RECLAMATION
Managing Water in the West

Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206): Contract Between the U.S. Bureau of Reclamation and the El Dorado County Water Agency, Subcontract Between the El Dorado County Water Agency and the El Dorado Irrigation District, and Subcontract Between the El Dorado County Water Agency and the Georgetown Divide Public Utility District

Draft Environmental Impact Statement/ Environmental Impact Report

Folsom, California
Mid-Pacific Region

Volume I: Draft EIS/EIR
State Clearinghouse No. 1993052016

The proposed project consists of a new CVP M&I water supply contract for the El Dorado County Water Agency (EDCWA) under which Reclamation would provide up to 15,000 acre-feet/year from Folsom Reservoir or points upstream. Currently, EDCWA intends to divide the water equally between the El Dorado Irrigation District and Georgetown Divide Public Utility District.

U.S. Bureau of Reclamation, Mid-Pacific Region
El Dorado County Water Agency

July 2009

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitment to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206): Contract Between the U.S. Bureau of Reclamation and the El Dorado County Water Agency, Subcontract Between the El Dorado County Water Agency and the El Dorado Irrigation District, and Subcontract Between the El Dorado County Water Agency and the Georgetown Divide Public Utility District

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Draft Environmental Impact Statement/Environmental Impact Report

El Dorado County, California

State Clearinghouse No. 1993052016
State of California

***Lead Agencies*:**
NEPA Lead Agency: U.S. Department of the Interior, Bureau of Reclamation (Reclamation)
CEQA Lead Agency: El Dorado County Water Agency (EDCWA)

ABSTRACT

This proposed action/proposed project is intended to implement those parts of Public Law 101-514 (P.L. 101-514), Section 206, pertaining specifically to the El Dorado County Water Agency (EDCWA) and the need for new water supply entitlements for El Dorado County. Under this new contract, up to 15,000 acre-feet per annum (AFA) of Central Valley Project (CVP) Municipal and Industrial (M&I) water would be made available to EDCWA for diversion from Folsom Reservoir, or from an exchange on the American River upstream from Folsom Reservoir. The contract would provide water that would serve existing and future M&I water needs in El Dorado County, establish and preserve entitlements to divert the water in accordance with State Water Resources Control Board (SWRCB) and Reclamation requirements, and provide new water supplies that would justify future construction, operation, and maintenance of new facilities to convey and treat the diverted water. Direct, indirect, and cumulative impacts resulting from the alternatives on the physical, natural, and socioeconomic environment of the region are addressed in the EIS/EIR.

This Draft EIS/EIR is prepared in compliance with the National Environmental Policy Act (NEPA), Reclamation NEPA procedures, and the California Environmental Quality Act (CEQA) and CEQA guidelines. Reclamation intends to adopt this EIS/EIR to satisfy the requirements of NEPA under P.L. 101-514 to execute a CVP Water Service Contract with EDCWA, as described in this EIS/EIR. The EDCWA intends to adopt this EIS/EIR to satisfy the requirements of CEQA for implementation of the proposed P.L. 101-514 CVP Water Supply Contract with Reclamation, as described in this EIS/EIR.

Comments on this document should be submitted by October 16, 2009.

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TABLE OF CONTENTS

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TABLE OF CONTENTS
VOLUME I: DRAFT EIS/EIR

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

(Included separately as Volume II: Technical Appendices, on CD in the back of this volume)

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EXECUTIVE SUMMARY

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PROPOSED ACTION DEFINED

The Proposed Action for this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is the execution of a new long-term Central Valley Project (CVP) Municipal and Industrial (M&I) water service contract between the El Dorado County Water Agency (EDCWA) and the U.S. Bureau of Reclamation (Reclamation). EDCWA is the "lead agency" for purposes of compliance with the California Environmental Quality Act (CEQA) (Cal. Pub. Resources Code § 21000 et seq.), and Reclamation is the "lead agency" for purposes of compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 et seq.).

This Proposed Action is intended to implement those parts of Public Law 101-514 (P.L. 101-514), Section 206, pertaining specifically to EDCWA and the need for new water supply entitlements for El Dorado County. Under this new contract, up to 15,000 acre-feet per annum (AFA) of CVP M&I water would be made available to EDCWA for diversion from Folsom Reservoir, or from an exchange on the American River upstream from Folsom Reservoir. The contract would provide water that would serve existing and future M&I water needs in El Dorado County, establish and preserve entitlements to divert the water in accordance with State Water Resources Control Board (SWRCB) and Reclamation requirements, and provide new water supplies that would justify future construction, operation, and maintenance of new facilities to convey and treat the diverted water. This EIS/EIR does not analyze at the project-level, the range of potential new facilities that might, in the future, be constructed, as these details and the commitments for these facilities are not yet available, and detailed analyses of the potential impacts of such facilities (including their operations) would be speculative.

EDCWA would make this new CVP water available to two of its member districts along the western slopes of El Dorado County, namely, the El Dorado Irrigation District (EID) and the Georgetown Divide Public Utility District (GDPUD) for use within specified areas within their respective service areas. Figures ES-1 and ES-2 show the regional location of the Proposed Action and the EID and GDPUD service area boundaries, respectively.

P.L. 101-514 does not specify how much of the up to 15,000 AFA would be allocated to each of the two EDCWA member districts that will receive this new water. Consistent with agreements reached between EDCWA, EID and GDPUD, however, it has been tentatively assumed, for purposes of formulating a proposed "project" (CEQA term) or proposed "action" (NEPA term), that the new CVP allocation would be split equally between EID and GDPUD. Figure ES-3 illustrates how diversions are proposed to be allocated between the two member districts.

For purposes of this EIS/EIR, however, several alternative diversion scenarios were developed to best cover the range of potential hydrologic conditions and variances that would accrue with differing allocations. This was undertaken to provide a more thorough environmental review and to address potential demand differences between EID and GDPUD in light of the realities involving current and anticipated future growth in these areas. The diversion scenarios for the alternatives that covered the Proposed Action included:

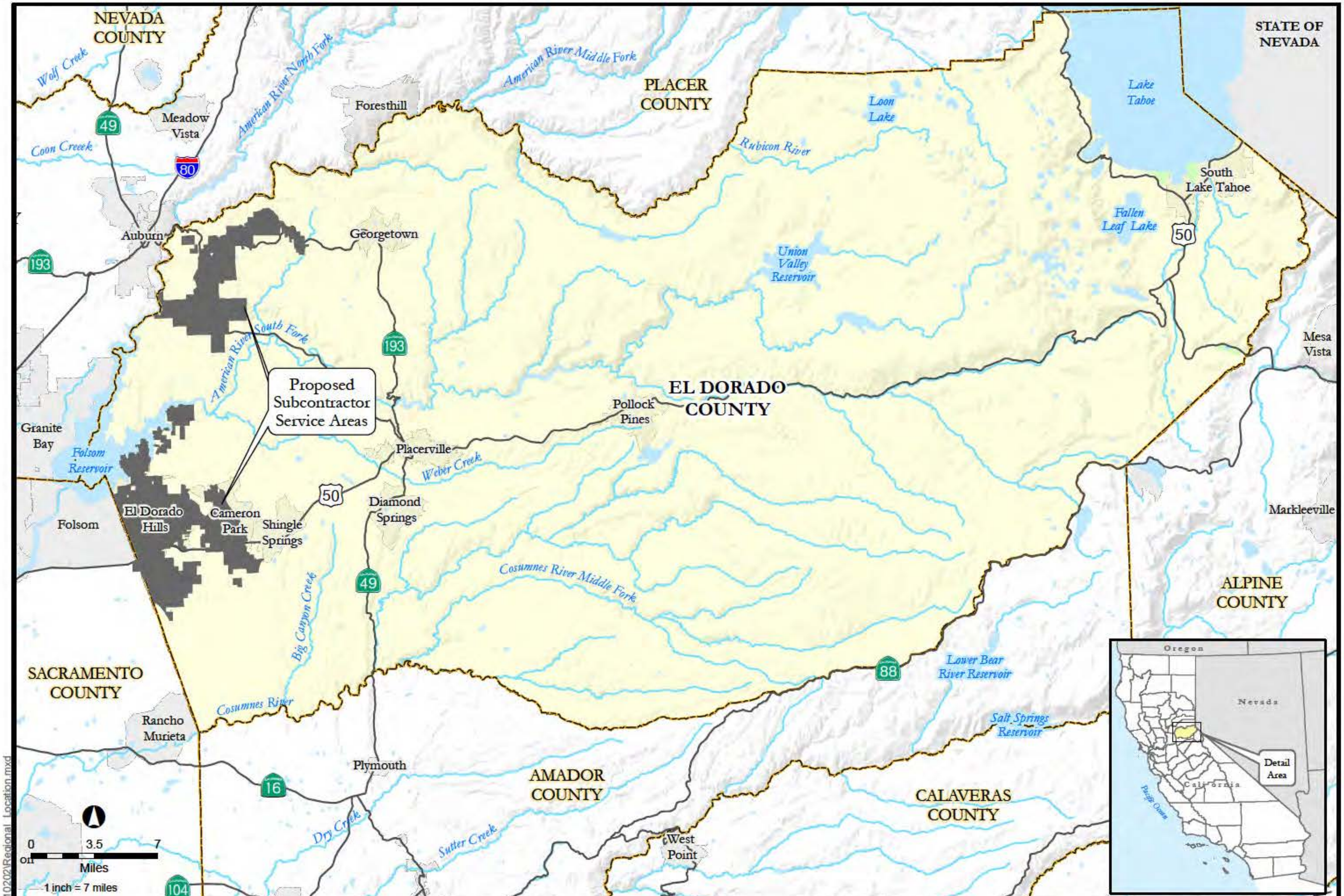
- Alternative 2A – Proposed Action Scenario A – (e.g., 7,500 AF each to EID and GDPUD)
- Alternative 2B – Proposed Action Scenario B – (e.g., 15,000 AF to EID)
- Alternative 2C – Proposed Action Scenario C – (e.g., 4,000 AF to EID and 11,000 AF to GDPUD)

Each of the Proposed Action scenarios represented individual alternatives that offered variations of how the Proposed Action would, or could be implemented, again with full consideration of the maximum coverage necessary for environmental review and disclosure purposes. As noted, these variations in allocation apportionment were necessary given the possibility that either EID or GDPUD could, depending on actual realized growth, experience water needs in the future that could surpass the other. To maintain the maximum beneficial use of this new CVP M&I water allocation, wide flexibility in apportionment between the purveyors was considered not only prudent but necessary.

All yearly requested quantities of this new CVP water would be made by EDCWA, on behalf of its member agencies; deliveries to EID and GDPUD may vary from year to year, based on anticipated need by each district. EDCWA would hold the master contract with Reclamation, with EID and GDPUD holding subcontracts with EDCWA and Reclamation. Such an arrangement would allow EDCWA discretion to determine initial allocations between EID and GDPUD and to make modifications to the allocations over time as long as the apportioned quantities stayed within the environmental bounds set by the alternative diversion scenarios addressed in this document. These contracts would be long-term (40-year) CVP water service contracts, subject to all of the same provisions and periodic adjustments authorized under Reclamation Law as the other CVP water service contracts.

Diversions by EID would occur at their existing water supply intake on the south arm of Folsom Reservoir (currently being considered for expansion). No new facilities would be required by EID to divert this new water supply at Folsom Reservoir. Water would be conveyed (pumped) to its existing El Dorado Hills Water Treatment Plant (WTP) under current pumping capacity for treatment and subsequent distribution. In the future, however, it may also be possible and necessary for EID to pump this water further upslope to a new WTP at Bass Lake. Additional conveyance, pumping capacity, related appurtenances, and a new WTP would be required if EID were to extend service from this new contract further up into its service area.

For GDPUD, however, the facility and infrastructure requirements are markedly different. Since it holds no direct point of access (or diversion) from Folsom Reservoir, it would be compelled to negotiate a separate exchange agreement with an upstream purveyor, which also holds current CVP diversion rights from Folsom Reservoir. Under this scenario, GDPUD would exchange its new CVP contract water with this purveyor for a water supply (likely a water right) more readily accessible to them at some upstream location.



PBS&J

FIGURE ES-1
Regional Location

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P.L. 101-514 USBR/EDCWA
CVP Water Supply Contract EIS/EIR

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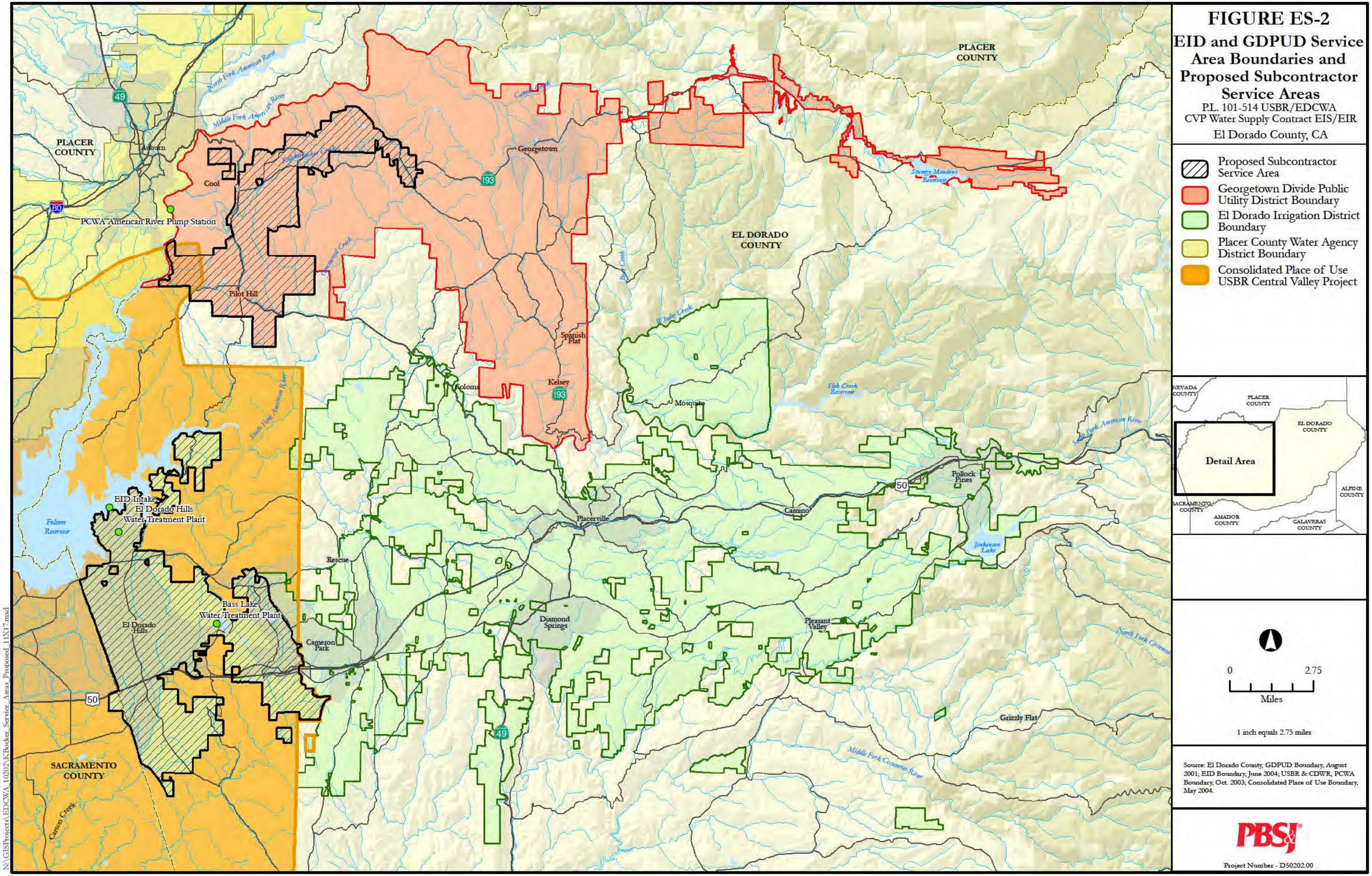

FIGURE ES-2
EID and GDPUD Service Area Boundaries and Proposed Subcontractor Service Areas
P.L. 101-514 USBR/EDCWA
CVP Water Supply Contract EIS/EIR
El Dorado County, CA

Source: El Dorado County, GDPUD Boundary, August 2001; EID Boundary, June 2004; USBR & CDWR, PCWA Boundary, Oct. 2003; Consolidated Place of Use Boundary, May 2004.

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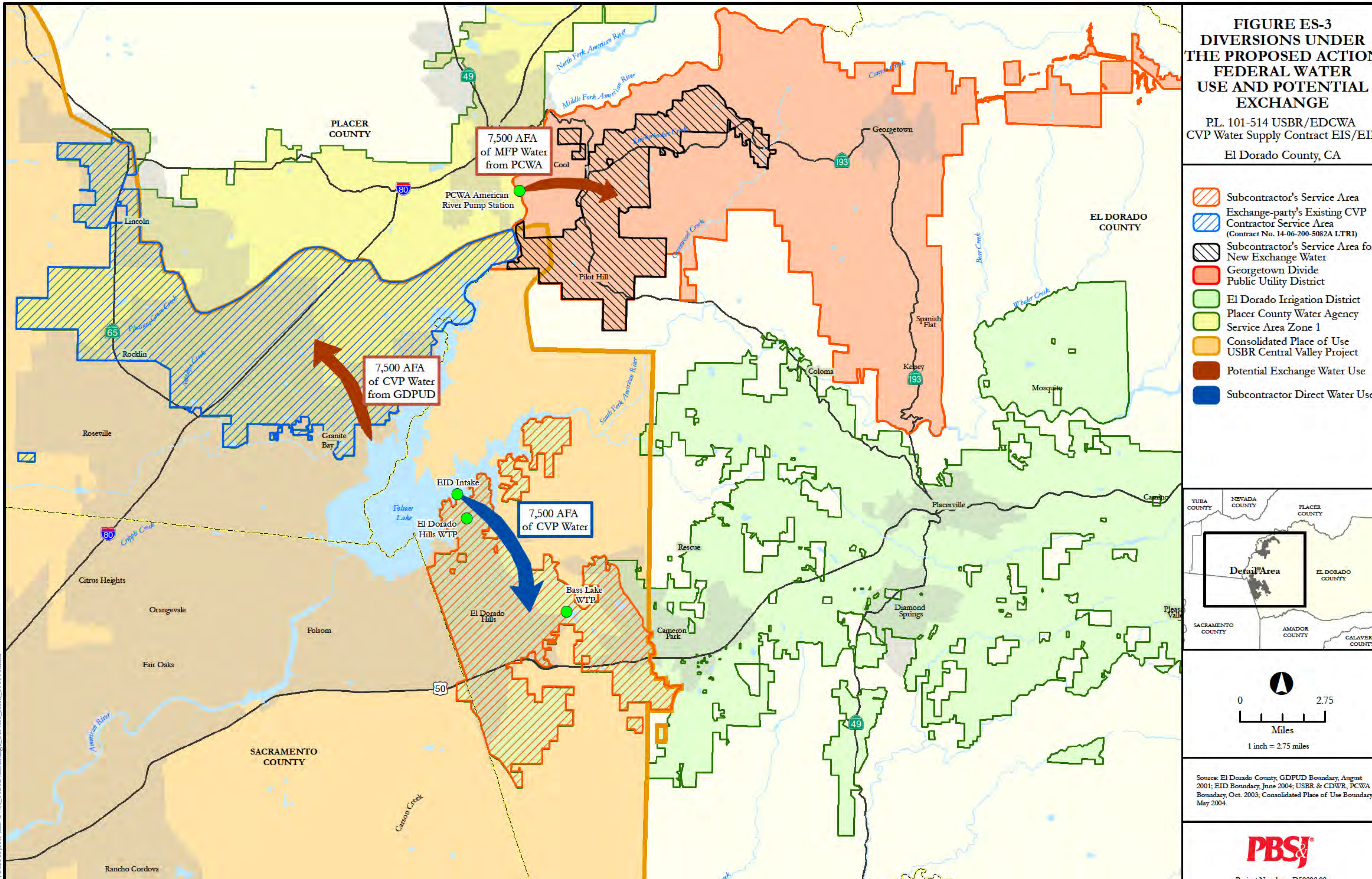

**FIGURE ES-3
DIVERSIONS UNDER THE PROPOSED ACTION
FEDERAL WATER USE AND POTENTIAL EXCHANGE**

P.L. 101-514 USBR/EDCWA
CVP Water Supply Contract EIS/EIR
El Dorado County, CA

At this time, the Placer County Water Agency (PCWA) and GDPUD have developed a Draft Memorandum of Understanding for cost sharing of the American River Pump Station construction, which could serve as the new point of diversion for GDPUD under an exchange. Under this scenario, GDPUD would take new water obtained from PCWA at the American River Pump Station on the North Fork American River in exchange for relinquishing a portion of its CVP allocation at Folsom Reservoir (where PCWA has historically diverted CVP water). At present, however, PCWA is not permitted to divert CVP water at Folsom Dam. As part of its amended CVP water service contract, its intended service area was inadvertently revised to include only its Zone 1 service area and omitted its service areas to the San Juan Water District (SJWD) (in Placer County), the City of Roseville, and the Placer Vineyards project in western Placer County. This service area, however, is being reallocated to PCWA as part of the environmental documentation and review process of the Sacramento River Water Reliability Study EIS/EIR. Once completed, PCWA will again have the ability to divert CVP water from Folsom Reservoir.

It is presumed that the likely source of PCWA exchange water would be from its Middle Fork Project (MFP) water rights, which are available along the North Fork American River as it passes the American River Pump Station; the actual quantities negotiated in any such exchange would consider long-term water availability and any differences in institutional reliability (e.g., Reclamation Water Shortage Policy provisions).

For GDPUD to physically acquire the new exchanged water, it would first have to ratify both an exchange agreement as well as the cost-sharing agreement for the American River Pump Station with PCWA. Additionally, it would be necessary for GDPUD to install the necessary pumping equipment at the American River Pump Station and build conveyance facilities from the southern shoreline of the American River Pump Station location, out of the American River canyon, to its service area.

At this time, two long-term options are possible for GDPUD regarding the ultimate location as to where this new water supply would be conveyed. GDPUD could either convey this water to its new Greenwood Lakes WTP (currently under design) which would require significant new additional raw water conveyance or, it could construct an entirely new WTP near the top of the canyon in the general area of Cool. At this time, no decision has been made on these two options and, accordingly, insufficient information exists from which a detailed facilities analysis could be included in this EIS/EIR. Any project-specific construction activities undertaken by GDPUD, therefore, would occur in the future, if or when it is decided, and would involve separate and independent environmental review, disclosure, and approval processes. This EIS/EIR, however, would provide the hydrological instream analysis that could be used at that time to address any water-related impacts associated with the anticipated new diversions associated with the construction and operation of various facilities. Where available, this EIS/EIR could also provide useful background information on the general types of construction- and operations-related impacts associated with those new facilities.

Finally, it should be noted the exchange of CVP and MFP water by GDPUD and PCWA would require a separate action by the SWRCB to change the authorized Place of Use for MFP water rights. The MFP water rights, under this exchange would be used in El Dorado County, which is currently entirely outside of the authorized Place of Use for the MFP water entitlement. PCWA, as the permitted licensee, would be required to petition the SWRCB to change its authorized Place of Use for its MFP water rights to effectively include those portions within El Dorado County upon which the exchanged water would be served.

This EIS/EIR, to the extent it has focused on CVP/SWP system hydrology at the project-level, can be used by the SWRCB as part of its environmental review documentation to support the Place of Use petition by PCWA. Thus, both PCWA and the SWRCB are “responsible agencies” for purposes of CEQA compliance under this Proposed Action.

PURPOSE AND NEED

The purpose of P.L. 101-514 was to help meet the long-term water needs of El Dorado County. As a recognized initial phase, in a long-term contracting program for EDCWA, the action was appropriate at the time and, with the passage of time, has become increasingly more important to EDCWA. The purpose of the Proposed Action is to acquire a new water supply through the new CVP water service contract authorized by P.L.101-514 in order to meet planned growth within El Dorado County.

Total anticipated M&I needs for EID at the year 2025 are 49,257 AF; this includes 7,484 AF of projected distribution system losses. Total residential demand, at 33,805 AFA, make up the majority of EID’s anticipated future M&I demands (i.e., almost 70 percent). Agricultural demands are anticipated to be 24,466 AFA. EID’s total water demands (M&I plus AG) is projected to be 73,723 AFA by the year 2025. With a normal year yield available supply of 68,484 AFA, the projected future water need at 2025 is 5,239 AFA. With a safe yield available supply of 61,597 AFA, the projected future water need of EID at 2025 is 12,126 AFA.

Total anticipated M&I needs for GDPUD at the year 2050 are 8,058 AF; this includes 1,058 AF of projected distribution system losses and 98 AF of unaccounted-for beneficial use. Residential demand, relative to non-residential demands (e.g., industrial/commercial) clearly make up the majority of GDPUD’s anticipated future M&I demands (i.e., almost 80 percent). GDPUD’s agricultural demands are anticipated to be 15,476 AFA by 2050, consistent with the 2007 Water Resources Development and Management Plan land use projections. GDPUD’s total water demands (M&I plus AG) is projected to be 23,534 AFA by the year 2050. With a firm yield available supply of 12,200 AFA, the projected future water needs at 2050 is 11,334 AFA. With a safe yield of 10,500 AFA, the projected future water needs at 2050 would be 13,034 AFA.

ALTERNATIVES

Numerous alternatives were evaluated in this EIS/EIR. These resulted from a comprehensive alternative identification and screening process conducted as part of this EIS/EIR development. Each of the alternatives is fully described herein. As a joint NEPA/CEQA document, certain terminology and vernacular had to be reconciled. For the purposes of this EIS/EIR, the term “alternatives” included all actions, even the Proposed Action (under NEPA) and what would typically be referred to separately as the proposed project under CEQA.

Screening criteria were applied to a wide range of new diversion and non-diversion water supplies. The final alternatives that passed the screening process and carried forward for more detailed analysis in this EIS/EIR are:

- Alternative 1A – No-Action
- Alternative 1B – No-Project
- Alternative 2A – Proposed Action Scenario A
- Alternative 2B – Proposed Action Scenario B
- Alternative 2C – Proposed Action Scenario C
- Alternative 3 – Water Transfer
- Alternative 4A - Reduced Diversion (12,500 AFA)
- Alternative 4B – Reduced Diversion (10,000 AFA)
- Alternative 4C – Reduced Diversion (7,500 AFA)

Under NEPA, the No-Action Alternative must contemplate the resulting environmental impacts of not going forward with the proposed federal action. Where the choice of "no action" by a federal Lead Agency, however, could result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis. "No action" in such cases would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of approving the Proposed Action. Under CEQA, the No-Project Alternative must also be analyzed (see CEQA Guidelines § 15126.6(e)). This requirement encourages a Lead Agency to compare the environmental effects of approving a proposed project with the effects of not approving it. Unlike the No-Action Alternative, the No-Project Alternative generally assumes that the land area or current environment would remain in its existing state. This is typically prefaced by the continuation of current plans, available infrastructure, and community services.

Under Alternative 1A, the **No Action Alternative**, as defined under NEPA[1], the proposed new CVP water service contract between Reclamation and EDCWA would not be executed. Notwithstanding no new CVP water supply, it is reasonable to expect that both EID and GDPUD would seek alternative supplies. Taking no action, under NEPA, would not restrict either purveyor from seeking alternative non-federal *actions* to meet their long-term needs. Accordingly, it would be possible for both EID and GDPUD to still pursue and acquire a new water supply from a non-federal entity and without requiring a federal nexus. Hydrologically, a new water right transfer or assignment would be possible, similar to the assumed conditions that would occur under the Water Transfer Alternative. Again, the total quantities requested would be similar with Alternatives 2A through 2C, the various Proposed Action scenarios (i.e., up to 15,000 AFA); the only difference being that it would not be this new CVP water supply.

1 NEPA defines the "no action" alternative as the most likely future condition that could be expected to occur in the absence of the project. (American Rivers v. Federal Energy Regulatory Commission, 187 F.3d 1186, 1199 (9th Cir. 1999) ("American Rivers"); see also 42 U.S.C. § 4332 (2)(c)(iii); 40 C.F.R. § 1502.14)

Under Alternative 1B, the **No Project Alternative**, as defined by CEQA,[2] the proposed water service contract between EDCWA and Reclamation would not be executed. Furthermore, under this alternative, it is assumed that no attempts by EDCWA, EID, or GDPUD to secure a new water supply would occur. Hydrologically, therefore, the baseline conditions across the CVP/SWP (including those within Folsom Reservoir, the lower American River, and the Delta), would be maintained at levels that existed at the time of circulation of the Supplemental Notice of Preparation (NOP) in September 2006.

Under each of Alternatives 2A through 2C, the Proposed Action scenario alternatives, varying quantities would be allocated to EID and GDPUD as discussed previously. The mechanisms of diversion, conveyance, treatment and end-user delivery would be identical under each of the alternatives, the only variation being the quantities assigned to EID and GDPUD. EDCWA would hold the master contract with Reclamation under each of these alternatives.

Under Alternative 3, the **Water Transfer Alternative**, both EID and GDPUD would seek an alternative water supply to the new CVP water contracts. It is assumed in this EIS/EIR that a water right transfer would be possible somewhere within the American River basin. Hydrologically, the quantities under any transfer would be the same as the Proposed Action (i.e., up to 15,000 AFA total), however, there may be long-term variances in delivery allocations depending on the specific nature of the water right transfer.

Under Alternatives 4A through 4C, the **Reduced Diversion Alternatives**, the total amount of the water that could be diverted under the proposed water service contract would be reduced from “up to 15,000 AFA” to variations of decreasing quantity. In other words, diversions would be reduced by increasing increments of 2,500 AFA. For purposes of analysis in this EIS/EIR, it is assumed that water diverted under these alternatives would be allocated evenly to EID and GDPUD. All other conditions associated with diversion, delivery, and treatment would be identical with Alternatives 2A through 2C, the various Proposed Action scenarios.

IMPACT ANALYSIS FRAMEWORK - OVERVIEW

As a new CVP water service contracting action, the primary focus of the environmental and socio-economic analyses was appropriately directed towards potential changes in CVP/SWP coordinated hydrology. This included a detailed assessment of the reservoirs, rivers, Sacramento-San Joaquin River Delta, and associated operations and constraints that make up the CVP/SWP. No new facilities are proposed; therefore, none was contemplated or evaluated under this EIS/EIR. Any new facilities selected and ultimately required to implement the P.L.101-514 water contract would be subject to future and separate environmental review processes. As noted previously, at this time, no

2 The CEQA “no project” alternative is defined as the most likely future condition that could be expected to occur in the absence of the project. More specifically, “[t]he ‘no project’ analysis shall discuss the existing conditions at the time the notice of preparation is published…as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.” (CEQA Guidelines, § 15126.6, subd. (e)(2)). This formulation is narrower than the NEPA formulation for a “no action” alternative, in that the CEQA concept assumes relatively limited future actions by third party agencies not involved in a proposed project.

adequate or currently applicable level of information exists that would have provided the framework for such an assessment.

For this EIS/EIR, project-level specificity pertained only to the potential changes in CVP/SWP and system-related hydrology. This was accomplished using the highly precise Reclamation planning and operational mass balance, reservoir routing model, CALSIM II. Along with Reclamation's other supporting environmental models (e.g., Reservoir Water Temperature Models, River Water Temperature Models, and Early Life-Stage Salmon Mortality Models) and their Long-Term Gen hydropower generation and capacity model, extensive modeling output were generated based on hindcasted 72-year historic hydrology. The impact framework compared modeled hydrology for any given parameter (e.g., Folsom Reservoir storage) between the Base Condition (assumed for the year 2005 level of development) and the Proposed Action or any of the action alternatives. The difference in simulated hydrology; therefore, represented the potential increment of impact. Modeling work for this EIS/EIR pre-dated the most recent upgrades to CALSIM II in terms of historical record (i.e., the CALSIM II historical record has now been extended to 2003).

In general, both *magnitude* and *frequency* were used as impact determinants in the modeling output assessment. Given that this EIS/EIR had the benefit of a 72-year hydrological record by individual year, it was possible to observe not only annual magnitude changes, but also the frequency with which such deviations from the Base Condition would occur. A large deviation from the Base Condition, while significant for a specific year, may not represent a significant environmental impact if its occurrence was infrequent (over the 72-year period of record). Conversely, where frequent deviations from the Base Condition would occur, but their magnitudes are of limited magnitude, such conditions may also not be indicative of a significant environmental impact. While it is acknowledged that, in reviewing time series data, outliers and deviations from the mean represent important data points, when assessing environmental effects on natural systems, long-term trends are often more important (e.g., variations in long-term monthly means). This is especially true when using data in a comparative mode, as is the case with CALSIM II and its associated environmental models. This EIS/EIR provides detailed discussion of the CALSIM II model, its assumptions, operations, limitations, and applications for this new CVP water contract.

The various resources potentially affected by the various alternatives were categorized as those directly affected by the proposed new water diversions and those indirectly affected. Diversion-Related Resources included the traditional water-related resources such as fisheries resources and aquatic habitat, water supply allocations, hydropower, flood control, etc. Non-Diversion Related Resources included those typically associated with service area activities under approved growth mandates (e.g., land use, transportation, air quality, noise, etc.). Some resources, such as recreation, possess both water-related and non-water related components; certain recreational activities (e.g., fishing, boating, swimming) rely on in-reservoir or instream hydrology while, at the same time, also possess recreational opportunities that are not hydrologically influenced (e.g., parks, playgrounds, outdoor sports facilities, etc.). For such resources, two separate analyses were conducted; one focusing on hydrological effects (using modeled hydrology) and the other focusing on service area effects.

The project area or, as it is sometimes referred (federal action area), therefore, represents the area covered by the integrated CVP as well as those portions of the EID and GDPUD service areas whereupon these new contract water supplies would be delivered. This is the collective geographic area upon which the environmental evaluations of this EIS/EIR were focused. The service areas, known collectively as the Subcontractor service areas represent a small portion of the total service areas for these water purveyors and are limited, primarily to the western regions of their larger service areas. These areas were based on the location of current and immediate future demands and/or constrained by current hydraulic pumping requirements.

Future cumulative effects were also assessed using the CALSIM II hydrological modeling platform. Past, present, and reasonably foreseeable future actions were identified and incorporated into a future cumulative condition within the modeling framework. This was set at year 2025 and incorporated as many of the most recent updates, projects, and institutional developments that are available in the public and private domains. Close coordination with Reclamation, the U.S. Fish & Wildlife Service, National Oceanic and Atmospheric (NOAA) Fisheries, California Department of Fish & Game, and other stakeholders as part of the ongoing Common Assumptions Workshops for the CVP-OCAP was rigorously upheld by the EIS/EIR modeling team.

It should be noted, however, that CALSIM II and other models relying on future prescribed timeframes, though the best analytical tools currently available, are only best guess snapshots in time. Adjusting future CVP/SWP operations and demands within the constructs of CALSIM II must be balanced against the likelihood of actually establishing increased accuracy. Within the context of known and verifiable future actions, it is virtually impossible to *accurately* predict the 2025 scenario. From a nomenclature perspective, a 2025 timeframe, within the context of CALSIM II, is no different than if the model were to identify 2030 or 2040. Moreover, while CALSIM II is extremely *precise*, as noted previously, it may not, in all circumstances, represent the most *accurate* depiction of hydrological changes resulting from small increments of change within the CVP/SWP. As most expert CALSIM practitioners acknowledge, CALSIM II modeling output is useful for observing large-scale, general trend sequences in the hydrologic regime. As discussed in this EIS/EIR, CALSIM II, along with its predecessors, Project Simulation Model (PROSIM) 2000 and PROSIM were originally intended to serve as broad system-wide planning tools to gauge Delta inflow/outflow from which to assign exports. It, nor any of its predecessors, was never intended to serve as an instrument of scrutiny for small-scale (e.g., less than 100,000 AF) changes in system hydrology. Caution, therefore, should be exercised when citing the numerical values or, making specific inferences as to what the quantification actually depicts.

Having disclosed these limitations, the CALSIM II modeling relied upon to support this EIS/EIR and made a part of it, still represents the most up-to-date rendition of the model used today as noted above. Moreover, it is still currently used as the planning and operational model by Reclamation and the California Department of Water Resources. The version used in this EIS/EIR, along with its specific updates, includes many of the newer improvements and new project actions that have occurred over recent years and have been generally accepted since the last CVP Operations Criteria and Plan (CVP-OCAP), Reclamation’s guiding document for operating the CVP, which was completed in 2004.

The hydrologic modeling contained in this EIS/EIR insofar as modeling assumptions for project operations and incorporated actions represents the most up-to-date CVP-wide system simulation currently available. While EDCWA supports this rendition of CALSIM II as the most technically and institutionally advanced version of the model currently available, it should be acknowledged that Reclamation has not officially endorsed the complete set of new demand assumptions used in this version of the model. Still, as discussed previously, the model, in terms of its fundamental routing and operational triggers, remains the same.

ENVIRONMENTAL ISSUES OVERVIEW

As noted above, the primary environmental focus (at least in terms of project-level specificity) was on the hydrology of the CVP/SWP, including the Sacramento-San Joaquin River Delta and all associated system operations, constraints, and institutional agreements. Typical of contracting actions of this nature, environmental issues and concerns associated with water-related resources include, but are not limited to the following:

- Reduced reservoir end-of-month storages
- Reduced reservoir water surface elevations
- Reduced littoral habitat in reservoirs
- Reduced flow releases from dams
- Reduced instream flows
- Elevated instream water temperatures
- Reduced frequency in meeting certain regulatory standards
- Elevated early life stage salmon mortality
- Reduced Delta outflow
- Increased X2 position (the two parts per thousand, near bottom, isohaline line)

From an aquatic resource perspective, key issues addressed in this EIS/EIR included the potential for the alternatives to significantly impact aquatic species of primary management concern that inhabit reservoirs and rivers affected by the operation of the CVP and State Water Project (SWP). Of particular concern are those federally and State listed endangered and/or threatened species of fish, which include:

Chinook salmon (*Oncorhynchus tshawytscha)*;

- Sacramento River Winter-Run Chinook salmon (Ecologically Significant Unit) ESU (Endangered);
- Central Valley Spring-Run Chinook salmon ESU (Threatened);
- Central Valley Spring-Run Chinook salmon Designated Critical Habitat;
- Central Valley Fall and Late-Fall Run Chinook salmon Essential Fish Habitat;

Central Valley steelhead (*Oncorhynchus mykiss*);

- Central Valley steelhead (Distinct Population Segment) DPS (Threatened);
- California Central Valley steelhead Designated Critical Habitat;

Delta smelt, (*Hypomesus transpacificus*) (Threatened); and

Green sturgeon *(Acipenser medirostris)* southern DPS (Threatened).

Other fish species recognized as being of management concern included striped bass, splittail, and American shad. For these species and their habitat conditions, reservoir releases, downstream river flows, water temperatures, X2 position, and, in the case of Chinook salmon, early life stage mortality estimates were used by the generated modeling output to evaluate potential impacts.

Riparian habitats, primarily along the lower American and Sacramento rivers are host to a variety of sensitive wildlife species and were also evaluated in this EIS/EIR. These included modeled hydrological changes to river flows and their relationships to near-shore vegetative growth (e.g., cottonwoods) and important backwater ponds and marshes along the riparian corridor along with the potential for their recharge.

Both water supply and hydropower impacts represented potential economic effects, rather than environmental impacts. CALSIM II modeling provided the modeling output required to assess potential impacts on CVP/SWP contractor delivery allocations both north and south of the Delta covering both M&I and Agricultural (Ag) contractors, and also included area-specific allocations to the local purveyors who participated in the Water Forum Agreement.[3] Long-Term Gen modeling output was used to evaluate potential impacts on CVP hydropower generation and capacity at load center, potential effects on Western Area Power Administration (WAPA) preference customers, and assess pumping power requirements for diverters from Folsom Reservoir. Potential flood control and water quality impacts were assessed using modeled data to determine the magnitude of hydrologic changes in reservoir releases and river flows. As a new diversion focused action, it was intuitive that its potential effects on flood control, especially as they may pertain to system-wide reservoir empty space requirements would be beneficial.

Water-related recreational and cultural impacts relied upon reservoir water surface elevation and river flow data to evaluate potential effects on water enhanced recreational activities and facilities, as well as the potential impacts on near-shore or submerged cultural resources within project area waterbodies.

3 The Water Forum Agreement is a regional document signed in 1999 by various water purveyors, business interests, environmental groups, and government agencies participating in the Water Forum; a lower American River based consensus building process that sought to develop a long-term plan for the continued health, vitality and multiple-use benefits of the river. Two co-equal objectives lie at the heart of the Water Forum. These were; 1) ensure a safe, reliable and secured water supply for area's residents, commercial, industrial, and municipal users and, 2) ensure the protection of the river's ecosystems including its aquatic life, riparian habitats, and recreational activities.

Non-water related resources were evaluated as Non-Diversion Related impact analyses and focused on the indirect effects that would occur as a result of providing a new water supply within the service areas of the two water purveyors. Reclamation, EDCWA and both EID and GDPUD are not involved in land use planning; these entities hold no authority or control over any land use decision-making matters. This is rightfully the responsibility of El Dorado County (within the project area) through actions, projects, ordinances and policies approved by the El Dorado County Board of Supervisors. While a range of planning documents, master plans, specific plans, and resource planning documents are available and interactively used, the primary guidance document for in-County resources and community functions such as land use, housing, traffic, growth and utility services is the El Dorado County General Plan. Moreover, environmental impacts associated with the implementation of the General Plan were thoroughly addressed in the El Dorado County General Plan EIR prepared by the County in 2004 and subjected to subsequent analysis and consideration as a result of the El Dorado County General Plan litigation in 2005. Accordingly, this EIS/EIR does not attempt to re-evaluate those same impact analyses covered by the General Plan EIR, which was ultimately the subject of a litigation settlement and is now legally unassailable.

Notwithstanding the existence of the El Dorado County General Plan, its supporting EIR, as well as the many associated policies and plans, this EIS/EIR identifies and discusses the relevant portions of these documents and references special projects implemented by the County to protect, enhance, and, otherwise conserve the natural resources of the County. Where relevant, this EIS/EIR notes the significant impact determinations made in these other documents and, where significant unavoidable impacts were found, this EIS/EIR makes specific mention of those conclusions.

Reclamation does not involve itself in local County land use decision-making or governance at the local level. While acknowledging that water contracts indirectly may affect activities and resources within these jurisdictions, the implementation of such actions (i.e., new water contracts) are typically viewed as accommodating already approved growth. Water contractors have long since adopted this same position, and EDCWA, EID, and GDPUD are no different. Notwithstanding this position, this EIS/EIR takes a conservative view of new water acquisitions (even if supported by General Plan projections for new growth) and accedes to the growth-inducing potential of this project purely for CEQA purposes.

Growth-inducing impacts were addressed through the General Plan assumptions and provisions for planned future growth within the County. The nexus between water supply availability, current and future demands, and planned or anticipated population growth and associated urban/rural development was identified and discussed. Generalized discussions of this nexus, within the context of the County's General Plan provisions, were evaluated; however, it was impracticable to attempt to assign a specific increment of effect between this water supply and the multi-faceted resource driven alternatives of the General Plan and the broad range of effects they presented. This EIS/EIR drew upon the information provided by the County General Plan projections, as well as EDCWA's most recent water supply analyses associated with their Water Resources Development and Management Plan of 2007.

Future potential cumulative impacts for water-related resources relied upon CALSIM II and associated environmental modeling, as noted previously, using a future demand/accretion horizon with which to compare modeled differences in various hydrologic parameters. All past, present and reasonably foreseeable future actions were included in this future horizon. Building off of the existing hydrologic modeling used in the development of the last CVP-OCAP in 2004, this EIS/EIR modeling team updated several of those model assumptions based on currently accepted changes in regional hydrology, operational practices, and ratified institutional agreements. These nuances are discussed in more detail in the following subsection (Areas of Controversy Known to Lead Agencies). The analysis documented the future cumulative condition for all water-related resources and identified the increment of change between the future no-action, relative to the future cumulative condition.

Finally, this EIS/EIR fully acknowledges the potential threat of climate change and provides extensive background, technical review from the recent scientific literature, and applied discussion of likely climate forced changes on California's water resources and natural resource environment including those specific to El Dorado County and the western slope water purveyors. Climate change effects, in many ways, represent a classic example of future cumulative impacts within the NEPA/CEQA contexts. Climate change discussions included both those associated with the effects of climate change on the natural and socio-economic environments, as well as the effects of the Proposed Action on climate change. Arguably, since the most significant climate change effects would first be observed as changes in system hydrology, any future attempt at establishing or generating more detailed documented evidence would need to first focus on a changing hydrologic baseline. Strict unadjusted application of CALSIM or any other models relying solely on historic hydrology, therefore, would be inappropriate for these purposes.

AREAS OF CONTROVERSY KNOWN TO LEAD AGENCIES

Several issues of controversy associated with the proposed new CVP water service contract were identified over the course of the EIS/EIR development. Since the passage of P.L.101-514 in 1990, the operational hydrology regarding the CVP/SWP has continued to evolve. Several major new project actions involving new system operations, facilities, environmental enhancement/flow standards, Biological Opinions (BiOp), flood control provisions, and regional/local water purveyor diversion agreements have taken place and continue to occur. While many of these actions are at the State-wide scale and, accordingly, have much broader implications than the issues specific to this action (i.e., P.L.101-514 contract), the fact that CVP contracts are intertwined within the context of overall CVP/SWP operations makes acknowledgment of these ongoing developments noteworthy. Moreover, while the term *controversy* is a matter of opinion over which parties may actively disagree, argue, or debate, the report preparers have broadened this section to include matters that have *relevance* to the proposed new contract, but may not necessarily be controversial at this time. In the interests of full and beneficial disclosure, this approach was thought to best meet the intent of NEPA/CEQA.

A complete listing of all of the changes occurring since 1990 would be exhaustive, but the more prevalent ones have been included. Many have been in place for a number of years and have been thoroughly discussed in other documents. This listing illustrates the long-standing nature of this Proposed Action. Suffice to say, at the State and CVP level, new initiatives and/or project actions that have imparted particular relevance to system-wide hydrology since the authorization of this Proposed Action include, but are not limited to the following:

- Central Valley Project Improvement Act (CVPIA) (specifically, “b2” water)
- Refuge Water Supply Contracts
- CVPIA Programmatic EIS (PEIS)
- Anadromous Fish Restoration Plan (AFRP)
- CALFED Bay-Delta Program
- SWRCB Decision 1641 (D-1641)
- Bay-Delta Water Quality Control Plan
- California Environmental Water Account (EWA)
- Bay-Delta Conservation Plan (BDCP)
- South Delta Improvement Program (SDIP)
- 2004 CVP-OCAP

In summary, the main attributes of these various past and current actions having relevance to the proposed new water contract, as defined, are associated with changes in system hydrology and operations. These actions, such as §3406(b)(2) of the CVPIA or “b2” water, which requires the CVP to dedicate and manage annually 800,000 acre-feet of CVP yield for the primary purpose of implementing the fish, wildlife and habitat restoration purposes and measures of the CVPIA is one example. Some of this b2 water has also been used to meet Bay-Delta Water Quality Control Plan obligations. The AFRP pertains to §3406(b)(1) of the CVPIA which calls for the development and implementation of a program that makes all reasonable efforts to double natural production of anadromous fish in California's Central Valley streams on a long-term, sustainable basis. Since 1995, the AFRP has helped implement over 195 projects to restore natural production of anadromous fish.

It should be clearly noted, however, that the proposed new contracts under this action (and P.L.101-514, generally) have long since been included in the modeling and operational simulations of the CVP/SWP. Numerous individual actions including those of the Department of the Interior have long accepted and included the P.L.101-514 contracts in the environmental analyses supporting these past actions. As an example, the 2004 CVP-OCAP as well as Reclamation’s modeling for its most recent Biological Assessment on the Long-Term Central Valley Project and State Water Project Operations and Criteria Plan (released in August 2008), the California Environmental Water Account EIS/EIR, and the many Reclamation actions in the American River basin over the past 10 years have all included the P.L.101-514 contracts in their future baseline hydrology.

For over twenty years, the CVP/SWP has been operated in a coordinated manner under the Coordinated Operating Agreement (COA) dating back to 1986. Since that time, these coordinated operations have evolved to reflect, among other things, changing facilities, delivery requirements, and regulatory restrictions. The most recent and applicable document addressing how the COA is implemented in light of these continually evolving circumstances is the CVP Operations and Criteria Plan (or CVP-OCAP). The CVP-OCAP was completed in 2004 and represents the official operational plan of Reclamation for the CVP.

In February 2005, the USFWS issued a BiOp on delta smelt that analyzed the potential effects of the coordinated, long-term operation of the CVP and SWP, as part of Reclamation's revised CVP-OCAP action. Several plaintiffs challenged this BiOp in federal court. The plaintiffs argued, on the essential points, that the BiOps were prepared without the benefit of the most recent data, did not account for climate change effects, unlawfully relied on certain management protocols (e.g., DSRAM), and, did not meaningfully analyze whether the CVP-OCAP would jeopardize the continued existence of listed species both in the Delta and mainstem tributaries. As part of the litigation in the matter of *Natural Resources Defense Council et al., v. Dirk Kempthorne, Secretary of the Interior, California Department of Water Resources, San Luis & Delta Mendota Water Authority et al.,* (E.D. Cal. Case No. 05-CV-01207 OWW), the court held, on May 25, 2007, that the BiOp was indeed "arbitrary and capricious" and "contrary to law". The court maintained that an appropriate interim remedy must be implemented.

The court ordered that the USFWS issue a new BiOp by September 15, 2008 (and later postponed to December 15, 2008). The USFWS issued its final BiOp on December 15, 2008. After reviewing the current status of the delta smelt, the effects of the Proposed Action and the cumulative effects, it was the USFWS's BiOp that the coordinated operations of the CVP and SWP, as proposed, are likely to jeopardize the continued existence of the delta smelt.

On October 22, 2004, NOAA Fisheries issued its BiOp on the proposed long term CVP and SWP CVP-OCAP. This opinion was challenged under *Pacific Coast Federation of Fisherman's Association/Institute for Fisheries Resources et al., v. Carlos Gutierrez, Secretary of Commerce, William Hogarth, National Marine Fisheries Service, NOAA, San Luis & Delta Mendota Water Authority et al*., E.D. Cal. Case No. 1:06-CV-00245-OWW-GSA). On April 26 and May 19, 2006, Reclamation requested reinitiation of consultation based on new listings and designated critical habitats.

It should be pointed out that the current consultation involving Reclamation, USFWS and NOAA Fisheries is for the long-term coordinated operations of the CVP and SWP. Several documents, however, including the NOAA draft BiOp (see below) refer to the OCAP as being the subject matter of these consultations. This is technically incorrect; Reclamation is continuing to operate to its 2004 OCAP and the subject matter of the current consultations is for the long-term coordinated operations of CVP and SWP, not the 2004 OCAP document. For ease of reference by reviewers of this document and, in deference to the wide-ranging use of the term CVP-OCAP, the term CVP-OCAP is carried forward in this EIS/EIR.

In a June 19, 2006, letter to Reclamation, NOAA Fisheries stated that there was not enough information in Reclamation's request to initiate consultation. NOAA Fisheries provided a list of information required to fulfill the initiation package requirements [50 CFR 402.14(c)]. From May

2007, until May 29, 2008, NOAA Fisheries participated in interagency forums, along with representatives from Reclamation, DWR, USFWS, and CDFG, in order to provide technical assistance to Reclamation in its development of a Biological Assessment and initiation package. NOAA Fisheries provided its draft BiOp on listed anadromous fish species potentially affected by the long-term CVP-OCAP on December 11, 2008. It did not, however, include the Reasonable and Prudent Alternatives (RPAs), Incidental Take Statement (ITS), or any of the associated terms and conditions or conservation measures. The final BiOp was released on June 4, 2009. Prior to its release, DWR issued a letter to Reclamation, USFWS, and NOAA Fisheries on May 7, 2009, requesting reinitiation of the delta smelt consultation and enhanced integration between the two separate consultations for delta smelt (under USFWS) and the listed anadromous fish species (under NOAA Fisheries).

Reclamation, while continuing to have concerns, has provisionally accepted the RPA contained in the Biological Opinion on the long-term coordinated operations of the CVP and SWP dated, June 4, 2009. Reclamation will immediately implement the near- term elements of the RPA by modifying the operations as required and continue with the planning and implementation associated with several major actions called for in the RPA, including construction of the Red Bluff Pumping Plant, replacement of the Whiskeytown Reservoir temperature curtain and fish passage improvements on Battle Creek. The provisional acceptance is conditioned on the need to further evaluate and develop many of the longer term actions. These actions are subject to future appropriations, and may be beyond Reclamation's authority, or require agreements from outside parties to implement, which are outside of Reclamation's control. Accordingly, Reclamation anticipates that re-initiation of Section 7 consultation may be needed as these actions are further developed.

Clearly, the revised BiOps for the CVP-OCAP represent a significant undertaking and have the potential to influence the entire State’s water management and operational framework for many years. They involve a comprehensive analysis of system operations and the modeling relied upon to support those decisions; the long-term implications of these Opinions for many water users are significant. It is likely that the BiOps on the CVP-OCAP will be subject to continuing litigation. The final outcome of the CVP-OCAP is, therefore, admittedly uncertain.

During the pendency of this re-initiated consultation, Reclamation has committed and has been ordered by the court in the NRDC Case to take no action on approving or implementing several initiatives including: 1) SDIP, 2) Delta Mendota Canal/California Aquaduct Intertie, 3) Lower American River – Flow Management Standard, 4) Long-term EWA, and 5) execution of any long-term CVP water service contract or repayment contracts including, ostensibly, the Reclamation/EDCWA contract authorized under P.L.101-514. It is unclear, however, if the EDCWA contract authorized under P.L.101-514 would be subject to this order.

The long-term contract authorized by P.L.101-514 is the Proposed Action evaluated under this EIS/EIR. EDCWA and Reclamation also have negotiated a temporary one-year contract under the general authorization provided by P.L.101-514. A temporary contract would be a completely separate action from the long-term contract evaluated under this EIS/EIR, but with the completion of this EIS/EIR, all of the NEPA requirements would have been completed and issuance of a temporary contract (and any ensuing temporary contracts) would be able to rely on the environmental analyses contained in this current document. A temporary contract has been viewed by Reclamation and EDCWA as a “bridging” contract, essentially accommodating the expected water needs of EDCWA, starting in Water Year (WY) 2009 that, but for the CVP-OCAP litigation, the long-term CVP water service contract would have been able to provide. For GDPUD, a place of use petition by PCWA to the SWRCB as described previously would have to be completed.

Notwithstanding the constraints and imposed delays associated with the ongoing CVP-OCAP consultations, this EIS/EIR proceeded with its own select CALSIM II upgrades based on the expert study team’s current knowledge and direct participation in a number of local/regional project actions, including direct involvement with CVO and the Common Assumptions Workshop process. Some of these model assumption changes might appear intuitive; however, they are identified since they are departures from the original modeling used to support completion of the 2004 CVP-OCAP. Under the Base Condition hydrology, refinements to the original CVP-OCAP modeling included:

> Trinity ROD – higher Trinity River minimum flow requirements of the ROD on the Trinity River Main Stem Fishery Restoration EIS/EIR.
>
> Yuba River Operation – The inflow and diversion at Daguerre Point Dam were updated with values based on SWRCB D-1644 Interim standards on the Yuba River and existing level demands on the diversion developed in support of the Yuba Accord EIS/EIR.
>
> American River Demands – Sacramento River Water Reliability Study (SRWRS) developed new American River demands including significantly higher City of Sacramento demands.
>
> Upper American River simulations – Re-simulation of the Upper American River Model (UARM) to get the appropriate American River inflows to Folsom Reservoir similar to those used in the Common Assumptions (CVP-OCAP modeling development workshop) process.

For the Future Cumulative Condition modeling, the CALSIM II modeling upgrades for this EIS/EIR included:

> Yuba River Operation – The Yuba Accord was assumed to be foreseeable and the inflow and diversion were updated based on Yuba Accord standards on the Yuba River and future level demands on the diversion developed in support of the Yuba Accord EIS/EIR.
>
> Water Forum Agreement Cuts – EID and GDPUD cuts were imposed consistent with Reclamation Water Shortage Policy provisions for CVP North of Delta M&I contractors (e.g., the same shortage provisions typically imposed by Reclamation to its M&I contractors were also imposed on EID and GDPUD for its P.L.101-514 water, regardless of whether they are Water Forum Agreement signatories)
>
> Lower American River Flow Management Standard – The Lower American River Flow Management Standard (FMS) was included.
>
> Banks Pumping Capacity – South Delta Improvement Program (SDIP) was assumed not in place. Banks Pumping Plant was limited to 6,680 cfs.

