake configuration has the potential to strand fish and macroinvertebrates during the dewatering process. Because a small population of fish and macroinvertebrates could suffer very high mortalities, this impact would be* ***potentially significant****.*

Dewatering of the cofferdam associated with intake construction has the potential to strand fish and macroinvertebrates during the dewatering process. As water is lowered from the pool behind the cofferdam, the trapped fish and macroinvertebrates have no opportunity to escape. Without mitigation, all aquatic fish and most macroinvertebrates would be stranded and fish mortality would be 100%. Because stranded fish and macroinvertebrates could suffer substantial mortality, this impact would be potentially significant.

IMPACT 4.3-e (Alternative 1)

Aquatic Habitat Loss at Intake Structure Site Along Victoria Canal Shoreline. *The proposed fish screen and intake along the existing levee in Victoria Canal would physically exclude fish from a small area of existing habitat or modify the existing habitat. The volume of riprap proposed to be used is relative small and would cover 1.0 acre of existing riprap and 0.04 acre of natural bed. The rip-rapped area represents only a fraction of the available low-quality habitat for rearing fish. The loss of aquatic habitat is not likely to adversely affect any fish species, critical habitat for delta smelt or steelhead, or EFH within Victoria Canal and the Bay-Delta. For these reasons, this impact would be* ***less than significant.*** *(The increment of habitat loss, however, when considered with other habitat losses in the Delta, may cause a significant cumulative effect on fish and their habitats.)*

The fish screen and intake structure would be constructed along the existing levee in Victoria Canal and would exclude fish from a small area of existing habitat or modify the existing habitat (additional detail on the amount of habitat lost is discussed later in the mitigation section. Although various fish species are present in the area, the habitat within Victoria Canal at the proposed intake site is characterized by riprap-stabilized levees and silt and sand substrate. Tules and other emergent vegetation associated with shallow water habitat occur in the general area but are not abundant in the portion of the canal being considered for the intake. Aquatic habitat at the intake site is characterized as highly disturbed. The area is not used as spawning habitat by either Chinook salmon or steelhead, and is not known to be used by green sturgeon. (Changes in green and white sturgeon habitat quality and availability for spawning and juvenile rearing have not been quantified and there is considerable uncertainty as to how changes in spawning habitat have affected green sturgeon population viability.)

Adult and juvenile Chinook salmon and steelhead use the area as a migratory corridor and juvenile rearing area during downstream migration. Resident fish species inhabit the area year-round. Habitat in the vicinity of the proposed intake location is used by resident fish and macroinvertebrates for spawning, juvenile rearing, migration, foraging, and adult holding.

Installation and sealing of the cofferdam used for construction of the intake structure may require the use of riprap. Riprap has been used extensively within Victoria Canal (and throughout the Delta) in the general vicinity of the proposed intake site as part of bank and levee stabilization. Riprap may be used to help seal off the cofferdam in addition to providing bank stabilization within the immediate levee area where intake construction is occurring. Bank stabilization would be required for the intake structure to ensure that channel margin erosion does not occur in the area that may otherwise adversely affect the stability and reliability of the intake structure. Riprap would be required for the intake structure, and the addition of riprap would affect localized substrate conditions and localized habitat for both fish and benthic macroinvertebrates. The change in habitat quality and availability associated with replacing existing riprap with new riprap would be minimal (1.03 acres) and only an additional 0.05 acre of shallow-water tidal freshwater emergent habitat would be replaced with new riprap, which would silt over with time. An additional 1.15 acres of shallow-water tidal freshwater emergent habitat in front of the proposed intake would be excavated about 10-15 feet deeper and would no longer constitute shallow-water habitat. The volume of riprap proposed to be used is relatively small, and its use would be limited to the area immediately adjacent to the intake structure. Furthermore, fishery aquatic habitat conditions at the proposed intake site are currently degraded, and not unique.

Although the use of riprap as part of the Proposed Action has been identified as relatively minor on aquatic habitat characteristics, primarily because mostly existing riprap habitat would be affected, these changes to aquatic habitat as a result of construction of the proposed intake structure would incrementally contribute to cumulative adverse impacts to the quality and availability of aquatic habitat within the Bay-Delta estuary. Construction of the proposed intake would generally not alter habitat (channel sides and substrate) for resident or migratory species, with the exception that the footprint area for the intake structure would be removed as available aquatic habitat and some existing riprap levee would be further stabilized and protected. Specifically, construction of the fish screen would exclude fish from 100–200 feet of shoreline along the channel margin of Victoria Canal. Because the new fish screen would be set back from the existing bank, no surface area of aquatic habitat would be lost. The linear shoreline habitat where exclusion by the proposed fish screen would occur represents only a fraction of the available habitat in the south Delta and is of low quality for rearing salmon, steelhead, and other species. This loss of aquatic habitat is not likely to adversely affect Chinook salmon or steelhead populations, critical habitat for delta smelt or steelhead, or EFH for Pacific salmon within Victoria Canal and the Bay-Delta. No spawning or vegetated juvenile rearing habitat would be lost. The aquatic habitat is currently disturbed and is not unique. The increment of habitat loss, however, when considered with other habitat losses in the Delta, may cause a significant cumulative effect on fish and their habitats.

IMPACT 4.3-f (Alternative 1)

Hydraulic Modifications to Habitat in Victoria Canal and Adjacent to the Proposed Intake. *The new intake structure on Victoria Canal would modify hydraulic and habitat conditions adjacent to the intake structure and could attract predatory fish. These changes, however, would not represent a physical barrier or impediment to fish migration in Victoria Canal. The overall abundance of predatory fish inhabiting Victoria Canal in the vicinity of the Proposed Action is not expected to increase. This impact would be* ***less than significant****.*

The presence of an intake structure on Victoria Canal would contribute to localized changes in hydraulic conditions (e.g., water velocities, water depths, and water circulation periods), and the availability of cover habitat utilized by various fish species, including salmon, steelhead, and delta smelt. Changes in local hydraulics within the immediate area adjacent to the intake structure may affect sediment deposition and erosion patterns, thereby affecting benthic macroinvertebrate habitat in the localized area. Additionally, these changes in current patterns may affect localized movement patterns for fish and macroinvertebrates within the area. Changes in water velocities and current patterns associated with the intake structure, however, are not expected to be significant or represent a barrier or impediment to either adult or juvenile fish movement in Victoria Canal because the intake structure would be set back from the existing bank and would not extend into Victoria Canal.

Changes in habitat characteristics in the immediate vicinity of the proposed intake structure, including localized changes in current patterns, sediment deposition, and erosion; riprap as part of construction and channel bank stabilization; and the potential for the intake structure to attract predatory fish, have been identified, but would be less than significant. The intake structure would not result in velocity changes or changes to current patterns expected to result in a barrier to either upstream or downstream migration of fish within Victoria Canal. The intake structure would not affect channel cross-section and would not create a physical barrier or impediment to migration.

Physical structures, such as a water intake and diversion facility, modify physical habitat and cover that may attract various species of fish to the area. A number of predatory fish species, such as striped bass and largemouth bass, are attracted to water intake facilities where predation on juvenile fish may occur. The behavioral response and attraction of these predatory fish species to the proposed intake structure, or the potential risk of increased predation mortality, cannot be quantitatively assessed. Attraction of predatory fish to the intake structure may change the localized distribution of these individuals within the area immediately adjacent to the proposed intake structure, but are not anticipated to result in an increase in the overall abundance of predatory fish inhabiting Victoria Canal in the vicinity of the Proposed Action. The Proposed Action would also reduce diversions from unscreened Rock Slough, where predatory fish densities are high. Minimizing diversions from Rock Slough would be a beneficial effect because special-status species could presumably avoid predatory fish better in the on-river Victoria Canal and Old River channels than in the 4-mile-long, dead-end Rock Slough/Contra Costa Canal channel.

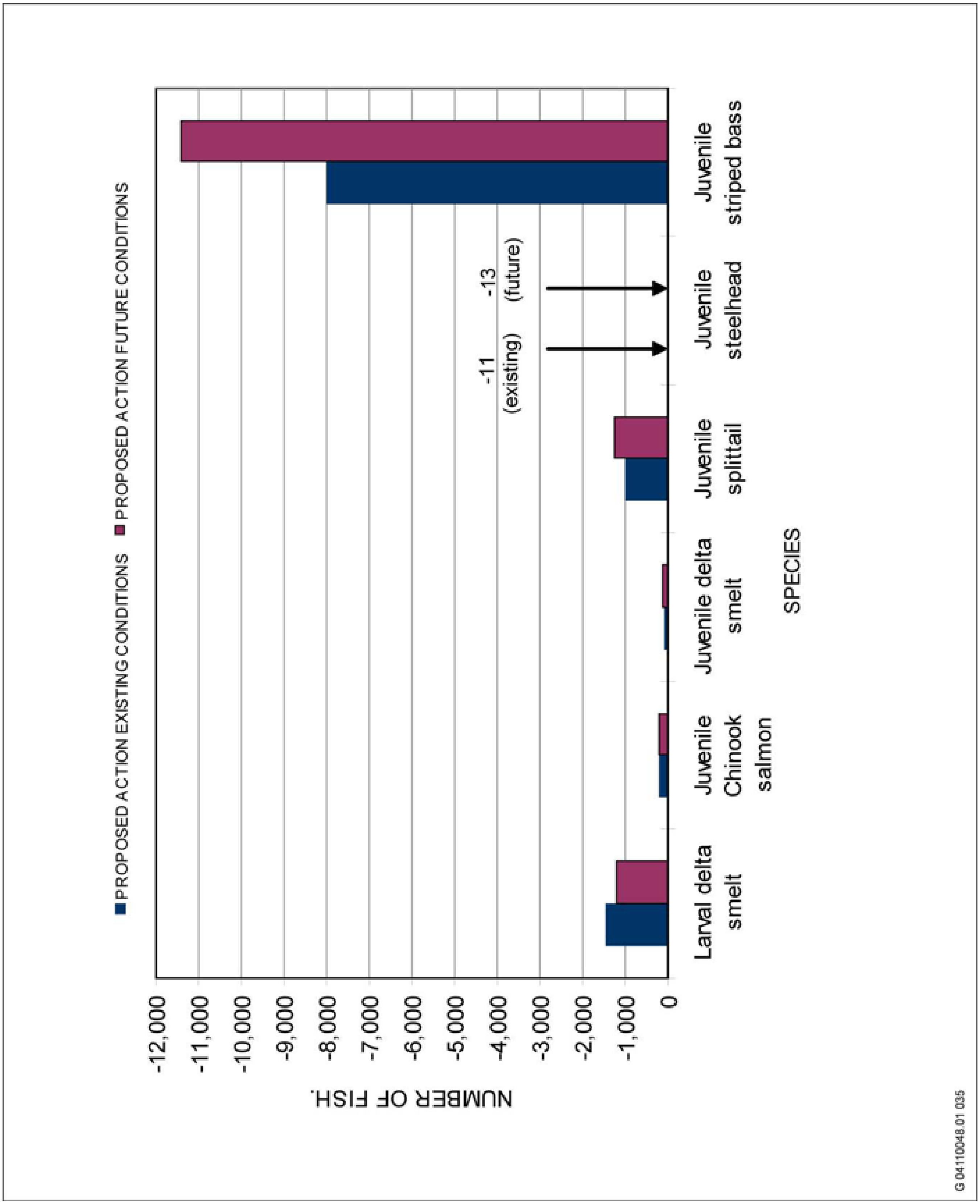
Based on these considerations, incremental changes in localized hydraulics and aquatic habitat characteristics, including predator attraction, are expected to be relatively minor. This impact would be less than significant.

IMPACT 4.3-g
(Alternative 1)

Fish Losses through Entrainment and Impingement at CCWD Intakes. *Installation and long-term operation of the positive barrier fish screen at the proposed intake site would reduce net entrainment and impingement losses of target life stages and species from CCWD diversion facilities. Relocation of some CCWD diversions to the proposed Victoria Canal intake would result in new entrainment and impingement losses at that site. However, the state-of-the-art positive barrier fish screen, reduced diversions at the unscreened Rock Slough intake and screened Old River intake, shifts in some CCWD diversions from spring to fall, and higher fish population densities in the greater Delta as compared to Victoria Canal would provide an overall benefit by reducing net entrainment and impingement losses at CCWD intakes under existing and future conditions. This would be a* ***beneficial*** *effect to all fish species with life stages subject to entrainment and impingement.*

Although relocation of some CCWD diversions to the new intake on Victoria Canal would result in some new entrainment and impingement losses at that site, a net environmental benefit (i.e., reduced net entrainment and impingement losses) would result from the combination of diversion through a state-of-the-art positive barrier fish screen, reduced diversions at the unscreened Rock Slough intake and screened Old River intake, shifts in timing of some CCWD diversions from spring to fall relative to existing conditions and the future baseline, and higher fish population densities subject to entrainment near the Rock Slough and Old River intakes as compared to in Victoria Canal, where diversions would increase. The Rock Slough intake is located in a dead-end slough in an area with greater fish densities and presumed higher fish survival rates than occurs in Victoria Canal, such that relocating diversions to Victoria Canal and Old River, which are both located on the banks of channels, is preferable even if the Rock Slough intake is screened or other fisheries mitigation measures for Rock Slough are taken in the future. Modeling results summarized in Exhibit 4.3-1 and Tables 4.3-4 and 4.3-5 estimate the entrainment/impingement losses for the Proposed Action.

The proposed Victoria Canal intake would be operated in coordination with CCWD's existing Delta intakes at Rock Slough, Old River, and Mallard Slough. The Rock Slough intake is currently unscreened. Operations modeling of the Proposed Action showed diversions at the unscreened Rock Slough intake would be reduced. Relocating some portion of diversions from Rock Slough to Old River or the Alternative Intake could directly contribute to reduced vulnerability of fish to entrainment mortality at the unscreened diversion.



Note: Negative numbers represent a net reduction in entrainment and impingement.
Source: EDAW 2005

Overall Net Benefit to Entrainment/Impingement Assuming the Proposed Action

EXHIBIT 4.3-1

EDAW

Table 4.3-4
Index of Estimated Net Entrainment/Impingement Losses for the Proposed Action (250-cfs diversion and existing conditions) Compared to Existing Conditions

Taxa	Rock Slough	Old River	Victoria Canal	Overall Net Change
Larval delta smelt	-318	-2,144	1,009	-1,454
Juvenile Chinook salmon	-204	-67	48	-223
Juvenile delta smelt	-53	-51	24	-81
Juvenile splittail	-984	-182	153	-1,014
Juvenile steelhead	-10	-4	3	-11
Juvenile striped bass	-7,901	-1,530	1,442	-7,988

Note: Negative values denote a net reduction in entrainment/impingement with the Proposed Action under existing conditions.
Source: Modeling conducted by Hanson Environmental, Inc. in 2005

Table 4.3-5
Index of Estimated Net Entrainment/Impingement Losses for the Proposed Action (320-cfs diversion and future conditions) Compared to the No-Action Alternative (Future Conditions)

Taxa	Rock Slough	Old River	Victoria Canal	Overall Net Change
Larval delta smelt	-250	-1,990	1,032	-1,208
Juvenile Chinook salmon	-207	-77	56	-227
Juvenile delta smelt	-88	-60	26	-121
Juvenile splittail	-1,256	-164	152	-1,268
Juvenile steelhead	-12	-5	4	-13
Juvenile striped bass	-11,559	-1,394	1,519	-11,434

Note: Negative values denote a net reduction in entrainment/impingement with the Proposed Action under future conditions.
Source: Modeling conducted by Hanson Environmental, Inc. in 2005

Operations modeling also shows that the Proposed Action would shift the timing of some CCWD diversions from spring to fall. Data from numerous studies show that the greatest vulnerability of fish eggs (all species combined) to entrainment occurs during spring (April through June), although fish eggs were also observed during winter (January through March) at lower densities (DFG 2005). Historical salvage data at the CVP and SWP salvage facilities, for example, show that peak total monthly salvage occurs during May and June (DFG 2005). A variety of fish species spawn within the Delta and upstream river areas during spring, including striped bass and delta smelt, whose lack of recent observed abundance is of critical concern. Known to be particularly vulnerable to mortality during the larval stage, delta smelt could benefit from the shift in timing of diversions that the Proposed Action would allow and there could be a net reduction in entrainment mortality and impingement for delta smelt, in addition to the eggs of other fish species.

A potential indirect impact could arise if the Proposed Action modified Delta conditions such that CVP, SWP, or other Delta diversions entrained more fish with current operations or diversions were somehow modified such that more fish would be exposed to entrainment. Modeling results shown in Section 4.2, "Delta Water Resources," however, indicate that changes caused by CCWD operations under the Proposed Action would be very small and would not affect CVP/SWP operations or deliveries. Consequently, there would only be minimal, if any, adverse effects on fish at other Delta diversions.

Because Chinook salmon and steelhead do not spawn in the project area, the small emergent life stages (e.g., swim-up fry) would not be vulnerable to diversion operations. The proposed fish screen would substantially reduce or eliminate entrainment of juvenile and older life stages (i.e., fry, smolts, yearlings, and adults) of Chinook salmon, steelhead, and other resident and migratory fish species and macroinvertebrates.

The threat of entrainment of juvenile green sturgeon into screened and unscreened agricultural, municipal, and industrial water diversions on the Sacramento River and Delta is largely unknown. Juvenile sturgeon are often not identified, and current DFG and NMFS screen criteria do not specifically address sturgeon. Based on the temporal occurrence of juvenile sturgeon and the high density of water diversion structures along rearing and migration corridors, entrainment has been identified as a potential factor contributing to mortality to larval and juvenile green sturgeon (NMFS 2004).

DFG (1992) and USFWS (1995) found a strong correlation between mean daily freshwater outflow (April to July) and white sturgeon year class strength in the Sacramento-San Joaquin estuary. Although no similar information or analyses are available for the relationship between river flow and green sturgeon growth, survival, or year class strength, seasonal river flows have been identified as a potential factor affecting green sturgeon. The Proposed Action, while having some hydraulic effects at CCWD intakes and other areas of the Delta, would not adversely affect the habitat or populations of green sturgeon.

Northern anchovy, Pacific sardine, and starry flounder would typically be found only incidentally in Victoria Canal. Given the decreasing salinity gradient from the Rock Slough intake to the proposed Victoria Canal intake, it is highly likely that reduced diversions from Rock Slough and increased diversions from the Victoria Canal intake would be slightly beneficial to these species as their densities would be substantially greater near the Rock Slough intake compared to the proposed Victoria Canal intake.

The CVPIA includes a requirement for Reclamation to develop and implement a program to mitigate for fishery impacts resulting from the operation of the Contra Costa Canal Pumping Plant No. 1. This program may include a fish screen at Rock Slough, modified operations, or other measures to mitigate fishery impacts. If a fish screen were to be installed, modeling results would predict lower entrainment losses at the Rock Slough Intake and the potential for new impingement losses. This would reduce some of the entrainment benefits the modeling analysis predicts resulting from the Proposed Action's reductions in Rock Slough pumping. However, the Proposed Action would still provide an overall net benefit to fisheries entrainment and impingement by:

- shifting the timing of some CCWD diversions from spring to fall (when fish are less vulnerable),
- shifting some CCWD diversions from a dead-end slough prone to substantially higher fish mortalities (i.e., Rock Slough intake) to an on-river fish screen subject to less mortality (i.e., proposed Victoria Canal intake), and
- shifting some CCWD diversions from a Delta location with generally higher fish densities and survival rates (i.e., central Delta) to a Delta location with generally lower fish densities and survival rates (i.e., south Delta).

While the fisheries benefits from the Proposed Action would be reduced with the screening of the Rock Slough intake, there would still be short- and long-term fisheries benefits associated with implementing the Proposed Action. Moreover, the Proposed Action would not affect Reclamation's ability to meet its CVPIA requirement to implement a program to mitigate for fishery impacts from operation of the Contra Costa Canal Pumping Plant No. 1.

Installation and long-term operation of the positive barrier fish screen, designed and operated in accordance with DFG, NMFS, and USFWS criteria, would minimize net entrainment and impingement of juvenile, sub-adult, and adult fish at the new intake. The technology is known and reliable. CCWD personnel would inspect and repair the facility, as needed to meet criteria, and would maintain a stock of replacement screens that would be installed rapidly in case repair is needed. Long-term operation is therefore expected to be reliable; periods of non-function would be brief. Given that approach velocities to the screen would be low (the maximum screen approach velocity is generally 0.2 feet/second or less), the net effect on fish swimming behavior in the vicinity of the diversion is predicted to be insignificant (Morinaka 2000). The fish screen would be equipped with a continuous mechanical cleaning system to remove impinged debris and maintain approach velocities within the tidal region of the Delta where sweeping velocities are affected by tidal currents. In addition, the fish screen would provide only minimal cover for ambush predators such as bass. Typically, the performance of a positive barrier fish screen is expected to reduce net entrainment and impingement of fish and macroinvertebrates by 95% or more when compared to an unscreened diversion.

Incidental take of certain life stages of any of the target special-status species could occur at the new Victoria Canal intake. However, CCWD operates its intakes conjunctively, and overall the net effect would be an overall reduction in entrainment and impingement losses for all species under existing and future operating conditions. This would be a beneficial effect to all fish species with life stages subject to entrainment and impingement, but would not affect habitats.

IMPACT 4.3-h (Alternative 1)

Effects on Delta Fisheries and Aquatic Habitat as Indicated by Changes in Key Hydrologic Indicators. *Several key hydrologic indicators are used to evaluate Delta fisheries resources and aquatic habitat; the Proposed Action would result in less than a 1% change in all of these indicators under existing, future, and cumulative conditions. There would not be a significant reduction in fish populations or the quality or quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta. Therefore, these impacts would be **less than significant**.*

Several key hydrologic indicators are used to evaluate fisheries resources (e.g., total Delta outflow, total Delta inflow, Sacramento River flow, San Joaquin River inflow, Export/Inflow ratio, X2 location, and CVP and SWP exports). Any significant changes to these hydrologic indicators would be suggestive of significant changes to aquatic habitat and fishery populations near the location of the hydrologic indicator. The key hydrologic indicators of estuarine habitat conditions within the Bay-Delta system are described below:

- **Total Delta Outflow** is the net amount of water (not including tidal flows) at a given time flowing out of the Delta towards the San Francisco Bay. Total Delta outflow provides an indicator of freshwater flow passing through the Delta and habitat conditions farther downstream within the San Pablo Bay and central San Francisco Bay. Delta outflow affects salinity gradients within these downstream aquatic habitats and the geographic distribution and abundance of various fish and macroinvertebrates (Baxter et al., 1999).

- **Total Delta Inflow** is the combined water flow entering the Delta at a given time from the Sacramento River, San Joaquin River, and other tributaries. Total Delta inflow from the Sacramento and San Joaquin river systems provides an indicator of several key ecological processes, including: (1) migration and transport of various life stages of resident and anadromous fishes using the Delta, (2) salinity levels at various locations within the Delta as measured by the locations of X2, and (3) the Delta's primary (phytoplankton) and secondary (zooplankton) production.

- **Sacramento River Flow** is the total flow from the Sacramento River entering the Delta, typically measured at Rio Vista. The Sacramento River is used by a number of fish species, either as direct habitat during one or more of their life stages or as a migration corridor to upstream habitat in other river systems. Flows within the Sacramento River are important in providing physical habitat for a variety of fish species (water depths and velocities); migratory corridors for anadromous fish species including Chinook salmon, steelhead, striped bass, and American shad; and downstream transport and dispersal of planktonic fish eggs and larvae for species such as striped bass and delta smelt.

- **San Joaquin River Inflow** is the total flow from the San Joaquin River entering the Delta, typically measured at Mossdale. The San Joaquin River is used as a migratory corridor for fall-run Chinook salmon and as habitat for a variety of resident and migratory fish species. Data available to date from the VAMP investigation, and analysis of historic adult salmon escapement to the river, show a general trend suggesting that salmon survival increases as a function of increased flow in the San Joaquin River. Flow from the San Joaquin River into the Delta also contributes to salinity gradients, physical habitat conditions, and other factors affecting habitat quality and availability within the Bay-Delta estuary for resident and migratory fish and macroinvertebrate species.

- **Export-to-Inflow (E/I) Ratio** is the percentage of Delta inflow diverted as exports from the Sacramento and San Joaquin river systems and the Delta. The ratio provides an indicator of several key ecological processes, including: (1) migration and transport of various life stages of resident and anadromous fishes using the Delta; (2) salinity levels at various locations within the Delta, as measured by the locations of X2; and (3) the risk of direct and indirect fish losses resulting from export operations. An increase in the E/I ratio, indicating greater exports from the Delta relative to the inflow of freshwater from the tributary rivers, would be an indicator of a potential increase in the risk of fish entrainment and salvage mortality at the CVP and SWP export facilities.

- **X2 location** is the Delta location where the 2-part-per-thousand salinity isohaline is established. The X2 location has been identified as an important indicator of estuarine habitat conditions within the Bay-Delta system. The location of X2 within Suisun Bay during the February through June period is thought to be directly and/or indirectly related to the reproductive success and survival of the early life stages for a number of estuarine species. Results of statistical regression analyses suggest that the abundance of several estuarine species is greater when the X2 location during spring occurs within the western portion of Suisun Bay, and that abundance is lower for those years when the X2 location is farther to the east, near the confluence between the Sacramento and San Joaquin rivers.

- **CVP and SWP Diversions** are measured as the amount of water diverted from the Delta at the Tracy Pumping Plant and Harvey O. Banks Pumping Plant, respectively. Changes in CVP and SWP diversions are an indicator of potential for direct and indirect fish losses. An increase in these Delta exports would indicate a potential increase in the risk of fish entrainment and salvage mortality at the CVP and SWP export facilities.

Monthly hydrologic modeling results with Proposed Action operations show no significant changes in any of the indicators above (see EIR/EIS Section 4.2, “Delta Water Resources,” and EIR/EIS Appendices C-3, C-4, and C-5). In those months with changes, the majority of changes is 1% or less and is within the error of the models. The Proposed Action would shift the location and timing of a portion of CCWD’s diversions. CCWD’s existing diversions are small compared to overall flows in the Delta, including total Delta outflow and Delta CVP and SWP exports. The shift would be a small percentage of CCWD’s total annual diversions. It is not anticipated that small changes in location or timing of CCWD diversions would affect overall Delta aquatic habitat. Modeling of key habitat indicators confirms this statement. There would not be a significant reduction in fish populations or the quality or quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta, for any fish species as a result of the Proposed

Action. This impact would be a less-than-significant effect on fish and their habitats under existing, future, and cumulative conditions.

IMPACT 4.3-i (Alternative 1)

Periodic Maintenance Dredging and Associated Effects on Fish. *Periodic maintenance dredging in front of the new fish screen may occur and expose fish to increased levels of sedimentation, turbidity, or other contaminants. The suspended sediment, turbidity, and other contaminant concentrations and duration of exposure to fish are expected to be below levels that cause adverse effects. The potentially adverse effects would be temporary and localized in the immediate vicinity of the new intake. This impact would be* ***less than significant****.*

The area immediately in front of the new Victoria Canal intake and fish screen may require periodic maintenance dredging to ensure proper flows and hydraulics at the fish screen face so that the intake and screen function properly. The existing Old River intake and fish screen have not required any maintenance dredging since project operations were initiated in 1998, but an intake on Victoria Canal could experience different sedimentation conditions. Any periodic dredging would cause similar effects as described in detail in Impact 4.3-a (Alterative 1) for in-water construction activities associated with the proposed intake and fish screen. Most fish would simply move away from the dredging activity. The suspended sediment, turbidity, and other contaminant concentrations and duration of exposure to fish are expected to be below levels that cause adverse effects to fish. The potentially adverse effects would also be temporary and localized in the immediate vicinity of the new intake. This impact would therefore be less than significant.

Cumulative Impacts

The Proposed Action would not have a long-term adverse effect on fisheries and would be beneficial with regard to net impingement and entrainment. As described under Impact 4.3-e (Alternative 1), however, habitat losses from facility installation are considered to be significant cumulative impacts because of overall habitat degradation throughout the Delta. These impacts would be fully mitigated by purchasing mitigation bank credits, as agreed to with NMFS, USFWS, and DFG. Therefore, this project would not contribute to a long-term cumulative adverse effect on fisheries from project operations and would provide an overall beneficial effect when implemented with mitigation measures described below.

A variety of factors have been identified that may individually or cumulatively result in significant changes in the abundance, species composition, geographic distribution, survival, and reproductive success of fish and macroinvertebrates inhabiting the Bay-Delta estuary. Evidence from fishery monitoring conducted by USFWS, DFG, and others has shown a dramatic decline in indices of abundance for a variety of pelagic fish species such as delta smelt and longfin smelt. The recent pelagic organism decline (POD) has heightened sensitivity and concern regarding factors affecting the overall health and condition of these resident and migratory fish species, zooplankton, and phytoplankton that form the basis for the tropic food web, and habitat conditions within the estuary. The four primary factors that have been hypothesized by state and federal resource agencies to affect these conditions include, but are not limited to, the following (Armor et al. 2005):

- changes in the estuarine food web resulting from the introduction and rapid expansion of exotic fish, macroinvertebrates, zooplankton, and aquatic plants;
- entrainment and impingement losses resulting from water diversions associated with the CVP, SWP, and the large number of agricultural, industrial, and municipal water diversions within the estuary;
- changes in the seasonal timing of hydrologic conditions occurring within the estuary, including an increase in CVP and SWP exports during winter in response to reduced water exports and other operational constraints during spring, as identified in the 1995 Bay-Delta Accord and subsequent State Water Resources Control Board decision; and
- chronic and acute toxicity effects from point and non-point source discharges of contaminants, including pesticides and herbicides (e.g., pyrethroids), associated with regional land-use within the Central Valley.

Although these four factors are thought to be important in affecting habitat conditions and fish abundance, no conclusions have been drawn regarding the individual or cumulative importance of each of these various factors (Armor et al. 2005). The Proposed Action would not adversely contribute directly or indirectly to any of the potential factors identified above:

- the Proposed Action would not result in the introduction, increase in abundance, or change in the geographic distribution of introduced aquatic species;
- the Proposed Action would contribute to a net reduction in the overall cumulative impacts of fish entrainment and impingement within the estuary. The Proposed Action would reduce water diversions at CCWD’s unscreened Rock Slough intake and increase water diversions from the proposed intake equipped with a state-of-the-art positive barrier fish screen located on Victoria Canal. The Proposed Action would therefore reduce cumulative net entrainment and impingement mortality occurring within the estuary and would contribute beneficially to the protection of resident and anadromous fish species;
- the Proposed Action would not change CVP or SWP exports or operations;
- the Proposed Action would not change contaminant loading to the estuary, either during project construction or as a result of long-term operations and maintenance; and
- the Proposed Action would not affect the Tracy Fish Facility Improvement Program, which could potentially reduce fish entrainment and impingement at the CVP/SWP intake facilities.

The expansion of Los Vaqueros Reservoir, a potential future project, may also change the timing and pattern of diversions in the Delta, but is not anticipated to have long-term adverse effects on fisheries; one of the project purposes is to provide a fisheries protection benefit by providing water for the Environmental Water Account. The Environmental Water Account provides a mechanism whereby water is diverted from the Delta when fewer fish are affected and diversions are curtailed when higher densities of fish are present such that the net effect is beneficial for Delta fisheries. Another proposed CCWD project, the Contra Costa Canal Encasement Project, would encase a portion of the Contra Costa Canal that has high fish mortality rates from substantial predation, and consequently is expected to have a beneficial effect on Delta fisheries. If Rock Slough is screened in the future, the Proposed Action would still provide benefits to fish, albeit reduced, as discussed above for Impact 4.3-g (Alternative 1). When considered with all other reasonably foreseeable or probable future projects, the Proposed Action would not have an incremental effect that is cumulatively considerable, but would provide a fisheries benefit with mitigation measures described below.

Global warming, increased Delta inflow from San Joaquin releases, and other potential future environmental changes are likely to occur, but are speculative. The effects of these changes on fish populations and their habitats could vary considerably. Slightly higher Delta water surface elevations or lower summer/fall flows from less snowmelt would be expected to have little effect on Proposed Action operations or effects on fish populations. An Adaptive Management Plan is included in the ASIP (see Chapter 6 in Appendix E-1) and would be employed to address any of these long-term changes as they arise.

Mitigation Measures

Mitigation measures designed to protect listed fish and terrestrial species and minimize the risk of adverse effects and incidental take from implementing the Proposed Action are proposed in this section. CCWD is committed to implementing all of these measures as part of the Proposed Action. Mitigation measures are proposed for potential effects presented above, and are proposed to meet the more stringent ESA and CESA standards for protecting habitats and individuals of special-status species. Consequently, this section provides mitigation measures to meet NEPA, CEQA, ESA, and CESA requirements and standards.

Based on results of an evaluation of the potential adverse effects that may directly or indirectly affect special-status fish species populations, individuals, or their habitats, a series of mitigation measures was identified. Key mitigation measures to be implemented by CCWD are summarized in Table 4.3-6 and described in more detail below. These mitigation measures are designed to reduce and avoid incidental take of Chinook salmon (winter-run, spring-run, and late fall-run), steelhead, delta smelt, green sturgeon, and other special-status species, as well as protect winter-run Chinook salmon critical habitat, proposed critical habitat for spring-run Chinook salmon and Central Valley steelhead, and EFH. The mitigation measures would also serve to protect and minimize impacts to other resident and migratory fish (e.g., white sturgeon, longfin smelt, Pacific lamprey, Sacramento splittail, hardhead, California roach, striped bass, American shad), their habitats, and macroinvertebrates.

Table 4.3-6 Summary of Mitigation Measures for Special-status Aquatic Species and Their Habitats		
Impact Mechanism/Objective	Mitigation Measure	
	Physical Action	Management Action
4.3-a Minimize Turbidity, Sedimentation, and Other Water Quality Impacts during Construction	► Conduct twice daily turbidity monitoring during periods when construction may create turbid conditions	► Obtain and comply with RWQCB Section 401 Water Quality Certification, DFG Streambed Alteration Agreement, and USACE Clean Water Act Section 404 permit as necessary
	► Conduct water quality surveys during dredging operations and installation/removal of cofferdam; project field manager responsible for monitoring in accordance with established protocols/procedures	► Develop and comply with a hazardous materials management plan similar to those that have been approved by RWQCB for similar fish screen projects
	► Verify construction documents contain Erosion Control Plan measures and Best Management Practices (BMPs) ► Conduct periodic inspections during construction ► Site intake on existing rip-rapped banks to avoid effects on higher-quality tule beds ► Install cofferdam to minimize in-water work	► Construction contractor to prepare and implement an Erosion Control Plan and Stormwater Prevention Plan prior to grading and excavation that shall include BMPs to minimize erosion and sedimentation as verified by RWQCB
4.3-b Implement Measures to Reduce and/or Avoid Underwater Sound Pressure Impacts	► Install cofferdam during the designated work window between August 1 and November 30 or modify the work window using the best available fish survey data to determine another appropriate work window for underwater construction activities to avoid and minimize impacts to special-status fish species ► If reasonable, use a vibration hammer for in-water work that minimizes underwater sound pressure levels	

Table 4.3-6
Summary of Mitigation Measures for Special-status Aquatic Species and Their Habitats

Impact Mechanism/Objective	Mitigation Measure	
	Physical Action	Management Action
4.3-c Develop and Implement a Hazardous Materials Control and Spill Prevention and Response Plan to Prevent/Avoid Hazardous Materials Impacts	► Implement Plan as written. Conduct periodic inspection during construction	► Construction contractor to prepare and implement a Hazardous Materials Control and Spill Prevention and Response Plan prior to construction
4.3-d Develop and Implement a Fish Rescue Program during Construction to Prevent Stranding in the Cofferdam	► Develop and implement a Fish Rescue Program ► Conduct fish rescue and relocation to Victoria Canal as dewatering proceeds	
4.3-e Compensate for the Permanent Loss of Shallow-water Aquatic Habitat at Victoria Canal Intake Site	► Determine the area of shallow water habitat lost in Victoria Canal due to the project footprint ► Purchase mitigation credits for shallow-water aquatic habitat at appropriate mitigation ratios at the Kimball Island Mitigation Bank or other mitigation bank	
4.3-g Minimize Fish Entrainment and Impingement at the New Victoria Canal Intake	► Conduct on-going monitoring of Alternative Intake screen condition and performance; monitoring of debris; and periodic visual inspection ► Conduct routine screen maintenance annually and make repairs as needed if screen performance is affected by damage or debris ► Conduct fish monitoring at the new Victoria Canal intake, consistent with monitoring at the Old River intake, for a period of 1 year beginning immediately upon operation ► After 12 months of fish monitoring, reassess the need for further monitoring at the intake site in consultation with NMFS, USFWS, and DFG	Operate new Victoria Canal intake consistent with Los Vaqueros Project Biological Opinion operational restrictions on filling Los Vaqueros Reservoir and diverting Delta water, and consistent with any Biological Opinion and DFG MOU issued for the Proposed Action*

*CCWD's operations are governed in part by three biological documents: (a) 1993 NOAA Fisheries Biological Opinion for winter-run Chinook salmon, (b) 1993 USFWS Biological Opinion for Delta smelt, and (c) 1994 Memorandum of Understanding between DFG and CCWD regarding the Los Vaqueros Project.

4.3 Delta Fisheries and Aquatic Resources

The Proposed Action would generally have low potential to cause adverse effects to special-status species and their habitats. Moreover, for fish species, the Proposed Action would have a long-term beneficial effect by reducing net fish entrainment and impingement losses at CCWD intakes. As part of designing, constructing, and operating the Proposed Action, however, a suite of mitigation measures would be implemented to avoid and minimize the potential effects to fisheries and aquatic resources, including incidental take and adverse effects on habitat.

The mitigation measures for the Proposed Action that would protect salmonids and other protected fish species and their habitats (critical habitat for delta smelt and steelhead, and EFH for Pacific salmon) would also protect other fish and macroinvertebrates in Victoria Canal and the Bay-Delta Estuary because impact mechanisms are similar. Measures that would be protective of salmonids would generally provide even greater protection for the non-salmonid species; for example, salmonids are more sensitive to turbidity than many estuarine fish species. The mitigation measures for the Proposed Action are consistent with avoidance and mitigation measures for other Bay-Delta fish screening projects and were developed in consultation with NMFS, USFWS, and DFG. The measures are intended to fully mitigate for incidental take and loss of habitat for fish species listed under CESA and ESA and would therefore support a consistency determination with the Federal biological opinions by DFG.

Mitigation Measure 4.3-a (Alternative 1): Minimize Turbidity, Sedimentation, and Other Water Quality Impacts during Construction.
To reduce turbidity in Victoria Canal during project-related construction activities (primarily excavation and cofferdam installation), CCWD shall:

- obtain and comply with RWQCB Section 401 Water Quality Certification and DFG Streambed Alteration Agreement, as needed;
- monitor periods of construction activity and coordinate with the contractor to identify periods when localized increases in turbidity may occur;
- install a silt curtain to reduce the dissipation of suspended sediments during dredging and cofferdam installation; and
- conduct cofferdam installation and removal, to the extent possible, during summer to avoid the potential risk of adverse impacts to Chinook salmon, steelhead, and delta smelt, which are all more abundant in the area during fall, winter, and spring. Installation of the cofferdam will occur during the designated in-water work window between August 1 and November 30, unless modified by written agreement with NMFS, USFWS, and DFG.

In addition, successful project-related turbidity control shall be accomplished by installation and subsequent removal of the temporary cofferdam, while maintaining suspended sediment and turbidity levels to the extent possible within the water quality criteria established by RWQCB. CCWD would be required to comply with water quality criteria established by applicable State and Federal permits and approvals for the Proposed Action. In addition, CCWD shall implement the following measures during project-related dredging and soil disposal that comply with the Fisheries Management Plan for EFH for Pacific Salmon:

- monitor project construction-related dredging activities especially any contaminated sediments, regularly report effects on EFH, and re-evaluate activities based on monitoring results;
- employ best engineering and management practices for all project construction-related dredging projects to minimize water-column discharges; and
- consider upland disposal options as an alternative to open water disposal during project construction activities. Dredged sediments removed during intake construction will be used beneficially on-site or disposed of at an upland site.

Avoidance and minimization measures would be implemented in accordance with standard RWQCB requirements that have been used in other similar fish screen construction projects. CCWD shall be responsible for implementing the following measures to the extent practicable during project construction activities:

- The discharge of petroleum products or other excavated materials to surface waters is prohibited;
- Project construction activities shall minimize substrate disturbance;
- Project construction activities shall not cause turbidity increases in surface waters as follows:
  - where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU;
  - where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20%;
  - where natural turbidity is between 50 and 100 NTUs, increase shall not exceed 10 NTUs; and
  - where natural turbidity is greater than 100 NTUs, increases shall not exceed 10%.

  These limits would be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses would be fully protected;
- Project construction activities shall not cause settleable matter to exceed 0.1 ml/l in surface waters as measured in surface waters 300 feet downstream from the project;

- Project construction activities shall not cause visible oil, grease, or foam in the work area or downstream;
- All areas disturbed by project construction activities shall be protected from washout or erosion;
- In the event that project construction activities create a visible plume in surface waters, CCWD will initiate monitoring of turbidity levels at the discharge site and 300 feet downstream, taking grab samples for analysis of NTU levels twice per day during the work period while the visible plume persists;
- CCWD shall notify RWQCB, DFG, USFWS, and NMFS immediately if the above criteria for turbidity, oil/grease, or foam are exceeded; and
- CCWD shall notify RWQCB, DFG, USFWS, and NMFS immediately of any spill of petroleum products or other organic or earthen materials.

CCWD shall prepare a soil erosion control plan and stormwater pollution prevention plan (SWPPP) prior to project grading and excavation activities to minimize potential project construction-related silt from entering waterways and increasing turbidity. The plans would include, but would not be limited to, the following measures to minimize project-related erosion and sedimentation:

- use sedimentation basins and straw bales or other measures to trap sediment and prevent sediment and silt loads to waterways during project construction;
- cover graded areas adjacent to levees and in other areas that may be subject to erosion (as appropriate) with protective material, such as mulch, and re-seed with adapted native plant species after project construction is complete;
- incorporate bank stabilization (riprap) into the project design on both the east and west sides of the intake to minimize channel margin erosion of soils into Victoria Canal. To the extent practicable, the aerial extend of riprap will be minimized and small (<8 inch diameter) riprap will be used for levee protection;
- minimize project construction-related surface disturbance of soil and vegetation and restore terrestrial habitats immediately after construction to the extent feasible;
- place any project construction-related stockpiled soil where it would not be subject to accelerated erosion; and
- commence re-vegetation with grasses native to the Delta and placement of erosion control devices, such as crushed rock, as soon as a graded area has attained finish grade.

CCWD shall ensure that a certified erosion control specialist or California-registered civil engineer prepare the plan. A project field manager would be responsible for monitoring in accordance with established protocols/procedures. If needed, RWQCB staff would review the plan prior to project construction to verify that physical best management practices (BMPs) have been incorporated to reduce project construction-related erosion and sedimentation to the maximum extent possible and ensure compliance with this measure.

Implementation of these measures would further minimize effects such that there would not be an adverse effect on species or habitats related to increased turbidity, sedimentation, or other contaminants.

Effects associated with periodic maintenance dredging in front of the fish screen are not covered in these mitigation measures, but would be addressed at such time in the future that maintenance dredging is needed, as recommended by DFG. It is expected that a mitigation measure similar to Mitigation Measure 4.3-a (Alternative1), herein, would be developed and implemented at that time by CCWD.

Mitigation Measure 4.3-b (Alternative 1): Implement Measures to Reduce and/or Avoid Underwater Sound Pressure Impacts.
Potential risk of adverse impacts and incidental take of steelhead, Chinook salmon, delta smelt, and other fish species shall be avoided by installing the sheet pile cofferdam using a vibration hammer that minimizes underwater sound pressure levels to the greatest extent feasible to minimize effects to sensitive fish species. If it is determined that a higher intensity percussion hammer would be required for installing the cofferdam, avoidance of potential adverse effects would be achieved by consulting with USFWS, NMFS, and DFG to determine the appropriate actions, which may include surveying Victoria Canal at the intake site to determine fish presence prior to installation, and possibly modifying the work window accordingly. Installation of the cofferdam, however, is expected to occur during the designated in-water work-window in summer and early fall when water temperatures within the central and south Delta are seasonally elevated and aquatic habitat in these areas is considered to be generally unsuitable for both salmonids and delta smelt. Chinook salmon and delta smelt avoid habitats, including Victoria Canal, when seasonal water temperatures increase during late spring and early summer reaching levels above 25°C (77°F). Installation of the cofferdam using percussion hammers during summer would reduce and avoid potential adverse effects to these species.

Implementation of this measure would minimize otherwise adverse effects related to underwater sound pressure and reduce the risk of incidental take of protected fish species.

Mitigation Measure 4.3-c (Alternative 1): Develop and Implement a Hazardous Materials Control and Spill Prevention and Response Plan to Prevent/Avoid Hazardous Materials Impacts.
CCWD shall prepare and implement a hazardous materials control and spill prevention and response plan prior to construction. Measures that would be included in the plan to minimize project construction-related effects will include the following:

- establish a spill prevention and countermeasure plan before the commencement of project construction that includes strict on-site handling rules to keep construction and maintenance materials out of drainages and waterways;

- prevent project-related raw cement, concrete, or concrete washings; asphalt, paint, or other coating material; oil or other petroleum products; or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, including Victoria Canal;
- clean up all project-related spills immediately according to the spill prevention and countermeasure plan, and notify RWQCB immediately of spills and cleanup procedures;
- provide staging and storage areas for project-related equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from watercourses and their watersheds; and
- conduct periodic inspection during construction.

USFWS, NMFS, DFG, and RWQCB shall review the plan prior to construction to verify that hazardous material control and spill response measures have been incorporated to control the use of hazardous materials and reduce the chance of spills to the maximum extent practicable. USFWS, NMFS, and DFG shall have access to inspect construction activities to ensure compliance.

