CHAPTER 5
Climate Change

5.1 Introduction

5.1.1 Chapter Overview

This chapter presents a discussion of climate change – what it is and its potential environmental consequences as understood to date – with a focus on climate change issues that are relevant to the Los Vaqueros Reservoir Expansion Project. Two general areas of inquiry are the focus of this discussion:

- To what extent would the project contribute to the global greenhouse gas (GHG) emissions that are causing climate change?
- Would the project be adversely affected by the environmental changes projected to result from climate change and/or would the project contribute to the adverse effects of climate change?

Whether the project will contribute to GHG emissions is an air quality issue and, therefore, is analyzed in Section 4.10, Air Quality, of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The second area of inquiry, the extent to which the project affects or is affected by the projected environmental consequences of climate change, centers on potential changes to water resources, water supply, and water quality.

5.1.2 Overview of Climate Change

Various gases in the earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters earth's atmosphere from space, and a portion of the radiation is absorbed by the earth's surface. The earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. GHGs are transparent to solar radiation and, therefore, are effective in absorbing infrared radiation. As a result, radiation that otherwise would escape back into space is retained, resulting in a warming of the earth's atmosphere. This phenomenon is known as the GHG effect.

Scientific research to date indicates that observed climate change is most likely a result of increased emission of GHGs associated with human activity (Intergovernmental Panel in Climate Change, 2007a, 2007b). Among the prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), ozone (O_3), water vapor, nitrous oxide (NO_x), and

chlorofluorocarbons (CFCs). Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for enhancing the greenhouse effect. GHG emissions contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential and agricultural sectors (CEC, 2006). In California, the transportation sector is the largest emitter of GHGs (accounting for 40.7 percent of the total GHG emissions in the state in 2004), followed by electricity generation (CEC, 2006).

As the name indicates, global climate change is a global problem. GHGs are global pollutants, unlike criteria air contaminants and toxic air contaminants, which are pollutants of regional and local concern, respectively. If California were a country, it would rank between the 12th and 16th largest emitter of CO2 in the world. California produced 492 million gross metric tons of carbon dioxide equivalents[1] in 2004 (CEC, 2006).

California is taking actions to reduce GHG emissions. Governor Schwarzenegger signed Executive Order S-3-05 in June 2005 to address climate change and GHG emissions in California. This order sets the goal that GHG emissions be reduced as follows:

- To 2000 levels by 2010
- To 1990 levels by 2020, and
- To 80 percent below 1990 levels by 2050

In 2006, California passed the California Global Warming Solutions Act of 2006 (AB 32; California Health and Safety Code Division 25.5, Sections 38500, et seq.). This Act requires the California Air Resources Board (CARB) to design and implement emission limits, regulations, and other feasible, cost-effective measures to reduce statewide GHG emissions to 1990 levels by 2020 (representing an approximate 25 percent reduction in emissions).

Global climate change will affect water resources in California. Rising temperatures will result in sea-level rise and perhaps the timing and amount of precipitation, which, in turn, could alter water quality. Climate change is also expected to result in more extreme weather, both heavier precipitation that can lead to flooding as well as more extended drought periods. Although much uncertainty remains regarding the timing, magnitude, and nature of potential changes to water resources as a result of climate change, several trends are evident. Thus, it is valuable to evaluate projects such as the Los Vaqueros Reservoir Expansion Project in light of these potential changes in water resource conditions.

[1] Carbon dioxide equivalents (CO_2E) are measurements used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, methane is a much more potent GHG than CO_2. As described in the General Reporting Protocol of the California Climate Action Registry, one ton of CH_4/methane contributes as much to the greenhouse effect as approximately 21 tons of CO_2/carbon dioxide (California Climate Action Registry, 2006). Expressing all GHG emissions in carbon dioxide equivalents converts them to a common unit of measurement calculated as if only CO_2 were being emitted.

5.2 Potential Changes to California's Water Resources

Focusing on precipitation, snow pack, runoff, flooding, and sea-level rise, the following text describes the potential for climate change to affect California's water resources.

5.2.1 Precipitation, Snowpack, and Runoff

Amount of Precipitation

Most precipitation events in California occur during the October through April rainy season with the largest amount of water falling during November through March. An analysis by the U.S. National Weather Service (USNWS) using data from 1931 through 2005 indicates a long-term trend of increasing annual precipitation in California, especially in northern California, where data show an increase of up to 1.5 inches per decade (USNWS, 2008). A second investigation completed by the California Department of Water Resources (DWR) indicates a statistically significant trend towards increased total precipitation in northern and central California since the late 1960s (DWR, 2006). A single investigation by Bardini and others (Bardini, et al., 2001) shows a trend of potentially decreasing annual precipitation in California; however, this result is probably related to the specific subset of data that the Bardini study relied upon, wherein extremes at the beginning or end of time series data can substantially impact the identified trend (DWR, 2006). An investigation of rainfall during November through March of 1930 through 1997 indicates significant increases in California rainfall (distinct from snowfall) (Mote, 2005).

There is also evidence that the amount of precipitation that occurs on an annual basis is becoming more variable. That is, periods of both high and low rainfall are becoming more common. Specifically, a study performed by DWR indicates that present-day variability in annual precipitation is about 75 percent greater than that of the early 20th century (DWR, 2006). The effects of these trends on the project along with trends resulting from climate change scenarios are discussed in the following subsections.

Snowpack and Snowmelt

In addition to potentially increased precipitation, snowpack and snowmelt may also be substantially affected by climate change. Because much of California's precipitation falls as snow in the Sierra Nevada and southern Cascades, the state's snowpack represents a significant reservoir of usable water. Specifically, about 35 percent of the state's usable annual surface water supply is derived from the annual snowmelt (DWR, 2006). This snowmelt typically occurs from April through July, providing natural water flow to streams and reservoirs after the annual rainy season has ended. Estimates by DWR further indicate that California's snowpack contributes, on average, about 14 million acre feet (MAF) per year of runoff to watersheds that flow into the Central Valley and Delta (DWR, 2006). For comparison, total reservoir capacity in the Central Valley is about 24.5 MAF per year (DWR, 2005a).

As air temperatures increase due to climate change, the water stored in California's snowpack could be affected in two ways: first, increasing temperatures could result in decreased snowfall, and second, increasing temperatures could result in earlier snowmelt. Several investigations of current and potential future snowfall trends in California illustrate these effects. Knowles and Cayan performed a model analysis of the portion of the California snowpack that feeds Delta watersheds. The study estimates that, by 2060, California's snowpack will be reduced substantially, especially within northern and eastern areas of the Sacramento River watershed (Knowles and Cayan, 2004). A recent study by the Scripps Institute of Oceanography estimates trends in snowpack, river runoff, and air temperatures in California and Oregon. Consistent with other studies, this investigation also indicates a substantial reduction in snowpack in California concurrent with an increase in winter rainfall (Scripps Institute of Oceanography, 2007).

Runoff

Runoff may be considered in terms of annual or peak runoff volumes. Annual runoff is measured during the annual water year (October 1st through September 30th) and includes river flows derived from precipitation events, snowmelt, and river base flow. Peak runoff is typically measured for individual storm events. Like annual runoff, peak runoff results from precipitation events, snowmelt, and river base flow. However, most of the water mass present during a peak runoff event is typically derived from concurrent precipitation and snowmelt.

As discussed above, precipitation across California appears to have increased over the past century, and the amount of precipitation that occurs in individual water years has become more variable. It follows, then, that similar trends would be seen for runoff. A study by DWR compares pre- and post-1955 annual average water year unimpaired runoff[2] for 24 watersheds across northern, central, and southern California (DWR, 2006). Data indicate an annual increase in runoff of up to 27 percent for 21 of the 24 watersheds, with an overall average increase of 9 percent. The remaining three watersheds – the Mokelumne, Stanislaus, and American Rivers – show runoff reductions of 1 to 2 percent.

The DWR study also addresses the amount of variability in runoff volumes among water years for the Sacramento and San Joaquin River watersheds. Results indicate a statistically significant increase in variability within the Sacramento River watershed, and an insignificant but increasing trend within the San Joaquin River watershed. Thus, the annual amount of runoff in the Sacramento River is becoming increasingly variable, and annual runoff in the San Joaquin may follow a similar trend (DWR, 2006).

In relation to snowpack, winter storms produce snow to higher elevations than other storms, snow that has historically melted during April through July. This process effectively stores water in California's snowpack until the spring snowmelt when the water flows downstream into major rivers and reservoirs, providing a significant portion of the water supply for the dry summer and autumn. April through July runoff in both the Sacramento and San Joaquin Rivers shows a

[2] Unimpaired runoff refers to the runoff water that occurs within a river above major regulating impoundments (e.g., major dams).

decreasing trend over the last century, indicating that, in both watersheds, an increasing percentage of runoff is occurring earlier in the year when many reservoirs are managed primarily for flood control and not for water supply (DWR, 2006).

These changes in the timing of precipitation and runoff, and in the amount of water stored in California's snowpack, have significant implications for the management of water resources in the state. These effects are discussed in greater detail below.

5.2.2 Flooding and Flood Management

As discussed above, it is anticipated that climate change will have a substantial effect on the timing and magnitude of snowfall, rainfall, and snowmelt events in California. Large annual variations in winter rainfall and runoff, which are normal in California, create uncertainty about climate change's potential to affect flooding. Still, based on more than a century of historical data and global and local-scale climate modeling efforts, a few generalities have emerged.

In terms of flooding, a peak flow analysis of three Delta tributaries was completed (DWR, 2006). The Feather, American, and Tuolumne Rivers were selected for their century-long, 3-day peak flow records. The investigation divided in half a century-long dataset to compare pre-1955 to post-1955 data. Results indicated that the 100-year 3-day peak flows have more than doubled in the American (111 percent increase) and Tuolumne (102 percent increase) Rivers, and increased by 51 percent in the Feather River. Comparing the pre- to post-1955 periods, only one major flood event occurred prior to 1955 in the three rivers, while four occurred during the post-1955 period. Thus, annual peak 3-day mean discharges in Central Valley watersheds are becoming larger and more variable. Independent climate modeling efforts (Dettinger, et al., 2004; Miller, et al., 2003), predict that these trends towards more variable river flows and more frequent flooding events will continue as a result of climate change.

5.2.3 Sea-level Rise

According to DWR, mean sea level at the Golden Gate Bridge has risen by at least 8 inches since 1900 (DWR, 2006). This corroborates a report by the Intergovernmental Panel on Climate Change (IPCC), which indicates average increases of 3.9 to 7.9 inches globally during the last century (IPCC, 2007a). The observed sea-level rise likely results from a combination of factors, including melting of polar and terrestrial ice and snow, and thermal expansion of ocean water as the earth's temperature has increased (IPCC, 2007b).

Efforts have also been made to predict the amount of sea-level rise likely to occur in the future under various worldwide GHG emissions scenarios. A 2007 IPCC report provides estimates of potential sea-level rise over the next century. That study indicates that global sea level could increase by an estimated 7 to 23 inches by 2099, or about 0.6 to 3.8 inches per 10 years (IPCC, 2007b). There is some disagreement and uncertainty about sea-level rise projections (Munk, 2002); however, the 2007 IPCC report is probably the most highly regarded study on the subject.

5.2.4 Implications for Los Vaqueros Reservoir Expansion Project

The project's expanded Old River Intake and Pump Station and the new Delta Intake and Pump Station would be in the Delta along Old River. This area would potentially be subject to increased flow of water from upstream areas as a result of flooding in the watershed's tributary to the Delta. These increased flood flows, in combination with sea-level rise discussed above that could occur as a result of climate change, could result in increased frequency of high water within the Delta.

However, the new Delta Intake and Pump Station would be designed to withstand projected high-water flood flows. Design of existing and future facilities incorporates the likelihood of high water levels increasing by over 3 feet; should water levels rise even higher, the facilities could be modified to accommodate them. Neither the expanded Old River Intake and Pump Station nor the new intake structure would significantly impede or redirect flood flows through the Delta because neither protrudes significantly into existing channels.

As discussed above, climate change could increase the frequency or severity of flooding within California. The Kellogg Creek watershed, as well as other minor tributaries to the Los Vaqueros Reservoir, could therefore receive increased flood flows during storm events, and these local storm flows would be collected in the expanded Los Vaqueros Reservoir. As discussed in Section 4.5, Local Hydrology, Drainage, and Groundwater the existing Los Vaqueros reservoir is sized and designed appropriately to either contain flood flows from Kellogg Creek and other minor tributaries to the reservoir, or release those flows downstream.

While the Los Vaqueros Reservoir is designed to function primarily as a water storage facility, expansion of the existing reservoir would provide additional capacity to withhold increases in future flood flows within the Kellogg Creek watershed. Under dam safety regulations, just as the existing reservoir has adequate water storage above its maximum levels to contain and hold the probable maximum flood, the expanded reservoir would also be required to have such capacity. Should future studies indicate a larger flood is probable as a result of climate change, the reservoir operations in winter would be adjusted to retain larger flood flows.

Setback levees surrounding the pump stations are designed and engineered to modern standards and incorporate features that make them far less likely to fail than typical Delta levees. Consequently, flooding caused by failure of levees on Byron Tract or Victoria Island is unlikely to affect the pump stations. Pipelines on islands and tracts subject to flooding are designed to allow access for maintenance, should that be necessary, under flood conditions on the islands. Both Byron Tract and Victoria Island house infrastructure of statewide importance and, in the case of Byron Tract, include a significant number of inhabitants. Consequently, neither Byron Tract nor Victoria Island is likely to be abandoned should it flood.