Supplemental Water Rights Project – The El Dorado Water & Power Authority's proposed and pending Supplemental Water Rights Project for an additional 40,000 AFA is assumed to be in place for all future level simulations.

American River Demands – Sacramento River Water Reliability Study (SRWRS) developed new American River demands including significantly higher City of Sacramento demands.

Upper American River simulations – Re-simulation of the Upper American River Model (UARM) to get the appropriate American River inflows to Folsom Reservoir similar to those used in the Common Assumptions (CVP-OCAP modeling development workshop) process.

EID Temperature Control Device – The temperature control device was implemented in the temperature modeling for all future level simulations.

At the same time that the CVP-OCAP and its support modeling are being refined, work is also underway at Reclamation and the Department of Water Resources on the next version of CALSIM (i.e., CALSIM III). To be sure, it remains in the developmental stage, but will likely continue to gain interest over the next several years. A thorough documented analysis of the differences between it and the current CALSIM II model is not yet publicly available.

Apart from the ongoing CVP-OCAP issues, it must be acknowledged that the general level of concern regarding Delta ecosystem health and, Pelagic Organism Decline (POD) in particular, has increased significantly over the past several years. Today, in fact, Delta issues rank as one of the top issues facing California water resources management. The complexity of the Delta *issue,* if one can call it that, is accentuated by the fact that the Delta serves so many vital functions. These include; a natural estuary supporting a wide variety of sensitive flora and fauna, vital life-cycle migration corridor for listed anadromous fish species, recreational focal point for many water enthusiasts and prosperous tourism industry, a new home to an ever expanding Bay-Area and Central Valley population base, long-standing in-Delta farming practices, critical water quality source for southern State interests, essential transfer point for CVP/SWP exports, and as a key inland waterway for commerce traffic destined for the Ports of Sacramento and Stockton. There is overwhelming consensus that the Delta is now critically challenged regarding how best to manage the system among these competing interests. The Governor's *Delta Vision* Blue Ribbon Task Force is a testament to the importance being placed on collaboratively working to resolve this long-standing challenge along with the multi-agency effort to prepare the Bay Delta Conservation Plan.

The decline in Delta ecosystem function, habitat, and species has been thoroughly documented and continues to be exhaustively reviewed by numerous public trust resource agencies, universities, and interested stakeholders. While the causal factors in this decline are several and complex, increased diversions upstream of the Delta and, their collective long-term effect on freshwater flows into the Delta have been identified as one significant contributor to the observed decline in Delta health. Any proposed project that diverts water from ultimately entering the Delta will continue to be closely examined for its potential effects on this essential estuary. It should be clearly noted that export pumping and upstream depletions represent two of several factors that, collectively, have resulted in adverse environmental effects on the fragile Delta ecosystem. No one factor is solely responsible.

Within the American River basin or, having specific implication to either Folsom Reservoir or the lower American River, numerous actions have occurred since the passing of P.L.101-514 on November 4, 1990. These have included, to name but a few:

- Folsom Interim Re-Operation (400-670 TAF)
- Reclamation/PCWA American River Pump Station Project
- New Shutter Re-Configurations at the Folsom Power Penstock Intakes
- Water Forum Agreement including all Purveyor-Specific Agreements (and the Dry-Year "Wedge")
- Sacramento River Water Reliability Study (SRWRS)
- Folsom Dam Safety/Flood Damage Reduction
- Development of the Lower American River – Flow Management Standard

These actions, either directly or indirectly, each have some influence on Folsom Reservoir, the lower American River, and the operational decision-making regarding flow releases, temperature targets, reservoir coldwater pool management, dry-year delivery allocations, and flood control operations.

The completion of the environmental review and approval for the Reclamation/PCWA American River Pump Station Project in 2002, which were based on the desire to discard the temporary pumps in favor of a permanent pumping plant on the North Fork American River, was a significant accomplishment for Reclamation and PCWA. With the completion of final construction in 2008, PCWA now possesses permanent access to its North Fork American River diversion location. This paves the way for GDPUD to also gain access to the American River at the location of the American River Pump Station, the site of a potential exchange with PCWA for GDPUD's portion of the new CVP water service contract. As noted previously, there are several agreements and regulatory provisions that GDPUD and PCWA would have to negotiate and initiate in order for GDPUD to begin planning their own infrastructure at this location. Additionally, as previously noted, this exchange is contingent upon the completion of the environmental review and approval process for the Sacramento River Water Reliability Study in order to secure the revised CVP service area for PCWA.

Reclamation's operational strategies at Folsom Dam are, in part, directed toward water temperature preservation (i.e., Folsom Reservoir coldwater pool). Virtually all water released into the lower American River passes through Folsom Dam's three hydropower penstock intake shutters, of which there are nine. Access to the reservoir's coldwater pool once it is below the intake shutters, is accomplished through releases from Folsom Dam's lower river outlets which effectively bypasses power generation.

Reclamation has the ability to preferentially access various levels of the reservoir at these three hydropower penstock intake shutters. These were originally designed in a 1-1-7 configuration; where the top shutter could be opened independent of the others, as could the second shutter, while the remaining 7 shutters could only be opened as one unit. Reconfigured in 1994 under a 3-2-4 ganging configuration, these shutters now provide greater control over the depth of intake, and thus, the temperature of the water being released from the dam. Reclamation also has the ability to “blend” water between the three hydropower penstock intakes, adding yet more operational flexibility towards optimizing coldwater pool management and resultant downstream temperatures.

Coldwater pool management in Folsom Reservoir continues to represent an important component of annual and seasonal lower American River operations. Coldwater is defined as that at 56ºF or below[4]. Constrained in some respects by the existing flood encroachment curve for the reservoir (currently operating under an interim 400,000 AF to 670,000 AF empty space reservation), annual refill to storage can vary. Where low reservoir refill occurs (owing to decreased winter precipitation totals), the operating pool is limited, thermal stratification occurs earlier, and total *coldwater* pool volume can end up in short supply. This was the situation as it unfolded during the most recent 2007 WY. Any continued and new future diversions from Folsom Reservoir will require close operational planning with Reclamation, the Lower American River Operations Group, and Water Forum purveyors, especially in years when the coldwater pool is limiting. Currently, Reclamation strives to meet a 60ºF or less mean average daily water temperature as early in the fall-run season as possible.

The Water Forum Agreement included purveyor-specific agreements (PSAs) for numerous water purveyors signatory to the Agreement. While participating in the Water Forum process, neither EID nor GDPUD executed purveyor-specific agreements due to legal challenges to the El Dorado County General Plan. Additionally, as a non-purveyor, EDCWA could not enter into a purveyor-specific agreement. The dry-year “wedge” of the Water Forum Agreement was, and still is, a significant element of the Agreement. Purveyors have met their obligations under the dry-year “wedge”[5] provisions of their individual PSAs. It was always intended that the various PSAs negotiated through the Water Forum Agreement would be codified in some regulatory form; the original intent was to have each PSA drafted as a diversion agreement with Reclamation (for those drawing from Folsom Reservoir). These have yet to be executed. Inclusion of the Water Forum PSAs into Reclamation modeling for the CVP-OCAP was also an issue; Reclamation took the position that without regulatory standing, such voluntary diversion restrictions (i.e., PSAs) could not be assumed to represent a realistic baseline condition.

Another issue of particular note regarding the Water Forum Agreement and its EIR are the modeling assumptions that went into its analysis. The Agreement essentially represented a future cumulative condition for the American River basin and, as such, its evaluation included all known diversions, allocations and other water project deliveries assumed to occur over the planning horizon (to the year 2030). The modeling, therefore, included the P.L101-514 contracts for both Sacramento and El Dorado counties (i.e., it included the 15,000 AFA diversions contemplated by this current action). The Agreement’s mitigation (e.g., lower American River Habitat Management Element), out-year

4 Under the AFRP prescriptions and LAR FMS, it is acknowledged that Reclamation shall operate Folsom/Nimbus dams to meet daily average water temperatures of 60º F or less, and striving to achieve 56º F or less as early in the season as possible at Watt Avenue during the October 11 to December 16, fall-run

5 The Water Forum “wedge” is the vernacular for the dry-year cuts voluntarily adopted by signatory purveyors to the Agreement. It sets out allowed diversion quantities in any year based on water-year type, which is defined by the projected unimpaired inflow to Folsom Reservoir.

diversion totals, and proposed new fish-friendly flow standard for the lower American River (see Lower American River – Flow Management Standard, below) were all predicated on the modeling results for the Agreement. One could make the argument that the P.L.101-514 contracts, hydrologically, were fully mitigated insofar as Folsom Reservoir and lower American River aquatic effects were concerned.

A notable new action for the American River is the proposed Lower American River – Flow Management Standard (or LAR FMS). Resulting from one of the seven elements of the Water Forum Agreement, the LAR FMS is the culmination of several years of continued work on developing a fish-friendly flow pattern for the lower American River; its predecessors included several iterations during the development of the Water Forum Agreement (e.g., F-Pattern). The new recommended minimum flow requirements in the lower American River below Nimbus Dam would vary throughout the year in response to the hydrology of the Sacramento and American River Basins and based on various hydrological indices typically used by both Reclamation and DWR. This new flow standard would, when complete, be submitted to the SWRCB with a request to amend Reclamation's minimum flow release obligations under D-893. Reclamation, while supporting a new flow regime for the lower American River, has yet to proceed with moving this forward in light of the uncertainties surrounding the CVP-OCAP and Wanger litigation.

Specifically, for the American River, the NOAA Fisheries Biological Opinion RPA identified a flow management standard for implementation. Reclamation is still evaluating this flow standard. The RPA also includes a requirement to develop a genetic management plan for Nimbus Fish Hatchery, a new target temperature objective of 65°F at Watt Avenue and a flow threshold of 4,000 cfs. Specific cold water pool temperature management facilities and actions have been identified in the RPA for study and implementation as well as the planning and implementation of fish passage facilities at both Nimbus and Folsom Dams. Reclamation is working to better understand, in detail, how all of the RPA requirements CVP wide, may affect the CVP and its operations.

The El Dorado Water & Power Authority (EDWPA), which consists of the County of El Dorado, the El Dorado County Water Agency, and the El Dorado Irrigation District, is pursuing a long-term supplemental water supply through water right filings (the Supplemental Water Rights Project) before the State Water Resources Control Board (SWRCB). The Supplemental Water Rights Project is a separate and distinct project from the new CVP water service contract authorized under P.L. 101-514. At this time, the Supplemental Water Rights Project is a duly noticed and ongoing effort consistent with the processes defined under both CEQA and the Water Code. Under the regulatory provisions of both NEPA and CEQA this EIS/EIR is required to include the Supplemental Water Rights Project in its evaluation of potential future cumulative impacts as one of many reasonable and foreseeable actions. Accordingly, its inclusion in the hydrological modeling for the future cumulative impact analysis of this current EIS/EIR was required by CEQA. Its inclusion for such environmental review purposes, however, does not mean or imply that the U.S. Bureau of Reclamation supports the Supplemental Water Rights Project or that any future discretionary actions available to Reclamation are waived.

With the completion of the Reclamation/Corps of Engineers Flood Damage Safety/Flood Damage Reduction EIS/EIR in 2007, a significant milestone was reached in the long-term safety of Folsom

Dam and Reservoir. A significant feature of this project is the proposed auxiliary spillway along the south abutment near the left wing dam. Early construction activities were initiated in 2008.

Current flood control operations for Folsom Dam and Reservoir (including regulating criteria) are set out in the U.S. Army Corps of Engineers (Corps) *Folsom Dam and Lake, American River, California Water Control Manual* (1987). In 1996, the Interim Flood Control Plan Diagram for Folsom Reservoir (a.k.a. Interim Flood Operations) was developed cooperatively between Reclamation and the Sacramento Area Flood Control Agency (SAFCA). As noted previously, a significant component of the Interim Flood Operations was the variable 400,000 to 670,000 AF empty space storage requirements for Folsom Reservoir which changed the then authorized storage space which was fixed at 400,000 AF. As a 5-year Interim Agreement, this was intended to increase the available flood storage space in Folsom Reservoir to a maximum of 670,000 AF depending on upstream storage conditions providing ostensibly, greater flood storage relief during times of high runoff or reservoir inflow. Upon expiration in 2000, this Interim Agreement was extended for two years. From 2002 to 2004, however, no agreement was in place.

In 2004, a new agreement was negotiated between Reclamation and SAFCA to continue with the 400,000-670,000 AF *variable flood storage* operation unless and until such time as the Corps implemented a new water control manual and associated new flood control diagram. Under this current agreement, the operational criteria (e.g., 400,000-670,000 AF variable flood storage) will expire in 2018. As part of this joint federal effort, the Corps will be developing an Updated Flood Management Plan and Flood Control Manual (e.g., a new flood control diagram) for Folsom Reservoir.

The Sacramento River Water Reliability Study (SRWRS), also known as the Sacramento River Diversion Feasibility Study, was authorized in December 2002 under P.L.106-554. The SRWRS is intended to develop a series of water supply components, consistent with the Water Forum Agreement, designed to meet the long-term water supply needs of the Placer-Sacramento County region and to preserve the riparian and instream elements of the lower American River. Reclamation is the Lead Federal Agency for NEPA, and PCWA is Lead State Agency for CEQA. PCWA, Sacramento Suburban Water District (SSWD), and the cities of Roseville, and Sacramento are cost-sharing partners.

One of the proposed facility components (known as the Elkhorn Diversion Alternative) involves constructing a new joint diversion facility on the Sacramento River upstream of the mouth of the lower American River, along with on-site treatment facilities to serve the cost-sharing partners. The diversion facility would consist of expanding the existing Elkhorn Diversion owned by the Natomas Mutual Water Company (NMWC) on the east bank of the Sacramento River at approximately river mile 73.3, or constructing a new diversion near the existing Elkhorn Diversion. Water treatment, storage, and pumping facilities would be located near the river. Also, a transmission line would connect to the west end of the existing Cooperative Transmission Pipeline/Northridge Transmission Pipeline in Antelope to serve SSWD, and an extension of that line would be built north to the service areas of the City of Roseville and PCWA. A separate transmission line would extend south to connect to Sacramento's existing distribution system. Another option is for a stand-alone new water treatment plant at Elverta.

The additional water supplies considered in the SRWRS for each cost-sharing partner include: (1) additional water supply of up to 35,000 AF for PCWA's M&I demand with a treatment capacity of 65 million gallons per day (mgd); (2) additional water supply of up to 29,000 AF in Water Forum average, drier, and driest years for SSWD's M&I demand and groundwater stabilization program with a treatment capacity of 15 mgd, (3) additional water supply of up to 7,100 AF for the City of Roseville's M&I demand with a treatment capacity of 10 mgd, and (4) additional water supply of up to 58,000 AF with a water treatment capacity of 165 mgd for the City of Sacramento's M&I demand. Note the consistency of these demands with the Water Forum Agreement PSAs.

Consistent with the Water Forum Agreement, the SRWRS project, when completed, will support the long-term intent of the Agreement; namely, to move a significant portion of the current diversions taken from Folsom Reservoir (and hence, the lower American River) downstream to the Sacramento River without adverse supply allocation effects on the Water Forum purveyors. The SRWRS project would meet that intent. Additionally, with reduced diversions from the American River basin, the lower American River habitat and ecosystem improvement objectives as part of the Water Forum Agreement can also be met.

Locally, within El Dorado County, several initiatives have been completed since the passing of P.L.101-514. Of particular note is the current County General Plan. The Board of Supervisors previously adopted a General Plan on January 23, 1996. However, a lawsuit challenging that General Plan was filed. The Court held that, although the substance of the General Plan satisfied the statutory requirements of law, the environmental review process followed in the adoption of the General Plan did not comply with certain requirements of CEQA. As a result, the 1996 General Plan was set aside and the County was directed to readopt a General Plan in conformance with the Court's decision. From July 19, 1999, when the Court's judgment was entered, the County's land use regulatory authority was defined by the terms of a court order (the "Writ") that was issued on that date. The Writ also required court review of any new General Plan adopted before it could become effective to ensure that the deficiencies identified by the Court had been corrected.

The El Dorado County Board of Supervisors adopted a new General Plan for the County on July 19, 2004 after a lengthy process that included noticed public hearings before the Planning Commission and Board of Supervisors, a recommendation by the Planning Commission, and environmental review under CEQA, including preparation of a new environmental impact report. However, following adoption of the 2004 General Plan, a referendum petition containing the requisite number of signatures was filed which had the effect of "suspending" the Board's approval of the 2004 General Plan. As a result of the referendum petition, the 2004 General Plan was not to become effective unless it was approved by a majority of the voters at a special election.

On March 15, 2005 the voters of El Dorado County approved the referendum on the plan adopted by the Board of Supervisors. This provided the opportunity for the County to return to the Sacramento County Superior Court to have the writ of mandate in the matter of *El Dorado County Taxpayers for Quality Growth, et al. v. El Dorado County Board of Supervisors and El Dorado County* lifted. On September 1, 2005 the Court ruled that the County had satisfied every term of the writ and it was discharged. The Court's ruling was appealed by the plaintiffs. On April 18, 2006, a Settlement

Agreement was entered into by the County and the plaintiffs, settling the lawsuit and resulting in the withdrawal of the appeal.

The 2004, now-adopted General Plan: *A Plan for Managed Growth and Open Roads; A Plan for Quality Neighborhoods and Traffic Relief,* includes an introduction and nine elements. The Elements are: Land Use, Transportation and Circulation, Housing, Public Services and Utilities, Public Health, Safety and Noise, Conservation and Open Space, Agriculture and Forestry, Parks and Recreation, and Economic Development. Each General Plan Element includes an Implementation Program with an approved list of implementation measures that are linked to annual work schedules. Overall, the 2004 General Plan has a total of 234 implementation measures which are the collective responsibility of a number of County departments. Fifty-five of these measures are to be enacted on an ongoing basis, and 57 were scheduled to be completed within one year of General Plan adoption.

Pertaining to water supply, the Public Services and Utilities Element of the General Plan, GOAL 5.2: WATER SUPPLY states:

> The development or acquisition of an adequate water supply consistent with the geographical distribution or location of future land uses and planned developments.

A clear goal of the General Plan is the development or acquisition of an adequate water supply to meet future needs. Of particular relevance is Policy 5.2.1.15 which states;

"The County shall support the efforts of the County Water Agency and public water providers to retain existing and <u>acquire new surface water supplies for planned growth</u> and existing and planned agricultural uses within El Dorado County. New surface water supplies may include wastewater that has been reclaimed consistent with state and federal law." [Emphasis Added]

Other notable policies within the Public Services and Utilities Element pertaining to water supply can be found in the following:

<u>Policies</u>

5.2.1.1 The El Dorado County Water Agency shall support a County-wide water resources development and management program which is coordinated with water purveyors and is consistent with the demands generated by the General Plan land use map.

5.2.1.13 The County shall encourage water purveyors to design water supply and infrastructure projects in a manner that avoids or reduces significant environmental effects to the maximum extent feasible in light of the water supply objectives of a given project.

5.2.1.14 The County, in cooperation with the Water Agency and water purveyors, shall collect and make available information on water supply and demand.

EDCWA has recently updated its final *Water Resources Development and Management Plan* (Plan). This Plan is designed to coordinate water planning activities within El Dorado County and provide a blueprint for actions and facilities needed to meet the County's water needs into the future. The major water agencies participating in development of the plan are: EDCWA, EID, GDPUD, Grizzly

Flat Community Services District, South Tahoe Public Utility District and the Tahoe City Public Utility District. The Plan addresses the water supply needs of the entire County including those areas presently not served by a purveyor, and identifies potential technical, environmental and institutional constraints for each water resource alternative.

Existing water supply infrastructure and operations have been able to absorb substantial urban growth in western El Dorado County, primarily within the EID service area. However, water demand forecasts indicate that considerably more water will be needed to support approved growth in the County and projected increases in agricultural demands. Based on the approved 2004 General Plan and refinements made to the agricultural projections, the estimated total water demand in the County in 2025 will be roughly 125,500 AF. Most of this demand would occur on the western slope of the county, while about 10 percent of the future demand would be in the Tahoe Basin.

Buildout of the General Plan will require a total water supply of about 194,820 AF. Based on the 2004 General Plan and refinements made to the agricultural projections, the additional water supply needed by 2025 is calculated to be 34,276 AF, and a total of 103,518 AF of additional water supplies will be needed to meet projected buildout demands. The Plan assumes a safe yield delivery of 5,625 AF to each of EID and GDPUD from the new CVP water service contract authorized under P.L. 101-514, which is the subject of this Proposed Action. Accordingly, even with these new CVP contracts in place, an additional 23,000 AF of new water supplies are needed to meet the County's 2025 General Plan growth projections and associated water needs.

SUMMARY OF SPECIFIC POTENTIAL IMPACTS

This summary, including Table ES-1 below, provides an overview of the analysis contained in Chapters 5 through 9 of this EIS/EIR. It also includes correlated information covering the following (as required under CEQA): (a) effects found to be less than significant; (b) potential areas of controversy; (c) significant impacts; (d) mitigation measures to avoid or reduce identified significant impacts; (e) significant unavoidable impacts; and (f) alternatives.

Table ES-1, Summary of Project Impacts and Mitigation Measures, has been organized to correspond with environmental issues discussed in Chapter 5.0 (Environmental Consequences). For each alternative analyzed in Chapter 5.0, the summary table identifies the specific action impact, level of significance before mitigation, any proposed mitigation measures, and the level of significance after mitigation.

For most impacts, there is little, if any, distinction between alternatives. This is due to several reasons. First, the total project increment was 15,000 AFA; by CVP/SWP system operational standards this represented a small, almost indiscernible hydrological change. Second, the CALSIM II model, while extremely precise in its ability to quantify simulated changes in hydrology could not, in most instances, reflect notable changes in monthly system hydrology based on a 15,000 AFA diversion (even when the analysis forced the 15,000 AF into three months). Third, each of the Reduced Diversion Alternatives, all with increments less than 15,000 AFA revealed no changes (both between each other and, relative to the base condition). Fourth, the Water Transfer Alternative, by definition, assumed a diversion of equal quantity with Alternatives 2A through 2C (the

Proposed Action scenarios) differing only in the possible entitlement type; therefore, hydrologically, its impacts under CALSIM II were no different than those of Alternatives 2A through 2C. And fifth, the same conditions applied for the No-Action Alternative which assumed again, that without a new CVP water contract, EDCWA would seek an alternative supply allocation. CALSIM II could not detect or differentiate any changes under this alternative with those of Alternatives 2A through 2C.

So, unlike larger Reclamation projects where, significant variation can occur between alternatives (not only in facility location, design, capacity, and function, but also in terms of the quantities of water under consideration), these conditions simply did not exist for this project and environmental review.

Table ES-1, therefore, strove to present the results of the environmental evaluation in a reader-friendly and comprehensible manner. With an aim to reduce redundancy and, in due consideration of provisions in CEQA Guidelines § 15123 (b)(1), alternatives were categorized together if they were shown to impart identical environmental effects rather than list the comparative differences between alternatives which, as noted, in most cases, simply did not exist. The reader can easily view the full results of the environmental analysis, by alternative, by referring to the appropriate header identification for the resource of interest as well as the alternative(s) in question in Table ES-1. Abbreviations for impact determinations are: NI – No Impact; LS – Less than Significant; S – Significant; SU – Significant and Unavoidable.

SIGNIFICANT UNAVOIDABLE IMPACTS

The project-specific significant unavoidable diversion-related impacts of the proposed new CVP water service contracts are limited to those of an economic nature and related to hydropower generation and associated costs. They are:

- The proposed new contract would result in changes to CVP hydropower generation and capacity; this would impart an economic impact on power suppliers.
- The proposed new contract would result in additional pumping power requirements, over the long-term, to those purveyors relying on Folsom Reservoir and the current urban water supply intake.

There would be significant and unavoidable impacts resulting from growth that would be accommodated by the proposed water supply contracts. These significant and unavoidable impacts were fully evaluated in the certified El Dorado County General Plan EIR. Resources that would be affected are: land use, agriculture and forestry, visual resources, traffic and circulation, water, utilities, public services, human health and safety, noise, air quality, and biological resources.

TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		5.4 Water Supply (Diversion-Related Direct Impacts)		
5.4-1	**Effects on delivery allocations to CVP customers.**	LS	None required – All Alternatives	NA
5.4-2	**Effects on delivery allocations to SWP customers.**	LS	None required – All Alternatives	NA
5.4-3	**Effects of delivery allocations to purveyors of the Sacramento Water Forum Agreement as provided under their Purveyor-Specific Agreements (PSAs).**	LS	None required – All Alternatives	NA
5.4-4	**Reduction in pumping at the State pumps for annual delivery to South of Delta contractors.**	LS	None required – All Alternatives	NA
5.4-5	**Result in operations inconsistent with the existing or anticipated CVP-OCAP or COA.**	LS	None required – All Alternatives	NA
5.4-6	**Result in an inadvertent reduction in groundwater aquifer yields in any of the North, Central or South area aquifers.**	LS	None required – All Alternatives	NA
		5.5 Hydropower (Diversion-Related Direct Impacts)		
5.5-1	**Effects on CVP hydropower generation and capacity.**	S	**Alternatives 2A through 2C, Alternatives 4A through 4C, Alternative 3, and Alternative 1A** would impart economic effects on power supply. There are no feasible mitigation measures that would reduce the economic impact to a less-than-significant level. Consequently, for full disclosure reasons, this EIS/EIR acknowledges that power supply impacts are considered economically significant and unavoidable. For purposes of CEQA, however, the effect is environmentally less-than-significant, and does not represent a significant unavoidable environmental impact.	SU
5.5-2	**Effects on CVP hydropower generation and capacity.**	NI	**Alternative 1B** would impart no change/impacts.	NA
5.5-3	**Effects on annual pumping power costs to purveyors relying on the Folsom Reservoir urban water supply intake.**	S	**Alternatives 2A through 2C, Alternatives 4A through 4C, Alternative 3, and Alternative 1A** would impart significant unavoidable economic impacts. These are considered unavoidable given that the process of delivering water using the	SU

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		Folsom Reservoir facilities necessitates pumping and consequently, the use of electrical energy. The relatively small size of Folsom Reservoir, coupled with a large storage reservation for flood control, constrains operations from achieving large carryover storage volumes. Any additional use of water from Reservoir that alters the timing of storage, affects pumping requirements and these new CVP water service contracts are no exception. Pumping energy economic impacts are unavoidable and are borne by the Folsom Reservoir water diverters themselves.	
	NI	**Alternative 1B** would impart no change/impacts.	NA
5.5-3 Change in hydropower generation opportunities in the upper American River basin.	NI	None required – All Alternatives	NA
5.6 Flood Control (Diversion-Related Direct Impacts)			
5.6-1 Substantial change in the ability to adhere to the flood control diagrams for Folsom Reservoir under current operation or to its long-term re-operation.	NI	None required – All Alternatives	NA
5.6-2 Substantial change in floodplain characteristics that would increase the exposure of persons or property to flood hazards including a substantial change in the hydraulic stress imparted to lower American River levees or lower Sacramento River levees.	LS	None required – All Alternatives	NA
5.6-3 Result in operations inconsistent with the Joint Federal Project for Folsom Dam (including the Folsom Dam Safety/Flood Damage Reduction Project).	NI	None required – All Alternatives	NA
5.6-4 Result in operations inconsistent with SAFCA and Water Forum levee improvement/stabilization work in the lower American River corridor.	NI	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.7 Water Quality (Diversion-Related Direct Impacts)				
5.7-1	**Effects of increased diversions and changes in CVP operations on water quality in reservoirs and rivers.**	LS	None required – All Alternatives	NA
5.7-2	**Effects on Delta water quality or operations contrary to the mandate of the Bay-Delta Water Quality Control Plan, California Inland Surface Waters Plan, Bay-Delta Pollutant Policy Document and Accord, Anti-Degradation Policy, and the pending Bay-Delta Conservation Plan.**	LS	None required – All Alternatives	NA
5.8 Fisheries and Aquatic Resources (Diversion-Related Direct Impacts)				
5.8-1	**Effects on warmwater fisheries in Shasta and Trinity reservoirs.**	LS	None required – All Alternatives	NA
5.8-2	**Impacts on Shasta and Trinity reservoirs' coldwater fisheries.**	LS	None required – All Alternatives	NA
5.8-3	**Flow-related impacts on fisheries resources in the upper Sacramento River.**	LS	None required – All Alternatives	NA
5.8-4	**Temperature-related impacts in the upper Sacramento River.**	LS	None required – All Alternatives	NA
5.8-5	**Temperature related impacts on fisheries resources in the lower Sacramento River.**	LS	None required – All Alternatives	NA
5.8-6	**Effects on Delta fisheries resulting from changes in inflow hydrology and water quality changes.**	LS	None required – All Alternatives	NA
5.8-7	**Flow impacts on fisheries resources of the North Fork American River downstream of the American River Pump Station site.**	PS	<u>Alternative 2C - Proposed Action – Scenarios C</u> Under Alternative 2C - Proposed Action – Scenario C, reductions in simulated mean monthly flows in the North Fork American River downstream of the Auburn Dam site, relative to the Base Condition were noted. Although small, these flow reductions could represent a significant impact on resident fisheries and associated aquatic resources within this reach of the North Fork. *Potential mitigation measures may include:*	LS

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		1. Altered seasonal diversion pattern; thus, avoiding a peaked mid-summer diversion (August through October as modeled); *2. Re-allocating the diversion quantities between EID and GDPUD, so as to follow either the Scenario A or B allocations; or* *3. Reduction in the overall diversion total as represented by the Reduced Diversion Alternative.* **For Alternatives 2A and 2B - Proposed Action – Scenarios A and B, Alternatives 4A through 4C - Reduced Diversion Alternatives, Alternative 3, and Alternative 1A – No Action Alternative -** None required.	
5.8-8 Flow impacts on fisheries resources of the North Fork American River upstream of the American River Pump Station site.	LS	None required – All Alternatives	NA
5.8-9 Impacts on Folsom Reservoir warmwater fisheries.	LS	None required – All Alternatives	NA
5.8-10 Impacts on Folsom Reservoir's coldwater fisheries.	LS	None required – All Alternatives	NA
5.8-11 Impacts on Nimbus Fish Hatchery.	LS	None required – All Alternatives	NA
5.8-12 Impacts on fall-run Chinook salmon and steelhead in the lower American River.	PS	**Alternatives 2A through 2C - Proposed Action – All Scenarios** Under these Alternatives, reductions in simulated mean monthly flows in the lower American River at the mouth during the month of September, relative to the Base Condition were noted. Although small, these flow reductions could represent a significant impact on fall-run adult Chinook salmon immigration. *Potential mitigation measures may include:* *1. Altered seasonal diversion pattern; thus, avoiding a peaked mid-summer diversion (August through October as modeled);* *2. Reduction in the overall diversion total as represented by the Reduced Diversion Alternative.* **Alternatives 4A through 4C - Reduced Diversion Alternatives, Alternative 3 - Water Transfer Alternative, Alternative 1A - No**	LS

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		Action Alternative, and Alternative 1B - No Project Alternative, None required. **Under Alternative 1B - No Project Alternative, t**here would be no additional diversions from the CVP system under the No Project Alternative. Consequently, flows and associated temperatures in the lower American River and lower Sacramento River would remain unchanged from existing conditions. Accordingly, there would be no temperature-related impacts on fall-run Chinook salmon/steelhead adult immigration under this Alternative.	
5.8-13 Impacts on splittail in the lower American River.	LS	None required –All Alternatives	NA
5.8-14 Impacts on American shad in the lower American River.	LS	None required – All Alternatives	NA
5.8-15 Impacts on striped bass in the lower American River.	LS	None required – All Alternatives	NA
5.9 Riparian Resources (Diversion-Related Direct Impacts)			
5.9-1 Effects on vegetation associated with changes in water surface elevations in Folsom, Shasta, and Trinity reservoirs.	LS	None required – All Alternatives	NA
5.9-2 Effects on riparian vegetation of the upper Sacramento River.	LS	None required – All Alternatives	NA
5.9-3 Effects on riparian vegetation in the lower Sacramento River and Delta.	LS	None required – All Alternatives	NA
5.9-4 Effects on Delta habitats of special-status species (non-fisheries).	LS	None required – All Alternatives	NA
5.9-5 Effects on riparian vegetation of the lower American River.	LS	None required – All Alternatives	NA
5.9-6 Effects on backwater pond hydrology in lower American River and its subsequent effect on pond vegetation.	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.9-7	**Effects on special-status species dependent on lower American River riparian and open water habitats.**	LS	None required – All Alternatives	LS
5.9-8	**Effects on species dependent on Folsom Reservoir near shore and open water habitats.**	LS	None required – All Alternatives	LS
5.9-9	**Direct impacts on the California red-legged frog and Foothill yellow-legged frog.**	LS	**Alternative 2C - Proposed Action – Scenario C** Although impacts on the California red-legged frog and Foothill yellow-legged frog could be significant in the portion of this reach of the North Fork American River, there is no legal authority requiring EDCWA to take action related to speculative future projects that could be implemented by GDPUD in the future. The obligation to adopt feasible mitigation measures only arises when an agency proposes to approve a project with significant environmental impacts. Future and specific mitigation measures would be prepared at the time project-specific actions are initiated and would become a part of the project-level environmental documentation for that action. This current EIS/EIR does not provide the environmental analysis necessary to support all of the new facilities ultimately required by GDPUD, at the location of the PCWA Auburn Pump Station to complete implementation of the new CVP water service contract for GDPUD. At present, no details are available as to the nature of these required facilities that would lend themselves to a project-specific analysis. Nevertheless, it is prudent to identify the types of mitigation measures that would benefit and help offset the potential hydrological effects revealed by the simulation modeling. In the future, when GDPUD actively proceeds with this new facility project, mitigation measures addressing the potential hydrological effects on either California red-legged frog and Foothill yellow-legged frog could include: • The EDCWA shall ensure that a spring survey in accordance with all applicable USFWS survey protocols is conducted by a	LS

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		qualified biologist during the appropriate spring survey window in areas with suitable habitat that will be affected. • Should no CRLF adults or egg masses be observed during the spring survey, then no further mitigation shall be required. If CRLF are determined to be present, then the following mitigation measure could be implemented: • Either a no jeopardy biological opinion or an incidental take permit shall be obtained from the USFWS for potential impacts on the CRLF. All the terms and conditions of the biological opinion or the incidental take permit from the USFWS shall be implemented. While at the discretion of the USFWS, the above-mentioned terms and conditions will likely include a requirement to avoid and minimize habitat impacts and measures to restore impacted areas and enhance other areas along the creeks or reservoirs to benefit the CRLF. Regardless of USFWS direction, however, GDPUD, at a minimum, commit to a no net loss [of CRLF habitat] performance standard, but shall defer to the USFWS to determine if a higher mitigation ratio is required, and to determine how the performance standard will be satisfied. • Implementation of the above mitigation measure would reduce the potential impacts under Proposed Action – Scenario C, to less than significant.	
5.10 Water-Related Recreational Resources (Diversion-Related Direct Impacts)			
5.10-1 Result in a substantial conflict with established water-dependent or water-enhanced recreational uses in Folsom Reservoir, the lower American River, upper Sacramento River reservoirs, upper and lower Sacramento River, and the Delta or, result in activities inconsistent with the American River Parkway Plan.	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.10-2 Result in a substantial change in river access or channel conditions that would decrease water-based recreational activities. For purposes of this analysis, the following thresholds are applicable: **1. Substantial decrease in the duration of Middle Fork American River flows below the 850 cfs threshold for boating.** **2. Substantial change in lower American River flows above or below the 1,750 to 6,000 cfs minimum/maximum range of adequate recreational flows; substantial change in lower American River flows above or below the 3,000 to 6,000 cfs optimum range of adequate recreational flows.**	LS	None required – All Alternatives	NA
5.10-3 Result in a substantial decrease in upper or lower Sacramento River flows below 5,000 cfs.	LS	None required – All Alternatives	NA
5.10-4 Shasta Reservoir boat launching criteria (reservoir elevation in msl; point at which boat launches must be closed): **1. Sacramento Arm: Antlers (995 ft) Sugarloaf #1 (955 ft) Sugarloaf #2 (918 ft).** **2. McLeod Arm: Baily Cover (1,017 ft) Hirz Bay #1 (1,020 ft) Hirz Bay #2 (973 ft) Birz Bay #3 (941 ft).** **3. Pit Arm: Packers Bay (951 ft) Centimundi #1 (943 ft) Centimundi #2 (876 ft) Centimundi #3 (848 ft) Jones Valley #1 (980 ft) Jones Valley #2 (924 ft) Jones Valley #3 (856 ft).**	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.10-5 Trinity Reservoir boat launching criteria (reservoir elevation in msl; point at which boat launches must be closed): 1. Fairview – Trinity Dam area (2,310 ft) 2. Main Arm – Trinity Center (2,295 ft) 3. Stuart Fork Arm – Minersville (2,170 ft)	LS	None required – All Alternatives	NA
5.10-6 Folsom Reservoir recreational thresholds (reservoir elevation in msl) including: 1. When all boat ramps are usable (420 feet or higher). 2. When the marina wet slips are usable (412 feet or higher). 3. When the swimming beaches are usable (420 feet to 455 feet).	LS	None required – All Alternatives	NA
5.11 Water-Related Cultural Resources (Diversion-Related Direct Impacts)			
5.11-1 Effects of changes in water surface elevations in Folsom, Shasta, and Trinity reservoirs on cultural resources.	LS	None required – All Alternatives	NA
5.11-2 Effects of changes in flows in the Sacramento River and Delta on cultural resources.	LS	None required – All Alternatives	NA
5.11-3 Effects of changes in flows in the lower American River on cultural resources.	LS	None required – All Alternatives	NA
5.12 Land Use (Service Area Indirect Impacts)			
5.12-1 Result in land uses that are incompatible with existing land use practices or land use policies.	LS	None required – All Alternatives	NA
5.12-2 Result in alteration of the region's planned capacity to accommodate projected future population growth.	LS	None required – All Alternatives	NA
5.12-3 Result in a physical change to the environment from changes in employment patterns.	LS	None required – All Alternatives	NA
5.12-4 Result in substantial conversion of agricultural lands to non-agricultural uses.	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.13 Transportation and Circulation (Indirect Non-Diversion-Related)			
5.13-1 Result in increased traffic that is substantial in relation to the existing traffic load and capacity of the street system.	LS	None required – All Alternatives	NA
5.13-2 Result in the exceedance of the level of service standard established by the county congestion management agency for designated roads or highways.	LS	None required – All Alternatives	NA
5.13-3 Result in additional hazards due to a design feature resulting in inadequate emergency access.	LS	None required – All Alternatives	NA
5.13-4 Result in conflicts with adopted policies supporting alternative transportation.	LS	None required – All Alternatives	NA
5.14 Air Quality (Service Area Indirect Impacts)			
5.14-1 Conflict with or obstruct implementation of the applicable air quality plan.	LS	None required – All Alternatives	NA
5.14-2 Result in a cumulatively-considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).	LS	None required – All Alternatives	NA
5.14-3 Violate any air quality standard or contribute substantially to an existing or projected air quality violation.	LS	None required – All Alternatives	NA
5.14-4 Substantially increase exposure of sensitive receptors to toxic air pollutants, or expose people to substantial levels of hazardous substance air emissions or create objectionable odors affecting a substantial number of people.	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.15 Noise (Service Area Indirect Impacts)			
5.15-1 Substantially increase exposure of sensitive receptors to noise levels above established federal, State or local standards.	LS	None required – All Alternatives	NA
5.16 Geology, Soils, Mineral Resources, and Paleontological Resources (Service Area Indirect Impacts)			
5.16-1 Expose people or structures to major geologic hazards, such as rupture of a known earthquake fault, as defined on the most recent Alquist-Priolo Earthquake Fault Zoning Act Map, seismic ground shaking, liquefaction, slope failure, or landslides.	LS	None required – All Alternatives	NA
5.16-2 Place structures on soils that are likely to collapse or subside, or be located on expansive soils (defined in Table 18-01-B of the Uniform Building Code) that could damage foundations or structures.	LS	None required – All Alternatives	NA
5.16-3 Substantially increase erosion or loss of topsoil due to site disturbance.	LS	None required – All Alternatives	NA
5.16-4 Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the state, or result in the loss of availability of a locally important mineral resource recovery site delineated in the El Dorado General Plan.	LS	None required – All Alternatives	NA
5.16-5 Directly or indirectly destroy a unique paleontological resources or site or unique geologic feature.	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.17 Recreation (Service Area Indirect Impacts)			
5.17-1 Result in permanent closure of recreation trails through the project area or result in a substantial increase in exposure to hazards for recreationists, for land-based activities due to project construction or operation.	LS	None required – All Alternatives	NA
5.17-2 Result in an increase in 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.	LS	None required – All Alternatives	NA
5.18 Visual Resources (Service Area Indirect Impacts)			
5.18-1 Result in a substantial adverse effect on a scenic vista or substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway.	LS	None required – All Alternatives	NA
5.18-2 Result in a substantial degradation to the existing visual character or quality of the site and its surroundings or create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area.	LS	None required – All Alternatives	NA
5.19 Cultural Resources (Service Area Indirect Impacts)			
5.19-1 Result in a substantial adverse change in the significance of an historical or archaeological resource.	LS	None required – All Alternatives	NA
5.19-2 Result in the disturbance of any human remains, including those interred outside formal cemeteries.	LS	None required – All Alternatives	NA
5.20 Terrestrial and Wildlifel Resources (Service Area Indirect Impacts)			
5.20-1 Have a significant adverse effect, either directly through habitat modifications, fragmentation, on any species in local or	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
	regional plan, policies, or regulations, or by the California Department of Fish & Game or U.S. Fish & Wildlife Service.			
5.20-1	**Substantially affect a rare, threatened or endangered species of animal or plant or the habitat of those listed species.**	LS	None required – All Alternatives	
5.22 Water Supply (Cumulative Impacts)				
5.22-1	**Effects on CVP Allocations.**	LS	None required – All Alternatives	NA
5.22-2	**Effects on SWP Allocations.**	LS	None required – All Alternatives	NA
5.22-3	**Effects of delivery allocations to purveyors of the Sacramento Water Forum Agreement as provided under their Purveyor-Specific Agreements (PSAs).**	LS	None required – All Alternatives	NA
5.23 Hydropower (Cumulative Impacts)				
5.23-1	**Effects on CVP hydropower generation and capacity.**	LS	None required – All Alternatives	NA
5.24 Flood Control (Cumulative Impacts)				
5.24-1	**Substantial change in the ability to adhere to the flood control diagrams for Folsom Reservoir under current operation or to its long-term re-operation.**	LS	None required – All Alternatives	NA
5.24-2	**Substantial change in floodplain characteristics that would increase the exposure of persons or property to flood hazards including a substantial change in the hydraulic stress imparted to lower American River levees or lower Sacramento River levees.**	LS	None required – All Alternatives	NA
5.25 Water Quality (Cumulative Impacts)				
5.25-1	**Effects of increased diversions and changes in CVP operations on water quality in reservoirs and rivers.**	LS	None required – All Alternatives	NA
5.25-2	**Effects on Delta water quality.**	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		5.26 Fisheries and Aquatic Resources (Cumulative Impacts)		
5.26-1	**Effects on CVP reservoir warmwater fisheries.**	LS	None required – All Alternatives	NA
5.26-2	**Impacts on Folsom Reservoir's coldwater fisheries.**	LS	None required – All Alternatives	NA
5.26-3	**Flow- and Temperature-related effects on upper Sacramento River fisheries.**	LS	None required – All Alternatives	NA
5.26-4	**Flow- and Temperature-related effects on lower Sacramento River fisheries.**	LS	None required – All Alternatives	NA
5.26-5	**Effects on Delta fisheries.**	LS	None required – All Alternatives	NA
5.26-6	**Effects on lower American River fall-run Chinook salmon and steelhead.**	LS	None required – All Alternatives	NA
5.26-7	**Effects on lower American River splittail.**	LS	None required – All Alternatives	NA
5.26-8	**Effects on striped bass.**	LS	None required – All Alternatives	NA
		5.27 Riparian Resources (Cumulative Impacts)		
5.27-1	**Effects of changes in water surface elevations on Folsom, Trinity, and Shasta reservoir vegetation.**	LS	None required – All Alternatives	NA
5.27-2	**Flow-related effects on upper and lower Sacramento River riparian vegetation.**	LS	None required – All Alternatives	NA
5.27-3	**Flow-related effects on Delta riparian vegetation and special-status species.**	LS	None required – All Alternatives	NA
5.27-4	**Flow-related effects on lower American River riparian vegetation and special-status species dependent upon riparian and open water habitats.**	LS	None required – All Alternatives	NA
		5.28 Water-Related Resources (Cumulative Impacts)		
5.28-1	**Impacts on recreational facilities and activities at Shasta and Folsom reservoirs.**	LS	None required – All Alternatives	NA
5.28-2	**Impacts on recreational activities along the lower American River.**	LS	None required – All Alternatives	NA
5.28-3	**Impacts on recreational activities in and along the upper and lower Sacramento River.**	LS	None required – All Alternatives	NA

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TABLE ES-1

SUMMARY OF PROJECT IMPACTS AND MITIGATION MEASURES (CEQA)

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
5.29 Water-Related Cultural Resources (Cumulative Impacts)				
5.29-1	**Effects of changes in magnitude and/or frequency of Folsom reservoir elevations on cultural resources.**	LS	None required – All Alternatives	NA
5.29-2	**Effects of changes in magnitude and/or frequency of lower American River and Sacramento River flows on cultural resources.**	LS	None required – All Alternatives	NA

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1.0 INTRODUCTION

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1.0 INTRODUCTION

1.1. Background

1.1.1. Public Law 101-514

In 1990, Congress passed Public Law 101-514 (P.L. 101-514),[6] which directed the U.S. Bureau of Reclamation (Reclamation) to enter into a long-term Central Valley Project (CVP) water service contract with the El Dorado County Water Agency (EDCWA). Under this contract, up to 15,000 acre-feet annually (AFA) of CVP water would be provided to EDCWA. The contract would provide water to serve municipal and industrial (M&I) water needs in El Dorado County and establish and preserve rights to divert the water in accordance with State Water Resources Control Board (SWRCB) and Reclamation requirements. EDCWA would make this water available for use by two of its member districts in the western portion of El Dorado County, the El Dorado Irrigation District (EID) and the Georgetown Divide Public Utility District (GDPUD). Various options for diversion and delivery of this new water supply are fully described in Chapter 3.0 (Alternatives Including the Proposed Action and Project Description).

Section 206 (b) of P.L. 101-514 authorizes a new CVP contract for EDCWA as well as the Sacramento County Water Agency (SCWA), and the San Juan Suburban Water District. Section 206 (b)(1)(B) specifically addresses EDCWA's allocation under the law. Section 206(b)(1) in its entirety reads as follows:

> The Secretary of the Interior is authorized and directed to enter into the following contracts: (A) a municipal and industrial water supply contract with the Sacramento County Water Agency, not to exceed 22,000 acre-feet annually, to meet the immediate needs of Sacramento County and a municipal and industrial water supply contract with the San Juan Suburban Water District, not to exceed 13,000 acre-feet annually, for diversion from Folsom Lake, with annual quantities delivered under these contracts to be determined by the Secretary based upon the quantity of water actually needed within the Sacramento County Water Agency service area and San Juan Suburban Water District after considering reasonable efforts to: (i) promote full utilization of existing water entitlements within Sacramento County, (ii) implement water conservation and metering programs within the areas served by the contract, and (iii) implement programs to maximize to the extent feasible conjunctive use of surface water and groundwater; and <u>(B) a municipal and industrial water supply contract with the El Dorado County Water Agency, not to exceed 15,000 acre-feet annually, for diversion from Folsom Lake or for exchange upstream on the American River or its tributaries, considering reasonable efforts to implement water conservation programs within areas to be served by the contracts</u>. The contracts required by this subsection are intended as the first phase of a contracting program to meet the long-term water supply needs of Sacramento and El Dorado Counties. The Secretary shall promptly initiate the necessary analysis for the long-term water supply contracts. The Secretary may include in these contracts terms and conditions to ensure that

6 P.L. 101-514 was a part of the Energy and Water Development Appropriations Act of 1991, H.R. 5019, Conference Report H101-235, filed October 15, 1990, passed October 20, 1990, and signed into law, November 4, 1990.

> the contracts may be amended in any respect required to meet the Secretary's obligations under applicable State law and the Federal environmental laws. [Emphasis Added]

At the time that P.L.101-514 was passed, it was acknowledged that El Dorado County (and Sacramento County) would continue to grow and that new water supplies would be required well into the future. These assumptions have been borne out over the past two decades with increasing population growth requiring the continual of additional water supplies. The most current assessment was prepared by the El Dorado County Water Agency as part of its 2007 Water Resources Development and Management Plan. For more information on the background behind P.L.101-514, readers are encouraged to review the House Report (101-96), Senate Report (S101-83), and the Conference Report (H101-235) in support of Bill H.R.5019 (Public Law 101-514).

Section 206(b)(2) of P.L. 101-514 recognizes the need for EDCWA and Reclamation to prepare jointly environmental documentation to fulfill environmental review requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). This EIS/EIR has been prepared in compliance with the requirements of NEPA and CEQA and in accordance with the mandate of P.L. 101-514.

It is important to note that, although a moratorium on new CVP water supply contracts was in place at the time of the P.L.101-514 authorization, the proposed contracts (including the EDCWA contract) are able to proceed because Section 3404(b) of P.L. 102-575, Title XXXIV (Central Valley Project Improvement Act) excludes water supply contracts provided by P.L. 101-514 from the moratorium.

An equally important point is that the P.L. 101-514 contract for EDCWA is recognized "…as the first phase of a contracting program to meet the long-term water supply needs of …El Dorado [County]." EDCWA, along with its member units, have continued to pursue various water supply acquisition and demand reduction initiatives concurrently with this new CVP water service contract. Further details regarding EDCWA's water needs, demand projections, and ongoing water supply development activities are provided in Chapter 2.0 (Purpose and Need).

1.2. EVENTS LEADING TO PUBLICATION OF THIS DRAFT EIS/EIR

Since the passing of P.L.101-514 in 1990, numerous events have unfolded that have affected or been a part of this new contracting process. A Notice of Preparation (NOP) for this EIS/EIR was prepared and circulated in April 1993 (1993 NOP) and a Notice of Intent (NOI) was prepared for the project and published in the Federal Register (Vol. 58, No. 90, May 12, 1993). After public circulation of the 1993 NOP and NOI, a series of informal scoping sessions with various stakeholder groups and agencies was conducted by EDCWA and its environmental consultant as part of the early project scoping process. The 1993 NOI and NOI, results of scoping sessions, and a report compiling the results of the NOP/NOI process and scoping sessions is included in Appendix A in this Draft EIS/EIR.

Following completion of the project scoping process in early 1994, activity related to preparation of this EIS/EIR slowed. In part, this was due to the renewed focus on the acquisition of new water rights for EID under the proposed "El Dorado Project". The El Dorado Project, as it was referred to in prior environmental documentation, was EID's proposed acquisition of Federal Energy Regulatory

Commission (FERC) Project No. 184 from Pacific Gas and Electric Company (PG&E), and the acquisition by EID of a water right permit for 17,000 AFA of water diverted through Project 184 facilities for consumptive use purposes. Additionally, at this time, the proponents of the P.L. 101-514 contract decided to wait to complete environmental review for EDCWA's action until the Sacramento County P.L. 101-514 EIS/EIR and contract were complete.[7] Several processes, including a service area analysis, were being required by the U.S. Fish & Wildlife Service (USFWS) as part of the Section 7 consultative requirements under the federal Endangered Species Act; this was a new requirement of the USFWS under Section 7 related to new water supply projects. Accordingly, it was uncertain as to how this new process would unfold; it took several years for the SCWA, San Juan Water District (SJWD), City of Folsom, and USFWS to develop an appropriate framework with which to undertake a service area analysis related to the new CVP water supply contract. Also during this period of time, Reclamation's long-standing planning and operations hydrologic model for the coordinated CVP/SWP, PROSIM, was being revised to later become known as PROSIM 2000.

The environmental review process for the El Dorado County Water Agency P.L. 101-514 CVP Water Service Contract was reinitiated with circulation of a revised NOP and NOI published in July 1998 (1998 NOI/NOP), following the adoption of an updated General Plan for El Dorado County by the County Board of Supervisors in 1996. During the NOI/NOP public review period, two public scoping sessions were held in August 1998 to solicit public comment formally. Appendix B in this Draft EIS/EIR includes the NOP and NOI materials and responses.

1.2.1. General Plan Update and Measure "Y"

After the circulation of the revised NOI/NOP in 1998, several events occurred involving the El Dorado County General Plan Update that were especially pertinent to this EIS/EIR. Following the 1996 adoption of the County General Plan by the El Dorado County Board of Supervisors, the General Plan EIR was challenged in court for not adequately disclosing certain potential impacts associated with the plan. In February 1999, the Sacramento County Superior Court ruled that, in certain respects, El Dorado County had failed to comply with CEQA in the adoption of its General Plan. Specifically, the Court found that impacts related to traffic, water, and biological resources were not sufficiently addressed. As a result of the Judgment and Writ of Mandate (Writ), issued in July 1999, certification of the General Plan EIR and adoption of the General Plan Update were set aside. The Writ contained orders about rewriting parts of the EIR for the General Plan and what land use activities could take place in the interim. The Writ allowed inclusion of lands that involved existing development agreements entered into between El Dorado County and the developers during the period between the adoption of the General Plan in 1996, and its suspension in 1999. These agreements and developments with approved specific plans were considered Writ-allowed development.

In November 1998, the voters of El Dorado County passed an initiative entitled "Measure Y". The measure was intended to ensure that acceptable levels of service for roadways within El Dorado County would be maintained in the face of substantial future planned residential development.

7 The EIS/EIR for CVP water supply contracts under P.L. 101-514 for Sacramento County agencies was completed in April 1999, and the contracts with Sacramento County, San Juan Water District, and the City of Folsom were executed in early 1999.

Implementation of this measure and the updated General Plan directly influenced the extent and nature of future development in the county, and therefore, are relevant to the use and resulting environmental impacts of future water supplies that would be provided under P.L. 101-514.

1.2.2. County of Amador v. El Dorado County Water Agency et al.

Another court decision affecting the current project was issued by the Third District California Court of Appeal, also in 1999. The case of *County of Amador v. El Dorado County Water Agency et al.* (1999) 76 Cal.App.4th 931 established that water supplies cannot be acquired to provide water for growth without a current, officially-adopted General Plan. This court decision was in response to EID's acquisition of 17,000 AFA of Project 184 water, but the implications of the decision prolonged the postponement of this current project. The CVP water supply contract environmental review associated with this EIS/EIR, therefore, could not be completed, nor the contracts executed, before El Dorado County adopted a General Plan and the Writ was lifted.

1.2.3. El Dorado County General Plan Update

Following the 1999 issuance of the Writ, El Dorado County performed additional environmental analyses, resulting in the revision of the General Plan Update and its associated environmental documents by 2003. In July 2004, the County General Plan Update was adopted by the County Board of Supervisors. Shortly after the General Plan Update adoption, in November 2004, the voters of El Dorado County had an opportunity to vote on Measure G. This initiative would have allowed approval of General Plans by ballot initiative, but was soundly rejected by the voters.

In March 2005, the El Dorado County ballot contained a referendum on the General Plan Update passed by the County Board of Supervisors, which the voters passed. In September 2005, the Sacramento County Superior Court determined that the new 2004 General Plan Update and its environmental review satisfied the terms of the Writ, and the Writ was lifted, allowing the full implementation of the General Plan.

The lifting of the Writ was appealed by the El Dorado County Taxpayers for Quality Growth. In response to the challenge, El Dorado County entered into a settlement agreement with Taxpayers for Quality Growth in April 2006, and the appeal was withdrawn. As a result, the 2004 General Plan is now legally binding, and embodies the County's vision of how much population growth the County expects and has planned for through the year 2025. This vision creates the basis for water supply planning by EDCWA, EID, and GDPUD, not only for this current project but for all other ongoing and potential future water supply development initiatives.