Preparation and implementation of a hazardous materials control and spill prevention and response plan would reduce the risk of incidental take of protected fish species related to potential chemical spills during construction such that there may be an effect, but the Proposed Action is not likely to adversely affect special-status species.

Mitigation Measure 4.3-d (Alternative 1): Develop and Implement a Fish Rescue Plan during Construction to Prevent Stranding in the Cofferdam.
Installation of the cofferdam and dewatering a portion of the proposed intake structure site during fish screen construction may result in fish stranding. CCWD shall develop and implement a Fish Rescue Plan acceptable to DFG, USFWS, and NMFS; the Fish Rescue Plan is presented in the ASIP (see Attachment F, "Fish Rescue Plan," of Appendix E-1) and summarized herein. CCWD shall ensure that a qualified fishery biologist designs and conducts the fish rescue and relocation effort to collect fish from the area behind the cofferdam. The fish rescue effort would be implemented during the dewatering of the area behind the cofferdam and would involve capture and return of those fish to suitable habitat within Victoria Canal. To ensure compliance, a fisheries biologist shall be present on-site during initial pumping (dewatering) activities.

CCWD shall monitor progress of installation of the cofferdam and the schedule for dewatering. CCWD shall coordinate the dewatering schedule with the construction contractor and fishery biologist to allow for the fish rescue to occur prior to completely closing the cofferdam and again when water depths are approximately 2 feet. USFWS, NMFS, and DFG shall be notified at least 48 hours prior to the fish rescue. Information on the species and sizes of fish collected in the rescue and estimates of survival immediately before release would be recorded during the time of the fish rescue and provided in a letter report to be submitted within 30 days after the fish rescue to USFWS, NMFS, and DFG.

The success of this dewatering measure would be the effective capture and removal of fish from the area to be dewatered with a minimum of capture and handling mortality for those fish returned to Victoria Canal. The Fish Rescue Plan contains a framework on how to minimize the risk of incidental take and stress to listed species that have the potential to occur within the impact area in Victoria Canal during installation of the cofferdam.

Implementation of the Fish Rescue Plan would result in an effect, but not an adverse or significant effect, and would minimize the risk of incidental take related to fish stranding during dewatering activities associated with the construction of the Proposed Action.

Mitigation Measure 4.3-e (Alternative 1): Compensate for the Permanent Loss of Shallow-water Aquatic Habitat at Victoria Canal Intake Site.

Construction of the proposed intake structure in Victoria Canal would result in the modification of shallow-water aquatic habitat estimated as follows

- 1.03 acres of existing rip-rap shallow-water tidal freshwater emergent habitat along the existing levee would be replaced by 1.03 acre of new rip-rap habitat immediately in front of the fish screen and along each side of the shallow-water fish screen along the existing levee;
- 0.05 acre of shallow-water tidal freshwater emergent habitat presumed to be earthen bottom would be replaced by 0.05 acre of new rip-rap habitat; and
- 1.15 acres of shallow-water tidal freshwater emergent habitat presumed to be earthen bottom would be excavated about 10-15 feet deeper, but would retain the same substrate characteristics; the resulting depth would not constitute shallow-water habitat but would provide habitat complexity in the existing channel.

These habitats are marginal, low-quality habitats. They are classified as shallow-water tidal freshwater emergent habitat based on physical characteristics that could potentially support emergent vegetation, but the intake has been sited to avoid existent emergent vegetation to the degree possible. CCWD would mitigate some of these existing habitats with high-quality emergent marsh habitat at the Kimball Island Mitigation Bank or another mitigation bank. The purchased mitigation credits would be for emergent marsh habitat that is far superior to the habitat being disturbed in Victoria Canal. Mitigation, determined in consultation with NMFS, USFWS, and DFG, is calculated as follows:

- 1.03 acres – no mitigation is necessary as the existing habitat would not be modified in a manner that adversely affects available habitat in Victoria Canal. The existing rip-rap would be replaced with similarly sized riprap in Victoria Canal (very little change in habitat).
- 0.05 acre – a 3:1 mitigation ratio is used because a presumed existing earthen bottom is being replaced with rip-rap, even though the rip-rap will quickly silt over and a natural earthen bottom will occur over the long-term. CCWD would purchase 0.15 acre of shallow-water emergent marsh habitat at the Kimball Island Mitigation Bank or other mitigation bank. This more than compensates for the modified habitat; and

- 1.15 acres – a 3:1 mitigation ratio is used because the shallow-water habitat would be replaced with open-water habitat. CCWD would purchase 3.45 acres of shallow-water emergent marsh habitat at the Kimball Island Mitigation Bank or other mitigation bank.

To fully compensate for physical habitat modifications at the Victoria Canal intake site, CCWD will purchase mitigation credits for 3.60 acres of shallow-water emergent marsh aquatic habitat. With this measure, there is no loss in aquatic habitat associated with the Proposed Action.

CCWD considered using other potential measures for bank and bed stabilization including: 1) incorporating a floodplain terrace or bench into the shoreline being stabilized, 2) using small rock less than 8 inches in diameter for rip-rapping the banks, 3) covering riprap with soil and planting with willows, and 4) designing bank slopes greater than a 3:1 ratio. These measures are not consistent with RD 2040 design standards for its levees and could compromise levee integrity. Based on input from the RD 2040 engineer, these measures were eliminated from further consideration. CCWD did remove the concrete apron, originally proposed as part of the project design, to minimize effects on habitat.

Mitigation Measure 4.3-g (Alternative 1): Minimize Fish Entrainment and Impingement at the New Victoria Canal Intake.

As part of the Proposed Action, CCWD would install a state-of-the-art positive barrier fish screen that would minimize fish entrainment and impingement at the new Victoria Canal intake. To ensure that the fish screen operates as intended and the risk of incidental take associated with diversions at this facility are in conformance with ESA and CESA, long-term monitoring of operation and maintenance of the positive barrier screen shall be conducted. Monitoring at the onset of diversions through the Victoria Canal intake would include approach velocity measurements immediately after initiation of the positive barrier screen operations, with fine-tuning of velocity control baffles or other modifications as necessary, to achieve uniformity of velocities in conformance with the screen criteria ($\leq$ 0.2 feet/second) established by DFG and NMFS, and mandated by USFWS in a number of biological opinions. Long-term velocity tests have been scheduled at 5-year intervals for the Old River Fish Screen Facility, and a similar schedule to test for effectiveness will be implemented for ensuring proper functionality of the Proposed Action's positive barrier fish screen.

CCWD shall also monitor the condition of the positive barrier screen on an annual basis for as long as diversions are occurring at Victoria Canal. CCWD shall conduct periodic visual inspections at least monthly, during periods of the year when the intake is in operation, to remove accumulated debris and repair screen panels as necessary. NMFS, USFWS, and DFG shall have access to the positive barrier screen for underwater inspections following completion of intake screen construction. The standards for success would be long-term reliable operation of the fish screen, and conformance with intake screen design criteria.

CCWD will also operate the new Victoria Canal intake consistent with the existing Los Vaqueros Project Biological Opinion operational restrictions on filling Los Vaqueros Reservoir and diverting Delta water, and consistent with any future changes to that Biological Opinion. CCWD will also operate the new Victoria Canal intake consistent with any Biological Opinion issued for the Proposed Action.

In addition, CCWD will incorporate entrainment monitoring for fish eggs, larvae, and juveniles at the new Victoria Canal intake consistent with the on-going fishery monitoring being conducted at the Old River Fish Facility. Informal consultation with NMFS, USFWS, and DFG has indicated that a monitoring program as frequent and long-term as that at the Old River Fish Screen Facility is likely not necessary due to the similarities in screen design and the proven effectiveness of the Old River screen. Consequently, entrainment monitoring will be conducted at the Victoria Canal intake for the first year of operation. Following one year of entrainment monitoring, CCWD will issue a performance report within 60 days to NMFS, USFWS, and DFG as a cumulative record of monitoring and communications with the regulatory agencies. Using the 1-year monitoring results, CCWD will recommend continuation, modification, or discontinuation of the biological monitoring program for approval by NMFS, USFWS, and DFG, and then an assessment will be made whether further sampling is necessary, or should be integrated with Old River intake sampling.

Previous monitoring conducted for the Old River Fish Screen Facility to evaluate the effectiveness of the screen to reduce and avoid entraining fish eggs and larvae has provided a technical basis for evaluating the effectiveness of the new Victoria Canal positive barrier fish screen. Juvenile Chinook salmon nor other species are substantially being entrained into the state-of-the-art positive barrier fish screen that was installed and fully operable at the Old River intake by 1998. This determination has been made by Morinaka (2000) following fishery sampling behind the screen with a large sieve net that caught few fish, and among them was only one delta smelt and no Chinook salmon. Morinaka concluded, “the results demonstrate that a properly designed and operated fish screen can reduce entrainment losses.” The low approach velocities of these screens (e.g., at Victoria Canal and Old River intakes) designed to meet agency criteria is such that juvenile fish can usually escape entrainment.

Implementation of this multi-faceted measure will minimize adverse effects and the risk of incidental take related to increased fish losses through entrainment and impingement by ensuring that the positive barrier fish screen is operating effectively and efficiently. All impacts would be less-than-significant with mitigation.

4.3.2.5 Alternative 2, Indirect Pipeline Alternative

The direct, indirect, and cumulative impacts of Alternative 2 on fishery and aquatic resources would be identical to those described for the Proposed Action. Implementation of the mitigation measures described for the Proposed Action would reduce these direct, indirect, and cumulative effects to a less-than-significant level.

4.3.2.6 Alternative 3, Modified Operations Alternative

Alternative 3 was developed based on scoping comments by NMFS to examine an alternative that would enable more pumping to be relocated from the currently unscreened Rock Slough intake to screened diversions at the Old River intake and/or the proposed Victoria Canal intake. Alternative 3 would have the same physical features of the Proposed Action but would involve modifying CCWD permitted operations to enable CCWD to shift additional pumping from Rock Slough to the screened intake at Victoria Canal. Delta fisheries, including threatened and endangered species, would benefit because fish mortality is reduced with screened diversions compared to unscreened diversions.

Operations under Alternative 3 would differ from the Proposed Action as follows: CCWD would immediately apply to change its permits to allow diversion of up to 320 cubic feet per second (cfs) through the Old River conveyance system rather than in the future, as planned. Combined diversions from the 250 cfs Old River pump station and the proposed 250 cfs alternative intake would be limited to 320 cfs by the capacity of the pipeline connecting the Old River pump station to CCWD’s transfer station that routes water either to the Los Vaqueros Reservoir or the Contra Costa Canal. CCWD would not increase the average total annual quantity diverted from the Delta. This change would enable CCWD to relocate up to half of the current Rock Slough diversions to the screened Old River conveyance system in the near-term. Rock Slough would continue to provide a portion of CCWD supply, but would be used less frequently in the near-term than under the Proposed Action. Mallard Slough operations would be similar under both alternatives.

Construction-related impacts under Alternative 3 would be identical to construction-related impacts under the Proposed Action. Implementation of the mitigation measures described for the Proposed Action would reduce these effects to a less-than-significant level.

Compared to operations under the Proposed Action, operations under Alternative 3 would divert up to an additional 70 cfs from the screened Victoria Canal and Old River intakes, with 70 cfs less diverted from the unscreened Rock Slough. Monthly hydrologic modeling results with Alternative 3 operations show no significant changes in any of the key hydrologic indicators of Delta aquatic habitat conditions (see Section 4.2, “Delta Water Resources”). The change in the diversion point from Rock Slough to Old River/Victoria Canal for the additional 70 cfs would be insufficient to cause significant impacts to Delta hydrology, hydraulics, or habitats. Therefore, there would be no significant impacts to fisheries habitat from Alternative 3 operations.

Under Alternative 3, however, estimated net entrainment/impingement losses would be reduced under existing conditions compared to the Proposed Action, with a net benefit occurring (Table 4.3-7).

Table 4.3-7
Index of Estimated Net Entrainment/Impingement Losses for the Modified Operations Alternative (320-cfs diversion under existing conditions) Compared to Existing Conditions

Taxa	Rock Slough	Old River	Victoria Canal	Overall Net Change
Larval delta smelt	-730	-2,404	1,619	-1,515
Juvenile Chinook salmon	-251	-61	45	-267
Juvenile delta smelt	-93	-52	25	-120
Juvenile splittail	-1,669	-174	175	-1,668
Juvenile steelhead	-13	-202	2	-213
Juvenile striped bass	-13,541	-1,422	1,582	-13,381

Note: Negative values denote a net reduction in entrainment/impingement with the Modified Operations Alternative under existing conditions.
Source: Modeling conducted by Hanson Environmental, Inc. in 2005

Overall, the Modified Operations Alternative would have beneficial effects on net entrainment and impingement under existing conditions. Under future conditions, Alternative 3 would operate the same as Alternatives 1 and 2 because capacity at Old River Pump Station is assumed to increase to 320 cfs in the future case, consistent with the CCWD Future Water Supply Implementation EIR (Contra Costa Water District 1998). Even if fisheries mitigation actions are taken by Reclamation at Rock Slough as part of CVPIA requirements, Alternative 3 would still provide a slight fisheries benefit over the Proposed Action for reasons described under Impact 4.3-g (Alternative 1), above. Consequently, Alternative 3 would result in the least environmental effects to fisheries of all the alternatives, and would provide the greatest benefits by reducing net entrainment and impingement losses to the greatest degree.

4.3.2.7 Alternative 4, Desalination Alternative

Indirect and Direct Impacts

Construction-related impacts to fishery and aquatic resources under Alternative 4 would be similar to construction-related impacts under the Proposed Action, except the impacts would occur in Mallard Slough rather than in Victoria Canal. Construction-related impacts that are potentially significant under the Proposed Action would be potentially significant under Alternative 4, and construction-related impacts found to be less than significant under the Proposed Action would also be less than significant under Alternative 4. Implementation of the construction-related mitigation measures described for the Proposed Action would reduce the Alternative 4 effects to a less-than-significant level. Alternative 4 would not contribute considerably to any cumulative construction-related impacts related to Delta fisheries and aquatic biology, but would have different operational effects as described below.

4.3 Delta Fisheries and Aquatic Resources

IMPACT 4.3-a (Alternative 4)

Fish Losses Through Entrainment and Impingement at CCWD Intakes. *Expansion of the intake at Mallard Slough would increase net entrainment and impingement of fish at this site. Beneficial and adverse impacts result depending on the species, life stage, and whether under existing or future conditions. This would be a* ***potentially significant*** *impact on larval delta smelt.*

Alternative 4 would have a mixed effect on fishery and aquatic resources because net entrainment and impingement losses would be increased or decreased depending on the species (Tables 4.3-8 and 4.3-9). Under existing and future conditions, larval delta smelt would be adversely affected; however, juvenile Chinook salmon, juvenile delta smelt, juvenile splittail, juvenile steelhead, and juvenile striped bass would slightly benefit under both existing and future conditions. This impact would be potentially significant for larval delta smelt.

Table 4.3-8
Index of Estimated Net Entrainment/Impingement Losses for the Desalination Alternative (132-cfs diversion under existing conditions) Compared to the No-Action Alternative

Taxa	Rock Slough	Old River	Mallard Slough	Victoria Canal	Overall Net Change
Larval delta smelt	-178	-669	6,479	0	5,632
Juvenile Chinook salmon	-87	-14	8	0	-93
Juvenile delta smelt	-26	-4	5	0	-25
Juvenile splittail	-468	-17	27	0	-458
Juvenile steelhead	-4	-1	0	0	-4
Juvenile striped bass	-3,717	-180	281	0	-3,617

Note: Negative values denote a net reduction in entrainment/impingement with the Desalination Alternative under existing conditions.
Source: Modeling conducted by Hanson Environmental, Inc. in 2005

Table 4.3-9
Index of Estimated Net Entrainment/Impingement Losses for the Desalination Alternative (132-cfs diversion under future conditions) Compared to the No-Action Alternative

Taxa	Rock Slough	Old River	Mallard Slough	Victoria Canal	Overall Net Change
Larval delta smelt	-484	-876	6,811	0	5,451
Juvenile Chinook salmon	-122	-13	9	0	-126
Juvenile delta smelt	-45	-4	5	0	-44
Juvenile splittail	-527	-11	28	0	-510
Juvenile steelhead	-4	-1	0	0	-5
Juvenile striped bass	-4,171	-139	296	0	-4,015

Note: Negative values denote a net reduction in entrainment/impingement with the Desalination Alternative under future conditions.
Source: Modeling conducted by Hanson Environmental, Inc. in 2005

IMPACT 4.3-b (Alternative 4)

Saline Discharges from the New Concentrate Disposal Pipeline. *Operation of the new concentrate disposal pipeline could have permanent long-term effects on sensitive habitats by altering the salinity of the water near the discharge, which could result in changes to adjacent fishery and aquatic communities. This direct impact would be* ***potentially significant.***

The Desalination Alternative would have adverse water quality effects from brine disposal through the new concentrate disposal pipeline. These impacts cannot be reasonably quantified and it would be overly speculative to estimate impacts to fishery and aquatic resources. However, such impacts could be potentially significant to fish communities and habitats in the immediate vicinity of the saline discharge. The potential effect of the saline discharge on the occurrence and behavior of various fish and aquatic macroinvertebrates within the near-field receiving waters would vary depending on the salinity tolerance of the species and lifestage or aquatic organisms within the area, the salinity concentrations in the discharge, local discharge mixing and plume dispersal, tidal current patterns in the area, and other factors. Although many of the fish and macroinvertebrates inhabiting the Bay-Delta estuary on a permanent or seasonal basis are generally tolerant of variable salinity conditions, salinity at the point of discharge may exceed these tolerances and result in localized exclusion and behavior avoidance of the discharge area by some species. As the discharge plume mixes and dissipates, salinities would be reduced to a level suitable as estuarine habitat. As a result of potential behavioral avoidance and exclusion of sensitive fish and macroinvertebrate species from the area immediately adjacent to the point of saline discharge, impacts to habitat quality and availability for estuarine aquatic species, including migratory salmonids, would be potentially significant.

Cumulative Impacts

IMPACT 4.3-c (Alternative 4 - Cumulative)

Cumulative Fish Losses Through Entrainment and Impingement at CCWD Intakes. *Because net entrainment and impingement at Mallard Slough would be expected to increase under future conditions, the project's contribution to cumulative impacts related to larval delta smelt and juvenile striped bass would be* ***potentially significant****.*

The models predict that net entrainment and impingement at Mallard Slough would increase under future conditions (which include other reasonably foreseeable future projects). Larval delta smelt and juvenile striped bass have experienced reduced populations in recent years, especially delta smelt. Consequently, the incremental impacts expected to result from Alternative 4 represent a considerable contribution to potentially significant cumulative impacts to these species. This cumulative impact would therefore be potentially significant.

Mitigation Measures

Construction-related impacts that would affect Delta fishery and aquatic resources in Mallard Slough under Alternative 4 would be similar to impacts described for the Proposed Action. Implementation of the mitigation measures described for the Proposed

Action would reduce these effects at Mallard Slough to less-than-significant levels. Additional mitigation measures are presented below.

Mitigation Measure 4.3-a (Alternative 4): Minimize Impacts to Larval Delta Smelt and Juvenile Striped Bass at Mallard Slough Intake Through Fish Monitoring and Operational Limitations.
Because the Mallard Slough intake location for Alternative 4 is relatively fixed, and state-of-the-art fish screens would be employed, there are not many mitigation measures that could be employed, with the exception of operational limitations.

CCWD would manage and operate the water diversion to reduce and avoid the increased risk of entrainment during spring using a reduction or curtailment in diversions. The actual curtailment period would be flexible and would be managed, to the extent possible, to respond to variation in the seasonal timing and geographic distribution of sensitive fish species vulnerable to entrainment into the intake. The primary emphasis for fishery protection would focus on larval delta smelt.

CCWD, working in coordination with CDFG and USFWS to determine the curtailment period each year, would use surveys and other available data sources. CCWD would maintain records and other documentation on the actual diversion operations and would need to provide CDFG and USFWS with a brief letter report each year documenting the curtailment of diversion operations designed to avoid and minimize the risk of fish entrainment. A curtailment schedule could be developed that results in a less-than-significant effect on delta smelt; however, the performance of this alternative in meeting CCWD objectives would be reduced, possibly substantially.

Mitigation Measure 4.3-b (Alternative 4): Reduce and Avoid Saline Discharge Impacts.
This mitigation measure would be the same as Mitigation Measure 4.6-h (Alternative 4), described in detail in Section 4.6, “Terrestrial Biological Resources.” CCWD would conduct an evaluation of the potential long-term effects of the brine discharge into Suisun Bay, obtain a National Pollutant Discharge Elimination System (NPDES) permit and comply with all of its measures, prepare and implement a restoration and monitoring plan, and conduct maintenance and monitoring of the site, if needed. Implementation of this measure would reduce the impact to a less-than-significant level.

Another option would be to route the saline discharge into a municipal wastewater treatment plant discharge (freshwater) where the saline discharge could be blended prior to discharge into the estuary. Blending of the saline and freshwater discharges would improve salinity conditions within the discharge while avoiding potential adverse effects associated with the concentrated desalination plant saline discharge. If feasible, this mitigation measure would also reduce this impact to a less-than-significant level.

Mitigation Measure 4.3-c (Alternative 4 – Cumulative): Minimize Impacts to Larval Delta Smelt and Juvenile Striped Bass at Mallard Slough Intake Through Fish Monitoring and Operational Limitations.
CCWD shall implement Mitigation Measure 4.3-a (Alternative 4) to address potential direct significant effects on larval delta smelt and juvenile striped bass.

Other sizeable projects would be required to implement measures similar to those that would be undertaken for the Desalination Alternative to ensure minimization of impacts on these fish species.

With mitigation, the Desalination Alternative would not result in impacts to these fish species that would contribute considerably to a cumulative impact. Therefore, implementation of the mitigation would reduce the potential contributions of the Desalination Alternative to any significant cumulative effect on Delta fisheries and aquatic resources to a less-than-significant level.

4.4 Earth Resources: Geology, Soils, and Seismicity

This section describes Federal and State regulations and local policies related to seismic conditions and geologic hazards; existing topographic, geologic, soil, and seismic conditions in the areas where the project alternatives would be implemented; and potential effects of the Proposed Action and alternatives related to these conditions.

Paleontological resources and unique geological features are addressed in Section 4.17, "Paleontological Resources."

4.4.1 Affected Environment

4.4.1.1 Regulatory Setting

Federal

There are no relevant Federal laws or regulations that are pertinent to this analysis.

State

California Building Standards Code

The State of California provides minimum standards for building design and construction through the California Building Standards Code (CBC) (California Code of Regulations, Title 24). The CBC is based on the Federal Uniform Building Code used widely throughout the country (generally adopted on a state-by-state or district-by-district basis). The CBC accounts for seismic conditions in California by providing more detailed and/or more stringent regulations. The State earthquake protection law (Health and Safety Code Section 19100 et seq.) requires that structures be designed to resist stresses caused by wind and earthquakes. Specific minimum seismic safety and structural design requirements are set forth in Chapter 16 of the CBC. Appendix Chapter A33 regulates grading activities, including drainage and erosion control, and construction on unstable soils, such as expansive soils and liquefaction areas.

California Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act of 1990 (Public Resources Code Sections 2690 to 2699.6) addresses seismic hazards other than surface rupture, such as liquefaction and induced landslides. The Seismic Hazards Mapping Act specifies that the lead agency for a project may withhold development permits until geologic or soils investigations are conducted for specific sites and mitigation measures are incorporated into plans to reduce hazards associated with seismicity and unstable soils.

Alquist-Priolo Fault Zoning Act

The California legislature passed the Alquist-Priolo Earthquake Fault Zoning Act with the main purpose of preventing the construction of buildings used for human occupancy on the surface trace of active faults. The act requires the State to identify zones around active faults (i.e., those having evidence of surface displacement within Holocene time, or the last 11,000 years) in which special studies are required before development may occur. Where projects are proposed in designated Alquist-Priolo Fault Study Zones, local agencies must require investigations that demonstrate that the proposed buildings would not be constructed across active faults.

CCWD Standards

CCWD has outlined seismic standards for all CCWD facilities in its *Technical Memorandum No. 5, Seismic Criteria* (CCWD 1994). This document serves as a guideline for the design, repair, alteration, and rehabilitation of low-rise buildings, water retention structures, canals, small buried structures, underground piping, atmospheric storage tanks, and silos and pressure vessels. These standards incorporate codes and specifications published by the International Conference of Building Officials, the American Concrete Institute, and the American Water Works Association. Because the seismic environment in the CCWD area is more severe than the conditions anticipated by these publications, standards are modified accordingly. The purpose of CCWD standards is to provide greater reliability for CCWD facilities than would be obtained only by application of the Uniform Building Code standards.

4.4.1.2 Environmental Setting

Information on earth resource conditions relevant to this study was compiled from on-site observations; photographs; maps of Alquist-Priolo Fault Zones and U.S. Geological Survey (USGS) quadrangles; and reports and documents, including general plans, the U.S. Soil Conservation Service (SCS) soil surveys for Contra Costa and San Joaquin Counties (SCS 1977, 1992), and a report prepared for the CCWD Seismic and Reliability Improvements Project (CCWD 1997).

Topography

The proposed project site is nearly level. In general, the topography of the Delta ranges from elevations of 6 to 30 feet above sea level at the tops of levees to 15 to 45 feet below sea level in the deepest channels. The elevation of Delta islands varies from 10 to 20 feet above sea level to approximately 20 feet below sea level at deeply subsided islands (Mount and Twist 2005). Recent topographic surveys completed for this project indicate that Victoria Island elevations along the potential pipeline alignments range from 9 to 14 feet below sea level and top of levee elevations are typically 10 feet above sea level.

The Desalination Alternative facilities would be located in two general topographic zones: lowland and hillside. The Mallard Slough area and the Bollman WTP site and its surroundings have almost flat topography. The untreated-water conveyance pipeline would follow the existing Contra Costa Canal alignment, which follows the edge of the Mount Diablo foothills.

Exhibit 4.4-1 shows the topography of the proposed project site and Desalination Alternative project sites in a regional context.

Geology

Eastern Contra Costa County and western San Joaquin County are within the Central Valley (Great Valley) geologic province. The Central Valley is a trough that extends over 400 miles from north to south and consists primarily of the alluvial, flood, and delta plains of its two major rivers and their tributaries. The Central Valley has been filled with a thick sequence of sedimentary rocks of Jurassic to Recent age. A very thick Mesozoic stratum is present and is probably underlain by a basaltic or ultramafic basement (Bailey 1966, p. 217).

The surface of the Central Valley is composed of unconsolidated Quaternary sediments, with lesser amounts of Tertiary sedimentary rock and Cretaceous shales. This geologic base is overlain with alluvium and fill deposits, including peat and detrital sediments that are interbedded with glacial sands and gravel washed down from the Sierra Nevada. Because of its proximity to the Sierra Nevada, the Delta is one of the few places in the world where glacially derived deposits merge with marine deltaic deposits (Norris and Webb 1990, pp. 412–418).

The Delta was part of the inland sea of Tertiary and post-Tertiary times, but during the Post-Pleistocene, the Delta became filled with many islands formed by waters moving through this region. During flooding, sediments were deposited along the islands' shores, forming natural levees. Each island's interior subsided and seasonal ponds provided an ideal environment for tule (*Scirpus* spp.). These tule marshes have formed significant peat deposits throughout the Delta (Center for Design Research and EDAW 1988, cited in California Department of Water Resources 2005).

The Desalination Alternative facilities would be in areas consisting mostly of nonmarine consolidated and unconsolidated sediments of Quaternary alluvium. The untreated-water conveyance pipeline alignment would extend along the northern edge of mostly loosely consolidated Pliocene and/or Pleistocene sandstone, shale, and gravel deposits. In this area, Tertiary formations made up of hard marine sandstone and shale are overlain by soft non-marine Pliocene units (Contra Costa County 2005, pp. 10-5).

Volcanism

Neither the proposed project site nor the Desalination Alternative project sites are subject to potential hazards from future volcanic eruptions (USGS 2003a). Therefore, no further discussion of this topic is provided in this EIR/EIS.

Landslides

One of the major hazards associated with unstable geologic conditions is landslide potential. The strong ground motions that occur during earthquakes are capable of inducing landslides and related forms of slope adjustments. Earthquakes generally induce land sliding only where unstable soil conditions already exist; the ground shaking provides a mechanism for ground movement.

Byron Tract is a filled reclaimed area with almost flat topography (Contra Costa County 2005, pp. 10-20–21). The probability of a landslide on slopes of 15% or less is low. Victoria Island is not specifically identified in the *San Joaquin County General Plan* as an area subject to landslides; however, the general plan indicates that a significant number of Delta levees are susceptible to failure because of slope movement (San Joaquin County 1992, p. III.A-11). The use of unconsolidated materials such as peat and silt for levee construction increases the risk of slope failure, liquefaction, and flooding. See Section 4.5, "Local Hydrology and Water Quality," for a further discussion of local flooding issues relating to levee failure.

The Desalination Alternative intake and treatment plant sites are in relatively flat areas that are not subject to landslide potential. A study conducted for CCWD's Seismic and Reliability Improvements Project found the landslide potential along most of the Contra Costa Canal (i.e., the untreated-water conveyance pipeline route) to generally be low, with two areas having a moderate landslide potential, meaning that there would be a moderate chance of debris from shallow landslides spilling into the canal and blocking flow (CCWD 1997).

Seismicity and Seismic Hazards

Fault Systems and Probability of Seismic Activity

All the sites where project facilities may be located under the Proposed Action and alternatives are subject to the effects of seismic activity generated on both nearby and distant fault systems.

There are no active faults in the Delta; however, several large faults outside the Delta area could affect Delta islands. Victoria Island is located in Seismic Zone 3, as defined by the Uniform Building Code. Building standards and regulations for this zone assume earthquakes with the potential to make standing difficult and to cause stucco and some masonry walls to fall. (San Joaquin County 1992, p. III.A-1). Byron Tract, across Old River from Victoria Island and across the Contra Costa/San Joaquin County line, is in Seismic Zone 4.

Eastern Contra Costa County is located in a seismically active region. Concord and Contra Costa County are included on the California Geological Survey list of cities and counties affected by Alquist-Priolo Earthquake Fault Zones as of June 1, 1997, because of their proximity to the Concord-Green Valley fault (Hart and Bryant 1997). Major earthquakes have occurred in the vicinity of the city of Pittsburg in the past and can be expected to occur again in the future. The Pittsburg thrust fault is a recently postulated extension of the Kirby Hills Fault extending northwest-southeast through the city limits, approximately 1.5 miles east of the Mallard Slough intake (City of Pittsburg 2004, p. 10-5).

Table 4.4-1 provides information on the known active faults that are located in the project region. "Active" faults are those that have shown evidence of activity during Historic time (the last 200 years) or during the geologically recent past (within the last 11,000 years). Any of these faults could cause strong seismic ground shaking that could be felt at the Proposed Action project site or Desalination Alternative project sites.

Source: Carollo Engineers

Regional Topography in the Vicinity of the Proposed Project Site and Desalination Alternative Project Sites

EXHIBIT 4.4-1

Table 4.4-1
Active Faults Potentially Affecting the Project Sites

Fault Name	Age of Fault Activity [a]	Last Major Ground Rupture	Nearest Distance from Victoria Island/ Byron Tract (Miles)	Nearest Distance from Bollman WTP/ Mallard Slough Intake/ Pipeline (Miles)	Maximum Moment Magnitude	Probability of a Magnitude 6.7 or Higher Earthquake by 2032
San Andreas Fault Zone	Historic	1906, 1989	55	35	7.4	21%
Calaveras (Northern)	Historic/ Holocene/ Late Quaternary	1861	25	15	6.8	11%
Hayward	Historic/ Holocene	1836, 1868	35	15	6.7	27%
Concord-Green Valley	Historic/ Holocene	1955	25	<1	6.2	4%
Greenville	Historic/ Late Quaternary/ Quaternary	1980	13	5	6.6	3%
Great Valley	Quaternary	N/A	16	36	6.7	Data not available
Mt. Diablo	Quaternary	N/A	36	16	6.6	3%
Rodgers Creek	Holocene	1640 to 1776	44	24	7.0	27%

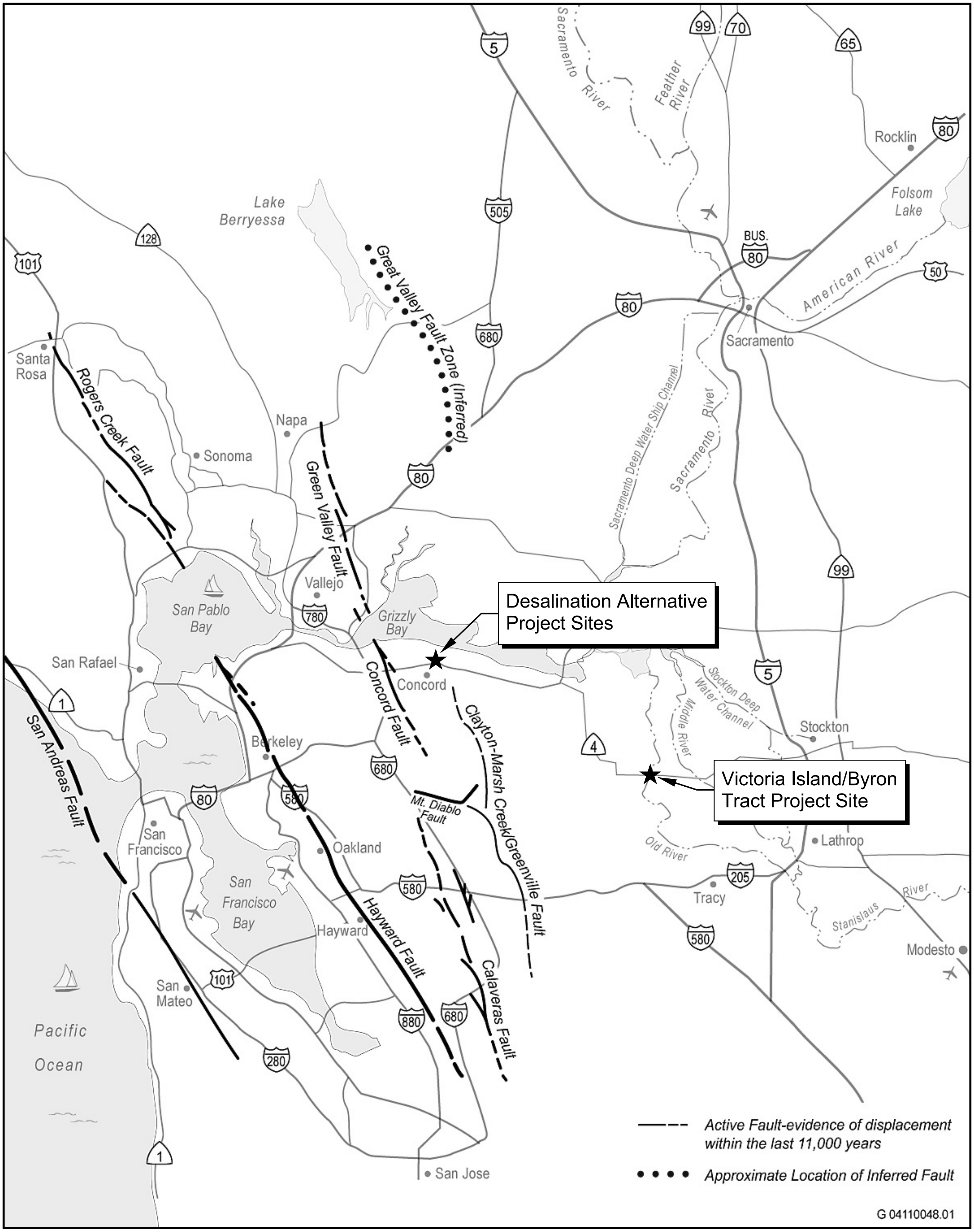
[a] Historic = activity within the last 200 years; Holocene = activity within the last 11,000 years; Late Quaternary = fault displacement during the past 70,000 years; Quaternary = shows evidence of displacement sometime during the past 1.6 million years.
N/A = The Great Valley and Mt. Diablo faults are blind/thrust faults that, by definition, are not exposed at the earth's surface.
Sources: Association of Bay Area Governments 2003; San Joaquin County 1992; City of Pittsburg 2004; Jennings 1994; Hart and Bryant 1997; Working Group on California Earthquake Probabilities 2003.

Exhibit 4.4-1 shows the potential locations of alternative intake facilities (Alternatives 1, 2, and 3) and desalination facilities (Alternative 4) in relation to the Concord Fault, which is the nearest active fault trace. Exhibit 4.4-2 shows the regional location of the active faults listed in Table 4.4-1.

In addition to the active faults described in Table 4.4-1, other faults and fault zones in the region could cause a hazard at one or more of the project sites. These include the Midway, San Joaquin, Antioch, Midland, and Black Butte faults, which are not identified as part of the Alquist-Priolo Earthquake Fault Zoning Act but have shown activity within the Cenozoic era (the past 65 million years) (Jennings 1994; San Joaquin County 1992, pp. III.A-1 to A-7). The *Contra Costa County General Plan 2005–2020* also identifies the Franklin and Black Diamond faults as active faults that may affect the county (Contra Costa County 2005, p. 10-6).

Seismic Ground Shaking

The intensity of seismic ground shaking depends on the distance from the earthquake epicenter to the site, the magnitude of the earthquake, site soil conditions, and the characteristic of the source. Deep unconsolidated materials amplify earthquake waves.



Source: Mualchin and Jones 1992; Jennings 1994; EDAW 2005

Active Faults Potentially Affecting the Project Sites

EXHIBIT 4.4-2

0 10 20 MILES

NORTH

EDAW

Seismic activity on these faults is projected to cause light to moderate ground shaking in the Victoria Island/Byron Tract area. The strongest ground shaking in the areas where Desalination Alternative facilities would be located would occur as a result of an earthquake on the Concord-Green Valley fault, which is about 1 mile from the Bollman WTP at its closest point. According to the distribution of ground-shaking intensity mapped by the Association of Bay Area Governments (ABAG), a large earthquake on the Concord-Green Valley fault would produce the maximum ground-shaking intensities in Bay mud deposits along Suisun Bay, which could cause damage to buried pipelines and partial collapse of poorly built structures (City of Pittsburg 2004, p. 10-8).

Soil Liquefaction

Soil liquefaction occurs when ground shaking from an earthquake causes a sediment layer saturated with groundwater to lose strength and take on the characteristics of fluids. Primary factors in determining liquefaction potential are soil type, soil consistency, the level and duration of seismic ground motions, and the depth to groundwater. Age is also a factor in the potential of soils to liquefy, with the younger (less than 11,000 years old) Holocene deposits being the most sensitive to liquefaction.

One consequence of liquefaction is an associated surface expression. If the seismic event occurs over an extended duration, the liquefied soils can migrate toward the surface, resulting in an ejection and subsequent sand boiling at the surface. If not mitigated, this phenomenon of surface expression can result in ground settlement and heave.

Two additional types of ground failure can result from liquefaction: lateral spread and loss of bearing strength, as defined below.

- **Lateral spread.** This term refers to the lateral displacement of surficial blocks of sediment as the result of liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluidized mass, gravity plus inertial forces that result from the earthquake can cause the mass to move downslope toward a cut slope or free face (such as a river channel or a canal). Such movement can damage pipelines, utilities, bridges, and other structures.

- **Loss of Bearing Strength.** When a soil loses strength and liquefies, loss of bearing strength can occur beneath a structure, possibly causing the structure to settle and tip or float upward.

The estuarine (coastal) areas where the Mallard Slough intake and pump station facility would be expanded and that would be crossed by a portion of the untreated-water conveyance pipeline and the concentrate disposal pipeline are underlain by Bay mud. Bay mud consists of unconsolidated silt and clay with abundant organic material, local peat, sand, and gravel lenses or discontinuous beds (City of Pittsburg 2004, p. 10-2). High and moderate liquefaction potential exists around the Mallard Slough pump station (CCWD 1997). Local deposits of artificial fill are present along the margins of Suisun Bay. Old fill (generally placed before the 1950s) typically consists of heterogeneous material. These soils tend to have a risk of liquefaction. The Bollman WTP site has a generally low liquefaction potential. According to the study prepared for CCWD's Seismic and

Reliability Improvements Project (CCWD 1997), liquefaction is the primary seismic hazard concern for the Contra Costa Canal, which defines much of the alignment of the untreated-water pipeline.

Tsunamis and Seiches

Earthquakes can create hazards in relation to open bodies of water in two ways: by creating seismic sea waves (tsunamis) and by creating seiches. Seiches are earthquake-induced oscillations of water, which can occur for a few minutes or several hours, in an enclosed or restricted water body such as a basin, river, or lake. There have been no recorded tsunamis or seiches in the Bay Area and the *San Joaquin County General Plan* indicates no historical records of seismic-generated water movement occurring in or adjacent to San Joaquin County. Because the Delta consists of a network of interconnected bays and sloughs, any waves generated in a portion of this water body by an earthquake would likely be damped and would not develop the "back and forth" motion associated with a seiche.

Soils and Associated Hazards

Soil Types

Soils in the Delta region and in the areas where Desalination Alternative facilities would be located are generally described as organic Delta soils, estuarine soils, and flatland soils.

Victoria Island and Byron Tract, like other Delta islands, contain soils that are very poorly drained, nearly level, and very deep. Some peat and organic silt remains near the ground surface on many portions of Victoria Island. These organic soils were formed from hydrophytic plant remains derived from reeds and tules. The underlying alluvium was derived from mixed rock sources, including granitic rock sources (Delta Protection Commission 1995, p. 25). Because much of the land on the Delta islands is at low elevations (below sea level), drainage ditches and pumps are needed in most areas to maintain the water table below the rooting depth of crops.

Hultgren-Tillis Engineers reviewed previous geotechnical explorations along Victoria Canal and Old River for several different projects. In addition, soil borings were drilled on Victoria Island during the initial phase of site characterization. Results of these explorations indicate that the subsurface soils can be divided into three units: the uppermost unit (Unit 1) consists of fill, peat and/or other highly organic soils, the second unit (Unit 2) is "Less Stiff" soil, and the third unit (Unit 3) is "Stiffer". These three soil units are discussed below.

- **Unit 1, Peat and Highly Organic Soils/Fills.** Fills make up much of the perimeter levee and farm roads. For the most part, fills were likely derived from excavations immediately adjacent to the fill areas. Levee and farm road fills consist of intermixed sands, silts, clays and peat. At the levee along Victoria Canal, about 13 feet of fill overlies 6 feet of peat. Up to 7 feet of fill and peat occurs beneath roads of the interior portions of the island.

Peat is weak and highly compressible. Where present, the base of peat was generally between elevations -10 and -20 feet. Peat may no longer exist across many portions of the potential pipeline routes within Victoria Island or Byron Tract. Where peat or highly organic soil was encountered beneath the interior of Victoria Island, it ranged from about 2 to 4.5 feet thick.

- **Unit 2, "Less Stiff" Soils.** Alluvial soils that underlie the peaty/highly organic materials generally consist of interbedded clays, silts and sands. These alluvial soils can be broadly subdivided into zones based upon stiffness or relative density of the material. The upper portions of the alluvium are labeled "Less Stiff" soils because they are generally weaker than the deeper alluvium and represent possible concerns for stability, settlement, and liquefaction potential.

  The "Less Stiff" soil unit includes mostly fine-grained material (clay and silt with rare peat) and occasional sand and silty sand layers. The fine-grained soils generally range from soft to medium stiff and are considered weak and compressible under new fill loads. The silts are mostly non-plastic or of low plasticity. Lower portions of this "Less Stiff" unit are mostly loose to medium dense sands and silts with some clay layers. The base of the Less Stiff unit was typically found between elevations -30 and -40 feet near Victoria Canal, and from elevations -55 to -65 feet near Old River.

- **Unit 3, "Stiffer" Soils.** Lower portions of the alluvial soil profile generally include stiff clays and silts, and dense to very dense sands. These soils were encountered below elevations ranging between -30 and -40 feet along the eastern portion of Victoria Canal. However, this unit is not conclusively delineated below the western portion of Victoria Island's southeast perimeter adjacent to Victoria Canal. For initial planning purposes, the transition between the "Less Stiff" and "Stiffer" units may be considered to be between elevations -30 to -40 feet in the more probable locations of the intake structure and conveyance routes. In one deep boring opposite the southwest end of Victoria Canal, the Stiff soil unit begins at a much lower elevation, around -72 feet. Near the Old River facility, the Stiff soil unit was typically encountered at elevations -55 to -65 feet, and very dense sands were found below elevations -70 to -85 feet.

Groundwater was encountered in borings at depths ranging from 0.5 feet to more than 10 feet below existing grades. At the various times when the borings were drilled, these groundwater depths corresponded to approximate elevations of -7 to -18 feet. Recent hand auger borings encountered groundwater at depths of 2 to 5 feet beneath the Victoria Island fields. Groundwater levels on Victoria Island may be affected by agricultural irrigation and drainage pumping practices.

Soils near Mallard Slough are characterized as nearly level, poorly drained saline mucks and silty clays. Soils more inland near Bollman WTP are nearly level to moderately steep, moderately well-drained and well-drained loams and clay loams that formed in old alluvium on terraces. Clear Lake-Cropley associations are present northeast of Bollman WTP. These associations are characterized as nearly level to gently sloping, poorly drained and moderately well-drained clays on valley fill and in coastal valley basins.

Table 4.4-2 summarizes the soil types and characteristics found at the proposed project and Desalination Alternative project sites. Both areas contain soil types that are of low strength. Special design features are necessary to protect structures in these soil types from damage.

Expansive Soils

Expansive soils shrink and swell as a result of moisture changes. Shrinking and swelling of soil causes volume changes that can damage building foundations, underground utilities, and other subsurface facilities if they are not designed and constructed to resist the changing soil conditions. The hazards associated with expansive soils can be avoided through proper drainage and foundation design. Soils with expansive properties are present at the proposed project and Desalination Alternative project sites, as identified in Table 4.4-2.