The expanded Old River Intake and Pump Station and the proposed new Delta Intake and Pump Station would be along Old River in an area that would potentially be subject to a projected climate-induced sea-level rise of about 1 to 3 feet (DWR, 2006). Intake facilities would be designed to

withstand inundation and be installed at a height above the potential inundation level. Sea-level rise would not be expected to have a significant effect on the proposed intake and pumping facilities. During the project design phase, project engineers will address the most current information regarding potential sea-level rise and will design pumps and other infrastructure to endure higher flood levels.

Portions of the Delta-Transfer Pipeline would lie within areas that are presently in the 100-year flood zone, as shown on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These areas would be potentially subject to additional Delta flooding associated with a rise in sea level. However, the Delta-Transfer Pipeline would be buried underground, so that flooding, if it did occur, would not disturb, obstruct, or otherwise damage the pipeline. The Transfer-LV Pipeline alignment would reach elevations above 150 mean sea level (msl) and, therefore, would not be in the portion of the project area potentially affected by sea-level rise or associated flooding.

The potential effects of sea-level rise on Delta water quality are discussed in subsection 5.3.2.

5.3 Potential Effects on Water Supply and Water Resources Management

The following text discusses existing climate change research and the potential for climate-induced effects to alter water management within California's natural and managed water environment.

5.3.1 Effects on the State Water Project and Central Valley Project

Reports by the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) and DWR, prepared in response to Executive Order S-3-05, represent the latest complete analysis of changes to State Water Project (SWP) and Central Valley Project (CVP) operations that are likely to occur as a result of climate change. Reclamation prepared *Sensitivity of Future Central Valley Project and State Water Project Operations to Potential Climate Change and Associated Sea Level Rise,* Appendix R of the *Operations and Criteria Plan (OCAP) Biological Assessment* (Reclamation, 2008). DWR wrote the Technical Memorandum Report *Progress on Incorporating Climate Change into Management of California's Water Resources* (DWR, 2006) and *The State Water Project Delivery Reliability Report, 2007* (DWR, 2008).

Contained in these reports is an analysis of the potential impacts of climate change on SWP and CVP operations and deliveries, as well as on Delta water quality and water levels. The analysis is based on runs of the CalSim II and DSM2 models, which are described in more detail in Section 4.2, Delta Hydrology and Water Quality. The specific CalSim II and DSM2 methodology used for the climate change analysis is detailed in the first-mentioned DWR report (DWR, 2006).

Results discussed in the reports include projections from 2035 through 2064 in four potential climate change scenarios compared to a base case scenario that does not assume climate change effects. The four potential climate change scenarios were based on modeling output from two separate global climate models (**Table 5-1**). Three of these scenarios presumed decreased average annual precipitation, while one assumed increased average annual precipitation. Results from the investigations are considered preliminary, incorporate several assumptions regarding the effects of climate change on California water resources, and reflect a limited number of climate change scenarios.

TABLE 5-1
PRECIPITATION PROJECTIONS FOR THE FOUR CONSIDERED CLIMATE CHANGE SCENARIOS

	Average Change in Precipitation (in/yr)	
Climate Scenario[a]	**Northern California**	**Southern California**
2050 GFDL A2	-0.75	-0.22
2050 PCM A2	-0.25	-1.77
2050 GFDL B1	-0.62	0.7
2050 PCM B1	0.83	-0.08

[a] The four climate scenarios DWR investigated were chosen from among several available scenarios compiled for the United Nations' Intergovernmental Panel in Climate Change's (IPCC's) Fourth Assessment Report. The four climate changes scenarios consist of two GHG emissions scenarios, A2 and B1. Each of the GHG emissions scenarios is represented by two different Global Climate Models, the Geophysical Fluid Dynamic Lab model (GFDL) and the Parallel Climate Model (PCM). Climate scenarios were modeled on a 2050 timeframe.

SOURCE: DWR, 2006

Results from the four modeled scenarios indicate effects to SWP and CVP operations. Because of shifts in seasonal and annual average runoff, the amount of water delivered by the SWP and CVP was reduced considerably. Under three of the four climate change scenarios, reservoir water levels were drawn to the minimum level (dead storage) during 21 to 31 months for Shasta, and 20 to 28 months for Folsom during the period of record, as compared to 1 month for each reservoir under a scenario without climate change. During these months, streamflow requirements were not predicted to be met on the Sacramento and American Rivers, and the CVP would not be able to contribute to its Coordinated Operation Agreement-defined share of in-basin use. However, it is thought that these are modeling artifacts; DWR suggests that these results would be avoided by making carryover storage allocations more conservative within the CalSim II model. Still, the overall projected trend shows a decrease in water availability within the system (DWR, 2006).

SWP Deliveries

As discussed above, climate change would generally increase the amount of runoff that occurs during winter and early spring and reduce the amount of runoff during late spring and early summer. Results from the DWR investigations show that these changes would make it more difficult to capture water in SWP and CVP facilities for delivery later in the year. Specifically, average annual deliveries to contractors could be reduced by 7 to 10 percent under three of the four

scenarios, and increased by 1 percent under the remaining scenario. In general, drought-year only deliveries could also be reduced for three of the four scenarios, in comparison to the base case. Reclamation studies (Reclamation, 2008) that included both sea-level rise and four climate scenarios arrived at generally the same conclusions: depending on the scenario, changes in SWP deliveries could range from +7 percent (wetter scenarios) to -15 percent (drier scenarios).

SWP Carryover Storage

Carryover storage is defined as the volume of water that remains in a given reservoir after all annual deliveries and releases have been fulfilled. Carryover storage can then be used during the following water year to supplement water supply in case of drought. DWR analyzed SWP carryover storage as the sum of Oroville and SWP storage in San Luis Reservoir on September 30th, a date that coincides with the end of the water year. Results indicate that carryover storage would be consistently lower under three of the four climate change scenarios, with reductions of about 10 percent at the 90 percent exceedance probability level,[3] to reductions of up to 28 percent at the 10 percent exceedance probability level. Results for the remaining fourth scenario indicate slightly increased carryover storage during below normal, dry, and critical water years, and slightly decreased carryover storage during above normal and wet water years (DWR, 2006).

CVP South of Delta Deliveries

Deliveries by the CVP to South of Delta (SOD) contractors were also affected under each of the four climate change scenarios. Under the three drier scenarios, DWR found that annual average CVP SOD deliveries would be reduced by 6 to 10 percent, likely resulting from generally drier conditions and a shift towards reduced April-July runoff and increased winter season runoff under these scenarios (DWR, 2006). The wetter scenario still exhibited increased winter season runoff and decreased April-July runoff but resulted in a 3 percent average annual increase in CVP SOD deliveries. Reclamation studies that included both sea-level rise and four climate scenarios came to generally the same conclusions: depending on the scenario, changes in CVP deliveries could range from +4 percent (wetter scenarios) to -12 percent (drier scenarios) (Reclamation, 2008).

CVP Carryover Storage

DWR found that changes in CVP carryover storage, defined as the sum of Trinity, Shasta, Folsom, and CVP storage in San Luis Reservoir on September 30th, would be similar to those described for SWP carryover storage. Specifically, results indicate that carryover storage would be consistently lower under three of the four climate change scenarios, with reductions of about 26 to 47 percent at the 90 percent exceedance probability level, and reductions of 4 to 15 percent at the 10 percent exceedance probability level. The fourth, wetter climate change scenario resulted in an increase of 9 percent at the 90 percent exceedance probability level, and a

[3] Exceedance probability for carryover storage is the percent chance of surpassing a specific volume of remaining carryover storage. For instance, under the base case scenario modeled by DWR (2006), there is a 90 percent chance that carryover storage during a given year will exceed 1,300,000 acre feet (AF). This means that the probability of exceedance for 1,300,000 AF of carryover storage is 90 percent, and only during 10 percent of years (the driest years) would there be less than 1,300,000 AF of carryover storage.

slight reduction of less than 1 percent at the 10 percent exceedance probability level (DWR, 2006). Reclamation studies indicate a similar range of carryover storage (Reclamation, 2008).

5.3.2 Effects on the Delta

Making use of CalSim II and DSM2 modeling exercises, DWR also analyzed the potential effects of climate change on the Delta. Details regarding this modeling analysis and underlying assumptions for the CalSim II and DSM2 models can be found in the DWR report (DWR, 2006).

Delta Inflow and Delta Outflow

Delta inflow is defined as the volume of water that flows into the Delta from a combination of the Sacramento, San Joaquin, and east-side Rivers. Delta inflow is important to Delta operations since, during dry summer and autumn periods, Delta water quality and flows must be sustained by either reducing Delta exports or increasing upstream releases. Additionally, the permitted pumping capacity at the SWP Banks Pumping Plant depends on inflow to the Delta from the San Joaquin River, from December 15th through March 15th. Under the three drier climate change scenarios, annual average Delta inflow would decrease by 3 to 4 percent in comparison to the base case scenario. Under the wetter climate change scenario, annual average Delta inflow would increase by 5 percent.

Considered on a monthly basis, average Delta inflow under all four climate change scenarios would increase, relative to the base case scenario, during December through March. This increase corresponds to increased rain and decreased snow events during this period, which results in additional flood control releases from upstream reservoirs and, therefore, greater Delta inflow. Conversely, under the three drier climate change scenarios, inflows from the Sacramento River to the Delta would decrease overall in comparison to the base case.

Delta outflow is defined as the volume of water that exits the Delta via the San Francisco Bay. Delta outflow helps maintain acceptable salinity levels within the Delta, facilitating pumping at state, federal, and local water project pumps, as well as maintaining Delta water quality. Under the three drier scenarios, CalSim II modeling indicates that there would be no reduction in required Delta outflow, but that there would be a 0 to 4 percent reduction in total Delta outflow (including surplus Delta outflow). The wetter climate change scenario would result in an overall increase in total Delta outflow of about 6 percent.

Delta Exports

Exports from the Banks and Tracy Pumping Plants and into the SWP and CVP, respectively, are considered together in DWR's CalSim II analysis of Delta exports. The modeling results indicate that total average annual changes in Delta exports to the two water systems combined would be reduced by 6 to 10 percent for the three drier climate change scenarios, and would increase by 2 percent under the wetter climate change scenario. On a monthly basis, average winter month exports under all four climate change scenarios would not be significantly changed, as compared to

the base case scenario. Conversely, during July through November, monthly average Delta exports would be reduced by up to about 20 percent for the three drier climate change scenarios. During most non-winter months, the wetter climate change scenario would not result in any substantial differences from the base case scenario.

DWR has updated its 2006 water supply reliability studies and has included current fishery restrictions on export pumping that were previously excluded. This latest modeling included moderate and severe fishery restrictions and several future climate model scenarios. The results of the updated modeling show that future climate conditions would have a smaller effect on operations than the previous studies indicated. Namely, depending on the climate scenario, average deliveries under future conditions would be slightly higher or about the same as those under current conditions. Overall, anticipated deliveries were reduced compared to the 2005 studies for both current and future conditions, largely due to the increased fishery restrictions (DWR, 2008). The results of the 2008 update are consistent with the studies used for the analysis of the project provided in this Draft EIS/EIR.

Sea-level Rise and Delta Water Quality

The greatest effect of sea-level rise on California's water supply would most likely occur in the Delta (DWR, 2005b). Specifically, rising sea levels in the vicinity of below-sea-level Delta islands would place additional stress and pressure on the Delta's existing levee system, potentially leading to more frequent overtopping and levee failures. Additionally, higher sea levels would push saltwater up into the Delta, potentially degrading freshwater quality at state, federal, agricultural, and local municipal pumping facilities. To offset increased salinity intrusion, Delta pumping could be curtailed, or upstream reservoir releases could be increased.

DWR conducted a preliminary modeling effort to evaluate potential impacts on Delta water quality. The DSM2 modeling study investigated how a 1-foot rise in sea level would affect Delta water quality. The model did not account for potential CVP or SWP operational changes. Results show an increase in salinity within the Delta under the 1-foot rise scenario, although this change is attributed largely to an assumed increase in the tidal range, not the overall mean sea-level rise (DWR, 2006). Whether or not to anticipate an increase in tidal range with sea-level rise is under further investigation. Still, chloride concentrations along Old River at Rock Slough were assumed to be below the 250 mg/L threshold during about 90 percent of the modeled period.

Under real-time conditions, releasing additional water from SWP and CVP reservoirs would offset increases in Delta salinity. Thus, water quality standards would be met but, during those times when additional water releases were not necessary to meet a standard, water quality would be degraded incrementally as a result of seawater intrusion. This, in turn, would incrementally degrade Delta water quality for drinking water purposes. Increasing reservoir releases to maintain Delta water quality could also affect supply reliability.

Sea-level Rise and Levee Overtopping

The DWR investigation included a preliminary analysis of the potential for levee overtopping under a scenario of a 1-foot increase in sea level. Three Delta islands – Sherman Island, Twitchell Island, and Jersey Island – were specifically considered in the analysis. These islands were selected due to their proximity to the ocean and vulnerability to overtopping should the sea level rise. Results of the DSM2 model, with its assumption of a 1-foot sea-level rise, show an increase in potential overtopping events from zero under the simulated base case scenario to two at a series of five low points along the levees of the Delta islands considered (DWR, 2006).

The model does not account for increased variability of inflows to the Delta from upstream sources or for the effects of wave action. However, both overtopping events occurred in the model during historically high water levels. Flooding of the islands could result in significant seawater intrusion if it occurs in dry periods, possibly making Delta water undrinkable for an extended period of time. If the levees were to be abandoned and not repaired, the resulting increase in surface water in the western Delta would result in permanent increased salinity intrusion. By contrast, permanently flooding interior islands would reduce seawater intrusion on a permanent basis.