1.3. Recent Events

As noted previously, during the period between the suspension of the El Dorado County General plan in 1999 and the lifting of the Writ in 2005, Reclamation's planning and operations hydrologic modeling tool was being further revised with cooperative assistance from the California Department of Water Resources (DWR). PROSIM 2000 was revised and superseded by the CALSIM II model which now represents the industry standard for coordinated CVP/SWP operational planning. The CALSIM II model, along with the compatible Reclamation environmental models, has been used to analyze potential environmental and socio-economic impacts in this document.

Early in 2006, as Reclamation and EDCWA were set to reinitiate the environmental review process, one remaining technical issue was to ensure that the proposed CALSIM II hydrologic modeling was consistent with the CALSIM II simulations used in the recent updating of the CVP-OCAP in 2004. This confirmation was received during the summer of 2006 with the proviso that no official endorsement of the model or its assumptions could be made by Reclamation, since at the time, the ongoing CVP-OCAP litigation under Judge Wanger was pending.

In September 2006, with the County planning documents and Reclamation operational tools updated, the environmental review process for this contracting action was reinitiated. A third NOI and NOP was deemed necessary due to the elapsed time from the last noticing in 1998. The NOI and NOP were prepared and re-circulated, with the comment period closing on October 16, 2006. Two Public Scoping Meetings were held in September 2006, one in Placerville and one in Greenwood (in the Georgetown Divide area). Public comment and response to the NOI and NOP were taken at the meetings, and by mail through October 16, 2006. Appendix C of this Draft EIS/EIR contains the NOP and NOI, comments on the NOP, and various public and agency notification documents.

Since then, the U.S. Department of the Interior and the U.S Department of Commerce have come under challenge from various intervenors, including, but not limited to the Natural Resources Defense Council (NRDC), Pacific Coast Federation of Fisherman's Associations/Institute for Fisheries Resources, and the Baykeeper (Delta Keeper Chapter), on the findings of its Biological Opinion (BiOp) for the updated 2004 CVP-OCAP regarding the federally threatened Delta smelt (*Hypomesus transpacificus*), various runs of Chinook salmon (*Onchorhynchus tshawytscha*), steelhead (*Onchorhynchus mykiss*), green sturgeon (*Acipenser medirostris*) and their designated critical habitats. A detailed discussion of the consultations with USFWS and NOAA Fisheries is provided in Chapter 10.0 (Consultation/Coordination and Applicable Laws). Reclamation initiated the formal phase of the consultations in May, 2008 and has been working closely with USFWS, NOAA Fisheries, DWR and the California Department of Fish & Game in the development of the BiOps, coordinating regularly with these agencies. Both BiOps (the NOAA BiOp, as a preliminary draft) have determined that the continued operation of the CVP and SWP as described in the Biological Assessment is likely to jeopardize the continued existence of delta smelt, some salmonids and green sturgeon and adversely modify their critical habitats.

While these consultations are ongoing, Reclamation is continuing to operate the CVP consistent with the provisions of the 2004 CVP-OCAP as conditioned by Judge Wanger's interim rulings; for example, Tracy Pumping Plant levels operated at historic pumping levels. At this time, with the completion of the revised final Biological Assessments in October 2008, along with NOAA Fisheries' preliminary draft BiOp on December 11, 2008 and the USFWS BiOp on December 15, 2008, Reclamation is reviewing the USFWS BiOp and the preliminary draft BiOp from NOAA Fisheries to determine if they can be implemented in a manner that is consistent with the intended purpose of the OCAP, is within Reclamation's legal authority and jurisdiction, and is economically and technologically feasible. NOAA Fisheries' final BiOp, including its final Reasonable and Prudent Alternatives (RPAs), Incidental Take Statement, and associated terms and conditions is expected sometime in June 2009.

This EIS/EIR is consistent with the key CALSIM II and related environmental modeling assumptions that supported the revised August and October 2008 Biological Assessments prepared by Reclamation on the current CVP-OCAP. Certain assumptions relating to new project actions that have been initiated since the completion of Reclamation's modeling, however, have been incorporated and do differ from those used in the final Biological Assessment. These assumptions and their implications are provided in more detail in Subchapter 5.3.3, CALSIM II Simulations, of this document.

1.3.1. Acknowledgement of this New Federal Action

Since the early to mid-1990s, the new anticipated CVP water service contract authorized by P.L.101-514 has been acknowledged by Reclamation, the resource agencies, local and regional water purveyors as well as the environmental interest groups. As noted previously, P.L.101-514, in its entirety, authorized three new CVP water service contracts. Reclamation has completed the necessary NEPA/Fish & Wildlife Coordination Act environmental documentation, supporting consultations required under the federal Endangered Species Act and National Historic Preservation Act, and fully executed two of those water service contracts: with the SCWA, SJWD as well as a subcontract with the City of Folsom through the SCWA. This occurred in 1999.

The landmark Sacramento Area Water Forum Agreement and accompanying EIR, also completed in 1999, acknowledged the EDCWA contract in its future cumulative condition PROSIM hydrologic modeling. All of the purveyor-specific agreements (PSAs) developed within the Water Forum Agreement were based on a future condition hydrology that assumed, in part, diversions of 50,000 acre-feet (AF) annually (constrained by Reclamation's normal CVP allocation shortage policy) of new CVP water from the American River system under the P.L.101-514 legislation (i.e., 35,000 AF annually to the SCWA which included 13,000 AF annually to the San Juan Suburban Water District and 15,000 AF annually to EDCWA).

Moreover, the most recent completed update to the CVP-OCAP in 2004 included the P.L.101-514 water contracts in both its current and future cumulative condition hydrologic modeling (i.e., as a 7,500 acre-foot annual diversion from Folsom Reservoir for EID and a 7,500 acre-foot annual diversion by GDPUD at the Reclamation/PCWA American River Pump Station, captured as reduced inflow into Folsom Reservoir from the North Fork American River). The current CVP-OCAP, therefore, and the operations of the coordinated CVP/SWP for which it controls have, in its current form, already assumed the inclusion of the full EDCWA water contract.

Over the past several years, various federal actions have included, and continue to include the new CVP water service contract for EDCWA in their hydrologic modeling and associated environmental documentation. These have included the Reclamation/PCWA American River Pump Station Project, the Sacramento River Water Reliability Study, the Freeport Regional Water Supply Project, the Environmental Water Account, the Yuba Accord, and the two local Warren Act contracts for the City of Roseville and the Sacramento Suburban Water District (formerly, Northridge Water District), to name but a few.

In short, as of today, not only is the new CVP water service contract for EDCWA assumed to be a part of the regional future cumulative hydrologic condition, but it has also been included in each of the hydrological modeling simulations that have supported the environmental documents for these various federal actions/projects. Most recently, the collaborative work of the Sacramento Area Water Forum (Water Forum) in developing a new flow management standard for the lower American River known as the *Lower American River Flow Management Standard* (or LAR FMS), also includes or accounts for the new CVP water service contract for EDCWA as contained in the base hydrology from the Water Forum Agreement. It should be noted, however, that while Reclamation supports the concept of an improved flow regime for the lower American River, it is not participating in the further development of the environmental documentation necessary to proceed with this project due to the uncertainty associated with the final NOAA Fisheries BiOp on the CVP-OCAP and Judge Wanger's final ruling.

1.3.2. Focus of this Draft EIS/EIR

The focus of this Draft EIS/EIR is to evaluate the potential environmental and socio-economic impacts of the new EDCWA CVP water service contract authorized under P.L. 101-514. As discussed in more detail in later chapters, this EIS/EIR combines both a program-level and project-level analysis of the potential effects of this action. At the project-level, it addresses the potential direct hydrologic changes to the American River basin and the CVP/SWP, including the Sacramento-San Joaquin River Delta. Detailed hydrologic simulations using CALSIM II and its associated environmental models across an array of action scenarios and alternatives provide the specificity required to determine the potential environmental and socio-economic effects of the new CVP water service contract. All relevant water-related resources rely on these data, as appropriate, to make their impact determinations within both the current and future condition time horizons provided by the modeling framework. These analyses, therefore, are said to be provided at the project-level, whereas the direct effects of the anticipated diversions associated with this new CVP water service contract would accrue.

At the program-level, this EIS/EIR looks at potential long-term indirect effects of this new water contract within the context of existing policies, infrastructure, public services, and population demographics as supported by and codified in the updated County General Plan and EIR. All indirect effects on resources, facilities, and activities within the county that could result from this action (i.e., from the provision of this new water supply) and, as contained within the delineated service areas of EID and GDPUD, have already been thoroughly evaluated as part of an exhaustive General Plan Update and associated EIR, the latter tested through the Sacramento County Superior Court and its Writ of Mandate. As noted previously, in September 2005, the Court determined that the new 2004 General Plan Update and its environmental review satisfied the terms of the Writ, and the Writ was lifted, allowing the full implementation of the General Plan. Accordingly, these effects, as meticulously investigated in the General Plan EIR are not re-evaluated in this EIS/EIR. Furthermore, since no new facilities or infrastructure are part of this new CVP water contracting action, no direct impacts of this new water contract can be reasonably tied to several resource categories that are typically affected by construction-related or direct land conversion or disturbance activities.

Notwithstanding the aforementioned, secondary effects or, indirect effects, are nevertheless important. This EIS/EIR addresses, but does not re-evaluate these effects. The various policies and ordinances governing land use activities, services, and facilities within El Dorado County and as discussed in the General Plan EIR are referenced, as appropriate. Where future facilities would be required to fully enable the physical diversion of new water by EDCWA's member units, their potential effects on the environment are identified, as appropriate. In most cases, however, the best available information and current conditions indicated that such information was premature and, in many cases, did not exist. It is presumed, however, that any such new facilities would require their own separate and independent environmental reviews once the full details of their design, impact footprint, and related appurtenances are known. Full environmental review of such facilities and their potential impacts, therefore, would not be circumvented; it is simply unavailable at this time.

1.4. DRAFT EIS/EIR ORGANIZATION

This joint Draft EIS/EIR is organized by chapter with the primary environmental impact discussions separated into two categories; Diversion-related Impacts and Indirect and Service Area-related Impacts. These two categories represent the resource categories upon which the project-level and program-level analyses are addressed and presented in the document. Each resource category is prefaced by an Introduction to Analysis subchapter, which describes the methodology, key assumptions, and approach used in the preceding resource impact discussions. Technical Appendices containing archival data, modeling results, notices, and other forms of project documentation are included in separate volumes.

2.0 PURPOSE AND NEED

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2.0 PURPOSE AND NEED

2.1. PURPOSE AND NEED

The purpose of P.L. 101-514 was to help meet the long-term water needs of El Dorado County. As a recognized initial phase, in a long-term contracting program for EDCWA, the action was appropriate at the time and, with the passage of time, has become increasingly more important to EDCWA. The purpose of the Proposed Action, therefore, is to acquire a new CVP water service contract authorized by P.L.101-514 and fulful the Congressional mandate stated confirmed by this law. The need for the Proposed Action is to meet the water demands of planned future and approved growth within El Dorado County.

EDCWA, as illustrated in its recent 2007 Water Resources Development and Management Plan, identified this current contract as one of many additional water acquisition (or contracting) actions that the agency must pursue to meet the General Plan growth projections of the county. Additional water supplies beyond this contract include ditch water rights, the partial assignments of existing State filed applications (i.e., Supplemental Water Rights Project), Texas Hill Reservoir Projects 1 and 2, and a new Alder Reservoir Project.

At the time that P.L. 101-514 became law, total diversions on the western slopes of El Dorado County were approximately 43,000 AFA with normal-year supplies around 60,000 AFA. Significant growth during the intervening years, however, has increased water demands throughout the western slopes. This demand increase and the narrowing gap between supply and demand are compounded by the ever present urgency for drought contingency planning. During the drought of the late 1980s and early 1990s for example, it became clear that County-wide drought contingency planning in addition to supplemental supplies were needed. While significant drought contingency planning has been undertaken and water conservations efforts continue, supplemental water supplies are still needed to ensure a sufficient water supply to the county in the event of multiple-dry years and over the long-term. The need for supplemental water supplies exists today and, as El Dorado County moves into the future, both an increased demand and the uncertainty of dry-year reliability (especially under multiple dry-year scenarios) will provide a continuing challenge for its water resources management strategies.

Since the mid-1990s, like many other parts of the State, growth has continued within El Dorado County. Numerous indicators confirm this trend. Between 1996 and 2005 for example, the total number of active accounts for EID increased by almost 35 percent (from 27,254 accounts in 1996 to 36,705 accounts in 2005).[8] Single-family residential water users in the EID service area, making up the largest use category for water consumption, increased their water consumption by approximately 50 percent (10,550 AF to 15,875 AF) between 1996 and 2005.[9] Multiple-family residential water

8 El Dorado County Water Agency, Water Resources Development and Management Plan, Chapter 2, Historic Water Use, Table 2-2, April, 2007.

9 El Dorado County Water Agency, Water Resources Development and Management Plan, Chapter 2, Historic Water Use, Table 2-3, April, 2007.

users also increased consumption over this same period, but not to the same extent and single-family residential users. Commercial/industrial users increased their water consumption by approximately 33 percent (2,099 AF to 2,796 AF).

Growth over the past 15 years in El Dorado has not been consistent. The period from 1996 to 2000, for example, showed an 11.9 percent increase in the total number of EID's active accounts (from 27,254 to 30,512). The ensuing five-year period from 2001 through 2005, however, showed an increase of 15.3 percent in the total number of EID's active accounts. Much of this latter increase can be attributed to the increase in single-family dual potable accounts, where these dwellings receive potable water from EID for indoor use, but recycled water for outside irrigation.

The need for the Proposed Action is supported by the continuing growth requirements within the western slopes of El Dorado County, as facilitated by the water deliveries made by EID and GDPUD, and as supported by the County General Plan.

2.1.1. Objectives

Reclamation and EDCWA share the following primary action/project objective:

- Execution of a new CVP M&I water service contract between Reclamation and EDCWA in accordance with the Congressional mandate of P.L.101-514;

The Mission Statement of EDCWA, based on its enabling legislation, the El Dorado County Water Agency Act (Uncodified Water Acts, Act 2245) furthermore, is as follows:

> "Ensure that El Dorado County has adequate water for today and in the future."

For EDCWA's part as the State Lead Agency under CEQA, it has identified five additional project objectives that, consistent with its Mission Statement and enabling legislation, appropriately fulfill its purpose and intent regarding this new water contract. These project objectives include the following:

- Consistent with P.L.101-514, diverting federal water for use in El Dorado County following completion of the administrative procedures that Reclamation and the State Water Resources Control Board (SWRCB) must complete in order to implement that Congressional mandate;
- Consistent with P.L.101-514, entering into a new CVP M&I water service contract to supply what Congress considers to be the first phase of a long-term effort by El Dorado County to acquire supplemental water supplies to meet its future needs;
- Consistent with the enabling legislation and the legal "duty to serve" customers to which EID and GDPUD are subject, obtaining additional water supplies needed to support planned and approved growth as embodied in the current El Dorado County General Plan;
- Consistent with the existing policies and ongoing efforts of EID, GDPUD and El Dorado County to conserve water during single- or multiple-dry year scenarios, to provide additional reliable water supplies to reduce the severity of dry-year cutbacks imposed on County residents, businesses, and other customers; and

- Delivering the new CVP M&I water supply through existing, planned and available infrastructure, for example, the PCWA American River Pump Station.

Given the regulatory uncertainty currently affecting the water resources of California's Central Valley and the need by EDCWA to proceed with the proposed contracting action in a timely fashion, the following supplemental objectives have also been identified. Accordingly, actions taken to provide water for El Dorado County should be:

- Permanent and practicable, both economically and institutionally; and
- Attainable in the short-term, to respond to the urgency of immediate water needs in light of the long-standing nature of this authorized action.

P.L. 101-514 was passed in 1990 in recognition of El Dorado County's need for supplementary water. Intervening issues, however, over the course of the past 17 years have only increased the urgency with which the proposed contract water is now needed.

2.2. WATER FOR NEW DEVELOPMENT

The traditional understanding of water suppliers under California law is that there is a "duty to serve" new development. As reflected in case law, this obligation has been understood to require water suppliers to find and develop any new water supplies needed to meet projected growth levels in their service areas. (See *Swanson v. Marin Municipal Water Dist.* (1976) 56 Cal.App.3d 512, 524 (water district has a "continuing obligation to exert every reasonable effort to augment its available water supply in order to meet increasing demand"); *Glenbrook Development Co. v. City of Brea* (1967) 253 Cal.App.2d 267, 277 ("county water district has a mandatory duty of furnishing water to inhabitants within the district's boundaries"); see also *Lukrawka v. Spring Valley Water Co.* (1915) 169 Cal.318, 322; *Building Industry Assn. of Northern California v. Marin Municipal Water Dist.* (1991) 235 Cal.App.3d 1641, 1648-1649; Slater, California Water Law and Policy (Michie Publications 1996), vol. 2, p. 14-11 (refers to water districts' "duty to serve").)

Consistent with this traditional obligation, a "distributor of a public water supply" can refuse to supply water to new development only if the distributor "finds and determines that the ordinary demands and requirements of water customers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection." (Cal. Water Code, § 350.)

The Urban Water Management Planning Act (Cal. Water Code, § 10610 et seq.), as amended in 2001, was passed in response to the California Legislature's concern that California's water supply agencies might not be engaged in adequate long-term planning. That Act requires "urban water suppliers" to maintain an "urban water management plan" that must identify existing water supply and demand, and must identify any new water sources required to satisfy demand as projected at least 20 years into the future. The projected 20-year supply must account for "average, single-dry, and multiple-dry water years."

In predicting 20-year water demands, urban water agencies must rely on "data from the State, regional, or local service agency population projections[.]" Thus, for example, to the extent that El Dorado County and its incorporated cities (e.g., South Lake Tahoe, and Placerville) anticipate large population increases in their adopted general plans, EDCWA is required to identify water sources necessary to serve such planned development, and is not in a position to refuse to comply with that legal obligation as a means of reducing the "growth-inducing" effects of obtaining new water supplies.

Under California Water Code sections 10910 and 10912, as amended in 2001 (also known as S.B. 610), an urban water supplier must consult with the county and cities within the supplier's service area when those entities propose development projects of a certain magnitude (e.g., residential projects with more than 500 dwelling units or a retail or business establishment employing more than 1,000 persons or having more than 250,000 square feet). The water supplier must respond to these requests either by identifying the water sources available to serve such development or by identifying the plans it would follow to obtain new water supplies for such developments. In the latter instance, such plans may include information concerning: (1) the estimated total costs, and the proposed method of financing the costs, associated with acquiring additional water supplies; (2) all federal, state, and local permits, approvals, or entitlements that are anticipated to be required in order to acquire and develop the additional supplies; and (3) the estimated time frames within which EDCWA expects to be able to acquire additional water supplies. (Cal. Water Code, § 10911, subd. (a).)

Urban water suppliers are also subject to 2001 State legislation commonly known as the "Kuehl Bill" (SB 221), after its author State Senator Sheila Kuehl. (See Cal. Gov. Code, § 66473.7.) That bill requires any city or county considering the approval of a proposed subdivision map for more than 500 units to consult with the relevant water supply agency to determine whether adequate water is available for the proposed subdivision, as well as for "existing and planned future uses" (including agriculture) over then next 20 years, under "normal, single-dry, and multiple-dry year" scenarios. This legal scheme, like the Urban Water Management Planning Act, requires urban water suppliers to constantly take the steps that will be necessary to accommodate the growth planned for the next 20 years by the county and cities within the supplier's service area.

2.3. WATER NEEDS ASSESSMENT METHODOLOGY

EDCWA has identified EID and GDPUD as the recipients of the water that would be made available under the proposed new CVP contract. This section describes the specific water needs of both EID and GDPUD, as determined using Reclamation's methodology for Water Needs Assessments (WNAs).

WNAs were developed for CVP water contractors eligible to participate in the CVP long-term contract renewals process. Not all CVP contractors, however, are subject to WNAs.[10] According to Reclamation, the WNAs are intended to:

10 Small purveyors serving water to areas of 2,000 irrigable acres or less, or those receiving amount of 2,000 acre-feet annually (AFA) or less are exempt from the Water Needs Assessments.

1. Confirm past beneficial use of CVP water;
2. Provide water demand and supply information under current and future conditions for the environmental documents; and
3. Provide an estimate of contractor-specific needs for CVP water by the year 2025, to serve as a starting point for discussions regarding contract quantities in the negotiations process.[11]

In order to establish the current demand of purveyors, Reclamation uses recent historical demands, rather than the full contract amount, and requires purveyors' historical water use to demonstrate beneficial use of the CVP supply.

After a baseline demand is established, the WNA projects future demand through 2025. In some cases, 2040 M&I demand has been used for re-contracting entities that have not yet reached buildout. Both agricultural demands and M&I demands are accounted for in the WNA. The M&I methodology estimates residential demand on a standard gallons-per-capita per-day (GPCD) basis, and includes additional calculations of commercial and industrial demands and system losses (such as unaccounted-for water). Agricultural demands are based on standard crop water and evapotranspiration coefficients, irrigation efficiency, and the projected number of acres expected to be cultivated.

Improvements in water use efficiency are built into the federal WNA method in a number of ways. First, purveyors are required by Section 210(b) of the Reclamation Reform Act to have a Reclamation-approved Water Conservation Plan as a prerequisite before being issued a long-term contract for federal water. Reclamation requires an implementation plan for elements of the Utility Operations and Educational Programs specified by the California Urban Water Conservation Council (CUWCC) to be included in the Water Conservation Plans. Second, the WNA method for future demand caps system losses for rural water systems at 15 percent (some rural water systems currently have system losses near 30 percent). Third, future agricultural demands are calculated using an irrigation efficiency of 85 percent, generally significantly higher than typical irrigation efficiency. Fourth, the GPCD used domestically is assumed to decrease from 75 GPCD in the baseline calculation, to 55 GPCD in the future scenario. This approximate 25 percent water conservation level is assumed to occur through the measures proposed in the Water Conservation Plans, such as water audits, tiered pricing, fixture replacement, and customer education programs.

The WNA also includes documentation of purveyors' existing water supplies, including but not limited to: State Water Project (SWP) contracts, other surface water (such as water acquired through riparian rights), groundwater supplies, water from transfers, and recycled water. Average historical deliveries over the past three years are used to evaluate a purveyor's realistic deliveries and potential supply at the time of the WNA. Reclamation takes into consideration situations where the historical supply may have been reduced due to shortage provisions.

Reclamation then determines the water "need" by subtracting a purveyor's total existing supply from the projected future demand; a purveyor's water need is the difference between the two. If this

11 Reclamation Grey literature, Central Valley Project (CVP) Water Needs Assessments Purpose and Methodology.

amount is within 10 percent of the proposed contract amount, the purveyor is deemed to have sufficient water need to justify execution of the contract. It should be noted that Reclamation's WNA methodology represents a snapshot in time and but one of several possible water needs evaluations; numerous evaluation techniques, methodologies, and assumptions are available. In fact, EDCWA completed its most recent 2007 Water Resources Development and Management Plan earlier this year and used a variety of methodologies to determine water demand and needs based on the General Plan and its own procedures and metrics as well as those of EID and GDPUD.

So, while other evaluations may differ based on varied methodologies and, as a result show, differing numbers over time, based on a different set of assumptions, the WNA determination is the process used by Reclamation to verify federal water contracting allocations. To support the new CVP water service contracting action contemplated here, the water needs methodologies relied upon must conform to Reclamation's contracting process requirements. Accordingly, the WNA represents the process relied upon for this joint environmental document.

This method was used in 2004 to determine EID's water needs during EID's long-term CVP contract renewal process, and in 2006 for GDPUD as a first step in Reclamation's establishment of a Basis of Negotiations for the proposed new CVP M&I water service contract under this action. The water needs analysis for GDPUD was extended to the year 2050 to cover the 40-year term of the proposed contract since its needs for the 7,500 AFA does not occur entirely within the 2025 timeframe.[12] It should be noted that the preliminary assessment performed for GDPUD did not include an independent analysis by Reclamation of the GDPUD's current and future agricultural water use.

For the purposes of the proposed new contract, because the contract water cannot be used for agricultural purposes, the M&I needs of each purveyor must be sufficient to support its claim to the P.L.101-514 contract allocation. As detailed below, both EID and GDPUD show sufficient M&I need to, collectively, justify this full contract. Although GDPUD existing and future agricultural acreage assumptions are based on the El Dorado County General Plan, analysis using Reclamation's WNA process must still be performed prior to contract execution. As discussed in the Alternatives Including the Proposed Action and Project Description (Chapter 3.0), the P.L.101-514 contract is tentatively proposed to be equally shared between EID and GDPUD in the amount of 7,500 AFA for each purveyor.

In addition to that used in the 2004 and 2006 water needs assessments, additional demand is projected as a result of a recent General Plan Amendment that increases the floor area ratio for commercial/industrial and research and development land use designations. The Final Environmental Impact Report for General Plan Amendment A06-0002 (December 2006) indicates that an additional 13,869 AF of water demand at buildout, occurring primarily within EID's service area, will result from the amendment.

A final updated WNA will be prepared by Reclamation prior to execution of the contract with EDCWA to reflect any substantial changes in the supply and demand data and assumptions.

12 New CVP M&I water service contracts are typically negotiated with a term of 40-years, subject to renewals.

2.4. EL DORADO IRRIGATION DISTRICT WATER NEEDS

Reclamation completed a federal Water Needs Assessment for EID as a part of the CVP long-term contract renewal process in 2004 for EID's existing CVP water contract. The assessment included justification both for the renewal of EID's existing long-term CVP contract, and for the proposed contract amount of 7,500 AFA under P.L. 101-514 Section 206(b)(1)(B), which was anticipated to be a part of EID's available supply in 2025.[13] The following is an excerpt from the letter documenting the final revision of EID's WNA:

> The revised water needs assessment documents that the District has used its CVP water beneficially in the past and confirms the District's future need of its current maximum contractual CVP supply, and 7,500 acre feet of the 15,000 acre feet identified in Section 206(b)(1)(B) of Public Law 101-514.

For the 2004 WNA, Reclamation considered EID's likely future water supply in 2025, which is anticipated to be 75,984 AFA. Table 2.4-1 provides detail of EID's existing and anticipated future water entitlements envisioned in 2004, including their source, total unadjusted quantities, and any potential shortages that may be imposed. EID has in excess of 75,000 AFA of water entitlements with the proposed P.L. 101-514 CVP contract included. With imposed shortages, this total would be reduced to a little over 67,000 AFA. The primary local water entitlements include Sly Park (Jenkinson Lake) (23,000 AFA), the pre-1914 rights of the South Fork American River Project (SFAR) (15,080 AFA), and the recently confirmed Project 184 (17,000 AFA). With the P.L.101-514 contract combined with its existing CVP supply, EID will have a total of 15,050 AFA in federal contract water (subject to dry-year cutbacks leaving a total of 11,288 AF available in those years, were Reclamation to impose the maximum shortage to M&I contractors).

On or about April of each year, EID prepares an annual update to the Water Resources and Service Reliability Report originally published in 1991. Recent available data indicate that the total water diversion was 37,655 AF in 2005, 43,358 AF in 2004, and 37,138 AF in 2003. The total diversion amount includes water used for various beneficial uses and unaccounted-for water. Beneficial uses are defined as water used for operational flushing, sewage lift station and collection system flushing, private fire services, construction meters, and aesthetic maintenance.[14]

Unaccounted-for water is defined as water that is taken into the system from all of EID's main sources, but which is not delivered to the consumers, put to beneficial use, or otherwise accounted for. EID has reduced its unaccounted-for water percentage dramatically over the past ten years, in recent years surpassing the California State goal of 15 percent or less for rural water districts such as EID (see Table 2.4-2).

13 Pers. Comm. From Donna E. Tegelman (Reclamation) to Ane Deister (EID), July 27, 2004.

14 Beneficial uses as defined here should not be confused with the "beneficial uses" of water bodies as defined in the Regional Water Quality Control Board Basin Plan.

TABLE 2.4-1

**EL DORADO IRRIGATION DISTRICT
TOTAL WATER ENTITLEMENTS – SOURCE AND QUANTITIES**

Water Source	Future Water Entitlements[1] (AFA)	Notes/Shortage Provisions[2]
Existing CVP water service contract	7,550	Supply after cutbacks under current CVP M&I shortage policy: 5,663 AFA
Proposed P.L. 101-514 CVP water service contract	7,500	Supply after cutbacks under current CVP M&I shortage policy: 5,625 AFA
Sly Park (Jenkinson Lake)	23,000	Facility acquired from Reclamation in 2003. Critical dry-year deficiency of 5,000 AF results in 18,000 AFA
Project 184 Crawford Ditch Satellites (Strawberry and Outingdale)	17,000 700 154	Associated with hydropower operation of Project 184, acquired from PG&E in 1999; not subject to Term 91 diversion limitation, based on outcome of recent litigation; diversion of full amount requires execution of a Warren Act Contract with Reclamation (temporary or permanent)
Pre-1914 Ditch Rights and Licensed Weber Reservoir rights[3]	3,200[4]	Farmers Free, Gold Hill, and Summerfield Ditches and Weber Reservoir storage rights
SOFAR (Pre-1914 rights)	15,080	EID's pre-1914 ditch water rights
Recycled water	1,800	Usable only for outdoor application in areas plumbed for recycled water (primarily El Dorado Hills)
Total	**75,984**	**67,222 (with critical dry-year and likely shortages)**

Notes:
1. USBR WNA developed for CVP Long-Term contract renewal process (2004). Assuming Normal water year deliveries.
2. El Dorado County Water Agency, Water Resources Development and Management Plan, Chapter 2, Historic Water Use, Table 5-2, April, 2007.
3. D. Corcoran Pers. Comm. September 2, 2008.
4. Ditch and other rights have subsequently changed to 4,560 AFA as part of the Long-Term Warren Act Contract negotiations (USBR Draft Environmental Assessment, 2008).

TABLE 2.4-2

**EL DORADO IRRIGATION DISTRICT
ANNUAL DIVERSION TOTALS AND UNACCOUNTED FOR LOSSES**

Calendar Year	Raw Water Diversions[a] (AF)	Real and Apparent Losses[b] (AF)	Losses as a Percentage[c] of Raw Water Diversions (%)
2005	37,656	5,046	13.4
2004	43,358	5,588	12.9
2003	37,138	4,909	13.2
2002	38,885	5,177	13.3
2001	38,847	5,218	13.4
2000	34,882	4,524	13.0
1999	35,496	4,829	13.6
1998	30,027	4,829	16.1
1997	35,748	5,485	15.3
1996	34,199	5,353	15.7

Notes:
a. Includes raw water diversions from Jenkinson Lake, Folsom Reservoir and Project 184 at Forebay Reservoir.
b. Real losses include physical water loss to the ground from pipeline leaks and breaks; while apparent losses are considered paper losses, such as under registration of large meters.
c. The percentage of real and apparent losses can be attributable to 1,245 miles of pipeline, 3 miles of open ditch and over 37,000 service connections.

Source: Appendix Table D, Historical Diversions, Demands and Losses, 2005 Water Resources and Service Reliability Report, El Dorado Irrigation District.

EID has delivered recycled water for industrial use and golf course irrigation for over 30 years. In the past 15 years, the use of recycled water has been expanded to include median and park irrigation, and, more recently, construction water and residential landscaping. Recycled water use for residential landscaping is expected to have a significant beneficial impact on the amount of water available for drinking water supplies and other domestic and commercial potable uses. Since approximately 60 percent of the water demand for single-dwellings is used for outside landscaping, the future prospects of using recycled water as a significant water demand offset is promising. However, a significant increase in recycled water availability will be dependent on the construction of a seasonal storage facility, which has not been authorized at the writing of this document.

2.4.1. Water Conservation

EID has implemented an active water conservation program including public information and educational elements promoting efficient water use to the general public. In addition to its Urban Water Management Plan (UWMP), EID also has an existing U.S. Bureau of Reclamation Water Management Plan, developed and approved according to Reclamation guidelines[15]. The plan is updated every five years. The district has also focused significant effort on water recycling in the western portions of its service area, and is continuing to increase the recycling facilities' capacity and improve the purple-pipe recycled water distribution network.

Under its UWMP, EID has implemented programs with quantifiable water savings, including residential water audits, water metering, fixture/washing machine rebates, irrigation management services, plumbing retrofits, leak detection and repair, landscape water audits, and commercial/industrial water audits. It also imposes fines and prohibitions on wasteful use of water.[16] The Reclamation Water Management Plan includes outlines of the funding, implementation, and structuring of the water conservation plans implemented by the district, including all elements of the CUWCC Utility Operations and Educational Programs.

EID's active Irrigation Management Services (IMS) program helps the District's agricultural growers use water more efficiently. The program currently conserves more than 2,000 AF every year, and was recognized in 2006 for its excellence by being chosen as a finalist for an Association of California Water Agencies award. The program was also awarded a Conservation Innovation Grant in 2006 from the USDA Natural Resources Conservation Service (NRCS).[17] The 2000 AFA savings is based on demand data prior to IMS program implementation compared to demand data after implementation.

EID has also undertaken significant water recycling efforts, and began producing recycled water for landscape irrigation purposes in 1999. EID has produced an average of 1,700 AFA of recycled water during the period from 1999 to 2005.[18]

15 Reclamation (2003), Achieving Efficient Water Management - A Guidebook for Preparing Agricultural Water Management Plans, Second Edition.
16 EID. January 2006. Final Urban Water Management Plan, 2005 Update.
17 EID. Press Release. July 20, 2006.
18 EID. Recycled Water Supply Data. Unpublished.

2.4.2. Agricultural Water Use

The County General Plan EIR states that in the year 2000, agricultural land uses within the EID service area included 1,665 acres of vineyard, Christmas trees, olive/citrus orchards, berries and similar crops, and 3,626 acres of pasture, deciduous orchards and other similar uses. Total agricultural water use in the year 2000 for irrigable land was 5,950 AF.[19] As noted previously, but for the limitation on acreage size, CVP M&I water service contracts are not permitted for agricultural use.

2.4.3. Future EID Water Demand

Table 2.4-3 is taken from the Reclamation WNA worksheet and shows the demand calculations used in verifying the water needs of EID to 2025, the time horizon used by Reclamation in its WNAs. Total anticipated M&I needs are 49,257 AF; this includes 7,484 AF of projected distribution system losses. Total residential demand, at 33,805 AFA, make up the majority of EID's anticipated future M&I demands (i.e., almost 70 percent). El Dorado County General Plan data supports the M&I WNA with a projected need of approximately 55,000 AFA at 2025 and 73,000 AFA at buildout (including associated system losses and unaccounted for beneficial uses). [20]

TABLE 2.4-3

EL DORADO IRRIGATION DISTRICT 2025 M&I WATER NEEDS ASSESSMENT[1]
U.S. BUREAU OF RECLAMATION

Residential Demand							
Interior Demand			**Landscape Demand**				
# of residents	**Per capita factor (gpcd)**	**Subtotal (AF)**	**Irrigated acreage (ac)**	**ETo**	**ET Factor**	**Subtotal (AF)**	**Total (AF)**
177,802	55	10,954	**7,161**	4	0.8	22,851	33,805
Nonresidential Demand							
Interior Demand			**Landscape Demand**				
Industrial	**Commercial/ Institutional**	**Subtotal (AF)**	**Irrigated acreage (ac)**	**ETo**	**ET Factor**	**Subtotal (AF)**	**Total (AF)**
335	**1,764**	2,099	**1,584**	4	0.8	5,804	7,903
Distribution system demand							
Distribution System Losses (AF)			**Unaccounted Beneficial Use (AF)**				**Total (AF)**
6,847			**637**				7,484
Total M&I demand (AF) =residential + nonresidential + distribution system =							**49,257**

Note:
1. Data compiled and presented in the WNA for the P.L 101-514 Water Service Contract; included as part of the BON for this contracting action.

Source: PBS&J, developed from EID, 2004, Water Needs Assessment (Reclamation); Pers. Comm. From Donna E. Tegelman (Reclamation) to Ane Deister (EID), July 24, 2004; and Reclamation WNA Worksheets.

19 Wood Rogers. March 2003. El Dorado County Water Management Plan. Agricultural Water Demand Tables.

20 EDCWA, December 2007. Water Resources Development and Management Plan, Table 5-7.

As shown in Table 2.4-4, agricultural demands are anticipated to be 24,466 AFA, based on General Plan land use and one possible scenario of growth that considers protective General Plan agricultural policies and a growing agro-tourism industry. EID's total water demands (M&I plus AG) is projected to be 73,723 AFA by the year 2025. With a normal year yield available supply of 68,484 AFA, the projected future water need at 2025 is 5,239 AFA. With a safe yield available supply of 61,597 AFA, the projected future water need of EID at 2025 is 12,126 AFA.

TABLE 2.4-4

EL DORADO IRRIGATION DISTRICT
ADDITIONAL AGRICULTURAL DEMANDS AND TOTAL DEMAND
TOTAL WATER NEEDS (AFA)

		Supply		Total Water Needs	
Ag demand	**Total demand**	**Normal[1] Year**	**Critically Dry[2] Year**	**Normal Year**	**Critically Dry Year**
24,466	**73,723**	68,484	61,597	**5,239**	**12,126**

Notes:
1. Total Normal Year Supply from Table 2.1 less the proposed P.L.101-514 CVP water service contract (i.e., 75,984 – 7,500 = 68,484 AFA).
2. Total Critically Dry Year Supply from Table 2.1 less the proposed P.L.101-514 CVP water service contract (i.e., 67,222 – 5,625 = 61,597 AFA).

Source: PBS&J, developed from EID 2004 Water Needs Assessment (Reclamation); Pers. Comm. From Donna E. Tegelman (Reclamation) to Ane Deister (EID), July 24, 2004; and Reclamation WNA Worksheets

2.5. Georgetown Divide Public Utility District Water Needs

The GDPUD was formed in 1946, and began acquiring the properties, facilities and water rights of the Georgetown Water Company. The GDPUD service area encompasses approximately 75,000 acres, or about 6 percent of El Dorado County. GDPUD currently provides surface water to about 30,000 acres within its service area, of which approximately 1,200 acres are currently in irrigated commercial crops. The District provides domestic treated water and untreated agricultural water to the communities of Cool/Pilot Hill, Garden Valley, Greenwood, Georgetown, and Kelsey. GDPUD's sole source of water is the Stumpy Meadows Project. Water is obtained through a total of nine pre-914 water rights and post-1914 appropriative rights and permits. The firm yield of the project is 12,200 AFA. Allowing for dry year deficiencies of 1,700 AF, the total estimated safe yield supply is 10,500 AFA.

Existing water demand is made up of current water sales plus latent demand. Latent demand is defined as current inactive meters plus non-metered parcels within assessment districts plus pre-season (April) agricultural requirements when needed. In 2005, GDPUD reported a total existing demand of 11,162 AF. Of that amount, irrigation water demand was 4,744 AF, treated water demand comprised 1,959 AF of the total, and latent demand was 1,159 AF (including pre-season irrigation requirements). The remaining demand consisted of a five-year average of losses, which includes treatment and conveyance losses, reservoir leakage, evaporation, and other system losses.

2.5.1. Water Conservation

GDPUD has adopted management practices to reduce system losses within the District's conveyance system. Georgetown's historic ditch system is a single, primarily unlined conveyance system. Ongoing management practices aimed at increasing water conservation by reducing storage and conveyance losses include lining of ditches with Gunite, replacement of sections of ditches with pipelines, and improving system operations that affect losses.[21] Current system losses are approximately 30 percent; the goal for losses in GDPUD's system, as a rural water system, is 15 percent. The federal WNA only allows losses of 15 percent to be counted toward the District's water needs.

Beyond decreasing losses, GDPUD has developed an UWMP that outlines measures for demand management and reduction. Nearly all of GDPUD's connections are equipped with water meters, and the District has used tiered pricing since 1982.[22] The District's UWMP includes implementation summaries for past and future efforts toward the CUWCC Utility Operations and Education Programs development. laid out by the CUWCC, and provides the District's water shortage contingency plan.

Before receiving any of the P.L.101-514 contract water, GDPUD will be required by Reclamation to develop a Water Management Plan consistent with Reclamation guidelines. This plan must be approved by the Reclamation contracting officer. The plan will be updated every five years. Included in this plan will be GDPUD's policies for addressing water shortages, wasteful use of water, and implementation plans for the elements of the CUWCC Utility Operations and Educational ProgramsDemand Management Measures.

2.5.2. Agricultural Water Use

The County General Plan EIR states that in the year 2000, irrigated acreage within the GDPUD service area totaled 1,195 acres; 81 acres of vineyard, Christmas trees, orchards, berries and similar crops, and 1,114 acres of pasture and other uses.[23] Total agricultural water use in the year 2000 for irrigable land was 4,349 AF. By the year 2025, it is anticipated that GDPUD will have 3,527 acres under cultivation; by 2050, GDPUD will have 7,385 acres under cultivation.[24]

2.5.3. Future GDPUD Water Demand

Based on land use projections presented in the approved El Dorado County General Plan, the future total water demand for the existing GDPUD service area in 2050 is anticipated to be approximately 23,534 AFA. This could result in a District-wide shortfall, or "need", of approximately 11,334 AFA without the P.L. 101-514 contract water. Of this anticipated future demand, agricultural demand is estimated to be 15,476 (66 percent) with M&I demand at 8,058 AFA (34 percent). This M&I demand exceeds the proposed contract amount. By 2025, M&I demand is preliminarily estimated to be 6,660 AFA, nearly within the 10 percent margin required by Reclamation to provide the full contract allocation under Reclamation contracting provisions.

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21 GDPUD. 2005. *Urban Water Management Plan 2005-2010, Including a: Water Shortage Contingency Plan*.
22 GDPUD. 2005. *Urban Water Management Plan 2005-2010, Including a: Water Shortage Contingency Plan*. p. 28.
23 El Dorado County Water Agency – *Water Resource Development and Management Plan, Agricultural Water Demand*, December, 2007.
24 Wood Rogers. March 2003. *El Dorado County Water Management Plan*. Agricultural Water Demand Tables.

The M&I demand assumptions for GDPUD include: a lot size of 0.33 acres, that 60 percent of those parcels are under irrigation, and distribution system losses of 15 percent. As previously noted, losses in the GDPUD system are currently around 30 percent; such losses would need to be significantly reduced in order to meet the target losses provided in the WNA. Agricultural demands are based on the predicted acreages from the County General Plan Update EIR, updated in the El Dorado County Water Agency Water Resources Development and Management Plan as well as Reclamation's estimates of crop water needs and evapotranspiration; these compare favorably.

The data provided in Table 2.5-5 are taken primarily from the Reclamation preliminary WNA worksheets and shows the demand calculations used in verifying the water needs of GDPUD to 2050. Again, updated information from the El Dorado County Water Agency's 2007 Water Resources Development and Management Plan have been included to more accurately portray GDPUD's current and anticipated water demand conditions to 2050. Total anticipated M&I needs are 8,058 AF; this includes 1,058 AF of projected distribution system losses and 98 AF of unaccounted for beneficial use. Residential demand, relative to non-residential demands (e.g., industrial/commercial) clearly make up the majority of GDPUD's anticipated future M&I demands (i.e., almost 80 percent).

TABLE 2.5-5

GEORGETOWN DIVIDE PUBLIC UTILITY DISTRICT[1]
WATER NEEDS ASSESSMENT

Residential Demand							
Interior Demand			**Landscape Demand**				
# of residents	**Per Capita Factor (gpcd)**	**Subtotal (AF)**	**Irrigated Acreage (ac)**	**ETo = 4.58**	**ET Factor**	**Subtotal (AF)**	**Total (AF)**
20,000	55	1,232	**1,414**	4.58	0.8	5,181	6,413
Nonresidential Demand							
Interior Demand (AF)			**Landscape Demand**				
Industrial	**Commercial/ Institutional**	**Subtotal (AF)**	**Irrigated acreage (ac)**	**ETo**	**ET Factor**	**Subtotal (AF)**	**Total (AF)**
95	35	130	98	4.58	0.8	359	**489**
Distribution System Demand (AF)							
Distribution System Losses			**Unaccounted Beneficial Use**				**Total (AF)**
1,058			98				1,156
Total M&I demand (AF) = Residential + Nonresidential + Distribution System =							**8,058**

Note:
1. Data compiled and presented in the WNA for the P.L 101-514 Water Service Contract; included as part of the BON for this contracting action.

Source: PBS&J, developed from Reclamation WNA Worksheets as amended by the El Dorado County Water Agency's 2007 Water Resources Development and Management Plan; and Personal communication from Tracy Slavin (Reclamation), April 17 and 25, 2006.

As shown in Table 2.5-6, GDPUD's agricultural demands are anticipated to be 15,476 AFA by 2050, consistent with County General Plan land use projections. GDPUD's total water demands (M&I plus AG) is projected to be 23,534 AFA by the year 2050. With a firm yield available supply of 12,200 AFA, the projected future water needs at 2050 is 11,334 AFA. With a safe yield of 10,500 AFA, the projected future water needs at 2050 would be 13,034 AFA.

TABLE 2.5-6

GEORGETOWN DIVIDE PUBLIC UTILITY DISTRICT
ADDITIONAL AGRICULTURAL DEMANDS AND TOTAL DEMAND
TOTAL WATER NEEDS (AF)

		Supply		Total water needs	
Ag demand[1]	**Total demand**	**Firm Year**	**Critically Dry Year**	**Firm Year**	**Critically Dry Year**
15,476	**23,534**	12,200	10,500	**11,334**	**13,034**

Note:
1. Acreages from El Dorado County Water Agency's 2007 Water Resources Development and Management Plan were used – in the calculation of GDPUD's ag demand using Reclamation's WNA formulas.

Source: PBS&J, developed from Reclamation WNA Worksheets; and personal communication from Tracy Slavin (Reclamation), April 17 and 25, 2006.

According to the federal WNA methodology as required by this joint document, GDPUD's total water needs within the term of the contract will exceed the proposed contract amount. However, because the proposed contract provides an M&I supply only, the new contract water may only be used to fulfill residential (5-acre limitation on residential parcels), commercial, and industrial demands. As previously indicated, the preliminary assessment performed for GDPUD did not include an independent analysis by Reclamation of the GDPUD's current and future agriculture water use, which may need to be included in the final WNA prior to contract execution.

3.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION AND PROJECT DESCRIPTION

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3.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION AND PROJECT DESCRIPTION

3.1. INTRODUCTION

This chapter presents the process upon which the alternatives carried forward for analysis in this EIS/EIR were developed. It includes discussion on the initial range of possible alternatives, including the Proposed Action (or preferred alternative); the screening process used to evaluate these alternatives; the alternatives eliminated from further analysis, while providing a rationale for their elimination; and identifies those alternatives selected to be carried forward in this EIS/EIR for further detailed environmental review.

The following alternatives were carried forward for detailed analysis in this EIS/EIR (their numbering sequences are retained throughout the remainder of this EIS/EIR):

Alternative 1A – No-Action Alternative

Alternative 1B – No-Project Alternative

Alternative 2A – Proposed Action – Scenario A (e.g., 7,500 AF each to EID and GDPUD)

Alternative 2B – Proposed Action – Scenario B (e.g., 15,000 AF to EID)

Alternative 2C – Proposed Action – Scenario C (e.g., 4,000 AF to EID and 11,000 AF to GDPUD)

Alternative 3 – Water Transfer Alternative

Alternative 4A – Reduced Diversion Alternative (12,500 AFA)

Alternative 4B – Reduced Diversion Alternative (10,000 AFA)

Alternative 4C – Reduced Diversion Alternative (7,500 AFA)

Each alternative, described in more detail in this chapter, was addressed in a similar and equal level of detail across all resource categories.

As a joint EIS/EIR, nomenclature between NEPA and CEQA should ideally be integrated or blended to the extent possible. Clear distinctions, however, in the use of specific terms or phrases between NEPA and CEQA exist. This can result in organizational challenges where joint documents are concerned. The proposed federal action or Proposed Action, for example, falls under the NEPA category of alternatives which, under the same term, has a completely different meaning under CEQA and is typically afforded separate discussion in an EIR. In this EIS/EIR, the Proposed Action, also known as the preferred alternative and all genuine alternatives to those actions are placed under the *alternatives* category, consistent with NEPA. A distinction, however, is made to those alternatives that represent variants of the proposed new CVP water service contract. Additionally, the term *project* represents a CEQA term and possesses specific meaning. The project description and its specific requirements are retained in this EIS/EIR as a fundamental tenet of CEQA. It is considered identical with the description of the Proposed Action or preferred alternative under NEPA.

The important point in any joint document is that the intended content and detail required by both NEPA and CEQA are upheld without rigorously adhering to one statute at the exclusion of the other. Joint EIS/EIR documents should exercise flexibility in this regard and, in fact, are encouraged to do so. The goal in joint documents is not statutory rigidity, but rather, to provide an informative, comprehensive, and structured environmental review that best captures the intent and specific requirements of the governing legislation.

Under NEPA, the evaluation of alternatives should present the Proposed Action and all the alternatives in comparative form, to define the issues and provide a clear basis for choice among the options. In its regulations implementing NEPA, the Council on Environmental Quality (CEQ) calls the alternatives analysis section the "heart of the EIS" and requires that agencies preparing environmental impact statements shall:

a. Rigorously explore and objectively evaluate all reasonable alternatives and for alternatives, which were eliminated from detailed study, and briefly discuss the reasons for their having been eliminated.
b. Devote substantial treatment to each alternative considered in detail including the Proposed Action so that reviewers may evaluate their comparative merits.
c. Include reasonable alternatives not within the jurisdiction of the Lead Agency.
d. Include the alternative of No-Action.
e. Identify the Lead Agency's preferred alternative or alternatives, if one or more exists, in the draft environmental impact statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.
f. Include appropriate mitigation measures not already included in the Proposed Action or alternatives

Similarly, according to CEQA Guidelines, an EIR must contain a reasonable range of alternatives to the proposed project or project location, which would feasibly attain *most* of the proposed project’s basic objectives, while avoiding or substantially lessening any of the significant environmental impacts of the proposed project (see CEQA Guidelines § 15126.6). Similar to NEPA, CEQA does not require a Lead Agency to analyze every conceivable alternative; however, an EIR must consider a reasonable range to encourage informed decision-making and public participation. An ironclad rule governing the nature or scope of the alternatives to be discussed in an EIR does not exist under CEQA; however, the range of alternatives is governed by a *rule of reason*, which compels a Lead Agency to consider only those alternatives necessary to permit a reasoned choice by the decision-making body (see CEQA Guidelines § 15126.6(f)). In summary, alternatives to a proposed project shall be centered on those that would:

a. Attain most of the proposed project’s basic objectives;

b. Avoid or substantially lessen one or more of the proposed project's significant environmental impacts; and

c. Be potentially feasible, both technically and economically.[25]

The following factors may be considered when evaluating feasibility: site suitability, economic viability, availability of infrastructure, general plan consistency, consistency with other plans or regulatory limitations, jurisdictional boundaries, and whether the proponent can reasonably acquire, control or otherwise have access to alternative site locations (see CEQA Guidelines § 15126.6(f)(1)). In addition, case law recognizes that agency decision-makers may reject alternatives as infeasible if they do not fully meet project objectives or are reasonably determined to be undesirable from a policy standpoint. (See *Sequoyah Hills Homeowners Assn. v. City of Oakland* (1993) 23 Cal.App.4th 704, 715 (court upholds findings rejecting alternatives for failing to meet project objectives; *City of Del Mar v. City of San Diego* (1982) 133 Cal.App.3d 410, 417 ("'feasibility' under CEQA encompasses 'desirability' to the extent that desirability is based on a reasonable balancing of the relevant economic, environmental, social, and technological factors"). Similar to what is required under NEPA, the discussion of alternatives under CEQA should focus on alternatives that would avoid or substantially lessen the proposed project's significant environmental impacts, even if the alternative would not attain all of the proposed project's objectives or would be more costly (see CEQA Guidelines § 15126.6(b)). CEQA requires that sufficient information about each alternative be included in the EIR to allow meaningful evaluation, analysis, and comparison with the proposed project (see CEQA Guidelines § 15126.6(d)).

3.2. NO-ACTION AND NO-PROJECT ALTERNATIVE CONTEXT

Section 1502.14(d) of NEPA requires that an EIS include the No-Action Alternative. Similarly, CEQA Guidelines section 15126.6(e) requires consideration of the No-Project Alternative. Under NEPA, the No-Action Alternative must contemplate the resulting environmental impacts of not going forward with the proposed federal action. Where the choice of "no action" by a federal Lead Agency, however, would result in predictable actions by others, this consequence of the "no action" alternative should be included in the analysis. For example, if denial of a new federal water contract would lead to the acquisition of water supplies, by other means, the EIS should answer this consequence of the No-Action Alternative (CEQ Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations). The NEPA regulations require the analysis of the No-Action Alternative even if the Lead Agency is under a court order or legislative command to act (e.g., new CVP water service contracts under P.L.101-514). This analysis provides a benchmark, enabling federal decision-makers to compare the magnitude of environmental effects of the action alternatives. It is also an example of a reasonable alternative outside the jurisdiction of the lead agency that should be analyzed.

Depending on the nature of the proposed federal action under investigation, two distinct approaches to identifying the "no action" scenario are possible. The first situation might involve a Proposed Action such as updating a land management plan. Under this situation, it might be expected that

25 Under CEQA, the ultimate determination of whether an alternative is "feasible" or "infeasible" is made by Agency decision-makers, who must address the issue in findings adopted at the time of project approval (CEQA Guidelines § 15091(a)).

ongoing programs initiated under existing legislation and regulations would continue, even as new plans are developed. In such cases, "no-action" essentially represents "no-change" from the current management direction or level of management intensity. Therefore, the No-Action Alternative under this circumstance may be thought of in terms of continuing with the present course of action until that action is changed. Consequently, anticipated impacts of alternative management schemes would be compared in the EIS to those impacts projected for the existing plan. In this case, alternatives would include management plans of both greater and lesser intensity, especially greater and lesser levels of resource development.

The second approach to identifying the "no action" scenario applicable herein, is illustrated in instances involving federal decisions on proposals for projects. "No action" in such cases would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of approving the Proposed Action. As noted earlier, however, inaction by the federal lead agency may inspire actions by other parties in furtherance of project objectives, purposes, or needs that might have been pursued through action by the federal lead agency.

Under CEQA, the No-Project Alternative must also be analyzed (see CEQA Guidelines § 15126.6(e)). This requirement encourages a Lead Agency to compare the environmental effects of approving a proposed project with the effects of not approving it. Unlike the No-Action Alternative, the No-Project Alternative generally assumes that the land area or current environment would remain in its existing state. This is typically prefaced by the continuation of current plans, available infrastructure, and community services. In this EIS/EIR, both the No-Action and No-Project Alternatives are identified and analyzed to provide the widest possible evaluation of the potential effects associated with not carrying forward with the Proposed Action.

3.3. ALTERNATIVES SCREENING PROCESS

During the preparation of an EIS/EIR, an array of potential alternatives to the Proposed Action including alternative locations readily come to the fore, often suggested by stakeholders and interested parties through the scoping process. This universe of possible alternatives must then be reduced to a reasonable range of potentially feasible alternatives that can be carried forward for more detailed analysis in the environmental document. Typically, this winnowing of potential alternatives is best accomplished through the implementation of a screening process. Such processes are important in that they provide a balanced and unbiased means of reducing the initial number of identified alternatives to a *reasonable* range. Ideally, the various screening criteria are developed independent of the alternatives as well as prior to the alternatives identification process, in order to maintain an unbiased evaluation. Subchapter 3.7 – Alternatives Screening Process, below, describes the methodology, considerations, and results of the process used to screen these initial alternatives into those carried forward for detailed analysis in this EIS/EIR.

3.4. SCREENING CRITERIA

Various screening criteria were identified and developed for the initial listing of potential alternatives. These criteria are presented in Table 3.4-1. These screening criteria are the result of updates to similar criteria used in the EIS/EIR for the new CVP water service contracts under P.L.101-514 prepared by Reclamation and Sacramento County Water Agency (1998), the PCWA/Northridge Groundwater Stabilization Project EIR (1999), and have their original basis from EBMUD's Water Supply Management Program (1989). They were originally developed from professional engineering and environmental expertise.