Table 4.4-2
Soils Types and Associated Hazards at the Proposed and Alternative Project Sites

Soil Symbol and Name	Soil Description/Hazards	Project Location	Shrink-Swell Potential	Corrosivity to Uncoated Steel	Seasonal High Water Table (Feet)
Victoria Island/Byron Tract					
179 Itano silty clay loam	Moderately slow permeability. The hazard of water erosion is slight. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Victoria Canal pump station/ direct and indirect pipelines	Moderate	High (high with concrete as well)	3–4.5
190 (Kb) Kingile muck	Slow permeability. The hazard of water erosion is slight and soil blowing is severe. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Victoria Canal pump station/ direct and indirect pipeline	Low to moderate	Moderate (moderate with concrete as well)	3–4
191 Kingile-Ryde complex	Slow to moderately slow permeability. The hazard of water erosion is slight and soil blowing is severe. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Direct and indirect pipeline	Low to moderate	Moderate (moderate with concrete as well)	3–4
230 Ryde clay loam	Moderately slow permeability. The hazard of water erosion is slight and soil blowing is moderate. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Direct pipeline	moderate	High (high with concrete as well)	3–4
231 Ryde silty clay loam, organic substratum	Moderately slow permeability in the upper part of the Ryde soil and rapid in the organic substratum. The hazard of water erosion is slight and soil blowing is moderate. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Direct and indirect pipeline	Moderate to low	Moderate (moderate with concrete as well)	3–4
232 Ryde clay loam, sandy substratum	Moderately slow permeability in the upper part of the Ryde soil and rapid in the sandy substratum. The hazard of water erosion is slight and soil blowing is moderate. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Direct pipeline	Moderate to low	Moderate (moderate with concrete as well)	3–4

Table 4.4-2
Soils Types and Associated Hazards at the Proposed and Alternative Project Sites

Soil Symbol and Name	Soil Description/Hazards	Project Location	Shrink-Swell Potential	Corrosivity to Uncoated Steel	Seasonal High Water Table (Feet)
233 Ryde-Peltier complex	Moderately slow permeability in the Ryde soil and slow in the Peltier soil. The hazard of water erosion is slight and soil blowing is moderate. Subject to subsidence and rare flooding during abnormally high precipitation years. Low strength. 0–2% slope.	Direct pipeline	Moderate	Moderate (moderate with concrete as well)	3–4
Desalination Alternative Project Sites					
Ja Joice muck	Moderate permeability. Subject to ponding, or surface water runs off very slowly. No hazard of erosion. Nearly level, slope less than 1%.	Mallard Slough pump station/ concentrate disposal pipeline	High shrink, low swell	Very high	1–3
AdA, AdC Antioch loam	AdA: Very slow permeability. Slight hazard of erosion where the soil is tilled and exposed. Low strength in subsoil.0–2% slopes. AdC: Very slow permeability. Slight to moderate hazard of erosion where the soil is tilled and exposed. Low strength in subsoil. 2–9% slopes.	Untreated-water pipeline	Low to high	High	>5
CaA Capay clay	Slow permeability. No hazard of erosion where the soil is tilled and exposed. Low strength. 0–2% slopes.	Untreated-water pipeline	High	High	>5
CaC Capay clay	Slow permeability. Slight hazard of erosion where the soil is tilled and exposed. Low strength. 2–9% slopes.	Untreated-water pipeline	High	High	>5
AcF Altamont-Fontana complex	Slow permeability. Moderate to high hazard of erosion where the soil is bare. Low strength. 30–50% slopes.	Untreated-water pipeline	High	High	>5
DdE Diablo clay	Slow permeability. Moderate hazard of erosion where the soil is tilled and exposed. Low strength. 15–30% slopes.	Untreated-water pipeline	High	High	>5
Sp Sycamore silty clay loam	Moderately slow permeability. Slight hazard of erosion. Low strength below depth of 40 inches. 0–2% slopes.	Untreated-water pipeline?	Moderate	High	>5
Cc Clear Lake clay	Slow permeability. No hazard of erosion where the soil is tilled and exposed. Low strength. 0–2% slopes.	Untreated-water pipeline?	High	Very high	>5
RbA Rincon clay loam	Slow permeability. No hazard to slight hazard of erosion where the soil is tilled and exposed. Low strength. 0–2% slopes.	Untreated-water pipeline?	Moderate	Moderate	>5
KaE Kimball gravelly clay loam	Very slow permeability. Moderate hazard of erosion where the soil is bare. Low strength. 9–30% slope.	Untreated-water pipeline?	Moderate	Moderate	>5
CkB Cropley clay	Slow permeability. Erosion hazard is slight where soil is tilled and exposed. Low strength. 2–5% slope.	Untreated-water pipeline/ potential desalination plant/ concentrate disposal pipeline	High	High	>5

Table 4.4-2
Soils Types and Associated Hazards at the Proposed and Alternative Project Sites

Soil Symbol and Name	Soil Description/Hazards	Project Location	Shrink-Swell Potential	Corrosivity to Uncoated Steel	Seasonal High Water Table (Feet)
KaC Kimball gravelly clay loam	Very slow permeability. Slight to moderate hazard of erosion where the soil is tilled and exposed. Low strength. 2–9% slope.	Potential desalination plant	Moderate to high	Moderate to high	>5
Ob Omni silty clay	Slow permeability. No hazard of erosion where soil is tilled and exposed. Less than 2% slope.	Concentrate disposal pipeline	High	Very high	2.5-4

Note: The alignment of the pipeline between the Contra Costa Canal alignment and the desalination facility is not defined. (?) indicates a soil that could potentially be within the pipeline alignment.

Source: SCS 1977, 1992

Subsidence

By 1920, it was recognized that the drained Delta lands were subsiding (CALFED 2000, p. 5.5-5). Subsidence of the peat soils (organic or highly organic mineral soils) in the Delta has caused the tidally influenced islands to become areas in which the land surfaces are now 10–25 feet below sea level (USGS 2000, p. 1-4). The dominant cause of land subsidence in the Delta is decomposition of organic carbon in the peat soils. Before agricultural development, the soil was waterlogged and anaerobic and organic carbon accumulated faster than it could decompose. Drainage for agriculture led to aerobic (oxygen rich) conditions that favor rapid microbial oxidation of the carbon in the peat soil. This process results in soil decomposition and subsidence. Elevation measurements made from 1922 to 1981 indicate that land-use practices on peat soils tended to cause from 1 to 3 inches of subsidence per year (CALFED 2000, p. 5.5-5).

Settlement

Settlement of the ground surface is a chief geologic constraint to development in areas of unconsolidated soils. Settlement includes the gradual downward movement of a structure resulting from one or more of the following: (1) consolidation of soft, normally consolidated soils from new surface loads or lowered groundwater levels, (2) compaction of loose silt and sand and of poorly compacted fill upon becoming wet, (3) shrinkage of expansive soils upon drying, and (4) lateral deformation of weak foundation soils. Secondary (creep) settlement may continue after consolidation is complete. More rapid settlement may be caused by seismically induced compaction.

Settlement is most extreme over peat and fine-grained sediments (Bay Mud) that have a high water content. In general, peat, such as that underlying portions of Victoria Island, and Bay Muds, such as those underlying the Mallard Slough area, have low density and are highly compressible and weak, and can fail because of imposed loads.

Settlement can result in vertical or horizontal separation of structures or portions of one structure; cracks in foundations, roads, sidewalks, and walls; and, in severe situations, building collapse and bending or breaking of underground utility lines.

Erosion
Soil erosion is the physical removal of material by agents such as water, wind, or ice and is a naturally occurring process on the earth's surface. The impact of raindrops on the soil surface can break down and dislodge soil particles, which can then be transported by water flow across the surface. Runoff occurs whenever excess water on a slope cannot be absorbed into the soil or trapped on the surface. Over time, the force of water flow can cut into the land surface, creating small channels (called rills) and eventually larger channels (called gullies). If the surface water flow makes its way into stream channels, the suspended soil particles are transported downstream and later deposited as sediment. Soil erosion rates vary depending on location, soil characteristics, climate, slope, and type of vegetation. Soil erosion can result in damage to structures (e.g., by exposing foundations), the loss of valuable cropland, and stream channel impairment (including the loss of aquatic habitat).

Wind erosion is a major factor affecting soil loss in the Delta. The Delta organic soils and highly organic mineral soils have wind erodibility ratings of 2–4 on a scale where 1 is most erodible, and 8 is least erodible. The high wind erodibility of Delta soils is due to their organic matter content. The rate of wind erosion is estimated at 0.1 inch per year (CALFED 2000, p. 5.5-6).

Soil removal by wind is generally less significant than by water. Victoria Island has been identified in the *San Joaquin County General Plan* (San Joaquin County 1992, p. III.A-11 to A-14) as having a high wind erosion hazard and low water erosion potential.

4.4.2 Environmental Consequences

4.4.2.1 Methods and Assumptions
The analysis presented in this section is qualitative and is based on the general information on geologic, seismic, and soil conditions documented for the region and the proposed and alternative project sites as reported in Section 4.4.1, "Affected Environment." The analysis for Alternatives 1, 2, and 3 is also based on the results of the soil borings performed on Victoria Island, which are summarized in that section. Because the specific footprints of facilities that would be constructed under Alternative 1, 2, or 3 have not yet been determined, it is assumed that the worst-case conditions for the proposed project site that are noted in Section 4.4.1 may apply to these alternatives.

4.4.2.2 Significance Criteria
The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect related to geology, soils, or seismicity if it would:

- expose people or structures to potential substantial adverse effects, involving rupture of known, active faults, strong seismic ground shaking, seismically induced seiche or tsunami, or seismically induced ground failure, including liquefaction;
- result in substantial soil erosion or loss of topsoil; or
- present a substantial risk to people or property due to geologic hazards such as landslides, lateral spreading, liquefaction, land subsidence, collapse, or expansive soils.

The potential for tsunami or seiche at Victoria Island and Byron Tract is considered negligible because of the distance from water bodies that could generate tsunamis (the Pacific Ocean is located approximately 30 miles to the west at the closest point) and because the interconnected nature of bays and sloughs in the Delta make it unlikely that earthquake-generated waves would develop the "back and forth" motion associated with a seiche.

The Proposed Action and alternatives would not include components, such as long-term groundwater withdrawal, that could cause land subsidence. Construction of facilities for the Proposed Action and Alternatives 2 and 3 may require dewatering on Victoria Island and Byron Tract; however, such activities would be temporary and would not permanently change the groundwater recharge rate.

4.4.2.3 No-Action Alternative

Under the No-Action Alternative, no new intake, conveyance, or desalination facilities would be constructed. Therefore, the No-Action Alternative would have no impact associated with geological hazards or soil erosion. All of the geotechnical hazards described in Section 4.4.1.2, "Environmental Setting," would remain as under existing conditions. The No-Action Alternative would not create any conditions to increase those hazards or reduce the risks to people, structures, or the environment.

4.4.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

IMPACT 4.4-a (Alternative 1)	**Hazards Resulting from Seismically Induced or Soil-Related Structural Failure of Project Facilities.** *The alternative intake facilities would be constructed on a site that may be subject to strong seismic ground shaking from active earthquake faults and that has soils with liquefaction and shrink-swell potential and corrosive properties. Seismic ground shaking could cause structural failure of proposed facilities (e.g., rupture the conveyance pipeline) directly or could damage the facilities indirectly by inducing liquefaction of the underlying soils. Facility damage could also result from expansion and contraction of underlying soils or pipeline corrosion. If pipeline rupture occurred during operation of the facilities, substantial localized flooding, erosion, and scour of surrounding land could result. Because of the potential for damage to agricultural land and associated hazards to people at the project site under extreme conditions, this indirect impact would be* ***potentially significant****.*

Seismic Activity and Liquefaction Potential

Victoria Island and Byron Tract are not located within an Alquist-Priolo Earthquake Fault Zone, and there are no active faults in their vicinity. Risks associated with surface rupture at the proposed project site are therefore very low. However, the site is located between 9 and 55 miles from the active Concord-Green Valley, Greenville, Great Valley, Mount Diablo Thrust, Calaveras, Hayward, Rodgers Creek, and San Andreas faults, for which the maximum moment magnitude is considered to be 6.2 or higher. Seismic activity on any of these faults could generate strong ground shaking in the project area (see Table 4.4-1). Movement associated with the 1989 Loma Prieta earthquake on the San Andreas fault, 55 miles from the project site, was felt in the Delta area (Delta Protection Commission 1995). A USGS-led study concluded that there is a 27% probability that a large-magnitude (greater than 6.7) earthquake will occur by 2032 on the Hayward fault, located about 35 miles from the project site (USGS 2003b). Probabilities of large-magnitude earthquakes at the other faults near the project area are displayed in Table 4.4-1.

Because of the potential for major earthquake activity in the region, ground shaking would be a potential hazard associated with the proposed project facilities. Ground-shaking intensity would depend on the magnitude of the earthquake, the distance from the epicenter, and the duration of shaking. The damage sustained at any given location would depend on the earthquake intensity, soil type, type of structure and its building materials, and construction quality.

Loose sands and silty sands occur within 40 feet below existing grade along Victoria Canal and Old River, and beneath the interior of Victoria Island. These materials may liquefy during a large earthquake. The soils present on Byron Tract are also categorized as having generally high liquefaction potential (Contra Costa County, p. 10-15).

Strong ground shaking could result in equipment or structural failure of the intake facility or pump station or could bend, crack, or rupture the proposed conveyance pipeline, resulting in leakage. Earthquake-induced liquefaction could result in loss of load-bearing capacity for the intake facility, pump station, pipeline, and other structures, possibly resulting in damage to the proposed intake and pump station.

Shrink-Swell Soil Properties

As shown in Table 4.4-2, the proposed project site is underlain by seven different soil types: Itano silty clay loam, Kingile muck, Kingile-Ryde complex, Ryde clay loam, Ryde silty clay loam, Ryde clay loam, and Ryde-Peltier complex. These soils range from low to moderate shrink-swell potential. The shrinking and swelling of expansive soils as a result of moisture changes can damage building foundations, underground utilities, and other subsurface facilities if these facilities are not designed and constructed to resist the changing soil conditions.

Soil Corrosivity

Soil corrosion is a complex phenomenon with a multitude of variables; corrosion generally occurs in soils with high moisture content, high electrical conductivity, high acidity, and high dissolved salts. Itano silty clay loam, potentially present along the pipeline alignment and at the intake and pump station site, has a very high potential to be corrosive to uncoated steel and concrete (see Table 4.4-2). Kingile muck, Kingile-Ryde complex, and Ryde silty clay loam are present at the potential intake locations, along the conveyance pipeline alignment, and where the pipeline would tie into CCWD's existing Old River conveyance facilities. These soils have a potential to be moderately corrosive to uncoated steel and concrete (SCS 1992). Like shrink-swell behavior, soil-related corrosion of pipes could cause or contribute to their failure.

Hazards Related to Seismicity and Soil Properties
As noted above, regional seismicity and soil characteristics of the proposed project site could lead to structural failure of project facilities, including pipeline rupture. Because the pump station would generally be unstaffed, the potential for injury to people caused by structural failure of the pump station and associated buildings would be very low. However, in the event of a pipeline rupture during project operations, leaking water could be forced downward into local aquifers and/or upward to the ground surface, potentially causing localized flooding, erosion, and scour of the overlying and surrounding agricultural land and creating a hazard to any individuals present on the site. This indirect impact would be potentially significant because of the potential for hazards to people and substantial damage to agricultural land associated with possible pipeline rupture.

IMPACT 4.4-b (Alternative 1)

Project-Related Soil Erosion. *Construction of the proposed alternative intake facilities could contribute to soil erosion at the project site during the installation period. The proposed project site is relatively flat, however, resulting in low potential for water-related erosion, and standard construction practices would minimize wind-caused erosion. Therefore, this indirect impact would be* ***less than significant****.*

Construction activities during project implementation would involve a substantial amount of grading and excavation within limited portions of the project site over a multi-year construction period. As shown in Table 4.4-2, all of the soils present at the proposed project site are rated as having a slight hazard of water erosion (SCS 1992). The hazard of wind erosion, however, is listed as moderate to severe for soils at the project site.

Construction would include standard best management practices (BMPs), such as applying water or other dust minimization techniques as necessary to prevent or alleviate dust nuisance generated by construction activities, or covering small stockpiles of earth. For this reason, it is not expected that wind-caused erosion on the project site would be greater than existing erosion under farming operations. Therefore, this indirect impact would be less than significant.

The potential impact of soil erosion on water quality is discussed in Section 4.5, "Local Hydrology and Water Quality."

Cumulative Impacts
The proposed project site would be exposed to potentially significant impacts resulting from seismically induced or soil-related structural failure of project facilities. The potential of the project to increase soil erosion is low. Effects of the Proposed Action related to geology, soils, and seismic hazards would be localized on Victoria Island and

Byron Tract, and there are no other planned projects identified in Section 4.1.3, "Cumulative Impact Analysis," with which the effects of the Proposed Action would combine to result in cumulative hazards on Victoria Island and Byron Tract related to geologic, soil, and seismic conditions. Therefore, the Proposed Action would not make a cumulatively considerable contribution to any cumulative impact related to earth resources.

Mitigation Measures

Mitigation Measure 4.4-a (Alternative 1): Complete a Design-Level Geotechnical Study for the Project that Assesses Site-Specific Conditions, and Implement Applicable Study Recommendations in Facility Construction Design.

A design-level geotechnical study shall be prepared for the project that assesses site-specific conditions at and near potential facility locations, including seismic activity, soil liquefaction, the presence of expansive soils, and soil corrosivity. CCWD shall ensure that the study is prepared by a licensed geotechnical engineer during design of the project facilities. The study shall consider the seismic history of the project site and surrounding area and include engineering recommendations for earthquake-resistant design of the project facilities. Engineering recommendations may include measures such as the use of reinforced structural design features, the use of reinforced or flexible pipeline, installation of shutoff valves to stop the flow of water in the event of pipeline rupture, or pipeline realignment. Project facilities shall be designed for acceptable predicted horizontal and vertical ground deformation and ground surface accelerations, as calculated by the geotechnical engineer. The study shall also identify any additional means, such as soil conditioning, to minimize or avoid damage from liquefaction.

In addition, the study shall entail sampling and testing of fill and foundation soils to determine their compressibility, strength, expansion, and corrosivity potential and identify appropriate means to minimize or avoid damage from construction on such soils consistent with International Building Code and CBC standards. Methods to address expansive soils may include, but are not limited to, excavation and replacement with non-expansive materials, with the required depth of excavation specified by a registered geotechnical engineer based on actual soil conditions, and treatment of the soils in place through mixture with lime.

Recommendations for corrosive soils may include excavation and replacement of highly corrosive soils with appropriate fill material and/or construction of buried pipelines using cathodic protection or mortar-lined and -coated welded steel pipe, reinforced concrete cylinder pipe, or other materials that can withstand corrosive conditions.

The measures used to address these conditions shall conform to applicable building codes. CCWD shall ensure that geotechnical design recommendations resulting from the study are included in the design of project facilities and in the project construction specifications as necessary to minimize the potential environmental effects resulting from seismic events and the presence of adverse soil conditions.

Implementing this mitigation would reduce the potential hazards to a less-than-significant level.

4.4.2.5 Alternative 2, Indirect Pipeline Alternative

The impacts of Alternative 2 would be essentially the same as those described for the Proposed Action. The indirect pipeline alignment route under Alternative 2 would be longer than the direct alignment under the Proposed Action, resulting in a somewhat greater risk of structural failure under extreme conditions; however, the pipeline alignment would be adjacent to existing farm roads, probably providing easier access for repairs. The mitigation measure described for the Proposed Action would apply to Alternative 2 as well and would reduce the potential impact to a less-than-significant level. The greater amount of land disturbance under Alternative 2 compared to the Proposed Action would also expose more soil area to potential erosion in the absence of construction BMPs; however, construction activity would employ these standard measures to minimize the loss of soil. As described for the Proposed Action, Alternative 2 would not contribute to any cumulative impact related to earth resources.

4.4.2.6 Alternative 3, Modified Operations Alternative

The impacts of Alternative 3 would be identical to those described for the Proposed Action. Implementation of the mitigation measures described for the Proposed Action would reduce these effects to a less-than-significant level. Alternative 3 would not contribute to any cumulatively considerable impact related to earth resources.

4.4.2.7 Alternative 4, Desalination Alternative

Direct and Indirect Impacts

IMPACT 4.4-a (Alternative 4)

Hazards Resulting from Seismically Induced or Soil-Related Structural Failure of Project Facilities. *Desalination Alternative facilities would be constructed on sites near active earthquake faults and could be subject to strong seismic ground shaking or earthquake-induced soil liquefaction that could lead to structural failure, particularly of pipelines. Various soils within the project footprint have moderate to high shrink-swell potential and corrosive properties that could contribute to structural failure, including pipeline rupture, particularly in combination with ground shaking. Because of the potential for injury to people or damage to property that could result from such failure, this impact would be* ***potentially significant****.*

Seismic Activity and Liquefaction Potential

Desalination Alternative facilities could be subject to intense ground shaking from several nearby faults. The Concord-Green Valley fault is less than 1 mile west and the Greenville fault about 5 miles south of the footprint of the Desalination Alternative facilities at its closest point. These faults, as well as other faults in the Bay Area that are within 35 miles of the project sites, including the San Andreas, Calaveras, Rodgers Creek, Mt. Diablo, and Hayward faults could generate large magnitude earthquakes (Working Group on California Earthquake Probabilities 2003).

The proximity of these and other faults and the potential for seismic activity that would result in intense ground shaking at project facilities (see Table 4.4-1) pose a substantial potential risk of possible structural failure of facilities that would be constructed under this alternative. The specific hazard posed at any particular facility would depend on the geology, soils, distance from an epicenter of ground shaking, and construction specifications of the facility. The Mallard Slough pump station and portions of the untreated-water conveyance pipeline and concentrate disposal pipeline would be located in the zone of highest damage susceptibility to ground failure, as identified in the *Contra Costa County General Plan 2005-2020* (Contra Costa County 2005). The remainder of the pipeline routes and the desalination treatment facility would be located in a moderate damage susceptibility zone. The Mallard Slough pump station could also be subject to inundation from a tsunami associated with an intense earthquake.

The study conducted for CCWD's Seismic and Reliability Improvements Project concluded that high and moderate liquefaction potential exists around the Mallard Slough pump station (CCWD 1997). Further, liquefaction was identified as the primary seismic hazard concern for the Contra Costa Canal (CCWD 1997). Liquefaction could result in loss of load-bearing capacity for the intake facility, pump station, and portions of the pipeline routes in response to seismic ground shaking, possibly resulting in damage of facilities, such as a pipeline rupture. A pipeline rupture occurring during use could result in localized flooding; substantial soil erosion in open space areas; and, if it occurred where the untreated-water conveyance pipeline would pass through Bay Point or Clyde, hazards to people and property.

Shrink-Swell Soil Properties

Several soil types in areas where desalination facilities would be constructed are considered very highly to moderately expansive (see Table 4.4-2). Expansive soils shrink when dry and swell when wet. This movement can exert enough pressure to crack sidewalks, driveways, pipelines, and foundations. The construction of project facilities in areas with these soils could lead to structural damage or contribute to structural failure in combination with other adverse conditions such as seismic ground shaking.

Soil Corrosivity

The installation of pipelines in corrosive soils also could result in their damage and structural failure. Table 4.4-2 indicates the corrosivity potential of the soil types at the Desalination Alternative project sites. Joice muck, present at the Mallard Slough pump station and along portions of the concentrate disposal pipeline route, has a very high potential to be corrosive to uncoated steel and concrete. Several soil types that are present along the untreated-water conveyance pipeline alignment, at the desalination plant site, and along portions of the concentrate disposal pipeline route have a potential to be moderate to very highly corrosive to uncoated steel and concrete. Like shrink-swell behavior, soil-related corrosion of pipes could cause or contribute to their failure.

Landslide Potential

A preliminary geotechnical investigation of conditions along the Contra Costa Canal was conducted in 1997 for CCWD's Multi-Purpose Pipeline Project (Leland R. Gardner and Associates 1998). The results of this investigation are also applicable to those portions of the desalination conveyance pipeline that coincide with the Contra Costa Canal alignment. Although potential soil movement hazards were identified along the Contra Costa Canal alignment, landslide problems that have directly affected the canal area appear to have been limited to shallow failures in cut slopes at various locations. Large landslides could occur, especially if strong earthquake shaking occurred during a time of high soil moisture.

Soil movement hazards were identified in two portions of the untreated-water conveyance pipeline alignment. Houses are located downslope of one of these areas. Construction-related failures could involve partial failure of the walls of the pipeline trench at some time between excavation and final backfilling (following installation of the pipeline), particularly when seismic ground shaking follows a period of heavy rainfall. In general, trench wall stability problems can be minimized through the use of adequate shoring and minimization of the length of time the trench is open.

Hazards Related to Seismicity and Soil Properties

Seismic ground shaking and soil characteristics in areas where Desalination Alternative facilities would be constructed could lead to structural failure of project facilities, including pipeline rupture. Because the pump station would be unstaffed, the increased potential for injury to people caused by structural failure of the pump station building and associated facilities would be very low. In the event of a pipeline rupture during project operations, leaking water could cause localized flooding, erosion in open space areas, and hazards to people and damage to streets and property in the Bay Point and Clyde areas. Soil movement in areas of the untreated-water conveyance pipeline that are subject to landsliding could damage the pipeline and put downslope houses at risk. This impact would be potentially significant because of the potential for hazards to people and damage to property associated with potential pipeline rupture.

IMPACT 4.4-b (Alternative 4)	**Project-Related Soil Erosion.** *Soils within parts of the footprint of project facilities have moderate to high hazard of erosion. Construction activity in these areas could substantially increase the potential for water-caused erosion in these areas during the construction period. This impact would be* ***potentially significant****.*

Construction activities during implementation of this alternative would involve excavation, transport, and temporary stockpiling of soil. Soil disturbance could occur at several different locations, including several miles of pipeline alignment. The extensive amount of earthwork activities could expose soils to erosion during all phases of construction. Construction would include standard BMPs, such as applying water or other dust minimization techniques as necessary to prevent or alleviate dust nuisance generated by construction activities, or covering small stockpiles of earth. Although these measures should minimize wind-caused soil erosion, some of the soils present at Desalination Alternative project sites are susceptible to water erosion. As shown in Table 4.4-2, Joice muck, Capay clay, and Clear Lake clay, present at the Mallard Slough pump station and along the untreated-water conveyance and concentrate disposal pipeline alignments, are rated as having no hazard of water erosion. However, other soils present along the pipeline alignments and those at the desalination treatment facility site have a slight to moderate hazard of erosion where the soil is tilled and exposed and Altamont-Fontana complex, present along the untreated-water conveyance pipeline alignment, has a moderate to high hazard of erosion where the soil is bare (SCS 1977). Because substantial soil erosion could occur during construction of the project facilities if excavated areas are exposed to runoff, this impact would be potentially significant.

Cumulative Impacts

The Desalination Alternative project sites would be exposed to potentially significant seismic hazard impacts resulting from seismically induced or soil-related structural failure of project facilities. Some of the project sites, particularly areas along the untreated-water conveyance pipeline alignment, have moderate to high potential for water-related soil erosion. However, effects of the Desalination Alternative related to geology, soils, and seismic hazards would be localized, and there are no other planned projects identified in Section 4.1.3, "Cumulative Impact Analysis," in the immediate vicinity of the Desalination Alternative site with which the effects of the Desalination Alternative would combine to result in cumulative hazards related to seismic or soil-related conditions. Therefore, the Desalination Alternative would not make a cumulatively considerable contribution to any cumulative impact related to earth resources.

Mitigation Measures

Mitigation Measure 4.4-a (Alternative 4): Complete a Design-Level Geotechnical Study for the Project that Assesses Site-Specific Conditions, and Implement Applicable Study Recommendations in Facility Construction Design.

This measure would be the same as described above for the Proposed Action and shall include measures to address landslide potential along the untreated-water conveyance route, in addition to the considerations of seismic activity, soil liquefaction, expansive soils, and soil corrosivity described for the Proposed Action.

Implementing this mitigation would reduce the potential hazards to a less-than-significant level.

Mitigation Measure 4.4-b (Alternative 4): Evaluate Site-Specific Soil Erosion Hazards as Part of the Geotechnical Study, and Include Relevant Erosion-Control Requirements in the Construction Specifications.

As part of the site-specific, design-level geotechnical study (see Mitigation Measure 4.4-a [Alternative 4]), CCWD and its engineer or erosion control specialist shall conduct an evaluation of soil erosion hazards at the project sites and identify appropriate site-specific means to minimize or prevent erosion. Methods may include using erosion-control materials that are typically employed during construction activity to prevent sedimentation in surface waters, such as hay bales, straw wattles, and silt fences, along with revegetation of temporarily exposed soil areas (see Mitigation Measure 4.3-a [Alternative 1] in Section 4.3, "Delta Fisheries and Aquatic Resources"). Where construction activity would be conducted in more highly erosive soils on slopes, additional methods, such as the use of mulch-control netting or erosion-control blankets, may be necessary to ensure soil stabilization. All relevant erosion control and prevention requirements shall be included in construction specifications for the project facilities based on site-specific soil conditions and anticipated construction activities and methods.

Implementing this mitigation would reduce soil erosion impacts to a less-than-significant level.

4.5 Local Hydrology and Water Quality

This section discusses local hydrology, water quality, drainage, flooding potential, and groundwater within the immediate vicinity of the project sites for the Proposed Action and alternatives. Regional water supply issues and the operations-related effects of CCWD project alternatives on system-wide and Delta hydrology, hydrodynamics, water quality, and water elevations are discussed in Section 4.2, "Delta Water Resources."

4.5.1 Affected Environment

4.5.1.1 Regulatory Setting

See Section 4.2, "Delta Water Resources," for Federal and State regulations specifying flow and water quality requirements for waterways.

Federal

Clean Water Act Section 404 Permits for Fill Placement in Waters and Wetlands
Section 404 of the Clean Water Act (CWA) regulates the discharge of dredged and fill materials into "waters of the United States," which include oceans, bays, rivers, streams, lakes, ponds, and wetlands. Projects subject to Section 404 must obtain a permit from the U.S. Army Corps of Engineers (USACE) for all discharges of dredged or fill material into waters of the United States, including wetlands, before proceeding with a proposed activity. Before any action that may impact surface waters is carried out, a delineation of jurisdictional waters of the United States must be completed according to USACE protocol to determine whether the project area encompasses wetlands or other waters of the United States that qualify for CWA protection. Construction of proposed project facilities would fill some waters of the United States and would require CWA Section 404 compliance. While important to water quality, the Section 404 program also addresses overall aquatic habitat functions and is therefore addressed in more detail in Section 4.6, "Terrestrial Biological Resources."

Clean Water Act Section 402 Permits for Stormwater Discharge
CWA Section 402 regulates construction-related stormwater discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, which is administered by the U.S. Environmental Protection Agency (EPA). In California, the State Water Resources Control Board (SWRCB) is authorized by the EPA to oversee the NPDES program through the Regional Water Quality Control Boards (RWQCBs). Construction of proposed project facilities could result in stormwater discharges that would require compliance with CWA Section 402.

Clean Water Act Section 401 Water Quality Certification
Under CWA Section 401, applicants for a Federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain

certification from the State in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects with a Federal component that may affect State water quality (including projects that require Federal agency approval such as issuance of a Section 404 permit) must also comply with CWA Section 401. Construction of proposed project facilities would require CWA water quality certification.

Rivers and Harbors Act
Section 10 of the Rivers and Harbors Act of 1899 regulates alteration of (and prohibits unauthorized obstruction of) any navigable waters of the United States. Projects that result in the construction of facilities within, over, or under a navigable water body are subject to the requirements of a Section 10 permit authorized by USACE. Construction and operation of proposed project facilities would require a Section 10 permit because navigable waterways would be affected.

Executive Order 11988–Floodplain Management
Executive Order (EO) 11988—Floodplain Management (May 24, 1977) directs Federal agencies to issue or amend existing regulations and procedures to ensure that the potential effects of any action it may take in a floodplain are evaluated and that its planning programs and budget requests reflect consideration of flood hazards and floodplain management. Guidance for implementation of EO 11988 is provided in the floodplain management guidelines of the U.S. Water Resources Council (40 CFR 6030; February 10, 1978) and in *A Unified National Program for Floodplain Management*, prepared by the Federal Interagency Floodplain Management Taskforce.

State

Regional Water Quality Control Board Construction Requirements
Under the statewide NPDES stormwater permit for general construction activity (SWRCB Order No. 99-08-DWQ), the RWQCBs are responsible for authorizing stormwater discharges from construction activities that involve greater than 1 acre of land disturbance. A Storm Water Pollution Prevention Plan (SWPPP) must be prepared that identifies the erosion and sediment control Best Management Practices (BMPs), means of waste disposal, implementation of approved local plans, post-construction sediment and erosion control BMPs and maintenance responsibilities, and non-stormwater “good housekeeping” management BMPs. The NPDES regulations also require implementation of appropriate hazardous materials management practices to reduce the possibility of chemical spills or releases of contaminants.

The Central Valley RWQCB also adopted a general order for dewatering and other low-threat discharges to surface waters (Order No. 500-175) that requires implementation of water quality control measures for construction dewatering activity. If dewatering discharges can be confined to land and are not allowed to enter surface water (i.e., are used entirely for dust control, irrigation, disposed of through evaporation or percolation, etc.), then authorization for these discharges can be obtained under a waiver for low-threat discharges to land (Order R5-2003-0008). The primary eligibility requirements for authorization under the waiver are that discharge water quality (with exception of suspended sediment or other constituents effectively filtered by discharge to soil) is as good as or better than the underlying groundwater quality, and any discharges to containment basins not cause nuisance conditions. These construction permits will be required of CCWD for project construction.

See Section 4.2, "Delta Water Resources," for a description of the State Porter-Cologne Water Quality Control Act of 1970.

Local

The Contra Costa County, San Joaquin County, City of Concord, and City of Pittsburg general plans include general policies calling for the minimization of flooding hazards and water quality impacts. There are no specific local requirements that apply to this study.

4.5.1.2 Environmental Setting

Climate and Precipitation

The general project area, encompassing the project sites of the Proposed Action and alternatives, has a moderate climate, similar to a Mediterranean climate. Most of the precipitation occurs between December and April, with the summer months virtually rainless. Average annual rainfall ranges from 11 to 18 inches. The annual average air temperature is about 60ºF, with summer temperatures ranging from highs in the 90s to lows in the 50s and winter temperatures ranging from highs in the 60s to lows in the 20s.

Victoria Island/Byron Tract

Local Surface Water Bodies

The proposed intake and pump station would be located on the lower third of Victoria Canal. Victoria Canal is a constructed, linear canal located between Middle River and Old River. Victoria Canal forms the southeastern border of Victoria Island while Old River defines the western boundary. Middle River forms the northeast boundary of Victoria Island; the project site does not extend to Middle River.

Victoria Island and Byron Tract are located within the San Joaquin Delta Watershed. The San Joaquin Delta Watershed encompasses about 613,000 acres and includes 741.6 miles of naturally occurring waterways (California Rivers Assessment 1997). The San Joaquin Delta Watershed is a part of the larger San Joaquin River Hydrologic Region. Surface water quality and hydrology in the Delta are further addressed in Section 4.2, "Delta Water Resources."

Groundwater

Byron Tract and Victoria Island are located within the Tracy Subbasin of the San Joaquin Valley Groundwater Basin. The Tracy Subbasin is defined by the areal extent of unconsolidated to semiconsolidated sedimentary deposits that are bounded by the Diablo Range on the west; the Mokelumne and San Joaquin Rivers on the north; the San Joaquin River to the east; and the San Joaquin-Stanislaus County line on the south. In general, areas of poor water quality exist throughout the subbasin. Constituents of concern are high total dissolved solids (TDS), chloride, nitrate, and boron. Review of hydrographs for the Tracy Subbasin indicates that except for seasonal variation resulting from recharge and pumping, the majority of water levels in wells have remained relatively stable over at least the last 10 years (California Department of Water Resources 2003).

Victoria Island is not considered to be a substantial groundwater recharge area (San Joaquin County 1992).

Drainage and Flooding

The Contra Costa County Flood Control and Water Conservation District (FCWCD) and the San Joaquin County FCWCD are empowered to control flooding and stormwater throughout their respective counties. Flood hazards in the Delta are the result of intense rain; snowmelt and cloudbursts; or failure of a flood control structure, such as a dam, levee, or drainage channel. The region is subject to runoff from a large area. Floods from rainstorms generally occur between November and April, and snowmelt floods are normally expected between April and June.

Drainage within Victoria Island is controlled by a series of irrigation canals/drainage ditches. Siphons pull water from Victoria Canal and Old River along the southern and eastern boundaries of Victoria Island for agricultural uses. Irrigation canals are used both to store and transport irrigation water to various parts of the island as well as to provide drainage for the island. Water from these irrigation canals is pumped into Old River via the Victoria Island North Drainage Pump Station and the Victoria Island South Drainage Pump Station. Irrigation and drainage ditches are regularly maintained by the Victoria Island landowner to ensure sufficient capacity. Drainage from Byron Tract lands is collected in a main ditch, which flows east to the existing Reclamation District (RD) 800 pump station, from which it is discharged into Old River.

The Victoria Island/Byron Tract project site is listed in both the Contra Costa and San Joaquin County General Plans as being within the 100-year floodplain. Although the project area has a long history of flooding, it has never experienced a 100-year flood in the time that San Joaquin County records have been kept. The most serious flooding hazard that exists in the project area relates to the system of levees that protects the islands and adjacent mainland in the Delta area. For further information on seismic hazards, see Section 4.4, "Earth Resources: Geology, Soils, and Seismicity."

Desalination Alternative Project Sites

Local Surface Water Bodies

Surface water in Contra Costa County drains either directly or indirectly into the Delta system. Watersheds in the county are defined by creeks, streams, and other surface water drainages that originate in the upland areas near Mount Diablo and flow toward the bays. Water from the northern and eastern portions of the county drains into Suisun Bay and the Delta river channels and eventually flows into San Pablo and San Francisco Bays. The Desalination Alternative project sites are within the Suisun Hydrologic Unit, which falls within the larger San Francisco Bay Hydrologic Region. Two sub-watersheds define the area in which the Desalination Alternative project sites are located: Mallard Slough and Lawlor Ravine. The Mallard Slough intake and pump station and portions of the untreated-water conveyance pipeline would be within the Mallard Slough watershed. The conveyance pipeline would be installed along the edge of the Lawler Ravine watershed and terminate at the Bollman Water Treatment Plant (WTP).

Surface water bodies in the vicinity of the Desalination Alternative project sites include Mallard Slough, Mallard Reservoir, Contra Costa Canal, intermittent steams, and wetlands located along Suisun Bay. A further description of surface water resources in the area is provided in Section 4.2, "Delta Water Resources."

Groundwater

The Desalination Alternative project sites are within the San Francisco Bay Hydrologic Region, which covers approximately 2.88 million acres (4,500 square miles) and includes all of San Francisco and portions of Marin, Sonoma, Napa, San Mateo, Santa Clara, Contra Costa, and Alameda Counties. In general, the groundwater quality throughout most of the San Francisco Bay Hydrologic Region is suitable for most urban and agricultural uses. The Desalination Alternative project sites are underlain by two groundwater basins, the Clayton Valley and Pittsburg Plain Groundwater Basins, as defined by the Department of Water Resources (DWR). The Clayton Valley basin includes the Concord area, and the Pittsburg Plain basin includes the Pittsburg area.

The water-bearing units of the Clayton Valley Groundwater Basin are hydraulically connected with Suisun Bay. Hydrographs created from DWR well data indicate that groundwater levels have shown a slight gradual decline over the period of record, and the depth to groundwater is generally greatest in summer months and shallowest in winter months. Municipal and domestic water supply is the existing beneficial use of Clayton Valley Groundwater Basin, and potential beneficial uses include industrial process water supply, industrial service water supply, and agricultural water supply (San Francisco Regional Water Quality Control Board 2004).

The Pittsburg Plain Groundwater Basin is hydrologically connected to the Sacramento River. Review of hydrographs for the Pittsburg Plain Groundwater Basin indicates that groundwater levels have remained fairly stable over the period of record, with the exception of static water level drops and subsequent recovery associated with the 1976–1977 and 1987–1992 drought periods (California Department of Water Resources 2003). The City of Pittsburg supplements its CCWD water supply with groundwater from two wells, located at City Park and at Dover Way and Frontage Road (City of Pittsburg 2004, p. 11-3). There are currently no other beneficial uses of the Pittsburg Plain Groundwater Basin; however, potential beneficial uses of the basin include municipal and domestic water supply, industrial process water supply, industrial service water supply, and agricultural water supply (San Francisco Regional Water Quality Control Board 2004).

Information on groundwater quality in the Clayton Valley and Pittsburg Plain Groundwater Basins is limited (California Department of Water Resources 2003).

Drainage and Flooding
The Contra Costa County FCWCD works with cities and other county agencies to implement drainage facilities throughout the county. Much of the drainage system serving the county consists of natural drainage swales, ditches, underground storm drains, and watercourses (Contra Costa County 2005). The cities and the Contra Costa County FCWCD have developed regional drainage plans in many areas to guide developers in the implementation of new drainage systems. The Desalination Alternative project sites are located within a flood control drainage area. According to the records maintained by the Federal Emergency Management Agency (FEMA), the majority of the creeks and shoreline areas in Contra Costa County lie within the 100-year floodplain. The Mallard Slough intake and pump station and portions of the untreated-water conveyance pipeline and concentrate disposal pipeline corridors are also within the 100-year floodplain.

4.5.2 Environmental Consequences

4.5.2.1 Methods and Assumptions
Information for this section was compiled through visits; photographs; and review of reports and documents, including the general plans for Contra Costa and San Joaquin Counties and the Cities of Concord and Pittsburg.

4.5.2.2 Significance Criteria
The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect on local hydrology and water quality if it would:

- violate any water quality standards or waste discharge requirements, create or contribute runoff water that would provide substantial additional sources of polluted runoff, or otherwise substantially degrade water quality;
- expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as result of the failure of a levee or a dam or inundation by seiche waves;
- place structures within a 100-year flood hazard area that would impede or redirect flows,
- substantially alter the existing drainage pattern of the project site in a manner that would result in substantial erosion or siltation on or off the site, result in flooding on or off the site, or exceed the capacity of existing or planned stormwater drainage systems; or
- substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the

local groundwater table such that the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted.

None of the alternatives have the potential to expose people or structures to significant risk of loss, injury, or death involving flooding as a result of inundation by seiche waves.

The Proposed Action and alternatives would not involve the use of groundwater or create facilities or conditions that could obstruct groundwater infiltration except in very localized areas (i.e., within the limited facility footprints). Therefore, the project would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a substantial lowering of the local groundwater table. Consequently, effects on groundwater supplies are not addressed further. Potential effects of the project on groundwater as related to agriculture are discussed in section 4.8, "Agriculture."

Potential effects of the Proposed Action and alternatives on surface water levels and local pumping are addressed in Section 4.2, "Delta Water Resources."

4.5.2.3 No-Action Alternative

Under the No-Action Alternative, none of the proposed facilities would be constructed. Local hydrology and drainage on Victoria Island and Byron Tract would be expected to remain substantially the same, with ongoing agricultural activities unchanged. Therefore, this alternative would not result in potential water quality degradation of surface water or groundwater or expose people to potential hazardous conditions associated with the placement of facilities within 100-year floodplain areas or areas susceptible to flooding from dam or levee failure.

4.5.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

IMPACT 4.5-a (Alternative 1)

Temporary Degradation of Surface Water Quality as a Result of Contaminant Releases and Runoff during Construction Activity. *Runoff from construction areas could drain to ditches on Victoria Island and Byron Tract that convey on-site irrigation and drainage water, carrying with it sediment or potentially hazardous substances used in construction. Sediment or hazardous materials could be released directly into Victoria Canal during in-water construction or into Old River during pipeline tunneling. Sediment or hazardous substances could temporarily degrade water quality in the ditches and in the receiving water in Old River and Victoria Canal and adversely affect beneficial uses of water. This direct impact would be* ***potentially significant****.*

Soil disturbed during construction-related activities, including vegetation removal and grading, trenching and stockpiling of soil, borrow-site excavation, and levee embankment construction, may be dispersed by wind, rain, and surface flow and carried into the irrigation/drainage ditches on Victoria Island and Byron Tract and their receiving water bodies, Old River and Victoria Canal. In addition, chemicals associated with the operation of heavy machinery, such as fuels, oils, lead solder, solvents, and glues, would be used, transported, and stored on-site during construction activities. These substances could be inadvertently introduced into the irrigation/drainage system and Old River and Victoria Canal through site runoff or on-site spills. Sediment and chemicals could degrade water quality in the ditches and their receiving waters and adversely affect agricultural water uses.

Tunneling techniques may be utilized for the pipeline crossing of Old River and, if used, might require the use of a bentonite clay and petroleum mixture as a lubricant for the boring device. Use of these compounds would depend on the sediment and rock material encountered during boring. Both bentonite clay and petroleum have the potential to adversely affect water quality in nearby waters if drilling fluids are accidentally released through fissures in drilled rocks and soil materials.

At the location of the proposed intake on Victoria Canal, disturbance of bottom sediments during construction has the potential to affect water quality at and down-current of the construction site. In addition, any chemicals, including fuel, oil, and solder, that are stored on the staging barge could affect the water quality of Victoria Canal and other Delta water if improperly handled or accidentally spilled. Some channel dredging in Victoria Canal associated with intake construction could also be necessary. All of these in-channel activities in Victoria Canal could cause significant impacts to localized water quality.

Several measures to minimize construction-related water quality impacts have been incorporated into the preliminary project design. As described in Section 3.4, "Alternative 1, Proposed Action," these include the use of a cofferdam during in-water construction of the intake and installation of the fish screen to isolate the work area from the canal water, environmental dredge buckets during dredging to minimize the release and suspension of sediments, and an earthen dike or siltation fences to enclose containment areas for dredged material and allow suspended sediments to settle out. Portable sedimentation tanks would be used to remove suspended material from groundwater that is pumped from excavation areas prior to its discharge into the adjacent drainage system, Victoria Canal, or Old River.