Adaptive Management Approaches

Current research generally indicates that the most probable impacts of climate change on water resources would be related to increased peak winter flows and decreased spring and early summer runoff. As discussed above, these changes in water flow would result in less water available for capture through the CVP and SWP, as well as through other local water projects and diversions. Without substantial changes in water management, it is, therefore, likely that climate change could lead to reduced deliveries to water contractors north and south of the Delta who rely on water supplies from the SWP, the CVP, and local sources.

Climate change most likely would reduce spring and early summer snowmelt, while increasing water discharged during winter months, from the standpoint of water supply, it would be useful to have additional screened, winter pumping capacity in the Delta. Such additional pumping capacity would facilitate retention and storage of storm season flood flows. Accordingly, DWR concluded that the key constraint to increasing winter withdrawals of Delta water is permitted and physical capacity at the Banks Pumping Plant for the SWP (DWR, 2006). CVP exports from the Tracy Pumping Plant have often been limited by the upper Delta Mendota Canal constriction, although the California Aqueduct-Delta Mendota Canal intertie could potentially be used to provide additional water supply from the SWP's California Aqueduct to the CVP's Delta Mendota Canal.

Additional permitted or physical, screened pumping plant capacity, along with supplemental SWP SOD conveyance capacity (surface storage, canals, pumps, and groundwater banking) and changes in management of the California Aqueduct-Delta Mendota Canal intertie, would potentially alleviate the reduced water supply that would result from climate change. Increasing the ability of water managers to adaptively manage Delta withdrawals and SOD storage would permit more effective withdrawal, storage, and distribution of water resources while minimizing impacts to Delta aquatic habitat and sensitive species.

5.3.3 Los Vaqueros Reservoir Expansion Project

The project would provide several opportunities for management to be flexible and implement adaptive management strategies to improve water supply reliability. As described above, two of the primary factors that would constrain water managers' ability to maintain existing levels of water supply as a result of climate change are limited pumping and storage capacity. The project would help to alleviate both of these constraints.

Under Alternatives 1 and 2, the new Delta Intake and Pump Station would provide 170 cfs of additional screened diversion capacity from the Delta, and the existing Old River Intake and Pump Station and Alternative Intake Project on Victoria Canal (AIP) would be operated at a combined rate of 500 cfs (up from current operations of 320 cfs combined). Total pumping capacity under Alternatives 1 and 2 would be 670 cfs, an increase of 350 cfs over the capacity of current operations. Under Alternative 3, the pumping capacity of the Old River Intake and Pump Station would be expanded by 70 cfs, which, in combination with the AIP, would become 570 cfs (an increase of 250 cfs over the current 320 cfs combined capacity).

This supplemental diversion capacity would be useful during the increased winter runoff scenarios that are projected under the effects of climate change. The additional 175 TAF of storage capacity in Los Vaqueros Reservoir under Alternatives 1 through 3 would allow needed flexibility between the timing of diversion and the timing of use. The South Bay Aqueduct (SBA) Connection included in Alternatives 1 and 2 would also permit direct conveyance of water from the Los Vaqueros Reservoir or the associated Delta intakes to the SBA via Bethany Reservoir and the South Bay Pumping Plant. Alternative 4 would provide an additional 60 TAF of storage capacity.

The extra intake and storage capacity provided by Alternatives 1 through 3 would substantially increase the flexibility of water diversion and delivery operations that will be needed to sustain water supply reliability under the projected effects of climate change. Alternative 4 would increase flexibility to a lesser extent. The project would help mitigate the effects of climate change and would facilitate the use of water to benefit fish and other aspects of the environment. **Table 5-2** compares the additional water management flexibility, in terms of pumping and storage capacity, that would result from each of the project alternatives.

TABLE 5-2
SUMMARY OF ADDITIONAL WATER MANAGEMENT FLEXIBILITY TO MITIGATE CLIMATE CHANGE

Alternative	Increase in maximum diversion capacity (cfs)	Increase in reservoir storage capacity (TAF)	Environmental Water Flexibility	Water Supply Flexibility	SBA Connection
Alternative 1	350	175	yes	yes	yes
Alternative 2	350	175	yes	yes	yes
Alternative 3	250	175	yes	yes	no
Alternative 4	0	60	yes	yes	no

Operations of the Delta were also examined under future climate change conditions with and without an expanded Los Vaqueros Reservoir. As expected, the response to climate change is mixed, depending on the assumptions and models used. Generally, available water supplies would decrease in drier years and would be mixed in wetter years, reflecting wetter conditions but earlier runoff. Generally, water quality conditions would degrade somewhat, especially in drier years, but water quality standards would still be met.

Operations of an expanded Los Vaqueros Reservoir respond in the following ways to climate change scenarios:

- The reservoir storage would tend to be lower in drier periods because of degraded water quality and reduced water availability. This indicates that stored water would be used more frequently in drier periods. Modeling also indicates that a modest increase of about 150 cfs in intake capacity over the amount planned for the proposed project would more than offset this effect of reduced storage levels. Such additional intake capacity could be considered in the future if climate change leads to the drier scenarios.

- The reservoir would tend to be at higher levels in wetter scenarios because of improved water quality and increased winter flows.

None of the climate change scenarios examined indicate that conclusions about the expansion project's impacts should be altered. Similarly, conclusions of the latest DWR studies (DWR, 2008) show only very modest changes in SWP operations under climate change scenarios.

CHAPTER 6
Summary of Impacts

6.1 Overview of the Environmental Effects of the Alternatives

For the Los Vaqueros Expansion project, four action alternatives and one No Project/No Action alternative were evaluated. Each of these alternatives is fully described in Chapter 3, Project Description. **Table 6-1** provides a summary of the major project components, for use in comparing the environmental effects of the alternatives.

TABLE 6-1
RESERVOIR EXPANSION ALTERNATIVES
WITH KEY DISTINGUISHING CHARACTERISTICS

Project Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Storage Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water/Benefits & Water Supply Reliability	Environmental Water/Benefits	Environmental Water/Benefits	Water Supply Reliability
New South Bay Connection?	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170 cfs intake facility on Old River	Construct new 170 cfs intake facility on Old River	Expand existing CCWD intake facilities by 70 cfs	No changes to existing intake facilities
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 570 cfs	No changes to pipeline capacity

Table 6-2 provides a summary comparison of the chief environmental effects of the four project alternatives and the No Project/No-Action Alternative. In the table, Alternative 1 is compared to the No Project / No Action alternative, while Alternatives 2, 3 and 4 are compared with Alternative 1.