TABLE 3.4-1

IDENTIFICATION AND DESCRIPTION OF SCREENING CRITERIA

Criterion	Description
A. Technical and Engineering Feasibility	An alternative must be technically and physically feasible. An alternative must be based on existing and accepted state-of-the-art engineering concepts and cannot be based on experimental technologies. Also, an alternative must not be dependent upon either the availability or acquisition of site locations that cannot be reasonably assured.
B. Raw Water Quality	An alternative must provide a water supply or, have the capability of providing a water supply that protects water quality and meets or exceeds State and federal water quality standards or other applicable water quality standards associated with its use.
C. Environmental Fatal Flaw	An alternative cannot have environmental impacts that are so significant as to negate the positive attributes of the alternative or, simply transfer potential environmental impacts from one location to another.
D. Economic – Capital and O&M	An alternative cannot be economically impractical or infeasible. An alternative should be economically attractive such that the total direct costs to the customers and purveyors are minimized and do not significantly exceed the costs of alternatives with similar benefits. Similarly, an alternative cannot result in excessive operation and maintenance costs.
E. Long-term Reliability	An alternative must be capable of supplying raw water reliably year round and on a long-term basis.
F. Public Health and Safety	An alternative should be able to meet all existing and anticipated future State and federal health and safety requirements.
G. Timing	An alternative must be capable of being implemented within a reasonable timeframe such that the benefits and needs of the proposed project are not unduly delayed.
H. Institutional	An alternative cannot possess significant uncertainty that all permits, licenses, or other logistical requirements can be reasonably obtained.

3.5. INITIAL IDENTIFICATION OF ALTERNATIVES

As noted previously, the following alternatives, therefore, were carried forward for detailed analysis in this EIS/EIR:

Alternative 1A – No-Action Alternative

Alternative 1B – No-Project Alternative

Alternative 2A – Proposed Action – Scenario A

Alternative 2B – Proposed Action – Scenario B

Alternative 2C – Proposed Action – Scenario C

Alternative 3 – Water Transfer Alternative

Alternative 4A – Reduced Diversion Alternative (12,500 AFA)

Alternative 4B – Reduced Diversion Alternative (10,000 AFA)

Alternative 4C – Reduced Diversion Alternative (7,500 AFA)

This section identifies and describes each of the initial alternatives developed for potential evaluation in this EIS/EIR. It follows NEPA format in that the No-Action Alternative is described first (followed by the CEQA No-Project Alternative), then the fundamental elements of the Proposed Action along with the various options (terms, scenarios) that define how the Proposed Action could be implemented, followed by other potential alternatives.

3.5.1. <u>Alternative 1A – No-Action Alternative</u>

The No-Action Alternative assumes that the proposed federal action, namely, execution of the P.L.101-514 water contract would not proceed. Without this new water entitlement, El Dorado County, through EDCWA, would be short 15,000 acre-feet per annum (AFA) from its total available water supplies. Both EID and GDPUD would bear the consequences of such a shortfall as it would represent a significant loss to their planned future water supplies. In lieu of this new Central Valley Project (CVP) water contract, it is likely that both EID and GDPUD would be compelled to more aggressively seek to acquire an alternative water supply. To make up the 15,000 AFA shortfall, EID and GDPUD could proceed with exploring any combination of potential alternative supply strategies. These are described in more detail later under separate dedicated headings.

New storage, transfers, assignments, and groundwater banking (in downstream aquifers) could represent feasible options. Given the extent to which EID already imposes water conserving practices, it is unlikely that water conservation would stand as an independent alternative to this action. At this time, the most likely supplemental water supply would be a new long-term permanent water transfer or new water right from the American River basin obtained through the filing for a partial assignment of a previous State-filed application or an area-of-origin application. The latter option, in fact, represents a pending project of the El Dorado Water & Power Authority. It is considered needed in addition to, not in lieu of, the Proposed Action described in this EIS/EIR. P.L.101-514 recognized that the 15,000 AFA of new CVP water was intended only as the first phase of a long-term program by El Dorado to acquire additional water supplies to meet its existing and future General Plan water needs projections. Accordingly, as a current and separate action, the pursuit of the current new water right (i.e., the El Dorado Water & Power Authority, of which both EDCWA and EID are members) does not represent an *alternative* to the P.L. 101-514 contract, but rather, an essential future water supply that is both consistent with P.L. 101-514 and the water needs projections of the El Dorado County General Plan. Without the P.L. 101-514 contract, the El Dorado Water & Power Authority would be compelled to increase its requested water right by 15,000 AFA, equivalent to the shortfall that would be experienced without the P.L. 101-514 contract water in order to fulfill its obligations to meet future General Plan water supply requirements.

3.5.2. <u>Alternative 1B - No-Project Alternative</u>

The CEQA No-Project Alternative would not only assume that the proposed P.L.101-514 water contract is not executed but, would further assume, that no independent new actions are initiated by either EID or GDPUD to acquire additional water supplies in order to meet General Plan water need projections. As such, it could be referred to as the No-Additional Water Supply Alternative. This alternative would, consistent with CEQA, represent the existing conditions at the time of the NOP. It would carry the existing baseline condition forward in time as the assumed state of El Dorado County's western slope water supply without change. This condition would apply to both EID and GDPUD.

Without a new water supply, the western slopes of El Dorado County would be significantly constrained and be further subject to the risk of appreciable shortfalls during drought periods. As discussed in Chapter 2.0 (Purpose and Need), the current entitlements of both EID and GDPUD without the P.L. 101-514 contract would fall short of projected demands, and would result in likely hardships to water users were a prolonged drought to occur. Moreover, dry-year cutbacks imposed on EID's and GDPUD's existing entitlements, where applicable, would exacerbate this situation in the long-term. In fact, due to the dry-year conditions of the past two water years (WY 2007 and 2008), EID has experienced imposed deficiencies in its existing CVP water service contract supplies.

3.5.3. Alternative 2 – Proposed Action

Background

Public Law 101-514 (Section 206), as part of the Water Resources Development Act of 1990, included, in total, 50,000 AFA of new CVP M&I contract water for Sacramento and El Dorado counties. The Act acknowledged that these new CVP water contracts represented the first phase of a long-term effort to secure additional water supplies to meet the future needs of this growing region of California. Sacramento County, under the auspices of the Sacramento County Water Agency (SCWA) and the San Juan Water District (SJWD) (then, San Juan Suburban Water District) completed its joint EIS/EIR with Reclamation in 1997 and has since begun diverting this new CVP water (along with the City of Folsom, which received a portion of SCWA's allocation through a subcontract). Sacramento County's new CVP water supplies are 22,000 AFA for the SCWA (with an agreed upon 7,000 AFA of that amount allocated to the City of Folsom's East Area under a subcontract) and 13,000 AFA for SJWD (for delivery within San Juan's service area in Sacramento County which includes the Citrus Heights Water District, Fair Oaks Water District, and the Orangevale Water Company, collectively referred to as the San Juan "family"). In total, the Sacramento County portion of its new CVP M&I contract authorized under P.L. 101-514 was 35,000 acre-feet. These contracts, under P.L. 101-514, approved new diversions from Folsom Reservoir, the lower American River, and the Sacramento River.

As noted previously (see Chapter 2.0; Purpose and Need), the Proposed Action being evaluated in this EIS/EIR is the execution of the new long-term CVP water service contract between EDCWA and Reclamation.

Once executed, the contract will fulfill the mandate of P.L.101-514 and complete this congressionally authorized new water contracting action. For this Proposed Action, Reclamation is the federal water contracting entity and, accordingly, the federal Lead Agency under the National Environmental Policy Act (NEPA). EDCWA is the primary contractor and, accordingly, the State Lead Agency under the California Environmental Quality Act (CEQA). Both agencies have jointly and cooperatively prepared this environmental document.

Under this new contract, not to exceed 15,000 AFA, CVP municipal and industrial (M&I) water would be made available to EDCWA consistent with federal Reclamation law (see below). Consistent with P.L.101-514, new CVP water can be taken directly from Folsom Reservoir, or exchanged for non-CVP water to be diverted from the American River upstream of Folsom Reservoir.

Master Contract

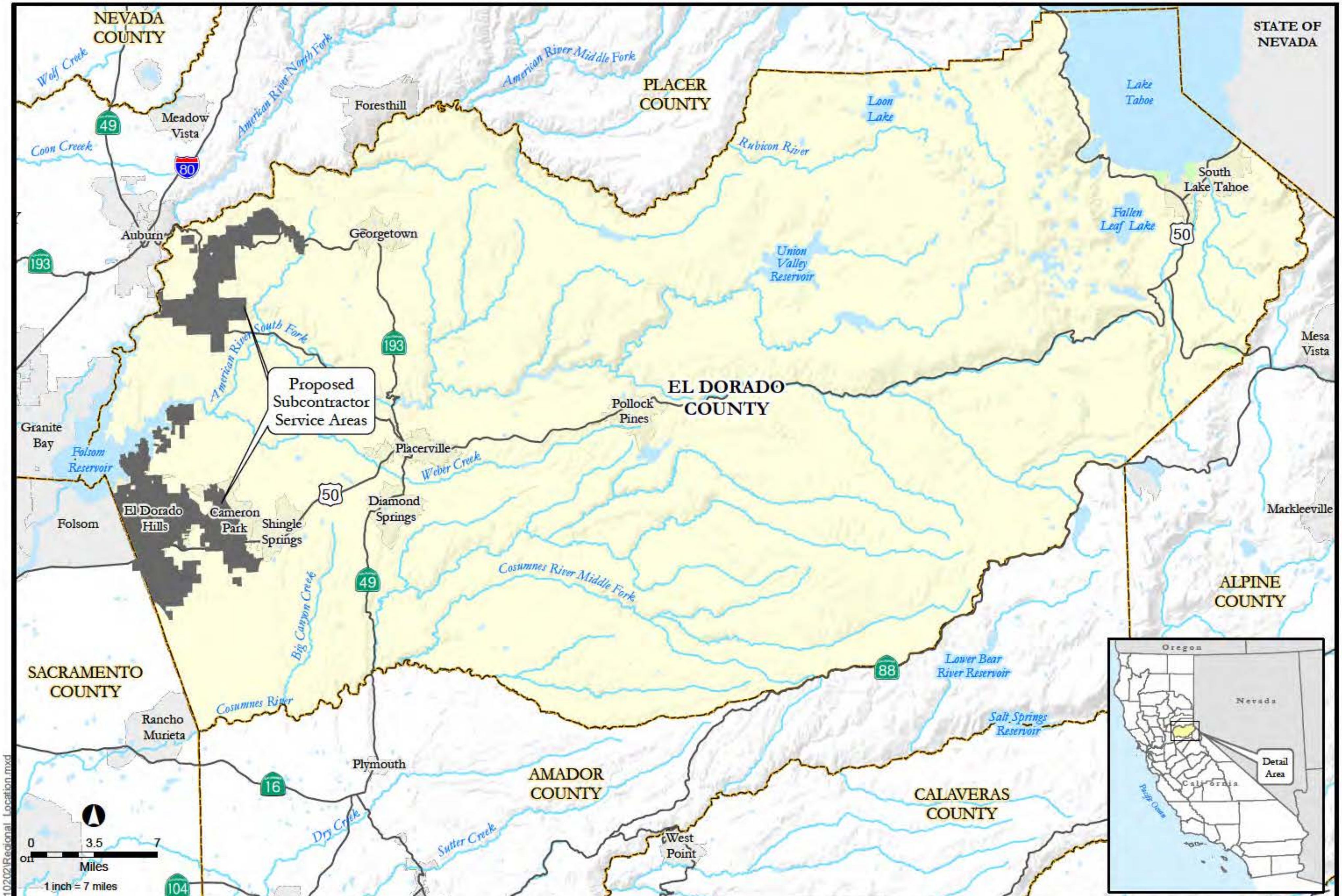
Under this Proposed Action, EDCWA would make this new water available to fulfill both current and future in-county water needs. EDCWA is a special district, established under the El Dorado County Water Agency Act that was established to deal with a range of water issues in El Dorado County. EDCWA has no land use authority, is not a physical supplier of water in the County, and acts as an advisory agency to purveyors in El Dorado County. Furthermore, EDCWA is governed by a Board of Directors separate from the County Board of Supervisors.

The purveyors within the county with the authority to supply water are referred to as EDCWA's member units, and include irrigation districts, public utility districts, and community service districts. Additionally, several are empowered to provide water service, but currently do not. This new CVP M&I water service contract would represent a *master* contract that, upon execution, would provide EDCWA the necessary flexibility to subsequently execute direct subcontracts with two of its member units, either the El Dorado Irrigation District (EID), Georgetown Divide Public Utility District (GDPUD), or both, depending on the timing, needs and desires of those districts. Both of these purveyors would deliver water to portions of their service area along the western slopes of El Dorado County.

The contract is titled, CONTRACT BETWEEN THE UNITED STATES AND EL DORADO COUNTY WATER AGENCY PROVIDING FOR PROJECT WATER SERVICE FROM THE AMERICAN RIVER DIVISION (Contract No. 07-WC-20-3534). It is authorized under the Act of June 17, 1902 (32 Stat. 388), and acts amendatory or supplementary thereto, including, but not limited to, the Acts of August 26, 1937 (50 Stat. 844), as amended and supplemented, August 4, 1939 (53 Stat. 1187), as amended and supplemented, October 12, 1982 (96 Stat. 1263), Title XXXIV of the Act of October 30, 1992 (106 Stat. 4706), and Section 206(b)(1)(B) of the Act of November 5, 1990 (104 Stat 2074), referred to collectively, as federal Reclamation law. The proposed Master Contract (No. 07-WC-20-3534) is included in Appendix D in this Draft EIS/EIR.

Project Location

El Dorado County is located in Northern California, and stretches from the eastern border of Sacramento County to the California/Nevada border south of Lake Tahoe (see Figure 3-5-1). Folsom Reservoir lies at the western end of El Dorado County, and includes portions of Sacramento, Placer, and El Dorado counties. Much of the county is in the American River Watershed. The South Fork American, Middle Fork, and Rubicon rivers drain much of the central and northern portions of the county into Folsom Reservoir. The southern portion of the county is drained by the North, Middle, and South forks of the Cosumnes River. At its eastern end, the Upper Truckee River drains a small portion of the county within the Lake Tahoe basin.



N:\GISProjects\EDCWA_10202\Regional_Location.mxd

FIGURE 3.5-1

Regional Location

D50202.00

P.L. 101-514 USBR/EDCWA
CVP Water Supply Contract EIS/EIR

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The county is home to 173,407 people (DOF 2005). The primary communities are South Lake Tahoe, El Dorado Hills, Cameron Park, and Placerville which together account for approximately 64 percent of the County population (DOF 2000). Two of the most rapidly growing areas are El Dorado Hills and Cameron Park, along the western slopes of the county. With its proximity to Folsom Reservoir (a CVP facility), EID's intended use of this new water will likely occur in the El Dorado Hills and Bass Lake Tank's service area (in the western portion Cameron Park). Similarly, for GDPUD, its allocation will be used within the western portion of its service area in the vicinity of Cool, Pilot Hill, Auburn Lakes Trail, and Greenwood. See Subchapter 3.5, under the Subcontractor Service Areas heading, for a complete discussion and description of these service areas.

Distribution of P.L. 101-514 Water

P.L.101-514 does not specify how much of the contract amount would be specifically distributed to each individual water district within El Dorado County. The law, in fact, is silent on identifying specific districts by name with whom the EDCWA could subsequently enter into subcontracts. For purposes of this EIS/EIR and the analyses contained herein, the Proposed Action is intended to represent a split of the master contract evenly between EID and GDPUD through subcontracts of 7,500 AFA each. The subcontracts, under their draft forms, are provided in Appendix E and Appendix F, respectively, and include the standard Articles pertaining to CVP water service contracts.

It is possible and quite likely that the future demands of EID or GDPUD may increase independently and differentially over time. Such demand increases could prompt a need for water that is greater or lesser than the 7,500 AFA identified as the Proposed Action based on the actual demand at that time. EDCWA, together with Reclamation, would facilitate subcontract agreements with both districts as their needs developed. As noted previously, the proposal of a *master* contract maximizes EDCWA's flexibility to distribute new CVP M&I water to those areas in need within the county, as needs dictate, and in a manner consistent with federal contracting provisions. This would ensure optimum beneficial use of the new CVP water supply.

While EID and GDPUD are the intended recipient districts for this new water supply, the specifics of timing, quantity, and the identity of the first recipient of any such water supplies depends on the specific water needs and diversion/delivery capabilities of the districts. EDCWA, as the primary contractor (i.e., holder of the *master* contract) would, therefore, have oversight and control over this ongoing process, and would execute any subcontracts negotiated between the two purveyors in coordination with Reclamation. As the prime contractor, EDCWA would be identified by Reclamation as holding primary responsibility for ensuring that the various terms and conditions of the master and subcontract(s) are met. Once executed, the water service master contract authorized by P.L.101-514 would allow EDCWA essentially to hold new CVP M&I water *in trust* until such time as the member districts initiate further action. The intent of P.L. 101-514 would be preserved, as this new CVP M&I contract would remain for use in El Dorado County.

Points of Diversion

Under the Proposed Action, all water diverted by EID would be taken from Folsom Reservoir at EID's existing intake. This water would be conveyed to EID's El Dorado Hills Water Treatment Plant (see Figure 3.5-2). This EIS/EIR does not cover EID's potential new water treatment facility at Bass

Lake. EID is in the process of completing engineering design and separate NEPA environmental review and approval for a temperature control device (TCD) on its diversion from the reservoir; Reclamation is the NEPA Lead Agency for this separate action. EID has already completed its CEQA review of the TCD. Installing the TCD would also include expansion of the capacity of the existing intake and possible re-location. For purposes of analysis in this EIS/EIR, the TCD is assumed to be in place and operational for all future-level impact evaluations (see Subchapter 5.1, Introduction to Analysis).

Distinct from EID's direct diversion capabilities at Folsom Reservoir, GDPUD may only obtain water under the Proposed Action through a water exchange with another purveyor, most likely the Placer County Water Agency (PCWA), where discussions between the two purveyors were initiated several years ago. This exchange would be necessary because GDPUD does not possess a direct diversion point on Folsom Reservoir (hence, no ability to directly divert CVP water). Water obtained by GDPUD through such an exchange would be from PCWA's Middle Fork Project, and could be diverted from the North Fork American River, near Auburn.

It should be noted that at the present time, PCWA does not possess an authorized point of diversion or service area for CVP water from which a CVP diversion from Folsom Dam and Reservoir could be implemented. This is because when PCWA amended its current CVP M&I water service contact, reducing the quantity from 117,000 AFA to 35,000 AFA, its service area was erroneously redefined to only include PCWA's Zone 1. PCWA has requested that its CVP service area be revised to include SJWD's Placer County portion of their service area, the City of Roseville, and PCWA's proposed new west Placer service areas (e.g., Placer Vineyards). Reclamation has agreed to this change. Rather than initiate a separate and independent NEPA action, this change in PCWA's CVP service area is being included as part of the proposed action for the Sacramento River Water Reliability Study EIS/EIR, currently pending. Accordingly, any exchange between GDPUD and PCWA of CVP water for Middle Fork Project water would be contingent upon completion of the Sacramento River Water Reliability Study EIS/EIR along with the appropriate Reclamation adjustments to PCWA's authorized CVP place of use.

In terms of diversion facilities, PCWA has recently completed construction of a new permanent pump station on the American River at the site of the Auburn cofferdam (referred to as the American River Pump Station). On Sept. 4, 2007, the old Auburn Dam tunnel was closed and, after 35 years, the American River returned to its natural channel. River restoration has been completed along with completed construction of the American River Pump Station, which began full operation in 2008.

The American River Pump Station Project includes an empty pump bay at the pumping plant along with an under-river caisson stubbed on the south side of the river. Were an agreement to be reached between GDPUD and PCWA, GDPUD could use the empty pump bay for its own pumps, the under-river caisson and build its own conveyance infrastructure on the southern bank of the North Fork American River to pump water out of the canyon. At this time, a Memorandum of Understanding between PCWA and GDPUD has been drafted and remains under negotiation. Together, these facilities would be capable of diverting water from the river and conveying it up out of the American River canyon to one of GDPUD's existing or future new water treatment facilities on the Georgetown Divide. See below for a more detailed discussion of the GDPUD/PCWA exchange.

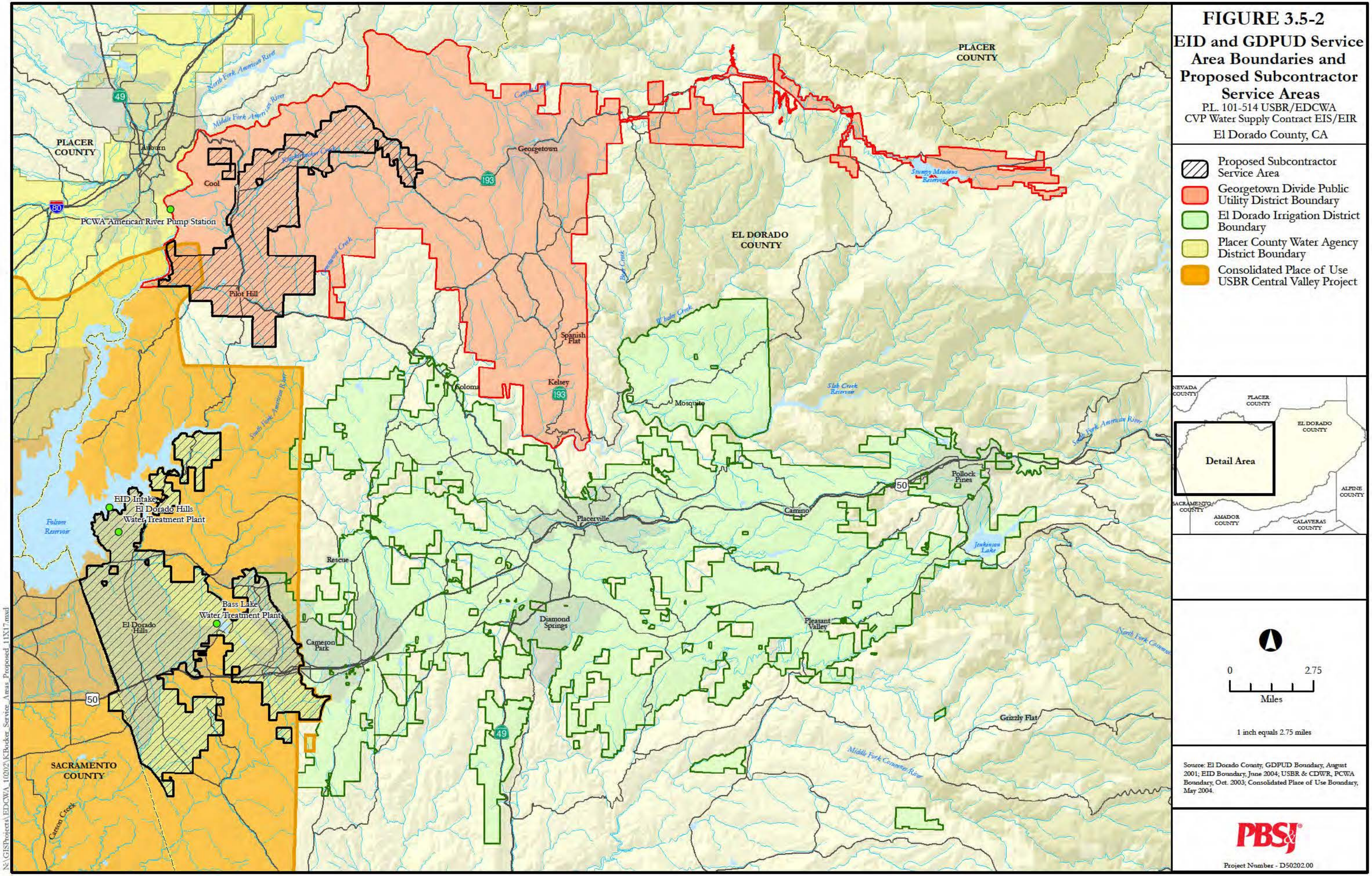

FIGURE 3.5-2
EID and GDPUD Service Area Boundaries and Proposed Subcontractor Service Areas
P.L. 101-514 USBR/EDCWA CVP Water Supply Contract EIS/EIR
El Dorado County, CA

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For the purposes of the hydrologic analysis in this EIS/EIR, the Proposed Action is represented in two ways. First, to account for EID's proposed diversion, a depletion of 7,500 AFA (assumed to occur at the existing EID intake downstream of the South Fork American River inflow) to Folsom Reservoir was modeled. Second, to account for GDPUD's proposed exchange, a depletion of 7,500 AFA from the inflow to Folsom Reservoir from the North Fork American River was also modeled. The reduction in inflow to Folsom Reservoir represents the diversion of Middle Fork Project water by GDPUD from the exchange with PCWA. Hydrologically, this latter modeling assumption represents the only physical means by which new water, made available through P.L.101-514 can be used by GDPUD within El Dorado County (see Subchapter 5.1, Introduction to Analysis). It should be noted that, in numerous environmental documents completed by Reclamation and others involving the American River basin in recent years, this exact model configuration (i.e. how to model the new contract), has been used (see Subchapter 5.1, Introduction to Analysis, for a detailed description of the modeling framework adopted for this EIS/EIR).

GDPUD/PCWA Exchange

As noted previously, for GDPUD to receive a new allocation of water under this new contract, an exchange would first have to be negotiated between GDPUD and PCWA. Without a direct diversion at Folsom Reservoir, GDPUD must seek an alternative water source, facilitated through an exchange, since CVP water, based on current CVP water rights permits, may not be diverted from the American River upstream of Folsom Reservoir, the furthest-upstream federal impoundment on the American River. PCWA represents the only water purveyor on the upper American River that could realistically provide GDPUD with an alternative water source that could be exchanged with the new P.L.101-514 contract water. P.L.101-514, in fact, expressly provided for this situation by noting that the, "…*CVP water could be diverted directly from Folsom Lake or for exchange upstream on the American River or its tributaries*."

Since GDPUD has no direct diversion capability of any kind from the North, South, or Middle forks of the American River, it must either rely on other existing or future facilities or establish its own. As noted previously, the new American River Pump Station would provide the necessary diversion facility for GDPUD. No other current efforts are being developed by GDPUD to establish new separate diversion facilities on these waterbodies (i.e., Folsom Reservoir, North, South or Middle forks of the American River).

Under a potential water exchange, GDPUD could divert a prescribed quantity of PCWA's Middle Fork Project (MFP) water rights water at the American River Pump Station, in *exchange* for relinquishing a prescribed quantity of its new CVP allotment to PCWA for diversion at Folsom Dam PCWA is already a CVP contractor; however, as previously noted, must await completion of the Sacramento River Water Reliability Study EIS/EIR and have Reclamation redefine its CVP service area before a diversion of CVP water from Folsom Dam under this exchange could occur.

The exact quantities of the exchange and the conditions of their diversions would be the subject of an agreement between GDPUD, PCWA, and Reclamation. One important consideration in any such exchange would be the differential in shortage provisions between CVP water and non-CVP water rights (see Figure 3.5-3).

For such an exchange to be put to beneficial use by GDPUD, PCWA would ultimately have to petition the SWRCB for a Change in Place of Use (POU) of its MFP water rights. This SWRCB action would be necessary because currently, MFP water rights are not approved for use in El Dorado County. For GDPUD to use MFP water rights water, therefore, its service area would have to be included in an expanded POU for MFP water rights. Consequently, because of the necessity for this exchange, both PCWA and the SWRCB are deemed to be Responsible Agencies under CEQA for this current action based on the reasons described above.

It is acknowledged, however, that execution of the master contract between Reclamation and EDCWA does not, in itself, require any action or approval by either PCWA or the SWRCB. In fact, deliveries of the new contract water could be wholly made, consistent with both P.L.101-514 and the provisions of the master contract, without any involvement by PCWA or the SWRCB, if diversions by GDPUD could be made directly from Folsom Reservoir. PCWA and SWRCB involvement is solely contingent upon GDPUD initiating and proceeding with a request for an exchange at some point in the future, at its sole discretion.

This EIS/EIR provides the project-level hydrologic analysis which not only supports the execution of the new CVP water service contract (i.e., the Proposed Action), but also a possible future exchange between PCWA and GDPUD made at the American River Pump Station on the North Fork American River. The SWRCB, PCWA and GDPUD could, in the future, rely upon this EIS/EIR as the proper environmental tiering document under CEQA. It would contain the necessary hydrologic analyses to support the exchange.

If such an exchange as described, were to come to fruition in the future, separate project-level environmental documentation addressing issues other than hydrology, with either PCWA or GDPUD serving as the Lead Agency under CEQA, would need to be prepared. This would include any new pumping facilities, conveyance infrastructure, storage reservoirs, related appurtenances and/or ultimate new treatment facilities.

Proposed Subcontractor Service Areas

CVP water is permitted for use only within a specified area as set in Reclamation's permits with the SWRCB. This area is known as the CVP Consolidated Place of Use (or CVP CPOU) and is illustrated in Figure 3.5-2. The Subcontractor service areas where the proposed P.L.101-514 water will be put to beneficial use is identified by the black-hatched areas on Figure 3.5-2. The Subcontractor service areas where EID intends to deliver water obtained through this contract is consistent with the CVP CPOU. Consistent with Reclamation contracting law, no CVP water can or will be delivered to areas outside of the CVP CPOU.

For GDPUD, since it would be acquiring new water through an exchange of CVP and non-CVP water, the CVP CPOU is not applicable for its use of new water. As long as the exchanged CVP water (to PCWA) is used within the CVP CPOU,[26] which it presumably would be, there would be no violation of federal Reclamation law regarding the exchange. The Subcontractor service areas are

26 As previously stated, PCWA has included a request for a redefined CVP service area within the Sacramento River Water Reliability Study EIS/EIR.

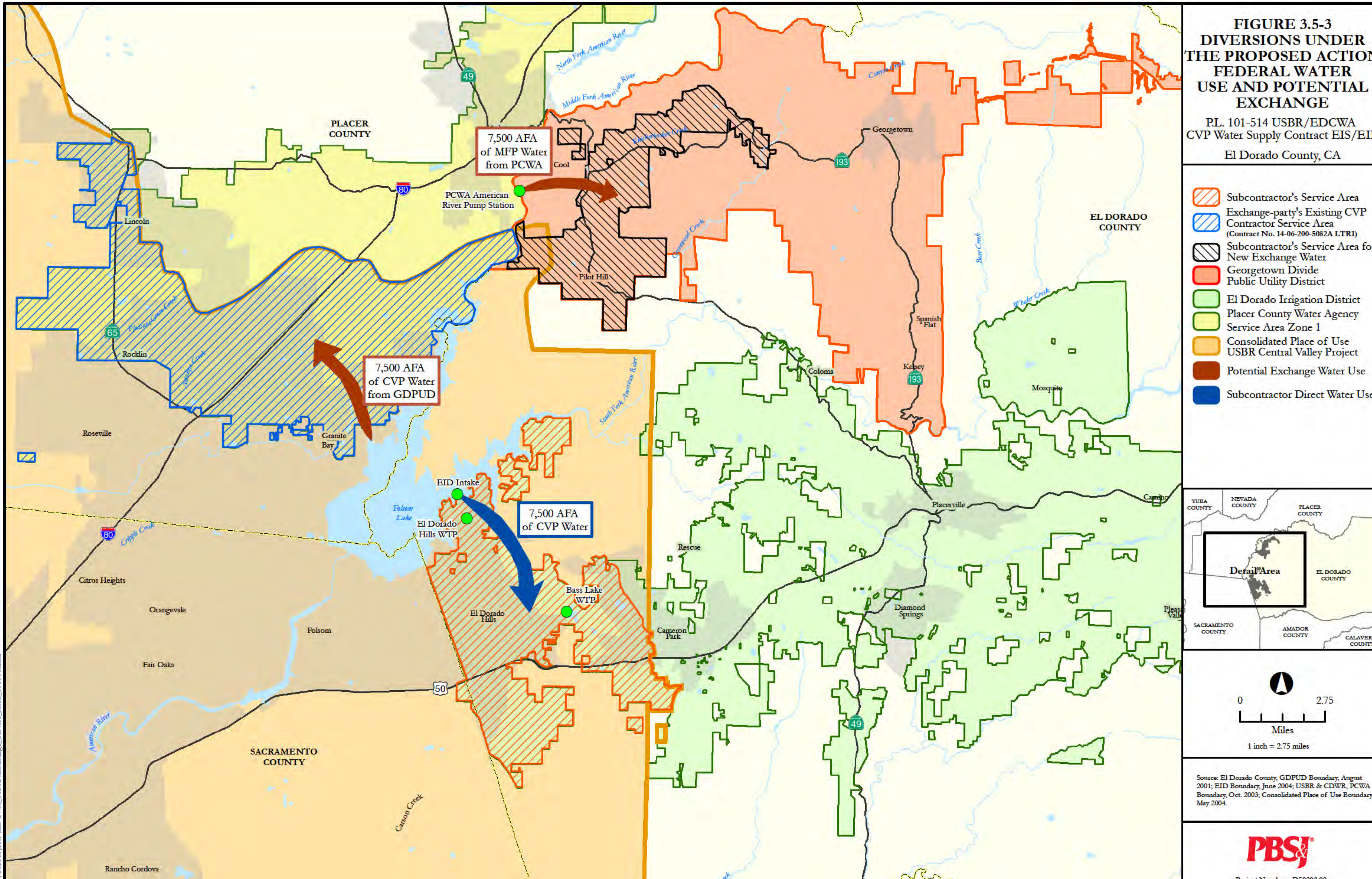

FIGURE 3.5-3
DIVERSIONS UNDER THE PROPOSED ACTION FEDERAL WATER USE AND POTENTIAL EXCHANGE

P.L. 101-514 USBR/EDCWA CVP Water Supply Contract EIS/EIR

El Dorado County, CA

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also known collectively, as the landside, or terrestrial federal *action area* (e.g., this is distinct from the aquatic federal *action area* which covers the CVP/SWP reservoirs and waterways, including the Bay-Delta).

Since the new contract water would be restricted to M&I use, the black-hatched areas shown in Figure 3.5.2 are limited to areas zoned for residential, commercial, public and industrial use according to the 2004 El Dorado County General Plan. All areas in the proposed Subcontractor service areas are wholly within the current service boundaries of either EID or GDPUD. In the future, if either purveyor wishes to expand its Subcontractor service area beyond that currently delineated, two possibilities could arise. If the areas to be added are outside of the current CVP CPOU, Reclamation's inclusion process would have to be requested. Additionally, if the areas to be added are outside of the purveyor's own service area boundaries, an annexation process with the El Dorado Local Agency Formation Commission (LAFCO) would have to be initiated. All required environmental documentation to support either process would have to be prepared at that time under the direction of Reclamation or El Dorado LAFCO.

3.5.4. EID Proposed Subcontractor Service Area

The western portion of the EID service area is shown in Figure 3.5-2, where EID provides surface water to approximately 140,000 acres. Its service area covers approximately 30 percent of western El Dorado County. EID's larger sphere of influence, about 347,000 acres, spans from El Dorado Hills in the west to Pollock Pines in the east, and from the Cosumnes River on the south to the South Fork American River on the north. Elevations in the primary EID service area range from 500 feet msl in the west to over 4,000 feet msl in the east. EID provides treated water to the communities of Pollock Pines, Camino, El Dorado, Diamond Springs, Shingle Springs, Cameron Park, El Dorado Hills, Outingdale, and Strawberry. It also provides both wholesale and retail water service within the City of Placerville.

3.5.5. GDPUD Proposed Subcontractor Service Area

GDPUD currently provides surface water to about 30,000 acres within its service area, of which 2,500 acres are in irrigated orchard, vineyard and pasture crops. Its service area encompasses approximately 75,000 acres. GDPUD's sphere of influence, about 173,000 acres, extends from the Middle and North Fork American River upstream of Folsom Reservoir and the Rubicon River to the north, to the South Fork American River, to the south. Its service area continues east as far as Stumpy Meadows Reservoir on Pilot Creek. Elevations in the GDPUD service area range from between 800 feet msl in the southwest, to about 3,500 feet msl in the northeast.

GDPUD's proposed Subcontractor service area, like EID's, is also restricted to areas within its current boundaries zoned for residential, commercial, public and industrial use. At this time, GDPUD does not intend to serve water obtained through this Proposed Action east of the Greenwood area, since the elevation differential between the American River Pump Station and the Greenwood area would be at the maximum economically feasible for pumping. The relatively small number of users beyond this area would likely make the cost of pumping water further uphill to Georgetown infeasible.

Contract and Diversion Pattern

Regardless of how the total contract amount is split between EID and GDPUD, actual annual allocations would be set based on the yearly determination of water availability made by Reclamation. Early in the water year, CVP contractors request a certain amount of water, up to their full contract amount, based on anticipated needs for that year. Reclamation then allocates water for CVP contractors based on historical uses, available Project storage, and the current year's water conditions. Allocations are expressed as a percentage of historical use during the prior three years of unrestricted allocations. Allocation for the proposed new CVP water service contract could typically range from 75 to 100 percent of historic water use under the Draft CVP M&I Shortage Policy, dated September 11, 2001, depending on the availability of water.

Accordingly, the proposed new CVP water service contract would be subject to the same shortage provisions as all other CVP M&I contractors consistent with the Draft M&I CVP Shortage Policy. Adherence to Reclamation shortage provisions is a Term and Condition of the contract. The draft Master Contract (Contract No. 07-WC-20-3534), under its draft form, is provided in Appendix D and includes the standard Articles pertaining to CVP water service contracts. These include, but are not necessarily limited to:

- Terms of the Contract
- Point of Diversion
- Point of Delivery/Place of Use and Contractor Service Area
- Timing of Delivery
- Measurement of Water
- Rates and Methods of Payment
- Sales, Transfers or Exchanges
- Temporary Reductions and Shortage Provisions
- Constraints on Availability
- Water Conservation Requirements (including the provision for tiered pricing as specified under P.L. 102-575)

Typically, new water deliveries are expected to occur on a characteristic demand pattern (consistent with either M&I or Ag use) on a monthly use pattern. Table 3.5-2 below, illustrates a potential monthly demand/diversion pattern for both EID and GDPUD, and assumes an equal allocation of 7,500 AFA each to the two districts.

Operational constraints during much of the year, however, preclude EID from diverting CVP water on a typical demand pattern. In any given year, EID takes its various water right entitlements first based on its past practices and economics. Existing system capacity during the early portion of the year is not conducive to taking this new CVP water at these times since much of the available capacity is used for its water right entitlements. Consequently, EID would most likely take the new

TABLE 3.5-2

TYPICAL M&I EXPECTED MONTHLY DIVERSIONS OF THE P.L.101-514 CONTRACT WATER BY EID AND GDPUD (AF PER MONTH)

Diversion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
% of annual	4	4	4	5	8	12	16	16	13	9	5	4	100
EID	300	300	300	375	600	900	1200	1200	975	675	375	300	7,500
GDPUD	300	300	300	375	600	900	1200	1200	975	675	375	300	7,500
Total	**600**	**600**	**600**	**750**	**1,200**	**1,800**	**2,400**	**2,400**	**1,950**	**1,350**	**750**	**600**	**15,000**

CVP water allocation during a short period spanning the late summer months, at the end of its peak demand season. One scenario could have EID taking the new P.L.101-514 water - wholly during the months of July, August and September, as individual diversions of 2,500 AF per month.

Conversely, for GDPUD, without the same operational constraints, it would likely divert its allocation on a more typical yearly M&I pattern. Therefore, the Proposed Action diversion schedule assumes an EID diversion from Folsom Reservoir condensed to three late-summer months of 2,500 AF each, while the GDPUD diversion would follow a more typical yearly M&I demand pattern. Table 3.5-3 below, shows how these diversion patterns would differ, with EID's pattern skewed to the three mid-summer months. This represents Alternative 2 – Proposed Action – Scenario A or, simply, Proposed Action – Scenario A. As discussed later, adopting this diversion pattern (at least in the case of EID) also provides a *worst-case* scenario for environmental review purposes and presents a positive bias for disclosing potential environmental effects.

TABLE 3.5-3

EXPECTED MONTHLY DIVERSIONS OF THE P.L.101-514 CONTRACT WATER BY EID AND GDPUD (AF PER MONTH) PROPOSED ACTION – SCENARIO A

Diversion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EID	0	0	0	0	0	0	2500	2500	2500	0	0	0	7,500
GDPUD	300	300	300	375	600	900	1200	1200	975	675	375	300	7,500
Total	**300**	**300**	**300**	**375**	**600**	**900**	**3700**	**3700**	**3450**	**675**	**375**	**300**	**15,000**

Variations of this Proposed Action scenario exist. Each variation makes certain assumptions about the ability of either GDPUD or EID to take this water and was developed to maximize the flexibility of the environmental review to support the pending contract. Table 3.5-4, for example, illustrates a potential diversion schedule that assumes a situation where GDPUD cannot physically take any of the new contract water for whatever reason, thereby re-allocating the complete contract amount to EID. This represents the Alternative 2 – Proposed Action – Scenario B or, simply, Proposed Action – Scenario B.

TABLE 3.5-4

EXPECTED MONTHLY DIVERSIONS OF THE P.L.101-514 CONTRACT WATER BY EID AND GDPUD (AF PER MONTH) PROPOSED ACTION – SCENARIO B

Diversion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EID	0	0	0	1000	1000	2500	2500	2500	2500	2000	0	0	15,000
GDPUD	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**1000**	**1000**	**2500**	**2500**	**2500**	**2500**	**2000**	**0**	**0**	**15,000**

Conversely, Table 3.5-5 makes the assumption that GDPUD is capable of taking the entire contract amount, that is, up to the limit of the El Dorado County General Plan projections for its service area. At this level of diversion, an analysis of GDPUD's demands indicate that it could take 11,000 AFA of the new contract water, leaving 4,000 AFA for EID (pers. comm. M. Preszler, 2006). This diversion option represents Alternative 2 – Proposed Action – Scenario C or, simply, Proposed Action – Scenario C.

TABLE 3.5-5

EXPECTED MONTHLY DIVERSIONS OF THE P.L.101-514 CONTRACT WATER BY EID AND GDPUD (AF PER MONTH) PROPOSED ACTION – SCENARIO C

Diversion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EID	0	0	0	0	0	0	1300	1400	1300	0	0	0	4,000
GDPUD	500	500	500	600	900	1300	1500	1500	1500	1100	600	500	11,000
Total	**500**	**500**	**500**	**600**	**900**	**1300**	**2800**	**2900**	**2800**	**1100**	**600**	**500**	**15,000**

Each of the Proposed Action Scenarios was carried forward for hydrologic modeling as part of the environmental evaluation; as noted, this additional level of analysis provided maximum flexibility to Reclamation, EDCWA, EID, and GDPUD to implement the proposed new contract. See Subchapter 5.2 (Overview of Impact Analysis) for a complete discussion of the diversion schedules and associated details used in the hydrologic impact analysis modeling.

3.6. PRELIMINARY ALTERNATIVES OTHER THAN THE PROPOSED ACTION

The Proposed Action, as defined, is the execution and ultimate implementation of the new CVP M&I water service contract authorized under P.L.101-514 between Reclamation and EDCWA. This action, in essence, is a new water supply allocation up to 15,000 AFA from the CVP. Potential alternatives, therefore, could include other water supplies that could be used in lieu of the P.L.101-514 contract.

The identification of potential alternatives to the Proposed Action can be viewed in three categories. First, the identification of possible alternatives to the new CVP water allocation can be made. This would include alternative *water supplies* to the P.L.101-514 contract. Second, the identification of possible options can be made which could reduce the existing and future demands that resulted in the authorization of the P.L.101-514 contract in the first place. Third, possible alternative means of *implementing* the P.L.101-514 contract can be explored (separate from the differing allocations between EID and GDPUD as represented by the Proposed Action – Scenarios). At this step of the EIS/EIR, the Alternatives are numbered (e.g., Alternative 1A – No Action Alternative) only if they are intended to be carried for further full environmental analysis in the document. The preliminary alternatives identified and discussed below are, at this point, given Alternative numbers.

Alternative water supplies *to* the P.L.101-514 contract can include the development of new water rights, securing water transfers or assignments from existing entitlement holders, obtaining a new State Water Project (SWP) contract, the development of new storage, the use of groundwater, or the use of reclaimed water. Potential alternatives that could reduce existing and future water demands could include water conservation in varying degrees of intensity and demand control through growth management. Possible alternatives to implementing the P.L.101-514 contract include variations in the allocations between the recipient parties (i.e., altering the delivery proportions between EID and GDPUD) as depicted previously in the three Proposed Action - Scenarios, looking at possible different diversion locations, and reducing the overall contract entitlement from the 15,000 AFA to something less.

In summary, the preliminary listing and description of potential alternatives are identified under the following categories:

3.6.1. Alternative Water Supplies

Potential alternative water supplies to the Proposed Action could include any of the following:

New Water Rights

A new water right for EDCWA would require a filing with the SWRCB for either a partial assignment of existing State filed applications or a new separate area-of-origin application relying on the protections provided in D-870 and D-893. In March 1957, the SWRCB, in reviewing the applications of the Sacramento Municipal Utility District (SMUD) for its Upper American River Project (UARP) and, specifically, the requests for direct diversion and diversions to storage from the South Fork Rubicon River, Rubicon River, Rock Bound Creek and Gerle Creek found that unappropriated water was available for power purposes. Moreover, the SWRCB found that water may be appropriated in the manner proposed in the applications without injury to any other lawful user. This was codified in Decision 870 (D-870). In March 1958, the SWRCB issued Decision 893 (D-893), granting permits to Reclamation for storage of water at Folsom Reservoir.[27] Reclamation's permits were subject to minimum flows for fisheries resources, as provided for in a memorandum between Reclamation and the Department of Fish & Game (e.g., 250 cfs from January 1 through September 14, and 500 cfs from September 15 through December 31). Reclamation's permits were also subject to reduction as a result of future water appropriations for reasonable beneficial use within the watershed tributary to Folsom Reservoir.

27 The Decision also granted permits to the City of Sacramento for the diversion of water from the American River. The City holds water rights on the Sacramento River as well. The Decision also granted to Sacramento, San Joaquin and Placer counties, a 10-year period in which to negotiate with the United States for a contact for American River water before the supply was permanently committed elsewhere.

A water source for an appropriation would need to be identified along with any proposed points of diversion, proposed quantities, delivery timing, and beneficial uses. A new water right acquisition for El Dorado County, however, is not a new concept. In 1980, for example, El Dorado filed applications for the proposed South Fork American River (SOFAR) project and petitioned for the assignment of various State-filed applications, including Application No. 5645.[28] Later, in March 1991, El Dorado filed four applications to appropriate water from Silver Lake, Caples Lake, Lake Aloha and the South Fork American River, which it subsequently, the following year, surrendered back to the SWRCB.

Most recently, EDCWA and SMUD have completed negotiation of a Cooperative Agreement that essentially provides EDCWA the use of SMUD's facilities in the UARP as part of the agency's longer term efforts at securing a new supplemental water supply. Currently, in fact, the El Dorado Water & Power Authority is pursuing a supplemental water supply through pending water right filings before the SWRCB; with a project known as the Supplemental Water Rights Project. This is a separate and distinct project from the P.L. 101-514 contract and supported by its own water needs justification. In other words, EDCWA and its member districts, in planning to meet demand established by the 2004 General Plan, will need not only the 15,000 AFA contemplated by this Proposed Action, but also additional supplies that might be obtained through a variety of means, including new water rights. Thus, the process of obtaining such rights is not an alternative to a contract between Reclamation and EDCWA, but rather, is a separate project with its own demand increment that is being be pursued separately albeit coincidentally.

3.6.2. <u>Water Transfers</u>

For EDCWA to initiate a water transfer, a willing purveyor with a reliable long-term water supply would have to be identified. Moreover, for any such transfer to be economically feasible, proximity to the ultimate use areas within the EID and GDPUD service areas would be important as would the availability of infrastructure. For EID, any purveyor holding a water entitlement in Folsom Reservoir (e.g., City of Folsom, SJWD, and Placer County Water Agency) could provide a feasible water transfer alternative if available supplies existed and those supplies were long-term.

For GDPUD, owing to its more isolated nature on the Divide, a water transfer would be again, similar to what is contemplated under the Proposed Action, likely have to rely on the closest point of diversion on a notable watercourse (i.e., American River Pump Station on the North Fork American River) as well as PCWA's Middle Fork Project (MFP) water rights. More complicated transfers are possible offering a wider range of potential willing water suppliers over a broader geographic range, but such alternatives would involve multiple parties, the likely need for exchange provisions, and increasingly complex facility and pump-back arrangements. For potential transfer partners on the Sacramento River or its tributaries, a complex arrangement would be needed in order to secure an exchange with a local purveyor having entitlements in Folsom Reservoir so that EID or GDPUD could benefit from any such agreement.

28 Application 5645, filed on July 30, 1927, was one of 37 applications filed in 1927 by the [State] Director of Finance under authorization provided by the *Feigenbaum Act* that sought a permit to appropriate for irrigation and domestic use, various amounts of water from various points in El Dorado County on the tributaries to the American and Cosumnes rivers, including the South Fork American River.

As part of the El Dorado Water & Power Authority's proposed Supplemental Water Rights Project, there is an opportunity for a long-term water transfer with the City of Sacramento. The City of Sacramento, with large unused water entitlements in the upper American River basin, may be willing to transfer a portion of its unused entitlements to EDCWA under an arrangement negotiated between the two parties. Such a transfer, however, would also need Reclamation support since the City's entitlements are tied to Reclamation's permits, as noted previously. Furthermore, as noted earlier, water demands established in the 2004 El Dorado County General Plan verify a need not only for the 15,000 AFA contemplated by the Proposed Action, but also for the Supplemental Water Rights Project as a separate and complimentary project, rather than as an alternative to the Proposed Action.

Water acquisitions under the alternative may, to some degree, also include temporary supplies such as surplus water (e.g., Section 215 water) from Reclamation "spilled" from Folsom Reservoir during the flood season under encroached conditions in the reservoir. Spill water, would not, however, be available outside of these periods and could not be used for drought planning or as a component of any firm yield projection. With the potential for continued and exacerbated water shortage conditions into the future, an increasing number of water purveyors are prudently looking at all options, short-term and long-term, as part of their overall secured water supply portfolios.

New SWP Contract

A new SWP water contract for EDCWA would likely require a complex multi-party agreement in order to provide EDCWA with a comparable water supply, relative to the Proposed Action. Since SWP supplies originate in the Feather River (at Oroville Reservoir), flow to the Sacramento River and do not include any flows from the American River, a State Water Contract held by EDCWA for such Feather/Sacramento River water would have to be exchanged with an American River purveyor holding entitlements in Folsom Reservoir and/or points upstream, but with access, either directly or through a wheeling arrangement with another party, who can access the Sacramento River (through releases from Oroville Reservoir). With the completion of the Sacramento River Water Reliability Project (i.e., new Sacramento River diversion upstream of the confluence with the American River, or "SRWRS" Project), this alternative may hold increased feasibility.

It should be noted, however, that the SRWRS Project has not yet been approved and is possibly many years away from construction. It currently does not envision the sort of very complex multi-party water exchange described herein with the El Dorado County interests. Nor is the California Department of Water Resources, which manages the SWP, a participant in the SRWRS Project, which currently involves CVP water and water obtained from State water rights, but no SWP contract water.

New Storage

For EDCWA to develop new storage, a new permanent reservoir site of sufficient capacity and proximity to both EID and GDPUD would be required. Moreover, once the reservoir(s) was approved, designed, and constructed, there would still be the need for EDCWA to perfect a water right to store, divert, and use any captured water within the new facility. The concept of new reservoir storage in the upper American River basin has been around for many years. Canyon

Creek Reservoir, for example, was identified as far back as the 1950's as a potential new storage facility for GDPUD. Recent studies have identified certain potential new on-stream reservoir sites such as Lower Ice House Reservoir[29] on the South Fork Silver Creek as well as a number of smaller reservoirs (e.g. Alder Creek Reservoir).

Within El Dorado County as well, pumped-storage reservoirs are gaining favor and interest (e.g., Iowa Hill Reservoir). Pumped-storage reservoirs are, however, typically smaller reservoirs and alone, would not meet the broader objectives for supplemental water supply development in the western slopes of the county. Moreover, current pumped-storage reservoirs are designed and operated for power production only and are not used for water supply enhancement.

The available hydrology of the American River basin in which the average annual unimpaired inflow is well over twice the maximum storage of Folsom Reservoir demonstrates that new storage alternatives are, however, feasible in terms of mass balance hydrology.

Groundwater and Groundwater Banking

Groundwater development within El Dorado County is highly tenuous and site-specific at best. Unlike the lower slopes of the Foothills and the Central Valley where deep alluvial unconsolidated materials provide excellent water bearing formations, the more igneous/metamorphic origin of the Foothills does not lend itself to high yield aquifers. Groundwater well fields for M&I use are not practical in the Sierra Foothills.

Groundwater banking, however, to an off-site location outside of the Foothills is an option that has generated, and continues to generate interest. In fact, Reclamation is now considering allowing CVP contractors to bank their unused contract water in areas outside of the authorized place of use for CVP water (i.e., outside of the CVP Consolidated Place of Use), and is working on a process to facilitate these actions. Currently, CVP contractors may bank federal water within each of their service areas without Reclamation approval. Were Reclamation to develop this process, it is true that certain contractors would seldom bank outside of the CVP Consolidated Place of Use (e.g., within the Sierra Nevada Foothills), but it is very conceivable that other contractors on the fringes of the Sierra Foothills may look to new Central Valley banking opportunities. Public workshops have been held by Reclamation introducing this new concept. While the details of any such federal program still need to be refined (e.g., accounting provisions, M&I versus Ag, financing, environmental compliance, etc.), the prospect of CVP-authorized groundwater banking represents an encouraging development and recognition by Reclamation that wider regional water management efforts need to be considered.

Under a groundwater banking program or project, EID or GDPUD could bank surplus water made available during the spring runoff period in a groundwater aquifer lower in the Sacramento Valley. An agreement with a downstream purveyor overlying a viable aquifer and possessing the appropriate infrastructure (e.g., percolation ponds or direct injection wells) would need to be negotiated and executed between the parties. Details would likely involve infrastructure cost

29 See Joint Benefit Investigation Plan, Technical Analysis of Preliminary Alternatives, Prepared for Joint Benefit Investigation Team, El Dorado County Water Agency, El Dorado Irrigation District, Sacramento Municipal Utility District, and Georgetown Divide Public Utility District, Mead & Hunt, July 2004.

sharing, timing of inputs/withdrawals, financial crediting, and water accounting. In dry years, the bank could be accessed or withdrawn by the downstream purveyor and EID or GDPUD could rely on the offsetting water entitlement held by the groundwater banking entity in Folsom Reservoir. This alternative would be more directed towards providing dry-year protection (drought contingency). Properly designed, it could provide multi-year drought protection.

Reclaimed Wastewater

EID is currently developing reclaimed wastewater in increasing quantities. In fact, surface storage sites for reclaimed wastewater are currently being planned and reviewed at several locations in western El Dorado County. EID has recognized the benefits of this drought resistant water source and has implemented its recycled water education program to help promote greater community awareness and assistance in implementation. While reclaimed wastewater can provide a genuine water demand offset for non-potable uses, reclaimed sources are not yet approved for potable uses. Accordingly, such use limitations significantly hamper reclaimed wastewater from ever being relied upon as a primary water supply source. To the extent, however, that reclaimed water can provide continually increasing supplies for landscape irrigation which can represent a significant demand on urban/rural outdoor use, reclaimed wastewater will continue to be an important component of long-term water resource management planning.

3.6.3. Demand Reduction Alternatives

Potential alternatives that would address and consider demand reduction include the following:

Increased Water Conservation

Currently, both EID and GDPUD implement a variety of water conservation practices. These are consistent with the best management practices (BMPs) identified in the California Urban Water Conservation Council's (CUWCC) *Memorandum of Understanding* and include, but are not limited to tiered pricing, water meters, leak audits, and public education. EID's Water Efficiency Division offers numerous programs directed towards conserving water uses for agricultural, commercial, residential, and landscaping purposes.

Water conservation can also be applied to raw water delivery. Both EID and GDPUD still rely on open ditches/canals as part of their delivery infrastructure to water treatment facilities. Water losses from these conveyances, through seepage, direct evaporation, evapotranspiration, and intended/unintended side and end spills still occur in varying degrees. GDPUD, for example, still experiences canal losses approximating 30 percent annually. EID, however, meets its loss targets of less than 15 percent for a rural water agency. While it is unlikely that EID or GDPUD could implement increased water conservation measures that would generate significant increased savings on the user end, raw water conveyance losses could be notably improved through full canal/ditch encasement. Such improvements, however, could increase agricultural water delivery efficiencies, especially in the GDPUD service area.