Nevertheless, the potential exists for the release of sediment and spilled chemical substances into irrigation/drainage canals, Victoria Canal, and Old River that could temporarily degrade water quality and affect beneficial uses in localized areas. Therefore, this direct impact would be potentially significant.

IMPACT 4.5-b (Alternative 1)	**Potential Contribution of Project Facilities to Flooding.** *Project facilities would be constructed within a 100-year flood zone area. However, the only facilities placed within 100-year floodplain areas would be pipelines buried beneath the scour depth. None of the project facilities would create hazardous conditions for individuals or property as a result of being placed in the 100-year floodplain, and none of the project facilities would substantially impede or redirect drainage. This direct impact would be* ***less than significant****.*

The Contra Costa County and San Joaquin County general plans indicate that the Proposed Action would be implemented within a 100-year flood zone area as designated by FEMA. The only aboveground facilities that would be constructed under this alternative would be limited to the pump station, motor control center/maintenance building, and electrical substation at the intake site; the segment of levee that would be widened and set back to serve as a platform for these facilities; and the tie-in of the conveyance pipeline to the existing Old River facilities. The 6- to 8-acre site of the pump station and associated facilities would be contiguous with the rest of the levee system and would not obstruct or redirect flows. Any drainage system (i.e., ditch) affected by the placement of the setback levee segment would be rerouted so that no impact on drainage would occur. Although impermeable surfaces would be introduced at the pump station site, these facilities would be surrounded by thousands of acres of flat agricultural lands (permeable vegetated surfaces). The proposed constructed surfaces would not impede infiltration substantially.

The pipeline would be located within a 100-year flood zone but would be buried underground, and would not impede or redirect overland flows, alter the drainage pattern of the project site in a manner that would result in substantial erosion or siltation on or off the site, result in flooding on or off the site, or exceed the capacity of existing or planned stormwater drainage systems from its placement. Any drainage ditches that would be affected by the pipeline routing would be siphoned under, rerouted, crossed over, or replaced. Therefore, the local drainage system would not be affected by the project facilities.

None of the project facilities would create hazardous conditions for individuals or the potential for substantial loss of property as a result of being placed in the 100-year floodplain, and none of the project facilities would substantially impede or redirect drainage. For these reasons, it is concluded that the contribution of the Proposed Action to increasing potential hazards associated with flooding would be minimal. This direct impact would be less than significant.

IMPACT 4.5-c (Alternative 1)	**Change in Local Flooding Potential as a Result of Levee Modifications.** *Reinforcement and reconfiguration of the levee at the intake/pump station site on Victoria Canal could potentially weaken the local levee system and increase the possibility of flooding of Victoria Island, particularly during the construction process. However, the levee construction method would ensure that levee stability would be increased over existing conditions, and all levee construction would be conducted in coordination with RD 2040 and in compliance with RD 2040 inspection requirements. This direct impact would be* ***less than significant****.*

Installation of the new intake on Victoria Canal would require modifying the existing levee, which protects Victoria Island from flooding. Construction work along the existing levee has the potential to destabilize adjacent levee segments and, under worst-case conditions, result in their failure. However, the proposed modifications entail reinforcing and substantially widening the levee in the area of the intake to serve as the engineered soil platform for the proposed intake/pump station facilities and to allow installation of the new intake structure (see Exhibit 3.4-5 in Section 3.4, "Alternative 1, Proposed

Action"). The approximate footprint area of the levee improvements (i.e., measured at the base of the side slopes) would be 250–300 feet wide by 1,000–1,200 feet long. Sheet piles would be longitudinally placed approximately 320 feet upstream and downstream of the intake location to serve as a seepage barrier, and slope protection (i.e., riprap) would also be installed on the water side of the levee for 400–500 feet on each side of the intake structure to enhance levee stability.

Construction activities for the new intake along the water side of the existing levee would be initiated only after the completion of construction of the "setback" levee (i.e., the widened levee segment) on the landward side of the existing levee. All new construction for the setback levee would incorporate modern techniques for soil compaction and would be adapted to the local conditions as identified in the project geotechnical investigations.

CCWD would be required to design and construct the levee modifications with the input and approval of RD 2040. Inspections would be conducted throughout the construction period in accordance with the requirements of RD 2040 to ensure that site-specific construction conditions meet RD 2040 standards. Because the levee modifications would modernize and strengthen the segment of the levee in the vicinity of the new intake, the effect of the Proposed Action on long-term flooding potential on Victoria Island would be somewhat beneficial. Therefore, the direct impact on flooding potential would be less than significant.

Cumulative Impacts

Effects of the Proposed Action on flooding potential would be limited to Victoria Island and Byron Tract. The Proposed Action would have a less-than-significant or beneficial effect on the potential for local flooding. There are no other known projects that would affect flooding potential on Victoria Island or Byron Tract. Therefore, the Proposed Action would not make a cumulatively considerable contribution to any significant effect on flooding potential.

IMPACT 4.5-d (Alternative 1 - Cumulative)

Cumulative Temporary Degradation of Surface Water Quality as a Result of Construction Activity. *Construction of the Proposed Action could contribute to degraded surface water quality due to sedimentation, contamination by toxic substances, or spilled chemical substances. The Proposed Action's incremental effect could be cumulatively considerable in association with the South Delta Improvements Program (SDIP) impacts if both projects are constructed simultaneously. This cumulative impact would be* ***potentially significant****.*

Construction activities associated with the Proposed Action could cause erosion, sedimentation, and contamination of adjacent waterways (Victoria Canal and Old River) by toxic substances, as described above. Construction of CCWD's Old River and Rock Slough Water Quality Improvement Projects were completed at the end of 2005, well in advance of any construction activities for the Proposed Action. Therefore, there would be no adverse cumulative construction-related impacts from the combination of these CCWD projects.

The primary activities in the south Delta that could contribute to a cumulative impact are related to the SDIP. This program anticipates minor dredging northeast of the Proposed Action in Middle River and several other channels, as well as in-channel construction of permanent operable barriers on Middle River (just south of Victoria Island Canal), Grantline Canal (southwest of Victoria Island, and Old River (south of the Clifton Court Forebay). Channel dredging proposed for Middle River and barrier construction on Middle River could cause temporary construction-related water quality impacts to Middle River that could also adversely affect Victoria Canal water quality. Construction of the SDIP elements is planned for completion in 2008 or 2009. Depending on the specific timing of construction, construction impacts associated with the SDIP and the Alternative Intake Project could overlap in time. Temporary increases in sedimentation and incidents of contamination by toxic substances used during construction activities outside the cofferdam could combine to cumulatively degrade water quality in Victoria Canal. The Proposed Action's incremental effect could be cumulatively considerable in association with the SDIP impacts if both projects are constructed simultaneously. This would be a potentially significant cumulative impact.

Mitigation Measures

Mitigation Measure 4.5-a (Alternative 1): Prepare and Implement a Stormwater Pollution Prevention Plan (SWPPP) that Minimizes the Potential Contamination of Surface Waters, and Comply with Regional Water Quality Control Board (RWQCB) Requirements to Protect Water Quality.
Before the start of any ground-disturbing construction activity, CCWD shall ensure that the construction contractor for the intake, pump station, pipeline, and associated facilities prepares a SWPPP that identifies BMPs to prevent or minimize the introduction of contaminants into surface waters. Several BMPs have already been incorporated into the project design. Other BMPs would include the erosion-control measures listed in Mitigation Measure 4.3-a (Alternative 1) in Section 4.3, "Delta Fisheries and Aquatic Resources." In addition, to minimize the potential for spills of potential water contaminants to be introduced into drainages and waterways, the SWPPP shall establish specific fueling areas for construction vehicles and equipment (located at least 200 feet from drainages) and identify the locations of sensitive habitats, which shall be avoided. It shall also specify procedures for handling hazardous materials establish the need for catch basins and absorbent pads for refueling of sedentary equipment within 100 feet of a drainage or water body. Under standard SWPPP procedures, grading areas must be clearly marked, and equipment and vehicles must remain within the grading areas. Additional requirements of the SWPPP shall include monitoring and reporting to show compliance.

CCWD shall also implement the avoidance and minimization measures in accordance with standard RWQCB requirements, as listed in Mitigation Measure 4.3-a (Alternative 1).

Implementation of this mitigation would reduce the potential direct project impact to a less-than-significant level.

Mitigation Measure 4.5-d (Alternative 1, Cumulative): Prepare and Implement a SWPPP that Minimizes the Potential Contamination of Surface Waters, and Comply with RWQCB Requirements to Protect Water Quality.

This measure is the same as Mitigation Measure 4.5-a (Alternative 1) described above. Implementation of this mitigation, together with the measures already incorporated into the project design, are expected to reduce the potential direct contribution of the project construction activities to a less-than-significant level. Furthermore, environmental commitments, including similar measures for erosion and sedimentation control and hazardous materials handling, are proposed as part of SDIP implementation and are expected to minimize the potential for erosion, sedimentation, and chemical spills from SDIP construction activities (Bureau of Reclamation and California Department of Water Resources 2005). Incorporation of protective measures into both the Proposed Action and the SDIP and implementation of this mitigation measure would reduce the potential cumulative impact to a less-than-significant level.

4.5.2.5 Alternative 2, Indirect Pipeline Alternative

The direct and cumulative impacts of Alternative 2 would be the same as those described for the Proposed Action. Implementation of the mitigation measures described for the Proposed Action would reduce potential degradation of water quality from direct project effects and cumulative effects to less-than-significant levels.

4.5.2.6 Alternative 3, Modified Operations Alternative

The direct and cumulative impacts of Alternative 3 would be the same as those described for the Proposed Action. Implementation of the mitigation measures described for the Proposed Action would reduce potential degradation of water quality from direct project effects and cumulative effects to less-than-significant levels.

4.5.2.7 Alternative 4, Desalination Alternative

Direct and Indirect Impacts

IMPACT 4.5-a (Alternative 4)

Temporary Degradation of Surface Water Quality as a Result of Contaminant Releases and Runoff during Construction Activity. *Runoff from construction areas could drain to local drainages, Mallard Slough, and Suisun Bay, carrying with it sediment or potentially hazardous substances used in construction. Sediment or hazardous materials could be released directly into the channel off Mallard Slough where the new intake structure would be constructed or in Suisun Bay during installation of the concentrate disposal pipeline. Sediment or hazardous substances could temporarily degrade water quality and adversely affect beneficial uses of water. This impact would be* ***potentially significant****.*

Soil disturbed during construction activities, including vegetation clearing and grading at construction sites, trenching, and stockpiling of soil, may be dispersed by wind, rain, and surface flow and carried into drainages and storm drains and ultimately to larger bodies of water, including Mallard Slough and Suisun Bay. In addition, chemicals associated with the operation of heavy machinery, such as fuels, oils, lead solder, solvents, and glues, would be used, transported, and stored on-site during construction activities. These substances could be inadvertently introduced into runoff from construction sites that would enter water bodies. Conveyance of sediment and other pollutants from construction sites to the drainages could occur by direct overland flow or via storm drains in urban areas (Bay Point and Concord).

Temporary disturbance of bottom sediments in the channel at the Mallard Slough intake and pumping plant location during construction of the intake and installation of the fish screen or in Suisun Bay during installation of the concentrate disposal pipeline would have the potential to degrade water quality and adversely affect aquatic organisms. In addition, any chemicals, including fuel, oil, and solder, that are stored on a staging barge have the potential to degrade local water quality if a spill occurs.

Several measures to minimize construction-related water quality impacts have been incorporated into the preliminary project design. As described in Section 3.7, "Alternative 4, Desalination Alternative," these include the use of a cofferdam during in-water construction of the intake and installation of the fish screen to isolate the work area from Mallard Slough water, environmental dredge buckets during dredging to minimize the release and suspension of sediments, and an earthen dike or siltation fences to enclose containment areas for dredged material and allow suspended sediments to settle out.

Nevertheless, the potential exists for the release of sediment and spilled chemical substances that could temporarily degrade water quality and impair beneficial uses in localized areas. Therefore, this direct impact would be potentially significant.

IMPACT 4.5-b (Alternative 4)

Potential Contribution of Desalination Alternative Facilities to Flooding. *Most of the project facilities would not impede flows, redirect drainage, or expose people or property to new flooding hazards. However, the creation of over 2 acres of impermeable surfaces at the new desalination treatment plant site would slightly change the runoff characteristics and infiltration capacity of the site, potentially exceeding the capacity of the local drainage system and resulting in localized site flooding. This direct impact would be* ***potentially significant****.*

FEMA flood maps indicate that the Mallard Slough pump station expansion would be located within the 100-year flood zone. The pump station site is in a relatively flat area, and the pump station expansion would be located on previously disturbed surfaces adjacent to the existing Mallard Slough intake and pump station, which is surrounded by permeable marshland. The existing disturbed ground surfaces consist of gravel-covered parking areas. The new permeable surfaces for the Mallard Slough pump station would cover approximately 1,700 square feet (0.04 acre). Because of the small area of new permeable surfaces, the generally flat topography of the site, and the surrounding permeable surfaces, the new facilities would not affect rainfall infiltration noticeably, and additional overland flow originating from the site would be minimal. Because of the small area of the facilities and because they are not directly located in a stream channel, they would not substantially impede or redirect drainage such that flooding or significant erosion would occur. In addition, because of the relatively small size and location of the Mallard Slough pump station expansion, runoff from the site would not contribute substantially to a stormwater drainage collection system. Because the plant would be unstaffed, would receive infrequent maintenance visits, and does not include habitable structures, the risk of flood-related injury to individuals working at the facility is extremely small, despite its presence within the flood zone.

Portions of the untreated-water conveyance and concentrate disposal pipelines would be installed in relatively flat land within a 100-year flood zone. Most of this area is currently marshland and general industrial land. Because these pipelines would be buried underground, they would not impede or redirect overland flows, alter drainage patterns in a manner that would result in substantial erosion or siltation, or cause flooding because of their presence in the 100-year flood zone.

The new desalination plant and associated facilities would be constructed at the Bollman WTP site in a business/industrial park. There are no flows across the site that would be impeded by the presence of the new plant. However, construction of the facility would add more than 2 acres of impermeable surfaces on land that is currently undeveloped. The development of this site would slightly change its runoff characteristics and reduce the permeable surfaces available for infiltration of rainwater and runoff. The Bollman WTP site has been developed with open space and landscaped areas designed to capture runoff from the impermeable surfaces on-site. However, the additional area of impermeable surfaces could result in localized flooding during a storm event. Therefore, this impact would be potentially significant.

Cumulative Impacts

Construction activities associated with the Desalination Alternative, without mitigation, could cause temporary erosion, sedimentation, and spills of contaminants that could adversely affect receiving waterways, as described above. However, there are no known construction-related activities in the vicinity of the project sites that would be expected to contribute similar impacts on surface waters and, in combination with effects of the Desalination Alternative, result in a cumulatively considerable potential impact (see Section 4.1.3, "Cumulative Impact Analysis," and Appendix F-1, "Local Development Projects Considered in Cumulative Impact Analysis"). Similarly, there are no projects that are expected to potentially result in local flooding effects that could combine with effects of the Desalination Alternative such that a cumulative increase in flooding potential would result. The Desalination Alternative would not result in a cumulatively considerable contribution to a cumulative impact related to local hydrology and water quality.

Mitigation Measures

Mitigation Measure 4.5-a (Alternative 4): Prepare and Implement a Stormwater Pollution Prevention Plan (SWPPP) That Minimizes the Potential Contamination of Surface Waters, and Comply with RWQCB Requirements to Protect Water Quality.

This measure is the same as Mitigation Measure 4.5-a (Alternative 1) described above for the Proposed Action and would include implementing the erosion-control measures described in Mitigation Measure 4.3-a (Alternative 1) in Section 4.3, "Delta Fisheries and Aquatic Resources," except that it would not include the requirement to incorporate bank stabilization at the intake location.

Implementation of this mitigation would reduce the direct project impact to a less-than-significant level.

Mitigation Measure 4.5-b (Alternative 4): Prepare a Drainage Study and Implement the Resulting Recommendations to Ensure that the Local Drainage System Will Accommodate Additional Runoff. As part of facility site design for the desalination plant at the Bollman WTP site, CCWD shall prepare a drainage study that evaluates the amount of additional runoff that would be associated with the increase in impervious surfaces at the site and compares the project's stormwater drainage requirements with the sizing of existing drainage facilities at Bollman WTP. CCWD shall implement the recommendations developed as part of the study to ensure that the local drainage system is sized to accommodate additional runoff and prevent flooding local flooding for at least the 10-year storm event.

Implementation of this mitigation would reduce the direct project impact to a less-than-significant level.

4.6 Terrestrial Biological Resources

Common and sensitive terrestrial biological resources that occur or potentially occur at the proposed project site (Victoria Island/Byron Tract) and the Desalination Alternative project sites (Mallard Slough intake, Bollman Water Treatment Plant [WTP] site, and associated pipeline routes) are discussed in this section, along with potential impacts on these resources. Fisheries resources are discussed separately in Section 4.3, "Delta Fisheries and Aquatic Resources." The terrestrial biology evaluation is based on data collected during reconnaissance field surveys, supplemented by reviews of aerial photographs and information from previously completed studies/analyses that addressed biological resources in the area. A reconnaissance-level field survey was conducted by an EDAW biologist on April 18, 2005, to characterize general biological resources present and document areas that could support special-status species and sensitive habitats. Special-status plant surveys were conducted on July 15, 19, and 22, 2005 at the proposed project site. The Victoria Island/Byron Tract area was also visited on numerous occasions by EDAW biologists to collect information related to the wetland delineation.

4.6.1 Affected Environment

4.6.1.1 Regulatory Setting

Many biological resources in California are protected and/or regulated by a variety of laws and policies.

Federal Regulations

Endangered Species Act

Pursuant to the Federal Endangered Species Act (ESA), the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) have authority over projects that may result in take of a Federally listed species. Under ESA, the definition of "take" is to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." USFWS has also interpreted the definition of "harm" to include significant habitat modification that could result in take. If there is a likelihood that a project would result in take of a Federally listed species, either an incidental take permit, under Section 10(a) of ESA, or a Federal interagency consultation, under Section 7 of ESA, is required.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) provides that it shall be unlawful, except as permitted by regulations, "to pursue, take, or kill…any migratory bird, or any part, nest or egg of any such bird, included in the terms of conventions" with certain other countries (16 U.S. Code [USC] 703). This prohibition includes direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA includes several hundred species and essentially includes all native birds.

Clean Water Act

The U.S. Army Corps of Engineers (USACE) regulates discharges of fill or dredged materials into waters of the United States under Section 404 of the Clean Water Act (CWA). Waters of the United States include lakes, rivers, streams, and their tributaries and adjacent wetlands. Wetlands are defined under Section 404 as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support (and do support under normal circumstances) a prevalence of vegetation typically adapted for life in saturated soil conditions. Activities that require a permit under Section 404 include, but are not limited to, placing fill or riprap, grading, mechanized land clearing, and dredging. Any activity that results in the deposit of dredged or fill material below the ordinary high-water mark of waters of the Unites States or within a jurisdictional wetland usually requires a Section 404 permit, even if the area is dry at the time the activity takes place.

Rivers and Harbors Act

Under Section 10 of the Rivers and Harbors Act of 1899, the construction of structures in, over, or under, excavation of material from, or deposition of material into "navigable waters" are regulated by the USACE. Navigable waters of the United States are defined as those waters subject to the ebb and flow of the tide shoreward to the mean high-water mark or those that are currently used, have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. A Letter of Permission or permit from the USACE is required prior to any work being completed within navigable waters.

State Regulations

California Endangered Species Act

Pursuant to the California Endangered Species Act (CESA) and Section 2081 of the Fish and Game Code, a permit from the California Department of Fish and Game (DFG) is required for projects that could result in the take of a State listed threatened or endangered species. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species, but the definition does not include "harm" or "harass," as the Federal act does. As a result, the threshold for take under CESA is higher than that under ESA.

California Native Plant Protection Act

In addition to CESA, the California Native Plant Protection Act (NPPA) provides protection to endangered and "rare" plant species, subspecies, and varieties of wild native plants in California. The NPPA's definition of "endangered" and "rare" closely parallel the CESA definitions of "endangered" and "threatened" plant species.

California Fish and Game Code Sections 3503 and 3513 - Protection of Birds

Section 3503 of the Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful to take, possess, or destroy any raptors (i.e., eagles, hawks, owls, and falcons), including their nests or eggs. Section 3513 of the California Fish and Game Code provides for adoption of the MBTA's provisions. It states that it is unlawful to take or possess any migratory nongame bird as designated in the MBTA or any part of such migratory nongame bird. These State codes offer no statutory or regulatory mechanism for obtaining an incidental take permit for the loss of nongame, migratory birds. Typical violations include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of Sections 3503.5 and 3513 could also include disturbance of nesting pairs that results in failure of an active raptor nest.

California Fish and Game Code Section 1602 - Streambed Alteration
Diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream or lake in California that supports wildlife resources are subject to regulation by DFG, pursuant to Section 1602 of the California Fish and Game Code. The regulatory definition of stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports wildlife, fish, or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation. DFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

Fully Protected Species under the Fish and Game Code
Protection of fully protected species is described in four sections of the Fish and Game Code that list 37 fully protected species (Fish and Game Code Sections 3511, 4700, 5050, and 5515). These statutes prohibit take or possession at any time of fully protected species. DFG is unable to authorize incidental take of fully protected species when activities are proposed in areas inhabited by those species. DFG has informed non-Federal agencies and private parties that they must avoid take of any fully protected species in carrying out projects.

Regional Habitat Conservation Plans
Regional habitat conservation plans (HCPs) establish a coordinated process for permitting and mitigating the incidental take of endangered species by various projects in an area as an alternative to a project-by-project permitting approach. Two habitat conservation planning efforts that may be relevant to the Alternative Intake Project are described below.

San Joaquin County Multi-Species Habitat Conservation and Open Space Plan
The San Joaquin County Multi-Species Habitat Conservation and Open Space Plan (SJMSCP), approved in 2000, applies to land within San Joaquin County (San Joaquin County 2000). Victoria Island is within San Joaquin County.

Ninety-seven species are covered by the SJMSCP, which is intended to provide comprehensive mitigation, pursuant to local, State, and Federal regulations, for impacts on these species from SJMSCP-permitted activities. The SJMSCP relies on minimization of potential take through implementation of take avoidance and minimization measures and compensation for incidental take and loss of habitat through payment of fees (or in-lieu land dedication) for conversion of open space lands. These fees are to be used to preserve and create natural habitats to be managed in perpetuity through the establishment of habitat preserves. Participation in the SJMSCP is voluntary for local jurisdictions and project proponents.

East Contra Costa County Habitat Conservation Plan

A Draft Eastern Contra Costa County Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP) has recently been prepared (Jones & Stokes 2005). The inventory area for the draft HCP/NCCP includes portions of Byron Tract that would be affected by the Proposed Action and Alternatives 2 and 3. It also includes portions of the Desalination Alternative untreated-water conveyance pipeline route, but does not include Mallard Slough or Bollman WTP. The HCP/NCCP is intended to allow Contra Costa County and the cities of Brentwood, Clayton, Oakley, and Pittsburg to better control local land use decisions in the region while providing comprehensive species, wetlands, and ecosystem conservation and contributing to the recovery of endangered species in northern California. Planning efforts for the HCP/NCCP have been underway since 2000, but this plan has not been finalized or adopted.

Action Specific Implementation Plan

An Action Specific Implementation Plan (ASIP) is a project-level environmental document meant to ensure that projects implementing CALFED Program actions are in compliance with all CALFED regulatory requirements, including the ecosystem and recovery goals. An ASIP should provide all of the information necessary for obtaining authorizations under the ESA, CESA, and the Natural Communities Conservation Plan Act (NCCPA) in a single document.

The Proposed Action is a part of CALFED's overall Delta Improvements Package and, therefore, CCWD has prepared an ASIP in conformance with regulatory guidance for preparing ASIPs (see Appendix E-1). Developing an ASIP necessitates informal consultation with USFWS and NMFS pursuant to ESA, the Fish and Wildlife Coordination Act, and the Magnuson-Stevens Fisheries Conservation and Management Act, and consultation with DFG under NCCPA. Similar to the agency coordination supporting the preparation of a biological assessment, informal consultation during preparation of an ASIP identifies covered species and endangered, threatened, and proposed or candidate species that may occur in the project vicinity or action area, and assists in developing the appropriate approach for assessing species listed and proposed for listing as part of required ESA Section 7 consultations.

4.6.1.2 Environmental Setting

Plant Communities and Wildlife Habitats

This section describes the common plant communities and wildlife habitats in the proposed project area. The focus of the section is terrestrial biological resources; however, semi-aquatic wildlife and plant species and their habitats are also described in this section. Although there is overlap in discussion of the aquatic environment between this section and Section 4.3, "Delta Fisheries and Aquatic Resources," the description in this section primarily relates to how aquatic areas provide habitat for plants, amphibians, and reptiles, which are typically addressed in terrestrial biology sections. Aquatic habitat for fishes is discussed separately in Section 4.3.

Victoria Island/Byron Tract

A habitat map was not prepared due to the small patch size of plant communities in relation to the agricultural areas. Representative photographs of the plant communities at Victoria Island/Byron Tract are shown in Exhibits 4.6-1 and 4.6-2. The following description of habitat types within the project area is consistent with NCCP habitats as described in the MSCS, but also includes habitat types not evaluated in the MSCS.

Upland Cropland

Row crops, the dominant vegetation community within the proposed project site, consisted of asparagus (*Asparagus officinalis* ssp. *officinalis*), alfalfa (*Medicago sativa*), and wheat (*Triticum aestivum*) during surveys in spring and summer 2005. Tomato and silage (fodder converted into succulent feed for livestock through processes of anaerobic acid fermentation) also comprise acreages at the proposed project site.

Agricultural habitats such as those present at Victoria Island generally provide limited value for wildlife species. However, alfalfa fields can be used by a number of wildlife species. Alfalfa often supports small mammals, such as Botta's pocket gopher (*Thomomys bottae*), western harvest mouse (*Reithrodontomys megalotis*), and California meadow vole (*Microtus californicus*). These small mammals are prey for a variety of raptor species known to be present in the Victoria Island/Byron Tract area, including American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), and Swainson's hawk (*Buteo swainsonii*).

Fallow Fields and Ruderal Habitat

Several agricultural fields on Byron Tract are not in active agricultural production and are fallow. Dominant vegetation in the fallow agricultural fields is Italian ryegrass (*Lolium multiflorum*) and perennial ryegrass (*Lolium perenne*). The fallow fields on Byron Tract have almost 100% vegetative cover.

The agricultural field boundaries, roadsides, and banks and levees along Old River and Victoria Canal are primarily devoid of vegetation. Where vegetation is present, it is dominated by nonnative grasses and forbs. These ruderal areas often include patches of invasive weeds, including Himalayan blackberry (*Rubus discolor*), poison hemlock (*Conium maculatum*), milk thistle (*Silybum marianum*), and artichoke thistle (*Cynara cardunculus*). Also present are species such as shepherd’s purse (*Capsella bursa-pastoris*), wild radish (*Raphanus sativa*), perennial pepperweed (*Lepidium latifolium*), annual bluegrass (*Poa annua*), and common cudweed (*Gnaphalium luteo-album*). Agricultural field boundaries, roadsides, and banks and levees on Byron Tract are also dominated by the same suite of nonnative grasses and forbs that dominate similar areas on Victoria Island; however, the total cover of such species is much higher on Byron Tract.

Agricultural fields (asparagus and alfalfa) on Victoria Island (April 18, 2005)

Emergent freshwater marsh and open water on west side of Victoria Island, across from existing Old River Intake and Pump Station (April 18, 2005)

Source: EDAW 2005

Representative Photographs from Victoria Island/Bryon Tract

EXHIBIT 4.6-1

Typical drainage ditch on Victoria Island with scant freshwater marsh, aquatic vegetation, and open water (April 18, 2005)

Byron Tract: fallow fields, ruderal habitat, and irrigation canal (April 18, 2005)

Source: EDAW 2005

Representative Photographs from Victoria Island/Byron Tract

EXHIBIT 4.6-2

As with agricultural habitats, low vegetation diversity in fallow fields and ruderal habitats limits their value to wildlife. However, these habitats are expected to support common mammals, such as California ground squirrel (*Spermophilius beecheyi*), western harvest mouse, California meadow vole, and desert cottontail (*Sylvilagus audubonii*). They also provide habitat for birds, such as white-crowned sparrow (*Zonotrichia leucophrys*), western meadowlark (*Sturnella neglecta*), and American goldfinch (*Carduelis tristis*).

Tidal Freshwater Emergent Habitat
Most tidal freshwater emergent habitats in the Delta occur as narrow bands along island levees and small to large swaths on in-channel islands and along shorelines. Freshwater emergent habitat within the Victoria Island/Byron Tract area is found along the shorelines of Old River and Victoria Canal, along in-channel islands, and in irrigation ditches. It ranges from sparse pockets of emergent vegetation in some areas to almost complete coverage of smaller drainages in other areas. Dominant vegetation includes California bulrush (*Scirpus californicus*), tule (*S. acutus*), common three-square (*S. robustus*), broadleaf cattail (*Typha latifolia*), narrowleaf cattail (*T. angustifolia*), Nevada bulrush (*S. nevadensis*), river bulrush (*S. fluviatilis*), slenderbeaked sedge (*Carex athrostachya*), southern cattail (*T. domingensis*), and umbrella flatsedge (*Cyperus eragrostis*).

Wildlife diversity in irrigation ditches that are regularly cleared to improve water flow is limited due to the repeated disturbance and absence of natural vegetation in uplands adjacent to the ditches (e.g., agricultural lands). Areas that are not regularly disturbed, such as shorelines of Old River and Victoria Canal and along in-channel islands, provide more valuable habitat for wildlife. Marsh wrens (*Cistothorus palustris*) and song sparrows (*Melospiza melodia*) were observed in the freshwater marsh during field surveys; western aquatic garter snake (*Thamnophis couchii*) and Pacific tree frog (*Hyla regilla*) also could occur in areas with marsh vegetation.

Tidal Perennial Aquatic Habitat
Old River and Victoria Canal provide open water habitat. This habitat type is generally unvegetated, but it does support some aquatic vegetation, especially in permanently to intermittently inundated shallow areas. Aquatic vegetation is commonly differentiated into two categories: submerged vegetation that grows below the water surface and is rooted to the substrate, and floating vegetation that floats freely and does not attach to a substrate (Cowardin et al. 1979). The boundaries for vegetated areas within the drainages and waterways are difficult to delimit because of seasonal variations in extent and presence. Native floating aquatic species at the Victoria Island/Byron Tract project site include water primrose (*Ludwigia peploides* ssp. *peploides*), duckweed (*Lemna* spp.), water-meal (*Wolffia* spp.), mosquito fern (*Azolla filiculoides*), and algae.

Open water areas provide habitat for pond turtle (*Actinemys marmorata*), Pacific treefrog, and bullfrog (*Rana catesbeiana*). Both submerged vegetation and floating aquatic vegetation are used as basking or foraging habitat and provide cover for aquatic wildlife species. Deeper open water areas without vegetation provide habitat for species that forage for fish, crayfish, or other aquatic organisms, such as terns (*Sterna* spp.), gulls (*Larus* spp.), river otter (*Lutra canadensis*), and sea lion (*Zalophus californianus*).

Managed Seasonal Wetland
Managed seasonal wetland habitat includes wetlands dominated by native or nonnative herbaceous plants. Ditches and drains associated with the upland cropland are also included in this category. Submerged aquatic vegetation within drainages on Victoria Island is dominated by two nonnative invasive species: parrot feather watermilfoil (*Myriophyllum aquaticum*) and water hyacinth (*Eichhornia crassipes*). Floating aquatic vegetation is found in most perennially inundated drainages. The ditches and drains on Victoria Island are rigorously managed for irrigation conveyance and appear to be dredged and re-contoured frequently.

The managed seasonal wetlands, and ditches and drains, may provide habitat for wildlife species associated with shallow water. However, their active management substantially reduces the likelihood that these features provide the stable or permanent habitat required for the survival, growth, and reproduction of most wildlife species. Few amphibian, reptile, or fish species were observed in the ditches and drains during a habitat assessment conducted by Eric Hansen in October 2005 (Hansen, pers. comm., 2005) or during EDAW reconnaissance-level biological surveys.

Riparian Scrub
Very small patches of riparian scrub are present on Victoria Island/Byron Tract. Riparian scrub consists primarily of shrubs and short trees such as sandbar willow (*Salix exigua),* arroyo willow (*S. lasiolepis*), and red alder (*Alnus rubra*) in the Victoria Island/Byron Tract area. A few larger trees, including valley oak (*Quercus lobata*) and California buckeye (*Aesculus californica*), are present on Victoria Island along Old River. Nonnative Himalayan blackberry, which commonly creates dense, impenetrable thickets along levee surfaces, and nonnative arundo (*Arundo donax*) are present in patches along the levees.

Riparian habitat provides nesting habitat for a variety of bird species, including black phoebe (*Sayornis nigricans*), western kingbird (*Tyrannus verticalis*), western scrub-jay (*Aphelocoma californica*), oak titmouse (*Baeolophus inornatus*), and Bewick's wren (*Thryomanes bewickii*). Riparian trees and shrubs also may provide nest sites for raptors, such as Swainson's hawk, red-tailed hawk, white-tailed kite (*Elanus leucurus*), and great horned owl (*Bubo virginianus*). Other wildlife observed during field surveys or expected to occur in riparian habitat in the Victoria Island/Byron Tract area include western fence lizard (*Sceloporus occidentalis*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), and opossum (*Didelphis viginiana*).

Desalination Alternative Project Sites
The plant communities surrounding the existing Mallard Slough Intake and Pump Station and the Desalination Alternative untreated-water conveyance pipeline corridor and concentrate disposal pipeline route are pickleweed wetland, saline emergent marsh, riparian scrub, and nonnative grasslands. The vegetation in the area near the Bollman WTP is nonnative grassland, bordered by landscape plantings. Representative photos of the plant communities near the Desalination Alternative project sites are shown in Exhibits 4.6-3 and 4.6-4.

Coastal brackish marsh and riparian scrub communities at existing Mallard Slough Intake and Pump Station (April 18, 2005)

Nonnative grassland and brackish marsh surrounding Mallard Slough Intake and Pump Station (April 18, 2005)

Source: EDAW 2005

Representative Photographs of the Desalination Alternative Project Sites

EXHIBIT 4.6-3

Nonnative grassland in new raw water conveyance pipeline corridor, with Mallard Slough Intake and Pump Station in distance (April 18, 2005)

Typical nonnative grassland at the new desalination treatment facility site at Bollman WTP (April 18, 2005)

Source: EDAW 2005

Representative Photographs of the Desalination Alternative Project Sites

EXHIBIT 4.6-4

Pickleweed Wetland
Areas of pickleweed wetland are present in and adjacent to the Mallard Slough Intake and Pump Station. The dominant plant in this community is pickleweed (*Salicornia virginica*), but patches of perennial pepperweed and rabbit's footgrass (*Polypogon monspeliensis*) also occur. Based on aerial photo interpretation, pickleweed wetland is also expected to occur along the new concentrate disposal pipeline route toward Point Edith.

Pickleweed wetland provides habitat for wildlife species that are adapted to or tolerant of the saline environment. Bird species that feed or roost in these wetlands include herons, egrets, ducks, and shorebirds. Characteristic mammals are species of shrews and mice, as well as raccoon, river otter, and harbor seal (*Phoca vitulina*). Species of frogs, lizards, and snakes, such as Pacific treefrog, western fence lizard, and garter snake, may use the saltmarsh on a temporary basis, especially at low tide or after heavy rains when the marsh is not as saline.

Saline Emergent Marsh
Large patches of emergent wetland vegetation are found throughout the Mallard Slough area. Typical species include bulrush, cattail, rushes, brass buttons (*Cotula coronopifolia*), umbrella sedge (*Cyperus eragrostis*), and smartweed (*Polygonum lapathifolium*). These patches likely occur in areas where soils remain saturated for longer periods and where the salinity is relatively low. Based on aerial photo interpretation, coastal brackish marsh is also expected to occur along the new concentrate disposal pipeline route toward Point Edith.

The saline emergent marsh at Mallard Slough provides valuable habitat for wildlife. The patches of emergent marsh form moderately large patches and appear relatively undisturbed. Similar to the freshwater emergent marsh found in the Victoria Island/Byron Tract area, the saline emergent marsh at Mallard Slough provides habitat for marsh wren, song sparrow, red-winged blackbird (*Agelaius phoeniceus*), and other aquatic bird species, such as herons, egrets, rails, ducks, and shorebirds.

Riparian Scrub
A strip of riparian scrub is present along the maintenance road leading from the Mallard Slough pump station to Susisun Bay. Species include willow (*Salix* sp.), California rose (*Rosa californica*), poison hemlock (*Conium maculatum*), mustard (*Brassica* sp.), and wild radish (*Rhaphanus sativa*).

Riparian habitat provides habitat for a variety of wildlife species, as described above for Victoria Island and Byron Tract.

Nonnative Grassland
Nonnative grasslands are found from the Mallard Slough Intake and Pump Station south to where the new untreated-water conveyance pipeline corridor would follow existing roadways through residential housing. This community is found in the upland area as the saline influence of Suisun Bay decreases. Vegetation includes Bermuda grass (*Cynodon dactylon*), curly dock (*Rumex crispus*), Italian ryegrass, ripgut brome (*Bromus diandrus*),

wild oat (*Avena fatua*), storkbill filaree (*Erodium botrys*), vetch, (*Vicia* sp.), coyote brush (*Baccharis pilularis*), fennel (*Foeniculum vulgare*), and English plantain (*Plantago major*).

The nonnative grassland along the new untreated-water conveyance pipeline corridor provides habitat for small mammals, such as shrews, voles, and mice. Ground-nesting birds, such as western meadowlark and Brewer's blackbird (*Euphagus cyanocephalus*), are likely to be found in the grasslands. Northern harriers may also nest in the grasslands, and other raptors, such as white-tailed kite and red-tailed hawk, may forage for small mammals or other prey in the grassland. Common reptiles, including alligator lizard (*Elgaria multicarinata*) and gopher snake (*Pituophis catenifer*), may use the grasslands in the area.

At the Bollman WTP, the location for the new desalination treatment plant includes fields of nonnative grasses and forbs, such as wild oat, Bermuda grass, and vetch, which are periodically mown. Landscaping trees and shrubs surround the grasslands.

Because of routine disturbance from mowing, landscaping, and other activities, the habitats at the Bollman WTP are less valuable to wildlife. Common native and nonnative species such as house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), American robin (*Turdus migratorius*), house mouse (*Mus musculus*), and fence lizard are expected to be present.

Sensitive Biological Resources

Sensitive biological resources include any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS. Also included are riparian habitat and other sensitive natural communities identified in local or regional plans, policies, or regulations, or by DFG or USFWS; Federally protected wetlands; and established native resident or migratory wildlife corridors or native wildlife nursery sites.

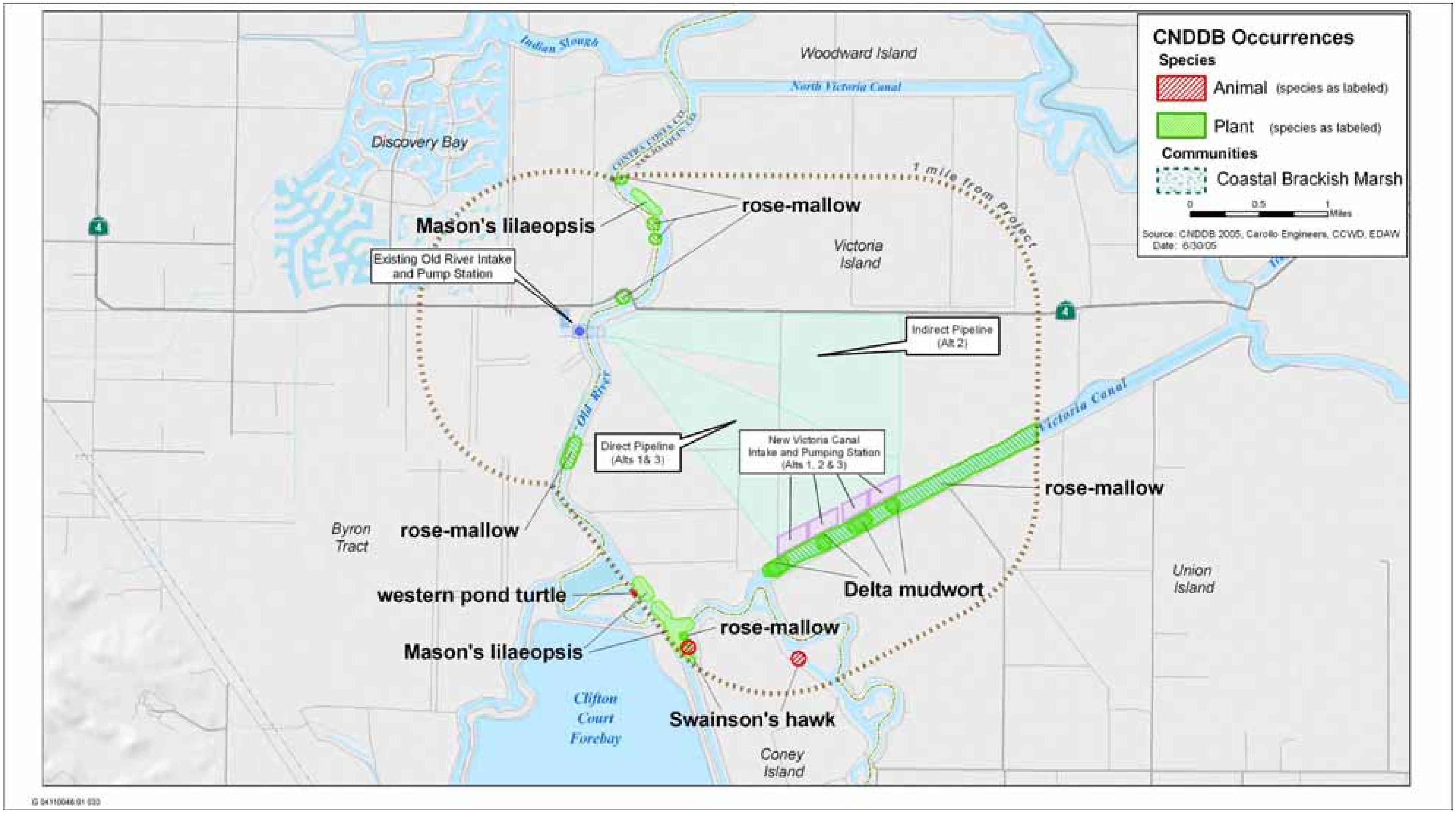
For the purpose of this EIR/EIS, special-status species are defined as plants and animals that are legally protected or that are otherwise considered sensitive by Federal, State, or local resource conservation agencies and organizations. Specifically, this includes species that are State and/or Federally listed as rare, threatened, or endangered; those considered as candidates for listing as threatened or endangered; species identified by USFWS or NMFS as Species of Concern, and/or by DFG as Species of Special Concern; animals protected by he California Fish and Game Code; and plants considered by the California Native Plant Society (CNPS) to be threatened, endangered, or rare, (i.e., plants on CNPS Lists 1 and 2).

Victoria Island/Byron Tract

A special-status species list was developed for Alternatives 1, 2, and 3 by conducting a records search of the California Natural Diversity Data Base (CNDDB) (California Natural Diversity Data Base 2005) for the Clifton Court Forebay and Woodward Island 7.5 minute USGS quadrangles. Exhibit 4.6-5 shows known CNDDB sitings within 1 mile of the project site on Victoria Island and Byron Tract. Additional information regarding the potential occurrence of special-status plants was obtained by searching the CNPS's On-line Inventory of Rare and Endangered Plants for quadrangles including and surrounding Victoria Island and Byron Tract (Clifton Court Forebay, Woodward Island, Holt, Union Island, Tracy, Midway, Altamont, Byron Hot Springs, Brentwood, Jersey Island, Bouldin Island, and Terminus) (California Native Plant Society 2005). A list of special-status species with potential to occur in the area was also requested from USFWS and DFG and both are provided in Appendix D, "Biological Resources."

Several listed species were eliminated from further consideration because typical habitat required by the species does not occur on Victoria Island or Byron Tract. Explanation for elimination of listed species follows. No vernal pools or stockponds are present on Victoria Island or Byron Tract; therefore, there is no suitable habitat for vernal pool fairy shrimp (*Branchinecta lynchi*), longhorn fairy shrimp (*B. longiantenna*), vernal pool tadpole shrimp (*Lepidurus packardi*), or California tiger salamander (*Ambystoma californiense*). Elderberry shrubs, required by valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), were not observed on Victoria Island or Byron Tract. California red-legged frog (*Rana aurora draytonii*) are not expected to occur because Old River and Victoria Canal are likely too deep and large and lack adequate emergent vegetation to support breeding red-legged frogs; in addition, the regular disturbance and variable hydrologic regime in the irrigation ditches likely make them unsuitable for red-legged frogs. Bald eagle (*Haliaeetus leucocephalus*) is not expected to breed in the Delta due to a lack of suitable nesting habitat. Although the species may be present in the Delta during the non-breeding season, Victoria Island and Byron Tract do not contain any historical sites where concentrated populations of eagles are known to winter. Typical habitat for California black rail (*Rallus longirostris obsoletus*), consisting of large patches of marsh with adjacent undisturbed uplands, is not present at the project site. Undisturbed grassland habitat is not present in the area and therefore San Joaquin kit fox (*Vulpes macrotis mutica*) is not expected to occur. Alameda whipsnake (*Masticophis lateralis euryxanthus*) is also not expected to occur due to a lack of chaparral habitat in or adjacent to Victoria Island and Byron Tract. In addition, the primary constituent elements of habitat for vernal pool fairy shrimp and Contra Costa goldfields (*Lasthenia conjugens*) are not present on Victoria Island or Byron Tract, and no areas within the proposed project site are designated as Critical Habitat for these or any other species.