TABLE 6-2
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.2: Delta Hydrology and Water Quality					
Water supply delivery	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water supply. Water supply reliability for CCWD and other Bay Area water agencies would not be improved and additional emergency storage for CCWD and other Bay Area water agencies would not be increased. No additional supplies for improved environmental water management would be provided, and no additional water would be diverted through positive-barrier fish screens.	No significant adverse changes in Delta inflow, Delta outflow, upstream flows, CVP or SWP deliveries, or CVP and SWP reservoir carry-over storage that would cause impacts to the water supply of other users under existing and future conditions. Small changes in total Delta diversions, largely in periods with surplus flows, resulting in a more reliable water supply for the South Bay agencies, and no changes in SWP and CVP water supply deliveries. It would not affect water supplies of other water users. Average Delta outflow changes would be less than significant in both magnitude and timing, decreasing by less than half of 1 percent difference from the Existing and Future Without Project conditions.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Delta water quality	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water quality	Alternative 1 operations would not result in adverse changes in water quality causing the violation of a water quality standard or result in changes to Delta water quality that would result in significant adverse effects on beneficial uses.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Delta water levels	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water levels for other Delta water users.	Largest decrease in Delta water levels estimated at lower-low tide during irrigation season would be -0.11 foot, which is less than 1.5 inches, and would occur infrequently (occurred once during irrigation season in modeled 16-year study period).	Same as Alternative 1	Largest decrease in water level estimated at lower-low tide during irrigation season would be 0.23 foot, which is less than 3 inches, and water level decreases greater than 0.1 foot would occur less than 1% of the time during irrigation season.	The largest decrease in water level changes estimated at lower-low tide during irrigation season would be 0.05 foot, and the estimated decrease in water level would not exceed 0.1 foot during irrigation season.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.2: Delta Hydrology and Water Quality (cont.)					
Cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels.	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have cumulatively considerable effects on water supply, Delta water quality or Delta water levels in the context of combined past, present, and probable future projects.	Alternative 1 operations would not result in a cumulatively considerable contribution to significant adverse cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.3: Delta Fisheries and Aquatic Resources					
In-channel construction - effects on fish/aquatic resources.	No new facilities would be constructed, no existing facilities would be modified. No impact.	In-channel construction activities associated with the new Delta Intake structure would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Old River, which would increase exposure of various life stages and species of fish to temporarily degraded water quality conditions.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Underwater sound-pressure - effects on fish/aquatic resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Underwater sound-pressure levels generated during cofferdam installation for the new Delta Intake could result in behavioral avoidance or migration delays for special-status fish species.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Dewatering of cofferdam - effects on fish	No new facilities would be constructed, no existing facilities would be modified. No impact.	Dewatering of the cofferdam for the new Delta Intake could result in localized, short-term stranding of fish.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.3: Delta Fisheries and Aquatic Resources (cont.)					
Loss of aquatic habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction of new Delta Intake and Pump Station along Old River would result in loss of .2 acre (approximately 50 linear feet by 180 feet depth) of riprapped levee shoreline and install up to 0.79 acres of riprap.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Hydraulic conditions - changes due to new Delta intake structure and effects on fish	No new facilities would be constructed, no existing facilities would be modified. No impact.	Incremental changes in localized hydraulics and aquatic habitat characteristics at the new Delta Intake structure, including disorientation of fish and predator attraction, would be minor.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Delta fish populations and aquatic habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Water diversion operations would not result in significant adverse changes in Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Operation of screened Delta intakes - increased entrainment	No new facilities would be constructed, no existing facilities would be modified. No impact.	Fishery benefit largely due to shift of a portion of South Bay water agencies' Delta diversions to the expanded Los Vaqueros system, which provides improved fish screening relative to the SWP and CVP export facilities.	Same as Alternative 1	Significant increase in entrainment losses compared to without project conditions using the entrainment index method, which is based on the fish monitoring data near Delta water intakes. This substantial effect is caused by the operating rules evaluated for these facilities.	Alternative 4 generally provides no change or slight reductions in estimated potential entrainment.
Cumulative effects on Delta fisheries and aquatic resources	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Alternative 1 when combined with other planned projects or projects under construction in the area, could cumulatively contribute to substantial adverse impacts to Delta fisheries and aquatic resources.	Same as Alternative 1	Cumulative entrainment impacts of Alternative 3 would be significant and unavoidable	Alternative 4 would not contribute to cumulative adverse impacts on Delta fisheries.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.4: Geology, Soils and Seismicity					
Seismic hazards - ground shaking, liquefaction, and local slope stability	No new facilities would be constructed, no existing facilities would be modified. No impact.	All proposed facilities would be designed and engineered in accordance with seismic code requirements; therefore project would not expose people or structures to increased risk of loss, injury, or death involving strong seismic ground shaking or seismic-related ground failure, including liquefaction and landslides.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Soil erosion and loss of topsoil	No new facilities would be constructed, no existing facilities would be modified. No impact.	During construction the proposed project could result in substantial soil erosion or the loss of topsoil.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Unstable soils including expansive soils	No new facilities would be constructed, no existing facilities would be modified. No impact.	Unstable soils exist at the proposed new Delta Intake and Pump Station site; a pier foundation would be installed to support this facility, avoiding risks posed by the soils. No other significant areas of soil instability have been identified but a site-specific geotechnical investigation would be conducted for all major facilities and recommendations implemented to minimize or eliminate soil stability constraints and risks.	Same as Alternative 1	Same as Alternative 1	Fewer facilities, particularly no new Delta Intake and Pump Station, would result in less impact than Alternative 1.
Cumulative effects related to geology, soils or seismicity	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction would not make a cumulatively considerable contribution to cumulative effects associated with erosion, topsoil loss or increased exposure to seismic or other geohazard risks.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.5: Local Hydrology, Drainage and Water Quality					
Water quality	No new facilities would be constructed, no existing facilities would be modified. No impact.	Potential for increased erosion and sedimentation to local waterways, release of fuels or other hazardous materials during construction, or dewatering of excavated areas that could result in substantial water quality degradation.	Same as Alternative 1	Similar types of impact but less extent of impact than Alternative 1 due to construction of fewer facilities.	Similar types of impact but much less extent of impact than Alternative 1 due to construction of the fewest facilities of all the alternatives.
Local groundwater supplies and groundwater recharge	No new facilities would be constructed, no existing facilities would be modified. No impact.	Dewatering of construction area would result in localized and temporary changes in groundwater levels near the active dewatering sites but would not deplete local groundwater supplies. Facility sites would interfere with groundwater recharge to an insignificant extent.	Same as Alternative 1	Same as Alternative 1	Similar types of impact but much less extent of impact than Alternative 1 due to construction of the fewest facilities of all the alternatives.
Drainage patterns	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not substantially alter drainage patterns but reservoir expansion would increase the reservoir shoreline area subject to erosion.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Runoff water	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems but would increase potential stormwater pollution run off. Project would not provide substantial additional sources of polluted runoff during operation.	Same as Alternative 1	Similar type of impact but less extent of impact than Alternative 1 due to construction of fewer facilities.	Similar type of impact but less extent of impact than Alternative 1 due to construction of fewer facilities.
Flood hazard	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could place structures within a 100-year flood hazard area as mapped on a federal Flood Insurance Rate Map but project facilities would not appreciably impede or redirect flood flows.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would not place structures within a 100-year flood hazard area.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.5: Local Hydrology, Drainage and Water Quality (cont.)					
Risk of inundation from dam or levee failure	No new facilities would be constructed, no existing facilities would be modified. No impact.	Reservoir expansion and construction of new Delta Intake and Pump Station along Old River would not increase the risk inundation by dam or levee failure.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative effects related to drainage, flooding, groundwater recharge or water quality degradation in the project area	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction and operation of Alternative 1 would not make a cumulatively considerable contribution to cumulative effects on drainage, flooding, groundwater recharge or water quality degradation in the project area.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.6: Biological Resources					
NCCP habitat types / CDFG sensitive plant communities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would affect the following NCCP habitat types (CDFG sensitive plant communities in parentheses): Natural Seasonal Wetland (i.e., bulrush-cattail series, northern claypan vernal pool, bush seepweed, and saltgrass series), Valley/Foothill Riparian (i.e., Fremont cottonwood series and valley oak series), Grassland (i.e., purple needlegrass series) and Valley/Foothill Woodland Forest (i.e., blue oak series).	Same as Alternative 1	Same as Alternative 1	Would result in permanent losses to the same sensitive plant communities as Alternative 1 (except for no effects to Northern claypan vernal pool habitat) but to a reduced extent.
Jurisdictional wetlands, waters of the U.S. or the State, and streambeds and banks	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could permanently affect up to 6.3 acres jurisdictional wetlands, waters of the U.S. or the State, or streambeds and banks and temporarily affect 26.79 acres. Total impact is 32.96 acres.	Same as Alternative 1	Same as Alternative 1 except 5.98 acres affected permanently and 3.76 temporarily. Total impact is 9.74 acres.	Same as Alternative 1 except 3.65 acres affected permanently and 0.04 temporarily. Total impact is 3.69 acres.
Special-status plant species	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could affect populations of special-status plant species including brittlescale, San Joaquin spearscale, Brewer's dwarf-flax, and rose-mallow.	Same as Alternative 1	Construction could affect Brewer's dwarf-flax.	No impact.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.6: Biological Resources (cont.)					
California red-legged frog and California tiger salamander habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in impacts on California red-legged frog and California tiger salamander, including aquatic breeding habitat (11 ponds permanently and 5 temporarily) and upland aestivation habitat (1,126 acres permanently and 233 acres temporarily) for these species.	Same as Alternative 1	Slightly less than Alternative 1, affecting150.9 acres less of upland breeding habitat.	Less than Alternative 1, affecting 7 ponds permanently and 5 temporarily of aquatic breeding habitat and,523 acres of upland aestivation habitat for these species.
Western pond turtle populations	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in direct and indirect impacts on existing populations of and habitat for western pond turtle.	Same as Alternative 1	Same as Alternative 1, but to a lesser extent because Transfer-Bethany Pipeline would not be constructed.	Same as Alternative 1, though to a lesser extent because of smaller reservoir and fewer facilities.
Vernal pool species and habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in direct and indirect impacts on 16 ponds containing listed vernal pool branchiopods and their habitat, and on the non-listed midvalley fairy shrimp and curved-foot hygrotus diving beetle.	Same as Alternative 1	Less than Alternative 1 because Transfer-Bethany Pipeline would not be constructed, therefore only 1vernal pool would be affected.	Unlike Alternative 1, there would be no impact upon vernal pool species or habitat because Alternative 4 facilities would not be located near vernal pools.
San Joaquin kit fox habitat and regional movement	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would have temporary and permanent impacts on potential San Joaquin kit fox habitat (approximately 1,500 acres) and permanently reduce potential regional movement opportunities on western side of reservoir.	Same as Alternative 1	Direct kit fox habitat impacts under Alternative 3 would be somewhat less than under Alternative 1 due to the exclusion of the Transfer-Bethany Pipeline.	Direct kit fox habitat impacts under Alternative 4 would be less than under Alternative 1 (819 acres) due to the exclusion of pipeline construction and the smaller reservoir; however Alternative 4 would, like Alternative 1, permanently reduce potential regional movement opportunities on western side of Los Vaqueros Reservoir.
Burrowing owl habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in temporary and permanent loss of habitat for burrowing owl, affecting 233 acres temporarily and 1,126 acres permanently.	Same as Alternative 1	Same as Alternative 1, but affecting 150.9 fewer acres temporarily.	Less than under Alternative 1 due to the exclusion of pipeline construction and smaller reservoir; affecting 19.2 acres temporarily and 522.8 acres permanently.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.6 Biological Resources (cont.)					
Golden eagle, bald eagle, and Swainson's hawk species and habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and operation activities would result in direct and indirect impacts on existing populations of and habitat for golden eagle, bald eagle, and Swainson's hawk.	Same as Alternative 1	Same as Alternative 1, but 150.9 fewer acres affected because of exclusion of Transfer-Bethany Pipeline.	Same as Alternative 1, though to a lesser extent because no facilities constructed outside watershed.
			B (bald eagle)	B (bald eagle)	B (bald eagle)
Alameda whipsnake habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and increased reservoir water levels would result in temporary and permanent loss of potential and occupied habitat for Alameda whipsnake. 6.9 acres permanently impacted and 0.5 acres temporarily impacted.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1, except that 6.4 acres permanently impacted and 0.4 acres temporarily impacted,
Valley elderberry longhorn beetle species and habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could result in direct and indirect impacts on valley elderberry longhorn beetle and its habitat, affecting 45 elderberry shrubs.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1, though lesser inundation area would affect 29 fewer elderberry shrubs.
Breeding bird nest sites and migratory birds	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect active breeding bird nest sites and new powerlines could affect migratory birds	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect designated critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields). 145.4 acres of vernal pool fairy shrimp habitat could be affected, and 98.1 acres of Contra Costa goldfields habitat.	Same as Alternative 1	Unlike Alternative 1, Alternative 3 would have no impact to designated critical habitat for vernal pool species because it does not include the Transfer-Bethany Pipeline.	Unlike Alternative 1, Alternative 4 would have no impact to designated critical habitat for vernal pool species because it does not include the Transfer-Bethany Pipeline.
Local and regional conservation plans and ordinances protecting biological resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project would not result in inconsistency with local and regional conservation plans, or local plans or ordinances protecting biological resources.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.6: Biological Resources (cont.)					
Special-status reptile species (San Joaquin coachwhip and coast horned lizard)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect nonlisted special-status reptile species (San Joaquin coachwhip and coast horned lizard). 943.6 acres to be affected permanently and 252.6 acres affected temporarily.	Same as Alternative 1	Same as Alternative 1, though 150.9 less acres temporarily affected because it does not include Transfer-Bethany Pipeline.	Same as Alternative 1, except 348.3 acres affected permanently and no temporary impacts because no facilities outside watershed to be constructed.
Special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect nonlisted special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse). 943.6 acres to be affected permanently and 252.6 acres affected temporarily.	Same as Alternative 1	Same as Alternative 1, though 150.9 less acres temporarily affected because it does not include Transfer-Bethany Pipeline.	Same as Alternative 1, except 348.3 acres affected permanently and no temporary impacts because no facilities outside watershed to be constructed.
Pacific Flyway species (waterfowl and shorebirds)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Draining the reservoir during project construction could affect Pacific Flyway species, including waterfowl and shorebirds.	Same as Alternative 1	Same as Alternative 1	Unlike Alternative 1, the reservoir would not be fully drained during construction; Alternative 4 impacts to Pacific Flyway species would be less than Alternative 1 effects.
Cumulative effects on special-status species and habitats	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Project construction would not make a cumulatively considerable contribution to cumulative effects on special-status species and habitats.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.7: Land Use					
Divide existing communities of Byron or Discovery Bay	No new facilities would be constructed, no existing facilities would be modified. No impact.	Facilities would not divide established communities.	Same as Alternative 1	Same as Alternative 1	No construction within any established community.
Conflict with any applicable land use plans	No new facilities would be constructed, no existing facilities would be modified. No impact.	Facilities would be located within the CCWD Watershed, on or adjacent to existing water system facility sites or in rural/agricultural areas. Facility siting in these locations would not conflict with applicable land use plans.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.7: Land Use (cont.)					
Conflict with aviation safety policies	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities within designated Airport Land Use Compatibility Zones near the Byron Airport could conflict with aviation safety policies such as height restrictions or nighttime lighting.	Same as Alternative 1	Same as Alternative 1	No construction within Airport Land Use Compatibility Zones near Byron Airport.
Create flight hazards at local airport	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities within the Airport Influence Area for Byron Airport could cause potential temporary flight hazards through: the creation of glare or distracting lights; the generation of dust or smoke, which could impair pilot visibility; or could attract an increased number of birds.	Same as Alternative 1	Same as Alternative 1	No construction within designated Airport Land Use Compatibility Zones near Byron Airport, but other construction could attract avian wildlife and create flight-related hazards.
Cumulative effects related to conflicts with land use plans and policies or dividing an existing community	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	No conflicts with any applicable land use plan or policy adopted for the purpose of reducing or avoiding environmental impacts.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.8: Agriculture					
Temporary affect Important Farmland	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could temporarily affect about 171 acres of Important Farmlands. This would represent less than 0.4 percent of the 41,619 acres of Important Farmlands in Contra Costa County. No Important Farmlands are within the project area in Alameda County.	Same as Alternative 1	Alternative 3 would temporarily affect up to 149 acres of Important Farmland, compared to 171 acres for Alternative 1. This represents about 0.3 percent of Important Farmlands in Contra Costa County.	Unlike Alternative 1, Alternative 4 would not temporarily affect any Important Farmlands.
Permanently convert Important Farmland	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction of a new Delta Intake and Pump Station would result in permanent conversion of about 22 acres of Important Farmland and could result in additional long-term loss of Important Farmland if protective measures are not taken during construction.	Same as Alternative 1	Unlike Alternative 1, no permanent conversion of Important Farmland would result from Alternative 3 since there would be no construction of a new Delta Intake and Pump Station; however, Alternative 3 could result in long-term loss of Important Farmland if protective measures are not taken during construction.	Unlike Alternative 1, Alternative 4 would not result in permanent conversion any Important Farmlands since there would be no construction of a new Delta Intake and Pump Station.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.8: Agriculture (cont.)					