Growth Control

Growth control would involve slowing the rate of growth in those parts of the EID and GDPUD service areas where this proposed new water contract would be served. As a future water demand reduction measure, slowed growth or even placing a moratorium on new growth has the potential to conserve existing water supplies. Neither EID nor GDPUD, however, as special district water providers, possess land use authority that would enable them to directly control growth within the County. Growth pressures in El Dorado County are generated irrespective of the water purveyors. In fact, State law gives EID and GDPUD the legal obligation to obtain the supplies necessary to serve planned growth.[30] Institutionally, the entity responsible for planning for growth within El Dorado County is the county itself, with its key document being the 2004 General Plan. That document, as noted earlier, establishes the need not only for the full 15,000 AFA contemplated by P.L.101-514, but also for additional supplies, such as might be obtained through the El Dorado Water & Power Authority's ongoing Supplemental Water Rights Project.

While the lack of new or expanded water supplies can have the practical consequences of slowing the rate of population growth, State law does not permit EDCWA or its member agencies to simply refuse to seek the full supplies necessary to serve growth. Rather, recently enacted statutes such as Senate Bill 610 (Wat. Code § 10910 et seq.) and Senate Bill 221 (Gov. Code § 66473.7) relate to the timing and procedures for obtaining water needed for planned growth, and do not permit water suppliers to either simply give up on finding needed water or to refuse to obtain water in order to thwart full implementation of growth decisions made by elected county and/or city officials.

3.6.4. Variations in P.L.101-514 Contract Implementation

Depending on the needs of EID and GDPUD which, to a large extent, would be dictated by the anticipated and actual growth within their service areas, water demands could accrue disproportionately between these water purveyors. EDCWA, as the holder of the master contract, would be responsible for ensuring that the county, within its western slopes, would derive benefit from this new water allocation. Any arrangements for water deliveries stemming from this Proposed Action will be carefully reviewed by EDCWA and Reclamation and be based on genuine water needs.

As previously described, the Proposed Action, therefore, in deference to the fact that EID and GDPUD have differing needs and capabilities in terms of physically taking the new CVP contract water, is made up of various alternative diversion scenarios (Alternative 2 – Proposed Action):

Alternative 2 - Proposed Action – Scenario A (EID – 7,500 AFA and GDPUD – 7,500 AFA)

Alternative 2 - Proposed Action – Scenario B (EID – 15,000 AFA and GDPUD – 0 AFA)

Alternative 2 - Proposed Action – Scenario C (EID – 4,000 AFA and GDPUD – 11,000 AFA)

30 See *Swanson v. Marin Municipal Water District* (1976) 56 Cal. App. 3d 512, 524 (water district has a "continuing obligation to exert every reasonable effort to augment its available water supply in order to meet increasing demands"); *Glenbrook Development Co. v. City of Brea* (1967) 253 Cal. App. 2d 267, 277 ("county water district has a mandatory duty of furnishing water to inhabitants within the district's boundaries"); *Lukrawka v. Spring Valley Water Co.* (1915) 169 Cal. 318, 332 (water company accepting franchise to furnish water assumes duty to provide service system that keeps pace with municipality's growth); *Building Industry Association of Northern California v. Marin Municipal Water Dist*. (1991) 235 Cal. App. 3d 1641, 1648-1649 (discussing municipal water district's duty to augment its water supply and discretion in determining how the existing water system can and should be augmented).

These diversion scenarios and their analysis provide a broader means of assessing the potential environmental effects of the Proposed Action. Accordingly, it covers a wider range of implementation possibilities than the use of just a single diversion scenario.

Reduced Diversions

From an alternatives perspective, reduced diversions warrant careful consideration since they represent options that would impart less impact on the aquatic environment, relative to the full diversion allocations provided for under P.L.101-514. A fundamental tenet of both NEPA and CEQA is that alternatives to the Proposed Action should reduce or minimize environmental effects, relative to the Proposed Action. A reduced diversion alternative would clearly meet those requirements.

Under these alternatives, water allocations would be made to some total lesser amount than that authorized. For the purposes of analysis in the Draft EIR, three separate possible reduced diversion alternatives were considered. These included gradations where, decreasing quantities of 2,500 AFA were made from the full 15,000 AFA down to the 50 percent allocation (from full entitlement). The three reduced diversion alternatives would, therefore, propose to divert: 12,500 AFA; 10,000 AFA; or 7,500 AFA, respectively.

It is assumed that such a reduction would be shared equally between EID and GDPUD. As noted previously, an alternative that could, intuitively, result in fewer or diminished environmental impacts on the CVP/SWP, its waterbodies, and related aquatic resources, relative to the Proposed Action, would be consistent with the requirements of both NEPA (40 CFR 1502.14) and CEQA. All of the other components necessary to deliver water as described under the Proposed Action would apply to these reduced diversion alternatives.

3.7. ALTERNATIVES SCREENING PROCESS

Each of the potential alternatives identified and described earlier was evaluated against the screening criteria listed in Table 3.4-1, covering a range of standards (e.g., industry norms). Alternatives that met the various screening criteria also had to be able to attain *most* of the Proposed Action's basic objectives and avoid or substantially lessen one or more of the Proposed Action's significant environmental impacts.

As noted in Chapter 2.0 (Purpose and Need), the following primary project objective is identified:

- Execution of a new CVP M&I water service contract between Reclamation and EDCWA in accordance with the Congressional mandate of P.L.101-514;

Additional project objectives for EDCWA also include the following:

- Consistent with P.L 101-514, diverting federal water for use in El Dorado County, following completion of the administrative procedures that Reclamation and the State Water Resources Control Board (SWRCB) must complete in order to implement that Congressional mandate;

- Consistent with P.L. 101-514, entering into a new CVP M&I water service contract to supply what Congress considers to be the first phase of a long-term effort by El Dorado County to acquire supplemental federal water supplies to meet its future needs;
- Consistent with the enabling legislation and the legal “duty to serve” customers to which EID and GDPUD are subject, obtaining water supplies needed to support planned growth as embodied in the 2004 El Dorado County General Plan;
- Consistent with the existing policies and ongoing efforts of EID, GDPUD, and El Dorado County to conserve water during single- or multiple-dry year scenarios, to provide additional reliable water supplies to reduce the severity of dry-year cutbacks imposed on County residents, businesses, and other customers; and
- Delivering the new CVP M&I water supply through existing, planned and agreed infrastructure.

By reviewing the project objectives against the alternatives, an initial assessment of the validity and reasonableness of the alternatives can be made. If an alternative does not satisfy the purpose and need for the Proposed Action, as a rule, it should not be included in the analysis as an apparent reasonable alternative. There are times in fact when an alternative that is not reasonable is nevertheless included based on the request of another agency or due to public expectation. As discussed previously, alternatives should offer some offset to the expected environmental impacts associated with the Proposed Action; providing the decision makers with a reasonable range of alternatives with which to compare impacts and associated benefits.

The degree of analysis devoted to each alternative in an EIS is to be substantially similar to that devoted to the Proposed Action. NEPA (40 CFR 1502.14) is titled "Alternatives including the Proposed Action" to reflect such comparable treatment. NEPA (40 CFR 1502.14(b)) specifically requires "substantial treatment" in the EIS of each alternative including the Proposed Action. This regulation does not dictate an amount of information to be provided, but rather, prescribes a level of treatment, which may in turn require varying amounts of information, to enable a reviewer to evaluate and compare alternatives. Notably, CEQA does not require this same level of evaluation between the proposed project and alternatives. In joint NEPA/CEQA documents such as this EIS/EIR, however, alternatives should satisfy the more stringent requirement under NEPA (i.e., providing an equal level of assessment between the alternatives and the Proposed Action).

The project objectives are, for the most part, clearly directed towards the execution, implementation, and long-term reliance on the proposed new CVP M&I water supplies provided under the authority of P.L. 101-514. Assessing the alternatives strictly in light of this objective would be somewhat deceiving, however, since none of the alternatives are specifically called out in P.L. 101-514. More practically, the purpose and need of the Proposed Action, in part, is to secure a new water supply; the Congressional mandate of P.L. 101-514 simply provides EDCWA with the authority to do so in a specific manner, and with a specific means. Accordingly, the range of feasible alternatives should be viewed in this context.

Table 3.7-6 identifies the Alternative Water Supply options and the screening results for those potential alternatives using the criteria previously identified in Table 3.4-1. All of the alternatives, in varying degrees, provide for a new water supply or, an offset to current demands such that a reduction in overall potable water would be accomplished. They warranted closer inspection through this screening process.

TABLE 3.7-6

ALTERNATIVE WATER SUPPLIES SCREENING

Alternative	T&E Feasibility	WQ	Environ. Fatal Flaw	Economics	Long-Term Reliability	Public H&S	Timing	Institut.
New Water Right	✓	✓	✓		✓	✓		
Transfers	✓	✓	✓	✓		✓	✓	✓
SWP Contract	✓	✓	✓			✓		
Storage		✓	✓		✓	✓		
GW Banking	✓		✓	✓			✓	
Reclaimed	✓		✓	✓			✓	

Note:
✓ Checkmarks denote that the alternative passed the screening for that criterion.

From Table 3.7-6, the most proficient alternative appears to be a new water transfer. This alternative passed all of the screening criteria except for Long-Term Reliability. Without knowing the specifics of any such potential transfer, it is not assured that it would possess viability in the long-term, relative to the proposed 40-year CVP M&I contract under P.L. 101-514. Yet, for all intents and purposes, it proved worthy and, hence, reasonable. Moreover, water transfers in an area such as the greater Sacramento area hold increased promise simply due to the number of water purveyors available that may be capable of participating. In fact, when looking at the various purveyor-specific agreements codified in the Water Forum Agreement, the number of inter-agency agreements that rely on some form of transfer is compelling. Transfers and assignments, within the greater Sacramento area are clearly an important component in the make-up of water purveyor portfolios.

A new water right as an alternative is complicated by both its costs and related timing. Given the pending water right filing by the El Dorado Water & Power Authority as part of its Supplemental Water Rights Project, a duplicative filing, as an alternative to the P.L 101-514 contract did not seem realistic. The economics of such an endeavor as well the timing constraints, also present problems. EDCWA would have to initiate a new regulatory process from the outset; thereby, negating any progress and timing advantage afforded by the P.L. 101-514 contract which has the benefit of many years of progress. Institutionally, the SWRCB would be confronted with potentially two water right applications and a compelling case would need to be prepared to justify this duplicative effort.

Acquiring a new SWP M&I contract, for essentially the same reasons as a new water right filing did not pass the Economics, Timing, or Institutional criteria. EDCWA would be engaging the California Department of Water Resources for a new M&I contract and again, would be starting from the beginning of that process. The complexities of any potential multi-party arrangement that would be necessary in order to allow EDCWA to hold rights to Feather/Sacramento River water in exchange for a diversion of American River water are also daunting and potentially complex.

A new storage alternative did not pass the majority of the screening criteria. While it is acknowledged that several small reservoirs are being considered within the western slopes of El Dorado County and indeed, pumped storage projects are underway, a large on-stream reservoir such as Lower Ice House or Canyon Creek failed several criteria. While these potential new reservoirs, under differing conditions of comparison may prove genuine, beneficial and indeed supportable, they did not pass the majority of the screening criteria in light of the Proposed Action. This latter point is an important one; new storage, as an alternative to the long-standing water contract authorized under P.L.101-514 is not the same as EDCWA looking at new water supply opportunities, because new water supplies are needed in addition to P.L. 101-514. A primary advantage associated with such large reservoirs would be their long-term reliability, excellent water quality, and retained control by EDCWA or its member agencies.

Significant drawbacks include the same reasons facing all new on-stream reservoirs in California; significant environmental issues, the high cost of approval, design, and construction, the lengthy approval process and, in the case of these reservoirs, the availability or acquisition of site locations that, at this time, cannot be reasonably assured. Pumped storage projects in El Dorado County are traditionally smaller than most reservoirs; numerous projects would have to be identified, approved, designed, and constructed before an equitable water supply to that provided by the P.L. 101-514 contract. Also, as noted previously, current pumped storage project design and operations would have to be revised to coincidentally include water supply development in addition to hydropower generation.

The screening of groundwater and groundwater banking as potential alternatives revealed completely opposite results from new storage reservoirs. Groundwater itself is not a viable option within El Dorado County as no appreciable aquifers or groundwater supplies exist. Groundwater banking, however, shows promise and is gaining interest throughout the region. The ability to store water in wet-years or during the annual wet season for long-term drought contingency planning is an increasingly attractive water resource management strategy. In El Dorado County where, as discussed, new surface storage reservoirs are challenging and no subsurface aquifer exists that can serve as an *underground* storage reservoir, off-site groundwater banking is gaining significant interest.

With groundwater, however, there is the patent uncertainty regarding the hydraulics of the phreatic zone and, its potential for contaminant migration. This hydraulic condition can lead to uncertainty, perhaps unacceptable, in terms of guaranteeing adequate water quality. To a certain degree, this concern can be attenuated through wellhead treatment. Additionally, with unconfined aquifers and, especially those in unadjudicated basins, water balance calculations are premised on gross assumptions of the continuity equation (what goes in, balances what comes out). A tight accounting system, therefore, would need to be developed and implemented to ensure proper tracking of accretions and depletions in any groundwater bank. While groundwater banking provides an excellent alternative to surface water storage, all of the conditions required of its proper site selection, financial agreement (with a groundwater banking purveyor), accounting system, and *in situ* hydraulics, make this alternative, at the very least, a speculative proposition at this time. Long-term reliability cannot be assured.

Reclaimed wastewater showed the same results as groundwater and groundwater banking. Its fundamental drawback is in its inability to provide a potable water supply. While increasing reliance on reclaimed wastewater can, under the proper circumstances, offset or reduce an agency's dependency on potable water, there is a maximum cap on the amount of reclaimed water that can serve new development. This is because there is only so much landscape irrigation where reclaimed wastewater could provide a benefit. Moreover, from an economic perspective, retrofitting existing development infrastructure is very costly. Reclaimed wastewater, therefore, as a means of reducing potable water demands is typically limited to new development areas only. Failure of the Water Quality, Public Health & Safety and Institutional criteria were evident with this alternative.

Table 3.7-7 identifies the screening results for the Demand Reduction Alternatives. Two alternatives in this category were evaluated; Increased Water Conservation and Growth Control. While increased water conservation easily passed all of the screening criteria, it could not meet an important check; the ability to meet the primary objectives of the Proposed Action, namely, the provision of a new water supply. Moreover, this alternative could be considered one that, for the most part, is already actively implemented. Many of the water conservation measures identified by the CUWCC *Memorandum of Understanding* are already being implemented by EID. Most importantly, however, there is general acceptance and acknowledgment that there is a limit to which additional water savings can be achieved at the consumer end. Water conservation alone, cannot be relied upon as a firm water supply for anticipated future planned growth. However, to the extent that open canals and ditches are still being relied upon by both EID and GDPUD, increased water conservation could be achieved through various conveyance improvements (e.g., canal lining and pipelines) and this would certainly help reduce current agricultural deliveries.

TABLE 3.7-7

DEMAND REDUCTION ALTERNATIVES SCREENING

Alternative	T&E Feasibility	WQ	Environ. Fatal Flaw	Economics	Long-Term Reliability	Public H&S	Timing	Institut.
Increased Conservation	✓	✓	✓	✓		✓	✓	✓
Growth Control		✓	✓			✓	✓	

Note:
✓ Checkmarks denote that the alternative passed the screening for that criterion.

Growth Control, as an alternative, similar to the Increased Water Conservation alternative would not provide an *additional* water supply for EDCWA. In fact, it would not even provide an offset or an in lieu supply. Growth Control, by definition, would simply impose restrictions on all future development (residential/commercial and institutional) for which, an additional water supply would be required. Such an alternative would halt further residential development in growing communities such as El Dorado Hills, Cameron Park, Shingle Springs, and Placerville and would remove any potential future development prospects in Pilot Hill and other areas on the Divide. Not only would the western slopes be affected, but so would areas further uphill, as EID would be faced with water needs for which no additional supplies would be available.

Administratively, a controlled growth alternative, however, could only be implemented by El Dorado County; neither EDCWA nor any of its member agencies have the authority to impose such restrictions on what is clearly a land-use and population designation issue. In the longer term, it is possible that it may be necessary to amend or update the County's General Plan to impose such an alternative (consistent with provisions of State law requiring counties to identify lands for their "fair share" of new housing demands), but again, this would be outside the purview of EDCWA or its member water agencies. Growth Control failed the Economic, Long-Term Reliability and Institutional criteria.

Table 3.7-8 identifies the three Reduced Diversion Alternatives under the Variable P.L.101-514 Contract Allocation discussion provided earlier. As discussed, these alternatives conceded implementation of the P.L. 101-514 contract, but at reduced diversion quantities. Relative to the Proposed Action, the results of the screening process were identical between the three Reduced Diversion Alternatives.

TABLE 3.7-8

VARIABLE P.L. 101-514 CONTRACT ALLOCATIONS SCREENING

Alternative	T&E Feasibility	WQ	Environ. Fatal Flaw	Economics	Long-Term Reliability	Public H&S	Timing	Institut.
Reduced Diversion – 12,500 AFA	✓	✓	✓	✓		✓	✓	✓
Reduced Diversion – 10,000 AFA	✓	✓	✓	✓		✓	✓	✓
Reduced Diversion – 7,500 AFA	✓	✓	✓	✓		✓	✓	✓

Note:
✓ Checkmarks denote that the alternative passed the screening for that criterion.

The only screening criteria that was not passed, was Long-Term Reliability. As the water needs assessment has shown (see Chapter 2.0, Purpose and Need), the full-authorized contract amount of 15,000 AFA is needed between EID and GDPUD. Any reduction from that fully entitled by P.L.101-514 would not meet this established water need.

3.8. ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

From the discussions provided above, certain potential alternatives showed distinct promise as reasonable potentially feasible options to the Proposed Action while others, clearly did not. The project objectives played an important factor in determining overall feasibility and pragmatic authenticity. The Institutional criterion was important in that it acknowledged the regulatory, administrative, and institutional framework in which these alternatives would have to operate in order to be approved. Fundamental to this acknowledgment was the fact that each of these processes would have to commence from the beginning, gaining internal political and interagency support to move forward. The Technical and Engineering Feasibility was easily passed by most alternatives, using a strict application of the criterion that, stated, "…*an alternative must be based on existing and* *accepted state-of-the-art engineering concepts and cannot be based on experimental technologies*". An aspect of this same criterion that did not allow the New Storage Reservoir alternative from passing was that, "…*an alternative must not be dependent upon either the availability or acquisition of site locations that cannot be reasonably assured*."

Economics played into the screening assessment given that a new water right or new storage reservoir would likely require new facility infrastructure. None of these new facilities (and the lands upon which they would be placed) are presently assured and, as such, was assumed to have to be funded by EDCWA and its member water agencies. The costs for such new infrastructure such as a new storage reservoir would be significant. As noted in the Economic criterion, *"[A]n alternative should be economically attractive such that the total direct costs to the customers and purveyors are minimized and do not significantly exceed the costs of alternatives with similar benefits*…".

Growth Control also failed this criterion since it was assumed that a growth moratorium or even some reduced growth policy would not be economically fulfilling. In a County that is prospering[31], such an alternative would be counter to the criterion that states in relevant part, "*An alternative cannot be economically impractical or infeasible*." As noted earlier, EDCWA, EID and GDPUD are legally bound to accept the County's general plan vision and to do their best to try to find the water needed to fulfill that vision.

For two of the criteria, Public Health & Safety and Water Quality; their application was similar across the alternatives. Both groundwater and reclaimed wastewater failed these criteria.

From a potential environmental impact perspective, all alternatives passed the Environmental Fatal Flaw criterion. This was largely premised on the fact that none of these alternatives is so objectionable as to be either prohibited by law or impossible to achieve solely due to environmental concerns. The most controversial of the alternatives from an environmental perspective was a New Storage Reservoir. The fatal flaw criterion states, "*An alternative cannot have environmental impacts that are so significant so as to negate the positive attributes of the alternative or, simply transfer potential environmental impacts from one location to another*."

Clearly, however, new storage reservoirs, if operated properly, could provide multiple benefits for water supply, increasing water management flexibility, reducing diversions from rivers during critical migration periods, improve flood control, and increase Delta flows during critical times. In fact, new on-stream and off-stream reservoirs are under consideration across the State. Recently, the Governor of California committed monies as part of the State's long-term water strategy, through the Department of Water Resources, to proceed with the investigation of Sites Reservoir in Colusa County and the Temperance Flat Reservoir near Friant Dam. The Temperance Flat Reservoir would be created with a new dam on the San Joaquin River; the Sites Reservoir would require a new dam diverting water from the Sacramento River. These two large new reservoir projects indicate a growing perception and commitment by the State that new storage reservoirs are viable alternatives in future water resources management. While unrelated, specifically, to the Proposed Action, they

31 Based on a 20 percent increase in population from 1997-2007; a 12.1 percent increase in housing from 2002-2007; a 15.6 percent increase in employment from 2001-2006; and, based on the Bureau of Economic Analysis, California Realtors Association, a 2007 median home price of $487,000.

confirm that new surface storage reservoirs in California are being evaluated under certain conditions and, at least with respect to the Department of Water Resources' long-term strategy for water supply enhancement appear to have surpassed recent environmental fatal flaw constraints.

Finally, both the No-Action Alternatives and the No-Project Alternative (i.e., No-Increased Water Delivery Alternative) were carried forward as required by NEPA and CEQA.

The following alternatives, therefore, were carried forward for detailed analysis in this EIS/EIR (their numbering sequences are retained throughout the remainder of this EIS/EIR):

Alternative 1A – No-Action Alternative

Alternative 1B – No-Project Alternative

Alternative 2A – Proposed Action – Scenario A

Alternative 2B – Proposed Action – Scenario B

Alternative 2C – Proposed Action – Scenario C

Alternative 3 – Water Transfer Alternative

Alternative 4A – Reduced Diversion Alternative (12,500 AFA)

Alternative 4B – Reduced Diversion Alternative (10,000 AFA)

Alternative 4C – Reduced Diversion Alternative (7,500 AFA)

Each alternative, as noted previously, was addressed in a similar and equal level of detail. The potential impacts associated with each of these alternatives are described individually, by resource, in the Environmental Consequences chapter. A full comparative summarization is provided in the Executive Summary, impact table (see Table ES-1).

3.9. Scope of the Environmental Document

This EIS/EIR addresses the potential environmental and socioeconomic impacts of the various alternatives in two ways. First, as a new CVP water contracting action the document addresses the potential impacts of executing this *master* contract at a project-level. The specific potential effects of this new 15,000 AFA contract (or lesser amounts) diverted from the CVP, including its effects on coordinated CVP/SWP operations, Bay-Delta hydrology, and all other CVP-related water resources is evaluated in detail. This assessment is necessary to support the execution of the new full contract.

To the extent that additional facilities would, however, be required to ultimately *implement* this action, EID and GDPUD would be responsible for the eventual construction, operation, and maintenance of any such new facilities. The potential environmental impacts of any such facilities would be examined under separate, project-specific environmental documentation in the future, if or when those needs arise. To this end, this EIS/EIR provides the project-level hydrological analysis of the new CVP water service contract and, includes the necessary hydrologic assessment for the SWRCB to rely upon in a Petition for Change in POU, if or when such a petition is made by

PCWA/GDPUD to implement a water exchange, as discussed previously. Additional environmental documentation will, however, be necessary in the future in order to address any infrastructure associated with a new diversion, conveyance/pumping, and treatment facilities involved in fully implementing a water exchange between PCWA and GDPUD.

Even though a project-specific review of any new potential facilities impacts would be completed in the future, a programmatic review of the facilities needed to ultimately deliver the P.L.101-514 contract water was considered as part of this EIS/EIR, only to the extent that such information is currently known. For the most part, little detailed information was available. As explained previously, this EIS/EIR primarily focuses on a detailed (or project-specific) review of the potential hydrological impacts associated with executing the *master* contract, involving a new diversion from the American River basin and a depletion of water supply from the CVP. The evaluation of indirect, or secondary effects of implementing this action, while important, have been exhaustively undertaken by El Dorado County as part of its General Plan Update process and associated EIR.

3.10. Intended Uses of the Draft EIS/EIR

A primary use of this Draft EIS/EIR is to fulfill the requirements for adequate NEPA and CEQA documentation as a precondition to executing the new CVP water service contracts authorized by P.L.101-514. Section 206 (b)(2) provides in relevant part;

> "Prior to entering into the contracts….the Secretary is directed to comply with the provision of the National Environmental Policy Act by preparing joint Environmental Impact Statements and California Environmental Quality Act Environmental Impact Reports."

In doing so, this EIS/EIR also supports the associated actions under CEQA by various Responsible Agencies (i.e., EID, GDPUD, PCWA and the SWRCB) to proceed with and make independent findings. As noted previously, Reclamation is the federal Lead Agency under NEPA and EDCWA is the State Lead Agency under CEQA. Both agencies have discretionary authority in acting upon this Proposed Action and have prepared this joint Draft EIS/EIR to support their ultimate decisions. Both agencies recognize the importance of cooperating to the fullest extent possible to avoid duplication and foster efficiency through joint planning processes, environmental studies, public hearings/ scoping, and this EIS/EIR document itself. After completion of the Final EIS, Reclamation will prepare a Record of Decision on the execution of the new water service contract. Similarly, after certifying the EIR portion of the Final EIS/EIR and making the findings and statements of overriding considerations required by CEQA along with the appropriate notices and filing fees, EDCWA will also be in a position to execute the new water contract.

Both of the potential recipients for this contract water, EID and GDPUD, are Responsible Agencies under CEQA. Before their individual direct subcontracts with EDCWA are executed, both member districts will also rely on the Final EIS/EIR as their CEQA compliance document. To the extent that a future exchange between GDPUD and PCWA would be supported by reliance on the hydrologic analyses contained in this environmental document, both PCWA and the SWRCB are identified as Responsible Agencies under CEQA. A petition before the SWRCB for a Change in POU regarding PCWA's MFP water rights will invoke a new and separate CEQA action but, to the extent appropriate, that process (and document) will be able to rely on this joint EIS/EIR for the hydrologic analyses necessary to support the request for the Change in POU. Additional analyses, however, will be required in a future separate CEQA document to address the potential impacts of any new facilities or infrastructure that become known and/or part of the proposed operations to fully realize the exchange between PCWA and GDPUD.

All four Responsible Agencies have participated in scoping and consultation meetings on this project. Each Responsible Agency will consider the potential environmental effects of the portion of the overall project affected by its actions. These agencies will, moreover, limit their responsibility for mitigation or avoidance to only those direct or indirect environmental effects of those parts of the project that they intend to implement. All Responsible Agencies will ultimately make Findings and file a Notice of Determination similar to what is required of EDCWA as the CEQA Lead Agency.

3.11. CONSULTATION REQUIREMENTS/REQUIRED PERMITS AND APPROVALS

Consultation requirements for this Proposed Action cover a range of regulatory requirements. These are described and documented in greater detail in Chapter 10.0 (Consultation/Coordination and Applicable Laws). Key consultations have included those associated with the following legislation and identified public trust resource agencies (both federal and State):

- CEQA Scoping (Resource Agency/Stakeholders)
- Federal Endangered Species Act (USFWS/NOAA Fisheries)
- Fish & Wildlife Coordination Act (USFWS)
- National Historic Preservation Act (Reclamation/SHPO)
- California Endangered Species Act (CDFG)
- Clean Water Act (U.S. EPA Region 9/USACE)

A number of regulatory permits and/or approvals have been identified as potentially being required for the Proposed Action or related projects either currently or, at some point in the future. Permits and/or approvals potentially applicable to the implementation of the Proposed Action may include:

- Petition for Change in POU (SWRCB)
- Section 401 Permit (Clean Water Act)
- Section 404 Permit (Clean Water Act)
- Reclamation Board Permit
- Streambed Alteration Agreement

As noted previously, with the exception of the Petition for Change in POU, all of the other permits and/or approvals are tied to future facility projects or new infrastructure and are not necessary to execute this new CVP water service contract.

This EIS/EIR provides a project-level evaluation of the hydrological changes and, therefore, potential environmental and socio-economic impacts on water-related resource values associated with the

Proposed Action. For any of these permits and/or approvals necessitating or otherwise requiring hydrologic evaluation, this EIS/EIR provides that information. Several of these permits and/or approvals, however, remain speculative at this time, primarily because no new facilities or infrastructure are being proposed. They will only become applicable if and/or when project-level approvals for specific new projects are proposed in the future.

For this Proposed Action, significant efforts have gone into consultations under section 7(a)(2) of the federal Endangered Species Act. Two technical areas of consultations have occurred. Aquatic resources - specifically, those related to the potential adverse effects on listed aquatic fish species and their critical habitats - are being addressed in consultations with both the U.S. Fish & Wildlife Service and the NOAA Fisheries under the U.S. Department of Commerce. Detailed discussion of the consultation processes is provided in Chapter 10.0 (Consultation/Coordination and Applicable Laws).

This new CVP water service contract will be identified as a new American River Division contract. The lower American River, including Folsom Reservoir, has been the focal point of significant collaborative conservation, restoration, and ecosystem protection work over the past decade or more. The landmark Sacramento Water Forum Agreement, together with its Lower American River Habitat Management Plan, associated River Corridor Management Plan and, the most recent LAR Flow Management Standard make this watercourse one of the most highly studied reaches in the CVP. As a new contracting action, Reclamation and EDCWA, as well as EID and GDPUD have recognized the importance of stakeholder liaison and consultation with these local and regional interests. Reclamation and EDCWA have worked closely with the lower American River groups (e.g., Water Forum Successor Effort) in developing this joint environmental document.

The ongoing Water Forum work associated with the LAR Flow Management Standard and continued activities through the Water Forum Successor Effort have included both Reclamation and EDCWA as active participants. The Water Forum per se, however, is not a legislated public entity and, as such, does not hold Responsible Agency status under CEQA. While various stakeholder agencies (e.g., Department of Fish & Game, U.S. Fish & Wildlife Service, and NOAA Fisheries) within the Water Forum hold permitting and/or approval authority over certain aspects of the Proposed Action, the Water Forum itself does not. This Proposed Action has been recognized as a part of the future environmental baseline in all recent LAR initiatives and project planning.

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4.0 AFFECTED ENVIRONMENT

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4.0 AFFECTED ENVIRONMENT

4.1. OVERVIEW OF AFFECTED ENVIRONMENT

The Affected Environment discussions provide a description of resource features of the regional and local study area that may be affected by implementation of the alternatives (i.e., proposed action and alternatives). The resource settings can be viewed as two distinct categories: those covering diversion-related resources, and those addressing service area-related resources.

The direct-effect study areas include resources in locations that could be affected by potential changes in hydrology (e.g., instream flows, reservoir storage, water surface elevations, etc.) due to the new water deliveries proposed by this action. The resources potentially affected directly are, therefore, referred to as diversion-related resources. For other projects where facility construction is proposed, the direct-effect study area typically also includes those facility footprints and associated areas where facility appurtenances are required. For this Proposed Action, however, no such new facilities or appurtenances are included.

The indirect effect study area is assumed to be those locations in the EID and GDPUD service areas where the water would be used (and, therefore, includes the service area-related or non-diversion related resources).

The conditions described for the various affected environments provide the basis for impact evaluation under both the No-Action Alternative for NEPA and the No-Project Alternative under CEQA. The information is based on the best available information and is intended to describe historical, existing, and where appropriate, likely No-Action Alternative conditions. Information was obtained through literature review, agency correspondence and consultations. The specific affected environments for each resource area are described in the separate subchapters pertaining to those individual resources.

For this EIS/EIR, resource evaluations were broken into two categories; diversion-related resources and their associated impacts, and indirect or non-diversion related service area resources and their associated impacts. The Affected Environment discussions describe those natural, social, cultural, and physical features upon which the alternatives for this action were evaluated and presented in the Executive Summary.

Diversion-related impacts could affect the following resources:

- Water Supply
- Hydropower Generation
- Flood Control
- Water Quality

- Fisheries
- Riparian Resources
- Water-related Recreation
- Water-related Cultural Resources

The Affected Environment/Setting for each of these resources is presented Subchapters 4.2 through 4.9 in this chapter.

Indirect or non-diversion related impacts could affect the following service area resources:

- Land Use/Urban Development
- Transportation and Circulation
- Air Quality
- Noise
- Geology, Soils, Mineral Resources, and Paleontological Resources
- Recreation
- Visual Resources
- Cultural Resources
- Terrestrial and Wildlife Resources

The Affected Environment/Setting for each of these resources is presented in Subchapters 4.10 through 4.18 in this chapter.

4.2. WATER SUPPLY (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing water supply conditions within the regional and local study areas, and provides the basis upon which the evaluation of potential diversion-related impacts on water supplies were made.

4.2.1. Affected Environment/Setting

A description of regional and local hydrology is presented below to provide a basis for assessing the potential impacts on water supplies that the Proposed Action and/or alternatives could have on these environments. The regional setting is the geographic area defined by the operations of the Central Valley Project (CVP) and coordinated operations with the State Water Project (SWP). The local setting includes those specific local area reservoirs and riverine reaches that could also be affected by implementation of the proposed new water service contract.

The regional setting includes:

- Trinity and Shasta Reservoirs;

- the upper Sacramento River and lower Sacramento River (that portion of the Sacramento River below the American River); and
- Sacramento-San Joaquin River Delta (Delta).

The local setting includes:

- Folsom Reservoir;
- Lower American River; and
- North Fork American immediately above Folsom Reservoir.

The Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Draft and Final EIS/EIR: U.S. Bureau of Reclamation/Sacramento County Water Agency (SCWA) (November, 1998) contains a detailed discussion of the general hydrology of these systems. Comprehensive reviews of the CVP/SWP and its hydrologic infrastructure and operations are also included in the U.S. Bureau of Reclamation, Long-Term Central Valley Project Operations Criteria and Plan (CVP-OCAP) (June 2004), CALFED Bay-Delta Program Programmatic EIR/EIS, (July 2000), and the Sacramento Area Water Forum Draft EIR for the Water Forum Proposal (January 1999). Much of the following hydrologic information describing the affected environment and settings are taken from these documents; they are, hereby, incorporated by reference.

4.2.2. Sacramento River Watershed

Upper Sacramento and Upstream Reservoirs

The Sacramento River is the largest river system in California. It originates near the slopes of Mount Shasta and flows southward to Suisun Bay in the Delta. The river drains 26,146 square miles with an average annual natural runoff of about 18 million acre-feet (MAF). Flows normally peak during the December through February period, corresponding to the annual rainy season and augmented by periodic upper watershed snowmelt events.

Sacramento River flows are largely determined by the operation of upstream or tributary reservoirs (e.g., Shasta, Oroville, and Folsom) as well as the timing and rates of diversions from the Sacramento River and tributary streams. The Trinity River Division of the CVP is a major source of water for the Sacramento River. Lewiston Dam regulates flows in the Trinity River to meet the downstream fishery and temperature requirements of the Trinity River Basin and provides a forebay for the inter-basin diversion of flows through the Clear Creek Tunnel to the Sacramento River. Upstream reservoirs in the Sacramento River basin are operated to fulfill a variety of functions within the coordinated operations of the CVP/SWP, including flood control, water supply, fisheries and wildlife benefits, and power generation, as well as to meet water quality and flow requirements in the Delta. Diversions from the Sacramento River and tributary streams also influence seasonal flow levels by reducing overall flow volumes in the river. Shasta Reservoir is the largest CVP reservoir, capable of storing up to 4.5 MAF.

The natural flow pattern of the Sacramento River has been altered over time due to construction of a variety of river flow control facilities. Flows have been reduced during the wetter months due to upstream storage and diversions, but are maintained during the drier months due to the requirements to sustain flows at levels capable of meeting water quality objectives and water delivery obligations downstream. The flow of the Sacramento River can significantly vary from year-to-year and within a year. Flow in the Sacramento River is generally controlled by operations of the CVP and SWP. At other times, such as during times of significant uncontrolled runoff during storms, flows are not controlled.

Lower Sacramento River

Sacramento River flows at the City of Sacramento are greatly influenced by the large facilities located in the upper regions of the watershed, particularly Shasta Reservoir; Keswick Reservoir; Whiskeytown Reservoir (which regulates imported water from the Trinity River system); and diversions such as the Corning, Tehama-Colusa, and Glenn-Colusa canals. The historical average annual flow for the Sacramento River at Freeport is approximately 16.7 MAF. The Feather and American rivers are the two largest tributaries of the Sacramento River. Two other inflows that contribute to the Sacramento River are the Cross Canal and the Colusa Basin Drain, which drain the agricultural land in the Glenn-Colusa Irrigation District. The lower Sacramento River begins downstream of its confluence with the lower American River.

During the flood season, Sacramento River overflows spill over the series of weirs upstream of Wilkins Slough and flow into the Butte Sink. These flows are then carried by the Sutter Bypass back into the Sacramento River at Verona. Flood flows may also bypass the Sacramento River at Verona by spilling over the Fremont Weir and into the Yolo Bypass. Overflows occur at this point when the Sacramento River flows exceed 55,000 cubic feet per second (cfs). Sacramento River overflows may also enter the Yolo Bypass just north of Sacramento by spilling over the Sacramento Weir.

4.2.3. Sacramento-San Joaquin Delta

The Sacramento-San Joaquin River Delta (or, Bay-Delta or, simply Delta) lies at the confluence of the Sacramento and San Joaquin Rivers. The Delta boundary extends north along the Sacramento River terminating just south of the American River, south along the San Joaquin River terminating just north of the Stanislaus River, east to the City of Stockton, and west to Suisun Bay.

Runoff from Central Valley streams account for approximately 95 percent of the inflows to the Delta. The Delta receives flows directly from the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras rivers. These rivers and their tributaries drain more than 40 percent of California. Annual inflows to the Delta averaged approximately 27.8 MAF during the period from 1980 to 1991.

Hydraulic conditions in the Delta are influenced by a number of factors such as inflows (controlled and uncontrolled) from tributary streams, tidal influences from the Pacific Ocean, operation of Delta export facilities, and water diversions within the Delta. The Delta is at mean sea level, and consequently, tides significantly influence both the level and direction of flows through its many channels and sloughs. Tidal water level variations can vary from one foot on the San Joaquin River near Interstate 5 to more than five feet at the outlet of the Delta, near the City of Pittsburg. The direction of flow at these two points also changes dramatically with the tides. On the San Joaquin River at Venice Island, flows range from 47,000 cfs downstream during low tide to 58,000 cfs upstream during high tide. Near the City of Pittsburg, flows can vary from 340,000 cfs downstream to 330,000 cfs upstream.[32]

The tidal currents carry with them large volumes of seawater back and forth through the Delta with each tide cycle. The mixing zone of saltwater and freshwater can shift two to six miles depending on the tides, and may reach far into the Delta during periods of low inflow. Thus, the inflow of the tributaries into the Delta is essential in maintaining water quality in the Delta.

The average annual Delta outflow to Suisun Bay (for the period 1980-1991) is approximately 21 MAF.[33] Delta inflows rely significantly on runoff from Central Valley streams, and accordingly, also depend on the operations of water facilities on these streams. Releases from Shasta, Folsom, New Melones, and Millerton reservoirs of the CVP and Oroville Reservoir of the SWP control, to a large extent, how much and when freshwater enters the Delta.

4.2.4. Central Valley Project

The CVP is operated and maintained by the U.S. Bureau of Reclamation (Reclamation) and represents the largest surface water storage and delivery system in California, with a geographic scope covering 35 of the State's 58 counties. The CVP is composed of some 20 reservoirs with more than 11 million acre-feet (MAF) of storage capacity, 11 power plants, and over 500 miles of major canals and aqueducts.

Within the Sacramento Basin, the CVP operates Shasta and Folsom reservoirs, among others. As noted previously, water is also imported from the Trinity River into the Sacramento Basin through Clear Creek Tunnel. The Tracy Pumping Plant exports water from the Delta for storage in San Luis Reservoir and delivery to contractors in the San Joaquin Valley. The CVP also operates New Melones Reservoir on the Stanislaus River and Millerton Reservoir on the San Joaquin River, and it exports water from the San Joaquin Basin to the Tulare Basin through the Friant-Kern Canal. Overall, the project supplies water to 253 water service contractors in the Central Valley, Santa Clara Valley (San Felipe Unit), and the San Francisco Bay Area (including Sacramento River Water Settlement Contractors). Key CVP reservoirs and their storage capacities are listed in Table 4.2-1.

TABLE 4.2-1

KEY CVP RESERVOIRS

Reservoir	Reservoir Capacity (TAF)
Trinity	2,447
Shasta	4,552
Folsom	977
San Luis (CVP-share)	966
New Melones	2,420
Millerton	520
Source: U.S. Bureau of Reclamation, CVO Operations, CVP Water Supply Reports, 2007.	

32 California Department of Water Resources, *Sacramento-San Joaquin Delta Atlas*, 1993.
33 California Department of Water Resources, *Sacramento-San Joaquin Delta Atlas*, 1993.

The CVP contract amounts total 6,751 thousand acre-feet (TAF) and are comprised of 3,140 TAF for the Sacramento River, 195 TAF for the American River, and 3,416 TAF for Delta exports.[34] As of 2000, the Sacramento River and Delta export contracts were considered fully subscribed with no new contracts being considered by Reclamation.

4.2.5. State Water Project

The State Water Project (SWP) is operated by the California Department of Water Resources (DWR). It consists of 32 storage facilities, 660 miles of aqueducts and pipelines, 17 pumping plants, and eight hydroelectric powerplants. Using these facilities, the SWP provides urban and agricultural water supply, flood control, recreation, fish and wildlife enhancement, power generation, and salinity-control in the Delta. The project delivers water to over two-thirds of California's population and approximately 600,000 acres of farmland through 29 urban and agricultural water districts. These agencies have long-term water supply contracts totaling 4.2 MAF per year. However, existing SWP facilities supply less than 2.4 MAF per year during drought conditions. The principal storage facility for the SWP is Oroville Reservoir. Key SWP reservoirs and their capacities are listed in Table 4.2-2.

TABLE 4.2-2

KEY SWP RESERVOIRS

Reservoir	Reservoir Capacity (thousand acre-feet)
Oroville	3,538
San Luis (SWP-share)	1,067

The North Bay Aqueduct, completed in 1988, supplies water to Napa and Solano counties from the northern Delta. Near Byron in the south Delta, the Banks Pumping Plant lifts water into Bethany Reservoir. From this reservoir, a portion of Delta water is lifted by the South Bay Pumping Plant into the South Bay Aqueduct, which serves both Alameda and Santa Clara counties.

Most of the water flows from Bethany Reservoir into the Governor Edmund G. Brown California Aqueduct, which winds along the west side of the San Joaquin Valley to the O'Neill Forebay. From there, part of the water is pumped through the William R. Gianelli Pumping-Generating Plant for storage in San Luis Reservoir until it is needed for later use. The B.F. Sisk San Luis Dam, which impounds 2,040,000 AF, is jointly owned; it was built by Reclamation and is operated by DWR. The SWP share of the storage volume of San Luis Reservoir is 1,067 TAF.

Water not retained at San Luis Reservoir continues south in the California Aqueduct, and is raised another 1,069 feet by four more pumping plants (Dos Amigos, Buena Vista, Wheeler Ridge, and Chrisman) before reaching the foot of the Tehachapi Mountains. The water is then raised 1,926 feet by the Edmonston Pumping Plant, over the Tehachapi Mountains, into a tunnel that conveys water to southern California. In the southern San Joaquin Valley, a short Coastal Branch Aqueduct serves agricultural areas west of the California Aqueduct along with Santa Barbara and San Luis Obispo counties.

34 CVPIA PEIS, 1997.

4.2.6. Factors Determining CVP/SWP Allocations

Water deliveries to CVP and SWP contractors are made continually throughout the year. The allocation of CVP and SWP water supplies for any given year is based on the following six criteria:

- Forecasted reservoir inflows and Central Valley hydrologic water supply conditions;
- Current amounts of storage in upstream reservoirs and in San Luis Reservoir;
- Projected water demands in the Sacramento Valley;
- Instream and Delta regulatory requirements;
- Demand pattern deliveries south of the Delta;
- Annual management of CVPIA 3406 (b)(2) resources (see Section 3406[b][2] under the CVPIA, below); and
- Efficient use of CVP/SWP export capacity through Joint Point of Diversion flexibility.

Beginning each year (in December for SWP contractors, and in February for CVP contractors), initial allocations of entitlement deliveries are determined based on the above criteria. Generally, allocations are updated monthly until May, although increases may occur later in the year based on changing reservoir storages.

4.2.7. CVP Water Allocations

In most years, the combination of carryover storage and current year snowmelt and runoff into CVP reservoirs are sufficient to meet the majority of CVP contractor demands. However, since about 1992 with the passage of the CVPIA, when increasing constraints placed on CVP operations removed some of the inherent flexibility required to deliver water to CVP contractors, this has become more difficult to achieve.

Generally, the water allocation process for the CVP begins in the fall when preliminary assessments are made of the upcoming year's water supply availability. Beginning on February 1, forecasts of water year runoff are prepared using precipitation to date, snow water equivalent content of the accumulated snowpack, and runoff to date. In recent years, February 15 has been the target date upon which the first announcement has been made to all CVP contractors of their forecasted water allocations for the upcoming year. NOAA Fisheries (formerly NMFS) requires Reclamation to use a conservative estimate (at least 90 percent probability of exceedance) when making such water allocation forecasts. Moreover, NOAA Fisheries reviews the operations plans prepared by Reclamation to support the initial water allocation (including any subsequent updates) to ensure that they can meet water temperature control criteria on the Sacramento River.

Forecasted runoff is updated monthly between February and May. Water allocations may or may not change as the year unfolds. Since a conservative water runoff forecast is initially prepared, it is often the case that water allocations actually can increase as the year progresses. In most years, therefore, the final water allocations are not known until April, May and even as late as June. This timing can be challenging for some agricultural contractors who, depending on agricultural crop, need to plan as early in the growing as possible.

4.2.8. CVP Water Shortage Provisions

Reclamation includes provisions in its CVP contracts specifying that a certain amount of CVP water will be made available to each CVP contractor, only to the extent that such water is available. While Reclamation uses all reasonable means to guard against shortages, delivery reductions can and do occur. Where the overall CVP water supply is not constrained by drought or other unavoidable circumstances, Reclamation is contractually committed to providing each contractor with the CVP water supply specified in the individual contracts.[35] CVP water service contracts have, over the years, had many varying water shortage provisions. In some contracts, M&I and agricultural use have shared shortages equally. In others, such as larger M&I contracts, agricultural water was shorted 25 percent before M&I water was shorted, and then both shared equally. Recognition of the increasing demands on a finite CVP water supply has, however, recently led Reclamation to consider revising its water delivery allocation guidelines. This has been ongoing since 1991, under Reclamation's M&I 2001 Water Shortage Policy.

In general, the policy provides M&I water supplies with a 75 percent water supply reliability based on a contractor's historical use. Historical use, in this context, is defined as the last 3 years of water deliveries unconstrained by the availability of CVP water. Before M&I supplies would be reduced, irrigation water supplies would be reduced below 75 percent of contract entitlement. When the irrigation allocation is reduced below 25 percent, Reclamation will reassess the availability of CVP water supplies and demand. During such water short periods, Reclamation may also reduce M&I water allocations below 75 percent of adjusted historical use. It should be noted that this policy would apply only to that portion of CVP water identified as of September 30, 1994, as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates Book, and for those contract quantities specified in P.L.101-514 (Section 206).

4.2.9. Water Allocation Priorities

Reclamation considers various categories of CVP water demands, their contractual amounts, and the deficiency criteria associated with each in their water allocation process. These various demands may be characterized as follows:

- Water Rights Settlement Agreements
- Municipal and Industrial (M&I) Water Service Contracts (e.g., P.L.101-514 contract)
- Legislative Mandates
- Agricultural Water Service Contracts
- Delivery Losses

35 U.S. Bureau of Reclamation, *Biological Assessment for U.S. Bureau of Reclamation, Central Valley* Operations, 1992.

In general, the allocation of CVP water supplies is accomplished through a two-tier hierarchy. The first tier, or Group I, includes all the categories of water demands with specifically defined minimum supplies. These include: 1) Sacramento River water rights and San Joaquin Exchange contracts, with associated minimum rate of delivery in "Critical" Shasta inflow years, 2) Refuge water supplies which must be provided at a minimum of 75 percent of supplies, 3) M&I water supplies, which are assumed to be maintained at 75 percent of maximum historical use, adjusted for growth (as per Reclamation's 2001 Draft M&I Water Shortage Policy), and 4) conveyance, evaporation, and other such water delivery losses. Group II includes all other agricultural water service contracts. Under this hierarchy, Group I water demands must be met first. Once met, the supplies available to Group II are then apportioned according to their contract entitlements that contain no delivery provisions. While there are approximately 2.0 MAF of Group II contracts for south of the Delta, due to the ongoing increases in certain Group I requirements over time (e.g., M&I and Refuge water), the potential for deficiencies to Group II users exists every year. With the potential for decreased pumping opportunities, resulting from ongoing and uncertain changes in operational criteria, these deficiencies to Group II could be exacerbated in the future.

4.2.10. American River Watershed

Surface water within the local setting originates in three primary watersheds: (1) the North and Middle Fork American River Watershed, which includes Hell Hole and French Meadows reservoirs, the Rubicon River and Stumpy Meadows Reservoir; (2) the South Fork American River Watershed, which includes the South Fork American River and its tributaries, Ice House Reservoir, Union Valley Reservoir, Slab Creek Reservoir, and Chili Bar Reservoir, and (3) the Cosumnes River Watershed, which includes Jenkinson Lake (Sly Park), Bass Lake, and the Cosumnes River and its tributaries. Each of these three watersheds flows into the Sacramento River, which ultimately flows to the Delta.[36]

The first two watersheds together comprise the upper portion of the American River Watershed and flow into Folsom Reservoir; the source of water for the proposed project diversions would be from within these two watersheds. No diversions will be made from within the Cosumnes River Watershed; thus, any hydrologic impacts on this watershed would be indirect, resulting, if at all, from water use within the Subcontractor service-areas.

The American River basin comprises a 1,875-square-mile drainage area, and is contained within Sacramento, El Dorado, Placer and a portion of Alpine counties. An average of 2.8 million acre-feet (MAF) of annual runoff drains from this basin.[37] Total reservoir storage of the American River Basin is approximately 75 percent of the mean annual runoff, or about 2.2 MAF.[38] Folsom Reservoir is the largest reservoir on the American River, and the primary flood control and water-storage reservoir, capable of storing maximum of 977 TAF. The other major reservoirs upstream of Folsom Reservoir, and their storage volumes, are: Union Valley, 277 TAF; Ice House, 459 TAF; French Meadows,

36 El Dorado County Planning Department, *El Dorado County General Plan, Volume II, Background Information*, January 23, 1996. Section V, Water: Resources, Quality, and Hazards.

37 California Department of Water Resources. May 2006. *Bulletin 120*. American River below Folsom Lake 50-year average unimpaired runoff.

38 Reclamation, SAFCA. 1994. (from Sac Fazio).

133.7 TAF; and Hell Hole, 208.4 TAF. There are also a number of smaller reservoirs in the upper watershed.

North and Middle Fork American River Upstream of Folsom Reservoir

The proposed GDPUD diversion site under a potential future exchange with PCWA s located near the old Auburn Dam construction site, at the American River Pump Station on the North Fork American River east of the town of Auburn. River flows at this location come from the Middle and North Forks of the American River, including the Rubicon River.

Flows on the Middle Fork are regulated upstream by Hell Hole and French Meadows reservoirs, and are re-regulated by the Ralston Afterbay. The Ralston Afterbay, the most downstream dam in the Middle Fork Project system, releases flows to the Middle Fork American River upstream of its confluence with the North Fork. Downstream of this confluence, Middle Fork flows are a combination of regulated and unregulated flows.[39] Stumpy Meadows Reservoir, operated by GDPUD, also regulates flows on Pilot Creek, a tributary to the Rubicon River, upstream of the confluence of the Middle Fork American and Rubicon rivers.

North Fork American River flows at the American River Pump Station have been estimated based upon upstream gage measurements. Dry-season (summer) flows at this location fluctuate daily; from 100 cfs when power is not being generated at Ralston Afterbay to about 1,100 cfs when power production peaks.[40]

Folsom Reservoir and Lake Natoma

The authorizing legislation for the construction of Folsom Dam, P.L. 81-356, directed Reclamation to operate the dam to control floods, provide for storage and delivery of water, generate power and provide salinity control in the Delta. The dam was completed in 1955. As a part of the CVP, Folsom Dam and Reservoir are operated not only for flood control and to meet CVP water delivery obligations, but also to satisfy in-stream flow needs in the lower American River and the Delta. Much of its original operational mandate was expanded with the passing of the CVPIA in 1992.

Flood-producing runoff occurs primarily during the October through April period and is usually most extreme during November through March. Snowmelt runoff by itself usually does not result in flood-producing flows, but it is usually adequate to fill the reservoir's empty space. Approximately 40 percent of the American River flow results from snowmelt.[41]

Lake Natoma is situated downstream of Folsom Dam and forms behind Nimbus Dam. This lake is operated as a re-regulating reservoir that accommodates the diurnal flow fluctuations caused by operating the Folsom Power Plant. The capacity of Lake Natoma is approximately 9,000 AF.

39 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-35 to 3-40.

40 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-35 to 3-40.

41 Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Final Environmental Impact Report. U.S. Bureau of Reclamation. November 1998. p. 4-3.

The region's municipal, agricultural, and industrial demands are met by several water purveyors in the areas above, around, and below Folsom Reservoir. El Dorado Irrigation District, City of Roseville, San Juan Water District (SJWD) (including its member family: Citrus Heights Water District, Fair Oaks Water District, and Orange Vale Water Company), Sacramento Suburban Water District (formerly, Northridge Water District), Placer County Water Agency, California State Prison and the City of Folsom for example, are the purveyors that divert water from Folsom Reservoir.

Under the Water Forum Agreement (see Sacramento Area – Water Forum Agreement, below), base condition diversions (i.e., unadjusted for water-year type) from the American River Watershed under normal water years provide the following quantities of water to various water purveyors (see Table 4.2-3).

TABLE 4.2-3

BASE CONDITION DIVERSION UNDER THE WATER FORUM AGREEMENT IN NORMAL (AVERAGE/WET YEARS)

Upstream of Folsom Reservoir	**Acre-Feet (AF)**
Placer County Water Agency	35,500
GDPUD	19,700
El Dorado Irrigation District	35,430
Folsom Reservoir	
Sacramento Suburban Water District	29,000
City of Folsom	34,000
San Juan Water District Placer County Sacramento County	 25,000 57.200
El Dorado Irrigation District	15,050
City of Roseville	54,900
Folsom South Canal	
Southern California Water Company/ Arden Cordova Water Company	5,000
California Parks & Recreation	5,000
SMUD	15,000
South Sacramento County Agriculture	35,000
Canal Losses	1,000
Lower American River	
City of Sacramento	96,300
Arcade Water District	11,200
Carmichael Water District	12,000
Sacramento River at SWRTP or SRWRS	
Placer County Water Agency	35,000
City of Sacramento	Up to 80,600
Sacramento County Water Agency	Up to 93,000
Source: Amended from Water Forum Draft EIR, Table 4.1-2., 1999.	

There are two pumping plants located at Folsom Reservoir: the Folsom Pumping Plant, located at Folsom Dam, and the EID Pumping Plant. The Folsom Pumping Plant serves the City of Folsom, California State Prison (Folsom Prison), the City of Roseville, Sacramento Suburban Water District, and the SJWD. At times when the reservoir water level is high, gravity flow is possible and pumping is not required. The elevation at which pumping is required depends on the amount of water being pumped. Higher flow rates, typical of summer months, require greater pumping head; therefore, the lower limit of the gravity flow is higher in the summer months.[42] The EID Pumping Plant on the South Fork arm of Folsom Reservoir serves EID exclusively.

Water Temperature Control

Water temperature control operations are affected by numerous factors and operational trade-offs with downstream environmental needs. These factors include the Folsom Reservoir coldwater pool volume, Nimbus Dam release schedules, annual hydrology, season of the year (for specific life cycles of rearing or immigrating fish species), Folsom power penstock shutter management flexibility, Folsom Dam's Urban Water Supply Temperature Control Device (TCD) management, and Nimbus Fish Hatchery conditions. Folsom Dam's TCD became operational in 2003. Selective withdrawal can occur at a reservoir water surface elevation of 401 feet (msl [mean sea level]) to 301 feet (msl). The centerline for the 84-inch urban water intake on the face of the dam is at elevation 317 feet (msl).