Although a portion of Byron Tract is within the range of San Joaquin kit fox (*Vulpes macrotis mutica*) according to the CNDDB, the species is not likely to occur along the extreme eastern edge of Byron Tract. San Joaquin kit fox occurrences have been recently analyzed and habitat has been modeled for eastern Contra Costa County during development of the draft Eastern Contra Costa HCP/NCCP (Jones and Stokes 2005). A recent survey of Contra Costa and Alameda Counties within the known range of the San Joaquin kit fox found no evidence of recent occupancy (Clark et al. 2003 in Jones and Stokes 2005). Furthermore, the Proposed Action area does not include any areas identified as suitable habitat for San Joaquin kit fox. Areas identified as core habitat are almost 5 miles to the southwest of the Proposed Action area and low use habitat is over 2 miles away (Jones and Stokes 2005). Therefore, San Joaquin kit fox was eliminated from further consideration in the analysis.



Source: EDAW 2005

Known CNDDB Sitings within 1 mile of the Victoria Island/Byron Tract Project Site

EXHIBIT 4.6-5

Sensitive Natural Communities and Waters of the United States
Two sensitive natural communities and waters of the United States occur in the Proposed Action project area.

- **Coastal and Valley Freshwater Marsh.** This wetland plant community is recognized as a sensitive habitat by DFG and USACE. This sensitive natural community occurs on and adjacent to Victoria Island and Byron Tract and is described above under Emergent Tidal Freshwater Marsh.

- **Waters of the United States.** Waters of the United States, including wetlands, are subject to USACE jurisdiction under Section 404 of the Clean Water Act. Section 404 establishes a requirement to obtain a permit prior to any activity that involves any discharge of dredged or fill material into waters of the United States, including wetlands. Based on preliminary wetland delineation field work, Old River and Victoria Canal, numerous small drainages, several seasonal wetlands and swales, and freshwater marshes on Victoria Island and Byron Tract may be under the jurisdiction of USACE. However, the preliminary wetland delineation has not yet been submitted to, or verified by, USACE.

Special-status Plants
The Delta is home to several special-status species, many of which are endemic. The emergent tidal freshwater marsh, mud banks, and other wet places at the proposed project site (Victoria Island/Byron Tract) provide potential habitat for 11 special-status plant species. Focused special-status plant surveys were conducted in July 2005 at the Victoria Island/Byron Tract project site. Two special-status species, Mason's lilaeopsis (*Lilaeopsis masonii*) and rose-mallow (*Hibiscus lasiocarpus*), were documented.

- **Mason's lilaeopsis (*Lilaeopsis masonii*).** Mason's lilaeopsis is considered rare by DFG. In addition, it is listed on CNPS List 1B (considered rare, threatened, or endangered in California and elsewhere) and is a Federal Species of Concern. It is a small, rhizomatous perennial herb in the carrot family that flowers from April to November. It produces narrow, grass-like, bright green leaves and small inconspicuous flowers in umbels. This species grows in freshwater and brackish marshes, generally found in tidal zones on depositional soils. At the proposed project site, it grows in linear colonies in silt in the grooves of logs that have washed up on the shore or rip-rap along the west bank of Old River. The first occurrence was documented adjacent to a remnant of tule marsh on the west bank of Old River, south of the existing intake and pump station. The second occurrence was documented south of the first occurrence on the rip-rap of the west bank of Old River.

- **Rose-mallow (*Hibiscus lasiocarpus*).** Rose-mallow is on CNPS List 2 (considered rare, threatened, or endangered in California, but more common elsewhere). It is an erect, rhizomatous perennial herb in the mallow family that flowers from June through September. It produces heart-shaped leaves and large white flowers that are rose-colored at the base. This species grows in freshwater marshes, generally found on wet riverbanks and low peat islands in sloughs. At the proposed project site, four occurrences of rose-mallow were observed along Old River and Victoria Canal at the base of the rip-rap. The first occurrence (one plant) was documented on the north bank of Victoria Canal, growing with common bog rush (*Juncus effusus*). The second occurrence (one plant) was documented growing on the west bank of Old River, in a mud flat adjacent to a large fragment of tule marsh (*Scirpus acutus*). The third occurrence (15 plants) was documented in several locations on the east bank of Old River adjacent to a large stand of blackberry. The fourth occurrence (one plant) was documented on the east bank of Old River by a small fragment of tule marsh also have the potential to occur in the freshwater marsh on Victoria Island and Byron Tract.

No other special-status plants were observed during focused surveys in July 2005 and no other special-status plants are likely to be present at the proposed project site.

Special-status Wildlife
The existing habitat types at the Victoria Island/Byron Tract project site support potential habitat for three wildlife species that are State or Federally listed as threatened or endangered: giant garter snake (*Thamnophis gigas*), greater sandhill crane (*Grus canadensis tabida*), and Swainson's hawk. Seven non-listed special-status wildlife species are known to or could potentially occur on Victoria Island/Byron Tract: western pond turtle, white-tailed kite, northern harrier, burrowing owl (*Athene cunicularia hypugaea*), California horned lark (*Eremophila alpestris actia*), loggerhead shrike (*Lanius ludovicianus*), and tricolored blackbird (*Agelaius tricolor*). Each of these species is evaluated in more detail below. See Appendix D, "Biological Resources," for a table that presents information on these special-status wildlife species.

- **Giant Garter Snake.** The giant garter snake is State and Federally listed as threatened. The giant garter snake inhabits agricultural wetlands and associated waterways, including irrigation and drainage canals, rice fields, marshes, sloughs, ponds, low-gradient streams, and adjacent uplands. Giant garter snakes are believed to be most numerous in rice growing regions. Giant garter snakes are typically absent from the larger rivers; wetlands with sand, gravel, or rock substrates; and riparian areas lacking suitable basking sites or suitable prey populations (U.S. Fish and Wildlife Service 1999). They are primarily restricted to aquatic habitat and nearby basking areas during their active period (April 1-October 1). From late October to late March, giant garter snakes hibernate in underground refugia (e.g., abandoned rodent burrows and deep crevasses) above the high-water line.

  Although the historical and current distribution of giant garter snake in the Delta is poorly understood, Victoria Island lies well outside of the species' documented range. The nearest giant garter snake record lies more than 9 air miles northeast of Victoria Island on Medford Island (CNDDB occurrence number 151). Although there is a scattering of additional giant garter snake occurrences to the north of Victoria Island spanning from east to west, all are 12 miles or farther from the project site. Furthermore, all are observations of individual snakes with none known to represent extant populations. Victoria Island is also south of the known boundary of the northern giant garter snake population clusters. The nearest locality record south of

Victoria Island lies more than 50 air miles distant in Madera County; no giant garter snake occurrences are documented in Stanislaus County between Victoria Island and San Joaquin Valley populations (Hansen, pers. comm., 2005). Additionally, general biological surveys for numerous nearby CCWD projects, such as the Rock Slough and Old River Water Quality Improvement Projects, and numerous focused surveys for giant garter snake by giant garter snake expert Eric Hansen in the southern and central Delta, have failed to locate any giant garter snakes.

Although giant garter snake is not expected to occur on Victoria Island or Byron Tract because of a lack of known populations in the area and the high level of giant garter snake surveys that have been conducted in the south and central Delta without any observations of giant garter snake, potentially suitable habitat is present. A habitat assessment of the project site on Victoria Island was conducted by Eric Hansen in October 2005 to evaluate habitat suitability for giant garter snake (Hansen, pers. comm., 2005). The assessment covered those areas with potential to provide habitat for this species (ditches and drains and adjacent upland areas). Most (64%) of the observed ditches and drains on Victoria Island were categorized as marginally suitable habitat for giant garter snake. A small area (0.9 mile or 3% of the surveyed area) along the inner toe of the levee along Victoria Canal was categorized as suitable habitat. The remainder of the surveyed area (33%) was categorized as unsuitable. (Hansen, pers. comm., 2005.)

Both Victoria Canal and Old River demonstrate a species composition and flow regime characteristic of large rivers, which are generally unsuitable for giant garter snake because of the presence of predatory gamefish, diminished densities of prey species, and lack of suitable cover and foraging habitat. Therefore, while the outer levee banks of Victoria Island may possess characteristics associated with giant garter snake habitat, these characteristics occur in a proportion and configuration unlikely to support the species long-term (Hansen, pers. comm., 2005). The interior levee slopes, ditches, and drains are also largely unfavorable for giant garter snake because of lack of upland refuge and prey species and frequent disturbance from vigorous maintenance associated with Victoria Island's irrigation system.

Focused surveys for giant garter snake were not conducted, but no giant garter snakes were seen during the reconnaissance biological surveys in April and July 2005, or during the giant garter snake habitat assessment in October 2005.

- **Greater Sandhill Crane.** The greater sandhill crane is State-listed as threatened and is a fully protected species. This subspecies of the sandhill crane primarily winters in the Delta and forages and roosts in agricultural fields and pastures. Habitats used by the sandhill crane include seasonal and freshwater emergent wetlands, grasslands, and agricultural lands. Generally, crane wintering habitat consists of shallowly flooded grasslands that are used as loafing and roosting sites, and nearby agricultural areas that provide food sources, including rice, sorghum, barley, and corn. The fallow fields on Byron Tract are potential habitat for greater sandhill crane, but the quality of the potential habitat is low due to the lack of preferred types of agricultural crops nearby. No sandhill cranes were observed in the area during the reconnaissance-level field survey; however, the survey was conducted in spring, when sandhill cranes have already left central California for breeding grounds to the north.

- **Swainson's Hawk, White-tailed Kite, Northern Harrier.** Swainson's hawk is State listed as a threatened species. Swainson's hawks are known to nest throughout the Delta in the vicinity of Victoria Island (California Natural Diversity Data Base 2005). Potential nest trees for this species occur on and adjacent to Victoria Island. Grasslands, alfalfa fields, and other row crops provide suitable foraging habitat for Swainson's hawks. This species was observed foraging on Victoria Island during the field surveys. The CNDDB reports two Swainson's hawk nests near the confluence of Old River and Victoria Canal.

  White-tailed kite is fully protected by DFG and is a Federal Species of Concern. Northern harrier is a California Species of Special Concern. The trees along the western and northern side of Victoria Island provide suitable nesting habitat for white-tailed kite. Northern harrier could nest in the agricultural fields and fallow fields on Victoria Island and Byron Tract.

- **Western Burrowing Owl.** Western burrowing owl is a California Species of Special Concern. Burrowing owl typically use burrows made by fossorial animals, such as ground squirrels. One burrowing owl was observed on Victoria Island during the field surveys. Pellets and white-wash were also observed at several burrow entrances, but a complete survey was not conducted as part of the site reconnaissance. Burrowing owl was also identified on Victoria Island during a levee habitat assessment conducted by DFG in September 2002. Because burrowing owls may occupy different burrows from year to year, conducting a complete survey at this stage of project development (i.e., several years before construction and without knowing the exact project footprint) would not accurately identify the location and number of burrowing owls that could be affected. Therefore, focused surveys for burrowing owl should be conducted closer to project construction (i.e., the non-breeding season prior to construction). Suitable habitat for burrowing owl occurs along the edges of the agricultural fields, irrigation ditches, roadways, and levees.

- **Western Pond Turtle.** Western pond turtle is a California Species of Special Concern. Suitable habitat consists of ponds, marshes, rivers, streams, and irrigation ditches supporting aquatic vegetation. The irrigation ditches, Victoria Canal, and Old River provide suitable aquatic habitat. The rip-rapped banks and in-channel vegetation in Victoria Canal, Old River, and irrigation ditches could provide basking sites for pond turtle. The CNDDB reports several western pond turtle individuals in Old River within 0.5 mile of the confluence with Victoria Canal; therefore, both Old River and Victoria Canal are considered occupied habitat for western pond turtle. Focused surveys for western pond turtle were not conducted, but none were seen during the reconnaissance survey.

- **California Horned Lark and Loggerhead Shrike.** The California horned lark and loggerhead shrike are California Species of Special Concern. The loggerhead shrike is also a Federal species of special concern. Horned larks nest on the ground in open areas, grasslands, or agricultural areas. Loggerhead shrikes require open grassland or agricultural areas with scattered shrubs or small trees for perching, hunting, and nesting. The ruderal grassland and fallow fields provide suitable nesting and foraging habitat for California horned lark and loggerhead shrike. Shrikes may also nest in the riparian shrub habitat on Victoria Island and Byron Tract. Focused surveys for giant horned lark and loggerhead shrike were not conducted, but none were seen during the reconnaissance survey.

- **Tricolored Blackbird.** The tricolored blackbird is a Federal and California Species of Special Concern. Tricolored blackbirds nest in small (hundreds of birds) to large colonies (hundred-thousands of birds) and typically use marsh habitats or thorny shrubs such as blackberry brambles or thistle stands. The larger patches of emergent marsh and blackberry brambles on Victoria Island and Byron Tract provide suitable nesting for tricolored blackbird. No tricolored blackbirds were observed during the site visit. Because tricolored blackbird colonies may move to different locations between years, it is possible in future years for tricolored blackbirds to nest in suitable habitat in the area.

Desalination Alternative Project Sites

A special-status species list was developed for the Desalination Alternative by conducting a records search of the CNDDB (California Natural Diversity Data Base 2005) for the Vine Hill and Honker Bay 7.5 minute USGS quadrangles. Exhibit 4.6-6 shows known CNDDB records within 1 mile of the Desalination Alternative project sites. Additional information regarding the potential occurrence of special-status plants was obtained by searching the CNPS's On-line Inventory of Rare and Endangered Plants for quadrangles including and surrounding Mallard Slough and the Bollman WTP (Cordelia, Fairfield South, Denverton, Antioch North, Antioch South, Clayton, Walnut Creek, Briones Valley, and Benicia) (California Native Plant Society 2005). A list of special-status species with potential to occur at the Desalination Alternative project sites was also requested from USFWS and DFG and is provided in Appendix D, "Biological Resources."

Several listed species were eliminated from further consideration because typical habitat required by the species does not occur at the Desalination Alternative project sites. Explanation for elimination of listed species follows. No dunes are present that would provide suitable habitat for Antioch Dunes evening-primrose (*Oenothera deltoides* ssp. *howellii*). No vernal pools or stockponds are present; therefore, there is no suitable habitat for vernal pool fairy shrimp, delta ground beetle (*Elaphrus viridi*s), or California tiger salamander. Elderberry shrubs, required by valley elderberry longhorn beetle, were not observed at the Desalination Alternative project sites. Callippee silverspot butterfly (*Speyeria callippe callippe*) is not expected to occur because its range is limited to the northern coastal scrub of the San Francisco Peninsula. Suitable riparian and stream habitat is not present for California freshwater shrimp (*Syncaris pacifica*). California red-legged frog is not expected to occur due to lack of suitable breeding habitat and lack of connectivity to protected dispersal corridors. No suitable areas, such as sparsely vegetated sand beaches or alkali flats, are present to support nesting California least tern (*Sterna antillarum browni*). Bald eagle is not expected to breed in the Delta due to a lack of suitable nesting habitat. Although the species may be present in the Delta during the non-breeding season, the Desalination Alternative project sites do not contain any historical sites where eagles are known to winter. Alameda whipsnake is also not expected to occur due to a lack of chaparral habitat in or adjacent to the Desalination Alternative project sites. In addition, no areas within the Desalination Alternative project sites are designated as Critical Habitat for California tiger salamander or California red-legged frog.

Sensitive Natural Communities and Waters of the United States
Three sensitive natural communities and waters of the United States occur in the Alternative 4 project area.

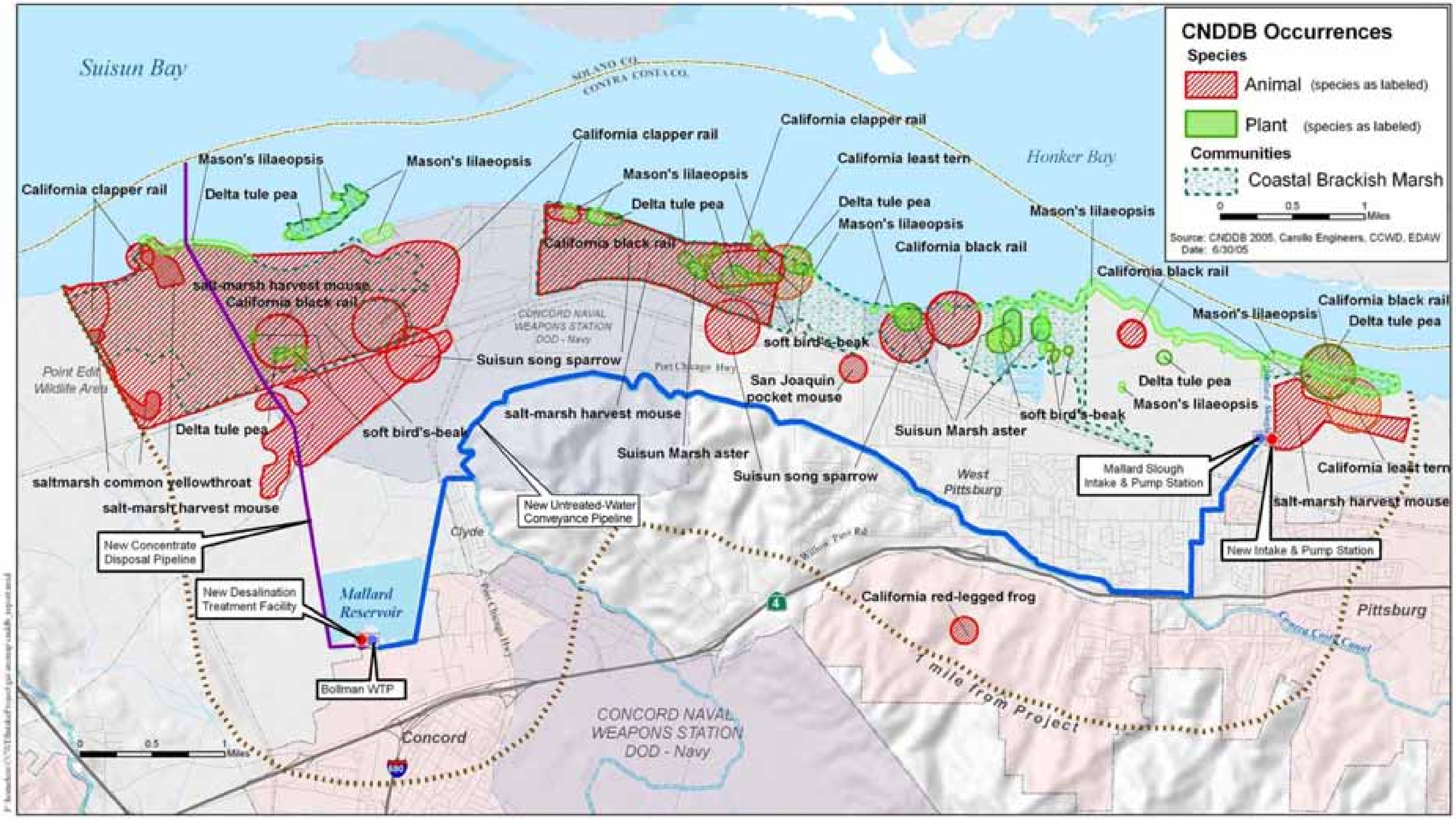
- **Pickleweed Wetland.** This wetland plant community is recognized as a sensitive habitat by DFG and USACE. Pickleweed wetland occurs adjacent to the Mallard Slough Intake and Pump Station and is described above.

- **Saline Emergent Marsh.** This wetland plant community is recognized as a sensitive habitat by DFG and USACE. Saline emergent marsh occurs adjacent to the Mallard Slough Intake and Pump Station and is described above.

- **Waters of the United States.** Waters of the United States, including wetlands and navigable waters, are subject to USACE jurisdiction. Potential waters of the United States at the Desalination Alternative project sites include brackish marsh, salt marsh, seasonal wetlands, and several named sloughs, canals, and irrigation ditches.

Special-status Plants
The existing vegetation and habitat types at the Desalination Alternative project sites support potential habitat for 37 special-status plant species, and several of these species are known to inhabit or have been observed in the vicinity of the Mallard Slough Intake and Pump Station and along the corridor for the new untreated-water conveyance pipeline. See Appendix D, "Biological Resources," for a table that presents information on special-status plant species that are either known to occur or have the potential to occur at the Desalination Alternative project sites. Six of these species are State and/or Federally listed as rare, threatened, or endangered: large-flowered fiddleneck (*Amsinckia grandiflora*), Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*), soft bird's beak (*Cordylanthus mollis* ssp. *mollis*), Santa Cruz tarplant (*Holocarpha macradenia*), Contra Costa goldfields (*Lasthenia conjugens*), and Mason's liliaeopsis. The remaining 31 species are not listed by State or Federal agencies, but are considered Federal species of concern, or listed by CNPS as rare or endangered.

- **Large-flowered fiddleneck (*Amsinckia grandiflora*).** Large-flowered fiddleneck is State and Federally listed as endangered and a CNPS List 1B species. There are only three known natural occurrences of this species remaining and they are located in Contra Costa, Alameda, and San Joaquin Counties. This species has been reintroduced on six sites within these same counties, including two sites on CCWD land within the Los Vaqueros watershed, but most of these reintroductions have apparently been unsuccessful (U.S. Fish and Wildlife Service 1997a). Suitable habitat



Source: EDAW 2005

Known CNDDB Records within 1 Mile of the Desalination Alternative Project Sites

EXHIBIT 4.6-6

for this species includes valley and foothill grassland and cismontane woodland. Historically, this species occurred in native perennial bunchgrass communities that have been mostly eliminated from the Central Valley through land use conversion, cattle grazing, and introduction of nonnative annual grasses. Suitable habitat for large-flowered fiddleneck is present at the Desalination Alternative project sites, but is below the species' known elevation range.

- **Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum*).** Suisun thistle is Federally listed as endangered and a CNPS List 1B species. Habitat for this species is restricted to a narrow tidal band within large saltwater or brackish tidal marshes that have fully developed tidal channel networks. This species does not generally occur in fringe tidal marshes that are less than 300 feet in width (U.S. Fish and Wildlife Service 1995). There are only two known occurrences of Suisun thistle remaining, both within Suisun Marsh in Solano County. This species was thought to be extinct until it was rediscovered on Grizzly Island in 1989 (California Native Plant Society 2001). Suitable habitat for this species is present at the Desalination Alternative project sites.

- **Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*).** Soft bird's-beak is State listed as rare, Federally listed as endangered, and a CNPS List 1B species. This species is hemiparasitic, meaning it extracts water and nutrients from the roots of other plants. Soft bird's-beak occurs in coastal salt or brackish marsh habitat, predominantly in salt grass-pickleweed marshes in reaches that are at or near the limits of tidal action (U.S. Fish and Wildlife Service 1995). There are only 18 known occurrences of soft bird's beak and eight of these are known or believed to be extirpated. The remaining ten occurrences are widely scattered throughout San Pablo and Suisun Bays in Contra Costa, Napa, and Solano Counties (U.S. Fish and Wildlife Service 1995). Suitable habitat for this species is present at the Desalination Alternative project sites.

- **Santa Cruz tarplant (*Holocarpha macradenia*).** Santa Cruz tarplant is State listed as endangered, Federally listed as threatened, and a CNPS List 1B species. The historic habitat of Santa Cruz tarplant consisted of native grasslands and prairies of coastal terraces, typically in sandy clay alluvium. Native coastal grassland and prairie habitat is now highly fragmented and limited in distribution, having been largely replaced by nonnative annual grassland. There are currently fewer than 15 known occurrences of Santa Cruz tarplant remaining and all known native San Francisco Bay populations have been extirpated (U.S. Fish and Wildlife Service 2000). The two known occurrences of this species in Contra Costa County are introduced (California Native Plant Society 2001). Suitable habitat for this species is present at the Desalination Alternative project sites.

- **Contra Costa goldfields (*Lasthenia conjugens*).** Contra Costa goldfields is Federally listed as endangered and a CNPS List 1B species. Suitable habitat for this species consists of vernal pools and seasonally wet areas within cismontane woodland, alkaline playa, and valley and foothill grassland communities. The historic distribution of Contra Costa goldfields included numerous occurrences over seven California central coast counties. There are now only twelve known occurrences remaining in Alameda, Contra Costa, Napa, and Solano Counties (California Native

Plant Society 2001). There is one known occurrence remaining in Contra Costa County (U.S. Fish and Wildlife Service 1997b). Suitable habitat for this species is present at the Desalination Alternative project sites.

- **Mason's lilaeopsis (*Lilaeopsis masonii*).** Mason's lilaeopsis is considered rare by DFG. In addition, it is listed on CNPS List 1B (considered rare, threatened, or endangered in California and elsewhere) and is a Federal Species of Concern. Suitable habitat for this species consists of brackish or freshwater marshes and riparian scrub. It is often found in tidal zones, where muddy or silty soil has formed through river deposition or river bank erosion. Mason's lilaeopsis has been documented at several locations in Suisun Bay near Mallard Slough (California Natural Diversity Data Base 2005). Suitable habitat for this species is present at the Desalination Alternative project sites.

- **Non-listed Special-status Plant Species.** Twenty-one CNPS List 1B species have potential to occur at the Desalination Alternative project sites: bent-flowered fiddleneck (*Amsinckia lunaris*), Suisun Marsh aster (*Aster lentus*), alkali milk-vetch (*Astragalus tener* var. *tener*), heartscale (*Atriplex cordulata*), brittlescale (*Atriplex depressa*), San Joaquin spearscale (*Atriplex joaquiniana*), big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*), big tarplant (*Blepharizonia plumose*), Mt. Diablo fairy-lantern (*Calochortus pulchellus*), Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), pappose tarplant (*Centromadia parryi* ssp. *parryi*), hispid bird's-beak (*Cordylanthus mollis* ssp. *hispidus*), Hoover's cryptantha (*Cryptantha hooveri*), recurved larkspur (*Delphinium recurvatum*), diamond-petaled California poppy (*Eschscholzia rhombipetala*), fragrant fritillary (*Fritillaria liliacea*), Brewer's western flax (*Hesperolinon breweri*), Carquinez goldenbush (*Isocoma arguta*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), showy madia (*Madia radiata*), and saline clover (*Trifolium depauperatum* var. *hydrophilum*). Suisun Marsh aster, heartscale, San Joaquin spearscale, and Delta tule pea are also considered Federal Species of Concern.

  Eight CNPS List 2 species have potential to occur at the Desalination Alternative project sites: bristly sedge (*Carex comosa*), dwarf downingia (*Downingia pusilla*), round-leaved filaree (*Erodium macrophyllum*), rose-mallow (*Hibiscus lasiocarpus*), Delta mudwort (*Limosella subulata*), eel-grass pondweed (*Potamogeton zosteriformis*), marsh skullcap (*Scutellaria galericulata*), and blue skullcap (*Scutellaria lateriflora*). Two species, bearded popcorn-flower (*Plagiobothrys hystriculus*) and caper-fruited tropidocarpum (*Tropidocarpum capparideum*), are CNPS List 1A species (presumed extinct in California) that are known from historical occurrences at the Desalination Alternative project sites, but have not been seen for many years and are now believed to be extinct.

Special-status Wildlife

See Appendix D, "Biological Resources," for a table that presents information on special-status wildlife species that are either known to occur or have the potential to occur at the Desalination Alternative project sites. Wildlife species listed as threatened or endangered that have been documented at the Desalination Alternative project sites include California clapper rail (*Rallus longirostris obsoletus*), California black rail, and salt marsh harvest mouse (*Reithrodontomys raviventris*) (California Natural Diversity Data Base 2005). Other special-status wildlife species that could occur at the Desalination Alternative project sites include western pond turtle, burrowing owl, white-tailed kite, northern harrier, loggerhead shrike, salt marsh common yellowthroat (*Geothlypis trichas sinuosa*), and Suisun song sparrow (*Melospiza melodia maxillaries*). Tricolored blackbird is not expected to occur due to lack of extant records of nesting colonies near the Desalination Alternative project sites.

- **California clapper rail.** California clapper rail is State and Federally listed as endangered. It is also fully protected by DFG. This species prefers salt marshes intersected by numerous tidal channels and dominated by cord grass, pickleweed, and salt grass (U.S. Fish and Wildlife Service 1984). California clapper rails have been detected at several locations in Suisun Bay, including several locations near Mallard Slough: the Concord Naval Weapons Station, Ryer Island, Point Edith, and Pacheco Creek (California Natural Diversity Data Base 2005). Potentially suitable habitat for California clapper rail exists in the coastal brackish marsh habitat along Mallard Slough and the new untreated-water conveyance pipeline from Mallard Slough to the existing roadways, and is expected to occur along the new concentrate disposal pipeline corridor to Point Edith.

- **California black rail.** California black rail is State listed as threatened and is fully protected under the Fish and Game Code. Black rails inhabit the upper reaches of marshes where there is emergent vegetation at high tides. To support black rails, marshes should grade gradually into weedy or brushy upland vegetation where the rails can retreat at extremely high tides (Shuford 1993). California black rails have been detected in the Avon-Port Chicago Marsh, west of Mallard Slough (California Natural Diversity Data Base 2005). Potentially suitable habitat for California black rail exists in the coastal brackish marsh habitat along Mallard Slough and the new untreated-water conveyance pipeline corridor from Mallard Slough to the existing roadways, and is expected to occur along the new concentrate disposal pipeline corridor to Point Edith.

- **Salt marsh harvest mouse.** Salt marsh harvest mouse is State and Federally listed as endangered and fully protected by DFG. Salt marsh harvest mice inhabit salt marshes with dense cover dominated by pickleweed. Salt marsh harvest mouse is known to occur at several locations in Suisun Bay, including several locations near Mallard Slough: the Avon-Port Chicago Marsh, Roe and Ryer Islands, and Pacheco Creek (California Natural Diversity Data Base 2005). Potentially suitable habitat for salt marsh harvest mouse exists in the pickleweed wetland at Mallard Slough and along the new untreated-water conveyance pipeline corridor from Mallard Slough to the existing roadways and is expected to occur along the new concentrate disposal pipeline corridor to Point Edith.

- **Western pond turtle.** The habitat requirements and regulatory status for pond turtle are described above under the special-status wildlife species for Victoria Island/Byron Tract. Suitable aquatic habitat for western pond turtle is present in Mallard Slough.

- **Burrowing owl.** The habitat requirements and regulatory status for burrowing owl are described above under the special-status wildlife species for Victoria Island/Byron Tract. Although it is unknown if burrowing owl occurs at the Desalination Alternative project sites, populations have been reported in Concord, Pittsburg, and Antioch (Center for Biological Diversity 2003).

- **White-tailed kite and northern harrier.** The habitat requirements and regulatory status for white-tailed kite and northern harrier are described above under the special-status wildlife species for Victoria Island/Byron Tract. Suitable nesting and foraging habitat for northern harrier is present in the nonnative grasslands within the new untreated-water conveyance pipeline corridor and at the Bollman WTP. Scattered trees in the grasslands and riparian scrub could also provide suitable nesting habitat for white-tailed kite.

- **Loggerhead shrike.** The habitat requirements and regulatory status for loggerhead shrike are described above under the special-status wildlife species for Victoria Island/Byron Tract. Suitable shrubs and trees in the grasslands and riparian scrub could provide suitable nesting habitat for loggerhead shrike.

- **Saltmarsh common yellowthroat and Suisun song sparrow.** Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) and Suisun song sparrow (*Melospiza melodia maxillaries*) are Federal and California species of special concern. Saltmarsh common yellowthroats nest in dense vegetation in fresh- or brackish-water marshes, associated with cattails, tules, and other sedges, young willow trees, and blackberry vines. Suisun song sparrow is endemic to Suisun Bay and is associated with saline emergent wetlands that contain permanent water or moisture in the form of tidal ebb and flow. Preferred habitat typically contains at least one patch of tall, hard-stemmed bulrush that stands above the surrounding vegetation and is used as a singing perch to establish territory.

4.6.2 Environmental Consequences

4.6.2.1 Methods and Assumptions

The impact analysis for terrestrial biological resources was based on consideration of: (1) construction activities and the area anticipated to be disturbed, (2) existing habitat conditions in the areas proposed for construction activities and nearby areas, and (3) known or presumed occurrence of protected species near construction areas. Hydrologic modeling results were not used to evaluate terrestrial species.

All available information regarding sensitive terrestrial biological resources that could be affected by the Proposed Action and alternatives was reviewed. Because the project footprints for the Proposed Action and alternatives have not been specifically determined and the wetland delineation has not been finalized, specific acreages of sensitive habitats (e.g., jurisdictional waters of the United States and freshwater marsh) that could be affected by project construction, as well as acreages gained through restoration efforts, could not be precisely determined. Impacts to sensitive habitats are discussed in terms of potential direct and indirect effects. Focused surveys for special-status plants were conducted on Victoria Island/Byron Tract in July 2005. Plant surveys were not conducted for the Desalination Alternative site due to the large area that could be affected. Reconnaissance-level surveys for special-status wildlife were conducted at Victoria Island/Byron Tract and for the Desalination Alternative. For this evaluation, the analysis of impacts on special-status wildlife was based on the habitat types that would be affected. Focused pre-construction wildlife surveys would be required and conducted, as appropriate, prior to any construction activities. Impacts to special-status species were assessed in terms of potential changes in the amount and distribution of suitable habitat, the relative importance of affected habitats, and the potential for direct loss of individuals.

4.6.2.2 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect on terrestrial biological resources if it would:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by DFG or USFWS;
- have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by DFG or USFWS;
- have a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, rivers, etc.) through direct removal, filling, hydrological interruption, or other means;
- interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;
- conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan; or
- substantially degrade the quality of the environment, substantially reduce the habitat of a fish and wildlife species, cause a fish or wildlife species to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species.

4.6.2.3 No-Action Alternative

The No-Action Alternative would result in no changes to the existing facilities, plant communities, or wildlife habitats in or near the proposed project site or Desalination Alternative project sites. Therefore, no impacts would occur to special-status species or their habitats, wetlands, or other sensitive habitats, including jurisdictional waters of the United States. In addition, movement corridors for wildlife or fish populations or wildlife nursery sites would not be adversely affected. The No-Action Alternative would not conflict with any local policies or ordinances protecting biological resources or approved HCPs or NCCPs, nor would it substantially degrade the quality of the environment.

4.6.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

IMPACT 4.6-a (Alternative 1)

Potential Fill of Jurisdictional Waters of the United States and Loss of Sensitive Habitat during Construction. *Construction of the new intake structure and pump station in Victoria Canal, and construction of the conveyance pipeline across Victoria Island and connection to the existing Old River Pump Station could result in fill of jurisdictional waters of the United States and freshwater marsh habitat, which is considered a sensitive habitat by DFG and USACE. This direct impact would be* ***potentially significant.***

Construction of the new intake structure would penetrate the levee and be placed within the ordinary high water mark (OHWM) of Victoria Canal. The proposed intake and fish screens would range from approximately 145 to 200 feet long, depending of the depth of the fish screen, which is anticipated to be 10 to 15 feet. Final sizing would be based on confirmation of fish screen design details with fishery agencies, levee geotechnical design considerations, and channel bathymetry. To provide additional depth for the fish screen, excavation may be required in Victoria Canal in the immediate vicinity of the intake in an area up to 50,000 square feet and to depths within 1-2 feet of the existing channel bottom. The existing levee would be reinforced and reconfigured to allow installation of the new intake structure. A 36-inch layer of riprap would be installed on the water side of the existing levee approximately 400-500 feet upstream and downstream from the new intake, resulting in approximately 4,500 cubic yards of replaced riprap and 200 cubic yards of new riprap. The installation of the new intake and construction of the new levee would also result in permanent fill of approximately 900 linear feet of a drainage ditch at the toe of the levee. A new, 1,050-foot long drainage ditch would be constructed at the toe of the new levee and provide additional permanent habitat greater than presently exists.

Victoria Island and Byron Tract contain many irrigation ditches, which may be considered jurisdictional wetlands by USACE. Although the exact route of the new pipeline across Victoria Island has not been determined, construction of the new pipeline from the new intake structure to the existing Old River Pump Station across Victoria Island could result in fill of wetlands and loss of freshwater marsh vegetation. The new conveyance pipeline would be installed using conventional trenching methods. Any ditches that potentially could be affected by the pipeline routing would be siphoned under, rerouted, crossed over, or replaced. Some of these irrigation ditches and canals may contain sensitive wetland habitat; however, in over 33 miles of ditches and canals on

Victoria Island and Byron Tract within the project area, less than 0.2 acre of potential wetlands was identified. Approximately 2.71 acres of potential wetlands, including freshwater marsh, seasonal wetlands, and swales, were observed along Old River from the confluence with Victoria Canal to the SR 4 bridge. The anticipated acreage affected by the Proposed Action is expected to be a very small fraction of the total acreage present.

The conveyance pipeline to connect the new Victoria Canal intake with the existing Old River Pump Station would either be tunneled under Old River or would cross over the levee. The tunneling option would involve constructing a launching and receiving pit outside of the levees on the west (Byron Tract) and east sides (Victoria Island) of Old River. This work likely would not result in fill of Old River or loss of freshwater marsh vegetation. If the conveyance pipeline crosses over the levee, it would penetrate the levee above the 100-year flood stage and follow the existing riprap-covered bank approximately 65–75 feet to the river bottom. Along the bottom of the river channel, the pipeline would be buried to a depth of 5-10 feet. This option may result in permanent fill (approximately 700 cubic yards assuming 6-foot diameter pipe along 75 feet of levee slope) of waters of the United States and loss of freshwater marsh and would be subject to USACE and DFG authorization.

Because the exact project footprint has not been determined, the actual fill of waters of the United States cannot be precisely calculated. However, the volume of potential fill below the OHWM was estimated based on current design specifications using the maximum values. A total estimate of fill of waters associated with Victoria Canal and Old River is approximately 10,000 cubic feet. This direct impact may adversely affect jurisdictional waters of the United States, including wetlands (e.g., freshwater marsh), and would therefore be potentially significant.

IMPACT 4.6-b
(Alternative 1)

Potential Loss of Special-status Plants. *Two special-status plant species, Mason's lilaeopsis and rose-mallow, are known to occur on Victoria Island/Byron Tract. These populations could be disturbed during project construction, resulting in destruction of these plants, their root system, or seed bank. This direct impact would be **potentially significant.***

Two special-status plant species, Mason's lilaeopsis and rose-mallow, were documented on Victoria Island/Byron Tract during focused botanical surveys in July 2005. Mason's lilaeopsis plants were observed in two locations on the west bank of Old River, south of the existing intake and pump station. Several rose-mallow plants were observed in four locations: on the north bank of Victoria Canal, on the west bank of Old River, in several locations on the east bank of Old River south of the intake station, and on the east bank of Old River directly across from the intake station. No other special-status plant species were observed on Victoria Island/Byron Tract in the survey area.

Ground-disturbing construction activities could destroy individual plants, their root system, or seed bank. Constructing a new intake structure on Victoria Canal and associated levee improvements could disturb the rose-mallow population on the north bank of Victoria Canal. Connecting the conveyance pipeline from Victoria Island to the existing Old River intake and pump station by either tunneling or crossing the levee could disturb one or more populations of Mason's lilaeopsis and/or rose-mallow. Loss of one or more of these special-status plant populations would be a potentially significant direct impact.

IMPACT 4.6-c (Alternative 1)

Potential Construction Effects on Giant Garter Snake. *The open water and freshwater marsh in the irrigation ditches on Victoria Island/ Byron Tract provide mostly marginally suitable and some suitable habitat for giant garter snake, Federally and State-listed threatened species. During construction activities, potential take of giant garter snake would be a temporary, but* ***potentially significant*** *direct impact. However, the levee drainage ditch would be lengthened by 150 feet, creating additional ditch habitat, which would be a permanent beneficial effect.*

Although the presence of giant garter snake on Victoria Island/Byron Tract is highly unlikely and giant garter snakes have never been documented in the south Delta despite numerous biological surveys, certain aspects of the Proposed Action may result in an increased risk of mortality or species take should a giant garter snake occur on the project site, well beyond its current range. Giant garter snakes could be injured or killed during excavation for levee improvements, during the construction of proposed intake facilities, or during the installation of the proposed pipeline wherever it intersects with potential habitat. Any ditches that potentially could be affected by the construction of the conveyance pipeline (e.g., trenching) across Victoria Island and Byron Tract would be siphoned under, rerouted, crossed over, or replaced. The levees would be temporarily disturbed during installation of the new intake structure on Victoria Canal. Because these areas would be temporarily disturbed during construction, individual giant garter snakes could be killed if they are present. During construction activities, potential take of giant garter snake, which is a Federally and State-listed threatened species, would be a potentially significant direct impact.

Potential aquatic habitat for giant garter snake would be temporarily disturbed during construction, but no permanent habitat loss is anticipated. To the contrary, an existing ditch along the toe of the levee would have 900 feet filled, but a new ditch would be constructed that would be 1,050 feet long. This permanent effect would be beneficial.

IMPACT 4.6-d (Alternative 1)

Potential Effects on Greater Sandhill Crane. *The fallow fields on Byron Tract are potential habitat for greater sandhill crane. Construction of a launching or receiving pit on Byron Tract associated with the Old River crossing of the conveyance pipeline could result in temporary disturbance to wintering sandhill cranes. Because the construction disturbance would be temporary and other suitable habitat is present in the immediate vicinity, this direct impact would be* ***less-than-significant.***

Although greater sandhill crane is present in the Delta in the winter, it is unlikely that the habitats on Victoria Island and Byron Tract would support large concentrations of the species because most of the area is in asparagus production, which does not provide preferred foraging areas for sandhill crane. Fields of other agricultural crops, such as rice, sorghum, and barley, in the Delta are preferred foraging areas for sandhill crane.

Installation of the new intake on Victoria Canal, construction of the conveyance pipeline across Victoria Island, and connection to the existing Old River Pump Station is not likely to substantially disturb wintering crane populations during project construction and would not result in permanent loss of preferred habitat for sandhill crane. Therefore, this would be a less-than-significant direct impact.

IMPACT 4.6-e (Alternative 1)

Potential Effects on Swainson's Hawk, White-Tailed Kite, Northern Harrier, And Other Raptors. *Removal or disturbance of raptors nests, which could result in loss of eggs or young, would be a direct adverse effect. Electrocution from the new powerlines is highly unlikely with proper power line design. Potential loss of Swainson's hawk foraging habitat would not be an adverse effect because of the small amount of habitat affected either temporarily or permanently, relative to the substantial surrounding foraging area and limited roosting and nesting trees on and near Victoria Island. Removal or disturbance of raptor nests, which could result in loss of eggs or young, would be a* ***potentially significant*** *direct impact.*

A few isolated trees that provide potential nesting habitat for Swainson's hawk, white-tailed kite, or other raptors are present on the west side of Victoria Island. No active raptor nests were observed on Victoria Island during the reconnaissance survey, but an active red-tailed hawk nest was observed on Byron Tract adjacent to the SR 4 bridge. Red-tailed hawk and Swainson's hawk were also observed foraging on Victoria Island. Construction-related disturbance, such as trenching or tunneling, on Victoria Island and Byron Tract could disturb nearby nesting pairs, potentially resulting in nest abandonment, which would be a potentially significant direct impact.

Suitable nesting habitat also exists for northern harrier. Construction-related activities in these areas also could result in destruction or abandonment of northern harrier nests if such nests are present in or near the construction area. Construction-related activities related to the conveyance pipeline also could result in destruction and abandonment of northern harrier nests, if such nests are present in or near the construction area. This would be a potentially adverse effect on raptor nesting.

The Victoria Island/Byron Tract project site that would be potentially affected by the Proposed Action is currently planted in asparagus, alfalfa, wheat, and tomato; used for silage; or is fallow. All of these agricultural areas, except those fields with tomato, provide foraging habitat for raptors. Approximately 200-470 acres of agricultural lands may be temporarily affected during installation of the pipeline, intake and pump station, access roads, and borrow and staging sites. However, the pipeline would be constructed in segments and agricultural lands would only be affected on a portion of the total acreage at any given point in time. After construction, all pipeline areas, access roads, borrow, and staging areas would be returned to agricultural use and, therefore, no permanent loss of foraging habitat would occur from installation of the new pipeline.

Borrow may be obtained on- or off-site. On-site borrow would be via a shallow "land-leveling" technique that would not cause permanent loss of agriculture and habitat. At most, up to an additional 135 acres of agricultural land may be used temporarily as borrow (included in total 470-acre calculation above). After it is used for borrow, however, the area could be regraded and agricultural uses could continue. Therefore, no permanent loss of foraging habitat would occur from the temporary borrow area.

The entire project construction would result in the permanent loss of approximately 6-8 acres of agricultural land, all from the new setback levee associated with the installation of the new intake on Victoria Canal and a single structure.

If the tunneling option is used to cross Old River, approximately 1 acre of land near the crossing would be temporarily affected during construction and staging. The entire area would be restored to pre-construction conditions, with the exception of a 25-foot by 50-foot area, where a permanent structure would be located. The structure would be directly across from the existing Old River intake station on the dry-side of the levee, likely in an area that is currently covered with ruderal vegetation. If the pipeline is routed up and over the levee, less than 1 acre of land would be disturbed during construction. The pipeline would penetrate the levee above the 100-year flood stage and follow the rip-rap covered bank to the river bottom. Under either method to cross Old River, no freshwater marsh, agricultural land, or other areas that provide valuable wildlife habitat would be permanently affected.

In summary, the Proposed Action would result in a maximum permanent loss of approximately 6-8 acres of foraging habitat for Swainson's hawk and other raptors. Two historical Swainson's hawk nest locations are known to occur from within 1 mile of the Proposed Action. Loss of 6-8 acres of foraging habitat would result in loss of no more than 0.4% of area within a 1-mile radius (2,010 acres) of the nest locations. The loss of 6-8 acres of potential foraging area for Swainson's hawk and other raptors in this area would not be an adverse effect that would result in incidental take. Moreover, nesting habitat, not foraging habitat, is likely the limiting factor for Swainson's hawk in this area. This impact would be less than significant.