The project would not conflict with zoning for agricultural use or a Williamson Act contract.	No new facilities would be constructed, and no changes in CCWD facilities or operations would conflict with zoning for agricultural use or a Williamson Act contract.	Under Alternative 1, up to nine properties with Williamson Act contracts would be temporarily affected by construction of pipelines because these facilities would require acquisition of temporary construction easements, and in the case of the Transfer-Bethany Pipeline, a temporary construction plus a permanent utility easement.	Same as Alternative 1	Under Alternative 3, up to four properties under Williamson Act contracts would be affected by construction of the Delta-Transfer Pipeline, the Transfer-LV Pipeline, and Power Option 1, which is less contracted land would be affected than under Alternative 1.	Unlike Alternative 1, under Alternative 4 there would be no land under Williamson Act Contracts affected by the project.
Cumulative temporary effects upon agricultural land and long-term conversion of Important Farmlands to non-agricultural uses	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	The incremental contribution of farmland conversion associated with Alternative 1 would be a cumulatively considerable contribution to an existing significant cumulative impact.	Same as Alternative 1	Unlike Alternative 1, no incremental contribution of farmland conversion would result from Alternative 3; however, Alternative 3 could result in long-term effects upon Important Farmland if protective measures not taken during construction.	Alternative 4 would not contribute to cumulative adverse impacts related to agriculture.
Section 4.9: Transportation and Circulation					
Traffic congestion during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project construction activities would intermittently and temporarily increase traffic congestion due to vehicle trips generated by construction workers and construction vehicles on area roadways.	Same as Alternative 1	Similar to but less than Alternative 1	Much less than Alternative 1
Access and emergency services disruption and creation of traffic safety hazards during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project construction activities would intermittently and temporarily impede access to local streets or adjacent uses, including access for emergency vehicles and could substantially increase traffic hazards due to construction in or adjacent to roads or possible road wear.	Same as Alternative 1	Similar to Alternative 1	No impact.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.9 :Transportation and Circulation (cont.)					
Traffic safety hazards during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project construction activities would intermittently and temporarily increase potential traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways due to increased traffic volumes.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative transportation and circulation effects	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Project construction, when combined with construction of other future projects, could contribute to construction-related short-term cumulative impacts to traffic and transportation (traffic congestion, access disruption, and traffic safety).	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.10: Air Quality					
Criteria air pollutant emissions / Federal general conformity	No facilities would be constructed and no impacts associated with criteria air pollutants would result.	Construction would generate short-term emissions of criteria air pollutants: ROG, NOx, CO, and PM10 that could potentially contribute to existing nonattainment conditions and further degrade air quality. However, this alternative would not exceed federal general conformity *de minimis* standards for emissions.	Same as Alternative 1	Same as Alternative 1, though emissions would be less intense because Transfer-Bethany Pipeline and new Delta Intake and Pump Station would not be constructed.	Same as Alternative 1, though emissions would be less intense because no facilities outside watershed would be constructed.
Violation of applicable air quality standards	No facilities would be constructed and no violation of applicable air quality standards would result.	Operation would not result in emissions of criteria air pollutants at levels that would substantially contribute to a potential violation of applicable air quality standards or to nonattainment conditions.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Expose sensitive receptors to substantial pollutant concentrations	No facilities would be constructed and no impacts associated with substantial pollutant concentrations would result.	Construction and/or operation would not expose sensitive receptors to substantial pollutant concentrations.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.10: Air Quality (cont.)					
Objectionable odors	No facilities would be constructed and no impacts associated with objectionable odors would result.	Operation would not create objectionable odors affecting a substantial number of people.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative greenhouse gas emissions	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and operation would not make a cumulatively considerable contribution to greenhouse gas emissions. CCWD would continue to implement actions to reduce GHG emissions of its overall water system enterprise.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative air quality effects	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction could result in cumulatively considerable increases of criteria pollutant emissions. Operation would not make a cumulatively considerable contribution to regional air quality impacts.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.11: Noise					
Exceed local noise standards during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Facilities construction would generate noise levels that exceed noise thresholds at nearby sensitive receptors if construction activities are carried out during noise-sensitive hours.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Exceed local noise standards during operation	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project operations would generate traffic, stationary source, and area source noise similar to existing noise associated with operation of Los Vaqueros Reservoir system and would not exceed County noise requirements.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Ground-borne vibration or noise.	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not expose persons to or generate excessive ground-borne vibration or ground-borne noise levels.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.11: Noise (cont.)					
Cumulative effects of construction and operation noise and vibration	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative noise or vibration impacts.	No cumulatively considerable contribution to operational noise levels or ground-borne vibration. Potential for cumulative noise impacts if construction overlaps with other projects in the vicinity (i.e., Cecchini Ranch, Brentwood Solid Waste Transfer Facility Expansion and/or various road safety improvements).	Same as Alternative 1	Same as Alternative 1	No cumulative noise effects.
Section 4.12: Utilities and Public Service Systems					
Disrupt utility services / public health hazard	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could temporarily disrupt utility services during construction such that a public health hazard could be created or an extended service disruption could result.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Require or result in new or expanded utility infrastructure or public service facilities that result in substantial adverse physical impacts	No new facilities would be required, no existing facilities would be modified. No impact.	Alternative 1 would not require or result in construction of new or expanded utility infrastructure or public service facilities that would result in substantial adverse physical impacts.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Solid waste generation / exceed the capacity of local landfills.	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities would generate solid waste for disposal but this would not exceed the capacity of local landfills.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative effects upon public services and utilities, or local landfill capacity	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative utility or public service impacts.	Construction could result in cumulatively considerable contributions to cumulative effects on public services and utilities, and local landfill capacity.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.13: Hazardous Materials / Public Health					
Health risks during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction not create significant health risks due to exposure to subsurface soils and groundwater during construction.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Accidental release of hazardous materials during construction or operation	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction or operation could, through routine transport, use or disposal, accidentally release hazardous materials thereby exposing construction workers, project personnel and the public to hazardous materials or accidentally releasing hazardous materials into the soil, groundwater, and/or a nearby surface water body.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Wildland fires	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could result in improper handling or use of flammable or combustible materials such as internal combustion equipment could result in wildland fires, exposing people or structures to a significant risk of loss, injury, or death.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Electric and magnetic fields (EMF)	No new facilities would be constructed; no effects on public health or safety related to EMF.	Construction project power supply facilities would not locate electrical transmission facilities within 150 feet of a school and there would be no EMF effects.	Same as Alternative 1, impacts under Alternative 2 would be Less than Significant	Same as Alternative 1, impacts under Alternative 3 would be Less than Significant	Unlike Alternative 1, there would be no effects under Alternative 4
Cumulative effects associated with hazardous materials, public health, accidental hazardous material spills, wildland fires or EMF	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction or operation would not cause cumulatively considerable contributions to any significant cumulative effect related to hazardous materials or public health, accidental hazardous material spills, wildland fires or exposure to EMF.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.14: Visual/Aesthetic Resources					
Negative aesthetic effect on a scenic vista.	No new facilities would be constructed, no existing facilities would be modified. No impact.	Would not have a substantial, demonstrable negative aesthetic effect on a scenic vista.	Same as Alternative 1	Under Alternative 3, construction activities and facility siting impacts would be less than Alternative 1.	Alternative 4 impacts would be less than Alternative 1 due to a smaller reservoir expansion (160 TAF only) and fewer project components.
Degrade the existing visual character or quality	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities and facility siting would result in a weak visual contrast and would not dominate nor obstruct the views of the public or recreational users; therefore, Alternative 1 would not substantially degrade the existing visual character or quality of the site and its surroundings.	Same as Alternative 1	Under Alternative 3, construction activities and facility siting impacts would be less than Alternative 1.	Unlike Alternative 1, Alternative 4 impacts associated with the 160 TAF Borrow Area would substantially degrade the existing visual character and quality of the site and its surroundings
New source of light or glare	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and operations would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users. However, a conductor within an area where no transmission lines currently exist could result in a noticeable visual change during the daytime. Therefore, operation of Power Option 1 could result in a new source of substantial glare that would be visible to the public from SR 4.	Same as Alternative 1	Construction and operational impacts would be less than Alternative 1, though Alternative 3 includes the conductor and therefore could result in a new source of substantial glare.	Unlike Alternative 1, Alternative 4 would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users
Cumulative effects upon scenic vistas, visual character or quality, or new sources of light or glare	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	No cumulatively considerable contribution to adverse effects on visual/aesthetic resources in the project area or broader region.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.15: Recreation					
Loss of recreation areas	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would require closure of Los Vaqueros Watershed to the public during the 3-year construction period and additional 2-year restriction for water-related activities causing short-term loss of recreation areas and activities provided in the watershed (fishing boating, hiking, picnicking, interpretive center). Following construction, CCWD Watershed would reopen to the public with similar but expanded recreational facilities and use areas. There would be no long-term adverse effects on recreation; there would be long-term benefits.	Same as Alternative 1	Same as Alternative 1	Alternative 4 construction would be of shorter duration (2 years) with no additional time restriction for water-related activities. Alternative 4 requires less recreation facility replacement and relocation. Similar to Alternative 1, it would have short term effects and long-term benefits.
Increased use of existing parks or recreational facilities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	Same as Alternative 1	Same as Alternative 1	Alternative 4 construction would be of shorter duration (2 years) and similar to Alternative 1 would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
Cumulative effects on recreation facilities, opportunities or experiences	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	No cumulatively considerable contribution that would reduce recreational opportunities, increase the use of existing neighborhood and regional parks, or otherwise contribute to a cumulative effect on recreation facilities, opportunities or experiences.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.16: Cultural and Paleontological Resources					
Disturbance of historical or archaeological resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Potential to impact 41 known historical resources, the Reburial site, and the Kellogg Creek Historic District due to construction and/or operation. There are additional areas of moderate to high potential for undiscovered cultural resources as well as human remains within the APE.	Same as Alternative 1	Alternative 3 would result in similar but less impact than Alternative 1 because the Transfer-Bethany Pipeline would not be constructed; potential effect on 39 historic resources rather than 41. Impacts to the Kellogg Creek Historic District and historic resources within the district would remain the same as Alternative 1	Alternative 4 would result in less impact than Alternative 1, affecting 15 historic properties (26 fewer than Alternative 1), as well as the Reburial site and Kellogg Creek District. Potential effects to previously unidentified cultural resources would be reduced compared to Alternative 1 because fewer facilities would be constructed.
Paleontological resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Earth disturbing activities could intersect and destroy fossil resources within certain sedimentary formations since the depth to bedrock associated with the majority of the APE would be less than 6 feet.	Same as Alternative 1	Although Alternative 3 components involve less area with depth to bedrock of less than 6 feet when compared to Alternative 1, earth disturbing activities and associated impacts to paleontological resources would be less but similar to Alternative 1.	Although Alternative 4 components involve much less area with depth to bedrock of less than 6 feet when compared to Alternative 1, earth disturbing activities and associated impacts to paleontological resources would be less but similar to Alternative 1.
Disturbance of human remains	No new facilities would be constructed, no existing facilities would be modified. No impact.	Impact to five known burial sites as well as the Reburial site. Ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains.	Same as Alternative 1	Alternative 3 would result in the similar effects as Alternative 1 on known human remains and the Reburial site because the impacts are caused by construction of facilities common to both alternatives. Alternative 3 also proposes ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains. Although there are no known burial sites within the APE for the Old River Intake and Pump Station Expansion and no potential impacts on known sites with human remains are expected, overall effects to	Alternative 4 would not affect the Reburial site and would have fewer impacts to known human remains when compared to Alternative 1. While the extent of impacts would be less, the nature of the impacts on known and previously unrecorded human remains would be equivalent to those from Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.16: Cultural and Paleontological Resources (cont.)					
Disturbance of human remains (cont.)				known and previously unrecorded human remains under Alternative 3 would be similar to Alternative 1.	
Cumulative effects associated with disturbance of historical, archaeological or paleontological resources or disturbance of human remains	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction of the project and proposed Vasco Wind Energy Repowering Project could contribute to cumulative cultural resource impacts. Construction of these and additional area projects would result in a significant cumulative impact to paleontological resources. Construction would not result in cumulative impacts associated with disturbance of human remains.	Same as Alternative 1	Cumulative impacts to paleontological resources would be less but similar to Alternative 1. Cumulative effects to cultural resources would be the same as Alternative 1.	Cumulative impacts to paleontological resources would be less but similar to Alternative 1. Cumulative effects to cultural resources would be similar to but less than Alternative 1.
Section 4.17: Socioeconomic Effects					
Local income and employment	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could temporarily generate new income and local employment affecting Contra Costa County's economy and resulting in beneficial impacts to the local economy.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Agricultural effects upon local economy	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction effects upon Contra Costa County and Alameda County's agricultural economy would be very minor.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Recreation income effects upon local economy	No new facilities would be constructed, no existing facilities would be modified. No impact.	Short-term loss of recreation income associated with project construction effects upon Contra Costa County's economy would be very minor.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1, though less impact due to shorter duration of construction.
Cumulative effects upon local income and employment	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction, when combined with construction of other future projects, could beneficially effect on income and local employment.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.17: Socioeconomic Effects (cont.)					
Cumulative effects upon local agricultural economy	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	The incremental contribution of farmland conversion would be a cumulatively considerable contribution to an existing cumulative impact and would therefore be unavoidable.	Same as Alternative 1	Cumulative effects would not be cumulatively considerable because no important farmland would be converted.	Cumulative effects would not be cumulatively considerable because no important farmland would be converted.
Cumulative effects of recreation income upon local economy	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Cumulative economic impacts from project-related construction and relocation of the recreation facilities would be minor.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.18: Environmental Justice					
Disproportionately affect identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Relatively little construction would occur near the Byron CDP and none in Census Tract 3031.00, therefore construction impacts to areas with minority or low-income populations would not cause a disproportionate impact to the minority and low-income community in the area.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would not implement any project activities within 2 miles of Census Tract 3031.00 or the Byron CDP, and could not cause a disproportionate impact to the minority and low-income communities in the area.
Disproportionately affect local employment opportunities for identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Employment opportunities including apprentice positions could result in minor beneficial effects that would be equally available to all populations.	Same as Alternative 1	Alternative 3 would involve less construction, reducing opportunities for local employment; however, these jobs would be equally available to communities of concern.	Alternative 4 would involve much less construction, reducing opportunities for local employment; however, these jobs would be equally available to communities of concern.
Cumulative effects upon identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction effects would not disproportionately affect nearby minority and/or low-income communities.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would not implement any project activities within 2 miles of Census Tract 3031.00 or the Byron CDP, and could not cause a cumulative disproportionate impact to the minority and low-income communities in the area.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.18: Environmental Justice (cont.)					
Cumulative effects upon local employment opportunities for identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction and operation would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would involve much less construction, reducing cumulative opportunities for local employment; however, jobs would be equally available to communities of concern.
Section 4.19: Indian Trust Assets					
Indian Trust Asset land affected	No Trust land affected.	The project would not affect Indian Trust Assets.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.20: Growth-Inducing Effects					
Growth Inducement	It is expected that the South Bay water agencies would pursue supplemental water supplies to support planned growth within their service areas in accordance with their long-term water supply and management plans and Urban Water Management Plans (updated in five-year increments). CCWD would continue to serve planned growth in its services area in accordance with its Future Water Supply Plan and as planned to secure dry-year supplies to maintain supply reliability.	This alternative would improve water supply reliability of the South Bay water agencies and CCWD. It would restore some of the Delta supply the South Bay water agencies have previously planned to receive. This alternative would not support growth beyond that already planned for by the South Bay water agencies and CCWD. However, this alternative would improve water supply reliability for South Bay water agencies and CCWD compared with existing and future without project conditions.	No growth-inducing potential for South Bay water agencies; improved water supply reliability for CCWD	No growth inducing potential for South Bay water agencies; improved water supply reliability for CCWD	No growth-inducing potential for South Bay water agencies; improved water supply reliability for CCWD