Folsom powerplant operations, as they affect water temperature releases are described in greater detail in Subchapter 4.3, Hydropower. Additionally, Folsom operations and its effects on downstream water temperature management for fishery purposes is discussed in Subchapter 4.6, Fisheries Resources.

Lower American River

The lower American River is that portion of the American River below Nimbus Dam. This reach, owing largely to its proximity to the greater Sacramento metropolitan area, has undergone significant channel and embankment alterations since the completion of Folsom and Nimbus dams in the mid-1950s.

Rapid flow fluctuations in the lower American River historically, have primarily been in response to either flood control operations at Folsom Dam or operational changes in releases to meet SWRCB water quality standards in the Delta. The close proximity of Folsom Dam and Reservoir to the Delta (and thus the relatively short amount of time required for releases to reach the Delta), results in releases from Folsom Reservoir commonly being relied upon first to meet Delta standards, in lieu of releases from more distant CVP reservoirs when timing is critical. In the past, rapid release-flow fluctuations were common. However, Reclamation, together with the Lower American River Operations Group (AROG), presently attempts to minimize these fluctuations in both magnitude and frequency. Current proposals within the Lower American River Flow Management Standard (LAR FMS) include ramping rate and flow fluctuation criteria to minimize even further, drastic changes in flows for the benefit of specific in-river fish life cycles.

Downstream of Nimbus Dam to around River Bend Park (formerly called Goethe Park), the American River is mostly unrestricted by levees, but is bordered on both the north and south by suburban development. Natural bluffs and terraces in this reach of the river also provide natural morphological controls. From the River Bend Park area to the confluence with the Sacramento

42 Placer County Water Agency, PCWA American River Pump Station Project Final EIS/EIR, June 2002, pp.3-292 to 3-294.

River, the lower American River is less constrained by natural features, and has been confined instead by levees, resulting in a slower moving, deeper reach with less meandering.[43] Thirteen diversions originate in the lower American River reach. The diverters with the largest diversions in this reach are the City of Sacramento (50,000 AFA) and Carmichael Water District (12,000 AFA). Under the Water Forum Agreement, 2030 total water demands from the watershed will be in excess of 280,000 AFA.

4.2.11. Groundwater

Locally, there are no designated groundwater basins identified for El Dorado County. Groundwater within the project area is primarily from hard rock aquifers where movement, recharge, and development of the groundwater are highly variable with location due to the area's geologic faults and fractures; volumes of groundwater are not peculiar to a certain geologic formation.[44] The movement of groundwater is limited at depths of 300 feet or more, resulting in greater groundwater yields in shallower wells. The median depth of wells in El Dorado County is 160 feet; the mean depth is 184 feet.[45] Groundwater is used to supply individual properties with water within El Dorado County, but is not considered reliable enough to serve as a supply for water wholesalers or retailers within the county. Within the regional context, the Sacramento Area Water Forum identified three groundwater basins (North, Central, and South) with specific long-term sustainable yield targets as part of the Water Forum Agreement.

4.2.12. Regulatory Framework

Various federal, State, and local regulations, policies, and rules affect available water supply and, related drainage, flooding, and water quality. These are described below. Explanations of other general rules, regulations and executive orders pertinent to this project are presented in Chapter 10.0 (Consultation/Coordination and Applicable Laws).

Federal and State

Within the context of hydrologic operations, numerous laws, directives, opinions, and orders affect or otherwise have influence on the management of the CVP. These include, but are not limited to the following:

Reclamation Act (1902)	Formed legal basis for subsequent authorization of the CVP.
Rivers and Harbors Act (1935)(1937)(1940)	First authorization of CVP for construction, and provision that dams and reservoirs be used first for river regulation, improvement of navigation, and flood control. Second authorization for irrigation and domestic uses. Third authorization for power.

43 U.S. Bureau of Reclamation and SAFCA. 1994. Interim Reoperation of Folsom Dam and Reservoir. Final Environmental Impact Report/Final Environmental Assessment.

44 SWRI, *Draft American River Basin Cumulative Impact Report*, August 2001, p.4-77, included as Appendix D to *PCWA American River Pump Station Project Draft EIS/EIR* (SCH #1999062089), August 2001.

45 El Dorado County Planning Department, *El Dorado County General Plan, Volume II, Background Information*, January 23, 1996. p.V.5-22. Water Forum, (2004) "Draft Policy Document" Lower American River Flow Management Standard, February 2004.

Reclamation Project Act (1939)	Provided for the repayment of the construction charges and authorized the sale of CVP water to municipalities and other public corporations and agencies.
Water Service Contracts (1944)	Provided for the delivery of specific quantities of irrigation, municipal, and industrial water to contractors.
Flood Control Act (1944)	Authorized flood control operations for Shasta, Folsom, and New Melones dams.
Water Rights Settlement Contracts (1950)	Provided diverters holding riparian and senior appropriate rights on the Sacramento and American rivers with CVP water to supplement water that historically would have been diverted from natural flows.
Trinity River Act (1955)	Provided that the operation of the Trinity River Division be integrated and coordinated with operation of other CVP features to allow for the preservation and propagation of fish and wildlife.
Fish and Wildlife Coordination Act (1958)	Provided for integration of fish and wildlife conservation programs under federal water resources developments. Authorized the Secretary of the Interior to include facilities to mitigate CVP-induced damages to fish and wildlife resources.
Reclamation Project Act (1963)	Provided a right of renewal of long-term contracts for municipal and industrial contractors.
SWRCB Decision 1379 (1971)	Established Delta water quality standards to be met by both the CVP and SWP.
Endangered Species Act (1973)	Provided protection for animal and plant species that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened).
SWRCB Decision 1485 (1978)	Ordered CVP and SWP to guarantee certain conditions for water quality protection for agricultural, municipal and industrial, and fish and wildlife use.
Secretarial Decision on Trinity River Release (1981)	Allocated CVP yield so that releases can be maintained at 340,000 AF in normal water years, 220,000 AF in dry years, and 140,000 AF in critically dry years.
Amended (1991)	Released a minimum of 340,000 AF for each dry or wetter water year. During each critically dry water year, 340,000 AF will be released if at all possible.
Corps of Engineers Flood Control	Prescribed regulations for flood control. Manuals for: Shasta (1977), Folsom (1959), New Melones (1982).
Corps of Engineers Flood Control	Outlined descriptions and data on flood potential/ratings. Diagrams for: Shasta (1977), Folsom (1986), New Melones (1982).

Long-Term Central Valley Project Operations and Criteria and Plan (CVP-OCAP)

In 1991, Reclamation requested formal consultation pursuant to Section 7 of the federal Endangered Species Act with both the U.S. Fish & Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), now NOAA Fisheries, regarding the effects of long-term CVP operations on the bald eagle in Shasta and Trinity reservoirs and on the winter-run Chinook salmon in the Sacramento River, respectively. At the time, the long-term operating criteria and procedures for the Trinity, Shasta, and Delta divisions of the CVP and the Red Bluff Diversion Dam (under the Sacramento River Division) were in question. As a result of this consultation, a development plan was prepared by Reclamation covering the long-term operation of the CVP under a range of potential hydrologic and reservoir storage conditions. Following the issuance by NMFS of a Biological Opinion (BiOp) on the 1992 operations on February 14, 1992, this development plan became known as the Long-Term Central Valley Project Operations and Criteria and Plan; CVP-OCAP (dated October 1992). For further background on the operations of the CVP, see the Long-Term Central Valley Project Operations and Criteria and Plan; CVP-OCAP (dated October 1992).

The most recent CVP-OCAP was completed in 2004. Since then, the BiOps prepared in support of the document have come under challenge from various intervenors, including, but not limited to the Natural Resources Defense Council (NRDC), Pacific Coast Federation of Fisherman's Associations/Institute for Fisheries Resources, and the Baykeeper (Delta Keeper Chapter). The challenges related to the findings of the BiOps regarding the federally threatened Delta smelt (*Hypomesus transpacificus*), various runs of Chinook salmon (*Onchorhynchus tshawytscha*), steelhead (*Onchorhynchus mykiss*), green sturgeon (*Acipenser medirostris*) and their designated critical habitats. A detailed discussion of the consultations with USFWS and NOAA Fisheries is provided in Chapter 10.0 (Consultation/Coordination and Applicable Laws).

While these consultations are ongoing, Reclamation is continuing to operate the CVP consistent with the provisions of the 2004 CVP-OCAP as conditioned by Judge Wanger's interim rulings. At this time, with the completion of the revised final Biological Assessment in October, 2008, along with NOAA Fisheries' preliminary draft BiOp on December 11, 2008 and the USFWS BiOp on December 15, 2008, Reclamation is reviewing the USFWS BiOp and the preliminary draft BiOp from NOAA Fisheries to determine if they can be implemented in a manner that is consistent with the intended purpose of the OCAP, is within Reclamation's legal authority and jurisdiction, and is economically and technologically feasible. NOAA Fisheries' final BiOp, including its final Reasonable and Prudent Alternatives (RPAs), Incidental Take Statement, and associated terms and conditions is expected sometime in June 2009.

Central Valley Project Improvement Act (CVPIA)

The Central Valley Project Improvement Act (Public Law 102-575, Title XXXIV, 1992) (CVPIA) reauthorized the CVP for a wider range of beneficial uses and interests than originally mandated. In relevant part, the CVPIA established that fish and wildlife are to be recognized as project purposes equal to that of irrigation, power generation, and municipal and industrial use. The CVPIA was intended to authorize water transfers outside of the CVP service area; implement an anadromous fish restoration program (AFRP); create a restoration fund financed by water and power users; provide for a Shasta Temperature Control Device (TCD); implement fish passage measures at the Red Bluff Diversion Dam; plan for increased CVP yield; mandate firm water supplies for Central Valley wildlife refuges; and meet federal trust responsibilities for the protection of fishery resources (Trinity River). A significant measure of the CVPIA was the dedication of 800,000 acre-feet annually for fish, wildlife and habitat restoration (see Section 3406(b)(2) below).

Currently, the CVPIA is being implemented on a broad front. The Final Programmatic Environmental Impact Statement (PEIS) evaluates projected conditions to the year 2022 (30 years from the CVPIA's adoption in 1992). The Final PEIS was released in October 1999, and the CVPIA ROD was signed on January 9, 2001.

Section 3406 (b)(2) under the CVPIA

As noted above, under the CVPIA, significant quantities (800,000 acre-feet annually) of CVP yield are reallocated to meet other new beneficial uses. This is the major provision under CVPIA Section 3406[b][2] whose annual allocation has come to be known as "b2" water. The allocation of 800,000 AF per year for this purpose was intended to address the anticipated and recurring impacts of CVP operations on fish and wildlife resources within CVP waterways.

The CALFED Environmental Water Account (EWA)

The Environmental Water Account (EWA) under the CALFED Program is a comprehensive effort to restore the ecological health of the Delta ecosystem consistent with the Ecosystem Restoration Program (ERP). It is intended to provide environmentally beneficial changes in CVP/SWP operations at no uncompensated water cost to the water users. By acquiring alternative sources of CVP/SWP water (or "project" water) supply, called "EWA assets", streamflows and Delta outflows could be augmented, exports modified to meet fishery needs, and regular project water that was interrupted by changes to project operations could be replaced. The EWA was designed so that replacement water would be able to compensate for reductions in deliveries, relative to existing facilities, project operations, and the regulatory baseline.

Long-Term CVP Contract Renewals

Reclamation has and continues to review and evaluate each CVP water service contract (M&I and Agricultural) as part of the long-term renewal terms of each contract. CVP Agricultural contracts are typically renewed for up to 25 years while M&I contracts are typically renewed for up to 40 years. Contract renewals are negotiated under the provisions of the CVPIA. Many CVP water service contracts are currently up for renewal or will be in the immediate future. These renewals represent a comprehensive effort on the part of Reclamation which is coordinating with USFWS and NOAA Fisheries through the latter's obligations under Section 7 of the federal Endangered Species Act (ESA). Groupings of contracts and contractors by CVP division are being addressed in the negotiation process for organizational purposes. A total of 109 CVP contracts contained across 12 units of the CVP are being addressed. Currently, completed NEPA and ESA processes exist for the Cross Valley Canal Unit and the Friant Unit (not including the City of Fresno).

Coordinated Operations Agreement

Both the CVP and SWP rely on the Sacramento River and the Delta as common conveyance facilities. Reservoir releases and Delta exports must be coordinated so that both the CVP and SWP are able to retain their portion of the shared water and also jointly share in the obligations to protect beneficial uses. A Coordinated Operations Agreement (COA) between the CVP and SWP was developed and became effective in November 1986 as signed by Reclamation and the California Department of Water Resources.

The COA defines the rights and responsibilities of the CVP and SWP regarding water needs of the Sacramento River system and Delta and includes obligations for in-basin uses, accounting, and real-time coordination of water obligations of the two projects. A CVP/SWP apportionment of 75/25 is implemented to meet in-basin needs under balanced Delta conditions, and the projects are using storage withdrawals to meet the in-basin demands. When unstored flow is available to export under balanced conditions, the apportionment is a 55/45 ratio. There is no apportionment needed when the Delta is under excess flow conditions. The COA contains considerable flexibility in the manner with which Delta conditions in the form of flow standards, water quality standards, and export restrictions are met.

State Water Resources Control Board

The State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCB) regulate water resources in California. The SWRCB protects water quality and determines rights to surface water use. Specifically, the SWRCB appropriates surface water, oversees disputes over rights to water bodies, establishes surface and groundwater quality standards, and oversees the RWQCBs, which implement water quality standards and regulations, which are described in greater detail below.

Decision 893 and Decision 1400

Minimum fishery releases to the lower American River from Nimbus Dam are made in accordance with the SWRCB water rights Decision No. 893 (D-893). The SWRCB increased the D-893 minimum release schedule in their Decision 1400 (D-1400). This decision was applied to the water rights permit for Auburn Dam and does not apply to the operation of Folsom and Nimbus dams at this time. However, Reclamation voluntarily operates Folsom and Nimbus dams to meet a “modified D-1400” for minimum fishery flows, and more recently has been striving to meet the recommended AFRP flows for the lower American River.

In 1996, Reclamation established the Lower AROG which includes the following regular participants (Reclamation, U.S. Fish & Wildlife Service, NOAA Fisheries, California Department of Fish & Game, Sacramento Area Flood Control Agency, City of Sacramento, County of Sacramento, Western Area Power Administration, the Water Forum, and Save the American River Association). The AROG generally convenes monthly, or more frequently, with the purpose of providing input to Reclamation regarding the management of Folsom Reservoir for fish resources within the context of water availability and other beneficial uses.

Typically, the AROG plans and develops projected flow release schedules for Folsom Dam based on information received from Reclamation (e.g., flows in the river, reservoir storage, water temperatures, and projected outflows). It provides not only input for reservoir releases but also into the management of the reservoir’s coldwater pool. For example, the AROG regularly provides input regarding how best to configure the shutters on the power penstocks at Folsom Dam. It should be noted that although the AROG has been voluntarily implementing these types of adaptive management procedures since 1996, its recommendations are only advisory and the group has no authority to oversee Folsom and Nimbus dam releases. Yet, Reclamation has managed both

Folsom and Nimbus dam releases according to AROG recommendations to the fullest extent possible, given its existing other obligations.

Sacramento Area - Water Forum Agreement

In early 2000, numerous water interests in the greater Sacramento region ratified a basin-wide agreement, known as the Water Forum Agreement. This long-term agreement was based on two co-equal objectives: providing a reliable and safe water supply for the region's economic health and planned development to the year 2030; and preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River. Ratified through a Memorandum of Understanding, the Water Forum Agreement has the commitment of local water purveyors, business and citizen organizations, environmental groups, and local, State, and federal governments. Of the seven elements that make up the Water Forum Agreement, acknowledged increases in future surface water diversions, commitments to reduce diversion impacts in drier years (dry-year cutbacks), water conservation (demand reduction), and the commitment to implement a new improved flow pattern for the lower American River will all have significant influence on water allocation and management of the lower American River (including Folsom Reservoir) in the future.

The reader is referred to the Sacramento City – County Office of Metropolitan Water Planning's 1995 Water Forum Proposal and its associated environmental documentation (SCH# 95082041) for a full description of the seven major elements including, the specific purveyor-specific agreements (each containing dry-year wedge restrictions on diversions from Folsom Reservoir and the lower American River). While participating in the Water Forum process, neither the El Dorado County Water Agency, nor its members (e.g., EID and GDPUD) hold purveyor-specific agreements under the Water Forum Agreement. Accordingly, they are not bound by the voluntary diversion provisions contained in those agreements that apply to other signatories. Additionally, Reclamation, while participating in the Water Forum Agreement process, is not a signatory to the agreement.

Lower American River – Flow Management Standard (FMS)

As part of the Water Forum Agreement, a new improved flow pattern for the lower American River was one of the seven key elements. The primary purpose of the proposed FMS is to maximize the annual production and survival of the anadromous fall-run Chinook salmon and steelhead in the lower American River, within water availability constraints and in consideration of Reclamation's obligation to provide for multi-purpose, beneficial uses of the project. With improved habitat conditions for salmonids, the proposed FMS is also expected to benefit other fish species within the river. A more detailed description of the various provisions of the flow standard is provided in Subchapter 4.6.4, Regulatory Framework, for Fisheries and Aquatic Resources.

While EDCWA, EID, and GDPUD support the FMS and, in the case of EDCWA, are active participants in the Water Forum Successor Effort planning process, which includes the FMS development, Reclamation has not supported the specific FMS as currently defined. Reclamation supports the benefits of an improved flow regime for the lower American River but, at this time, owing to the uncertainty associated with the CVP-OCAP, has not committed to the details of the FMS.

4.3. HYDROPOWER (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing hydropower infrastructure and operations of the CVP and includes discussion of the hydropower operations at Folsom Reservoir which, because of its uniquely based multi-purpose infrastructure, possesses important implications to hydropower generation as well as water supply and environmental considerations, namely, coldwater pool management and downstream thermal benefits. The proposed new CVP water service contract has the potential to affect CVP hydropower generation and capacity as well as pumping power at Folsom Reservoir.

4.3.1. Affected Environment/Setting

Hydropower generation in California consists of the coordinated operations of the CVP and its integration with the Northern California Power System and the operations of the Western Area Power Administration (WAPA).

4.3.2. Central Valley Project (CVP) Hydropower System

The CVP hydropower system consists of eleven power plants, 38 generators, two of which are pump-generating plants (Table 4.3-1). This system is fully integrated into the Northern California Power System and provides a significant portion of the hydropower available for use in northern and central California. The installed power capacity of the system is 2,078,750 kilowatts (kW), or approximately 7,079 megawatts (MW). By comparison, the combined capacity of the 368 operational hydropower plants in California is 12,866 MW; the Pacific Gas and Electric Company (PG&E), the area's major power supplier, has a generating capacity from all sources of over 20,000 MW. The CVP also includes approximately 860 miles of high-voltage transmission lines needed to deliver CVP power.

Once a strong influence on CVP operations, power operations are now secondary to other considerations. In part, this subordination is caused by the elevation of environmental needs to a higher standing, but changes in contractual relationships have also reduced the priority of power generation. Prior to 1977, Reclamation marketed and transmitted power from the CVP; however, under the Department of Energy Organization Act of 1977, WAPA now markets and conveys electrical power throughout the 15 western states.

Power produced by the CVP hydropower system is used first for meeting the authorized needs of the CVP including irrigation and M&I pumping (i.e., project pumping loads), fish and wildlife requirements and station service. Approximately 25 to 30 percent of the CVP total power generation is used to support these “Project Use” needs. CVP pumping facilities are listed in Table 4.3-2. Power surplus to project use is “commercial power” and is marketed by the WAPA to its “Preference Power Customers” under long-term firm contracts to municipal and government entities (preference customers) at cost-based rates. Preference Power Customers can include federal agencies, military bases, municipalities, public utilities districts, irrigation and water districts, State agencies, rural electric cooperatives, and public transportation districts (Reclamation, 2004).

TABLE 4.3-1

POWER RESOURCES OF THE CENTRAL VALLEY PROJECT

Unit	**Maximum Generating Capacity (kW)**
Northern California Area Office	
Carr [a]	154,000
Keswick	105,000
Lewiston	350
Shasta [b]	676,000
Spring Creek	180,000
Trinity	140,000
Subtotal	**1,255,350**
Central California Area Office	
New Melones	383,000
Folsom	207,000
Nimbus	17,000
Subtotal	607,000
Southern California Area Office	
O'Neill [c]	14,400
San Luis [c,d]	202,000
Subtotal	**216,400**
TOTAL	**2,078,750**

Notes:
a. Limited by tunnel restrictions.
b. With rewinds as of summer 2000.
c. Pump-generating plant.
d. Operated by DWR for Reclamation; eight 53,000 kW units for a total installed capacity of 424,000 kW, of which Reclamation's share is 202,000 kW.

Source: U.S. Bureau of Reclamation, Office of Public Affairs. August 2006. Central Valley Project Hydropower Production Progress Report.

TABLE 4.3-2

MAJOR PUMPING PLANTS IN THE CVP

Unit	**Capacity (cfs)**	**Average Annual Energy Use (kWh)**
American River Service Area		
Folsom Pumping Plant	350	1,041,000
Delta Export and San Joaquin Valley		
Contra Costa Canal	410	18,908,000
Dos Amigos[1]	13,200	180,146,000[2]
O'Neill	4,200	87,185,000
San Luis[1]	11,000	306,225,000 2
Tracy	4,600	620,712,000

Notes:
1. Joint State-Federal facility.
2. Federal energy use.

Source: U.S. Army Corps of Engineers, 1992.

In addition to providing peaking generation to the central and northern California power system, the CVP supplies many secondary benefits to the power system including VAR (magnetic or inductive power) support, regulation, spinning reserves, and black-start capabilities.

In an average year, 4,600 gigawatt hours (GWh) of energy and 1,700,000 kW of capacity are marketed to preference customers at rates that recover full cost of production and repayment obligations of project investment with interest.[46]

4.3.3. History of Central Valley Project Power Allocations

Power was first generated in the CVP at the Shasta Powerplant in 1944. Formal allocations of 450 MW of CVP power were first made in 1952. In 1964, with the addition of the Trinity River Division facilities, allocations to preference customers were increased to 925 MW. In 1967, under terms of Contract 2948A, power imports over the Pacific Intertie (Northwest imports) were incorporated along with provisions for load level increases up to 985 MW in 1975 and up to 1,050 MW in 1980. Later in 1980, the load level was increased by 102 MW to 1,152 MW (the required PG&E support level for capacity usage by CVP preference customer loads).

This increase in allocations was accomplished under the 1981 Power Marketing Plan (47 FR 4139) dated January 28, 1982. New customers received 26 MW of non-withdrawable power and 42 MW of withdrawable power for a total of 68 MW, with 4 MW of withdrawable power left unallocated. Also, diversity power allocations of 30 MW were made to those customers who could shed load during Sierra Nevada Region's system simultaneous peak. During the same time period, SMUD challenged WAPA's right to meld the costs of Northwest imports into CVP power rates charged to SMUD. In a 1983 settlement, it was agreed that SMUD would pay the melded CVP power rates; SMUD's electric service contract at the time due to expire in 1994, would be extended to 2004; and SMUD would have the right to purchase 100 MW of peaking capacity through 2004. Further, SMUD would have the right to purchase a portion of the power to be marketed from 2005 to 2014.

Under the 1994 Power Marketing Plan (57 FR 45782 and 58 FR 34579) dated October 5, 1992 and June 28, 1993, respectively, existing customers with contracts expiring in 1994 were allocated 501 MW, and approximately 8 MW was allocated to new customers.

In addition to the power marketed in the 1994 Power Marketing Plan, total power under existing contracts includes approximately 910 MW of long-term firm power, 100 MW of peaking capacity, and 60 MW of withdrawable power, for a total of about 1,580 MW. On November 30, 1993, the National Defense Authorization Act (NDA Act) was signed into law. This act provides that, for a 10-year period, the CVP electric power allocations to military installations in the State of California, which have been closed or approved for closure shall be reserved for sale through long-term contracts to preference entities which agree to use such power to promote economic development at the military installations closed or approved for closure. On December 1, 1994, WAPA published the final NDA Act procedures developed to fulfill the requirements of section 2929 of the NDA Act (59 FR 61604). To date, about 42 MW of long-term firm power and about 9 MW of withdrawable power under contract to military installations being closed has been converted to NDA Act power.

46 Placer County Water Agency, PCWA American River Pump Station Project Final EIS/EIR, June 2002, pp.3-292 to 3-294.

4.3.4. Folsom Dam and Reservoir

The Folsom Power Plant is located at the foot of Folsom Dam on the right abutment. Three 15-foot diameter steel penstocks are embedded in the concrete section of the dam and deliver water to the turbines. The centerline of each penstock to the turbines is at elevation 307 feet (msl) and the minimum power pool elevation is at 328.5 feet (msl). A reinforced concrete trashrack structure with steel trashracks protects each penstock intake.

The steel trashracks, located in five bays around each intake, extend the full height of the trashrack structure (between 281 and 428 feet). Forty-five 13-foot steel shutter panels (nine per bay) and operated by a gantry crane, were installed in steel guides to select the level of water withdrawal from the reservoir. The shutter panels are attached to one another in a “ganging” configuration starting with the top shutter in groups of 3-2-4.

Reclamation has the ability to preferentially access various levels of the reservoir at these three hydropower penstock intake shutters. These were originally designed in a 1-1-7 configuration; where the top shutter could be opened independent of the others, as could the second shutter, while the remaining 7 shutters could only be opened as one unit. Reconfigured in 1994 under a 3-2-4 ganging configuration, these shutters now provide greater control over the depth of intake, and thus, the temperature of the water being released from the dam. Reclamation also has the ability to “blend” water between the three hydropower penstock intakes, adding yet more operational flexibility towards optimizing coldwater pool management and resultant downstream temperatures.

The three power generating units have a total release capacity of approximately 8,600 cfs. By design, the facility is operated as a peaking facility. Peaking plants schedule the daily water release volume during the peak electrical demand hours to maximize generation at the time of greatest need. At other hours during the day there may be little or no release (and no generation) from the plant.

To avoid fluctuations in flow in the lower American River, Nimbus Dam is operated as a regulating facility. While the water surface elevation in Lake Natoma fluctuates, releases to the lower American River are kept constant. The Nimbus Power Plant consists of two generating units with a release capacity of approximately 5,100 cfs. Electric generation from this facility is continuous throughout the day.

4.3.5. Western Area Power Administration (WAPA)

WAPA is the marketing agency for power generated at Reclamation facilities in the American River Basin. As noted previously, WAPA, created in 1977 under the Department of Energy (DOE) Organization Act, markets and transmits electric power throughout 15 western states. WAPA's Sierra Nevada Customer Service Region (Sierra Nevada Region) markets approximately 1,480 MW of power from the CVP and other sources.

WAPA's mission is to sell and deliver electricity that is in excess of Project Use (power required for project operations), which, for the Sierra Nevada Region, includes CVP powerplants. WAPA's power marketing responsibility includes managing the federal transmission system and, as a federal agency, ensuring that operations of the hydropower facilities are consistent with its regulatory responsibilities. Specifically, WAPA's capacity and energy sales must be in conformance with the laws that govern its sale of electrical power. As noted previously, the hydroelectric generation facilities of the CVP are operated by Reclamation. Reclamation manages and releases water in accordance with the various acts authorizing specific projects and in accordance with other laws and enabling legislation. Hydropower operations at each facility must comply with minimum and maximum flows and other constraints set by FERC, Reclamation, USFWS, or other regulatory agencies, acting in accordance with law or policy. FERC regulations apply only to non-federal facilities and, as such do not apply to Folsom Dam and Reservoir. However, the case of *California v. FERC* in 1990 established that requirements of the Federal Energy Regulatory Commission can supersede State regulations relating to minimum stream flows. Most recently, long-term contracts for the sale of Sierra Nevada Region power resources expired December 31, 2004. WAPA developed a marketing plan that defines the products to be offered and the eligibility and allocation criteria for CVP electric power resources beyond the year 2004, and a number of long-term contracts were re-established in 2005.

4.3.6. Regulatory Framework

In 1906, Reclamation Law was amended to include power as a purpose of the projects if power was necessary for operation of the irrigation water supply facilities, or if power could be developed economically in conjunction with the water supply projects. The Act of 1906 allowed for lease of surplus power. Surplus power was described as power that exceeds the capacity and energy required to operation the Reclamation facilities (Project Use load). The Act of 1906 stipulated that surplus power would be leased with preference for municipal purposes.

Power supply was first authorized as a purpose for some CVP facilities in the Rivers and Harbors Act of 1937, which included authorization of initial CVP facilities. The Act of 1937 defined the priorities for the purposes of the CVP as: 1) navigation and flood control, 2) irrigation and M&I water supplies, and 3) power supply.

The Reclamation Act of 1939 modified Reclamation Law for all Reclamation facilities including the CVP. This Act reconfirmed the preference clause, and included the policy that the federal government would market power to serve the public interest rather than to obtain a profit. The Trinity River Act of 1955 authorized construction of the Trinity River Division (TRD) and allocated up to 25 percent of the energy resulting from the TRD to Trinity County. The Rivers and Harbors Act of 1962 authorized the New Melones Project and authorized up to 25 percent of the energy resulting from that project to Calaveras and Tuolumne counties. Customers receiving energy under these authorizations are referred to as “First Preference” customers.

As noted previously, the CVPIA in 1992 modified further the authorizations of the CVP, making fish and wildlife mitigation a higher priority than power, and power and fish and wildlife enhancement, equal priorities.

4.4. FLOOD CONTROL (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing flood control facilities and operations within the regional and local study areas, and sets the context for an analysis of the potential diversion-related effects of the new CVP water service contracts on these flood control elements.

4.4.1. Affected Environment/Setting

Flood-producing runoff in the American River basin occurs primarily during the October through April period and is usually most extreme between November and March. Snowmelt runoff by itself usually does not result in flood-producing flows, but it is usually adequate to refill the reservoirs in the basin. Approximately 40 percent of the American River flow results from snowmelt.[47] The primary flood-causing events are rain-on-snow events, where warm Pacific storms result in a large amount of precipitation in the form of rain, even in the higher elevations that generally receive snow, prompting rapid melting of the existing snowpack.

Flood control throughout the region is set out by a comprehensive system of dams, levees, overflow weirs, drainage pumping plants, and flood control bypass channels provided by the Sacramento River Flood Control Project (SRFCP) and the American River Flood Control Project (ARFCP).[48] Folsom Dam and Reservoir provide additional flood protection for the greater Sacramento metropolitan area. Each of these is discussed in more detail below.

On a regional level, flood control is a major function of the CVP. Along with the other CVP reservoirs providing flood control protection, both Shasta and Folsom reservoirs represent important elements of CVP-coordinated operations with respect to flood control. CVP operational priorities do change between seasons, and flood control is the top priority from November to April. During this period, reservoir releases are controlled by the need to create and maintain reservoir empty space for flood control storage.

4.4.2. Folsom Dam and Reservoir

On the local level, flood control is provided by Folsom Dam. Folsom Dam and Reservoir is a unit of the CVP and is the main flood control project in the American River basin. It provides critical flood protection for the approximately 350,000 residents and over $30 billion worth of damageable property currently occupying the floodplain in the Sacramento metropolitan area. Nimbus Dam and Lake Natoma lie immediately downstream of Folsom Dam, but the dam is operated to re-regulate flows released by Folsom Dam rather than for independent flood-control purposes.

Flood control requirements and regulating criteria are specified by the U.S. Army Corps of Engineers (Corps) and described in the Folsom Dam and Lake, American River, California Water Control Manual (Corps, 1987). Flood control objectives for Folsom Reservoir require that the dam and reservoir are operated to:

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47 Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Final Environmental Impact Report. U.S. Bureau of Reclamation. November 1998. p. 4-3.

48 Corps et al. 1996.

- Protect the City of Sacramento and other areas within the lower American River floodplain against reasonable probable rain floods;
- Control flows in the American River downstream of Folsom Dam to existing channel capacities, insofar as practicable, and to reduce flooding along the lower Sacramento River and in the Delta in conjunction with other CVP projects;
- Provide the maximum amount of water conservation storage without impairing the flood control functions of the reservoir; and
- Provide the maximum amount of power practicable and be consistent with required flood control operations and the conservation functions of the reservoir.

From June 1 through September 30, no flood control storage restrictions exist for Folsom Reservoir. From October 1 through November 16 and from April 20 through May 31, reserving storage space for flood control is a function of the date only, with full flood reservation space required between November 17 and February 7. Beginning on February 8 and continuing through April 20, flood reservation space is a function of both date and current hydrologic year conditions (e.g., snowpack water equivalent).

If inflow into Folsom Reservoir causes the storage to encroach into the space reserved for flood control, releases from Nimbus Dam are increased. Flood control regulations prescribe the following releases when water is stored within the flood control reservation space:

- Maximum release (after the storage entered into the flood control reservation space) of as much as 115,000 cfs but not less than 20,000 cfs when inflows are increasing;
- Releases will not be increased more than 15,000 cfs or decreased more than 10,000 cfs during a 2-hour period, and
- Flood control requirements override other operational considerations in the fall and winter periods. Consequently, changes in river releases of short duration may occur.

Since 1996, Reclamation has operated according to modified flood control criteria, which reserve 400,000 to 670,000 acre-feet of flood control space in Folsom Reservoir and a combination of upstream reservoirs. The flood control plan, which provides additional protection for the lower American River, is implemented through an agreement between Reclamation and the Sacramento Air Flood Control Agency (SAFCA). The terms of the agreement allow some reservoir empty space in Hell Hole, Union Valley, and French Meadows to be treated as if it were available in Folsom Reservoir. The SAFCA release criteria are generally the same as the Corps plan, except the SAFCA diagram may prescribe flood releases earlier than the Corps plan. The SAFCA plan also relies on Folsom Dam outlet capacity to make the earlier flood releases. The outlet capacity of Folsom Dam is limited up to 32,000 cfs based on water surface elevations.

4.4.3. Upper American River Basin

Approximately 820,000 acre-feet of storage capacity exists in American River basin reservoirs upstream from Folsom Reservoir. These facilities have at times proved beneficial in attenuating inflow to Folsom Reservoir, and under current operations, the three largest upstream reservoirs (French Meadows, Hell Hole, and Union Valley) provide as much as 200,000 acre-feet of usable flood storage capacity.

As noted previously, downstream of Nimbus Dam to around River Bend Park, the American River is mostly unrestricted by levees, but is bordered on both the north and south by suburban development. Natural bluffs and terraces in this reach of the river also provide natural morphological controls. From the River Bend Park area to the confluence with the Sacramento River, the lower American River is less constrained by natural features, and has been instead confined by levees, resulting in a slower moving, deeper reach with less meandering.[49]

This reach of the river is also constrained by the American River Flood Control Project (ARFCP). The project, constructed by the Corps in 1958 and operated/maintained by the State of California, consists of a levee extending along the north side of the American River beginning near Carmichael and extending approximately seven miles downstream to a previously-existing levee near the Interstate Business 80 crossing. Two pumping plants located in low areas landside of the levee discharge storm drainage into the lower American River. The presence of this levee permits Folsom Reservoir to operate to its maximum design release of 115,000 cfs (Corps et al. 1996).

4.4.4. Recent Sacramento-Area Floodplain History

After the 1986 flood, the Corps initiated a comprehensive evaluation of the entire Sacramento River and American River flood control systems. Conclusions from the Corps' evaluation downgraded flood protection for the residents and businesses occupying low-lying areas of the Sacramento area to a 63-year level of flood protection, rather than the 120-year level levees were thought to have provided. FEMA reassessed the Sacramento area’s 100-year floodplain and issued new Flood Insurance Rate Maps (FIRMs), placing about 110,000 additional acres in the revised 100-year floodplain.[50]

In order to address the deficiencies of the flood control systems, the Corps recommended separation of the Sacramento and American river problems, clearing the way for the Sacramento Urban Levee Reconstruction Project to repair structurally deficient levees along the Sacramento River, and the American River Watershed Investigation to evaluate the alternatives available to increase the capacity of the American River flood control system and the levees around Natomas. The State of

49 Reclamation and SAFCA. 1994.

50 These revised insurance maps became effective in November 1989. U.S. Bureau of Reclamation and Sacramento Area Flood Control Agency, *Interim Reoperation of Folsom Dam and Reservoir: Volume I, Final Environmental Impact Report/Final Environmental Impact Assessment*, 1994b.

California, through DWR and the State Reclamation Board, joined these efforts as the non-federal sponsor.[51]

After the floods of 1997, the Corps once again reevaluated the flood control system on the American and Sacramento Rivers; it determined that the 100-year flood event was much larger than previously predicted. The new evaluation revealed that releases from Folsom Dam would reach 175,000 cfs, which significantly exceeds the design capacity of the American River levee system. FEMA issued revised FIRMs in 1998, which delineate the boundary of the revised 100-year floodplain. The new maps delineate areas classified Zone AR, a designation indicating "an area of special flood hazard that results from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide a 100-year or greater level of flood protection." The AR classification is temporary and will expire 10 years from the date of classification or when certification of the 100-year flood protection is obtained.

4.4.5. Folsom Dam Safety and Flood Damage Reduction Spillway Addition

In response to the new estimate of the 100-year flood event, Reclamation has proposed the alteration of Folsom Dam to include an auxiliary spillway, capable of spilling 180,000 cfs in case of a massive flood event. In December 2006, Reclamation released a Draft EIS/EIR for the Folsom Dam Safety and Flood Damage reduction project. The Final EIS/EIR was released in 2007. The proposed action is solely intended to avoid catastrophic failure of the Folsom Dam. The document was finalized and early construction work has commenced on the spillway. The revised water control manual and Folsom Reservoir Flood diagram and downstream levee improvements necessary to contain the maximum spillway flows are yet to be completed. These actions are primarily the responsibility of the Army Corps of Engineers, and their development is anticipated to commence in 2008.

4.4.6. Regulatory Framework

There are numerous agencies that regulate flood control in the greater Sacramento area. At the federal level, the Corps is involved in planning, studying, and constructing regional federally funded flood control projects. The Federal Emergency Management Agency (FEMA) is responsible for administering the National Flood Insurance Program. State agencies responsible for implementing flood control measures include the State Department of Water Resources (DWR) and the State Reclamation Board. The Corps and the State Reclamation Board are the primary agencies responsible for flood control facilities along the Sacramento River, while flood control along the American River is maintained by the State of California.

The Corps is responsible for providing the flood control regulations (operating criteria/flood control diagrams) and has ultimate authority for approval of flood control operations. Reclamation operates Folsom Dam and Reservoir for flood control within the operational parameters set by the Corps. The

51 U.S. Bureau of Reclamation and Sacramento Area Flood Control Agency, *Interim Reoperation of Folsom Dam and Reservoir: Volume I, Final Environmental Impact Report/Final Environmental Impact Assessment*, 1994b.

flood control operation principles for Folsom Dam and Reservoir, however, are mutually agreed upon by Reclamation and the Corps.

4.5. WATER QUALITY (DIRECT EFFECTS STUDY AREA)

This subchapter describes the existing water quality conditions within the regional and local study areas, and presents the context under which an analysis of potential effects on water quality due to implementation of the Proposed Action or alternatives can be made.

4.5.1. Affected Environment/Setting

The following text provides a description of regional and local water quality setting, to provide a basis for assessing the potential impacts that the Proposed Action and Alternatives could have on the environment.

4.5.2. Sacramento River

The Sacramento River system drains a 26,146 square mile basin that extends from the Southern Cascade Range, through the Sierra Nevada to the Coast Ranges. The RWQCB has defined the following existing and potential future beneficial uses for the Sacramento River:

- municipal and domestic water supply;
- industrial service and industrial process supply;
- irrigation and stock watering;
- hydropower generation;
- groundwater recharge;
- contact recreation, non-contact recreation, and canoeing/rafting;
- warm and cold freshwater habitat, warm and cold freshwater migration and spawning habitat, wildlife habitat; and
- navigation

Several of these beneficial uses (i.e., municipal, industrial and agricultural supply, recreation, groundwater recharge, and fish and wildlife habitat) depend, in part, on maintaining existing water quality. A discussion of each of these beneficial uses is provided below because of their relevance to the discussion of impacts that follow in the subsequent chapters.

Municipal, Industrial, and Agricultural Uses

Water is diverted from the Sacramento River for use in municipal systems. Industrial uses of water diverted from the river include mining, plant cooling, hydraulic conveyance, gravel washing, fire protection, and oil well re-pressurization. In addition, extensive use is made of Sacramento River waters for agricultural purposes. These uses include irrigation of crops, orchards, and pastures; stock watering; support of vegetation for range grazing; and ranching- and farming-support operations.

Recreation

Recreational uses of the Sacramento River include swimming, sport fishing, rafting, boating/canoeing and related activities that involve direct water contact and the possibility of limited water ingestion. Non-contact recreational uses include picnicking, hiking, camping, hunting, education, and various other forms of aesthetic enjoyment.

Groundwater Recharge

Sacramento River flows serve to recharge the groundwater aquifer within the broader project study area. Groundwater recharge helps to maintain soil column salt balance, to prevent salt-water intrusion into freshwater aquifers, and provides a replenishing supply for future groundwater extraction to support municipal, industrial, and agricultural uses.

In addition to natural groundwater recharge, Sacramento River water from downstream of the confluence with the American River may be used in the near future for Aquifer Storage and Recovery (ASR) projects. These artificial recharge projects can use either percolation ponds or injection wells to replenish groundwater by temporarily storing, or banking, water in the aquifer for withdrawal later. ASR projects may be used to store surface water for *in-lieu* use during dry periods, when using groundwater is preferable to diversion of surface water.

Maintenance of Fish and Wildlife Habitat

The Sacramento River provides important aquatic habitats that support a wide variety of aquatic and terrestrial wildlife populations. These habitats provide migration, spawning, and rearing areas for anadromous and other migratory fish species, as well as resident fishes. In general, the anadromous salmonid species using the river (i.e., steelhead and Chinook salmon) have the most restrictive water quality requirements. The water quality parameter most likely to adversely affect anadromous salmonids annually is water temperature.

Existing Water Quality

Sacramento River water quality monitoring studies indicate that the river's water is generally of high quality.[52] Sacramento River water quality is primarily affected by land use practices within the watershed and associated urban runoff, stormwater discharges, agricultural runoff, effluent discharge from wastewater treatment plants, and acid mine drainage. The lower Sacramento River receives urban runoff, either directly or indirectly (through tributary inflow), from the cities of Sacramento, Roseville, Folsom, and their surrounding communities.[53] The Natomas East Main Drainage Canal discharges to the Sacramento River immediately upstream of the confluence with the American River. This canal transfers both agricultural discharges and urban runoff into the Sacramento River.

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52 Larry Walker Associates, 1991, 1996; Brown and Caldwell et al., 1995; Larry Walker and Associates and Brown and Caldwell, *Sacramento Coordinated Water Quality Monitoring Program 1994 Annual Report*, 1995.

53 City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.

Past monitoring studies have occasionally shown certain priority pollutants (e.g., trace metals, pesticides) to be at concentrations above State water quality objectives in portions of the Sacramento River.[54] Despite the seasonal variability of many constituents, a recent study revealed that monitored water quality parameters in the vicinity of Freeport (immediately upstream of the SRWWTP's point of discharge) typically met water quality objectives specified in the former Inland Surface Waters Plan (described below), except for some metals.[55] The principal source of trace metal loading to the Sacramento River is believed to be the Iron Mountain Mine complex, which discharges to the upper Sacramento River via Spring Creek and Keswick Reservoir. The complex is thought to contribute approximately one-half of the metals loadings attributable to mine drainage.

Ongoing water quality management initiatives (e.g., Sacramento River Coordinated Monitoring Program, Sacramento River Watershed Program, Cal EPA Department of Pesticide Regulation's Rice Pesticides Program) are helping to reduce the frequency with which water quality objectives are exceeded. In terms of the river's quality as a raw municipal water source, total dissolved solids (TDS), total organic carbon (TOC), and pathogen levels are of particular concern, but are currently at acceptable regulatory levels. TDS is of concern primarily because of its effects on water treatment costs. TOC is of concern because of its role in the formation of carcinogenic disinfection by-products (e.g., trihalomethanes) during the chlorination process of treatment. Pathogens (i.e., *Cryptosporidium* and *Giardia*) also are of concern with regard to their potential to affect human health. Sacramento River water is diverted for municipal and industrial uses and its flows constitute the bulk of freshwater inflows to the Delta where municipal and industrial diversions also occur. Accordingly, additional discussion of these important water quality parameters is provided below.

Salinity, often measured in terms of TDS, is relatively low in the Sacramento River (on the order of hundreds of mg/l, whereas the TDS concentration of seawater is approximately 35,000 mg/l or 35 ppt). However, salinity does vary somewhat seasonally and among years, depending on flow levels.[56] TDS concentrations measured at the West Sacramento Intake on the Sacramento River between April 19, 1994 and May 1, 1996 revealed a mean concentration of 92 mg/l. TDS concentrations measured at Greene's Landing (located downstream of the SRWWTP) averaged 102 mg/l during the period March 13, 1986 to November 9, 1995.[57] High TDS concentrations can result in increased municipal water treatment costs. When reaching sufficiently high levels (i.e., many hundreds to thousands of mg/l), productivity of crops and habitat quality for freshwater aquatic life can be reduced.[58]

Organic carbon and bromide in waters serving municipal uses are of concern because they can react with disinfectants during the water treatment process to form trihalomethanes (THM), which pose carcinogenic risks to humans. Between December 1992 and July 1996, mean TOC concentrations at Freeport were determined to be 2.2 mg/l, with a maximum measured concentration

54 City of Sacramento and City of West Sacramento, 1995.
55 State Water Resources Control Board, *Draft Environmental Report Appendix to Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1994.
56 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
57 DWR data as transmitted by R. Woodard, 1996.
58 California Department of Water Resources, 1994.

of 6.8 mg/l.[59] Dissolved organic carbon (DOC) for Sacramento River at Greene's Landing for the period 1990-1993 ranged from 1.4 to 5.7 mg/l.[60] The vast majority of the organic carbon in this system tends to be in the dissolved form, and so, TOC and DOC values are generally similar.

Agricultural drainage constituents of concern include nutrients, pesticides/herbicides, suspended and dissolved solids and organic carbon.[61] In the 1980s, rice pesticides were responsible for fish kills in agricultural drains and also for taste and odor problems in the water treated at the SRWTP. The major fish kills in the Colusa Basin Drain have since been eliminated as a result of the multi-agency rice pesticide control program.[62]

The concern over *Giardia* and *Cryptosporidium* concentrations in Sacramento River water, as well as other pathogens, has increased in recent years. The most comprehensive study of these pathogens conducted to date was performed by the Metropolitan Water District of Southern California,[63] which monitored concentrations of both *Giardia* and *Cryptosporidium* at four geographic locations (Greene's Landing, Banks Pumping Plant, the Delta Mendota Canal (DMC), and the California Aqueduct Checkpoint 29) for one calendar year. Findings from this study showed that quantification of *Giardia* and *Cryptosporidium* is currently subject to poor recovery and reproducibility, resulting in highly variable detection limits for both pathogens. Therefore, the results from this study should be regarded as qualitative and should not be interpreted to represent definitive concentrations of these pathogens in the waterbodies monitored. Nevertheless, spatial differences in the relative abundance of these pathogens in the Sacramento River and Delta, as well as their prevalence, relative to other surface waters of the United States, can be approximated from this study. Concentrations of the pathogens *Giardia* and *Cryptosporidium* are measured in cysts (the dormant state) or oocysts (fertilized egg form) per 100 liters of water.

Results reported by MWD (1993) indicated that *Giardia* and *Cryptosporidium* were detected in 42 percent and 50 percent, respectively, of the Greene's Landing samples. In the positive samples, the mean concentration of *Giardia* cysts was 37 per 100 liters, with a range of 8 to 82 per 100 liters. However, it should be noted that the mean detection limit for *Giardia* was 38 cysts per 100 liters (range: 8-125). The mean concentration of *Cryptosporidium* oocysts at this Sacramento River site was 50 per 100 liters (range: 5-132), with the mean detection limit for this pathogen reported as 46 oocysts per 100 liters (range: 8-125). It should be noted that the above results do not provide information regarding the viability of these organisms or the human risk of infection associated with the observed levels.

4.5.3. Sacramento-San Joaquin Delta

Water quality in the Delta is heavily influenced by a combination of environmental and institutional variables, including upstream pollutant loading, water diversions within and upstream of the Delta,

59 Larry Walker Associates, 1996.
60 Brown and Caldwell *et al*., 1995.
61 City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.
62 City of Sacramento and City of West Sacramento, 1995.
63 MWD, 1993.

and agricultural and other land use activities throughout the watershed. Critical Delta water quality parameters (e.g., salinity and/or TDS, TOC, bromide, pathogens, temperature, nutrients, and priority pollutants) can show considerable geographic and seasonal variation. Salinity, bromide concentrations, and temperature are strongly related to changes in Delta inflows.[64]

Reduced Delta inflows can increase the amount of seawater intrusion and increase the water quality influence of organic-rich agricultural runoff in Delta channels. Delta water quality conditions that are critical for municipal drinking water quality include salinity, chloride, bromide, and TOC concentrations. Delta water quality conditions that are critical to aquatic habitat include salinity, temperature, DO, TSS and turbidity, pH, nutrients, and chlorophyll. The Delta waterways are listed as impaired for two organophosphate pesticides (chlorpyrifos, diazinon), Group A organochlorine pesticides, electrical conductivity, mercury, and unknown toxicity (SWRCB 2007).

The extent of saltwater intrusion into the Delta from the Pacific Ocean is largely controlled by freshwater inflow from the Sacramento, San Joaquin, Mokelumne, Calaveras, and Cosumnes rivers. Water diversion facilities upstream and within the Delta can reduce Delta inflows resulting in higher salinity levels at specific locations within the Delta than might otherwise occur. Conversely, water storage facilities can augment Delta inflows in certain months, resulting in salinity levels lower than would otherwise occur. By augmenting natural or historic flows via releases from upstream reservoirs, the severe salinity level intrusions that once occurred every summer—which sometimes moved upstream as far as the City of Sacramento on the Sacramento River, and as far as Stockton on the San Joaquin River, have been eliminated.

An additional source of salt or TDS to the Delta is upstream agricultural discharges to the Sacramento and San Joaquin rivers, which can sometimes create elevated salinity levels in portions of the south Delta. Runoff and treated wastewater, to a limited degree, also influence Delta TDS levels.[65] TDS concentrations at the Banks Pumping Plant for the period 1990-1993 ranged from 44 to 417 mg/l, with an annual average of approximately 300 mg/l.[66] Salinity requirements, represented in electrical conductivity (EC) units, for the Delta are defined in Table 4.5-1. These standards are intended to protect various beneficial uses of Delta waters. As noted previously, there are numerous standards for salinity and flow requirements governed by the Bay-Delta Water Quality Control Plan; Table 4.5-1 provides only a sample.

Delta waters receive organic carbon materials from a variety of sources, including agricultural drainage, surface runoff, algal productivity, in-channel soils, levee materials, riparian vegetation, and the Banks Pumping Plant during 1990-1993 ranged from 2.6 to 10.5 mg/l, approximately double that at Greene's Landing. Recent work has shown an average increase in TOC concentrations of

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64 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
65 Brown and Caldwell *et al*., 1995.
66 Brown and Caldwell *et al*., 1995.

1.5 mg/l between Greene's Landing and the Banks Pumping Plant, which may be largely attributed to agricultural drainage.[67]

TABLE 4.5-1

SACRAMENTO-SAN JOAQUIN (BAY-DELTA) DELTA WATER QUALITY CONTROL PLAN STANDARDS FOR DELTA INFLOW AND OUTFLOW

Location	Parameter	Standard	Description
Contra Costa Canal at Pumping Plant #1	Chloride (Cl-)	240 days[1]	Maximum mean daily 150 mg/l Cl- for at least the number of days shown during the calendar year
Contra Costa Canal at Pumping Plant #1	Chloride (Cl-)	250 mg/1	Maximum mean daily (mg/l)
Sacramento River at Emmaton	Electrical Conductivity (EC)	0.45 EC[2]	Maximum 14-day running average of mean daily EC (mmhos/cm) Apr 1 through Aug 15
West Canal at mouth of Clifton Court Forebay and Delta Mendota Canal at Tracy Pumping Plant	Electrical Conductivity (EC)	1.00 EC	Maximum monthly average of mean daily EC (mmhos/cm)
Sacramento River at Collinsville	Electrical Conductivity (EC)	8.00 EC[3]	Maximum monthly average of both daily high tide EC values (mmhos/cm)
Sacramento River at Rio Vista	Flow Rate	4,500 cfs[4]	Minimum monthly average flow rate (cfs)
Delta Outflow	Net Delta Outflow Index	8,000 cfs[5]	Minimum Monthly average (cfs)

Notes:
1. Number of days per year is dependent on water year type. Wet Þ 240 days; Above Normal Þ 190 days; Below Normal Þ 175 days; Dry Þ 165 days; Critical Þ 155 days.
2. EC standard is relaxed before August 15 depending on water year type. Wet Þ no relaxation; Above Normal Þ on July 1 relaxed to 0.63; Below Normal Þ on June 20 relaxed to 1.14; Dry Þ on June 15 relaxed to 1.67; Critical Þ on April 1 relaxed to 2.78
3. EC standard varies by month. October Þ 19.0; November-December Þ 15.5; January Þ 12.5; February-March Þ 8.0; April-May Þ 11.0
4. Flow rate varies by month and water year type. September Þ all year types = 3,000 cfs; October Þ Wet, Above Normal, Below Normal & Dry year types = 4,000 cfs; October Þ Critical year type = 3,000 cfs; November & December Þ Wet, Above Normal, Below Normal & Dry year types = 4,500 cfs; November & December Þ Critical year type = 3,500 cfs
5. Index varies by month and water year type. January Þ all year types = 4,500 cfs or 6,000 cfs depending on Eight River Index; February through June Þ all year types = variable between 7,100 cfs and 4,000 cfs depending on Eight River Index; July Þ Wet & Above Normal year types = 8,000 cfs; July Þ Below Normal year type = 6,500 cfs; July Þ Dry year type = 5,000 cfs; July Þ Critical year type = 4,000 cfs; August Þ Wet, Above Normal & Below Normal year types = 4,000 cfs; August Þ Critical year type = 3,000 cfs; September Þ all year types = 3,000 cfs; October Þ Wet, Above Normal, Below Normal & Dry year types = 4,000 cfs; October Þ Critical year type = 3,000 cfs; November & December Þ Wet, Above Normal, Below Normal & Dry year types = 4,500 cfs; November & December Þ Critical year type = 3,500 cfs

Sources: RWQCB, 1994; SWRCB, 1995. From Tables 1, 2 and 3 (pages 16 through 19) of the 1995 Bay-Delta Water Quality Control Plan. The select location and standard listed in this Table represents only a few of the Water Quality Objectives for municipal and industrial beneficial uses, agricultural beneficial uses, and fish and wildlife beneficial uses.

Nutrients in the Delta (nitrogen, phosphate, and silicate) are derived from several sources including river inflow, ocean water, runoff (urban and agriculture), wetlands, atmospheric deposition (rain and dust), and upstream sewage effluent. Nutrient concentrations vary geographically and seasonally. In the northern reach, where river flow provides most of the nutrient load, nutrient concentrations are highest in winter and lowest in summer.[68] Nutrients at sufficient levels can lead to algal blooms that deplete oxygen in the water during decomposition.

Metals, pesticides and petroleum hydrocarbons enter the Delta from several sources and environmental pathways, including agricultural runoff, municipal and industrial wastewater discharge,

67 Brown and Caldwell *et al*., 1995.
68 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.

urban runoff, recreational uses, river inflow, and atmospheric deposition.[69] The concentrations of these pollutants in the Delta vary both geographically and seasonally. Pesticides from agricultural runoff are of particular concern, as biologically significant concentrations have been recorded in portions of the Delta.[70] Toxic effects of priority pollutants to aquatic life can vary with flow levels, as water flowing into and through the Delta acts to dilute concentrations of priority pollutants.