The Proposed Action also includes constructing power transmissions lines from either the Pacific Gas & Electric Company (PG&E) or the Western Area Power Administration (WAPA) distribution systems to the new power substation to be constructed on-site. Utility poles can benefit most raptors by providing perching and/or nesting structures in areas where few natural perches or nest sites exist. However, utility structures can also pose a threat to raptors and other birds through electrocutions or collisions. Mortality is most common with large birds, such as eagles or cranes. Electrocution can occur when a bird simultaneously touches two energized parts or an energized part and a grounded part of the electrical equipment. CCWD has consulted with WAPA, and WAPA typically can use standard devices that minimize bird electrocutions. Consequently, this impact would be less than significant.

IMPACT 4.6-f (Alternative 1)

Potential Effects on Burrowing Owl. *Suitable burrowing owl habitat (e.g., ground squirrel burrows) exists on Victoria Island/Byron Tract along the banks of Old River, Victoria Canal, and edges of agricultural fields and irrigation ditches. One burrowing owl and other signs of burrowing owl activity were observed on Victoria Island. Construction-related activities, such as trenching, could destroy burrows or disturb individuals. Destruction of active burrowing owl burrows or disturbance that results in nest abandonment would be a* ***potentially significant*** *direct impact.*

Burrowing owl is known to be present on Victoria Island in at least one location. Signs of burrowing owl activity (e.g., whitewash and pellets) were observed at several burrow entrances. Suitable habitat occurs throughout Victoria Island and Byron Tract along the levee banks and edges of agricultural fields and irrigation ditches. Although focused surveys have not been conducted, burrowing owl may occur in several locations on Victoria Island and Byron Tract due to the presence of suitable habitat for the species. Installation of the new intake on Victoria Canal, construction of the conveyance pipeline, and connection with the existing Old River Pump Station could destroy burrows occupied by burrowing owl if such burrows are present in the construction area, resulting in loss of adults, young, or eggs. Construction activities occurring adjacent to active burrows could also disturb individuals resulting in nest abandonment by the adults and loss of eggs or young. Loss of adult, eggs, or young burrowing owls from construction activities would be a potentially significant direct impact.

A total of 6-8 acres of agricultural land would be permanently lost from construction of the new setback levee and intake structure. Although suitable habitat for burrowing owl occurs throughout the area, one occupied burrow was observed in the north-central portion of the project site. This area would not be affected by the new setback levee construction or use of borrow. Because the surrounding areas are primarily agricultural and provide thousands of acres of foraging habitat, the loss of 6-8 acres of potential foraging areas for burrowing owl would not be a substantial adverse effect and, therefore, potential loss of foraging habitat may affect, but is not likely to adversely affect, this species.

IMPACT 4.6-g (Alternative 1)

Potential Effects on Western Pond Turtle. *Western pond turtle could inhabit the open water habitat of the irrigation ditches, Old River, and Victoria Canal. While potential construction-related disturbances would be temporary, individual pond turtles could be killed if they are present within these areas during construction. Loss of pond turtles would be a* ***potentially significant*** *direct impact.*

Pond turtles are known to occur throughout the Delta region in a variety of aquatic habitats, including rivers, canals, and irrigation ditches. Although no pond turtles were observed during the reconnaissance survey, suitable open water habitat for the species is present in the irrigation ditches on Victoria Island and in Old River and Victoria Canal. Potential basking sites, such as logs, rocks, and aquatic vegetation, were observed in the open water habitat as well. It is unlikely that this species will nest at the proposed project site because the upland habitats are routinely and substantially disturbed by ongoing agricultural activities. Pond turtles could be destroyed during installation of the new intake on Victoria Canal or conveyance pipeline across irrigation ditches if they are present at the proposed project site. Crossing the levee to connect the conveyance pipeline to the existing Old River intake and pump station could also adversely affect pond turtles. Western pond turtles may also be injured during construction in aquatic habitat from underwater sound pressure, chemical spills, and dewatering of the coffer dam. Tunneling of the conveyance pipeline under Old River is not expected to affect open water habitat and therefore no impacts to pond turtle are expected during this construction activity. Destruction of pond turtles during construction in Victoria Canal or in irrigation ditches would be a potentially significant direct impact.

IMPACT 4.6-h (Alternative 1)

Potential Effects on California Horned Lark and Loggerhead Shrike. *Suitable nesting and foraging habitat for California horned lark and loggerhead shrike is present in the fallow fields and ruderal and riparian scrub habitats on Victoria Island/Byron Tract. These habitat types are abundant in the surrounding areas. Nesting habitat for both species is of marginal quality due to the disturbance from active agricultural operations. Because Victoria Island and Byron Tract are not likely to provide important nesting or foraging habitat to the local or regional populations of these species, direct impacts to California horned lark and loggerhead shrike would be* ***less than significant****.*

Project construction may disturb fallow fields, and ruderal and riparian scrub habitats, which could provide both nesting and foraging habitat for California horned lark and loggerhead shrike. Loss of foraging habitat would not be a significant impact because this habitat type is abundant in the surrounding areas. It is unlikely that these species would nest on Victoria Island or Byron Tract due to the high disturbance level (i.e., regular agricultural activities) of the site. Construction activities have the potential, although unlikely, of destroying an active nest if this species did nest on the project site; however, the Proposed Action would not substantially affect the local or regional population of this species. Therefore, direct impacts to California horned lark and loggerhead shrike would be less than significant.

IMPACT 4.6-i (Alternative 1)

Potential Effects on Tricolored Blackbird. *Suitable nesting habitat for tricolored blackbird is present in emergent marsh and blackberry brambles on Victoria Island/Byron Tract. Disturbance during construction could result in nest abandonment and failure of the nesting colony. Due to the potential for large numbers of nesting tricolored blackbirds to be lost, this direct impact would be* ***potentially significant****.*

Although no nesting colonies are known to have historically occurred on Victoria Island or Byron Tract, the emergent marsh and blackberry brambles in the area could provide suitable nesting habitat. In particular, the large patch of emergent marsh across Old River from the existing pump station could be used by nesting tricolored blackbirds. Other smaller patches of emergent marsh in the irrigation ditches are likely too small in size to provide adequate cover and protection from predators required for successful nesting. The blackberry brambles on Byron Tract, lining the large irrigation ditch, and on the east bank of Old River also could provide nesting substrate for tricolored blackbirds.

Construction of the conveyance pipeline near Old River, tunneling under Old River, or crossing over the levee to connect to the existing Old River pump station could cause ground disturbance and vibrations that would cause nesting tricolored blackbirds to abandon a colony. No suitable habitat for tricolored blackbird occurs near Victoria Canal, and installation of the new intake would not adversely affect tricolored blackbirds. The failure of a nesting tricolored blackbird colony if present in or near the construction area could represent a substantial loss to the local population of tricolored blackbirds and would be a potentially significant direct impact.

IMPACT 4.6-j (Alternative 1)

Potential Effects to NCCP Terrestrial Habitat Types. *Potential effects to Natural Communities Conservation Plan (NCCP) habitats are discussed throughout many of the impacts described above. NCCP habitats covered under USACE jurisdiction may be adversely affected (e.g., tidal freshwater emergent habitat, tidal perennial aquatic habitat, and managed seasonal wetland habitat). This impact would be* ***potentially significant****.*

Although the exact project footprint has not been determined, the impacts to NCCP habitat types were estimated (Table 4.6-1). These approximations are based on acreage calculations of each habitat type in the study area and estimates of the size of the proposed facilities. Because the precise location of the proposed facilities has not yet been determined, the actual acreage of impact to each habitat type may increase or decrease. However, the calculations provide an estimate of the order of magnitude of the effect on each habitat type, and many of the habitat types are fairly homogeneous on Victoria Island. The permanent impacts of the proposed project are small, but impacts to aquatic or wetland habitats under USACE jurisdiction would be potentially significant.

Table 4.6-1
NCCP Habitats Affected by the Proposed Action

NCCP Habitat Type	Approximate Acreage Potentially Affected by Proposed Action (acres)		Total Approximate Acreage in Study Area (acres)
	Temporary	Permanent	
Upland Cropland	200–470 (pipeline, access roads, staging area, and borrow area)	6–8 (VC intake and levee improvement)	2,000
Grassland	1 (Fallow field on Byron Tract)	0	68
Tidal Freshwater Emergent Habitat	2.23	<0.1 (Old River crossing)	2.5
Tidal Perennial Aquatic Habitat	None	<0.1 (VC intake 10-15 feet by 100-200 feet, Old River crossing)	175 (only includes Old River acreage, not VC or drainage ditches)
Managed Seasonal Wetland Habitat	<0.05 (9 drainage crossings, 15 feet wide by 10 feet long)	<0.1 (fill on land side of VC levee 1,000-1,200 feet long by 20 feet wide)	62 (includes seasonal wetlands and swales and drainage ditches and canals)
Valley/Foothill Riparian	<0.02 (Old River crossing)	0	<0.5

Cumulative Impacts

The Proposed Action would have less-than-significant direct and indirect impacts on common biological resources, greater sandhill crane, California horned lark, and loggerhead shrike. These effects would be less than considerable in relation to any potential cumulative effect; the removal of ruderal and agricultural areas associated with project implementation would be minor in relation to the total amount of these habitats present locally and regionally and no important sandhill crane wintering sites would be affected by the Proposed Action.

IMPACT 4.6-k (Alternative 1 - Cumulative)	**Potential Cumulative Effects on Terrestrial Special-status Species and Habitats.** *The Proposed Action has the potential to adversely affect these resources and contribute to significant cumulative effects. The project's contribution to cumulative impacts would therefore be **potentially significant**.*

As stated above, construction activities associated with the Proposed Action could have potential adverse effects on the following resources: jurisdictional waters of the United States, including wetlands; special-status plants; giant garter snake; burrowing owl; Swainson's hawk, white-tailed kite, and other raptors; western pond turtle; tricolored blackbird; and NCCP terrestrial habitat types. The only other known projects having similar potential adverse effects on any of these species at the proposed project site are other water resource projects in the Delta being planned and implemented by CCWD, DWR, and others (see Section 4.1, "Approach to the Environmental Analysis"). In addition to these projects, numerous development projects are planned within the region (see Appendix F-1, "Local Development Projects Considered in Cumulative Impact Analysis"), and many of these are likely to have the potential to contribute to adverse effects on these species through temporary disturbance or permanent conversion of potential habitat (e.g., open ruderal and grassland areas and ditches and adjacent lands).

The Los Vaqueros Reservoir Expansion Project would be constructed on a later time schedule than the Proposed Action so there would not be any temporal overlap of any temporary construction-related impacts. The long-term impacts on terrestrial biological resources from the Proposed Action would not provide a cumulatively considerable contribution to any future adverse cumulative impact with or without implementation of the Los Vaqueros Reservoir Expansion Project, as the habitat types affected by both projects differ substantially.

Populations of special-status plants, giant garter snake, burrowing owl, raptors, western pond turtle, and tricolored blackbird have declined for numerous reasons, most significantly because of the loss and fragmentation of habitat as a result of urban development; for wildlife species, because of the loss of movement corridors; and, in the case of giant garter snake, because of increased predation resulting from the introduction of exotic species. Jurisdictional waters of the United States, including wetlands, have also declined regionally in large part as a result of urban development and associated land uses (e.g., recreation and vehicular use in wetland areas) and agricultural land uses such as grazing. Any effects of the Proposed Action on these resources are expected to be relatively minor because they would mainly be limited to the construction period; however, because of the sensitive status of the resources, any contribution to potentially adverse effects would be significant. Therefore, the potentially significant direct effects of the Proposed Action on these resources would be a cumulatively considerable contribution to potentially significant cumulative impacts.

Mitigation Measures

Based on results of the evaluation of the potential adverse effects that may directly or indirectly affect jurisdictional waters of the United States, and special-status plants and wildlife species and their habitat as a result of the Proposed Action, a series of mitigation measures will be implemented by CCWD.

Mitigation Measure 4.6-a (Alternative 1): Minimize Potential Fill of Jurisdictional Waters of the United States and Loss of Sensitive Habitat, and Compensate for Unavoidable Impacts.

CCWD shall implement the following measures:

- CCWD shall minimize fill of waters of the United States and loss of freshwater marsh habitat to the greatest extent feasible.

- For those waters of the United States that cannot be avoided during construction, authorization for fill of jurisdictional waters of the United States shall be secured from USACE via the Section 404 permitting process prior to project implementation. Any mitigation measures determined necessary during the 404 permitting process shall be implemented. As required, CCWD shall implement waste discharge Best Management Practices (BMPs) during dredging and minimize the disturbance of the river channel bottom and release of sediment into the water to the extent possible.

- If the Proposed Action results in the loss of jurisdictional wetlands, a conceptual wetlands mitigation plan, including an agreed upon replacement ratio of wetlands with USACE, will be developed by a qualified biologist. The mitigation plan shall quantify the total jurisdictional acreage lost, describe creation/replacement ratios for acres filled, annual success criteria, mitigation sites, and monitoring and maintenance requirements. The plan shall be prepared by a qualified wetland biologist pursuant to, and through consultation with, USACE. Implementation of the plan would compensate for any loss of wetland resulting from project construction activities and result in no net loss of wetlands.

- CCWD shall obtain a Letter of Permission or permit from the USACE under Section 10 of the Rivers and Harbors Act prior to any work being completed within navigable waters. Any conditions associated with the authorization shall be implemented.

- Water Quality certification pursuant to Section 401 of the Clean Water Act will be required as a condition of issuance of the 404 permit. CCWD shall obtain water quality certification from the Regional Water Quality Control Board (RWQCB) prior to project implementation. Any measures required as part to the issuance of water quality certification shall be implemented.

- A DFG Streambed Alteration Agreement will be required. Issuance of the Agreement may require the preparation of a habitat mitigation plan. The wetland mitigation plan developed for impacts to wetland and other waters of the United States may be suitable, if it adequately covers impacts to the stream channel of Victoria Canal and impacts to riparian habitat occurring on Victoria Island or Byron Tract from project construction activities. Any conditions of issuance of the Streambed Alteration Agreement shall be implemented as part of project implementation.

- If the Proposed Action results in loss of freshwater marsh habitat in an area that is not a jurisdictional wetland, a wetland mitigation plan shall be developed by a qualified biologist, in consultation with DFG. The mitigation plan shall quantify the total freshwater marsh acreage lost, describe creation/replacement ratios for habitat lost, annual success criteria, mitigation sites, and monitoring and maintenance requirements. Implementation of the plan would be required to compensate for any loss of freshwater marsh habitat and result in no net loss of such habitat.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-b (Alternative 1): Minimize Potential Effects on Special-status Plants, and Mitigate for Loss If Required.

The following measures shall be implemented to protect the documented populations of Mason's lilaeopsis and rose-mallow at the proposed project site:

- Information on the special-status plant populations shall be recorded in the field on CNDDB data forms. These forms shall be submitted to the CNDDB upon completion of the survey;

- If the populations can be avoided during project implementation, they shall be clearly marked in the field by a qualified botanist for avoidance during construction activities. Before ground disturbance, all on-site construction personnel shall be given instruction regarding the presence of this species and the importance of avoiding impacts to this species and its habitat; and

- If special-status plant populations cannot be avoided, consultations with DFG and/or USFWS would be required. If needed, CCWD shall develop a mitigation plan to compensate for the loss of Mason's lilaeopsis and rose-mallow. The plan would detail appropriate replacement ratios determined through consultation with the resource agencies, methods for implementation, success criteria, monitoring and reporting protocols, and contingency measures that would be implemented should the initial mitigation fail. Because CCWD would not own the land outside the project facility footprint, mitigation through replacement is likely to be impractical at the project site and would need to be achieved at an appropriate off-site location. The plan shall be developed in consultation with the appropriate agencies prior to beginning construction activities in the area of concern.

If mitigation is required, CCWD shall maintain and monitor the mitigation area for 3 years following the completion of construction and restoration activities. Monitoring reports documenting the restoration effort should be submitted to DFG and/or USFWS upon the completion of the restoration implementation and 3 years after the restoration implementation. Monitoring reports should include photo-documentation, when restoration was completed, a description of materials that were used, specified plantings, and justifications of any substitutions to the mitigation plan. Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-c (Alternative 1): Implement Avoidance and Mitigation Measures as Needed to Minimize Potential Effects on Giant Garter Snake.
Although it is highly unlikely for giant garter snake to be present in the aquatic or upland areas on Victoria Island, there is potentially suitable and marginal habitat present (4,800 feet of suitable habitat and 21,900 feet of marginal habitat out of 178,385 linear feet of potential habitat within the potential impact area). For any work that has the potential to affect giant garter snake or its habitat, CCWD shall consult with USFWS and USACE under ESA Section 7 to develop conservation measures. Work that may affect giant garter snake habitat includes constructing the new intake station and levee improvements on Victoria Canal, installing the conveyance pipeline across irrigation ditches, and connecting the conveyance pipeline to the existing facilities at the Old River intake and pump station (either by tunneling or crossing the levee). Minimization and avoidance measures may include the following:

- All project-related construction activity within giant garter snake habitat (aquatic habitat and adjacent suitable upland habitat within 200 feet) shall be conducted between May 1 and October 1 to the extent feasible. For any project-related construction outside of the May 1-October 1 period, CCWD shall contact the USFWS Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

- Dewatering of aquatic habitat for project-related construction purposes shall not occur between October 1 and April 15, with the exception of the area within the cofferdam, unless authorized by USFWS. Any dewatered habitat must remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat. If complete dewatering is not possible, potential snake prey (i.e., fish and tadpoles) will be removed so that snakes and other wildlife are not attracted to the project construction area.

- Within 24 hours prior to commencement of project-related construction activities, the site shall be inspected by a qualified biologist who is approved by the USFWS Sacramento Fish and Wildlife Office. The construction area shall be re-inspected whenever a lapse in project-related construction activity of 2 weeks or greater has occurred. If a giant garter snake is encountered during project-related construction, all project-related construction activities shall cease in the immediate area until appropriate corrective measures have been completed or it has been determined by the biologist that the snake will not be harmed. USFWS shall be contacted by telephone immediately.

- Movement of heavy equipment to and from the project site during project-related construction activities shall be restricted to established roadways and haul routes to minimize habitat disturbance, and project construction equipment shall be stored in established staging areas.

- Before ground disturbance, all on-site project-related construction personnel shall be given instruction regarding the presence of the giant garter snake and the importance of avoiding impacts to this species and its habitat.

- After completion of project-related construction activities, any temporary fill and construction debris shall be removed, and wherever feasible, disturbed areas shall be restored to pre-project conditions.

- No plastic, monofilament, jute, or similar erosion control matting that could entangle snakes will be placed on the project site when working within 200 feet of potential snake habitat during their active period of April 1 until October 1.

The 900 feet of drainage ditch at the toe of the levee that would be filled during construction of the intake would be replaced by a new 1,050-foot-long drainage ditch that wraps around the new levee at the intake site, an increase of 150 feet of potential giant garter snake habitat of equal habitat quality on a long-term basis. This permanent habitat enhancement offsets the temporary loss of this habitat during construction.

Implementation of this mitigation would result in no adverse effect on or incidental take of giant garter snake, and would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-e (Alternative 1): Conduct Surveys and Implement Protective Measures, If Needed, to Minimize Potential Effects on Swainson's Hawk, White-Tailed Kite, Northern Harrier, and Other Raptors.

CCWD shall implement the following mitigation measures.

If feasible, in order to avoid impacts to northern harrier, all vegetation within the project's construction footprint and on-site borrow areas shall be cleared in the non-breeding season.

Complete avoidance of project construction-related activity during the breeding and nesting season is not feasible. Consequently, pre-construction surveys shall be conducted by a qualified biologist to identify active Swainson's hawk nests within ½ mile of the proposed project site and nests of other raptors within 500 feet of the proposed project site. The survey shall be conducted no less than 14 days and no more than 30 days prior to the beginning of construction. To the extent feasible, guidelines provided in the *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in the Central Valley* (Technical Advisory Committee 2000) shall be followed.

If active nests are found, project-related construction impacts shall be avoided by establishment of appropriate buffers to limit project-related construction activities. The size of the buffers shall be determined by a qualified biologist in consultation with DFG.

No project-related construction activity shall commence within the buffer area until a qualified biologist confirms that the nest is no longer active or consultations with DFG specifically allow certain construction activities to continue. Monitoring of the nest by a qualified biologist may be required if the project-related construction activity has potential to adversely affect the nest.

To the extent feasible, CCWD will follow Avian Protection Plan guidelines for power lines (Edison Electric Institute's Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service 2005):

- provide 60-inch minimum horizontal separation between energized conductors and/or energized conductors and grounded hardware,
- insulate hardware or conductors against simultaneous contact if adequate spacing is not possible,
- use WAPA-approved poles that minimize impacts to birds, and/or
- increase the visibility of conductors or shield wires to prevent avian collisions.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-f (Alternative 1): Conduct Surveys and Implement Protective Measures, If Required, to Minimize Potential Effects on Burrowing Owl.

Prior to any ground-disturbing project-related construction activity, CCWD shall retain a qualified biologist to conduct preconstruction surveys for burrowing owls in suitable habitat within 250 feet of the project footprint, including the ruderal areas, and along the levees, roads, channel banks, and irrigation ditches on Victoria Island/Byron Tract. Surveys shall be conducted in accordance with DFG protocol (California Department of Fish and Game 1995).

If no occupied burrows are found in the survey area, a letter report documenting survey methods and findings shall be submitted to DFG, and no further mitigation is necessary.

If occupied burrows are found, impacts to them shall be avoided by establishing a buffer of 165 feet during the nonbreeding season (September 1 through January 31) or 250 feet during the breeding season (February 1 through August 31) for all project-related construction activities. The size of the buffer area may be adjusted if a qualified biologist and DFG determine project-related construction activities would not be likely to have adverse effects. No project-related construction activity shall commence within the buffer area until a qualified biologist confirms that the burrow is no longer occupied, or consultations with DFG specifically allow certain construction activities to continue.

If avoidance of occupied burrows is infeasible for project-related construction activities, on-site passive relocation techniques approved by DFG shall be used to encourage owls to move to alternative burrows outside of the impact area. However, no occupied burrows shall be disturbed by project-related construction activities during the nesting season unless a qualified biologist verifies through noninvasive methods that the burrow is no longer occupied.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-g (Alternative 1): Conduct Surveys and Implement Protective Measures, If Required, to Minimize Potential Effects on Western Pond Turtle.

Impacts on potential basking sites (i.e., logs and rocks) shall be avoided during project-related construction activities, wherever feasible. Measures to reduce and/or avoid underwater sound pressure and minimize the risk of hazardous spills (as described in Mitigation Measures 4.3-b and 4.3-c in Section 4.3, "Delta Fisheries and Aquatic Resources") would also protect western pond turtle during construction activities.

Preconstruction surveys in any aquatic habitat, including Old River, Victoria Canal, and irrigation ditches and canals, shall be conducted by a qualified biologist immediately prior to (within 24 hours of) commencement of project construction.

If western pond turtles are found during field surveys, a qualified biologist shall move the turtle(s) to the nearest suitable habitat outside the project construction area. A qualified biologist shall also be present during installation and dewatering of the cofferdam and during any dredging. Any dredge spoils shall be dumped and inspected for western pond turtles by the biologist.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-i (Alternative 1): Conduct Surveys and Minimize Potential Effects on Tricolored Blackbird, If Required.

To minimize potential project-related construction disturbance to nesting tricolored blackbirds during the breeding season, vegetation within the impact area footprint shall be removed during the non-breeding season (August to mid-April). Project-related construction disturbance to vegetation outside of the impact area shall be avoided.

If project-related construction activities are expected to occur during the breeding season for tricolored blackbirds (mid-April to July), preconstruction surveys shall be conducted by a qualified biologist in any areas of potentially suitable habitat. These areas specifically include emergent marsh in Old River across from existing pump station and blackberry brambles on Byron Tract and along Old River.

If no nesting tricolored blackbirds are observed during the preconstruction surveys, then no further mitigation is required.

If tricolored blackbirds are observed nesting on Victoria Island or Byron Tract, project-related construction impacts shall be avoided and minimized by establishment of a 0.25-mile buffer around the colony during the nesting period (mid-April to July) for all project-related construction activities.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-j (Alternative 1): Implement Mitigation Measures 4.6-a through 4.6-i (Alternative 1) to Minimize Potential Effects to NCCP Terrestrial Habitat Types.
To minimize potential effects to NCCP terrestrial habitat types, CCWD shall implement Mitigation Measures 4.6-a through 4.6-i (Alternative 1). Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

CCWD shall implement Measures 4.6-a through 4.6-i (Alternative 1) to address potential direct and indirect effects on NCCP terrestrial habitat types. Any unavoidable effects on waters of the United States, including wetlands, would be addressed through restoration or replacement according to methods and terms agreed upon through consultation with USACE and/or DFG, ensuring no net loss of the affected resources. Surveys, maintenance of buffer areas where practicable, and other avoidance measures described in the conservation measures described above would ensure minimization of any potential temporary effects of construction on special-status plants, giant garter snake, western pond turtle, tricolored blackbird, burrowing owl, and nesting Swainson's hawk and other raptors.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-k (Alternative 1 - Cumulative): Implement Mitigation Measures 4.6-a Through 4.6-c, 4.6-e Through 4.6-g, and 4.6-i (Alternative 1) to Minimize Potential Effects on Sensitive Resources.
CCWD shall implement Mitigation Measures 4.6-a through 4.6-c, 4.6-e through 4.6-g, and 4.6-i (Alternative 1) to address potential significant cumulative effects on sensitive terrestrial biological resources. No indirect impacts are expected. Any unavoidable effects on waters of the United States, including wetlands, would be addressed through restoration or replacement according to methods and terms agreed upon through consultation with USACE and/or DFG, ensuring no net loss of the affected resources. Surveys, maintenance of buffer areas where practicable, and other avoidance measures described in the mitigation measures described above would ensure minimization of any potential temporary effects of construction on special-status plants, giant garter snake, western pond turtle, tricolored blackbird, burrowing owl, and nesting Swainson's hawk and other raptors.

The Los Vaqueros Reservoir Expansion Project would be constructed on a later time schedule than the Proposed Action so there would not be any temporal overlap of any temporary construction-related impacts. The long-term impacts on terrestrial biological resources from the Proposed Action would not provide a cumulatively considerable contribution to any future adverse cumulative impact with or without implementation of the Los Vaqueros Reservoir Expansion Project, as the habitat types affected by both projects differ substantially.

Other sizeable projects would be required to implement measures similar to those that would be undertaken for the Proposed Action to ensure minimization of impacts on these potentially affected species, most of which are protected by the Federal ESA and/or sections of the California Fish and Game Code, including CESA.

With mitigation, the Proposed Action would not result in permanent loss of habitat or take of listed species that would contribute considerably to a cumulative impact. Therefore, implementation of the mitigation would reduce the potential contributions of the Proposed Action to any significant cumulative effect on terrestrial biological resources to a less-than-significant level.

4.6.2.5 Alternative 2, Indirect Pipeline Alternative

The type of direct, indirect, and cumulative impacts of Alternative 2 would be similar to those described for the Proposed Action. However, the severity of impact may differ between Alternative 1 and 2. Although the total ground area to be disturbed may be greater under Alternative 2 because the pipeline route is expected to be longer, the impacts on biological resources would not necessarily be increased under Alternative 2 because the exact footprints of the routes have not been determined and so effects cannot be quantified. Because of its substantially longer pipeline route, Alternative 2 has the potential to affect greater acreages of waters of the United States because of crossing more irrigation ditches. Consequently, more potential habitat for giant garter snake and western pond turtle would be affected by Alternative 2. It is possible that this alternative would affect more potential habitat for burrowing owl because they prefer field edges and roads, and this alternative would route the conveyance line along their edges, rather than through agricultural fields. Because the exact project footprint has not been determined, it cannot be determined whether impacts on special-status plants, raptors, and tricolored blackbirds would be greater or lesser under Alternative 2 than under the Proposed Action. Because the nature of the impacts is similar under Alternatives 1 and 2, implementing mitigation measures described for the Proposed Action would reduce potential impacts to terrestrial biological resources from direct and indirect project effects and cumulative effects to less-than-significant levels.

4.6.2.6 Alternative 3, Modified Operations Alternative

The impacts of Alternative 3 on terrestrial biological resources would be identical to those described for the Proposed Action. Implementation of the mitigation measures described for the Proposed Action would reduce these effects to a less-than-significant level. With mitigation, Alternative 3 would not contribute considerably to any cumulative impact related to biological resources.

4.6.2.7 Alternative 4, Desalination Alternative

Direct and Indirect Impacts

Construction-related impacts are discussed first, and then long-term impacts as a result of operation of the new desalination facilities are discussed.

IMPACT 4.6-a (Alternative 4)

Potential Fill of Jurisdictional Waters of the United States and Loss of Sensitive Habitat. *Expansion of the intake and pump station at Mallard Slough, construction of the new untreated-water conveyance pipeline and new desalination treatment facility at Bollman WTP, and construction of the new concentrate disposal pipeline could result in fill of jurisdictional waters of the United States. Associated wetlands, including freshwater or brackish marsh and pickleweed wetlands, which are considered sensitive habitats by DFG and USACE, may also be filled. The operation of the new concentrate disposal pipeline could have permanent long-term effects on sensitive habitats by altering the salinity of the water near the discharge, which could result in changes to adjacent vegetation communities. This direct impact would be* ***potentially significant.***

A wetland delineation has not been prepared for the Desalination Alternative. However, based on the reconnaissance field visit and aerial photo interpretation, there is the potential for this alternative to result in the fill of jurisdictional waters of the United States. The expansion of the existing Mallard Slough intake or construction of a new intake to accommodate the increased capacity to meet the desalination facility demands would require work within Mallard Slough or another location within Suisun Bay, which are considered jurisdictional waters of the United States. Sensitive habitats, which are also considered jurisdictional waters of the United States, are located in the vicinity of Mallard Slough and Suisun Bay and include pickleweed wetland and freshwater or brackish marsh. The installation of the new untreated-water conveyance pipeline could affect these sensitive habitats or jurisdictional drainages. In addition, construction of the new concentrate disposal pipeline could potentially affect sensitive habitats such as pickleweed wetland and freshwater or brackish marsh, as it leads from Bollman WTP to Suisun Bay. The discharge into Suisun Bay at Edith Point would also be considered fill of jurisdictional waters of the United States. Direct impacts to waters of the United States, including wetlands, and sensitive habitat areas would be potentially significant.

IMPACT 4.6-b (Alternative 4)

Potential Loss of Special-status Plants. *The brackish marsh, pickleweed wetland, and grasslands associated with the Desalination Alternative project sites provide potentially suitable habitat for 37 special-status plant species. If any populations of these species occur in areas to be disturbed during construction, they could be impacted. The construction of new facilities associated with the Desalination Alternative could result in the destruction of these plants, their root system, or seed bank. Because the exact distribution of special-status plants at the Desalination Alternative project sites is currently unknown and construction activities could result in the loss of one or more special-status plant populations, this direct impact would be* ***potentially significant****.*

As the overall presence and distribution of special-status plant species at the desalination alternative project sites are largely unknown, direct impacts to special-status plants would be potentially significant. Potential impacts to special-status plant species were determined based on the presence of suitable habitat for the species (i.e., freshwater or brackish marsh and grasslands). The construction of the intake structure, new untreated-water conveyance pipeline from the intake to Bollman WTP, new desalination treatment facility, and new concentrate disposal pipeline to Edith Point could directly affect special-status plants, resulting in loss of populations, or indirectly affect special-status plants, resulting in loss of suitable habitat. However, loss of one or more populations of special-status plants would be a potentially significant direct impact.

IMPACT 4.6-c (Alternative 4)

Potential Disturbance or Removal of Habitat for California Clapper Rail, California Black Rail, and Salt Marsh Harvest Mouse. *Implementation of the Desalination Alternative could result in disturbance or removal of pickleweed wetlands and freshwater and brackish marsh vegetation that could provide habitat for California clapper rail, California black rail, salt marsh harvest mouse. This would be a* ***potentially significant*** *direct impact.*

As the overall presence and distribution of California clapper rail, California black rail, and salt marsh harvest mouse at the Desalination Alternative project sites are largely unknown, impacts to California clapper rail, California black rail, and salt marsh harvest mouse would be potentially significant. Potential impacts to California clapper rail, California black rail, and salt marsh harvest mouse were determined based on the presence of suitable habitat for the species (i.e., pickleweed wetlands, freshwater and brackish marsh). The construction of the intake structure, new untreated-water conveyance pipeline from the intake to Bollman WTP, new desalination treatment facility, and new concentrate disposal pipeline to Edith Point could result in loss of California clapper rail, California black rail, and salt marsh harvest mouse during construction. Due to the potential for loss of individuals and temporary and/or permanent modification of habitat, this would be a potentially significant direct impact.

IMPACT 4.6-d (Alternative 4)

Potential Effects on Burrowing Owl. *Grassland habitat at the Desalination Alternative project sites, including the pipeline corridors and new desalination treatment facility site, could provide potential nesting habitat for burrowing owl. Destruction of active burrowing owl burrows or disturbance that results in nest abandonment would be a* ***potentially significant*** *direct impact.*

Because specific species surveys have not been conducted, it is unknown if burrowing owl is present at the desalination alternative project sites. Potentially suitable habitat occurs in the grasslands present along the new untreated-water conveyance pipeline corridor to Bollman WTP, at Bollman WTP, and along the new concentrate disposal pipeline corridor to Point Edith. Construction of new facilities associated with the Desalination Alternative could destroy burrows occupied by burrowing owl, resulting in loss of adults, young, or eggs. Construction activities occurring adjacent to active burrows could also disturb individuals resulting in nest abandonment by the adults and loss of eggs or young. Loss of adult, eggs, or young burrowing owls from construction activities would be a potentially significant direct impact.

IMPACT 4.6-e (Alternative 4)

Potential Effects on Northern Harrier, White-Tailed Kite, And Other Raptors. *Trees and grassland habitat at the Desalination Alternative project sites could provide potential nesting habitat for various raptor species. Removal or disturbance of raptors nests, which could result in loss of eggs or young, would be a* ***potentially significant*** *direct impact.*

The grasslands within the new untreated-water conveyance pipeline and new concentrate disposal pipeline corridors could provide suitable nesting habitat for northern harrier. Trees in or adjacent to the pipeline corridors could provide potential nesting habitat for white-tailed kite or other raptors. In addition, suitable nesting habitat for raptors could be present in trees and grasslands adjacent to the new intake and at the location of the new desalination treatment facility. Impacts to nesting raptors would be potentially significant because construction-related disturbances, such as trenching, could disturb nearby nesting pairs, potentially resulting in nest abandonment. Loss of raptor nests would be a potentially significant direct impact.

IMPACT 4.6-f (Alternative 4)

Potential Effects on Western Pond Turtle. *Western pond turtle could inhabit the open water habitat of Mallard Slough or other aquatic habitats within the new untreated-water conveyance pipeline and new concentrate disposal pipeline corridors. While potential construction-related disturbances would be temporary, individual pond turtles could be killed if they are present within these areas while construction is occurring. Loss of pond turtles would be a* ***potentially significant*** *direct impact.*

Suitable open water habitat for the species is present in Mallard Slough. Suitable habitat may also occur along the new untreated-water conveyance pipeline and new concentrate disposal pipeline corridors, such as Mallard Reservoir and Hastings Slough. Pond turtles could be destroyed during expansion of the intake at Mallard Slough or construction of the new pipelines if they are present at the desalination alternative project sites. Western pond turtles may also be injured during construction in aquatic habitat from underwater sound pressure, chemical spills, and dewatering of the coffer dam. Destruction of pond turtles would be a potentially significant direct impact.

IMPACT 4.6-g (Alternative 4)

Potential Effects on Habitat for Saltmarsh Common Yellowthroat, Suisun Song Sparrow, and Loggerhead Shrike. *Suitable nesting habitat for saltmarsh common yellowthroat and Suisun song sparrow is present in emergent marsh at Mallard Slough and could be present along the new concentrate disposal pipeline corridor. Suitable nesting habitat for loggerhead shrike is present in the riparian scrub and shrubs in the grasslands near Mallard Slough and could be present along the new concentrate disposal pipeline corridor. Because these areas are not likely to provide important nesting habitat to the local or regional populations of these species, impacts to salt marsh harvest mouse, common yellowthroat, Suisun song sparrow, and loggerhead shrike would be* ***less than significant.***

Construction could disturb emergent marsh habitat that provides nesting habitat for saltmarsh common yellowthroat and Suisun song sparrow. Construction could also disturb riparian scrub and grassland habitats that provide both nesting and foraging habitat for loggerhead shrike. Construction activities would have the potential, although unlikely, of destroying an active nest if these species did nest at the desalination alternative project sites; however, the Desalination Alternative would not substantially affect the local or regional population of these species. Therefore, direct impacts to saltmarsh common yellowthroat, Suisun song sparrow, and loggerhead shrike would be less than significant.

IMPACT 4.6-h (Alternative 4)

Potential Long-term Effects of the Brine Discharge into Suisun Bay. *The long-term operation of the new concentrate disposal pipeline and brine discharge disposal into Suisun Bay could have permanent long-term effects on sensitive habitats by altering salinity and result in changes to vegetation communities adjacent to the bay. This could permanently alter sensitive habitats and result in loss of habitat for common and special-status plants and animals. This direct impact would be* ***potentially significant****.*

The new concentrate disposal pipeline outfall would be located adjacent to the DFG Point Edith Wildlife Area, which provides habitat for numerous aquatic and terrestrial wildlife and plant species. The salinity of the discharge, the amount of discharge, and the extent of the effect into the surrounding area is not quantified, but it is known that concentrated brine discharge will occur and at least localized impacts from the brine discharge will occur. Changes in salinity could affect aquatic habitat for wildlife and plant species, including special-status species. More saline water could also alter adjacent vegetation, resulting in a trend towards more salt marsh vegetation and less freshwater or brackish vegetation. This could reduce habitat for some species and increase habitat for other species. Because the impact has not been quantified and habitat for common and special-status species and sensitive habitats may be permanently altered, this would be a potentially significant direct impact.

Cumulative Impacts

The Desalination Alternative would have less-than-significant direct and indirect impacts on common biological resources, salt marsh harvest mouse, common yellowthroat, Suisun song sparrow, and loggerhead shrike. For the same reasons described above, these effects would be less than significant in relation to any potential cumulative effect; the removal of habitat for these species associated with project implementation would be minor in relation to the total amount of these habitats present locally and regionally and no important breeding sites would be affected by the Desalination Alternative.

IMPACT 4.6-i (Alternative 4 - Cumulative)

Potential Cumulative Effects on Terrestrial Special-status Species and Habitats. *The Desalination Alternative has the potential to adversely affect these resources and contribute to significant cumulative effects. The project's contribution to cumulative impacts would therefore be* ***potentially significant****.*

As stated above, construction activities associated with the Desalination Alternative could have potential adverse effects on the following resources: jurisdictional waters of the United States; special-status plants; habitat for California clapper rail, California black rail, and salt marsh harvest mouse; burrowing owl; northern harrier, white-tailed kite, and other raptors; western pond turtle; saltmarsh common yellowthroat, Suisun song sparrow, and loggerhead shrike; and sensitive habitats that could be affected by long-term brine discharge adjacent to the Point Edith Wildlife Area. While long-term effects of brine discharge on sensitive waterside habitats would be a significant direct effect of the Desalination Alternative, there are no other known projects that would have similar effects on these habitats in the area of the Desalination Alternative discharge. Therefore, this effect would not be expected to contribute to a significant cumulative effect.

As described for the Proposed Action, numerous development projects are planned within the region (see Appendix F-1, “Local Development Projects Considered in Cumulative Impact Analysis”), and many of these are likely to have the potential to contribute to adverse effects on these species and terrestrial habitats through temporary disturbance or permanent conversion of potential habitat (e.g., marsh and adjacent upland habitat, ditches, grasslands, and riparian habitat). Populations of special-status plants and the wildlife species and sensitive terrestrial habitats listed above have declined for numerous reasons, most significantly loss and fragmentation of habitat as a result of urban development and associated land uses. Jurisdictional waters of the United States, including wetlands, have also declined regionally in large part as a result of urban development and associated land uses (e.g., recreation and vehicular use in wetland areas). Any effects of the Desalination Alternative on these resources are expected to be relatively minor because they would mainly be limited to the construction period; however, because of the sensitive status of the resources, any contribution to potentially adverse cumulative effects would be significant. Therefore, the potentially significant direct effects of the Proposed Action on these resources would be a cumulatively considerable contribution to potentially significant cumulative impacts.

The Los Vaqueros Reservoir Expansion Project would be constructed on a later time schedule than Alternative 4 so there would not be any temporal overlap of any temporary construction-related impacts. The long-term impacts on terrestrial biological resources from Alternative 4 would not provide a cumulatively considerable contribution to any future adverse cumulative impact with or without implementation of the Los Vaqueros Reservoir Expansion Project, as the habitat types affected by both projects differ substantially.

Mitigation Measures

Mitigation Measure 4.6-a (Alternative 4): Minimize Potential Fill of Jurisdictional Waters of the United States and Loss of Sensitive Habitat, and Compensate for Unavoidable Impacts.
This measure is the same as Mitigation Measure 4.6-a (Alternative 1). Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-b (Alternative 4): Minimize Potential Effects on Special-status Plants, and Mitigate for Loss, If Required.
Before the initiation of any ground-disturbing or vegetation-clearing activities in areas that provide suitable habitat for special-status plants, the following measures shall be implemented:

- CCWD shall retain a qualified botanist to conduct surveys for the special-status plant species identified in Appendix D, “Biological Resources.”
- The botanist shall conduct surveys for these special-status plant species in all suitable habitat that would potentially be disturbed by project implementation at the

appropriate time of year when the target species would be in flower and therefore clearly identifiable (i.e., blooming period).

- Surveys shall be conducted following the DFG or other approved protocol for surveying for special-status plant species.
- If no special-status plants are found during focused surveys, the botanist shall document the findings in a letter report to the appropriate agencies (depending on the listing status of the plant), and no further mitigation will be required.

If special-status plants are found, the measures described under Mitigation Measure 4.6-b (Alternative 1) shall be implemented.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-c (Alternative 4): Implement Avoidance and Mitigation Measures, If Required, to Minimize Potential Loss of Habitat for California Clapper Rail, California Black Rail, and Salt Marsh Harvest Mouse.

The environmental effects on California clapper rail, California black rail, and salt marsh harvest mouse are not quantified because the desalination facilities have not yet been precisely designed or sited. CCWD shall implement the following measures to reduce potential impacts to California clapper rail, California black rail, and salt marsh harvest mouse:

(a) Once the project footprint has been precisely determined, potential habitat for California clapper rail, California black rail, and salt marsh harvest mouse shall be mapped by a qualified biologist.

(b) If feasible, the construction of proposed desalination facilities shall avoid habitat for these species, including pickleweed wetland, and freshwater and brackish marsh to minimize the impacts.

(c) If habitats for these species cannot be avoided, additional mitigation shall be developed in consultation with USFWS and DFG. Additional mitigation may include:

- conducting surveys to determine if the habitat is occupied by California clapper rail, California black rail, and salt marsh harvest mouse;
- avoiding known occurrences of California clapper rail, California black rail, and salt marsh harvest mouse;
- establishing appropriate buffers around potential habitat for these species;
- avoiding construction activities during the nesting season for California clapper rail and California black rail (mid-March-July)); and
- compensating for unavoidable impacts to habitat through restoration, enhancement, or preservation of habitat for these species.

(d) CCWD shall obtain appropriate permits and clearance through the applicable regulatory program (e.g., Section 7 consultation pursuant to the Federal ESA, Section 2082 permit pursuant to the California ESA). Because California clapper rail, California black rail, and salt marsh harvest mouse are Fully Protected species under the California Fish and Game code, take of these species is not permitted.

Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-d (Alternative 4): Conduct Surveys and Implement Protective Measures, If Required, to Minimize Potential Effects on Burrowing Owl.
This measure is the same as Mitigation Measures 4.6-f (Alternative 1). Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-e (Alternative 4): Conduct Surveys and Implement Protective Measures, If Needed, to Minimize Potential Effects on Northern Harrier, White-Tailed Kite, and Other Raptors
This measure is the same as Mitigation Measures 4.6-e (Alternative 1). Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-f (Alternative 4): Conduct Surveys and Implement Protective Measures, If Required, to Minimize Potential Effects on Western Pond Turtle.
This measure is the same as Mitigation Measures 4.6-g (Alternative 1). Implementation of this mitigation would reduce the potential impact to a less-than-significant level.

Mitigation Measure 4.6-h (Alternative 4): Evaluate Potential Long-term Effects of the Brine Discharge into Suisun Bay and Implement Actions to Meet RWQCB, USFWS, NMFS, and DFG Approval.
(a) CCWD shall conduct an evaluation of the potential long-term effects of the brine disposal outfall. Possible elements of this evaluation could include:

- quantification of amount of brine to be disposed;
- discharge/dispersion modeling to demonstrate the design criteria to minimize changes in salinity in Suisun Bay;
- the extent of the effect into the surrounding area, based on known water currents and other factors;
- predicted vegetation response to salinity changes;
- and quantification of loss and/or addition of sensitive habitats and habitats for special-status wildlife species.

(b) CCWD shall coordinate with RWQCB and obtain a National Pollutant Discharge Elimination System (NPDES) permit to protect water quality. The project shall comply with all measures outlined in the NPDES permit, including dilution ratio requirements. The brine disposal outfall shall be routinely monitored and reports shall be submitted to RWQCB and NMFS to ensure the project is operating within permitted standards. In addition, soil samples shall be taken near the outfall and analyzed for metal contents.