CHAPTER 7
Environmental Review and Agency Consultation/Coordination

Since the initial phases of project development beginning in 2001, CCWD and Reclamation have engaged and consulted with agencies, stakeholders, landowners, and the general public. These consultations assisted the lead agencies in determining the scope of the EIS/EIR, identifying the range of alternatives and mitigation measures, and defining potential environmental impacts and impact significance. Consultation included informal agency communications, formal interagency meetings, and public meetings. CCWD and Reclamation will continue to solicit public and agency input on the project by encouraging review of this Draft EIS/EIR. As noted previously, CCWD is the lead agency pursuant to CEQA and Reclamation is the lead agency pursuant to NEPA.

This chapter summarizes public and agency involvement activities undertaken by CCWD and Reclamation that have been conducted to date for this project, and which satisfy NEPA and CEQA requirements for public scoping and agency consultation and coordination. Appendix F, EIS/EIR Distribution List presents the entities receiving a copy of the Draft EIS/EIR.

7.1 Stakeholder Consultation

The Los Vaqueros Reservoir Expansion Project communication strategy involves informing the public about the project, as well as engaging agencies and stakeholders to partner and collaborate together to move the project forward for public and agency review. An extensive public and stakeholder involvement process was implemented, which included a Customer and Stakeholder Feedback Group, an Agency Coordination Work Group (ACWG), public workshops, stakeholder and agency meetings, newsletters and a project website. Between 2001 and the public scoping process in early 2006, the lead agencies conducted more than 170 meetings with regional water task forces, city and county governments and local water agencies (approximately 100), elected officials (approximately 15), media (approximately 10), other Delta-related projects, environmental and stakeholder groups, homeowners associations in the project area, and potentially affected landowners (approximately 45).

Outreach activities have included continuous coordination with and input from public agencies including the Department of Water Resources (DWR), U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (DFG), National Marine Fish Service (NMFS), and local water agencies through regularly held ACWG meetings and additional briefings. CCWD has presented at various CALFED-related public meetings including environmental justice workshops and tribal forums. Meetings have been held with agency staff working as part of

multi-agency CALFED workgroups, as well as staff working only for their respective agencies on non-CALFED-related activities. CCWD regularly participates in the CALFED Bay-Delta Public Advisory Committee, Water Supply Subcommittee together with representatives from Reclamation, DWR, CALFED Bay-Delta Authority, statewide water agencies, and stakeholders.

7.2 Notice of Preparation and Notice of Intent

Reclamation and CCWD notified interested parties of the scoping period and upcoming public scoping meetings through electronic and postal service mailings and through publication of a Notice of Intent (NOI) and Notice of Preparation (NOP) consistent with NEPA and CEQA, respectively.

Reclamation published a NOI in the Federal Register on December 20, 2005 to advise interested agencies and the public that an EIS would be prepared. On January 10, 2006, CCWD published and distributed a NOP to advise interested agencies and the public that an EIR would be prepared. CCWD distributed the NOP to approximately 80 agencies, elected officials, and interested parties.

7.3 Public Scoping

Public scoping activities are conducted as part of compliance with both NEPA and CEQA, but are more formalized under NEPA. Scoping is intended to assist in identifying the final range of actions, alternatives, site design options, environmental resources, and mitigation measures that will be analyzed in an environmental document. The scoping process helps ensure that problems are identified early and properly studied and also helps to eliminate from detailed study those issues that are not critical to the decision at hand.

The approximately 70-day scoping comment period extended from December 20, 2005 through February 28, 2006. The public was invited to submit written comments on the scope, content, and format of the environmental document by mail, fax, or email to representatives at CCWD and Reclamation.

7.3.1 Scoping Meetings

During the Public Scoping Process, Reclamation and CCWD conducted four formal scoping meetings to gather input and comments prior to the development of the EIS/EIR. The tabulation below shows the dates and locations of the four meetings. Approximately 55 people attended the four meetings.

Sacramento, CA
Tuesday, January 24, 2006
1:30 to 3:30 p.m.
Department of Water Resources
Bonderson Building
(Public Hearing Room – 1st Floor)
901 P Street
Sacramento, CA 95814

Antioch, CA
Tuesday, January, 24, 2006
6:00 to 8:00 p.m.
Veteran's Memorial Building, Legion Hall
403 West 6th Street
Antioch, CA 94509

Livermore, CA
Wednesday, January 25, 2006
6:00 to 8:00 p.m.
Martinelli Event Center
Agricultural Center
3583 Greenville Road
Livermore, CA 94550

Concord, CA
Thursday, January 26, 2006
6:00 to 8:00 p.m.
Contra Costa Water District
1331 Concord Avenue
Concord, CA 94520

The format of each public meeting program was identical and began with a 45-minute open house during which participants could view exhibit boards with project information including an overview of the regional context, project objectives and purposes, possible alternatives, environmental issues, the environmental review process, and the project schedule. Participants were also encouraged to ask informal questions of project team members to understand the project objectives and alternatives.

Participants were encouraged to sign in and were provided with materials including an agenda, open house program, presentation slides, comment card, and speaker card. Copies of the NOI and NOP were available upon request.

A formal 15-minute presentation focused on the process, schedule, and role of public comments. Following the presentation, 60 minutes were allotted for public comments on the scope, content, and format of the environmental document. Comments were accepted in writing; a court reporter recorded oral comments. The informational materials, presentation slides, and exhibit boards used during the scoping meetings as well as the written and oral scoping comments, attendance sheets and meeting summaries are included in the project Scoping Report, described below.

7.3.2 Scoping Report

A Scoping Report was prepared and is included in Appendix A, Notices and Public Involvement of this Draft EIS/EIR. The report outlines the process and outcome of the scoping meetings and other activities.

Specifically, this report includes an overview of scoping requirements; a list of all documents / products generated for project outreach; a summary of all comments made during the scoping process, both written and verbal; a description of the issues anticipated to be addressed in the EIS/EIR; and an appendix that includes hard copies of all written comments, summaries of the scoping meetings, and other project-related print materials used to inform interested parties about the project alternatives and the EIS/EIR.

7.3.3 Public Information Materials

In addition to the NOP, NOI, and Scoping Report, numerous informational materials were publicly distributed to inform stakeholders about the Los Vaqueros Reservoir Expansion Project and to solicit their input. These materials are described below.

Press Release

Interested parties were notified about the public scoping meetings through a press release. The press release provided basic information; date, time, and location of meetings; and a brief explanation of the public scoping process and encouraged recipients to attend the open house/public scoping meetings. Reclamation distributed the press release on January 5, 2006.

CCWD Newspaper Notices

CCWD published a display advertisement in the Central Zone and East Zone editions of the *Contra Costa Times*, the primary newspaper in CCWD's service area, on Wednesday, January 18, 2006, and Sunday, January 22, 2006. In addition, a legal advertisement was published Thursday, January 19, 2006. The advertisements announced CCWD and Reclamation's intention to prepare an EIS/EIR, the places and times of the scoping meetings, CCWD contact information, and the availability of information on CCWD's project web site.

Reclamation News Release

Reclamation issued a news release on January 27, 2005, announcing the scoping meetings and soliciting public input on the project. The distribution list included 48 recipients, including newspapers; radio stations; television stations; water districts; and interested agencies, groups, and organizations.

Web Sites

An electronic copy of the meeting display advertisement was posted on the CCWD project web site, www.lvstudies.com, and the Reclamation project web site, www.usbr.gov/mp/vaqueros.

General Notification Flyer

Reclamation prepared and CCWD mailed a notification flyer to approximately 2,000 interested organizations, agencies, elected officials, and residents on January 12, 2006.

7.4 Additional Steps in the Environmental Review Process

In accordance with CEQA and NEPA requirements, this Draft EIS/EIR will be circulated for public and agency review and comment for a 60-day period following the publishing of the Notice of Availability (NOA) of the EIS by the U.S. Environmental Protection Agency (EPA), and filing of the Notice of Completion (NOC) with the California State Clearinghouse.

Similar to the approach to public scoping, public hearings have been scheduled throughout the greater project area to receive public input on the Draft EIS/EIR. Public hearings, to be located in Concord, Dublin, Livermore, Oakley, and Sacramento, will be held during the public comment period so that any comments received at the meetings can be addressed in the Final EIS/EIR. In addition, written comments from the public, reviewing agencies and stakeholders will be accepted

during the public comment period. Following consideration of these comments by CCWD and Reclamation, a Final EIS/EIR will be prepared and circulated per NEPA and CEQA requirements that will include responses to all comments. CCWD and Reclamation will use the Final EIS/EIR when considering approval of one of the project alternatives. Once a project is approved, CCWD will adopt CEQA findings and issue a Notice of Determination (NOD) and Reclamation will issue a Record of Decision (ROD) to document that decision.

7.5 Ongoing Agency and Stakeholder Consultation and Coordination

CCWD and Reclamation will continue to proactively engage interested agencies and stakeholders throughout the NEPA, CEQA, and project permitting processes. In particular, CCWD and Reclamation will continue to have regular meetings with NMFS, USFWS, and DFG. CCWD will continue regular interactions with local, state and federal agencies through the ACWG. CCWD will also meet as needed with other agencies with potential permitting authority over the approved project including U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board, State Water Resources Control Board, Reclamation Districts 2040 and 800, California State Office of Historic Preservation, Bay Area Air Quality Management District, and others.

7.6 Compliance with Federal Statutes and Regulations

The following sections describe relevant federal laws, executive orders, and policies, and the status of compliance. **Table 7-1** summarizes the status of consultation for the requirements that must be met by Reclamation and CCWD before the Los Vaqueros Reservoir Expansion project can be built and operation of facilities implemented.

Compliance with most of these regulations is an ongoing process being conducted in coordination with preparation of this EIS/EIR. The information and analysis in relevant sections of this Draft EIS/EIR will be used in the regulatory compliance process. For example, Section 4.6 Biological Resources identifies loss of wetlands under Section 404 of the Clean Water Act as an issue for the reservoir expansion project, assesses the potential for impacts and recommends mitigation measures to address those impacts. This analysis will be used to apply for a USACE permit under Section 404 of the Clean Water Act. During and after construction, relevant permit conditions will be adhered to as a requirement for project implementation.

7.6.1 Federal Endangered Species Act

Pursuant to the Federal Endangered Species Act (FESA), USFWS and NMFS have authority over projects that may result in take of a federally listed species. Under FESA, 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 FESA, or a federal interagency consultation, under Section 7 of FESA, is required.

TABLE 7-1
SUMMARY OF ENVIRONMENTAL COMPLIANCE FOR THE PROPOSED PROJECT

Requirements	Status of Compliance/Expected Completion
National Environmental Policy Act	Ongoing until this EIS/EIR Record of Decision published.
California Environmental Quality Act	Ongoing until this EIS/EIR document certified and mitigation met.
Federal Endangered Species Act and California Endangered Species Act	Ongoing until project Biological Opinion issued (see Sec. 4.6 Biological Resources).
Magnuson-Stevens Fishery Conservation and Management Act	Ongoing until project Biological Opinion issued (see Sec. 4.3 Delta Fisheries and Aquatic Resources).
Fish and Wildlife Coordination Act	Ongoing until Fish and Wildlife Coordination Act Report issued (see Sections 4.3 Delta Fisheries and Aquatic Resources and 4.6 Biological Resources).
Clean Water Act Section 401	CCWD will apply for Water Quality Certification after EIS/EIR is approved and project design underway (see Sec. 4.5 Local Hydrology, Drainage, and Groundwater).
Clean Water Act Section 404	CCWD will apply for Wetland Permit after the EIS/EIR is approved and project design underway (see Sec. 4.6 Biological Resources).
Clean Air Act	In compliance. Conformity analysis is not required. (see Sec. 4.10 Air Quality).
National Historic Preservation Act and Native American Consultation	Ongoing. Once Section 106 review process is completed, the project will proceed in accordance with conditions stipulated in the agreement with the State Historic Preservation Officer and appropriate agencies (see Section 4.16 Cultural and Paleontological Resources).
Executive Order 11988 - Floodplain Management	Ongoing. The project complies by using this EIS/EIR to identify and assess project effects (see Section 4.5 Local Hydrology, Drainage, and Groundwater).
Executive Order 11990 - Protection of Wetlands	CCWD will apply for Wetland Permit after the EIS/EIR is approved and project design underway (see Sec. 4.6 Biological Resources).
Executive Order 12898 - Environmental Justice	In compliance based on EIS/EIR Sec. 4.18 Environmental Justice.
Migratory Bird Treaty Act	Reclamation and CCWD will comply with provisions of the Migratory Bird Treaty Act (see Sec.4.6 Biological Resources).
California Fish and Game Code (Section 1600 Lake or Streambed Alteration Agreement Program)	Ongoing. The project complies with Section 1600 by using this EIS/EIR to identify and address expected project effects (Sec.4.6 Biological Resources).
Caltrans Encroachment Permit	As needed, CCWD will apply for a Caltrans Encroachment Permit to construct within Caltrans right-of-way prior to construction (see Sec. 4.9 Transportation and Circulation).
Disabilities Regulations - Americans with Disabilities Act, Rehabilitation Act, and Architectural Barriers Act	Project will adhere to the construction guidelines of the Uniform Federal Accessibility Standards and comply with regulations proposed for incorporation into the Americans With Disabilities Act Accessibility Guidelines as a part of design for individual facilities.
Farmland Protection Policy Act	Ongoing. (see 4.8 Agriculture).
Section 10 of the Rivers and Harbors Act of 1899	Ongoing. This regulation is addressed in coordination with wetlands regulations (see Clean Water Act, Section 404, above).
NPDES Construction Stormwater Permit	CCWD will comply by preparing and using a Storm Water Pollution Prevention Plan at the time of construction (see Sec. 4.5 Local Hydrology).
General Order for Dewatering and Other Low Threat Discharge to Surface Waters	CCWD will comply by preparing and using a permit at the time of construction (see Sec. 4.5 Local Hydrology, Drainage and Groundwater).

Either an Action Specific Implementation Plan (ASIP) or a Biological Assessment (BA) could be used to address both FESA and the California Endangered Species Act (CESA) as well as the California Natural Community Conservation Planning Act (NCCPA) consultation requirements of federal and state agencies. The ASIP or BA will be prepared for the selected project alternative. Reclamation will initiate formal consultation with USFWS and NMFS. USFWS and NMFS will then use the ASIP or BA to develop biological opinions for the selected project alternative. DFG will use the ASIP or BA to address compliance with CESA and NCCPA.