Finally, levels of *Cryptosporidium, Giardia,* and other pathogens in Delta waters are becoming of increasing concern to municipal water suppliers. *Giardia* was not detected at Banks Pumping Plant or Checkpoint 29, but was found in one sample at the DMC at a concentration of 6 cysts per 100 liters. *Cryptosporidium* was detected at Banks Pumping Plant, the DMC, and Checkpoint 29 at mean concentrations of 54, 40, and 17 oocysts per 100 liter, respectively.[71]

Delta X2

A major regulatory cornerstone of the 1995 Bay-Delta Water Quality Control Plan is the development of water quality standards based on the geographical position of the 2-parts-per-thousand (ppt) isohaline (also known as X2). The geographical position of the 2-ppt isohaline is considered significant to the biologically important entrapment zone of the estuary and the resident fishery. It provides an indicator of habitat protection outflow and salinity starting conditions in the Delta.

As contained in SWRCB Decision-1641 (D-1641), various flow, operational, and water quality standards create a systematic approach to CVP/SWP operations which influence the position of the X2 location. The key to the regulatory system is the concept of an “X2 day”. An X2 day can be operationally accomplished by the CVP/SWP meeting one of three possible equivalents. These include:

- 2.64 mmhos/cm Electrical Conductive (EC) at the desired geographic compliance location for the day;
- 14-day average of 2.64 mmhos/cm EC at the desired geographic compliance location; and
- A pre-determined Delta outflow equivalent for the desired X2 compliance location for the day.

If any of these conditions are met, the day is included as a potential compliance X2 day.

The determination of the desired geographic compliance location and the required number of X2 days per month in the February through June time period that meet the above noted criteria is defined by regulatory standard tables. The various tables determine the number of required of X2 days based on the previous months inflow, noted as “8RI” since it is estimated on the full natural runoff of the largest eight streams in the Sacramento-San Joaquin River Watershed. Various geographic compliance locations have specific conditions, which are listed in the footnotes of Table 4.5-1.

69 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
70 San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.
71 MWD, 1993.

Folsom Reservoir

Water quality in Folsom Reservoir is generally acceptable for the beneficial uses currently defined for the facility. However, taste and odor problems have occurred in municipal water supplies diverted from Folsom Reservoir in the past, which were attributed to blue-green algal blooms that occasionally occur in the reservoir as a result of elevated water temperatures.

Folsom Reservoir has numerous beneficial uses as defined in the Central Valley Regional Water Quality Control Board's Basin Plan. The following existing and potential beneficial uses have been defined by the RWQCB:

- municipal, domestic, and industrial water supply;
- irrigation;
- power;
- water contact and non-contact recreation;
- warm and cold freshwater habitat, warm freshwater spawning habitat; and wildlife habitat.

The proposed diversion site for GDPUD is on the North Fork American River, just downstream of the confluence of the North and Middle forks of the American River. Water quality in the American River is considered to be good, although historical water quality data for the North Fork are limited. During early construction activities for the proposed Auburn Dam, Reclamation collected water samples at two locations upstream of the proposed dam site and two locations downstream. These samples were analyzed for pH and turbidity. Monitoring was conducted weekly from 1977 until 1995. The 1991-92 water-year was considered to be representative of the entire period because data for other years showed little variation. Turbidity was low at the nearest downstream and upstream monitoring locations, with annual averages just below or above 1 NTU (nephelometric turbidity unit). The pH ranged from 7.0 to 8.2 at the four monitoring locations. Information on sediment in the river was not readily available; however, the turbidity data indicate the river carries little sediment during low flows.[72]

Sources of historic wastewater flows to the North Fork American River include a sawmill located in Foresthill that discharges to a tributary to Devil's Canyon.[73]

The beneficial uses of the North Fork American River have been established by the RWQCB and are included in the Water Quality Control Plan for the Sacramento San Joaquin River Basins (1998).[74] These uses are:

- municipal and domestic supply;

72 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-205 to 3-206.
73 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-205 to 3-206.
74 Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002, pp.3-205 to 3-206.

- agricultural supply;
- water contact and non-contact recreation;
- potential warm freshwater habitat;
- cold freshwater habitat;
- cold freshwater spawning, reproduction, and/or early development of fish; and
- wildlife habitat.

4.5.4. Lower American River

Surface water quality in Folsom Reservoir, Lake Natoma, and the lower American River depends primarily on the mass balance of various water quality constituents from groundwater inputs, tributary inflow, permitted discharges from municipal and industrial sources, indirect watershed runoff (unchannelized flow), urban runoff, and stormwater discharges. Water quality varies somewhat among years and seasonally within a year based primarily on these and related factors.

Historically, water quality parameters for the lower American River have typically been well within acceptable limits to achieve water quality objectives and beneficial uses identified for this waterbody,[75] and remain so today. Principal water quality parameters of concern for the river (e.g., pathogens, nutrients, TDS, TOC, priority pollutants, and turbidity) are primarily affected by urban land use practices and associated runoff and stormwater discharges. The stormwater discharges to the river temporarily elevate levels of turbidity and pathogens during and immediately after storm events. TOC and TDS levels in the lower American River are, however, relatively low compared to Sacramento River and Delta waters and thus are generally not of substantial concern.

Although urban land use practices, urban runoff, and stormwater discharges all contribute priority pollutants to the river, recent monitoring has not identified any priority pollutant at concentrations consistently above State water quality objectives.[76] However, water quality objectives for dissolved oxygen, temperature, and pH are not always met in the lower American River.[77] Finally, taste and odor problems occasionally arise (generally during the late summer months) in the domestic water supplies taken from the lower American River at the Fairbairn WTP.

Water released from Folsom Reservoir, through Lake Natoma, and into the lower American River can affect several water quality parameters in the river. In addition, operation of Folsom Dam and Reservoir directly affects lower American River temperatures throughout much of the year. Water temperatures in the lower American River are often unfavorably high for salmonids during the summer and fall months of the year. Elevated river temperatures can be particularly problematic to the river's salmonid resources under low-flow conditions, which occur during the drier years.

75 SWRCB, 1992.
76 City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.
77 Sacramento County, *Draft Sacramento County General Plan Update Environmental Impact Report, Volume I, Sacramento County, Department of Environmental Review and Assessment*,1992.

4.5.5. Regulatory Framework

Section 303 of the federal Clean Water Act (CWA) requires states to adopt water quality standards for all surface water of the United States. Where multiple uses exist, water quality standards must protect the most sensitive use. Water quality standards are typically numeric, although narrative criteria based upon biomonitoring methods may be employed where numerical standards cannot be established or where they are needed to supplement numerical standards.

The SWRCB and RWQCB are responsible for ensuring implementation and compliance with the provisions of the federal CWA, California's Porter-Cologne Water Quality Control Act, and related programs. Along with the SWRCB and RWQCB, water quality protection is the responsibility of numerous water supply and wastewater management agencies, as well as city and county governments, and requires the coordinated efforts of these various entities.

Water Quality Control Plan for the Sacramento San Joaquin River Basins

The Water Quality Control Plan for the Sacramento-San Joaquin River Basins (Basin Plan), adopted by the RWCQB on December 9, 1994 and reprinted (as amended in 1995 and 1996) on September 1, 1998, provides water quality objectives and standards for waters of the Sacramento River and San Joaquin River Basins. The Basin Plan contains specific numeric water quality objectives for bacteria, dissolved oxygen, pH, pesticides, EC, TDS, temperature, turbidity, and trace elements, as well as numerous narrative water quality objectives, that are applicable to certain waterbodies or portions of waterbodies. As discussed above, the Basin Plan contains specific numeric standards for Delta inflow and outflow, chloride, and electrical conductivity (EC), a measure of water's ability to conduct an electric current, which is based on the relative abundance of free ions in the water, which come from the dissociation of solid materials into the water. Thus, EC is directly related to TDS. EC standards in the Delta exist for both agricultural and fish and wildlife beneficial uses.

Bay-Delta Pollutant Policy Document and Accord

The Pollutant Policy Document (PPD) for the San Francisco/Sacramento-San Joaquin Delta Estuary was adopted by the SWRCB on June 21, 1990. The PPD sets forth basic policies for the control of toxic pollutants in the Bay-Delta Estuary. The PPD identifies seven pollutants of concern: arsenic, cadmium, copper, mercury, selenium, silver, and polynuclear aromatic hydrocarbons (PAHs). The PPD also indicates that publicly owned treatment works (POTWs) are a significant source (i.e., greater than 10 percent) of three of the seven pollutants of concern: cadmium, mercury, and silver. The RWQCB has identified the entire Delta as a waterbody of concern and designated the seven pollutants listed by the PPD as pollutants of concern. The most significant provision of the PPD for POTWs is the mass emission strategy (MES), which is designed to control the accumulation of toxic pollutants in sediments and aquatic tissue.

In June 1994, State and federal agency cooperation was formalized with the signing of a Framework Agreement. The Agreement stated that the State and federal agencies would focus on the following three areas of concern: water quality standards formulation; coordination of SWP and CVP operations with regulatory requirements; and long term solutions to problems in the Bay-Delta

Estuary.[78] On December 15, 1994, an agreement was reached regarding water quality standards and related provisions that would remain in effect for three years. This agreement included springtime export limits, regulation of the salinity gradient, specified springtime flows on the lower San Joaquin River and intermittent closure of the Delta Cross Channel gates. Many of the standards and provisions in the December 1994 agreement were incorporated into the SWRCB's "Draft Water Quality Control Plan for the San Francisco Bay/Sacramento San Joaquin Delta Estuary" dated December 1994. After revisions were made that addressed comments, the final Delta Water Quality Control Plan was adopted on May 22, 1995,[79] and remains in effect today.

Anti-Degradation Policy (State Water Board Resolution 68-16)

In addition to designating beneficial uses and water quality objectives to define water quality standards, federal water quality regulations require each State to adopt an “anti-degradation” policy and to specify the minimum requirements for the policy.[80] The SWRCB has interpreted State Water Board Resolution 68-16 to incorporate the federal anti-degradation policy.

The SWRCB adopted State Water Board Resolution No. 68-16 on October 28, 1968. The goal of this policy is to maintain high quality waters where they exist in the State. Resolution No. 68-16 does not prohibit any reduction to existing water quality. Rather, the RWQCB applies Resolution No. 68-16 when considering whether to allow a certain degree of degradation to occur or remain. As stated in Resolution No. 68-16, whenever the existing quality of water is better than that defined by State water quality objectives and policies, such existing high water quality will be maintained until it has been demonstrated to the State that any change will: 1) be consistent with the maximum benefit to the people of the State; 2) not unreasonably affect present and anticipated beneficial use of such water; and 3) not result in water quality less than that prescribed in water quality control plans or policies.[81] In addition, the discharger must apply best practicable treatment or control measures to assure that: 1) a pollution or nuisance will not occur; and 2) the highest water quality, consistent with the maximum benefit to the people of the State, will be maintained.[82] Hence, for actions that produce significant changes in water quality, the State policy states that a showing must be made that such changes result in the maximum benefit to the people of the State and are necessary to the social and economic welfare of the community in order to be consistent with the anti-degradation policies.

The Porter-Cologne Water Quality Control Act states that water quality objectives are to be established that “. . . will ensure the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.” The State Water Code further states that “. . . it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses.” This policy statement supports the position that some level of water quality change is allowable under the anti-degradation policies.

78 DWR, 1995.
79 State Water Resources Control Board, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, Environmental Report, Appendix I*, 1995.
80 40 CFR '131.12.
81 RWQCB, 1994.
82 RWQCB, 1994.

National Toxics Rule and California Toxics Rule

The U.S. EPA promulgated the National Toxics Rule (NTR) on December 22, 1992, which was amended on May 4, 1995, and November 9, 1999, to establish numeric criteria for priority toxic pollutants for California. The NTR established water quality criteria for 42 pollutants not covered, at that time, under California's state-wide water quality regulations. As a result of a court-ordered revocation of California's state-wide water quality control plan for priority pollutants in September 1994, the EPA initiated efforts to promulgate additional numeric water quality criteria for California. The EPA approved CTR promulgated numeric criteria on May 18, 2000 for priority pollutants not included in the NTR; the CTR was later amended on February 13, 2001. The CTR documentation (Federal Register, Volume 65, 31682) carried forward the previously promulgated criteria of the NTR, thereby providing a single document listing California's fully adopted and applicable water quality criteria for priority pollutants.

National Pollutant Discharge Elimination System (NPDES)

Title 40 of the Code of Federal Regulations (40 CFR) includes U.S. EPA regulations to implement the National Pollutant Discharge Elimination System (NPDES) permit system, which was established in the CWA to regulate municipal and industrial discharges to surface waters of the U.S. Each NPDES permit contains limits on allowable concentrations and mass emissions of pollutants contained in the discharge. Sections 401 and 402 of the CWA contain general requirements regarding NPDES permits. Section 307 of the CWA describes the factors that EPA must consider in setting effluent limits for priority pollutants.

Non-Point Source Discharges

Two types of non-point source discharges[83] are controlled by the NPDES program – non-point source discharges caused by general construction activities and the general quality of stormwater in municipal stormwater systems (either as part of a combined system or as a separate system in which runoff is carried through a developed conveyance system to specific discharge locations). The goal of the NPDES non-point source regulations is to improve the quality of stormwater discharged to receiving waters to the "maximum extent practicable" through the use of best management practices (BMPs). BMPs can include the development and implementation of various practices including educational measures (workshops informing public of what impacts result when household chemicals are released into storm drains), regulatory measures (local authority of drainage facility design), public policy measures (label storm drain inlets as to impacts of dumping on receiving waters) and structural measures (filter strips, grass swales and detention ponds).

The 1987 amendments to the CWA directed the federal EPA to implement the stormwater program in two phases. Phase 1 addressed discharges from large (population 250,000 or above) and medium (population 100,000 to 250,000) municipalities and certain industrial activities. Phase 2 addresses all other discharges defined by EPA that are not included in Phase 1, and construction

83 Non-point sources diffuse and originate over a wide area rather than from a definable point. Non-point pollution often enters receiving water in the form of surface runoff and is not conveyed by way of pipelines or discrete conveyances.

activities that affect one to five acres. The Phase 2 regulations were published in the Federal Register on December 8, 1999.

4.6. FISHERIES AND AQUATIC RESOURCES (DIRECT EFFECT STUDY AREA)

This subchapter describes the fisheries resources and aquatic habitats, including the regional and local area affected environments, and presents the context under which the analyses of the potential diversion-related effects on these resources resulting from implementation of the new CVP water service contracts can be made.

4.6.1. Affected Environment/Setting

The following describes the affected environment related to fisheries and aquatic biological resources in areas potentially affected by the Proposed Action and Alternatives. The discussion addresses environmental conditions that could be affected by increased depletions from the coordinated CVP/SWP system (including upper Sacramento reservoirs, the upper and lower Sacramento River, the Sacramento-San Joaquin River Delta, Folsom Reservoir, and the lower American River), including those potentially resulting from a new water exchange between the North Fork American River and Folsom Reservoir.

Fish species of primary management concern include recreationally/commercially important species, species listed under the State and/or federal Endangered Species Act (ESA), and those species being considered for State and/or federal ESA listing or other special status. Special emphasis is placed on these species since they are the focus of State and/or federal ESA initiatives, and are the primary subject of both State and federal fisheries restoration and recovery plans. Improvement of habitat conditions for these species of priority management concern will likely protect or enhance conditions for other fish resources, including native resident species.

Evaluating potential impacts on fishery resources requires an understanding of fish species' life histories and life-stage-specific environmental requirements. Therefore, this information is provided for fish species of primary management concern that occur (or potentially occur) within both the regional (Sacramento River and associated reservoirs and the Delta) and local (American River and associated reservoirs) study areas.

4.6.2. Fish Species of Primary Management Concern

The species described in this subchapter are presented in no particular order of preference.

Chinook Salmon (*Oncorhynchus tshawytscha)*

Four runs of Chinook salmon (i.e., fall-run, late-fall-run, winter-run, and spring-run) occur in the Sacramento River system, whereas only fall-run occur in the lower American River. Chinook salmon are anadromous, meaning they spend most of their lives in the ocean and return to their natal freshwater stream to spawn. A separate discussion for each of the four runs of Chinook salmon is provided below.

Winter-run Chinook Salmon

Winter-run Chinook salmon was listed as endangered under the federal ESA on January 4, 1994 and was reaffirmed this status on June 28, 2005. The Evolutionary Significant Unit (ESU) includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California, as well as two artificial propagation programs: winter-run Chinook from the Livingston Stone National Fish Hatchery (NFH), and winter run Chinook in a captive broodstock program maintained at Livingston Stone NFH and the University of California Bodega Marine Laboratory. A final designation of its critical habitat status was made on June 16, 1993.

Under Section 7 of the ESA, federal agencies are required to ensure that their actions are not likely to result in the destruction or adverse modification of a listed species' critical habitat. Critical habitat for the winter-run Chinook salmon is defined to occur in the Sacramento River from Keswick Dam (river mile [RM] 302) to Chipps Island (RM 0) in the Delta. Also included are waters west of the Carquinez Bridge, Suisun Bay, San Pablo Bay, and San Francisco Bay north of the Oakland Bay Bridge.[84]

Adult winter-run Chinook salmon immigration (upstream spawning migration) through the Delta and into the lower Sacramento River occurs from December through July, with peak immigration during the period January through April.[85] Winter-run Chinook salmon primarily spawn in the main-stem Sacramento River between Keswick Dam (RM 302) and Red Bluff Diversion Dam (RM 258). Winter-run Chinook salmon spawn between late-April and mid-August, with peak spawning generally occurring in June.

Winter-run Chinook salmon fry rearing in the upper Sacramento River exhibit peak abundance during September, with fry and juvenile emigration past Red Bluff Diversion Dam occurring from August through March.[86] Emigration (downstream migration) of winter-run Chinook salmon juveniles past Red Bluff Diversion Dam is believed to peak during September and October,[87] with abundance of juveniles in the Delta generally peaking during February, March, or April.[88] Additional information on the life history and habitat requirements of winter-run Chinook salmon is contained in the NOAA Fisheries Biological Opinion for this species, which was developed to specifically evaluate impacts on winter-run associated with CVP and SWP operations.[89]

Spring-run Chinook Salmon

Spring-run Chinook salmon was listed as threatened under the federal ESA on September 16, 1999 and reaffirmed as threatened on June 28, 2005. Its habitat was designated as critical habitat on September 5, 2005 with an effective date of January 2, 2006. Spring-run Chinook salmon enter the

84 National Marine Fisheries Service, *Biological Opinion on the Winter-run Chinook Salmon*, 1993.
85 U.S. Fish and Wildlife Service, *Draft Anadromous Fish Restoration Plan*, 1995.
86 U.S. Bureau of Reclamation, *Biological Assessment for U.S. Bureau of Reclamation, Central Valley Operations*, 1992.
87 R.J. Hallock and F.W. Fisher, *Status of the Winter-run Chinook Salmon (Onchorynchus tshawytscha) in the Sacramento River*, 1985.
88 D. Stevens, “When do winter-run Chinook salmon smolts migrate through the Sacramento-San Joaquin Delta?”, unpublished memorandum, 1989.
89 National Marine Fisheries Service, *Biological Opinion on the Winter-run Chinook Salmon*, 1993.

Sacramento River during the period late March through September,[90] but peak abundance of immigrating adults in the Delta and lower Sacramento River occurs from April through June.[91] Adult spring-run Chinook salmon hold in areas downstream of spawning grounds during the summer months until their eggs fully develop and become ready for spawning. This is the primary characteristic distinguishing the spring-run from the other runs of Chinook salmon. Spring-run Chinook salmon spawn primarily upstream of Red Bluff Diversion Dam, and in several upper Sacramento River tributaries (e.g., Mill and Deer creeks). Spawning has been reported to primarily occur during mid-August through early October.[92] The timing of juvenile emigration from the spawning and rearing grounds varies among the tributaries of origin, and can occur during the period November through June.

Late Fall-run Chinook Salmon

Late fall-run Chinook salmon did not warrant listing under the federal ESA on September 16, 1999, but was classified as a Species of Concern on April 15, 2005. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River Basins and their tributaries, east of Carquinez Strait, California.

Adult immigration of late fall-run Chinook salmon in the Sacramento River generally begins in October, peaks in December, and ends in April.[93] Primary spawning grounds for late fall-run Chinook salmon are in tributaries to the upper Sacramento River (e.g., Battle, Cottonwood, Clear, and Mill creeks), although late fall-run Chinook salmon are believed to return to the Feather and Yuba rivers as well.[94] Spawning in the main-stem Sacramento River occurs primarily from Keswick Dam (RM 302) to Red Bluff Diversion Dam (RM 258), and generally occurs from December through April.[95] Post-emergent fry and juveniles emigrate from their spawning and rearing grounds in the upper Sacramento River and its tributaries during the period May through November. Juveniles emigrate through the Delta primarily during the period October through December.[96]

Fall-run Chinook Salmon

Similar to late fall-run Chinook salmon, the fall-run also did not warrant listing under the federal ESA as of September 16, 1999, but was also classified as a Species of Concern late on April 15, 2005. The ESU includes all naturally spawned populations of fall-run Chinook salmon in the Sacramento and San Joaquin River Basins and their tributaries, east of Carquinez Strait, California.

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90 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.

91 U.S. Fish and Wildlife Service, *Technical/Agency Draft Sacramento-San Joaquin Delta Native Fishes Recovery Plan*, 1994a.

92 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.

93 U.S. Bureau of Reclamation, Appendices to *Shasta Outflow Temperature Control Planning Report/Environmental Statement, Part I – Fisheries*, 1991b.

94 U.S. Fish and Wildlife Service, *Technical/Agency Draft Sacramento-San Joaquin Delta Native Fishes Recovery Plan*, 1994a.

95 U.S. Bureau of Reclamation, Appendices to *Shasta Outflow Temperature Control Planning Report/Environmental Statement, Part I – Fisheries*, 1991b.

96 U.S. Fish and Wildlife Service, *Technical/Agency Draft Sacramento-San Joaquin Delta Native Fishes Recovery Plan*, 1994a.

The fall run of Chinook salmon is currently the largest run of Chinook salmon in the Sacramento River system, and the primary run of Chinook salmon using the lower American River. Fall-run Chinook salmon represent the greatest percentage of all four runs, and consequently, they continue to support commercial and recreational fisheries of significant economic importance.

In general, adult fall-run Chinook salmon migrate into the Sacramento River and its tributaries from July through December, with immigration peaking from mid-October through November.[97] Fall-run Chinook salmon spawn in numerous tributaries of the Sacramento River, including the lower American River, lower Yuba River, Feather River, as well as tributaries to the upper Sacramento River. The majority of main-stem Sacramento River spawning occurs between Keswick and Red Bluff Diversion dams. A greater extent of fall-run spawning (relative to the other three runs) occurs below Red Bluff Diversion Dam, with limited spawning potentially occurring as far downstream as Princeton (RM 163).[98] Spawning generally occurs from October through December, with fry emergence typically beginning in late December and January. Fall-run Chinook salmon emigrate as post-emergent fry, juveniles, and as smolts after rearing in their natal streams for up to six months. Consequently, fall-run emigrants may be present in the lower American and Sacramento rivers from January through June,[99,100] and remain in the Delta for variable lengths of time prior to ocean entry.

As fall-run Chinook salmon occur within the local study area and are a species of primary management concern in the lower American River, additional life history and environmental requirement information pertaining more specifically to the lower American River fall-run population is provided below.

Adult Chinook salmon begin entering the lower American River annually in August and September, with immigration continuing through December in most years and January in some years. Both historic (fish passage at Old Folsom Dam, 1944-46) and more contemporary (creel survey, 1991-94) data indicate that adult Chinook salmon arrivals in the lower American River peak in November, and that typically greater than 90 percent of the run has entered the river by the end of November.[101]

Once in the lower American River, the timing of adult Chinook salmon spawning activity is strongly influenced by water temperature. When daily average water temperatures decrease to approximately 60°F, female Chinook salmon begin to construct nests (redds) into which their eggs (simultaneously fertilized by the male) are eventually released. Fertilized eggs are subsequently buried with streambed gravel. Due to the timing of adult arrivals and occurrence of appropriate spawning temperatures, spawning activity in recent years (i.e., 1991-1993) has peaked during mid- to late-November.[102] These same studies indicated that approximately 98 percent of all redds

97 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*,1990.

98 Burmester, personal communication, 1996.

99 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990

100 B. Herbold, A.D. Jassby and P.B. Moyle, *Status and Trends Report on the Aquatic Resources in the San Francisco Estuary, San Francisco Estuary Project Public Report*, 1992.

101 CDFG 1992, 1993, 1994, 1995.

102 CDFG 1992, 1993a, 1995.

observed during these years were located between Watt Avenue (RM 9.5) and Nimbus Dam (RM 23).

Egg incubation survival rates are dependent on water temperature and intragravel water movement. CDFG reported egg mortalities of 80 percent and 100 percent for Chinook salmon at water temperatures of 61°F and 63°F, respectively.[103] Egg incubation survival is highest at water temperatures at or below 56°F.

Fall-run Chinook salmon emigrate from the lower American River during two distinct time periods. The primary period of emigration occurs from mid-February through early March. The remaining fry rear in the lower American River where they feed and grow for up to 6 months, prior to emigrating as juveniles or smolts through June. Emigration surveys conducted by CDFG have shown no evidence that peak emigration of Chinook salmon is related to the onset of peak spring flows.[104] Temperatures required during emigration are believed to be about the same as those required for successful rearing.

Water temperatures between 45°F and 58°F have been reported to be optimal for rearing of Chinook salmon fry and juveniles.[105,106] Raleigh et al. reviewed the available literature on Chinook salmon thermal requirements and suggested a range of approximately 53.6°F to 64.4°F as suitable rearing temperatures, and 75°F as an upper limit.[107] Lower American River water temperatures at Watt Avenue generally range from about 46°F to 60°F during the period December through April, and from 60°F to 69°F during the months of May and June. The 69-year average (1922-1990) water temperatures at Watt Avenue, as indicated by the Reclamation's Lower American River Temperature Model under existing hydrology, are 61.7°F in May and 65.9°F in June. Hence, average May and June river temperatures at Watt Avenue are currently at the upper end of the suitable range of Chinook salmon rearing temperatures, as defined above.

Central Valley Steelhead (*Oncorhynchus mykiss*)

Central Valley steelhead (hereinafter, simply referred to as steelhead) was listed as threatened under the federal ESA on March 19, 1998. Its threatened status was reaffirmed on January 5, 2005. The final designation of its critical habitat status was made on September 2, 2005 with an effective date of January 2. 2006. The Distinct Population Segment (DPS) includes all naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs: the Coleman NFH, and Feather River Hatchery steelhead hatchery programs.

Steelhead are the anadromous form of rainbow trout. Adult steelhead migrate through the Sacramento River system beginning in August and continue through March. Adult steelhead return

103 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.
104 Snider et al. 1997.
105 Reiser and Bjornn 1979.
106 Rich 1987.
107 Raleigh et al. 1986.

to their spawning grounds in the upper Sacramento River and tributaries (the lower American River). Steelhead also are produced at the Coleman Fish Hatchery on Battle Creek, the Nimbus Hatchery on the American River, and the Feather River Hatchery on the Feather River.[108] Spawning generally occurs from January through April.[109] Juvenile steelhead rear in their natal streams for one to two years prior to emigrating from the river. Emigration of one- to two-year-old fish primarily occurs from April through June.[110,111]

The lower American River steelhead population is believed to be supported primarily by fish produced at the Nimbus Hatchery. Adult steelhead immigration into the lower American River typically begins in November and continues into April. The steelhead spawning immigration generally peaks during January.[112,113] Optimal immigration temperatures have been reported to range from 46°F to 52°F.[114]

Spawning usually begins during late-December and may extend through March, but can range from November through April.[115] Optimal spawning temperatures have been reported to range from 39°F to 52°F.[116] Unlike Chinook salmon, not all steelhead die after spawning. Those that do not die return to the ocean after spawning, and may return to spawn again in future years. The egg and fry incubation lifestage for steelhead in the lower American River typically extends from December through May.

Fry emergence from the gravel generally begins in March and occurs through June, with peak emergence occurring during April.[117,118,119] Optimal egg and fry incubation temperatures have been reported to range from 48°F to 52°F.[120] Optimal temperatures for fry and juvenile rearing is reported to range from 45°F to 60°F.[121] As with Chinook salmon, it is believed that temperatures up to 65°F are suitable for steelhead rearing, with each degree increase between 65°F and the upper lethal limit of 75°F[122] being increasingly less suitable and thermally more stressful.

108 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.
109 McEwan, personal communication, 1997.
110 F.L. Reynolds, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.
111 McEwan, personal communication, 1997.
112 California Department of Fish and Game, *Endangered and Threatened Animals of California*, 1986.
113 California Department of Fish and Game, unpublished data.
114 California Department of Fish and Game 1991.
115 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.
116 California Department of Fish and Game 1991.
117 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.
118 Snider and Titus 1996.
119 California Department of Fish and Game, unpublished data.
120 CDFG 1991.
121 CDFG 1991.
122 Bovee 1978.

American Shad (*Alosa sapidissima*)

American shad occur in the Sacramento River, its major tributaries (including the lower American River), and the Delta. A popular sport fishery for American shad exists annually in the Sacramento River and certain tributaries, including the lower American River.[123]

Adult American shad typically enter the lower American River from April through early July,[124] with the spawning migration peaking from mid-May through June.[125] Water temperature is an important factor influencing the timing of spawning. American shad are reported to spawn at water temperatures ranging from approximately 46°F to 79°F,[126] although optimal spawning temperatures are reported to range from about 60ºF to 70°F.[127,128,129,130,131]

Based on their 1990 field investigation, Jones and Stokes Associates (1990) reported that water velocity was the most important physical variable determining shad spawning habitat preference in the lower Yuba River, followed by depth and water temperature. In contrast to salmonids, distributions of spawning virgin shad are determined by river flow rather than homing behavior.[132] Substrate and cover played no apparent role in habitat selection. Snider and Gerstung recommended flow levels of 3,000 to 4,000 cfs in the lower American River during May and June as sufficient attraction flows to sustain the river's American shad fishery.[133] When suitable spawning conditions are found, American shad school and broadcast their eggs throughout the water column.

Based on laboratory experiments conducted on American shad incubation, Walburg and Nichols concluded that temperatures suitable for normal egg development ranged from about 54°F to 70°F.[134] These investigators further reported that eggs hatched in 3 to 5 days at 68°F to 74°F and in 4 to 6 days at temperatures of 59°F to 64.4°F. Egg incubation and hatching, therefore, are coincident with the primary spawning period (i.e., May through June). A large percentage of the eggs spawned in the lower American River probably do not hatch until they have drifted downriver and entered the Sacramento River.[135] Few juvenile American shad have been collected in the lower

123 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.
124 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.
125 California Department of Fish and Game, *Requirements of American Shad in the Sacramento-San Joaquin River System, Exhibit 23, State Water Resources Control Board 1987 Water Quality/Water Rights Proceeding on the San Francisco Bay/Sacramento-San Joaquin Delta*, 1987.
126 U.S. Fish and Wildlife Service, *Special Scientific Report Fisheries No. 550, Biology and Management of the American Shad and Status of the Fisheries, Atlantic Coast of the U.S.*, 1967.
127 Leggett and Whitney 1972.
128 Painter et al. 1978.
129 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.
130 Bell 1986.
131 Rich 1987.
132 Painter et al. 1978.
133 W.M. Snider and E. Gerstung, *Instream Flow Requirement of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California, California Department of Fish and Game Stream Evaluation Report*, 1986.
134 Walburg and Nichols 1967.
135 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

American River.[136] Therefore, the presence of American shad in the lower American River is primarily restricted to adult immigration, spawning, and fry lifestages.

Striped Bass (*Morone saxatilis*)

Striped bass occur in the Sacramento River, its major tributaries (including the lower American River), and the Delta. Substantial striped bass spawning and rearing occurs in the Sacramento River and Delta. Year-class strength of striped bass in the Delta has been correlated with survival and growth during the first 60 days after hatching. The abundance of young striped bass, in turn, was positively correlated with freshwater outflow from the Delta, and negatively correlated with the percentage of Delta inflow diverted from Delta channels during spring and early summer by the CVP and SWP.[137]

Adult striped bass are present in the lower American River throughout the year,[138] with peak abundance occurring during the summer months.[139,140] No studies have definitively determined whether striped bass spawn in the lower American River.[141,142] However, the scarcity of sexually ripe adults among sport-caught fish indicates that minimal, if any, spawning occurs in the lower American River, and that adult fish which entered the river probably spawned elsewhere or not at all.[143] The number of striped bass entering the lower American River during the summer is believed to vary with flow levels and food production.[144] Snider and Gerstung suggested that flows of 1,500 cfs at the mouth during May and June would be sufficient to maintain the striped bass fishery in the lower American River.[145] However, these investigators reported that, in any given year, the population level of striped bass in the Delta was probably the greatest factor determining the relative number of striped bass occurring in the lower American River. Most striped bass spawning is believed to occur in the Sacramento River and Delta. The majority of Sacramento River spawning occurs in the lower Sacramento River, downstream of RM 140 (USFWS 1988).

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136 California Department of Fish and Game, *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.

137 USFWS 1988.

138 R. W. DeHaven, *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 2*, 1977.

139 R. W. DeHaven, *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California*, 1977, and *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 4*, 1979.

140 California Department of Fish and Game, *A Report to the State Water Resources Control Board on the Fish and Wildlife Resources of the American River to be Affected by the Auburn Dam and Reservoir and the Folsom-South Canal and Measures Proposed to Maintain These Resources*, 1971.

141 California Department of Fish and Game, *A Report to the State Water Resources Control Board on the Fish and Wildlife Resources of the American River to be Affected by the Auburn Dam and Reservoir and the Folsom-South Canal and Measures Proposed to Maintain These Resources*, 1971.

142 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

143 R. W. DeHaven, *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California*, 1977, and *An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 3*, 1978.

144 California Department of Fish and Game, *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

145 W. M. Snider and E. Gerstung, *Instream Flow Requirement of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California, California Department of Fish and Game Stream Evaluation Report*, 1986.

The lower American River apparently is a nursery area for young striped bass (CDFG 1971; 1986). Numerous schools of 5- to 8-inch-long fish have been reported in the river during the summer months (CDFG 1971). In addition, juvenile and sub-adult fish have been reported to be abundant in the lower American River during the fall (DeHaven 1977). Optimal water temperatures for juvenile striped bass rearing has been reported to range from approximately 61°F to 71°F (USFWS 1988).

Sacramento Splittail *(Pogonichthys macrolepidotus)*

Sacramento splittail were listed as threatened under the federal ESA on February 8, 1999. On September 22, 2003, USFWS delisted it. Splittail are currently listed as a State species of special concern. Splittail are members of the minnow family (*Cyprinidae*), achieving lengths of up to about 16 inches.

Adult splittail usually reach sexual maturity in their second year, and migrate upstream in the late fall to early winter prior to spawning activities. Spawning occurs from mid-winter through July in water temperatures between 9-20°C (48-68°F) (Wang 1986) at times of high winter or spring runoff (DWR 1994a). Splittail prefer to spawn over flooded streambank vegetation or beds of aquatic plants, and the timing of their upstream movements and spawning corresponds to the historically high-flow period associated with snowmelt and runoff each spring. Water temperature and photoperiod also influence the timing of spawning.

Historically, splittail could be found in the upper reaches of the Sacramento River. Today, Red Bluff Diversion Dam appears to be a complete barrier to upstream movement (CDFG 1989). The presence of splittail in the Sacramento River and its tributaries (including the lower American River) is believed to be largely restricted to their upstream and downstream movements associated with spawning. Juvenile splittail are not believed to use the Sacramento River or its tributaries for rearing to a great extent (USFWS 1994a). Downstream emigration into the Delta is believed to peak during the period April through August (Meng and Moyle 1995).

Low numbers of splittail have been collected in the lower American River. CDFG has conducted fish sampling surveys on the lower American River annually from 1991 through 1995 (Brown et al. 1992; Snider and McEwan 1993; Snider and Keenan 1994; Snider and Titus 1994; Snider and Titus 1996). The fish sampling surveys were conducted from approximately January through June, when adult and larval splittail would likely be in the river. Splittail were collected in very low numbers, primarily at the lowest sampling station located downstream of Interstate Business 80 (RM 4) (Brown et al. 1992). All splittail captured in 1991 were young-of-the-year. Only two splittail have been captured above RM 9.

Hardhead (*Mylopharodon conocephalus)*

Hardhead is a large (occasionally exceeding 600 mm standard length), native cyprinid species that generally occurs in large, undisturbed low- to mid-elevation rivers and streams of the region (Moyle 1976). They are widely distributed throughout the Sacramento-San Joaquin River system. Spawning migrations, which occur in the spring, into smaller tributary streams are common. The spawning season may extend into August in the foothill streams of the Sacramento and San Joaquin river basins. Little is known about lifestage-specific temperature requirements of hardhead;

however, temperatures ranging from approximately 65°F to 75°F are believed to be suitable (Cech et al. 1990). Hence, this species has greater thermal tolerance compared to that of the anadromous salmonids discussed above.

Delta Smelt (*Hypomesus transpacificus*)

The USFWS listed delta smelt as a threatened species under the ESA in March 1993 (CFR 58 12854), and critical habitat for delta smelt was designated on December 19, 1994. Delta smelt also is listed as threatened under the CESA.

Delta smelt is a short-lived, slender-bodied, translucent fish endemic to the Delta. Adult size is typically 60-70 mm, although some individuals as large as 120 mm standard length have been recorded (USFWS 1994a). As a euryhaline species, delta smelt can tolerate wide-ranging salinities, but rarely occur in waters with salinities greater than 10-14 ppt. Historically, they have been abundant in low (around 2 ppt) salinity habitats. Delta smelt typically live for only one year but some can live for two years. At all life stages they are found in greatest abundance in the top two meters of the water column and usually not in close association with the shoreline, inhabiting open surface water of the Delta and Suisun Bay. Critical thermal maximum for delta smelt, the temperature at which smelt can no longer survive as determined by laboratory studies, is 25.4°C (plus or minus 1.7°C).

Critical habitat for delta smelt is defined (USFWS 1994c) as:

> "Areas and all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma Sloughs; and the existing contiguous waters contained within the Delta."

When not spawning, adult delta smelt tend to concentrate just upstream from the entrapment zone (the saltwater-freshwater interface) (USFWS 1994a), the location of which varies daily, seasonally, and annually in response to tidal action and the volume of freshwater inflow to the Delta. Adults migrate from brackish water areas to freshwater areas to spawn during the winter. The adult migration may begin in October and continue through April, but movement peaks during the period December through April (USFWS 1994a). The adults and young-of-the-year remain in the spawning areas until late summer, when they begin emigrating downstream. In the Sacramento River, delta smelt have been found as far upstream as the confluence with the American River (USFWS 1994a). Delta smelt lay adhesive eggs that are believed to attach to tree limbs or small rocks. Eggs hatch after approximately 11-13 days and smelt become free-floating larvae. The larvae are difficult to detect with fish sampling gear and are not detectable in the standard fish salvage sampling at the CVP and SWP fish facilities.

In drier years, spawning is often concentrated on the Sacramento River side of the Delta, especially near the Cache Slough area. In wetter years, spawning is widespread and can occur as far west as the Napa River, as it did during 1997. A large young-of-the-year delta smelt population often results in higher "take" at the CVP and SWP pumping facilities.

Stressors for delta smelt and longfin smelt include several factors related to entrainment, species production, habitat quality/availability, as well as other factors. Entrainment concerns include those for CVP/SWP facilities, DWR-owned diversions, Reclamation owned diversions, private diversions (e.g., Contra Costa Water District), Mirant Pittsburg and Contra Costa power plants, and North Bay Aqueduct. Factors concerning species production include: insufficient food supplies/location, reduced suitable spawning habitat, reduced suitable rearing habitat, reduced seasonal availability of adult habitat, competition, water quality problems (e.g., reduced DO, seasonal salinity gradients, and TSS), and levee construction/island reclamation. Habitat quality and availability issues involve; sediment input, reclamation/land conversions, agricultural/urban development, reduced seasonal transport flows, reduced upstream attraction flows, reduced riparian vegetation, channelized riprap levees, expansion of non-native species (e.g., *Egeria*), upstream impoundment storage, flood control operations, and island subsidence. Other sources of mortality that have been noted include; CVP/SWP salvage, Clifton Court predation, exposure to toxics, predation, propeller entrainment, harvest, illegal harvest, and disease.

Continued challenges will be faced by fisheries managers as they strive to understand and better manage to increase the resilience of this species. Facing them will be several factors including; reduced genetic integrity and diversity, reduced population abundance, reduced population geographic distribution, reduction in independent populations, adaption to variability, reductions in habitat diversity, frequency of chaotic events, changes in long-term seasonal hydrology (i.e., from climate-induced changes – diminishing snowpack and shifts in precipitation events), and potential future sea level rise.

CDFG conducts four types of monitoring surveys through the year to determine distribution of juvenile, sub-adult and adult delta smelt. In two cases, abundance indices have been calculated historically. These indices provide an indication of general trends in smelt abundance over the years. The abundance indices also provide an indication of the year to year trends in smelt abundance based on the number of fish caught in each survey.

Two of these monitoring surveys, the Fall Mid-Water Trawl and the Summer Tow Net Survey, have been conducted since the 1960s. These surveys are undertaken in a consistent manner each year allowing for effective trend analysis over time. Such data, however, are not indicative of actual population estimates, which would have to make assumptions about the effectiveness of the sampling equipment, distribution of smelt, volume of water sampled by the equipment, and other factors. To date, it has been difficult to garner scientific consensus regarding these assumptions.

In addition to the surveys, the number of fish salvaged at the CVP and SWP facilities may provide an indication of the presence of delta smelt in the south Delta channels. However, the SWP has the 31,000 AF maximum capacity Clifton Court Forebay in front of its Harvey O. Banks (Banks) Pumping Plant, while the CVP William Jones (Jones) Pumping Plant and salvage facilities divert directly from the south Delta channels. Accordingly, the CVP facility is, in many ways, more reliable as a sampling “instrument” of the south Delta channels than the SWP facility, especially in June and July. Delta smelt may spawn in the Clifton Court Forebay or, juveniles may move into the Forebay earlier in the year and, therefore, the juveniles salvaged at the SWP facility in June and July may reflect those fish already in the Clifton Court Forebay and not those from the south Delta channels.

The CDFG sample adult delta smelt from mid-January into April or May as part of their Spring Kodiak Trawl survey. Sampling is conducted every other week, taking four to five days and sampling some 39 stations (from the Napa River to Stockton on the San Joaquin River, and to Walnut Grove on the Sacramento River).

The CDFG's 20 mm survey provides information of the distribution and relative abundance of post-larval and juvenile delta smelt at up to 41 locations throughout their historical range from March through June, or July. The surveys take eight to ten days and are conducted bi-weekly. The sampling equipment is designed to detect juveniles between 20 mm and 50 mm in length.

Green Sturgeon (*Acipenser medirostris)*

NOAA's Fisheries received a petition in June 2001 from several environmental organizations requesting that the agency list the north American green sturgeon (*Acipenser medirostris*) under the federal ESA. On January 29, 2003, NOAA Fisheries announced its determination that listing green sturgeon was not warranted at that time. However, due to the remaining uncertainties that existed at the time about the population structure and overall status of the species, NOAA Fisheries added two distinct population segments of green sturgeon to its list of candidate species. On April 6, 2005, the species was proposed for listing by NOAA Fisheries as threatened under the federal ESA. This included only those species south of the Eel River, California (the southern DPS). This species was listed a year later on April 7, 2006, when the southern DPS was listed as threatened under the federal ESA. On September 8, 2008, NOAA Fisheries proposed to designate critical habitat for the southern DPS; the comment period on this proposal closed on December 22, 2008.

Green sturgeon is an anadromous species, migrating from the ocean to freshwater to spawn. They exist in the Sacramento River system, as well as in the Eel, Mad, Klamath, and Smith rivers in the northwest portion of California. Adults of this species tend to be more marine than the more common white sturgeon. Nevertheless, spawning populations have been identified in the Sacramento River (Beak Consultants 1993), and most spawning is believed to occur in the upper Sacramento River. Fertilization of eggs occurs in the water column of relatively fast-flowing rivers (Emmett et al. 1991 *in* Moyle et al. 1992). In the Sacramento River, green sturgeon presumably spawn at temperatures ranging from 46°F to 57°F (Beak Consultants 1993). Small numbers of juvenile green sturgeon have been captured and identified each year from 1993 through 1996 in the Sacramento River at the Hamilton City Pumping Plant (RM 206) (Brown, pers. comm. 1996). Lower American River (Gerstung 1977), fish surveys conducted by the CDFG in recent years have not collected green sturgeon (Snider, pers. comm. 1997).

Longfin Smelt (*Spirinchus thaleichthys)*

On April 8, 2009, the USFWS announced that the Bay-Delta population of longfin smelt does not meet the legal criteria for protection as a species subpopulation under the federal ESA. The 2007 petition specifically asked to list as a DPS only the population that lives in Bay-Delta. The petition asserted that the Bay-Delta longfin smelt are physically isolated, genetically different, and live in a unique setting.

Longfin smelt is also a euryhaline species. This is particularly evident in the Delta where they are found in areas ranging from almost pure seawater upstream to areas of pure freshwater. In this system, they are most abundant in San Pablo and Suisun bays (Moyle 1976). The longfin smelt spends the early summer in San Pablo and San Francisco bays, generally moving into Suisun Bay in August. Spawning occurs in the winter months when this species congregates in upper Suisun Bay and the upper reaches of the Delta (Moyle 1976). Young longfin smelt move downstream and back into the bays in April and May (Ganssle 1966).

4.6.3. Potentially Affected Waterbodies

Shasta, Keswick, and Trinity Reservoirs

Shasta Reservoir is a deep reservoir supporting a wide variety of cold and warmwater fish species. Fish inhabiting the reservoir include several species of trout, landlocked salmon, Sacramento sucker, Sacramento squawfish, largemouth and smallmouth bass, channel catfish, white catfish, threadfin shad, and common carp. Water surface elevations in this reservoir generally fluctuate by approximately 55 feet over the course of a year. The reservoir's littoral (i.e., nearhshore shallows) habitats are often subject to physical perturbations caused by the water surface fluctuations and shoreline wave action resulting from wind and boating activities.

Keswick Reservoir, the area between Shasta and Keswick dams, serves as a regulating afterbay for Shasta Reservoir. It is characterized as a coldwater impoundment that supports a rainbow and brown trout sport fishery. Keswick Dam is a complete barrier to the upstream migration of anadromous fish in the Sacramento River. Some of the migrating anadromous fish impeded at the dam are captured in a fish trap at the dam and transported to the Coleman National Fish Hatchery located on Battle Creek (southeast of the town of Anderson).

Trinity Reservoir, an impoundment resulting from Trinity Dam, lies on the Trinity River. A portion of the water from this reservoir is directed through the Clear Creek Tunnel into Whiskeytown Reservoir and then into Keswick Reservoir. This water mixes with water from Shasta Reservoir and is released in the Sacramento River from Keswick Dam. Trinity Reservoir supports both warm- and coldwater fish species. Common species include smallmouth bass, largemouth bass, white catfish and rainbow trout.

Figure 4.6-1, Potentially Affected Reservoirs, Rivers and the Delta, shows the geographic extent of the various waterbodies and watercourses that make up, essentially, the CVP/SWP and support fisheries that could be affected by the Proposed Action and its alternatives. As noted in previous discussions regarding the hydrologic impact framework, the upper Sacramento River basin reservoirs (e.g., Shasta) are an integral component of the CVP and play an important role in coordinated CVP/SWP operations, including those as geographically distant as the Bay-Delta. Operations (i.e., coldwater pool management, flow releases, storage forecasts, etc.) in these reservoirs represent an important means of gauging downstream fisheries protection.

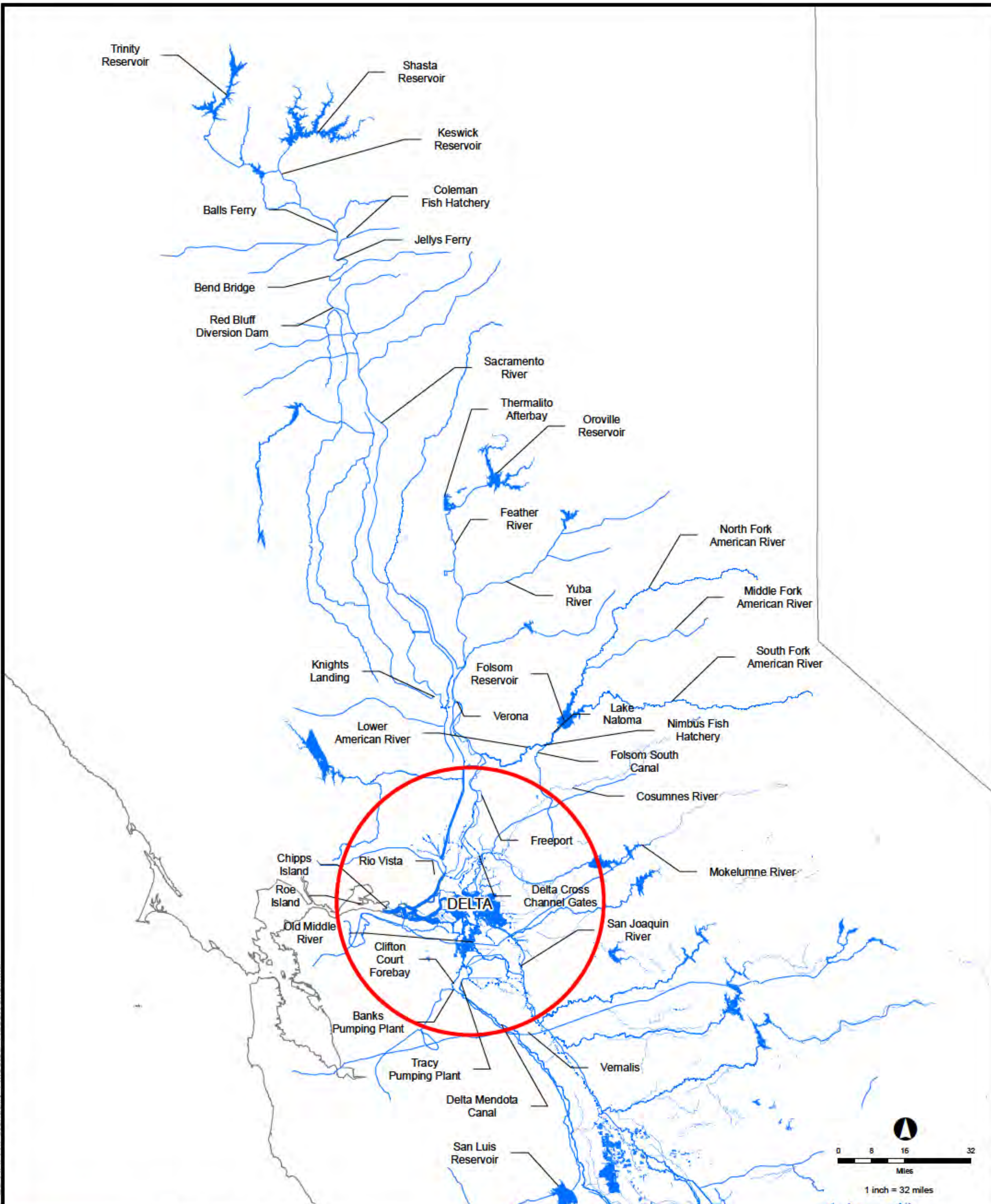

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Figure 4.6-1
Potentially Affected Reservoirs, Rivers, and the Delta

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Upper Sacramento River

The upper Sacramento River is often defined as the portion of the river from Princeton (RM 163), the downstream extent of salmonid spawning in the Sacramento River and Keswick Dam, the upstream extent of anadromous fish migration. The Sacramento River serves as an important migration corridor for anadromous fish moving between the ocean and/or Delta and their upper river/tributary spawning and rearing areas. The upper Sacramento River is differentiated from the river's "headwaters", which lie upstream of Shasta Reservoir. The upper Sacramento River provides a diversity of aquatic habitats, including fast-water riffles and shallow glides, slow-water deep glides and pools, and off-channel backwater habitats.

In excess of 30 species of fish are known to use the upper Sacramento River. Of these, a number of both native and introduced species are anadromous. Anadromous species include Chinook salmon, steelhead, green and white sturgeon, striped bass and American shad. The upper Sacramento River is of primary important to native anadromous species, and is presently utilized for spawning and early-life-stage rearing, to some degree, by all four runs of Chinook salmon (i.e., fall, late-fall, winter, and spring-runs) and steelhead. Consequently, various life stages of the four races of Chinook salmon and steelhead can be found in the upper Sacramento River throughout the year. Other Sacramento River fishes are considered resident species, which complete their life cycle entirely within freshwater, often in a localized area. Resident species include rainbow and brown trout, largemouth and smallmouth bass, channel catfish, sculpin, Sacramento squawfish, Sacramento sucker, hardhead, and common carp.

An important component of aquatic habitat throughout the Sacramento River system is referred to as Shaded Riverine Aquatic Cover (SRAC). SRAC consists of the portion of the riparian community that directly overhangs or is submerged in the river. SRAC provides high value feeding and resting areas and escape cover for juvenile anadromous and resident fishes. SRAC can also provide some degree of local temperature moderation during the summer months due to the shading it offers nearshore habitat areas. The importance of SRAC to Chinook salmon has been known for many years. In early summer, juvenile salmon have been found almost exclusively in areas of SRAC, with none observed in nearby rip-rapped areas.

Lower Sacramento River

The lower Sacramento River is generally defined as that portion of the river from Princeton to the Delta, at approximately Chipps Island (near Pittsburg). The lower Sacramento River is predominantly channelized, leveed and bordered by agricultural lands. Aquatic habitat in the lower Sacramento River is characterized primarily by slow-water glides and pools, is depositional in nature, and has reduced water clarity and habitat diversity, relative to the upper portion of the river. Much of the embankment is rip-rapped; this is where much of the current levee improvement work being undertaken by the Department of Water Resources and Corps of Engineers is focused.

Many of the fish species utilizing the upper Sacramento River also use the lower river to some degree, even if only as a migratory corridor to and from upstream spawning and rearing grounds. For example, adult Chinook salmon and steelhead primarily use the lower river as an immigration route to upstream spawning habitats and an emigration route to the Delta. The lower river is also used by other fish species (e.g., Sacramento splittail and striped bass) that make little to no use of the upper river (i.e., upstream of RM 163). Overall, fish species composition in the lower river is quite similar to that of the upper Sacramento River and includes resident and anadromous cold- and warmwater species. Many fish species that spawn in the Sacramento River and its tributaries depend on river flows to carry their larval and juvenile life stages to downstream nursery habitats. Native and introduced warmwater fish species primarily use the lower river for spawning and rearing, with juvenile anadromous fish species also using the lower river, to some degree, for rearing.

Sacramento-San Joaquin River Delta (Delta)

The Delta, along with San Francisco Bay, comprise the largest estuary on the western coast of the U.S. Its importance to fisheries resources is supported by the over 120 fish species that rely on its unique habitat characteristics for one or more of their life-stages (e.g., spawning, out-migration, immigration spawning corridor, over-summer rearing, etc.). Fish species found in the Delta include anadromous species, as well as freshwater, brackish water, and saltwater species. Delta inflow and outflow are important for species residing primarily in the Delta (e.g., delta smelt and longfin smelt) as well as juveniles of anadromous species (e.g., Chinook salmon) that rear in the Delta prior to ocean entry. Seasonal Delta inflows affect several key ecological processes, including; 1) the migration and transport of various life stages or resident and anadromous fishes using the Delta, 2) salinity levels at various locations within the Delta as measured by the location of X2 (i.e., the position in kilometers eastward from the Golden Gate Bridge of the 2 ppt near-bottom isohaline), and 3) the Delta’s primary (phytoplankton) and secondary (zooplankton) production.

Middle Fork American River

The Middle Fork American River supports both warm- and coldwater fish species year-round. Operation of PCWA’s MFP, constructed in 1962 (including Ralston Afterbay), results in cooler summer and fall water temperatures, thereby improving habitat suitability for rainbow trout and brown trout for a portion of the river below Ralston Afterbay.[146,147] Brown trout are resident stream fish, meaning they spend their entire lifecycle in fresh water as distinct from anadromous fish. Spawning generally occurs during November and December.[148] Brown trout fry typically hatch in seven to eight weeks, depending on water temperature, with emergence of young three to six weeks later.