(c) Once the long-term effects of the brine discharge on common and sensitive biological resources are better understood, CCWD shall prepare and implement a restoration and monitoring plan. The plan shall be submitted to DFG, USFWS, and NMFS for approval. An objective of the plan shall be to ensure that project-related impacts, both direct and indirect, on sensitive habitats and high-value natural resources are avoided and/or reduced to the greatest extent feasible. CCWD shall be responsible for reasonable implementation and management requirements that would achieve this objective. Because development and implementation of a comprehensive salt marsh restoration and monitoring plan is a complex process with inherent agency consultation, cost, and timing constraints, it is not feasible to fully define the details and implement the plan prior to completion of the draft EIR/EIS. Substantial agency coordination and consultation with USFWS, NMFS, and DFG will be required, as will conformance with both Federal and State ESAs. However, at a minimum, the restoration and monitoring plan shall include details about replacement planting at ratios determined through consultation with the resource agencies, methods for implementation, success criteria, monitoring and reporting protocols, and contingency measures, should the initial mitigation fail. If the area potentially affected by the brine discharge cannot be feasible restored, area outside of the impact zone within Suisun Bay will be restored and/or enhanced to provide compensation for the loss of habitat due to the project in order to fully mitigate loss of habitat.

(d) If mitigation is required, CCWD shall maintain and monitor the mitigation site and/or any off-site compensation areas for 2 or more years following the completion of construction and restoration activities. Monitoring reports documenting the restoration effort should be submitted to DFG and/or USFWS upon the completion of the restoration implementation and each year after the restoration implementation for 2 or more years. Monitoring reports should include photo-documentation and detail when restoration was completed, what materials were used, specified plantings, and justifications of any substitutions to the mitigation plan.

Implementation of this mitigation measure would reduce the impact to a less-than-significant level.

Mitigation Measure 4.6-i (Alternative 4 - Cumulative): Implement Mitigation Measures 4.6-a Through 4.6-f and 4.6-h (Alternative 4) to Minimize Potential Effects on Sensitive Resources.
CCWD shall implement Mitigation Measures 4.6-a through 4.6-f and 4.6-h (Alternative 4) to address potential direct significant effects on sensitive terrestrial biological resources. No indirect impacts are expected. Any unavoidable effects on waters of the United States, including wetlands, would be addressed through restoration or replacement according to methods and terms agreed upon through consultation with USACE and/or DFG, ensuring no net loss of the affected resources. Surveys, maintenance of buffer areas where practicable, and other avoidance measures described in the mitigation measures described above would ensure minimization of any potential temporary effects of construction on special-status plants, habitat for clapper rail, California black rail, and salt marsh harvest mouse; burrowing owl; northern harrier, white-tailed kite, and other

raptors; western pond turtle; saltmarsh common yellowthroat, Suisun song sparrow, and loggerhead shrike.

Other sizeable projects would be required to implement measures similar to those that would be undertaken for the Desalination Alternative to ensure minimization of impacts on these potentially affected species, most of which are protected by the Federal ESA and/or sections of the California Fish and Game Code, including CESA.

With mitigation, the Desalination Alternative would not result in permanent loss of habitat or take of listed species that would contribute considerably to a cumulative impact. Therefore, implementation of the mitigation would reduce the potential contributions of the Desalination Alternative to any significant cumulative effect on terrestrial biological resources to a less-than-significant level.

4.7 Land Use

This section summarizes information regarding the agencies with jurisdiction over land uses in the vicinity of the proposed project site (Victoria Island/Byron Tract) and Desalination Alternative project sites, and the land use policies and regulations that may apply to the Proposed Action and alternatives; describes the existing land uses and land use designations of the project sites; and addresses the consistency of the Proposed Action and alternatives with the applicable land use designations, plans, and policies. Agricultural resources, regulations, and impacts are not discussed herein; a separate section (Section 4.8, “Agriculture”) is devoted entirely to agricultural uses on Victoria Island and Byron Tract, including Williamson Act and Prime Farmland designations.

4.7.1 Affected Environment

4.7.1.1 Regulatory Setting

Federal

Federal land use policies apply only to actions on, or affecting the uses of, Federal lands. The only Federal lands in the vicinity of the project sites are at the Concord Naval Weapons Station; portions of pipeline alignments for the Desalination Alternative would cross or run along the boundary of Concord Naval Weapons Station lands. Encroachment within this Federal property would require approval from the U.S. Department of Defense.

State

State Lands Commission

The State Lands Commission has jurisdiction over 4.5 million acres of land held in trust for Californians. The commission’s jurisdiction includes a 3-mile-wide section of tidal and submerged land adjacent to the coast and offshore islands, including bays, estuaries, and lagoons. It also includes the waters and underlying beds of more than 120 rivers, lakes, streams, and sloughs. The State holds these lands for the public trust purposes of water-related commerce, navigation, fisheries, recreation, and open space. The State Lands Commission may grant dredging permits and issue land use leases for activities within its jurisdiction. It does not have a comprehensive use plan for these lands but manages them according to State laws and regulations. Of the areas where project facilities could be sited under the Proposed Action or project alternatives, the commission’s jurisdiction includes the Delta waterways, the area around the Mallard Slough pump station and intake site, and marshlands where portions of the untreated-water conveyance and concentrate disposal pipelines would be installed for the Desalination Alternative.

In comments to the lead agencies during the scoping period for this EIR/EIS, the State Lands Commission indicated that CCWD would not be required to obtain a permit from the State Lands Commission for actions within the commission's jurisdiction, provided applicable permits are obtained from the local reclamation district, the State Reclamation Board, the U.S. Army Corps of Engineers, or the California Department of Water Resources (see the State Lands Commission scoping letter in Appendix A of this EIR/EIS). Consistent with these comments, CCWD projects at Mallard Slough have not required approval or permitting from the State Lands Commission. CCWD would obtain a permit from one or more of the specified agencies, as described elsewhere in this EIR/EIS (see Chapter 5, "Environmental Review and Agency Consultation/ Coordination").

Delta Protection Commission - Delta Protection Act of 1992

The Delta Protection Act of 1992 (California Water Code Section 12220) established the Delta Protection Commission. The commission has land use planning jurisdiction over the Delta Primary Zone, which generally consists of the lands in the central portion of the Delta that were not within either the urban limit line or sphere of influence line of any local government's general plan or currently existing studies as of January 1, 1992. The Primary Zone, which comprises 487,625 acres, or approximately 66%, of the Delta, encompasses portions of San Joaquin, Contra Costa, Solano, Yolo, and Sacramento Counties. The remaining areas of the legal Delta are designated the Secondary Zone and are not under Delta Protection Commission land use jurisdiction.

The Delta Protection Commission is charged with preparing a regional plan for the Primary Zone to address land uses and resource management, with particular emphasis on agriculture, which was designated by the Delta Protection Act as the primary use of this zone; wildlife habitat; and recreation. The commission adopted its *Land Use and Resource Management Plan for the Primary Zone of the Delta* (Delta Plan) on February 23, 1995. In 2000, the policies within the Delta Plan were adopted as regulations (California Code of Regulations, Title 14, Chapter 3, Regulations Governing Land Use and Resources Management in the Delta). The Delta Plan was revised and reprinted in May 2002 (Delta Protection Commission 2002, cited in California Department of Water Resources 2005).

Victoria Island and the waters north of the existing Mallard Slough intake and pump station are within the Primary Zone of the Delta and, therefore, within the Delta Protection Commission's planning jurisdiction. In its comment letter during the scoping period for this EIR/EIS, the commission indicated that the proposed alternative intake and associated utility facilities would be consistent with the planned uses of the Delta Primary Zone (see Delta Protection Commission letter in Appendix A-1, "Public Scoping Report," of this EIR/EIS).

Bay Conservation and Development Commission - Suisun Marsh Preservation Act

The San Francisco Bay Conservation and Development Commission (BCDC) is a California State agency established to respond to broad public concern over the future of San Francisco Bay. Its responsibilities include, but are not limited to: (1) regulating filling and dredging in San Francisco Bay, which includes Suisun Bay; (2) protecting the

Suisun Marsh, the largest remaining wetland in California; and (3) regulating new development within the first 100 feet inland from the Bay to ensure that maximum feasible public access to the Bay is provided (BCDC 2001, p. 1). BCDC's land use authority relates primarily to ensuring public access.

The *Suisun Marsh Protection Plan* was developed in 1976 by the BCDC and the California Department of Fish and Game (DFG), as directed by the Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974. The objectives of the plan are to preserve and enhance the approximately 85,000 acres of Suisun Marsh, including its aquatic and wildlife habitats and upland areas adjacent to the marsh (BCDC and DFG 1976, pp. 5-6). None of the facilities for the Proposed Action or project alternatives would be within the plan area; however, Chipps Island, north of Mallard Slough, is within the plan area. The concentrate disposal pipeline for the Desalination Alternative would extend into Suisun Bay; its installation would be under the jurisdiction of the BCDC.

Local

As a local agency that provides public utility services, CCWD is typically exempt from local zoning and building ordinances; however, there may be local policies and plans with which the Proposed Action and alternatives would need to be in compliance. Regarding local planning, under Government Code section 65402, CCWD is required to report to the local planning jurisdiction (i.e., city or county) any land acquisition or disposal or the construction of any public building or structure if there is a locally adopted general plan or part thereof that is applicable to the proposed activity. The planning agency has a period for review and comment on the proposed activity, however, CCWD's Board can overrule the planning agency's recommendations.

Regarding local building and zoning ordinances, Government Code section 53091 *et seq*. generally exempt location or construction of facilities for the storage, treatment, or transmission of water.

Reclamation Districts

The Reclamation District Law (Water Code Section 50000 et seq.) provides a means for local entities to form reclamation districts to finance the reclamation of land that has been made unusable by overflow or flooding. Reclamation districts assess fees from members of the district to finance services and facilities related to land reclamation, such as levees and irrigation and drainage facilities. Victoria Island is under the jurisdiction of Reclamation District (RD) 2040, and Byron Tract is under the jurisdiction of RD 800.

Contra Costa County

Chapter 3, Land Use Element, of the *Contra Costa County General Plan 2005–2020* identifies land use goals, policies, and implementation measures that encourage compatible development that reinforces the physical character and desired images of the county. None of these land use policies or implementation measures are directly relevant to the Proposed Action or alternatives. The general plan also includes the following policies to promote county land use decisions that support the maintenance and protection of significant ecological resources:

- 8-9. Areas determined to contain significant ecological resources, particularly those containing endangered species, shall be maintained in their natural state.
- 8-10. Any development located or proposed within significant ecological resource areas shall ensure that the resource is protected.
- 8-18. The filling and dredging of lagoons, estuaries, and bays which eliminate marshes and mud flats shall be allowed only for water-oriented projects which will provide substantial public benefits and for which there are not reasonable alternatives, consistent with State and Federal laws.
- 8-20. Fish, shellfish, and waterfowl management shall be considered the appropriate land use for marshes and tidelands, with recreation being allowed as a secondary use in limited locations, consistent with the marshland and tideland preservation policies of the general plan.

The Contra Costa County Airport Land Use Commission adopted the *Contra Costa County Airport Land Use Compatibility Plan* in December 2000. The plan identifies compatibility standards regarding development within designated zones in and around the county airports, Buchanan Field Airport, and Byron Airport. Components of the Desalination Alternative would be located within the "airport influence area" of Buchanan Field Airport; the airport influence area includes the locations commonly overflown by aircraft as they approach and depart the airport or fly within the traffic pattern (Contra Costa County Airport Land Use Commission 2000, p. 3-1 and 3-3). In addition, some of the Desalination Alternative project sites are located within the Buchanan Field Airport Airspace Protection Surfaces (Contra Costa County Airport Land Use Commission 2000, Figure 3D, p. 3-10) and within the U.S. Standard for Terminal Instrument Procedures (TERPS) airspace. TERPS is one of several Federal regulations that form the basic criteria for limiting the height of structures, trees, and other objects near airports. Height limits are provided within airspace protection surfaces for surrounding uses based on their distance from the airport. At the Bollman Water Treatment Plant (WTP), height limits must not exceed approximately 173 feet (Contra Costa County Airport Land Use Commission 2000, Figure 3D, p. 3-10). The facilities constructed at the Bollman WTP site under the Desalination Alternative would not exceed heights of 100 feet.

San Joaquin County

The *San Joaquin County General Plan* (adopted July 29, 1992 and amended July 2002) contains goals, objectives, policies, and implementation measures that guide the development pattern of San Joaquin County. The Community Development chapter of the General Plan identifies specific objectives and policies that address growth accommodation; residential, commercial, industrial, and mixed use development; economic development; housing; and infrastructure and public services. However, there are no relevant land use objectives and policies relevant to the Proposed Action or alternatives.

City of Concord
The *City of Concord General Plan* (adopted by City Council July 26, 1994 and amended April 1, 2003) identifies goals and policies that guide the future development of the City of Concord. Only the Desalination Alternative would have components in Concord. Generally, these guidelines are not relevant to the Desalination Alternative.

City of Pittsburg
The Land Use Element of the *City of Pittsburg General Plan, Pittsburg 2020: A Vision for the 21st Century* (amended through December 2004) provides a framework to guide development within city limits and in the city's planning subareas. The new untreated-water conveyance pipeline of the Desalination Alternative would pass through parts of Pittsburg and the Bay Point and Northwest River subareas. Citywide goals and policies relate to commercial and housing development and thus are not relevant to the project. However, the following subarea goal and policy may be relevant to the Desalination Alternative:

- Goal 2-G-33: Preserve existing wetlands and salt marshes along the Suisun Bay.
- Policy 2-P-95: Preserve the wetlands and salt marsh habitats along the Suisun Bay waterfront. Allow only the development of multi-use trails and recreation facilities.

4.7.1.2 Environmental Setting

Victoria Island/Byron Tract

General Location
Alternative intake facilities would be located on Victoria Island, in San Joaquin County, and Byron Tract, in Contra Costa County. Old River, which separates the two counties, also separates the two tracts (see Exhibit 4.7-1). SR 4 bisects both Victoria Island and Byron Tract, and forms the northern boundary of the proposed project site.

Victoria Island is bounded by Woodward Island and Woodward Canal/North Victoria Canal to the north, Upper Jones Tract and Middle River to the east, Union Island and Victoria Canal to the south, and Old River and Byron Tract to the west. The island is under private ownership by the Victoria Canal Limited Partnership, and the land is used exclusively for agriculture. RD 2040 maintains the levee system.

Byron Tract is located within the East County Area of Contra Costa County, but outside its urban limit line (Contra Costa County 2005a, p. 3-9). Byron Tract is bounded by Orwood Tract to the north, the community of Byron to the west, and Old River and Victoria Island to the east. Byron Tract is under private ownership by various entities, including CCWD, which owns the existing Old River intake and pump station site and adjacent lands. The Corporation of the Presiding Bishop of the Church of Jesus Christ of Latter-day Saints own lands surrounding the CCWD property. The Old River levee at the project site is maintained by RD 800.

4.7 Land Use

Existing Land Uses
Existing land uses at Victoria Island and Byron Tract consist primarily of agricultural lands that are in production or fallowed. Row crops, the dominant vegetation community at Victoria Island and Byron Tract, are planted in asparagus, alfalfa, and wheat. Agricultural support facilities (barn structure, storage facilities, and farm employee housing) are located on Victoria Island, south of SR 4 (see Exhibit 4.7-1). Seaton's Marine Service and CCWD's existing Old River intake and pump station are located adjacent to Old River on Byron Tract, bounded by agricultural lands.

Several residential communities are located nearby but outside of the project site. These include the Town of Discovery Bay, located approximately one-half mile northwest of the project site; residential uses on two islands immediately west of Old River and south of Victoria Canal; and the community of Byron, located about 4 miles west of the project site.

In addition to these communities and residential areas, other major land use features nearby but outside of Victoria Island and Byron Tract include Clifton Court Forebay and Byron Airport. Clifton Court Forebay is immediately south of Victoria Island and Victoria Canal. Byron Airport is approximately 3.5 miles south of Victoria Island and Byron Tract, west of Clifton Court Forebay. Victoria Island and Byron Tract are not located within the airspace protection area or associated compatibility zones of Byron Airport.

Land Use and Zoning Designations
General Plan land use and zoning designations for Victoria Island are general agriculture and AG-80, respectively (San Joaquin County 2000, pp. 9-10). The waterways are identified as Open Space/Resource Conservation. The characteristics of general agriculture, as defined by the *San Joaquin County General Plan*, include lands with soils that are capable of producing a wide variety of crops and/or that support grazing, that have parcel sizes large enough to support commercial agricultural activities, and where there exists a commitment to commercial agriculture in the form of Williamson Act contracts and/or capital investments (San Joaquin County 1992, p. VI-10).

The *Contra Costa County General Plan* designation for Byron Tract is primarily Delta Recreation and Resources, with the exception of two developed areas within the tract designated as Public and Semi-Public uses. The zoning designation is heavy agricultural use. The Delta Recreation and Resources land use designation encompasses the islands and adjacent lowlands of the Delta, which are generally located within the 100-year floodplain and currently in agricultural production (Contra Costa County 2005a, p. 3-20 to 3-25). The Public and Semi-Public land use designation includes properties owned by public government agencies, such as CCWD (Contra Costa County 2005a, p. 3-23).

Sensitive Land Uses
Sensitive land uses in the vicinity of Victoria Island and Byron Tract include schools, fire stations, residential areas, churches, and other uses (primarily located in and around Discovery Bay). The only sensitive land use located within the Victoria Island and

Source: Carollo Engineers

Land Uses at the Proposed Project Site (Victoria Island/Byron Tract)

EXHIBIT 4.7-1

Byron Tract project site is the temporary (seasonal) farm employee residence situated on Victoria Island south of SR 4. The nearest sensitive land uses outside the proposed project site include residences in Discovery Bay, approximately one-half mile or more northwest of the proposed project site, and residential homes approximately 1 mile away from the proposed intake site on an island south of Victoria Canal.

Desalination Alternative Project Sites

General Location

The locations of the Desalination Alternative project sites are shown in Exhibit 4.7-2. The desalination treatment facility would be located at CCWD's existing Bollman WTP site, which is outside of the Concord city limits but within its sphere of influence in Contra Costa County. The new untreated-water intake and pumping plant would be an expansion of CCWD's existing Mallard Slough intake and pump station, located at the southern end of a channel south of Mallard Slough. The site is in unincorporated Contra Costa County, within the City of Pittsburg's Northwest River subplanning area.

The untreated-water conveyance pipeline would extend from the Mallard Slough intake and pump station to the Bollman WTP site. It would follow the existing Mallard Slough pump station pipeline corridor through private and public road rights-of way, along the existing Contra Costa Canal easement, and through additional public road rights-of-way from the canal to the Bollman WTP site. The pipeline would cross both public and private lands and would pass through Bay Point and Clyde in unincorporated Contra Costa County and the cities of Pittsburg and Concord. Portions of the pipeline would be in subplanning areas within the spheres of influence of Pittsburg and Concord. Between the canal and the Bollman WTP site, the untreated-water conveyance pipeline alignment would pass through residential and industrial uses. It would also cross the Concord Naval Weapons Station property along Port Chicago Highway.

The concentrate disposal pipeline would be routed from the Bollman WTP west and north along the western perimeter of Mallard Reservoir, and would continue north (crossing under Waterfront Avenue) along the western perimeter of the Concord Naval Weapons Station property to Suisun Bay. The pipeline would cross private lands owned by CCWD and Mirant (formerly Southern Energy) and would cross under utilities and railroads operated by Monsanto Chemical Company, Tosco Oil Company, Kinder Morgan, Union Pacific Railroad, Burlington Northern Santa Fe Railroad, and the U.S. Navy.

Existing Land Uses

Existing uses at the Desalination Alternative project sites include existing water treatment, storage, and support facilities at the Bollman WTP site; the existing Mallard Slough intake and pump station; and open space, residential, commercial, industrial, vacant land, and public uses along the pipeline routes. The Bollman WTP and portions of the untreated-water conveyance pipeline would be located within the Buchanan Field Airport influence area, although the facilities would not be within the airport's designated safety zones. Exhibit 4.7-2 shows the existing uses at the various project sites for this alternative.

4.7 Land Use

The Bollman WTP is surrounded by industrial uses south of the plant fenceline on Bates Avenue. Buchanan Field (airport) is located about 1.25 miles to the south, in Concord, and the U.S. Naval Weapons Station is located to the north and southeast. Surrounding uses around the existing Mallard Slough intake and pump station consist of undeveloped marshland. Surrounding land uses in the vicinity of the untreated-water conveyance pipeline alignment include residential and commercial uses, as well as the Pittsburg/Bay Point Bay Area Rapid Transit (BART) Station south of SR 4 and west of Bailey Road.

The portion of the untreated-water conveyance pipeline alignment between the Contra Costa Canal and Bollman WTP would pass through residential and industrial uses. Porter Park and Big Oak Tree Park are located in the northern portion of Clyde south of the pipeline alignment, and the Clyde Park and Maybeck Nature Park are located in the southern portion of Clyde. Diablo Creek Golf Course is also located south of the pipeline alignment.

The concentrate disposal pipeline would pass through generally industrial areas west of the Bollman WTP and open space to Suisun Bay.

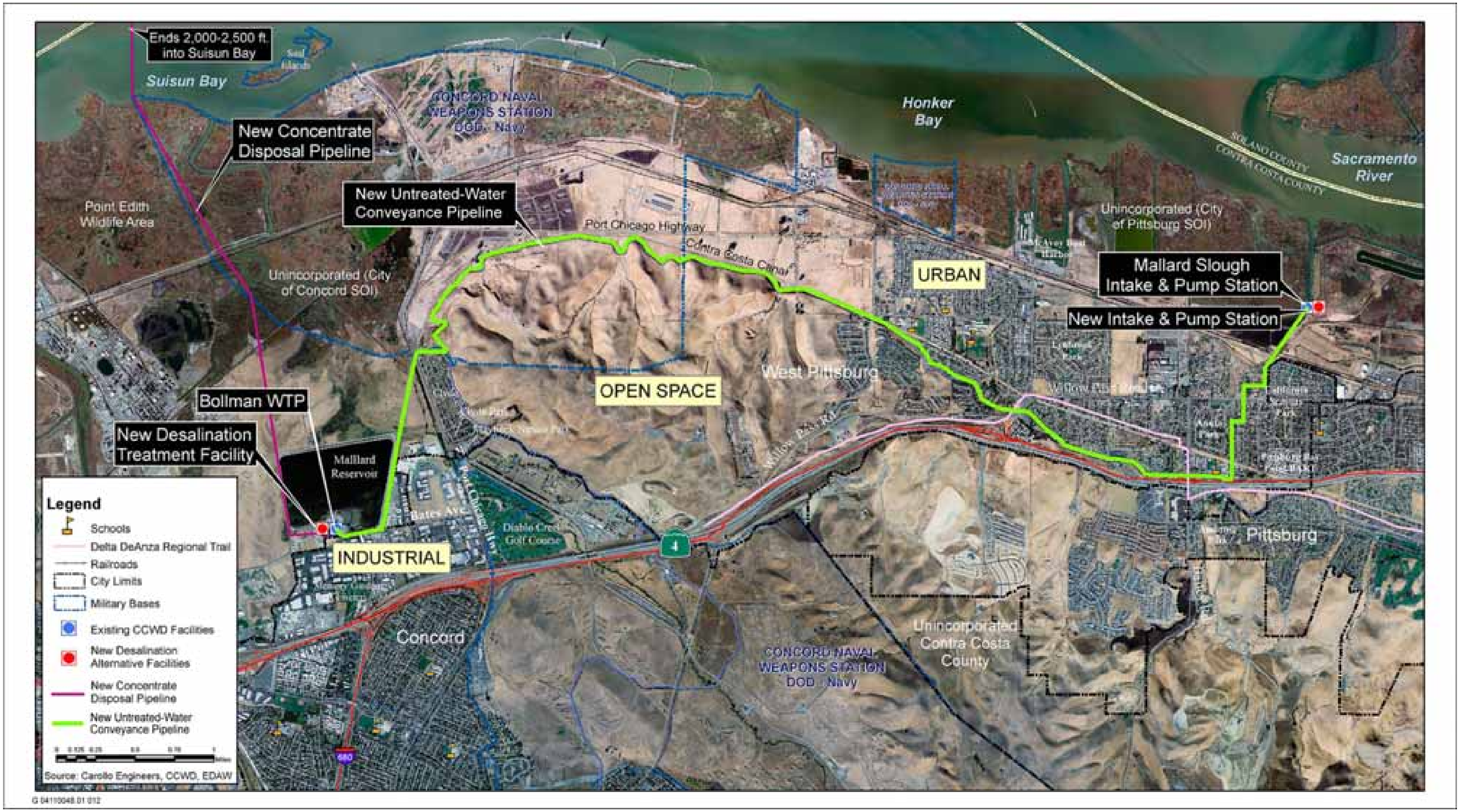
Designated Land Use and Zoning Designations

The Bollman WTP site is designated as a Public and Quasi-Public land use (City of Concord 2003, p. 8). This designation is defined as lands owned by public entities and used for public purposes, and lands owned by private parties but committed to a public or quasi-public use (City of Concord 1994, p. 3-32).

The land use designation at the Mallard Slough intake and pump station site is Open Space (City of Pittsburg 2004, p. 2-70). This designation includes publicly owned, open space lands, including wetlands and tidelands and other areas of significant ecological resources or geologic hazards (Contra Costa County 2005a, pp. 3-21 and 3-22).

Land uses along the untreated-water conveyance pipeline route have been designated by Contra Costa County as open space, single-family residential uses (high density), mixed uses, and public and semi-public uses. Land uses designated by the City of Pittsburg include open space north of Bay Point, low-density residential uses within Bay Point local streets, community commercial uses along Willow Pass Road, and public/institutional (Bel Air Elementary School) use along Canal Road (City of Pittsburg 2004, pp. 2-70 and 2-72). Land uses along the portion of the untreated-water conveyance pipeline route between the Contra Costa Canal and Bollman WTP include single-family residential, multiple-family residential, light industrial, public and semi-public uses, and parks and recreation.

Contra Costa County zoning designations for the Desalination Alternative project sites include R-6 and R-10 (single-family residential), M-12 (medium-density multiple family residential), P-1 (planned unit district), N-B (neighborhood business district), L-1 (light industrial), H-1 (heavy industrial), and A-2 (general agricultural district) (Contra Costa County 2005b). The concentrate disposal pipeline would pass through areas designated as wetlands resource conservation areas, industrial areas west of the Bollman WTP site, and through open space to open water of Suisun Bay.



Source: EDAW

Land Uses at the Desalination Alternative Project Sites

EXHIBIT 4.7-2

Sensitive Land Uses

Sensitive land uses include residences, a church (Jefferson Street and South Bella Monte Avenue), and Bel Air Elementary School (663 Canal Road), all of which are located along the untreated-water conveyance pipeline alignment in the Bay Point area. Ambrose Park is also located along Canal Road, but on the south side of SR 4, which is divided by a highway noise wall. Residential uses and the Rio Vista Elementary School (611 Pacifica Avenue) are located near the Contra Costa Canal in Bay Point. Additional sensitive uses include residences in the community of Clyde. Sensitive receptors are not located in or around the Bollman WTP or Mallard Slough intake and pump station.

4.7.2 Environmental Consequences

4.7.2.1 Methods and Assumptions

This section presents an evaluation of the potential for general land use or planning conflicts associated with implementation of the Proposed Action or alternatives. Conflicts with agricultural resources and agricultural land uses are addressed in Section 4.8, “Agriculture.”

4.7.2.2 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant land use effect if it would:

- physically divide an established community; or
- conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

None of the alternatives would physically divide an established community. Pipelines associated with the alternative intake under the Proposed Action and Alternatives 2 and 3 would be buried, and the intake and pump facilities would be constructed at the edge of Victoria Island. None of these facilities would prevent access to any communities. The Desalination Alternative pipelines would be buried underground, and new aboveground structures (i.e., desalination treatment facility and Mallard Slough pump station and intake) would be located at existing properties with other water-related facilities. Because these alternatives would not physically divide an established community, no further discussion of this issue is required.

Discussions of consistency with land use and zoning designations are provided below for the action alternatives. As previously explained, CCWD is not subject to local zoning laws. However, these discussions are provided to fully inform the public and the decision makers about such consistency if local laws were applicable.

Sections 4.7.2.3 through 4.7.2.7 address the potential for the No-Action Alternative, the Proposed Action, and the action alternatives to conflict with agency land use policies or regulations adopted for the purpose of avoiding or mitigating environmental effects.

Project Consistency with Land Use and Zoning Designations – Alternatives 1, 2, and 3

As described above, land use designations for Victoria Island and Byron Tract include general agricultural (Victoria Island) and public and semi-public uses (Byron Tract). Zoning in these areas is AG-80 and heavy agricultural use, respectively. In areas of public uses (i.e., Old River Pump Station), installation of water-related facilities would not conflict with existing designations. Installation of a pipeline on privately owned agricultural lands also would not conflict with designated land use and zoning designations of these two counties in areas because the presence of the pipeline would not preclude continued farming.

Project Consistency with Land Use and Zoning Designations – Alternative 4

Land use and zoning designations at the Desalination Alternative project sites vary by location. The new Mallard Slough intake and pump station would be constructed within land designated as open space but that currently includes CCWD intake and pumping facilities. The desalination treatment facility would be located at the Bollman WTP site, which is designated public and semi-public, and thus would be compatible with the existing land use designations. The untreated-water conveyance pipeline and the concentrate disposal pipeline would be installed through open space, residential, mixed use, or industrial areas and along the Contra Costa Canal (owned by Reclamation). Because these pipelines would be buried underground and would be located generally within public rights-of-way typically used for utility corridors, their placement in these areas is not expected to conflict with land use and zoning designations.

4.7.2.3 No-Action Alternative

Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no environmental impacts related to land use would occur from implementing the No-Action Alternative, and the No-Action Alternative would not contribute to any cumulative land use impacts.

4.7.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

RD 2040 is responsible for levee maintenance and generally ensuring the integrity of the levee system on Victoria Island. RD 800 is responsible for levee maintenance on Byron Tract. The proposed levee modifications at the Victoria Canal intake and pump station site would improve and strengthen the levee in that location, and would be implemented in coordination with RD 2040 and consistent with RD 2040 standards. CCWD would also need to coordinate with RD 800 and RD 2040 for pipeline routing if the over-the-levee crossing option is selected.

Contra Costa County and San Joaquin County establish design policies that are intended to protect sensitive resources (e.g., waterways, archaeological resources, and biological resources) as well as reduce potential safety hazards to people and structures. The Proposed Action would generally conform with these goals and policies. The Proposed

Action would have essentially no impact related to conflicts with land use goals, policies, and regulations of an agency with jurisdiction over the project, adopted for the purpose of avoiding or mitigating any environmental effect.

Implementing the Proposed Action would not physically divide a community. It therefore also would not contribute to a cumulative impact regarding this issue.

Impacts involving land use plans or policies and zoning generally would not combine to result in cumulative impacts. The determination of significance for impacts related to these issues, as considered in Appendix G of the State CEQA Guidelines, is whether a project would conflict with any applicable land use plan or policy adopted for the purpose of reducing or avoiding environmental impacts. Such a conflict is site specific; it is addressed on a project-by-project basis. As described above, implementing the Proposed Action would not result in land use planning impacts. The Proposed Action would not result in a cumulatively considerable contribution to any potentially significant cumulative land use impacts.

Mitigation Measures

No mitigation is required.

4.7.2.5 Alternative 2, Indirect Pipeline Alternative

As described for the Proposed Action, Alternative 2 would have no direct or indirect impacts related to conflicts with land use plans, policies, or regulations and would not contribute to any significant cumulative land use impact.

4.7.2.6 Alternative 3, Modified Operations Alternative

As described for the Proposed Action, Alternative 3 would have no direct or indirect impacts related to conflicts with land use plans, policies, or regulations and would not contribute to any significant cumulative land use impact.

4.7.2.7 Alternative 4, Desalination Alternative

Direct and Indirect Impacts

IMPACT 4.7-a (Alternative 4)	**Conflicts with Existing Land Use Goals and Policies of Affected Jurisdictions.** *The Desalination Alternative facilities would be generally consistent with the applicable land use plans, policies, or regulations of agencies with land use jurisdiction over the Desalination Alternative project sites. This impact would be* ***less than significant****.*

The State agencies that may have land use oversight over portions of the Desalination Alternative are the State Lands Commission and the BCDC. As indicated under "Regulatory Setting," CCWD would not be required to obtain a permit from the State Lands Commission for actions within the commission's jurisdiction, provided applicable permits are obtained from the local reclamation district and other State and Federal agencies. The concentrate disposal pipeline would extend into Suisun Bay within the jurisdiction of the BCDC. Although BCDC authorization may be required for installation of the pipeline, because the pipeline would be buried underground and beneath the bed of the bay consistent with the requirements of Federal and State resource agencies, it would not affect the aesthetic or physical qualities of the bay or conflict with the goals of the *Suisun Marsh Protection Plan*.

Local agencies with land use jurisdiction in the vicinity of the Desalination Alternative project sites include Contra Costa County, the Contra Costa County Airport Land Use Commission, and the cities of Concord and Pittsburg.

Contra Costa County has design policies that are intended to protect sensitive resources (e.g., waterways, archaeological resources, and biological resources) and reduce potential safety hazards to people and structures. The project would generally conform with these goals and policies. The installation and operation of the discharge pipeline for desalination concentrate (i.e., brine) could affect sensitive resources, as discussed in Section 4.6, "Terrestrial Resources." However, this component of the Desalination Alternative would conform with Contra Costa County policies supporting the protection of sensitive resources such as marshes because construction disturbance would be temporary and any potential effects on sensitive resources would be mitigated as described in Section 4.6.

The airport land use commission restricts building heights within airspace protection surfaces, including the Bollman WTP site, where height limits must not exceed approximately 173 feet. The proposed facilities would be in compliance with this limit and would not conflict with any goals or policies of the commission.

The City of Concord has land use policies that relate to the goal of maintaining compatibility between the airport and proposed land uses. The project facilities and operations would not conflict with this goal or supporting policies.

The City of Pittsburg has policies that relate to preserving wetlands and salt marshes along Suisun Bay and limiting development to recreational uses. Project components within the City of Pittsburg sphere of influence are expansion of the Mallard Slough intake and pumping facility and installation of untreated-water conveyance pipeline. The Mallard Slough facility expansion would be on existing CCWD land and would not affect Suisun Bay resources or land uses. The untreated-water conveyance pipeline would be buried under undeveloped private land and urbanized areas and would not affect marsh or wetland areas or recreational uses.

For these reasons, land use effects of the Desalination Alternative would be less than significant.

Cumulative Impacts

Impacts involving land use plans or policies generally would not combine to result in cumulative impacts. The determination of significance for impacts related to these issues, as considered in Appendix G of the State CEQA Guidelines, is whether a project would conflict with any applicable land use plan or policy adopted for the purpose of reducing or avoiding environmental impacts. Such a conflict is site specific; it is addressed on a project-by-project basis. As described above, implementing the Desalination Alternative would not result in significant land use planning impacts. The Desalination Alternative would not result in a cumulatively considerable contribution to any potentially significant cumulative land use impacts.

Mitigation Measures

No mitigation is required.

4.8 Agriculture

This section addresses regulations and policies, existing conditions, and effects of the Proposed Action and alternatives related to agricultural land uses, preservation, and productivity. Economic effects of changes in agricultural crop production are discussed in Section 4.18, "Socioeconomic Effects."

4.8.1 Affected Environment

4.8.1.1 Regulatory Setting

Federal

Farmland Protection Policy Act
The Farmland Protection Policy Act (FPPA) is intended to minimize the impact of Federal programs with respect to the conversion of farmland to non-agricultural uses. It ensures that, to the extent possible, Federal programs are administered to be compatible with State, local, and private programs and policies to protect farmland. The Natural Resources Conservation Service (NRCS) is the agency primarily responsible for implementing the FPPA.

The FPPA established the Farmland Protection Program (FPP) and the Land Evaluation and Site Assessment (LESA) system, which are discussed below in further detail. The NRCS administers the FPP, which is a voluntary program that provides funds to help purchase development rights to keep productive farmland in agricultural uses. The program provides matching funds to State, local, and tribal government entities and nongovernmental organizations with existing farmland protection programs to purchase conservation easements. Participating landowners agree not to convert the land to non-agricultural uses and retain all rights to the property for future agriculture. A minimum 30-year term is required for conservation easements, and priority is given to applications with perpetual easements. NRCS provides up to 50% of the fair market value of the easement (NRCS 2005).

The LESA system is a tool used to rank lands for suitability and inclusion in the FPP. LESA evaluates several factors, including soil potential for agriculture, location, market access, and adjacent land use. These factors are used to rank land parcels for inclusion in the FPP based on local resource evaluation and site considerations (NRCS 2005).

4.8 Agriculture

State

California Important Farmland Inventory System and Farmland Mapping and Monitoring Program

The California Department of Conservation, Office of Land Conservation, maintains a statewide inventory of farmlands. These lands are mapped by the Division of Land Resource Protection as part of the Farmland Mapping and Monitoring Program (FMMP). The maps are updated every 2 years with the use of aerial photographs, a computer mapping system, public review, and field reconnaissance. Farmlands are divided into the following five categories based on their suitability for agriculture:

- **Prime Farmland**—land that has the best combination of physical and chemical characteristics for crop production. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed.
- **Farmland of Statewide Importance**—land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production.
- **Unique Farmland**—land that does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but has been used for the production of specific crops with high economic value.
- **Farmland of Local Importance**—land that is either currently producing crops or has the capability of production, but does not meet the criteria of the categories above.
- **Grazing Land**—land on which the vegetation is suited to the grazing of livestock.

Other categories used in the FMMP mapping system are "urban and built-up lands," "lands committed to non-agricultural use," and "other lands" (land that does not meet the criteria of any of the other categories).

Williamson Act Contracts

The California Land Conservation Act of 1965, commonly known as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of promoting the continued use of the relevant land in agricultural or related open space use. In return, landowners receive property tax assessments that are based on farming and open space uses instead of full market value. Local governments receive an annual subvention (subsidy) of forgone property tax revenues from the State via the Open Space Subvention Act of 1971.

The Williamson Act empowers local governments to establish "agricultural preserves" consisting of lands devoted to agricultural uses and other uses compatible therewith. Upon establishment of such preserves, the locality may offer to owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years (i.e., the contract continues to run for 10 years following the first date upon which the contract is not renewed). In return, the landowner is guaranteed a relatively stable tax base, founded on the value of the land for agricultural/open space use only and unaffected by its development potential.

Cancellation of a Williamson Act contract involves an extensive review and approval process, in addition to payment of fees of up to 12.5% of the property value. The local jurisdiction approving the cancellation must find that the cancellation is consistent with the purpose of the California Land Conservation Act or is in the public interest. Several subfindings must be made to support either finding, as defined in California Government Code Section 51282.

Local

Contra Costa County
The *Contra Costa County General Plan 2005–2020* (Contra Costa County 2005) identifies goals, policies, and implementation measures aimed at conserving large contiguous areas of productive agricultural land and limiting urban uses to areas within the urban limit line.

San Joaquin County
The Resources chapter of the *San Joaquin County General Plan* (amended July 2002) identifies objectives and policies that address agricultural lands. Specific objectives are: (1) to protect agricultural lands needed for the continuation of commercial agricultural enterprises, small-scale farming operations, and the preservation of open space; (2) to recognize agricultural lands that contain concentrations of small-scale agricultural operations and dwellings; and 3) to minimize impacts on agriculture in the transition of agricultural areas to urban development (San Joaquin County 1992, p. VI-10).

The San Joaquin County Development Title Section 9-1800, Williamson Act Regulations, prescribes the County's regulations for implementing the Williamson Act (p. 611–622). Development Title Section 9-1810.3(b) identifies residential and nonresidential uses that are allowed on Williamson Act lands, including public services (essential) and utility services (San Joaquin County 1995).

4.8.1.2 Environmental Setting

Victoria Island/Byron Tract
The proposed project site is primarily in agricultural use (see Exhibit 4.7-1 in Section 4.7, "Land Use"). With the exception of the Old River intake and pump station site on Byron Tract, the proposed project site is farmed mainly for asparagus, alfalfa, and wheat. Some parcels are also fallowed. Within Byron Tract, the Old River intake and pump station site and adjoining area is owned by CCWD and is not used for agriculture. Agricultural support facilities (barn structure, storage facilities, and limited farm employee housing) are located on the Victoria Island portion of the proposed project site, south of State Route (SR) 4.

The land use designation for Victoria Island is general agriculture. The area is designated as Prime Farmland and Farmland of Statewide Importance as defined by the California Department of Conservation, with the areas of Farmland of Statewide Importance extending in webs throughout the Prime Farmland (California Department of Conservation 2005a; San Joaquin County 2000). Exhibit 4.8-1 illustrates the California Department of Conservation's farmland designations for the proposed project site. The land use designation for Byron Tract is Delta Recreation and Resources and public and semi-public uses. However, a portion of the tract south of SR 4 (excluding the developed portion of the land) is considered to be an important agricultural area by Contra Costa County as specified in the *Contra Costa County General Plan* (Contra Costa County 2005, Figure 8-2, p. 8-28), and is designated as Farmland of Statewide Importance by the California Department of Conservation (California Department of Conservation 2005b). While the Alternative Intake Project would most likely not extend into the important agricultural area on Byron Tract, it is possible that temporary construction activities may require temporary conversion of this agricultural area on Byron Tract to non-agricultural uses. No permanent conversion of Prime Farmland or Farmland of Statewide Importance is expected to occur on Byron Tract.

All of Victoria Island is under Williamson Act contract. There are no Williamson Act contract lands on Byron Tract or in adjacent areas (CCWD 2003, p. 3-7).

Desalination Alternative Project Sites

The Desalination Alternative facilities would be located within open space/marsh lands and urban lands (e.g., public roads rights-of-way and private property). The Desalination Alternative project sites are not located within areas designated or used for agriculture.

4.8.2 Environmental Consequences

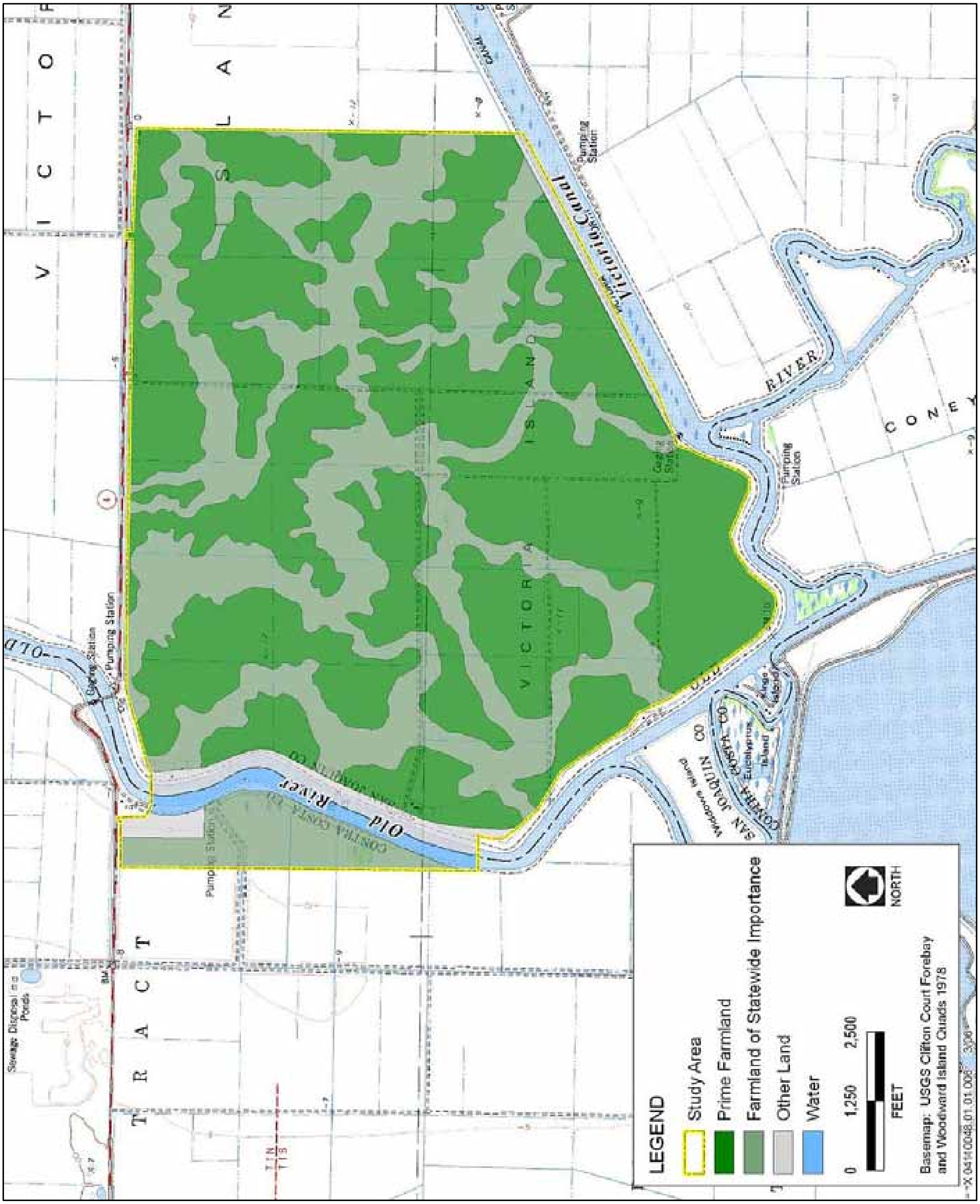
4.8.2.1 Methods and Assumptions

Information on the acreage of farmlands that may be permanently eliminated or temporarily removed from agricultural production under the Proposed Action and Alternatives 2 and 3 is based on preliminary estimates of facility footprints and easement widths provided by Carollo Engineers. Economic effects of the permanent and temporary conversion of Prime Farmland and Farmland of Statewide Importance to non-agricultural use and the temporary disruption of farming activity at the proposed project site are addressed in Section 4.18, "Socioeconomic Effects."

4.8.2.2 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect related to agriculture resources if it would:

- convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use;
- conflict with existing zoning for agricultural use or a Williamson Act contract; or



Source: EDAW 2005

Farmland Designations for Victoria Island/Byron Tract Project Site

EXHIBIT 4.8-1

- involve other changes in the existing environment that, due to their location or nature, could result in the conversion of farmland to non-agricultural use.