7.6.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) ensures that fish and wildlife receive equal consideration during planning and construction of federal water projects. The FWCA requires that USFWS's views be considered when evaluating impacts and determining mitigation needs. USFWS is preparing the FWCA Report and has conducted Habitat Evaluation Procedures analyses for most of the proposed project facility sites to date. USFWS continues to participate in ACWG meetings reviewing preparation of the Draft EIS/EIR impact analysis. USFWS also participates in additional work group meetings focused on the analyses and documentation conducted in compliance with related environmental regulations including the ASIP process for compliance with FESA and CESA.

7.6.3 Clean Water Act

The Clean Water Act (CWA) is the primary surface water protection legislation throughout the country. The 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." The U.S. Environmental Protection Agency (EPA) is the federal agency with primary authority for implementing regulations adopted pursuant to the CWA, and has delegated the authority to implement and oversee most of the programs authorized or adopted for CWA compliance to USACE and the Regional Water Quality Control Boards (RWQCB).

Under Section 404(b)(1) of the CWA, the Least Environmentally Damaging Practicable Alternative (LEDPA) must be identified from among those alternatives considered in detail in the EIS/EIR. If a federal agency is a partner in the implementation of a project, then the Proposed Action/Project must be recognized as the LEDPA. A 404(b)(1) evaluation will be included with the Final EIS/EIR pursuant to the CWA to provide required information on the potential effects of the proposed action/project regarding water quality and rationale in support of identifying the LEDPA. This Draft EIS/EIR will be reviewed by concerned public and stakeholders with the opportunity to provide comments on the alternatives and documentation before making determinations of the Proposed Action/Project, LEDPA, environmentally preferred alternative, and environmentally superior alternative in the Final EIS/EIR.

Construction of the proposed project, including construction of the proposed intake facilities, pipelines, expanded reservoir, appurtenant facilities, and other associated facilities, would be subject to regulation under Sections 401, 402, and/or 404 of the Clean Water Act. CCWD and Reclamation have participated in a pre-application meeting with USACE, and CCWD will

prepare and submit an application for Section 404 compliance in the near future. CCWD will also be seeking a Section 401 water quality certification from the Central Valley RWQCB.

7.6.4 Section 10 of the Rivers and Harbors Act of 1899

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 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.

CCWD will obtain the necessary permits from USACE prior to beginning any project-related work in navigable waters.

7.6.5 Section 106 of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended in 1992) requires federal agencies to evaluate the effects of federal undertakings on historical, archaeological, and cultural resources, and to consult with the Advisory Council on Historic Preservation concerning potential effects of federal actions on historic properties. Before federal funds are approved for a particular project or prior to the issuance of any license, the effect of the project on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register shall be evaluated. The effects of the proposed Los Vaqueros Reservoir Expansion Project on historical, archeological, and cultural resources are evaluated in Section 4.16 Cultural and Paleontological Resources.

To comply with the NHPA, notices of public meetings for this project will be sent to the State Historic Preservation Officer (SHPO), which acts as an intermediary for the Advisory Council on Historic Preservation. A copy of this Draft EIS/EIR will be sent to SHPO, as a unit of the California Department of Parks and Recreation, requesting its review and soliciting input on the project. CCWD and Reclamation will coordinate with the Advisory Council on Historic Preservation and SHPO, consistent with Section 106 of the NHPA.

7.6.6 Indian Trust Assets and Native American Consultation

Indian Trust Assets

An Indian Trust Asset (ITA) is defined by Reclamation as a legal interest in an asset that is held in trust by the U.S. Government for Indian tribes or individual tribal members. Examples include. land assets held in trust for individual tribal members, more specifically referred to as allotments, or as in the case of allotments created out of public domain lands - Public Domain Allotments (PDAs). An Indian trust has three components: 1) the trustee, 2) the beneficiary, and 3) the trust asset. ITAs can include water rights, lands, minerals, hunting and fishing rights, money, and claims.

Beneficiaries of the Indian trust relationship are federally recognized Indian tribes and individual tribal members with trust land; the United States is the trustee.

By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The definition and application of the U.S. trust relationship has been defined by case law that supports Congressional acts, executive orders, and historical treaty provisions. The project alternatives would not be implemented on or affect tribal lands, areas where mineral or water rights may be held by a tribe, traditional hunting or fishing grounds, or other ITAs. The potential for the project to affect significant Native American sites is addressed in Section 4.19 Indian Trust Assets.

Native American Consultation

Implementing regulations for Section 106 require that federal agencies identify potentially affected Indian tribes that might have knowledge of sites of religious and cultural significance in the area of potential effects (APE) (36 CFR 800.3[f][2]). If any such properties exist, the regulations require that federal agencies invite Indian tribes to participate in the Section 106 process as consulting parties. Consultation with the Native American Heritage Commission is ongoing.

7.6.7 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 nonagricultural 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. Agricultural resources are addressed in Section 4.8 “Agriculture”. CCWD and Reclamation will submit this Draft EIS/EIR to the NRCS for its comment.

7.6.8 Executive Order 11988 (Floodplain Management)

Executive Order 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 the Order 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.

CCWD and Reclamation have considered Executive Order 11988 in their development of this Draft EIS/EIR and have complied with this order.

7.6.9 Executive Order 11990 (Protection of Wetlands)

The purpose of Executive Order 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, the Order requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The Order applies to:

- acquisition, management, and disposition of federal lands and facilities construction and improvement projects which are undertaken, financed or assisted by federal agencies; and
- federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

CCWD and Reclamation have considered Executive Order 11990 in their development of this Draft EIS/EIR and have complied with this order. CCWD has taken a number of actions to minimize project effects on wetlands (see Section 4.6 Biological Resources) and will be pursuing a CWA Section 404 permit from the USACE.

7.6.10 Executive Order 12898 (Environmental Justice)

Executive Order 12898, Section 2-2, requires all federal agencies to conduct programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color or national origin. Section 1-101 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority and low-income populations. This Draft EIS/EIR has identified and described the project's potential to result in disproportionately high and adverse human health or environmental effects on minority and low-income populations (see Section 4.18 Environmental Justice), as required by this order.

CHAPTER 8
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CHAPTER 9
List of EIS/EIR Preparers

This EIS/EIR was prepared by CCWD and Reclamation. A list of persons who prepared various sections of the EIS/EIR, significant background materials, or participated to a significant degree in preparing the EIS/EIR is presented below and in **Table 9-1**.

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TABLE 9-1
LIST OF PREPARERS

Name	Qualifications	Participation
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TABLE 9-1 (Continued)
LIST OF PREPARERS

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TABLE 9-1 (Continued)
LIST OF PREPARERS

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CHAPTER 10
Glossary

100-year flood	The flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years.
acre-foot (AF)	The volume of water that would cover 1 acre to a depth of 1 foot. Equal to 1,233.5 cubic meters (43,560 cubic feet).
Action Specific Implementation Plan (ASIP)	Document that may serve as a biological assessment for compliance with Section 7 of the Federal Endangered Species Act and the natural community conservation plan for compliance with the California Endangered Species Act and the California Natural Community Conservation Planning Act.
Alternative Intake Project (AIP)	The new CCWD intake, currently under construction and expected to be operational in 2010, that is located along Victoria Canal and connected to the Old River Pipeline. The maximum capacity of the intake will be 250 cubic feet per second.
anadromous fish	Fish that spend a part of their lifecycle in the sea and return to freshwater streams to spawn.
appropriation	The right to withdraw water from its source.
Bay Area	San Francisco Bay Area
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin estuary.
beneficial uses	Those uses of water as defined in the State of California Water Code (Chapter 10, Part 2, Division 2), including but not limited to, agricultural, domestic, municipal, industrial, power generation, fish and wildlife, recreation, and mining.
bentonite	A clay mineral used in drilling operations; mixed with water to form a gel that lubricates the drill bit, helps keep the walls of a borehole intact, and helps bring drill cuttings to the surface.
Biological Opinion	Document issued under the authority of the Federal Endangered Species Act stating the findings of the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction of adverse modification of critical habitat.
borrow area	An excavated area or pit created by the removal of earth material to be used as fill in a different location.
bromate	A chemical compound of bromine that can be formed from the ozonation of water containing bromide. A disinfection byproduct of ozone water treatment.
bromide	A chemical compound of bromine with another element or radical naturally occurring in small concentrations in sea water. Bromides interact with disinfection agents used in water treatment to create disinfection byproducts that have potential adverse health effects.

CALFED Bay-Delta Program (CALFED)	Joint federal and state program to address water-related issues in the Sacramento-San Joaquin Delta.
California Environmental Quality Act (CEQA)	Act requiring California public agency decision-makers to document and consider the environmental impacts of their actions. Also requires an agency to identify ways to avoid or reduce environmental damage and to implement those measures where feasible. Provides means to encourage public participation in the decision-making process.
CalSim II	Agreed upon CVP-SWP implementation of the CalSim model code.
CalSim model	A planning model designed to simulate the operations of the CVP and SWP reservoir and water delivery system under current and future conditions; predicts how reservoir storage and river flows would be affected based on changes in system operations; output is typically used to help assess impacts on water supply, water quality, aquatic resources, and recreation.
Central Valley Project (CVP)	Multiple-purpose federal water project operated by the Bureau of Reclamation in California extending from the Cascades to the Tehachapi Mountains. Consists of 20 dams and reservoirs, 11 powerplants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities. Manages some 9 million acre-feet of water.
channel	Natural or artificial watercourse, with a defined bed and banks to confine and conduct continuously or periodically flowing water.
CNEL	Community Noise Equivalent Level adds a 5-dBA "penalty" for the evening between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between 10:00 p.m. and 7:00 a.m. See also "decibel (dB)", below.
conjunctive use	A water management strategy for the coordinated use of groundwater and surface water resources.
consumptive uses	The application of water to agricultural, municipal, or industrial uses. In contrast, non-consumptive uses would include water dedicated to fish and wildlife.
Contra Costa Canal	The 48-mile canal that begins at Rock Slough and travels west to Clyde, south to Walnut Creek, and north to Martinez.
cooperating agency	Any federal agency other than the lead agency that has jurisdiction by law or special expertise with respect to the environmental impacts expected to result from a proposed project.
criteria air pollutants	Pollutants that are the primary focus of regulatory agencies as indicators of ambient air quality, which include ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead. These are the most prevalent air pollutants known to be harmful to human health, and extensive documentation on health-effects criteria is available for them.
critical habitat	An area designated as critical habitat listed in 50 CFR Parts 17 or 226 (50 CFR Section 402.02); specific geographic areas, whether occupied by special-status species or not, that are determined to be essential for the conservation and management of the special-status species, and that have been formally described in the Federal Register.
cryptosporidium	A waterborne intestinal parasite of the genus Cryptosporidium that can cause the disease cryptosporidiosis in humans and other vertebrates. The disease, characterized by vomiting, diarrhea, abdominal cramps, and fever, can be severe or fatal to immuno-suppressed individuals.
cubic foot per second (cfs)	A measurement of water flow equivalent to one cubic foot of water passing a given point in a second.

cultural resource	An aspect of a cultural system that is valued by or significantly representative of a culture or that contains significant information about a culture. Properties such as landscapes or districts, sites, buildings, structures, objects, or cultural practices that are usually more than 50 years old and possess architectural, historic, scientific, or other technical value.
cumulative impact	For NEPA purposes, defined in Council of Environmental Quality (CEQ) regulations 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 actions. Under CEQA, defined as the change in the environment that results from the incremental impact of the project when added to other, closely related past, present, and reasonably foreseeable probable future projects.
CVP Improvement Act (CVPIA)	This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the Federal CVP; puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower uses.
CVP Operations Criteria and Plan (OCAP)	Document that identifies the factors influencing the physical and institutional conditions and decision-making process under which the CVP operates.
CVP Tracy Pumping Plant	The CVP pumping plant in the south Delta.
CVP water	As defined by Section 3403(f) of the CVPIA, all water developed, diverted, stored, or delivered in accordance with statutes authorizing the CVP, in accordance with terms and conditions of water rights acquired pursuant to California law; water diverted by CCWD under its CVP contract.
decibel (dB)	A unitless measure of sound on a logarithmic scale that indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals. An A-weighted dB (dBA) is an overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear. A measurement that includes the low frequency component is denoted by dBL.
delivered water	General term for water provided to CCWD untreated- and treated-water customers.
Delta	In this report, “Delta” refers to the delta formed by the Sacramento and San Joaquin Rivers. See also “Sacramento-San Joaquin Delta”, below.
Delta balanced conditions	During balanced conditions, Delta inflow and exports are controlled by Reclamation and DWR to meet SWRCB environmental and water quality standards, the needs of in-Delta diverters, and CVP/SWP exports from the Delta. Balanced conditions in the Delta can occur at any time of the year, but generally occur during late spring, summer, and fall, or during very dry years.
Delta excess conditions	During excess (also known as surplus) conditions, Delta flow requirements for water quality and environmental regulations have been met, and excess water is available for Delta users.
Delta inflow	The combined water flow entering the Delta at a given time from the Sacramento River, San Joaquin River, and other Central Valley tributaries.
Delta outflow	The net amount of water (not including tidal flows) at a given time flowing out of the Delta towards the San Francisco Bay. The Delta outflow equals Delta inflow minus the water used within the Delta and exported from the Delta.
delta smelt	A small, slender-bodied fish with a typical adult size of 2 to 3 inches that is found only in the Sacramento-San Joaquin Delta estuary.

Delta surplus	Under excess conditions in the Delta, surplus water is available to Delta users after all environmental protection and water quality regulations have been met.
desalination	A process whereby the salt concentration of sea water or brackish water is reduced, generally through an advanced form of water treatment.
dewater	To remove water.
disinfection byproducts (DBPs)	Chemical, organic, and/or inorganic substances that can form during a reaction of a disinfectant (such as chlorine or ozone) with naturally occurring materials in water.
diversion	A location where water is removed from a water body (river, creek, reservoir, etc.) for use in another location.
DNL	The 24-hour day and night A-weighted noise exposure level, which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.
DSM2	The Delta hydrodynamic and salinity model developed by DWR to simulate hydrodynamic and mixing processes in the Delta, using upstream river flows and salinities, downstream tidal stage and salinity, diversion rates, agricultural return flow and seepage rates, and salinities as boundary conditions.
ecosystem	A geographically identifiable area that encompasses unique physical and biological characteristics. An ecosystem is the sum of the plant community, animal community, and environment in a particular region or habitat.
electric and magnetic fields (EMF)	Fields of force caused by electric voltage and current around the electric wire or conductor when an electric transmission line or any electrical wiring is in operation. Magnetic fields exist only when current is flowing. Electric fields are present in electrical appliances and cords whenever they are plugged in.
electrical conductivity (EC)	A measure of salinity in water.
endangered species	Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range. Official federal designations of endangered species are made by the USFWS or NMFS and published in the Federal Register. Species are listed under the California Endangered Species Act by the California Department of Fish and Game.
Endangered Species Act (ESA)	The federal or state acts administered by the USFWS/NMFS and California Department of Fish and Game, respectively, to list and protect animal and plant species that are listed as threatened or endangered, are formally recognized candidates for listing, or are declining to a point where they may be listed.
entrainment	The incidental trapping of fish and other aquatic organisms in water diverted from streams, rivers, and reservoirs. The process of drawing fish into diversions along with water, resulting in the loss of such fish.
Environmental Impact Report (EIR)	A detailed statement (i.e., report) prepared under the California Environmental Quality Act by a state or local agency describing and analyzing the significant environmental effects of a project and discussing ways to mitigate or avoid the effects.

Environmental Impact Statement (EIS)	An environmental impact document required of federal agencies under the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. Describes the positive and negative effects of the proposed action, lists alternative actions, and documents the information required to evaluate the environmental impacts of a proposed action.
environmental justice	Defined by the U.S. Environmental Protection Agency (EPA) Office of Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Fair treatment means "no group of people, including racial, ethnic, or socioeconomic group shall bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."
erosion	The gradual wearing away of land by water, wind, and general weather conditions; the diminishing of property by the elements. With regard to levees specifically: loss of levee material as a result of the effects of channel flows, tidal action, boat wakes, and wind-generated waves.
evapotranspiration	Water losses from the surface of soils and plants.
expansive soils	Soils that shrink and swell as a result of moisture changes.
export	Water diversion from the Delta used for purposes outside the Delta.
export/inflow (E/I) ratio	This requirement of the SWRCB Water Rights Order D-1641 presently limits Delta exports by the state and federal water projects to a percentage of Delta inflow. In July through January, 65% of inflow can be exported. During February through June, months most critical to fisheries, the allowable E/I ratio is reduced to 35% to help diminish reverse flows and the resulting entrainment of fish caused by south Delta export operations.
federal P&Gs	Principles and Guidelines for federal water studies, published as "Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" by the U.S. Water Resources Council, 1983.
fish screen	Barrier on the front face of a river intake to prevent fish and debris from being drawn into the intake.
floodplain	Any land area susceptible to inundation by floodwaters from any source.
flow	The volume of water passing a given point per unit of time.
groundwater	Any water naturally stored underground in aquifers, or that flows though and saturates soil and rock, supplying springs and wells.
habitat	The specific area or environment in which a particular type of animal or plant lives.
impingement	Contact or collision with a diversion structure (used to describe deleterious effects of some diversion facilities on aquatic species).
Important Farmland	Farmland categories mapped by the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP). Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance are often described together under the term "Important Farmland."
integrated water resource planning	An open and participatory planning process emphasizing least-cost principles and a balanced consideration of objectives, infrastructure risk, supply, resources and demand management options for meeting water needs.
L50	The noise level that is equaled or exceeded 50 percent of the specified time period. The L50 represents the median sound level.

L90	The noise level that is equaled or exceeded 90 percent of the specified time period. The L90 is sometimes used to represent the background sound level.
Leq	The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).
levee	An embankment raised to restrict a river to a defined channel.
liquefaction	The process in which soil loses cohesion when subject to seismic activity (i.e., shaking).
Lmax	The instantaneous maximum noise level for a specified period of time.
Los Vaqueros Project	CCWD's 1998 project which included the construction of the Los Vaqueros Reservoir and associated facilities, such as the Old River intake and Old River, transfer, and Los Vaqueros pipelines. The primary purposes of the Los Vaqueros Project are to improve the quality of water supplied to CCWD customers, to minimize seasonal water quality changes in delivered water, and to improve the reliability of the emergency water supply available to CCWD.
minimum flow	Lowest flow in a specified period of time.
mitigation	One or more of the following: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing an impact by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and/or (5) compensating for an impact by replacing or providing substitute resources or environments.
modeling	Computer simulations of natural and man-made water systems used to provide a forecast of outcomes for a variety of parameters, such as water quality, flow rates, and reservoir levels, under an assumed set of conditions.
National Environmental Policy Act (NEPA)	Act that directs federal agencies to prepare an environmental impact statement for all major federal actions that may have a significant effect on the environment. States that it is the goal of the federal government to use all practicable means, consistent with other considerations of national policy, to protect and enhance the quality of the environment. Requires all federal agencies to consider the environmental impacts of their proposed actions during the planning and decision-making processes.
neap tide	Especially low high tides and high low tides that occur during quarter moons, when the gravitational forces of the moon and the sun are perpendicular to one another with respect to the Earth. The opposite of a spring tide.
Notice of Availability (NOA)	The notice issued by a local, state, or federal agency to publicly announce that a draft environmental impact report or environmental impact statement is available for review, pursuant to the California Environmental Quality Act and the National Environmental Policy Act, respectively.
Notice of Intent (NOI)	The notice issued by a federal agency to publicly announce its intention to prepare an environmental impact statement, pursuant to the National Environmental Policy Act.
Notice of Preparation (NOP)	The notice issued by a state or local agency to publicly announce its intention to prepare an environmental impact report, pursuant to the California Environmental Quality Act.
Old River intake	The CCWD intake located on Old River, with conveyance facilities linked to the Contra Costa Canal and Los Vaqueros Reservoir. The maximum capacity of the intake is 250 cubic feet per second.

opacity	The amount of light obscured by particle pollution in the atmosphere.
peak flow	Maximum instantaneous flow in a specified period of time.
Piezometer	A device used to measure ground-water pressure head at a point in the subsurface. It can consist of either an vertical open pipe that allows the depth to the water in pipe to be measured, or an electronic instrument (or less commonly pneumatic or hydraulic) embedded in the ground that records hydrostatic pressure.
Qwest	A broad indication of the net direction and quantity of flow in the San Joaquin River at Jersey Point. This is only an indicator since net flow is not measurable at this location. Considerable tidal exchange at this point is not included, because Qwest is an estimate of net flow conditions. A positive Qwest indicates the net flow is generally in the downstream direction towards San Francisco Bay. A negative number indicates that the net flow is generally in the upstream direction to the east. Generally, a positive Qwest is desirable for Delta flow circulation, water quality, and fisheries.
reclamation district	A district formed under California State Water Code 50000 *et. seq.* as a way to pay for the costs of reclaiming land for future use. Reclamation districts are formed in areas that have been inundated with water, such as swamps, salt marshes, or tidelands.
Record of Decision (ROD)	Concise, public, legal document that identifies and officially discloses the federal lead agency's decision following the completion of an environmental impact statement.
recycled water	Wastewater that becomes suitable for a specific beneficial use as a result of treatment.
reservoir	An artificially impounded body of water.
responsible agency	As per the CEQA Guidelines, a public agency other than the lead agency that has discretionary approval over a project.
riparian area	The land adjacent to a natural watercourse such as a river or stream. Riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank or fall into the water.
Rock Slough intake	The CCWD intake located near the town of Oakley and used to serve the Contra Costa Canal. Also referred to as Pumping Plant No. 1.
Sacramento splittail	A somewhat large (40-centimeter full-length) *Cyprinid* endemic to the Sacramento and San Joaquin River systems and other drainages of the San Francisco Bay.
Sacramento-San Joaquin Delta (Delta)	The legal Delta, as described in the California Water Code Section 12220, generally extends from Sacramento to the north, Tracy to the south, Interstate 5 to the east, and Collinsville to the west. The Delta covers approximately 738,000 acres.
salinity	The amount of dissolved salts in a given volume of water.
seawater intrusion	The intrusion and mixing of saline or brackish water into a body of freshwater (in this case, into the Delta).
sedimentation	The phenomenon of sediment or other fine particulates entering a water body, or being disturbed from the bottom of a water body such that they move downstream and settle on the substrate in other aquatic areas.
seiche	A wave on the surface of a lake or landlocked bay caused by atmospheric or seismic disturbances.
seismicity	The frequency, intensity, and distribution of earthquake activity in a given area.

siltation	Sediment influx either from erosion or sediment carried into a water body by inflowing rivers and tributaries.
soil corrosion	The deterioration of metal due to interaction with materials in the soil; corrosion generally occurs in soils with high moisture content, high electrical conductivity, high acidity, and high dissolved salts.
South Bay Aqueduct (SBA)	A State Water Project facility that conveys water from Bethany Reservoir to the South Bay water agencies in Alameda and Santa Clara Counties.
South Bay water agencies	The South Bay water agencies include the three water agencies served by the SBA (Alameda County Water District, Santa Clara Valley Water District, Alameda County Flood Control and Water Conservation District, Zone 7).
special-status species	Federal and state classifications for plant and animal species that are listed as threatened or endangered, are formally recognized candidates for listing, or are declining to a point where they may be listed.
spring tide	The tide with the most variation in water level, occurring during new moons and full moons. This is the time of the highest high tide and the lowest low tide. The opposite of a neap tide.
stage	Water surface elevation; the elevation above mean sea level (msl) datum (typically measured in feet msl).
State Water Project (SWP)	California's largest water supply project operated and maintained by the California Department of Water Resources that stores surplus water during wet periods and later distributes it to areas of need in the San Francisco Bay area, northern California, San Joaquin Valley, and southern California. SWP facilities include 23 dams and reservoirs, 18 pumping plants, 4 generating-pumping plants, 5 hydroelectric power plants, and approximately 600 miles of canals and pipelines.
stormwater	Untreated surface runoff into a body of water during periods of precipitation.
Stormwater Pollution Prevention Plan (SWPPP)	Required to be developed and implemented when an entity is obtaining a General Permit under the National Pollutant Discharge Elimination System (NPDES). The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of stormwater discharges, and (2) to describe and ensure the implementation of best management practices to reduce or eliminate sediment and other pollutants in stormwater as well as non-stormwater discharges.
subsidence	A decrease in ground surface elevation in the Delta, which results primarily from peat soil being converted into gas.
SWP Harvey O. Banks Pumping Plant	The SWP export pumping plant in the south Delta. The plant is located downstream of Clifton Court Forebay.
take	Defined in the Federal Endangered Species Act as "…harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" on special-status species covered under the Act.
terrestrial species	Types of species of animals and plants that live on or grow from the land.
threatened species	Legal status afforded to plant or animals species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or NMFS for federal species and by the California Department of Fish and Game for state species.
tidal flow	Water movements caused by tidal forces (i.e. gravitational); used to describe the movement of water in Delta channels caused by tidal level variations propagating from San Francisco Bay.
total Delta inflow	See Delta inflow.

total organic carbon (TOC)	A measure of organic matter content in water, which plays a significant role in aquatic ecosystems and has direct implications to drinking water treatment, including the potential for formation of disinfection byproducts.
treated water	Water treated at a water treatment plant and delivered to municipal and industrial customers.
turbidity	A measure of the cloudiness of water caused by the presence of suspended matter. Turbidity in natural waters may be composed of organic and/or inorganic constituents, and has direct implications to drinking water treatment.
unregulated tributary	A tributary stream that does not have a reservoir or other feature used to restrain or control flows.
uplands	The area on the landward side of the tidal marsh, where the land surface is not inundated by even the highest tides.
water right	A legal entitlement, granted as a permit or license from the California State Water Resources Control Board, authorizing water to be diverted from a specified source and put to beneficial, nonwasteful use.
water use efficiency	Refers to actions or activities that lead to sustainable or renewable uses of water and includes water conservation, water recycling and desalination.
waters of the U.S.	As defined in the Clean Water Act Section 404, waters of the U.S. applies only to surface waters, rivers, lakes, estuaries, coastal waters, and wetlands. Not all surface waters are legally waters of the U.S. Generally, those waters include interstate waters and tributaries, intrastate waters and tributaries used in interstate and/or foreign commerce, territorial seas at the cyclical high-tide mark, and wetlands adjacent to the above.
watershed	A region or area that ultimately drains to a particular watercourse or body of water.
wetland	A zone that is periodically or continuously submerged or has high soil moisture, has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation.
Williamson Act	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 restricting specific parcels of land to agricultural or related open space use for 10 years. In return, landowners receive property tax assessments that are based on farming and open space uses as opposed to full market value.
X2	An index used to assess the location of, and thus the movement of, salinity inland from the ocean to the Delta. Used by regulatory agencies to establish estuarine habitat objectives, it is defined as the distance in kilometers from the Golden Gate Bridge to the point at which 2 parts-per-thousand salinity is found at any given time.