Because San Joaquin County has no adopted thresholds related to the conversion of agricultural land to non-agricultural uses, any amount of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance that would be permanently converted to non-agricultural uses was considered to be a significant impact.

Because the Alternative Intake Project is a water quality improvement project, and not a development project, it would not result in specific types of impacts to agricultural resources that would be expected with a typical development project. The project would not result in further urbanization of the area, make agricultural land vulnerable to the pressures of urbanization, induce growth (described in more detail in Section 4.20, "Growth-Inducing Effects"), or lead to the additional loss of agricultural land.

4.8.2.3 No-Action Alternative

Under the No-Action Alternative, no new intake facilities would be constructed, and no changes in CCWD facilities or operations would occur that would directly or indirectly convert agricultural land to non-agricultural use or otherwise affect the continued use of agricultural lands for agricultural production. Therefore, the No-Action Alternative would have no impact on agriculture.

The No-Action Alternative also would make no contribution to cumulative impacts relating to agricultural resources.

4.8.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

IMPACT 4.8-a (Alternative 1)	**Conversion of Prime Farmland and Farmland of Statewide Importance to Non-agricultural Uses.** *The Proposed Action would permanently convert approximately 6–8 acres of Prime Farmland and Farmland of Statewide Importance in San Joaquin County to non-agricultural uses. Although this amount of conversion would be minor in comparison with the total amount of Prime Farmland and Farmland of Statewide Importance in the county, this direct impact would be **significant**.*

All of Victoria Island is designated by the California Department of Conservation as Prime Farmland or Farmland of Statewide Importance. These designations are not distinguished on a plot-by-plot basis within the island, but rather exist as an interwoven network determined by the underlying soil type. While most of the Byron Tract portion of the proposed project site is within designated public/semi-public use areas, a portion of the land is designated by the California Department of Conservation as Farmland of Statewide Importance.

Permanent Impact

Project facilities with the potential to change the land use at the project site include the intake and levee structure, pipeline, tunneling access station (including an access road), and borrow areas. The installation of the proposed new intake and pump station site would encompass the new setback levee adjacent to the permanent pump station facility, including electrical and mechanical structures, parking, and other associated facilities. Depending on the final design and layout of these facilities, the intake and pump station site and tunneling access station would require the permanent removal of approximately 6 to 8 acres of Prime Farmland and Farmland of Statewide Importance.

The direct pipeline would diagonally cross agricultural land in active use, creating the need to ensure that the effects of compaction, groundwater hydrology, and soil profile alteration would not permanently alter the agricultural land use over the buried pipeline. The conveyance pipeline would be constructed across Victoria Island using a conventional trench design. The pipeline would be buried in a trench excavated to maintain a minimum 5-foot cover over the pipe. This depth was determined with consideration of farming operations (e.g., root zone for crops and subsurface drainage) based on consultation with an agronomist. Geotechnical investigations indicate that the soils on Victoria Island are a mix of loosely consolidated sands, silts, and clays, and are predominantly mineral soil type. With mineral soils of these characteristics, the current practice of managing water level below the root zone via subsurface drainage could continue for pipeline installation with 5 feet minimum cover over the pipeline. The pipeline would also include some appurtenances installed above grade (e.g., air release valves) and some installed in buried vaults. These would be sited on the edge of fields or roads to minimize effects on agricultural operations.

Other important agricultural considerations related to the pipeline trench excavation are soil profile and compaction. Construction methods such as using scrapers to stockpile the top layer of soil can be implemented to ensure minimal soil profile alteration during trench backfill. Maximum compaction is a desirable construction result, but undesirable for areas intended for future plant growth. Excess compaction inhibits root, water, and air penetration in soil and thus plant growth. With insufficient compaction, soil may settle over time, potentially interfering with surface water flow and tractor traffic over the land. Geotechnical investigations and compaction monitoring during trench backfill are among methods that can be implemented to ensure appropriate compaction and minimize effects on the existing land use. With consideration of the agricultural concerns noted above included in the design, the presence of the buried pipeline would not preclude farming over the pipeline alignment; therefore, no acreage of permanent agricultural land conversion is anticipated for the pipeline corridor.

The new widened and set back levee section would require approximately 140,000 to 170,000 cubic yards of soil, which may be obtained from the borrow areas on Victoria Island. Based on preliminary field work, it is expected that select soils for the setback levee could be obtained by on-site shallow excavation (e.g., “land leveling”) to depths of approximately 1 to 1.5 feet in an area of up to135 acres. The “land leveling” operation is not anticipated to result in permanent agricultural land conversion within the borrow area.

If the borrow material is obtained from an existing off-site borrow location, no permanent impact to agricultural land would occur as a result of borrow activity.

In total, the Proposed Action would result in the permanent removal of approximately 6–8 acres of Prime Farmland and Farmland of Statewide Importance on Victoria Island from agricultural use. This acreage of farmland conversion, although small, would be considered a significant impact.

Temporary Impact

In addition to the permanent impacts described above, construction activity for the Proposed Action would require temporary, limited disturbance of agricultural lands and farming operations on Victoria Island and Byron Tract for various durations. Table 4.8-1 presents the estimated duration of construction activity in different land areas for the Proposed Action. These durations apply to Alternatives 2 and 3 as well.

Table 4.8-1
Estimated Duration of Construction Activity for the Proposed Action and Alternatives 2 and 3

Element	Victoria Island	Byron Tract
Intake/pump station site	24 months (concurrent with levee construction)	N/A
Borrow area for levee construction	6–8 months	N/A
Pipeline	6–18 months	6 months (concurrent with Victoria Island pipeline construction)
Access easements	36 months	N/A
Staging areas	24–36 months	6 months

Source: Estimates provided by Carollo Engineers in 2005

The direct pipeline alignment would be approximately 12,000 to 14,000 feet long. For the duration of project construction, a temporary construction easement approximately 200 feet wide would be required. Upon completion of project construction, a permanent easement approximately 70 feet wide along the pipeline alignment would be required; however, farming could be conducted over this permanent easement as the pipeline would be buried with a minimum of 5 feet of cover and all aboveground appurtenances would be sited along existing roadways or edges of fields and, thus, no permanent conversion of farmland would result from the permanent pipeline easement.

Additional temporary construction easements totaling approximately 10 acres on Victoria Island and up to 1 acre on Bryon Tract would also be required for construction staging areas. Temporary construction easements of approximately 25–40 acres for site access would be required on Victoria Island (includes on-island road access and potential levee road access).

In addition to the temporary direct disturbance of land, construction activities could affect agricultural operations on adjacent lands. Temporary impacts to farming activities may extend slightly beyond the easement in order to provide temporary farming access roads, temporary relocation of irrigation and drainage ditches, and/or turn rows for equipment maneuvering. Transection of fields could also isolate areas too small to economically continue farming during construction.

In summary, construction activity could result in direct temporary disruption to approximately 200 to 470 acres of agricultural operations on Victoria Island during the construction period. The Proposed Action would not result in the permanent conversion of agricultural lands along the pipeline alignment.

Construction dewatering of the pipeline trench could affect drainage in the area adjacent to the pipeline construction. Because it is desirable to minimize the amount of water developed by the trench dewatering system, dewatering operations would be designed to maximize dewatering in the immediate area of the trench and minimize the amount of "drawdown" in areas outside the trench. Drawdown inside and outside the trench construction area would be temporary; the affected land could be returned to agricultural use after construction has ended. Therefore, temporary effects on agricultural resources would be less than significant. Potential economic effects are addressed in Section 4.18, "Socioeconomic Effects."

Summary of Conversion Impact

Table 4.8-2 presents a summary of the permanent and temporary impacts of the Proposed Action related to the conversion of agricultural land.

Table 4.8-2
Summary of Land Impacts for the Proposed Action

	Victoria Island	Byron Tract	Total
Permanent Impact			
Intake/Pump Station Site and Setback Levee	6-8 acres	N/A	6–8 acres
		Subtotal Permanent	**6-8 acres**
Temporary Impact			
Pipeline	160-285 acres	N/A	160-285 acres
Access Roads	25-40 acres	N/A	25-40 acres
Borrow Area	0-135 acres	N/A	0-135 acres
Staging Areas	10 acres	1 acre	11 acres
		Subtotal Temporary	**Approximately 200–470 acres**
Source: Estimates provided by Carollo Engineers in 2006			

As described above, under the Proposed Action, the amount of Prime Farmland and Farmland of Statewide Importance permanently converted to non-agricultural uses would total approximately 6–8 acres. In 2004, San Joaquin County had a total of 566,307 acres of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance (California Department of Conservation 2005). The maximum amount of permanent conversion of

Prime Farmland and Farmland of Statewide Importance to non-agricultural uses would be about 0.001% to 0.0014% of the county's total acreage of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. Although this amount is very small, because San Joaquin County does not have adopted standards for loss of agricultural land, for the purposes of this analysis this conversion of Prime Farmland and Farmland of Statewide Importance to non-agricultural use is considered significant.

IMPACT 4.8-b (Alternative 1)

Conflict with Agricultural Zoning or Williamson Act Contracts. *The proposed facilities and land use would not change the agricultural character or use of the study area or promote the future conversion of land to urban or other uses. Williamson Act contracts over some land on Victoria Island could be nullified upon acquisition of fee title or easements by CCWD. However, because water-support facilities are compatible with Williamson Act contracts, and because the project would not be expected to lead to cancellations of Williamson Act contracts over adjacent land, this impact would be* ***less than significant****.*

The proposed facilities would not change the overall agricultural character or use of the proposed project site and would not promote the future conversion of agricultural lands to urban or other uses or hinder the overall preservation of agricultural uses on lands in the surrounding area. Therefore, the Proposed Action would not conflict with county policies regarding the commitment to preserve agricultural uses at the proposed project site or with agricultural zoning, and would not involve other changes in the existing environment that could result in the conversion of farmland to non-agricultural use.

There are no lands under Williamson Act contract on Byron Tract. However, all of Victoria Island is under Williamson Act contract. Levee widening and facility installation on Victoria Island would require acquisition of fee title or easement interests in the active or fallowed agricultural lands that are under Williamson Act contract on Victoria Island within the project footprint. The Williamson Act anticipates such acquisitions and states that when an agency acquires all or a portion of property subject to the Williamson Act by eminent domain or threat of condemnation, the Williamson Act contract is deemed null and void as to the land or interest acquired by the agency. If only an easement is acquired, then the contract is void as to that interest. Because water facilities are considered compatible uses under the Williamson Act, the landowner's remaining interest likely would still be subject to the Williamson Act. Accordingly, because the Williamson Act contemplates acquisition of land by public agencies, and nullification of Williamson Act contracts over such acquired land would not lead to the conversion of additional land to non-agricultural purposes, this impact would be less than significant.

Cumulative Impacts

IMPACT 4.8-c (Alternative 1 - Cumulative)	**Cumulative Conversion of Prime Farmland and Farmland of Statewide Importance to Non-agricultural Use.** *Implementation of the Proposed Action would contribute incrementally to the cumulative conversion of Prime Farmland and Farmland of Statewide Importance to non-agricultural use in San Joaquin County. The incremental contribution of the Proposed Action would be cumulatively* ***significant****.*

Most of the agricultural lands in Contra Costa County are in the eastern portion of the county. Most of the land in San Joaquin County is in agricultural production. The total acreages of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in Contra Costa County and San Joaquin County are 44,501and 566,307 acres, respectively (California Department of Conservation 2005).

With or without the Proposed Action, the trend of land conversion from agricultural uses to urban and other non-agricultural uses (e.g., wildlife habitat enhancement) in the Central Valley would continue. In San Joaquin County, the acreage of remaining Important Farmland (including Farmland of Local Importance) is expected to decrease from approximately 630,000 in 2000 to 520,000 in 2040 and 270,000 in 2080 as a result of urbanization (San Joaquin County 2000, p. 20). San Joaquin County estimates that conversion of farmland to non-farmed wildlife habitat as a result of CALFED projects could reduce the acreage of Important Farmland (including Farmland of Local Importance) to 360,000 acres in 2040 and 90,000 acres in 2070 (San Joaquin County 2000, p. 20).

It is likely that other future projects, particularly large development projects that would require large tracts of land, would convert agricultural lands to non-agricultural uses; these lands may or may not be designated Prime Farmland, Unique Farmland, and Farmland of Statewide Importance and may or may not be under Williamson Act contracts. As most of the proposed projects listed in Appendix F-1, "Local Development Projects Considered in Cumulative Impact Analyses," are not yet in the environmental planning stage, the acreage of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance that could be converted by these projects is not known. However, in general, the acreage of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in San Joaquin County is expected to decline. The Proposed Action would contribute incrementally to this decline. This cumulative impact would be significant.

Mitigation Measures

Mitigation Measure 4.8-a (Alternative 1): Preserve the Agricultural Productivity of Prime Farmland and Farmland of Statewide Importance to the Extent Feasible.

To support the continued productive use of Prime Farmland and Farmland of Statewide Importance at the proposed project site on Victoria Island and Byron Tract, CCWD shall ensure that the following measures are taken, to the extent feasible and practicable, in the design and implementation of the project:

- To the extent feasible, ensure that existing drainage systems at the proposed project site that are needed for agricultural uses are functioning as necessary so that agricultural uses are not disrupted.

- Minimize the disturbance of Prime Farmland and Farmland of Statewide Importance, and continuing agricultural operations, during construction by locating construction access and staging areas in areas that are fallow and using existing roads to access construction areas to the extent possible.

- Perform soil density monitoring during backfill and ripping to minimize excessive compaction and minimize effects on future agricultural land use. Remove topsoil prior to excavation in fields and return it to top of fields to avoid detrimental inversion of soil profiles. Avoid excessive compaction of trench backfill. Rip excessively compacted soils to prevent adverse compaction effects. Control compaction to minimize changes to lateral groundwater flow which could affect both irrigation and internal drainage.

- Coordinate construction scheduling as feasible and practicable so as to minimize disruption of agricultural operations.

This mitigation would reduce the impact of the proposed conversion of Prime Farmland and Farmland of Statewide Importance to non-agricultural uses, but not to a less-than-significant level.

Mitigation Measure 4.8-c (Alternative 1 - Cumulative): Preserve the Agricultural Productivity of Prime Farmland and Farmland of Statewide Importance to the Extent Feasible.
This mitigation measure is described above under Mitigation Measure 4.10-a (Alternative 1). The Proposed Action would result in a significant and unavoidable cumulative impact with respect to the cumulative conversion of Prime Farmland and Farmland of Statewide Importance to non-agricultural use even with implementation of this mitigation measure. The incremental contribution of farmland conversion associated with the Proposed Action would be a cumulatively considerable contribution to an existing significant cumulative impact. This impact would therefore be significant and unavoidable.

4.8.2.5 Alternative 2, Indirect Pipeline Alternative

The impacts of Alternative 2 would be the same as those described above for the Proposed Action except that the amount of temporarily affected agricultural land along the indirect pipeline alignment could be less. Much of the estimated acreage subject to potential disruption during construction is currently used for access roads and/or is bordered by existing drainage ditches on the perimeter of existing fields. The net effect of Alternative 2 is a reduction in the acreage subject to temporary disruption of farming operation, as compared to the Proposed Action. Under Alternative 2, the pipeline would be 17,500 to 20,000 feet long. For the duration of project construction, a temporary construction easement approximately 200 feet wide would be required. After completion of construction, a permanent easement measuring approximately 70 feet wide would be required along the pipeline alignment; however, farming could be conducted over this permanent easement and, thus, no permanent conversion of farmland would result from the permanent pipeline easement.

Similar to the Proposed Action, temporary impacts to farming activities may extend slightly beyond the temporary construction easement to provide temporary farming access roads, temporary relocation of irrigation and drainage ditches, and/or turn rows for equipment maneuvering. In summary, construction activities could result in temporary disruption to approximately 155–305 acres of agricultural operations on Victoria Island during the pipeline construction period. No permanent conversion of agricultural lands along the indirect pipeline alignment would occur as a result of Alternative 2.

Table 4.8-3 presents a summary of the permanent and temporary impacts of the Indirect Pipeline Alternative related to the conversion of agricultural land. The only difference in effect between Alternative 2 and the Proposed Action is the amount of temporarily affected agricultural land along the indirect pipeline alignment.

Table 4.8-3
Summary of Land Impacts for the Indirect Pipeline Alternative

	Victoria Island	Byron Tract	Total
Permanent Impact			
Intake/Pump Station Site and Setback Levee	6-8 acres	N/A	6-8 acres
		Subtotal Permanent	6-8 acres
Temporary Impact			
Pipeline	120 acres	N/A	120 acres
Access Roads	25-40 acres	N/A	25-40 acres
Borrow Area	0-135 acres	N/A	0-135 acres
Staging Areas	10 acres	1 acre	11 acres
		Subtotal Temporary	**Approximately 155–305 acres**

Source: Estimates provided by Carollo Engineers in 2006

Similar to the Proposed Action, Alternative 2 would result in the permanent conversion of approximately 6–8 acres of Prime Farmland and Farmland of Statewide Importance on Victoria Island to non-agricultural uses. The same mitigation described for the Proposed Action would apply to Alternative 2, but the direct and cumulative impact on Prime Farmland and Farmland of Statewide Importance would remain significant and unavoidable.

As described for the Proposed Action, conflicts with county agricultural zoning and Williamson Act contracts would be less than significant.

4.8.2.6 Alternative 3, Modified Operations Alternative

The direct and cumulative impacts of this alternative would be identical to those of the Proposed Action. The same mitigation measure described for the Proposed Action would apply to this alternative. This mitigation would not reduce the impacts to less-than-significant levels, and the direct and cumulative contribution to the conversion of Prime

Farmland and Farmland of Statewide Importance to non-agricultural use would therefore be significant and unavoidable.

4.8.2.7 Alternative 4, Desalination Alternative

Development of the Desalination Alternative would require construction of facilities within urban and open space lands that do not contain agricultural lands. Therefore, this alternative would have no direct impact on agricultural resources. This alternative would not cause any effects that would indirectly result in the conversion of agricultural land to non-agricultural use, and would not contribute to any cumulative impact on agricultural resources.

4.9 Transportation and Circulation

This section describes the traffic and circulation characteristics of the existing transportation corridors in the vicinity of the proposed project site and Desalination Alternative project sites, and analyzes the potential impacts of the Proposed Action and alternatives on traffic circulation and transportation systems. Potential project effects on emergency vehicle access and response are discussed in Section 4.12, "Utilities and Service Systems."

4.9.1 Affected Environment

4.9.1.1 Regulatory Setting

Federal and State

The California Department of Transportation (Caltrans) is responsible for planning, designing, constructing, operating, and maintaining all State-owned roadways in San Joaquin and Contra Costa Counties. Federal highway standards are implemented in California by Caltrans.

Local

The general plans for San Joaquin and Contra Costa Counties, and the Cities of Concord and Pittsburg identify estimated future travel demand and present goals, policies, and implementation programs for transportation systems and facilities within those jurisdictions and their spheres of influence. The focus of these goals and policies is long-term development and design of transportation facilities, improvements to existing roadways, interagency coordination, and encouragement of alternative transportation.

Encroachments in county or city road rights-of-way are subject to encroachment permits and the provision of temporary traffic control systems as required by the public works departments of the respective jurisdictions.

4.9.1.2 Environmental Setting

Regional

Roadways

The regional transportation system (encompassing Contra Costa and San Joaquin Counties) consists of roadways (freeways, expressways, arterials, collectors, and local roads); regional transit systems; bikeways; and air, water, and rail service. Freeways are limited-access, high-speed regional travelways that are part of the State and Federal highways systems. Freeways in the regional vicinity of the Proposed Action project site and Desalination Alternative project sites include State Route (SR) 4, SR 160, SR 242, SR 24, Interstate (I) 680, I-580, and I-205. Exhibit 4.9-1 shows the transportation network in the region.

The east- to west-trending SR 4 (freeway) originates south of Lake Tahoe near the Nevada-California border and is the primary route in the vicinity of the proposed project site, forming the northern boundary of the project site on Victoria Island. SR 4 crosses SR 160, where it transitions into the local roadway system through the communities of Oakley and Brentwood. SR 160 begins at SR 4 and traverses north to Sacramento. SR 4 also crosses SR 242 and I-680 west of Concord and terminates at the north/south trending I-80 near the City of Hercules.

I-680 begins at I-80 near Cordelia (north of the Delta) and traverses south to the San Jose region, crossing other highways, including SR 4 and SR 24 near Concord and Pleasant Hill, respectively. SR 242 connects I-680 and SR 24 to SR 4. I-580 provides an east- west connection between I-5 south of Tracy and US 101 near Novato, and is south of Victoria Island and Byron Tract.

Traffic volume on SR 4 varies by segment. Traffic counts for SR 4 in the vicinity of the proposed project site and Desalination Alternative project sites are shown in Table 4.9-1.

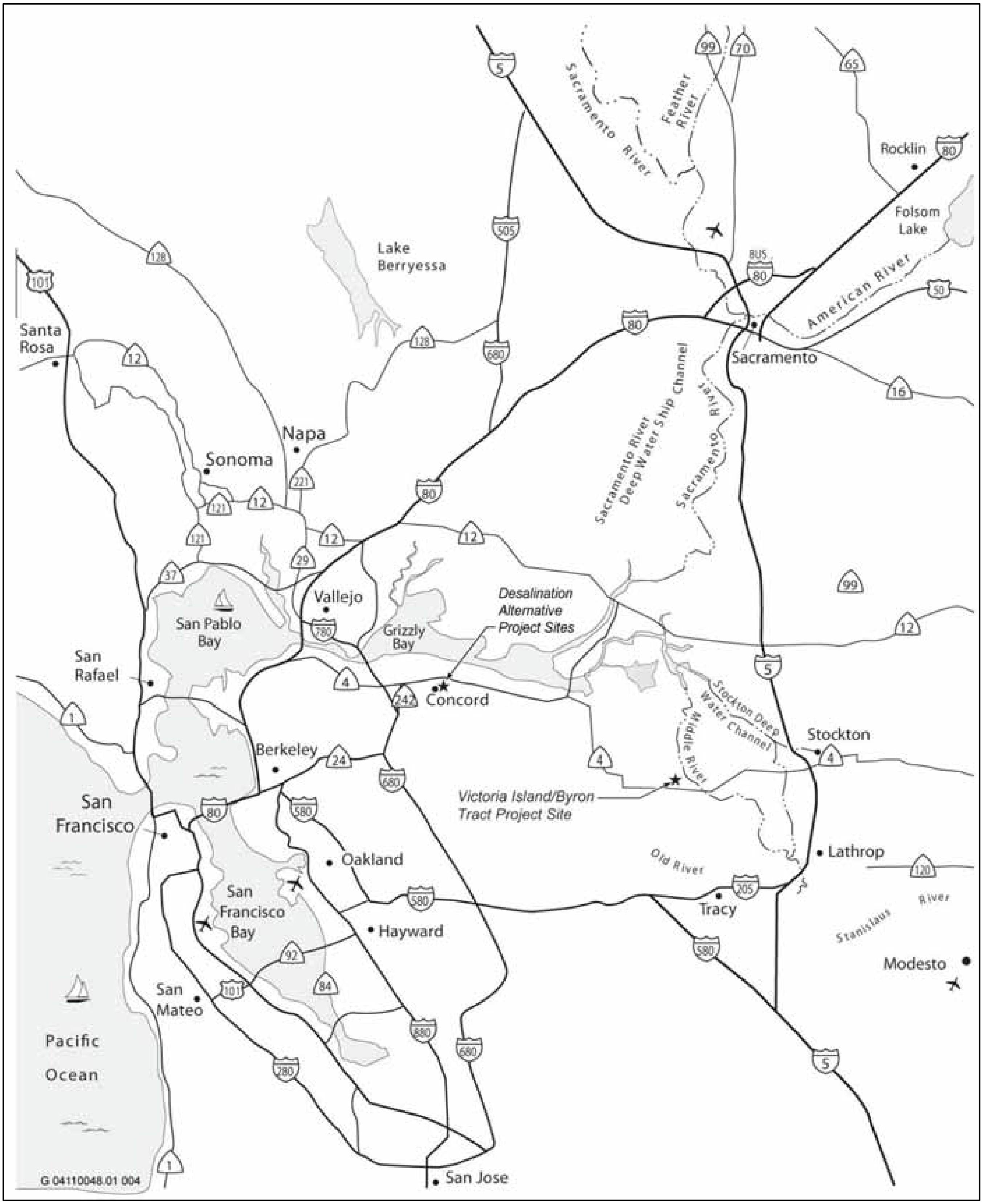
Table 4.9-1
Traffic Counts along SR 4 in the Project Area

County	Location	Average Annual Daily Traffic (vehicles) (two-ways)
Contra Costa	Concord, Port Chicago Highway	121,500
Contra Costa	Bailey Road	126,000
Contra Costa	Pittsburg, Railroad Avenue	110,500
Contra Costa	Pittsburg, Loveridge Road	104,000
Contra Costa / San Joaquin County	Contra Costa-San Joaquin County Line (Old River Bridge)	8,200

Source: Caltrans 2004
Note: Average annual daily traffic = total volume for the year divided by 365 days. The traffic-count year is from October 1 through September 30.

Westbound SR 4 between Hillcrest Avenue and Loveridge Road (in Antioch, east of Pittsburg) has been ranked the fifth traffic hotspot in the Bay Area in daily weekday vehicle hours of delay (Metropolitan Transportation Commission 2005).

Non-highway roadways include arterials, collectors, and local roadways. Arterials move traffic to and from freeways, expressways, and collectors. Collectors are low-speed roadways meant for internal traffic movement within a community, carrying traffic to arterials and between neighborhoods. Local roads are low-speed, low-capacity roadways that provide circulation within neighborhoods and access to adjacent land uses. Arterials,



Source: EDAW 2005

Regional Transportation Network

EXHIBIT 4.9-1

CCWD Alternative Intake Project EIR/EIS
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collectors, and local roadways in the vicinity of the proposed project site and the Desalination Alternative project sites are described below under “Victoria Island/Byron Tract” and “Desalination Alternative Project Sites,” respectively.

Transit Service

Regional public transportation includes rail and bus service. The Bay Area Rapid Transit (BART) district provides commuter rail service between Pittsburg and the rest of the Bay Area via the Pittsburg/Bay Point line. The Central Contra Costa Transit Authority (CCCTA-County Connection) and the Eastern Contra Costa Transit Authority (Tri-Delta) provide bus service throughout Contra Costa County. Specifically, CCCTA provides service to most of Contra Costa County’s cities (including the City of Concord) with limited service to east county areas, whereas Tri-Delta serves eastern Contra Costa County, including Pittsburg and the unincorporated community of Bay Point (City of Pittsburg 2004, p. 7-20). San Joaquin County does not provide bus service in the vicinity of Victoria Island. The National Railroad Passenger Corporation and Subsidiaries (commonly known as Amtrak) operates both long distance and intercity passenger trains in Contra Costa and San Joaquin Counties. All transit service providers offer regularly scheduled services.

Bikeways

Contra Costa County, area cities, and the East Bay Regional Park District operate and maintain on- and off-road bikeway facilities throughout the vicinity of the proposed project site and Desalination Alternative project sites (Contra Costa County 2005).

Truck Routes

City, rather than county, jurisdictions have the authority to designate truck routes in their general plans.

The City of Pittsburg identifies truck routes within its city boundaries only and not within its sphere of influence. Therefore, there are no designated truck routes located within the Pittsburg portion of the Desalination Alternative project sites, which are outside of Pittsburg but within Pittsburg’s sphere of influence.

The City of Concord identifies truck routes within city boundaries. These routes are intended to direct the movements of commercial vehicles or vehicles exceeding a gross weight limit of three tons (City of Concord 2002). Exemptions include passenger buses and any vehicles owned by a public utility while in use in the construction, installation, or repair of any public utility, and refuse collection vehicles that operate on city streets. Truck routes adjacent to the Bollman Water Treatment Plant (WTP) within the City of Concord include the Port Chicago Highway between Bates Avenue and SR 4 (City of Concord 2000).

Victoria Island/Byron Tract

Access to the proposed project site at Victoria Island and Byron Tract would be from SR 4, which forms the northern boundary of the site. There is one access road to the Byron Tract portion of the site immediately west of the Old River Bridge, and there are several access roads to Victoria Island south of SR 4, including one immediately east of the Old

River Bridge. SR 4 is a two-lane freeway with 10- to 12-foot-wide lanes and minimal shoulders. The speed limit on SR 4 is 55 miles per hour (mph), although actual driving speed varies from 55 to 70 mph, depending on the type of vehicle. Traffic slows substantially at the Old River Bridge (located on SR 4 between Victoria Island and Byron Tract) because of the tightness of the turn west of the crossing. In fact, numerous traffic collisions occur in this area, especially that portion of SR 4 between Brentwood and the San Joaquin County line at Old River Bridge, where there has been an increase in traffic collisions over the past few years (Kroeger 2003). Because of the presence of agricultural land uses in the area, a substantial number of 18-wheel trucks regularly traverse this highway. Traffic volumes on SR 4 in the vicinity of Victoria Island and Byron Tract (at Old River Bridge) are shown in Table 4.9-1, above.

The internal roadways on Victoria Island and Byron Tract include roads on top of the levees, which are under the jurisdiction of Reclamation District (RD) 2040 on Victoria Island and RD 800 on Byron Tract. The levee roads are overlain by gravel and range from 12 to 15 feet wide. There are no designated speed limits on these roads. Victoria Island is also crossed by a network of dirt roads of varying widths that are used for access for agricultural activities and levee maintenance.

There are no bicycle facilities in the vicinity of Victoria Island and Byron Tract.

Desalination Alternative Project Sites

The new intake and pump station would be located at the existing Mallard Slough intake and pump station site. Site access is primarily provided by SR 4, Bailey Road, Willow Pass Road, Pullman Avenue, and existing private access roads (see Exhibit 3.7-4 in Chapter 3, “Alternatives, Including the Proposed Action”).

The new untreated-water conveyance pipeline alignment would cross the right-of-way of three sets of railroad tracks: Union Pacific, Atchison Topeka & Santa Fe, and Southern Pacific Transportation Company. The pipeline would be located partially along the existing Mallard Slough pipeline corridor, which extends through private property from the intake/pump station site into the Bay Point area, through city streets in Bay Point, along an existing easement adjacent to the Contra Costa Canal, and from the canal easement to the Bollman WTP site (see Exhibit 4.7-2 in Section 4.7, “Land Use,” for an overview of the pipeline alignment). From the Mallard Slough intake to the Contra Costa Canal junction, the new untreated-water conveyance pipeline would cross or be routed along the following public rights-of-way: Cirvello Avenue, Siino West Avenue, South Bella Monte Avenue, Jefferson Street, Cleveland Avenue, South Street, Madison Avenue, and Canal Road (see Exhibit 3.7-4 in Chapter 3, “Alternatives, Including the Proposed Action”). These are local roadways adjacent to residential uses with two traffic lanes, speed limits of 25 mph, and parking on both sides of the road. Along the Contra Costa Canal route, the new untreated-water conveyance pipeline corridor would cross two arterials (Canal Road, shown in Exhibit 3.7-4, and Willow Pass Road) and local roads crossed by the Contra Costa Canal (Camino Anders, Pomo Street, Mota Drive, and Driftwood Drive). Exhibit 4.9-2 shows the local roads crossed by the Contra Costa Canal and the new untreated-water conveyance pipeline in the vicinity of SR 4 and Willow Pass Road. The western portion of the new pipeline alignment would cross city streets in the community of Clyde and the City of Concord, including Kilburn Street, Norman Avenue, Port Chicago Highway, and Bates Avenue. Exhibit 4.9-3 shows the local roads crossed by the new untreated-water conveyance pipeline alignment in the vicinity of Bollman WTP. Between these areas, the pipeline alignment would pass through undeveloped land and would not cross any roadways (See Exhibit 4.7-2 in Section 4.7, "Land Use").

The new desalination treatment facility would be located within the fenceline of the existing Bollman WTP site, and would not encroach on public road rights-of-way. Access to the Bollman WTP is via SR 4, Port Chicago Highway, and Bates Avenue (see Exhibits 4.7-2 and 4.9-3).

The new concentrate disposal pipeline would traverse west and north along the western perimeter of Mallard Reservoir, and continue northward (across Waterfront Avenue), crossing under Union Pacific Railroad and Burlington Northern Santa Fe Railroad tracks and along the western perimeter of the Concord Naval Weapons Station property to Suisun Bay.

Traffic volumes on local roads in the vicinity of the Desalination Alternative project sites are generally not available. The average, daily, bidirectional traffic volume on Willow Pass Road (between the Pittsburg western city limit to Range Road) was 17,255 vehicles in 2000 (City of Pittsburg Engineering Department 2003). The average daily traffic volume on Bates Avenue in 2002 was 6,525 vehicles (City of Concord 2003, p. 42).

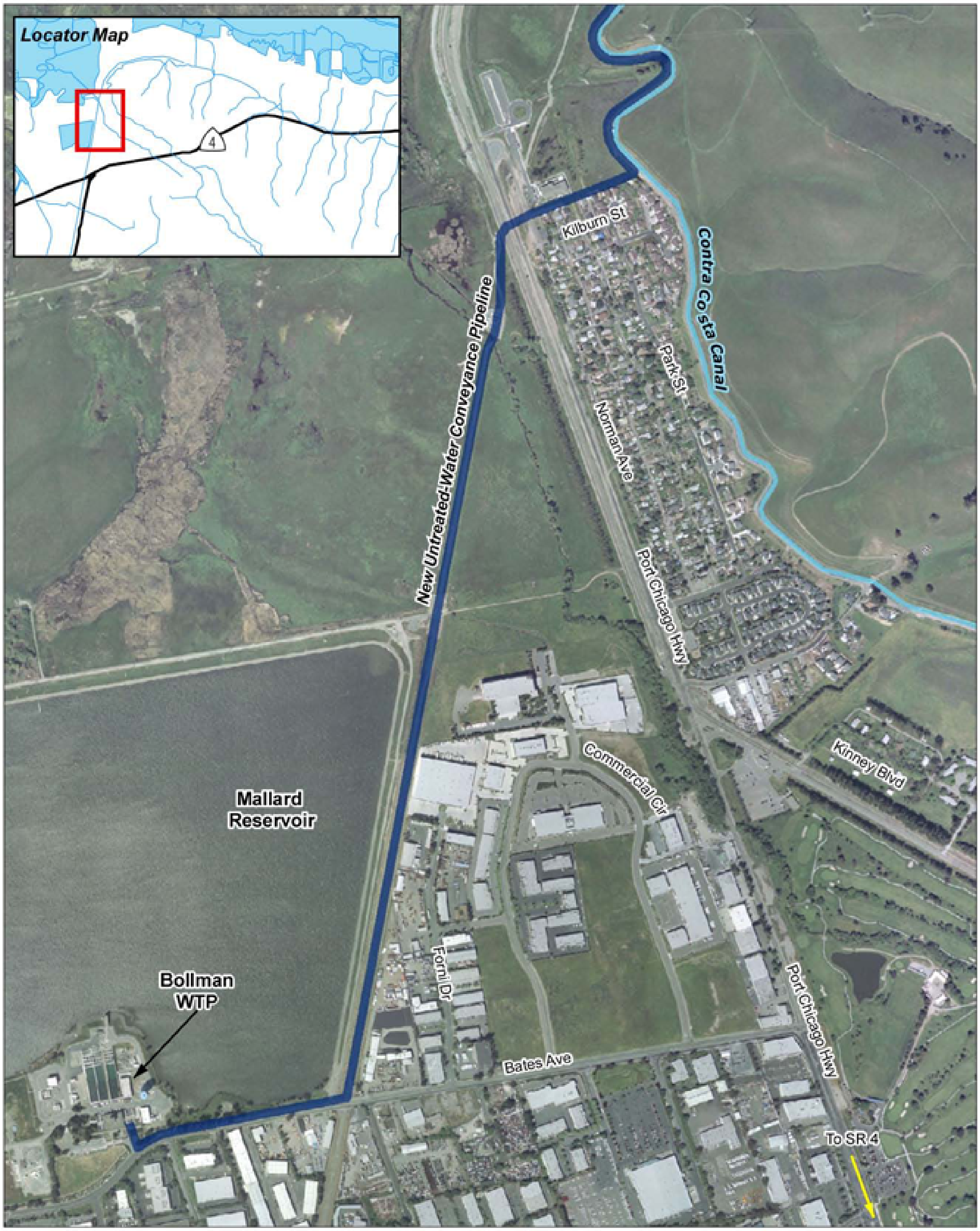
Tri-Delta Transit operates buses in the vicinity of the new untreated-water conveyance pipeline corridor. Specifically, bus lines that cross the pipeline corridor at Willow Pass Road include Line 380, which connects the Pittsburg BART station to Brentwood; Line 387, which connects the Pittsburg BART to Tri Delta Transit station in Antioch; and Line 392, which connects the Pittsburg BART to the Brentwood Park & Ride. The latter bus line is operated during the weekends and holidays only, whereas Lines 380 and 387 are operated during the weekdays (Tri-Delta Transit 2005).

Transit service in the Concord area is provided by the County Connection. Lines 108, 127, and 117 originate from the North Concord Martinez BART station and traverse north along Port Chicago Highway. Line 108 ends approximately south of the community of Clyde on Port Chicago Highway whereas lines 127 and 117 turn west on Bates Avenue (Central Contra Costa Transit Authority staff, pers. comm., 2005; City of Concord 2003, p. 46).

Bicycle lanes are located along Willow Pass Road and Bailey Road, both of which would be crossed by the new untreated-water conveyance pipeline alignment, as described above (Contra Costa County 2001). In addition, a Class I bike path is located along the Contra Costa Canal between Bailey Road and the intersection of Driftwood Drive and Pacifica Avenue, a total distance of about 2.25 miles (City of Pittsburg 2004, p. 7-27).

Desalination Alternative:
Local Roadways Crossed by the Contra Costa Canal

EXHIBIT 4.9-2



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Source: EDAW 2005

Desalination Alternative:
Local Roadways in the Vicinity of Bollman WTP

EXHIBIT 4.9-3

4.9.2 Environmental Consequences

4.9.2.1 Methods and Assumptions

The following analysis is focused primarily on construction-related traffic effects because long-term operation of any project alternative would generate minimal vehicular trips. Therefore, typical traffic standards such as level of service (LOS), which are often calculated by counties' congestion management agencies and are a useful measure for analyzing potential long-term effects on traffic flow, were not used in this analysis.

The following project-related assumptions are important to the analysis of construction-related traffic generation:

- The total construction duration of Alternative 1, 2, or 3 is estimated to be 36 months, with levee improvements completed over a 6–8-month period, intake/fish screen/pump station completed in a 24-month period, pipeline installation completed in a 6–18-month period, Old River pipeline crossing completed in a 7–9-month period, and new pipeline connection at the existing Old River pump station completed in a 1-month period. There would likely be overlap in the timing of construction of some of these components.

- The construction labor force for Alternative 1, 2, or 3 is estimated to average about 75 to 100 people over the total construction period. Peak staffing could be close to 125 people if major construction components are conducted simultaneously. Typical construction would occur during daylight hours Monday through Friday.

- The total construction duration for the Desalination Alternative is estimated to be 36 months, with the Mallard Slough intake/pump station expansion completed in 8–12 months, construction of the untreated-water conveyance pipeline completed in 10–12 months, desalination facility construction completed in 30–36 months, and construction of the concentrate disposal pipeline completed in 4–6 months. The timing of construction of some of these components would overlap.

- The construction labor force for the Desalination Alternative is estimated to average about 10 to 150 workers per day at the various projects sites over the 36-month period of construction. Typical construction would occur during daylight hours Monday through Friday.

4.9.2.2 Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect on transportation and circulation if it would:

- cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system;
- substantially impede access to local streets or adjacent uses, including emergency access;
- substantially interfere with rail service or operations;
- result in lengthy delays for transit riders;
- result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that would result in substantial safety risks;
- substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or
- conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

Several of these thresholds do not apply to this analysis, as described below.

The proposed intake and pump station at Victoria Canal and proposed pipeline across Victoria Island would be located entirely within Victoria Island and Byron Tract, and would not encroach upon public roadways (specifically SR 4) or railroads. The nearest railway is located nearly 4 miles north of Victoria Island and Byron Tract. Therefore, the Proposed Action and Alternatives 2 and 3 would not affect rail service or operation.

There are no bus stations along SR 4 in the vicinity of Victoria Island and Byron Tract and, therefore, disruption to transit services would not occur under the Proposed Action or Alternatives 2 and 3.

Project facilities under all alternatives would not affect air traffic patterns of nearby airports (Byron Airport and Buchanan Airport). Although the new desalination treatment facility and new untreated-water conveyance pipeline would be located within Buchanan Airport's Influence Area, they would not exceed height restrictions permitted within this area. Therefore, the Desalination Alternative would not alter the traffic pattern nor result in substantial safety risks associated with airport operations.

The project alternatives would not include new design features (e.g., new facilities or obstructions within public roadways) or alterations of existing features (e.g., road realignment) that would pose a danger to the public. Therefore, the alternatives would not result in hazards caused by a design feature or incompatible use.

None of the alternatives would directly or indirectly eliminate alternative transportation corridors or facilities (e.g., bike paths, lanes, bus turnouts, etc.) both because of facility locations and because of the short-term nature of construction activities where potential effects could occur. In addition, the alternatives would not include changes in policies or programs that support alternative transportation. Therefore, the alternatives would not conflict with adopted policies, plans, or programs supporting alternative transportation.

4.9.2.3 No-Action Alternative

Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Because no additional vehicle trips would be generated, this alternative would not result in any adverse environmental effects with respect to transportation and circulation.

The existing Old River pump station and intake would be operated in the same manner as under current operations, and no new physical changes to the environment would occur. The number of vehicular maintenance trips to the Old River pump station and intake site would remain the same as under current conditions, and no additional trips would be generated. Therefore, no temporary construction-related or long-term operational traffic would be generated under this alternative. Further, the No-Action Alternative would not contribute to any cumulative transportation impacts.

4.9.2.4 Alternative 1, Direct Pipeline Alternative (Proposed Action)

Direct and Indirect Impacts

IMPACT 4.9-a (Alternative 1)

Temporary Effects on Traffic, Including Effects on Emergency Service Response Times and Access, during Construction. *During the 36-month construction period anticipated for the Proposed Action, commute trips and haul truck trips would increase traffic on SR 4 and private access roads entering the proposed project site. No restrictions in roadway access, such as lane closures or road blockages, are expected to be associated with the construction activity. The temporary traffic increase would not be considered substantial in relation to current traffic levels, and the traffic increase would not significantly alter existing traffic patterns or congestion, and are not expected to be substantial enough to adversely affect the response times of any emergency vehicles that may need to travel on SR 4 during the construction period. This impact would be* ***less than significant****.*

The construction of the proposed facilities would have only a temporary effect on traffic. Installation of the new intake and pump station at Victoria Canal and new pipeline across Victoria Island to the existing Old River intake and pump station would necessitate construction worker commute trips and haul truck trips (for delivery and transport of materials and equipment), resulting in increased traffic levels on SR 4 in the vicinity of Victoria Island and Byron Tract. Existing roadway features along SR 4 (e.g., speed limit signs) would not be affected by construction activities.

Construction-related traffic would consist of daily commute trips of construction workers and truck trips to haul materials and supplies from outside the project vicinity. Construction personnel, equipment, and imported materials would reach the proposed project site via SR 4, which is currently used by trucks and other heavy agricultural equipment as well as automobiles.

The construction labor force is estimated to average about 75 to 100 people over the total construction period. Peak staffing could be close to 125 people if major construction components are conducted simultaneously. Construction-related commute traffic, therefore, could reach a total of 125 trips during the peak morning and evening commute hours at times of peak construction activity. However, construction crew members would travel to the proposed project site from different directions on SR 4 and by way of different sets of roadways and intersections before reaching SR 4. It is also likely that some ridesharing would take place. Therefore, 125 trips is a conservative estimate of the maximum increase in commute traffic volume that may be associated with project construction, and this volume would likely be split between vehicles arriving eastbound and westbound on SR 4.

It is anticipated that approximately 50 to 75 truck round trips would be required to transport the contractor’s equipment to the site. A similar number of round trips would be needed to remove the equipment from the site as the work is completed. About 200–300 highway truck trips would be needed to bring the riprap and an additional 1,000–1,500 trips would be needed to bring aggregate surfacing to the site from the quarry of origin. About 300–400 concrete loads, transported by transit mixer truck, are also likely. About 150 trailer truck loads would be required to bring other permanent materials, such as geogrid, fish screens, sheet piles, masonry, piping, structural steel, utility poles, and ancillary equipment, to the site. In addition, about 50 highway truckloads may be needed to carry construction debris and waste dump materials to a suitable landfill. As described in Section 3.4.3, “Project Construction,” borrow materials could be obtained from either on-site or off-site sources. If on-site borrow is used, the hauling of borrow material would be mostly contained within Victoria Island. However, if off-site borrow is needed, potential borrow areas have been identified within 20 miles of the project site, which would add to construction-period traffic volumes on area roadways; up to an estimated 11,500 trips may be needed. No restrictions in road access, such as lane closures or roadway blockages, are expected to be required in relation to the delivery of materials and equipment.

The total number of truck round trips would be about 14,000 during the 36-month construction period, or an average of about 15 round trips per day. The actual number of round trips per day during construction may range from between 8 and 100 to meet specific construction sequencing needs. Over the course of the entire construction effort, it is likely that some phases of construction would necessitate higher traffic volumes, while other construction phases would require far lower. For example, there would likely be a peak in traffic volume at the commencement of construction, for initial delivery of construction equipment and materials. During other times, traffic volumes would be much lower.

The addition of a maximum of 225 daily trips (125 commuter trips + 100 truck trips) on SR 4 at the Old River Bridge (very conservative estimate) would constitute a total traffic increase of less than 3% over the average daily volume (225/8,200 existing trips). The percentage increase would be much smaller for other segments of SR 4 that have higher existing traffic volumes. This increase in traffic would not substantially disrupt daily traffic flow on SR 4 in the vicinity of the project site, where project-related traffic would be the most concentrated, or on other regional or local roadways. The traffic increases associated with project construction activity would not be substantial enough to cause