Optimal riverine habitat for brown trout reportedly consists of cool to coldwater, silt-free rocky substrate, an approximate 1:1 pool-to-riffle ratio, and relatively stable water flow and temperature regimes (Raleigh et al. 1986). Moyle reported that while brown trout will survive for short periods at temperatures in excess of 80.6°F, optimum temperatures for growth range from 44.6°F to 66.2°F,

146 Corps 1994.
147 U.S. Bureau of Reclamation, 1996.
148 P.B. Moyle, *Inland Fishes of California*, 1976.

with a preference for temperatures in the upper half of this range.[149] Brown trout tend to utilize lower reaches of low to moderate gradient areas (less than one percent) in suitable, high gradient rivers.[150]

As with brown trout, rainbow trout also are resident stream fish whose optimal riverine habitat reportedly consists of coldwater, silt-free rocky substrate, a 1:1 pool-to-riffle ratio, and relatively stable water flow and temperature regimes (Raleigh and Duff 1980 *in* Raleigh et al. 1984). Moyle reported that while rainbow trout will survive temperatures up to 82.4°F, optimum temperatures for growth and completion of most lifestages reportedly range from 55.4°F to 69.8°F. Rainbow trout spawning generally occurs from February to June. Rainbow trout fry emerge from spawning nests approximately 45 to 75 days after spawning, depending on water temperatures.[151]

In addition to rainbow and brown trout, fish sampling surveys of the Middle Fork American River conducted by the USFWS in 1989 from Ralston Afterbay downstream to the confluence documented the presence of hitch (*Lavinia exilicauda)*, Sacramento sucker (*Catostomus occidentalis*), pikeminnow (*Ptychocheilus grandis*), and riffle sculpin (*Cottus gulosus*).[152] No federal- or state-listed species or species proposed for listing under the federal ESA and CESA are reported in the Middle Fork American River.

North Fork American River

Downstream of its confluence with the Middle Fork, the North Fork American River supports warmwater fish species year-round, including smallmouth bass (*Microprterus dolomieu*), pikeminnow, Sacramento sucker, riffle sculpin, brown bullhead (*Ictalurus nebulosus*), and green sunfish (*Lepomis cyanellus*). Although some rainbow and brown trout are present, summer and fall water temperatures are generally too warm for significant spawning and early-lifestage rearing of trout. The majority of trout that do occur in the North Fork American River below the Middle Fork American River are believed to be transitory downstream adult and/or sub-adult migrants that have dispersed into the area from upstream habitats (i.e., Middle Fork American River).

The PCWA American River Pump Station intakeis screened. Flat panels are recessed into the invert of the new diversion channel with wedge wire at 0.5 mm spacing.

Folsom Reservoir

In terms of aquatic habitat, the warm epilimnion of Folsom Reservoir provides habitat for warmwater fishes, whereas the reservoir's lower metalimnion and hypolimnion form a "coldwater pool" that provides habitat for coldwater fish species throughout the summer and fall portions of the year. Hence, Folsom Reservoir supports a “two-story” fishery during the stratified portion of the year (i.e., April through November), with warmwater species using the upper, warmwater layer and coldwater species using the deeper, colder portion of the reservoir.

149 P.B. Moyle, *Inland Fishes of California*, 1976.
150 Raleigh et al. 1986.
151 Raleigh et al. 1986.
152 Corps 1991.

Black bass, sunfish, and catfish constitute the primary warmwater sport fisheries of Folsom Reservoir. The reservoir's coldwater sport species include rainbow and brown trout (*Oncorhynchus mykiss* and *Salmo trutta*, respectively), kokanee salmon (*Oncorhynchus nerka*), and Chinook salmon (stocked). The reservoir's coldwater pool is important not only to the reservoir's coldwater fish species, but is also important to lower American River steelhead and fall-run Chinook salmon. Seasonal releases from the reservoir's coldwater pool provide thermal conditions in the lower American River that support annual in-river production of these salmonid species. Reduction of the reservoir's coldwater pool may reduce the volume of coldwater that is available to be released in any given year into the lower American River to benefit the river's steelhead and fall-run Chinook salmon populations. Folsom Reservoir's annual coldwater pool volume is not sufficiently large to facilitate coldwater releases during the warmest months (i.e., July through September) to provide maximum thermal benefits to lower American River steelhead and coldwater releases during October and November that would maximally benefit fall-run Chinook salmon immigration, spawning, and incubation. Consequently, optimal management of the reservoir's coldwater pool on an annual basis is essential in order to provide the optimal thermal benefits to both steelhead and fall-run Chinook salmon, within the constraints of annual coldwater pool availability. This has been discussed previously as part of Reclamation's coordination with the AROG.

Lower American River

The lower American River provides a diversity of aquatic habitats, including shallow, fast-water riffles, glides, runs, pools, and off-channel backwater ponds and related habitats. The lower American River from Nimbus Dam (RM 23) to approximately River Bend Park (RM 14) is primarily unrestricted by levees, but is bordered by some developments on high cliff scarps. The river along this reach is hydrologically controlled by natural bluffs and terraces cut into the side of the channel. The river reach downstream of River Bend Park, and extending to its confluence with the Sacramento River (RM 0) is bordered by levees. The historic construction of levees and, their continual improvements, have changed the natural channel geomorphology and have resulted in a reduction in current velocities and meanders, and an increase in overall stream length.

The river is utilized by over 30 species of fish, including numerous resident native and introduced species, as well as several anadromous species. A number of species are of primary management concern due either to their declining status or their importance to recreational and/or commercial fisheries. These include Chinook salmon (fall-run), steelhead, Sacramento splittail, striped bass and American shad.

Historically, the majority of fall-run Chinook salmon and steelhead spawning and rearing habitat within the American River was located in the watershed above what is now Folsom Dam. The lower American River currently provides spawning and rearing habitat for fall-run Chinook salmon and steelhead below Nimbus Dam. The majority of the steelhead run is believed to be of hatchery origin. However, with the exception of an emergency release during January 1997 due to poor water quality caused by flooding, no stocking of steelhead directly into the lower American River has occurred since 1990.

Current fall-run and Chinook salmon and steelhead production within the lower American River is believed to be limited, in part, by inadequate instream flow conditions and excessively high water temperatures during portions of their freshwater residency in the river. High water temperatures during the fall can delay the onset of spawning by Chinook salmon, and river water temperatures can become unsuitably high for juvenile salmon rearing during spring and steelhead rearing during summer. Relatively low October and November flows, when they occur, tend to increase the amount of fall-run Chinook salmon redd superimposition, thereby limiting initial year-class strength.

Lake Natoma

Lake Natoma was constructed to serve as a regulating afterbay for Folsom Reservoir. Consequently, water surface elevations in Lake Natoma fluctuate three to seven feet on a daily and weekly basis. During most of the year, Lake Natoma receives controlled releases from Folsom Reservoir. Due to its small size (i.e., operating range of 2,800 AF) and rapid turnover rate, the lake has relatively little influence on water flowing through it, with the possible exception of water temperature. As residence time in the lake increases during warm summer months, warming of water released from Folsom Reservoir increases. Water released is from Lake Natoma into the lower American River at Nimbus Dam.

Lake Natoma supports many of the same fisheries found in Folsom Reservoir (e.g., rainbow trout, bass, sunfish, and catfish). Some recruitment of warmwater and coldwater fishes likely comes from Folsom Reservoir. In addition, the CDFG stocks catchable-size rainbow trout into Lake Natoma annually. Although supporting many of the same fish species found in Folsom Reservoir, Lake Natoma's limited primary and secondary production, colder epilimnotic water temperatures (relative to Folsom Reservoir), and daily elevation fluctuations are believed to reduce the size and annual production of many of its fish populations, relative to Folsom Reservoir. Lake Natoma's characteristics, coupled with limited public access, result in its lower angler use compared to Folsom Reservoir.

Nimbus Fish Hatchery

The CDFG operates the Nimbus Salmon and Steelhead Hatchery and the American River Trout Hatchery, which are both located at the same facility immediately downstream from Nimbus Dam. This hatchery facility (henceforth, referred to as the Nimbus Hatchery) receives its water supply directly from Lake Natoma.

The Nimbus Hatchery is devoted to producing anadromous fall-run Chinook salmon and steelhead. Recent production goals have been 4 million smolt-sized (60 fish/lb) fish. The hatchery fish ladder is opened to fall-run Chinook salmon annually when the average daily river temperature declines to approximately 60°F, which generally occurs in October or early November. The fall-run Chinook salmon produced are released directly into the Delta. In the event that the hatchery's inventory of Chinook salmon requires reduction prior to releasing all of the year's production, Chinook salmon fry are released into the Sacramento River at either Miller Park or Garcia Bend.

Immigrating adult steelhead typically begin arriving at the hatchery fish ladder in December. Peak steelhead egg collection generally occurs during January and February, but sometimes continues through March. Recent production goals for steelhead have been 430,000 yearling (4 fish/lb) fish, which are released into the Sacramento River at either Miller Park or Garcia Bend. Steelhead are no longer stocked directly into the lower American River on a regular annual basis. In the event that water temperatures become too high to successfully rear juvenile steelhead through the summer, these fish are generally transported to rearing facilities at the hatcheries on the Feather and Mokelumne rivers.

The Nimbus Hatchery also produces non-anadromous rainbow trout stocks. In 1997, the goal was 736,000 catchable (2 fish/lb), 280,000 sub-catchable (6-16 fish/lb) and 1.4 million fingerling rainbow trout. These trout are stocked into numerous waterbodies throughout the region.

The Nimbus Hatchery receives water for its operations from Lake Natoma via a 60-inch pipeline. Water temperatures in the hatchery are dictated by the temperature of water diverted from Lake Natoma which, in turn, is primarily dependent upon the temperature of water released from Folsom Reservoir, meteorological conditions, and retention time in Lake Natoma. The temperatures of water diverted from Lake Natoma for hatchery operations is frequently higher than that which is optimal (i.e., 55-56°F) for hatchery production of rainbow trout, steelhead, and Chinook salmon. Under such conditions, more suitable temperatures may be achieved by increasing releases at Folsom Dam and/or releasing colder water from a lower elevation within the reservoir via the release shutters at the power penstocks of Folsom Dam. However, seasonal releases from Folsom Reservoir's limited coldwater pool to benefit hatchery operations must be considered together with seasonal in-river benefits from such releases.

4.6.4. Regulatory Framework

For fisheries resources and associated aquatic habitats, the regulatory framework at the federal, State, and local levels is comprehensive. Fisheries resources remain at the forefront of water resource management mandates throughout the CVP, OCAP operations, and COA. These are reflected clearly in the ongoing and new efforts and initiatives focusing on fisheries and associated ecosystem health across California.

Management of non-anadromous fish and other aquatic biological resources (including habitats) are the responsibility of the U.S. Fish & Wildlife Service (USFWS). Management of anadromous fish is the responsibility of the National Marine Fisheries Service, NOAA (NOAA Fisheries). The California Department of Fish & Game (CDFG) serves as the State trustee for aquatic species. Sensitive aquatic resources are regulated by the federal Endangered Species Act, as well as the California Endangered Species Act. Some of the relevant statutes, regulations, and policy/programs affecting fisheries resources in California are set out below.

Central Valley Project Improvement Act (CVPIA)

Over the past two decades, no other regulatory action has had as significant an influence on California water management practices and related aquatic resources as the passing of the CVPIA in 1992. The CVPIA amended previous authorization of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic water supply uses, and fish and wildlife enhancement having an equal priority with power generation. Accordingly, inherent in the CVPIA are several measures intended to gauge the balanced needs for fish and wildlife, recreation, water supply, and hydropower.

Significant among these measures is the broad goal identified as the Anadromous Fish Restoration Program (AFRP), under Section 3406 (b) of the CVPIA which states:

> "…develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in the Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991…".

Clearly, these goals have not been met; recent declines in anadromous fish species and in-Delta species (as previously discussed) are important indicators in the current state of fisheries health in California waterways.

Of particular relevance under the CVPIA is directed under Section 3406(b)(2) which mandates the dedication of 800,000 AF annually of CVP yield for the primary purpose of implementing the various fish, wildlife, and habitat restoration measures authorized by Title 34 (P.L.102-575). Project yield is defined as the delivery capability of the CVP during the drought period of 1928-34 as it would have been with all facilities and requirements on the date of enactment of the CVPIA (October 30, 1992) in place.

On May 9, 2003, Reclamation clarified its November 20, 1997 policy (see Department of the Interior's Final Administrative Proposal on the Management of Section 3406(b)(2) Water) with a document entitled, Department of the Interior, Decision on Implementation of Section 3046 (b)(2) of the Central Valley Project Improvement Act. This Decision provided much-needed clarification on the calculation of CVP yield and the accounting methodologies used for such purposes including upstream actions, Delta actions, and any limitations on Delta actions. The Decision further authorizes the modification of CVP operations to provide flows of necessary quantity, quality, timing, including the timing of exports, for fishery purposes. Finally, the Decision provides further explanation regarding water banking, transfers, exchanges, water to meet Water Quality Control Plan/ESA obligations and shortage criteria. Currently, Reclamation relies on the B2IT, EWA Team and the Water Operations Management Team (WOMT) to coordinate the (b)(2) fishery action.

Ecosystem Restoration Program Plan of the CALFED Bay-Delta Program

CALFED's Bay-Delta Program was originally developed as a long-term comprehensive plan for ecosystem health restoration and the improvement of water management practices within the Bay-Delta ecosystem. The program was intended to address four resource areas: ecosystem quality, water quality, system integrity, and water supply reliability. The CALFED Ecosystem Restoration Program Plan (ERPP) was designed to improve and increase aquatic and terrestrial habitats and improve ecological functions necessary to support sustainable populations of diverse and valuable plant and animal species.

Key restoration actions for Sacramento River fisheries included the following: enhancement of river flows, restoration of natural river meanders process, enhancement of riparian and riverine habitats, maintenance of suitable river water temperatures for salmonids, reduction of fish losses at water diversion intakes, improvement of anadromous fish passage at existing barriers, maintenance and improvement in water quality, improvements in hatchery and stocking programs, and improvements in the management of inland harvest salmonids.

Environmental Water Account (EWA)

The original Environmental Water Account (EWA) was established in 2000 by the CALFED ROD. The operating criteria are described in detail in the EWA Operating Principles Agreement, an attachment to the ROD. In 2004, the EWA was extended to operate through the end of 2007 and, may be reasonably expected to again be extended through 2011. Reclamation, USFWS, and NOAA Fisheries have received congressional authorization to participate in the EWA at least through September 30, 2010, as per the CALFED Bay-Delta Authorization Act (P.L. 108-361). However, for these agencies to continue to participate beyond that date, additional authorization will be required.

The EWA agencies acquire assets and determine how the assets should be used in order to best benefit the at-risk native fish species of the Bay-Delta. Operation of the EWA Program is guided by the EWA Team (EWAT), which is comprised of technical and policy representatives from each of the five EWA Agencies. The EWAT coordinates its activities with the WOMT.

The original purpose of the EWA was to enable diversions of water by the SWP and CVP from the Delta to be reduced at times when at-risk species may be harmed while, at the same time, preventing the uncompensated loss of water to both SWP and CVP contractors. Typically, the EWA replaced water loss due to curtailment of pumping by the purchase of surface and/or groundwater supplies from willing sellers and by taking advantage of regulatory flexibility and certain operational assets. Under the EWA's past operations (from 2001 through 2007), when there were pumping curtailments at Banks Pumping Plant to protect Delta fish, the EWA often owed a debt of water to the SWP.

The EWA Agencies are undertaking an environmental review to determine the future of the program. Since no decision has yet been made regarding the EWA, Reclamation analyzed the EWA as part of its project description for the OCAP Biological Assessment as having limited assets, focusing on providing assets to support Vernalis Adaptive Management Plan (VAMP) and, in some years, related actions such as the VAMP shoulders. The EWA assets will include the following:

- Implementation of the Yuba River Accord, Component 1 Water, which is an average 60,000 AF of water released annually from the Yuba River to the Delta, would be an EWA asset through 2015, with possible extension through 2025. The 60,000 AF is expected to be reduced by carriage water costs in most years, estimated at 20 percent, leaving an EWA asset of 48,000 AFA.
- Purchases of assets to the extent funds are available.
- Operational assets granted the EWA in the CALFED ROD:
    - A 50 percent share of SWP export pumping of (b)(2) water and ERP water from upstream releases;

- o A share of the use of SWP pumping capacity in excess of the SWP's needs to meet contractor requirements with the CVP on an equal basis, as needed (such use may be under the Joint Point of Diversion);
- o Any water acquired through export/inflow ratio flexibility;
- o Use of 500 cfs increase in authorized Banks Pumping plant capacity in the July through September period (from 6,680 to 7,180 cfs); and
- o Storage in project reservoirs upstream of the Delta, as well as in San Luis Reservoir, with a lower priority than project water. Such stored water will share storage priority with water acquired for Level 4 refuge needs.

For the period 2001 through 2006, these operational assets average 82,000 AF, with a range between 0 AF and 150,000 AF.

40 CFR 131.37 – Water Quality Standards (Subpart D – Federally Promulgated Water Quality Standards)

On July 1, 2005, new federal water quality standards were promulgated for California under 40 CFR 131.37. These new criteria are applicable to those waters specified in the Water Quality Control Plan for Salinity for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, adopted originally by the State Water Resources Control Board in State Board Resolution No. 91-34 on May 1, 1991. Among others, the additional criteria include estuarine habitat criteria focusing on salinity measurements at the confluence of the Sacramento and San Joaquin rivers, Roe Island, and Chipps Island, in addition to fish migration criteria.

NOAA Fisheries – Biological Opinion for Winter-Run Chinook Salmon

On February 12, 1993, NOAA Fisheries (NMFS, at the time) issued a long-term BiOp regarding the operational impacts of the CVP on winter-run Chinook salmon. Based on Reclamation's Long-Term Central Valley Project Operations Criteria and Plan (CVP-OCAP) and the biological assessment of impacts, the BiOp concluded that the proposed long-term operations of the CVP and SWP would likely jeopardize the continued existence of winter-run Chinook salmon and identified Reasonable and Prudent Alternatives (RPAs) to avoid jeopardy.

On December 11, 2008, NOAA Fisheries released its Draft BiOp on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan. The purpose of the Draft BiOp is to determine, based on the best scientific and commercial information available, whether the Central Valley Project and State Water Project Operations Criteria and Plan, as proposed by Reclamation, is likely to jeopardize the continued existence of the following species: Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*, hereafter referred to as winter-run); Central Valley spring-run Chinook salmon (*O. tshawytscha*, hereafter referred to as spring-run); Central Valley (CV) steelhead (*O. mykiss*); Central California Coast (CCC) steelhead (*O. mykiss*); Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*, hereafter referred to as Southern DPS of green sturgeon); and Southern Resident killer whales (*Orcinus orca*, hereafter referred to as Southern Residents) or, destroy or adversely modify the designated critical habitat of the above salmon and steelhead species, or proposed critical habitat for Southern DPS of green sturgeon.

NOAA Fisheries concluded that, as proposed, the long-term continued operation of the CVP and SWP is not likely to adversely affect Central California Coast steelhead and their designated critical habitat. However, the long-term CVP and SWP OCAP is likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and Southern DPS of North American green sturgeon. The long-term CVP and SWP OCAP is also likely to destroy or adversely modify critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, and proposed critical habitat for the Southern DPS of green sturgeon. The consultation on the effect of that proposed action on Southern Resident killer whales is ongoing. Therefore, no conclusion was reached for that species. The final BiOp with the required Reasonable and Prudent Alternatives, Incidental Take Statements, and associated conservation recommendations were released on June 4, 2009.

USFWS Biological Opinion for Delta Smelt

With the signing of the Principles for Agreement for the Bay-Delta Plan, the USFWS agreed to initiate immediate re-consultation on the BiOp it had issued on February 4, 1994, which addressed the effects of the combined operations of the CVP and SWP on delta smelt for the period February 15, 1994, through February 15, 1995. In that opinion, the USFWS had concluded that the proposed operations of the CVP and SWP would result in jeopardy; therefore, RPAs were included in the BiOp consisting of specific operational criteria that the CVP/SWP would implement as part of their operational protocols.

On March 6, 1995, the USFWS issued a revised BiOp for delta smelt. This opinion stated that the proposed long-term combined CVP/SWP operations, as modified by the BiOp for winter-run Chinook salmon, the Principles for Agreement, and the Bay-Delta Plan, are not likely to jeopardize the continued existence of the threatened delta smelt or adversely modify its critical habitat. The opinion identifies the water quality standards along with the operational constraints that were to provide benefits to delta smelt.

The USFWS more recently, re-reviewed the listing status of the delta smelt and, on March 31, 2004, concluded that the species still faces a “high degree of threat” and should remain listed under the federal ESA. Most recently, the USFWS completed a BiOp on the long-term coordinated operations of the CVP and SWP (see below).

CVP-OCAP Biological Opinions

In February 2005, the USFWS issued a BiOp that analyzed the potential effects of the coordinated, long-term operation of the CVP and SWP, as part of Reclamation’s revised CVP-OCAP action, on delta smelt. As part of the litigation in the matter of *Natural Resources Defense Council et al., v. Dirk Kempthorne, San Luis & Delta Mendota Water Authority et al.,* (Case No. 05-CV-01207 OWW), the court held, on May 25, 2007, that the BiOp was “arbitrary and capricious” and “contrary to law”. The court maintained that an appropriate interim remedy must be implemented. The court ordered that the USFWS issue a new BiOp by September 15, 2008 (subsequently postponed to December 15, 2008). The USFWS issued its final BiOp on December 15, 2008. After reviewing the current status of the delta smelt, the effects of that proposed action and the cumulative effects, it was the USFWS's biological opinion that the coordinated operations of the CVP and SWP, as proposed, are likely to jeopardize the continued existence of the delta smelt. A full discussion of the consultation history, background, and current status of the consultation is provided in Chapter 10.0 (Consultation/ Coordination and Applicable Laws) and is not duplicated here.

SWP Pumping/CVP-OCAP

On April 28, 2007, the Alameda Superior Court made final its March 22, 2007, Proposed Order issuing a Writ of Mandate against the Department of Water Resources in a case brought by the Watershed Enforcers challenging the former's incidental take authority under the CESA for operation of the SWP pumping facilities. The Writ ordered the Department of Water Resources to cease and desist from further operation of the SWP Pumping Plant within 60 days from the date of entry of the judgment.

Bay-Delta Conservation Plan (BDCP)

State and federal agencies, along with numerous stakeholders, are developing a conservation plan for the Delta. The Bay-Delta Conservation Plan (BDCP) is intended to provide both State and federal agencies with the necessary authorization for State and federal water projects as well as their contractors. The following information is taken from the Bay-Delta Office of the DWR.

Reclamation is the Lead Agency under NEPA, and DWR is the Lead Agency under CEQA for the proposed BDCP EIS/EIR. The federal co-lead agencies under NEPA include NOAA Fisheries and the USFWS. The federal co-lead agencies have requested that both the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency participate in that EIS/EIR as cooperating agencies for the purposes of compliance with their regulatory programs such as the Clean Water Act.

Reclamation, DWR, along with the Metropolitan Water District of Southern California, Kern County Water Agency, Santa Clara Water District, Alameda County Flood Control and Water Conservation District, Zone 7, San Luis and Delta Mendota Water Authority, Westlands Water District, and Mirant Delta (known collectively as the "Potentially Regulated Entities" or PREs) are preparing the BDCP for their covered activities. It is the goal of the PREs that the BDCP follow a process that meets:

- The requirements of Section 10(a)(1)(B) of the ESA for non-federal PREs and result in the issuance of Incidental Take Permits (ITPs) from the USFWS and NOAA Fisheries;
- The requirements of an ITP under the California fish and wildlife protection laws, either pursuant to the Natural Community Conservation Planning Act, Section 2835 and/or Section 2081 of the Fish and Game Code; and
- The requirements of Section 7 of the ESA related to consultation with other federal agencies, resulting in the issuance of BiOps, including Incidental Take Statements (ITSs), from NOAA Fisheries and/or USFWS on specific activities of certain members of the PREs.

The BDCP is being developed by a Steering Committee of these State and federal water management and public trust resource agencies, water contractors, and non-governmental organizations (e.g., Nature Conservancy, Environmental Defense Fund, Defenders of Wildlife, California Farm Bureau, Natural Heritage Institute, The Bay Institute, etc.). The Friant Water Authority and the North Delta Water Agency become Steering Committee members on October 17, 2008.

The BDCP will likely consist of three primary elements: 1) actions to improve ecological productivity and sustainability in the Delta, 2) potential capital improvements to the water conveyance system, and 3) potential changes in Delta-wide operational parameters of the CVP and SWP associated with improved water conveyance facilities.

At this time, three general alternatives are being considered as they relate to the potential changes in the water conveyance system and CVP/SWP operations. These include: 1) a through Delta alternative, 2) a dual conveyance alternative, and 3) an isolated facility alternative.

When completed and approved, it will provide for conservation of the covered listed species, water supply reliability, regulatory assurances, and funding assurances for the implementation of identified conservation actions. These actions will contribute to the implementation of many parts (e.g., water quality, supply and ecosystem) of the CALFED Bay-Delta Program. While not intended to represent a comprehensive approach to ecosystem restoration of the Delta, the BDCP is focused on the conservation of species closely associated with aquatic habitats that may be affected by water conveyance actions through the Delta.

Species proposed for coverage in the BDCP are species that are currently listed as federal or State threatened or endangered or have the potential to become listed during the life of the BDCP and, additionally, have some likelihood to occur within the BDCP Planning Area. The covered species include:

- Central Valley steelhead (*Onchorhychus mykiss*)
- Central Valley Chinook salmon (*Onchorhynchus tshawytschia*) (spring-run, and fall/late-fall runs)
- Sacramento River Chinook salmon (*Onchorhynchus tshawytschia*) (winter-run)
- Delta smelt (*Hypomesus transpacificus*)
- Green sturgeon (*Acipenser medirostris*)
- White sturgeon (*Acipenser transmontanus*)
- Splittail (*Pogonichthys macrolepidotus*)
- Longfin smelt (Spirinchus thaleichthys)

Other species may be included in the BDCP include:

- Swainson's hawk (*Buteo swainsoni*)
- Bank swallow (*Riparia riparia*)
- Giant garter snake (*Thamnophis gigas*)
- Valley elderberry longhorn beetle (*Desmoceris californicus dimorphus*)

The purpose and project objectives are to achieve the following:

To be granted incidental take permits for the covered species that authorize take related to:

- The operation of existing State Water Project Delta facilities and construction and operation of facilities for the movement of water entering the Delta from the Sacramento Valley watershed to the existing State Water Project and Central Valley Project pumping plants located in the southern Delta;
- The implementation of conservation actions that have the potential to result in the take of species that are or may become listed under the ESA, pursuant to the ESA at §10(a)(1)(B) and its implementing regulations and policies; and
- The diversion and discharge of water by Mirant LLC for power generation in the western Delta.

To improve the ecosystem of the Delta by:

- Providing for the conservation and management of covered species through actions within the BDCP Planning Area that will contribute to the recovery of the species;
- Protecting, restoring, and enhancing certain aquatic, riparian, and associated terrestrial natural communities and ecosystems; and
- Reducing the adverse effects on certain listed species of diverting water by relocating the intakes of the SWP and CVP.

The completed BDCP is expected to cover a subset of species and habitats within CALFED's purview and provide a mechanism with which to address improvements. The Steering Committee anticipates that a Draft EIS/EIR will be available by the end of 2009. Environmental analysis for that EIS/EIR is fully underway; 12 scoping meetings across the BDCP Planning Area were held in March 2009. Final scoping comments on the EIS/EIR were accepted until May 14, 2009.

Sacramento Water Forum – Lower American River Flow Management Standard

As noted earlier in this document, over the past several years, the Water Forum, together with Reclamation, USFWS, NOAA Fisheries, CDFG, and various stakeholders, including the Environmental Caucus, have developed a new flow standard for the lower American River known as the Lower American River Flow Management Standard (or LAR FMS). This new proposed standard is the culmination of numerous previous efforts during the development of the Water Forum

Agreement in the mid-1990s to design a new flow regime for the river that would be “fish friendly”, maintain delivery allocations to local/regional water interests, remain consistent with ongoing changes in Folsom Dam and Reservoir flood control operations, and benefit instream habitat conditions in the lower American River.

The LAR FMS is intended to result in improved conditions for fish in the lower American River, particularly fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*). In addition, it is anticipated that the LAR FMS will comply with California Department of Fish and Game (CDFG) Code 5937, which requires that lower American River fish resources be maintained in “good condition.” The LAR FMS also is intended to be consistent with the NOAA Fisheries, Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units (2000).

The primary purpose of the proposed LAR FMS is to maximize the annual production and survival of the anadromous fall-run Chinook salmon and steelhead in the lower American River, within water availability constraints and in consideration of Reclamation's obligation to provide for multi-purpose, beneficial uses of the project. With improved habitat conditions for salmonids, the proposed LAR FMS also is expected to benefit other fish species within the lower American River. Development of an improved flow standard will:

- Improve currently required flow, water temperature, ramping rate, and flow fluctuation criteria;
- Establish a river management process for Folsom Reservoir and lower American River operations; and
- Monitor, evaluate, and report the resultant hydrologic and biologic conditions.

Each of the three primary elements of the LAR FMS is described below.

<u>Element One – Required Flows and Water Temperatures</u>

The required flow, water temperature, ramping rate, and flow fluctuation standards discussed below together comprise the first element of the LAR FMS; Required Flows and Water Temperatures. The primary objective of the Required Flows and Water Temperature element of the LAR FMS is to sustain increased habitat availability, while concurrently minimizing flow fluctuations and reductions, within the context of hydrologic uncertainty. Specifically, the required flow, water temperature, ramping rate, and flow fluctuation standards intend to:

- Provide the best possible flow and temperature based on water availability;
- Maximize the occurrence of target Chinook salmon and steelhead spawning flows;
- Stabilize flows during the Chinook salmon and steelhead egg incubation periods;
- Reduce month-to-month flow reductions to minimize juvenile salmonid stranding and isolation; and
- Manage flow releases and reservoir storage to effectively utilize coldwater pool availability.

Required Flow Standard

The required flow, as measured by the total release at Nimbus Dam, would vary throughout the year depending on the hydrology of the Sacramento and American rivers. As used in the flow standard, the term "required flow" is meant to describe the minimum required flow and does not preclude Reclamation from making higher releases at Nimbus Dam. Except for extremely dry conditions, from October through May required flows would be established between 800 cfs and 2,250 cfs. During June through September, required flows would be established between 800 cfs and 1,750 cfs. Actual required flow would be determined by specified conditions at biologically significant times of the year. For instance, during wetter years, the required flow would generally be higher, but not so high as to substantially reduce the coldwater pool volume in Folsom Reservoir by the end of summer. During drier years, the required flow would be reduced to most effectively utilize the limited availability of Folsom Reservoir storage and coldwater pool.

During the October through December period, the required flow would be based on an index of American River Basin carryover storage conditions. This index, referred to as the FRI (Four Reservoir Index), is calculated as the combined end-of-September storage in four reservoirs − French Meadows, Union Valley, Hell Hole, and Folsom. If, for example, the combined carryover storage in Folsom Reservoir and the upstream American River reservoirs was low, the required flow would be near 800 cfs; if carryover conditions were high, the required flow would be near 2,250 cfs. During October of each year, flows would be "stepped-up" until the required flow is met, at different rates depending on the magnitude of the required flow, as follows:

- Required Flows equal to 2,250 cfs
  - 250 cfs step increases from 1,500 cfs on October 1 to 2,250 cfs on November 9
    - Oct 1 to Oct 24 1,500 cfs
    - Oct 25 to Oct 31 1,750 cfs
    - Nov 1 to Nov 8 2,000 cfs
    - Nov 9 to Dec 31 2,250 cfs
- Required Flows between 2,250 cfs and 1,500 cfs
  - Incremental step increases from 1,500 cfs on October 1 to Required Flows on November 9
    - Oct 1 to Oct 15 Required Flows = 1,500 cfs
    - Oct 16 to Oct 31 Required Flows -500 cfs, or 1,500 cfs, whichever is greater
    - Nov 1 to Nov 8 Required Flows -250 cfs, or 1,500 cfs, whichever is greater
    - Nov 9 to Dec 31 Required Flows
- Required Flows less than or equal to 1,500 cfs
  - Implemented on October 1
  - Continue at same level through December 31

This "stepping-up" of flow, or increasing flow progression, was developed to maximize flow release utilization efficiency based on analysis of the last decade of fall-run Chinook salmon spawning distribution. In other words, more water is provided when more fish are expected to be spawning. In addition, the increasing flow progression is intended to minimize the incidence of redd superimposition.

During January and February, adjustments to the required flows would be based on the Sacramento River Index (SRI), an index of water year runoff for the entire Sacramento River Basin that is updated monthly. During this time, the fall-run Chinook salmon spawning period is completed, and the first part of the steelhead spawning period has begun. Based on the early January SRI, the January flow requirement may be modified from the December value. If the SRI predicts a critically dry year, then the January flow requirement would be set as 85 percent of the December requirement or 800 cfs, whichever is greater. If the SRI predicts a dry or normal year, then the January flow requirement remains the same as December. If the SRI predicts an above normal or wet year, the required flow would be set at 2,250 cfs. In February, the calculation is the same as the January routine, except the January flow is used as the basis.

Generally, by March, water supply availability and snow-pack conditions are reasonably certain for the remainder of the water year. At this time, knowledge of the actual available water supply can be used to make flow management decisions. Early in the spring, tradeoffs must be made between maintaining flows to sustain current habitat conditions versus reserving water supply for future releases to ensure that sufficient coldwater is available during both the steelhead over-summer rearing period and Chinook salmon spawning in the fall. From March through September, the required flow is based on the Impaired Nimbus Inflow Index (INI). The INI is defined as the May through September Folsom Reservoir inflow, minus May through September Folsom Reservoir diversions, minus May through September Folsom Reservoir evaporation, minus May through September Folsom South Canal diversions. Using the INI as an index, the flow requirement for the entire March through May period is established between 800 and 2,250 cfs. The same flow requirement is used for June through September, except the maximum flow requirement is capped at 1,750 cfs.

Conference Year Principles

Implementation of the required flows discussed above facilitates the release of available water for aquatic resources during all types of water years. The LAR FMS also recognizes agreements for water diversions, which are necessary because of the wide variation in runoff, ranging from over 6 MAF in one year to less than 400,000 AF in the driest water year on record. As defined in the Water Forum Agreement, “conference years” are those years when the projected March to November unimpaired inflow to Folsom Reservoir is less than 400,000 AF. It is during times of low runoff that demands on the available water supply are the greatest. Therefore, special provisions for conference years are included in the LAR FMS. A summary of these provisions is provided below. For a more detailed discussion regarding conference year principles, please refer to the Water Forum Agreement.

During conference years, water availability is insufficient to meet the lower American River instream needs, and provide the quantities of diversions specified in purveyor-specific agreements. Special provisions are necessary to deal with water management in these extremely dry years. Therefore, stakeholders agree to meet in these years to confer on how the available water supply should be managed to achieve, to the extent possible, both of the Water Forum's two co-equal objectives. The guiding principle will be for both instream and consumptive users to bear an equitable burden.

- Reclamation's water rights permit for operation of Folsom and Nimbus dams would include a minimum flow requirement of 190 cfs at the mouth of the American River. In extraordinary circumstances, the 190 cfs could be relaxed if reallocating that volume of water to another time in the year would be more beneficial for the fishery.
- In conference years, water purveyors agree to implement the highest level of conservation/rationing in their drought contingency plans.
- The River Management Group can recommend that the Water Forum Successor Effort, as defined in the Water Forum Agreement, meet and confer on operations in any year if called for by extraordinary circumstances.

These Conference Year Principles are intended to be included in the diversion agreements between Reclamation and purveyors signatory to the Water Forum Agreement that divert upstream of Nimbus Dam.

"Off-ramp" Criteria

Recent hydrologic modeling has identified some water years wherein total American River runoff is not as low as in conference years, yet the temporal distribution of runoff is such that the required flow in the lower American River below Nimbus Dam, identified in the proposed LAR FMS, could jeopardize other water right entitlements within the American River Basin. By the same token, during these years, subsequent water availability for appropriate instream flows and water temperatures could be reduced, thereby threatening adequate fish protection. To avoid: (1) infringement on other water rights; and (2) subsequent reductions of fish protection, "off-ramp" criteria were developed to allow relaxation of the required flow within the lower American River below Nimbus Dam.

The off-ramp criteria included as part of the LAR FMS allow the required flow to be less than 800 cfs (but greater than or equal to D-893 levels) if certain conditions are forecasted to occur. For the LAR FMS, Folsom Reservoir storage is used as a surrogate for other water rights. The off-ramp criteria is triggered if, at any time, Folsom Reservoir storage is forecasted to be less than 100,000 AF. Application of the off-ramp criteria is as follows:

- If, at any time between and including September 16 through December 31, Folsom Reservoir storage is forecasted to be less than 100,000 AF, then the required flow for the remainder of the period may be reduced to as low as 500 cfs, to preclude depletion of Folsom Reservoir storage; and
- If, at any time between and including January 1 through September 15, Folsom Reservoir storage is forecasted to be less than 100,000 AF, then the required flow for the remainder of the period may be reduced to as low as 250 cfs.

Water Temperature Standards

The proposed LAR FMS includes the following water temperature standards:

- Reclamation shall operate Folsom Dam and Reservoir and Nimbus Dam to meet daily average water temperatures of 60ºF or less, striving to achieve 56°F or less as early in the season as possible, in the lower American River at Watt Avenue from October 16 through December 31 for fall-run Chinook salmon spawning and egg incubation; and
- Reclamation shall operate Folsom Dam and Reservoir and Nimbus Dam to maintain daily average water temperatures that do not exceed 65°F in the lower American River at Watt Avenue from June 1 through October 15 for juvenile steelhead over-summer rearing.

Although the standards specify Watt Avenue as the location where water temperature compliance must be met, the proposed LAR FMS allows for alternative upstream compliance locations (up to Nimbus Dam) on occasions when the coldwater pool at Folsom Reservoir is insufficient to provide target water temperatures for fish. On these occasions, achieving the water temperature standard could jeopardize fish survival by causing a further depletion of the coldwater pool. Therefore, during these occasions, alternative locations can be designated by Reclamation after consultation and concurrence with the River Management Group.

There may be some instances in which factors beyond Reclamation's reasonable control may preclude the ability to meet the specified water temperatures during the indicated time periods, even at an alternative upstream location. Factors considered beyond the reasonable control of Reclamation include the amount of water in storage at Folsom Reservoir, the volume of the coldwater pool, ambient air temperatures, tributary inflow, and natural events such as prolonged droughts. On these occasions, the starting date of the specified water temperatures may need to be delayed. Reclamation shall immediately report instances when it is necessary to meet the daily water temperature requirements at alternative locations or time periods to the Chief of the Water Rights Division of the SWRCB (Chief of Division), and shall file an operation plan showing Reclamation's strategy to meet the water temperature requirements.

This element of the proposed LAR FMS would work in conjunction with other projects designed to improve water temperatures in the lower American River that have been completed, are in progress, or are planned for completion. One such project is the installation of a water temperature control device for municipal and industrial water at Folsom Dam, completed by Reclamation in 2003. Additionally, the El Dorado Irrigation District plans to install a water temperature control device at its pumping plant on the South Fork American River arm of Folsom Reservoir. These devices will allow operators to draw water from various elevations in Folsom Reservoir, thereby most effectively conserving the coldwater pool. Also, the Sacramento Area Flood Control Agency is in the implementation phase of a project that will upgrade the shutter configuration serving the power penstocks at Folsom Dam to allow for increased operational flexibility.

Ramping Rate Standard

A ramping rate is the rate at which flows, released from a dam, are increased or decreased in a river. Since the majority of medium and low gradient gravel bars in the lower American River are inundated at about 4,000 cfs, the greatest threat of beach stranding occurs at flows less than or equal to 4,000 cfs. Decreases from relatively high flows that result in flows remaining above 4,000 cfs would be less likely to result in salmonid beach stranding.

The proposed LAR FMS includes the following ramping rate standards:

- Decreases in flow shall not exceed 100 cfs per hour when flows are less than or equal to 4,000 cfs during December through June to prevent possible stranding of fry-sized fall-run Chinook salmon and steelhead in the lower American River.

This ramping rate standard is directed toward preventing salmonid fry from stranding due to changes in water surface elevation (river stage). Information on the rate of water surface elevation change relative to flow provided by CDFG indicates that stage can decrease more than one inch per 100 cfs change in flow, when flows are less than or equal to 4,000 cfs. The gradual reduction of flows is intended to minimize "beach stranding" and provide conditions that are more conducive to the survival of fry-sized fall-run Chinook salmon and steelhead.

Flow Fluctuation Objectives

The release of relatively stable flows into the lower American River will help provide conditions that are more conducive to the protection of fall-run Chinook salmon and steelhead. Thus, the LAR FMS includes the flow fluctuation objectives described below. The flow fluctuation objectives would apply to the extent that lower American River flow fluctuations are controllable. Depending upon the amount of water in storage at Folsom Reservoir, tributary inflow, and other factors (e.g., flood events), flow fluctuations are not always controllable.

- Avoid flow increases to 4,000 cfs or more, year-round, to avoid significant losses of juvenile Chinook salmon and steelhead due to isolation.

Juvenile Chinook salmon and steelhead can become stranded, or isolated from the main channel of the river, when flows increase to levels that inundate side-channel or off-channel depressions and subsequently recede, trapping the fish in unconnected pockets of water. The actual effect of an isolation event appears to be directly related to the relative abundance of juvenile salmonids in the river, and the timing and duration of a potential isolation flow. According to CDFG, flow increases above 4,000 cfs, with subsequent decreases in flow to less than 4,000 cfs, have resulted in large numbers of juvenile salmonids stranded in isolated areas. Accomplishing the flow fluctuation objective is intended to minimize the loss of juvenile anadromous salmonids due to potential isolation events.

- Minimize flow reductions during the spawning and incubation periods of late October through May to prevent possible dewatering of fall-run Chinook salmon and steelhead redds in the lower American River.

The greatest potential for fall-run Chinook salmon and steelhead redd dewatering exists at the lower flow levels, due to stage-discharge relationships in the lower American River. In other words, for a given increment of flow reduction, water surface elevation decreases more at lower flow levels. Operations which minimize flow reductions, after spawning nests have been constructed and eggs are incubating, will minimize the potential for Chinook salmon and steelhead egg mortality in the lower American River.

Element Two – River Management

The River Management element of the proposed LAR FMS is a systematic process of continually improving management policies and practices by learning from the outcomes of prior operational actions. The formal incorporation of river management into Reclamation's SWRCB water right permit will facilitate beneficial management of the lower American River on a continuing basis.

Implementation of the proposed LAR FMS will require management of the lower American River based on operational decisions that must take into account multiple factors and objectives. In operating Folsom Dam and Reservoir, Reclamation must meet:

- Flood control, water, and energy supply obligations;
- Requirements of the CVPIA, the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (1995 Bay-Delta Plan), the federal ESA, and California Fish and Game Code Section 5937 (which requires Reclamation to operate Folsom Dam and Reservoir to maintain lower American River fish resources in "good condition"); and
- Terms and conditions of its water right permits.

Real-time operations to meet these regulatory objectives must be based on consideration of many factors, including current and anticipated hydrological conditions, water supply forecasts, demand for water and electricity, the location, movement, and condition of fish, water temperature, coldwater pool availability, and water quality conditions in the Delta.

Reclamation's implementation of the proposed LAR FMS will be guided by an annual operations plan prescribing operations affecting the lower American River. The operations plan will include a description of the decision-making considerations, parameters, and actions necessary to implement the LAR FMS, including average monthly flows in the lower American River, end-of-month storage in Folsom Reservoir (specifically including end-of-month storage for September), and water temperature in the lower American River from Nimbus Dam to Watt Avenue, consistent with the temperature requirements of the Flow Management Standard. The operations plan will include a range of operating flexibility consistent with Reclamation's ability to meet the requirements of the LAR FMS. The initial operations plan prepared by Reclamation will be based on its April 15 delivery forecast and will describe projected operations for the 12-month period beginning May 1. The operations plan will be reviewed and updated each month to describe operations for the following 12-month period, to incorporate any changes needed to address new information or changed conditions.

Element Three – Monitoring and Evaluation

The third element of the proposed LAR FMS, Monitoring and Evaluation, includes preparation of a monitoring and evaluation plan. The purpose of the monitoring and evaluation plan is to provide information that can be used by the RMG for real-time operational decisions, as well as in the on-going evaluation of whether the long-term goals and objectives of the LAR FMS are being met. The monitoring and evaluation plan will allow the RMG to learn from previous management actions and decisions, build on successes, and adjust operations simultaneously with changes in fishery resources and associated habitats. In addition, monitoring the outcomes of previous management decisions provides early warning of potential problems, allowing corrective actions to be taken before adverse impacts on lower American River fishery resources occur.

4.7. RIPARIAN RESOURCES (DIRECT EFFECTS STUDY AREA)

This subchapter describes existing riparian resources, i.e., riparian and wetland vegetation and associated species that use it for habitat. The regional setting for these resources includes the lower American and Sacramento rivers and reservoirs that may be influenced by the new CVP water service contracts. It also includes that portion of the North Fork American River between the American River Pump Station and Folsom Reservoir. The discussion provides the context for various species and critical habitat. Special-status species include those that are listed as threatened or endangered by the CDFG or the USFWS, species proposed for State or federal listing, species designated as "species of concern" by USFWS or "special concern species" by CDFG, and species tracked by the CNDDB or California Native Plant Society (CNPS).

4.7.1. Affected Environmental/Setting

The regional setting includes riparian/terrestrial resources that may be directly affected by implementation of the new CVP water service contract where changes to CVP system operations including its numerous reservoirs and rivers may occur. Certain CVP facilities and associated waterways are included in the regional study area. These facilities include: Trinity and Shasta reservoirs, the upper and lower Sacramento River, and the Delta. Detailed descriptions of the terrestrial resources associated with these facilities are provided below.

4.7.2. Shasta and Trinity Reservoirs

Vegetation Surrounding Reservoirs

Habitats associated with these reservoirs include ponderosa pine forest, non-native grassland, oak-pine woodlands, and chaparral. Much of the vegetation surrounding the reservoirs consists of forested habitats, with small enclaves of oak woodland, grassland, and chaparral. Pine forest habitats are located on the upland banks, and slopes of the reservoirs are dominated by ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*), Douglas fir (*Pseudotsuga menziesii*), madrone (*Arbutus menziesii*), and incense cedar (*Calocedrus decurrens*). Chaparral occurs in openings in the forest, and is characterized by several native shrubs such as manzanita (*Arctostaphylos* sp.) and various species of ceanothus (*Ceanothus* sp.). Non-native grasslands and oak-pine woodlands are similar to habitats described for Folsom Reservoir (see local project area description). Similar to Folsom Reservoir, the drawdown zone of these reservoirs is expected to be devoid of substantial vegetation, and contiguous riparian communities are not present in these areas due to constantly changing water levels and hence, water availability; therefore, the drawdown zones do not provide or promote the establishment of high-value plant communities or wildlife habitat.

Wildlife of Reservoirs

Ponderosa pine forest and chaparral habitats associated with the reservoirs support a variety of birds, including western tanager (*Piranga ludoviciana*) and white-breasted nuthatch (*Sitta carolinensis*). Raptors that use these habitats near water include osprey (*Pandion haliaetus*) and bald eagle (*Haliaeetus leucocephalus*). Mammal species likely to occur in these habitats include mule deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), ringtail (*Bassariscus astutus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), black bear (*Ursus americanus*), and beaver (*Castor canadensis*).

4.7.3. Upper and Lower Sacramento River

Vegetation of the Sacramento River

Much of the Sacramento River is confined by levees that reduce the natural diversity of riparian vegetation. Agricultural land (rice, dry grains, pastures, orchards, vineyards, and row and truck crops) is common along the lower reaches of the Sacramento River, but is less common in the upper portions. The bands of riparian vegetation that occur along the Sacramento River are similar to those found along the lower American River, but are generally somewhat narrower and not as botanically diverse. The riparian communities consist of Valley oak (*Quercus lobata*), cottonwood (*Populus fremontii*), wild grape (*Vitis californica*), box elder (*Acer negundo*), elderberry (*Sambucus mexicanus*), and willow (*Salix* sp.). Freshwater, emergent wetlands occur in the slow moving backwaters and are primarily dominated by tules (*Scirpus acutus* var. *occidentalis*), cattails (*Typha* sp.), rushes (*Juncus* sp.), and sedges (*Carex* sp.) (SAFCA and USBR, 1994). Although such riparian vegetation occurs along the Sacramento River, it is confined to narrow bands between the river and the river side of the levee.

Wildlife of the Sacramento River

The wildlife species inhabiting the riparian habitats along the lower Sacramento River are essentially the same as those found along the lower American River. These include, but are not limited to, wood duck (*Aix sponsa*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), green heron (*Butorides virescens*), black phoebe (*Sayornis nigricans*), ash-throated flycatcher (*Myiarchus cinerascens*), sora (*Porzana carolina*), great horned owl (*Bubo virginianus*), Swainson's hawk (*Buteo swainsoni*), California ground squirrel (*Spermophilois beecheyi*), and coyote (*Canis latrans*). The freshwater/emergent wetlands represent habitat for many wildlife species, including reptiles and amphibians such as the western pond turtle (*Clemmys marmorata*), bullfrog (*Rana catesbeiana*), and Pacific tree frog (*Hyla regilla*). Agricultural areas adjacent to the river also represent foraging habitat for many raptor species.

4.7.4. Sacramento-San Joaquin Delta

Vegetation of the Delta

Most of the vegetation in the Delta consists of irrigated agricultural fields and associated ruderal (disturbance-adapted or weedy), non-native vegetation fringes that border cultivated fields. Throughout much of the Delta, these areas border the levees of various sloughs, channels, and other waterways within the historic floodplain. Native habitats include remnant riparian vegetation that persists in some areas, with brackish and freshwater marshes also being present. Saline wetlands consist of pickleweed (*Salicornia virginica*), cord grass (*Spartina* sp.), glasswort (*Salicornia* sp.), saltgrass (*Distichlis spicata*), sea lavender (*Limonium californicum*), arrow grass (*Triglochin* spp.), and shoregrass (*Monanthochloe littoralis*). These wetlands are very sensitive to fluctuations in water salinity, which are determined by water flows into the Delta (San Francisco Estuary Project, 1993).

Wildlife of the Delta

The wetlands of the Delta represent habitat for a number of shorebirds and waterfowl species including killdeer (*Charadrius vociferous*), California black rail (*Laterallus jamaicensis coturniculus*), western sandpiper (*Calidris mauri*), long-billed curlew (*Numenius americanus*), greater yellow-legs (*Tringa melanoleuca*), American coot (*Fulica americana*), American wigeon (*Anas americana*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), canvasback (*Aythya valisineria*), and common moorhen (*Gallinula chloropus*). These areas also support a number of mammals such as coyote, gray fox (*Urocyon cereoargenteus*), muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), and beaver. Several species of reptiles and amphibians also occur in this region.

4.7.5. Folsom Reservoir

Vegetation of Folsom Reservoir

Habitats associated with Folsom Reservoir include non-native grassland, blue oak-pine woodland, and mixed oak woodland. Non-native grassland occurs around the reservoir, primarily at the southern end. The reservoir rim is surrounded by a barren band (the drawdown zone) as a result of historic fluctuations in water elevations. The majority of this zone is generally devoid of substantial vegetation, although arroyo willows (*Salix lasiolepis*) and narrow-leaved willows (*Salix exigua*) have established in some areas (USFWS, 1991a). The only contiguous riparian vegetation occurs along Sweetwater Creek at the southern end of the reservoir (USFWS, 1991a). The drawdown zone is virtually devoid of vegetation and the sparse willows that have established in some areas do not form a contiguous riparian community. Consequently, the drawdown zone does not possess consistent or substantial habitat value.

Non-native grassland consists of wild oat (*Avena fatua*), soft chess brome (*Bromus hordeaceus*), ryegrass (*Lolium multiflorum*), mustard (*Brassica* sp.), and foxtail (*Hordeum murinum* ssp. *leporinum*). The oak woodland habitat located on the upland banks and slopes of the reservoir is dominated by interior live oak (*Quercus wislizenii*), blue oak (*Quercus douglasii*), and foothill pine (*Pinus sabiniana*) with several species of understory shrubs and forbs including poison oak

(*Toxicodendron diversilobum*), manzanita (*Arctostaphylos* sp.), California wild rose (*Rosa californica*), and lupine (*Lupinus* sp.).

Wildlife of Folsom Reservoir

Oak-pine woodlands and non-native grasslands in the reservoir area support a variety of birds, including acorn woodpecker (*Melanerpes formicivorus*), Nuttall's woodpecker (*Picoides nuttallii*), western wood pewee (*Contopus sordidulus*), scrub jay (*Aphelocoma californica*), Bewick's wren (*Thryomanes bewickii*), plain titmouse (*Parus inornatus*), hermit thrush (*Catharus guttatus*), loggerhead shrike (*Lanius ludovicianus*), black-headed grosbeak (*Pheucticus melanocephalus*), dark-eyed junco (*Junco hyemalis*), and Bullock's oriole (*Icterus bullockii*). A number of raptors will also use oak woodlands for nesting, foraging, and roosting. These include red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), great horned owl, and long-eared owl (*Asio otus*). Mammal species likely to occur in the woodland habitat include mule deer, coyote, bobcat, gray fox, Virginia opossum (*Didelphis virginiana*), raccoon, striped skunk, black-tailed jackrabbit (*Lepus californicus*), California ground squirrel, and a variety of rodents. Amphibians and reptiles that may be found in oak woodlands include California newt (*Taricha torosa*), Pacific tree frog (*Hyla regilla)*, western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleucus*), common kingsnake (*Lampropeltis getulus*), and western rattlesnake (*Crotalus viridis*).

The non-native grassland surrounding Folsom Reservoir represents habitat for a variety of rodents, which, in turn. serve as a prey base for carnivores such as hawks and owls, coyote, bobcat, gray fox, and some snakes. Although very few birds will nest in the grassland areas, a number of species will forage in this habitat, including white-crowned sparrow (*Zonotrichia leucophrys*), lesser goldfinch (*Carduelis psaltria*), western meadowlark (*Sturnella neglecta*), and several raptor species. Migratory waterfowl are known to feed and rest in the grasslands associated with the north fork of Folsom Reservoir (USFWS, 1991a). Several of the reptiles and amphibians that inhabit the oak woodlands will also occur in the adjacent non-native grasslands.

4.7.6. Lower American River

Vegetation of the Lower American River

The lower American River provides a diverse assemblage of vegetation communities, including freshwater marsh and emergent wetland, riparian scrub, riparian forest, and in the upper, drier areas further away from the river, oak woodland and non-native grassland. The current distribution and structure of riparian communities along the river has been determined by human-induced changes such as gravel extraction, dam construction and operations, and levee construction and maintenance, as well as by both historic and on-going streamflow and sediment regimes and channel dynamics (Sands, et al., 1985; Watson, 1985).

As a result of these factors, several riparian vegetation zones exist along the banks of the lower American River. The composition and vegetative structure of these zones at any particular location along the river depends on the geomorphology and other physical characteristics of the river bank.

In general, willow scrub and alders tend to occupy areas within the active channel of the river, which are repeatedly disturbed by elevated winter and spring river flows. Plant species in this zone typically include various species of willow. Cottonwood-willow thickets and cottonwood forests occupy the narrow belts along the active river channel where seasonal disturbance by occasional large flows influence community structure. Fremont cottonwood dominates these riparian forest zones. Other species associated with this habitat include willow, poison oak, wild grape, blackberry (*Rubus ursinus*), northern California black walnut (*Juglans californica* var. *hindsii*), and white alder (*Alnus rhombifolia*). Alder-cottonwood forest is typical of the steep, but moist banks along much of the river corridor. Valley Oak Woodland occurs on upper terraces composed of fine sediment where prolonged availability of soil moisture provides a long growing season. Valley oak is the dominant tree species in these areas, although some of the sites also have a cottonwood component as a result of infrequent flood inundation. Live oak woodland occurs in the more arid and gravelly terraces that are isolated from the fluvial dynamics and moisture of the river. Non-native grassland commonly occurs in areas that have been disturbed by human activity and can be found on many of the sites within the river corridor.

Backwater areas and off-river ponds that are recharged during high flows support emergent wetland vegetation. These habitat areas are located throughout the length of the river, but occur more regularly downstream of the Watt Avenue bridge. Plant species that dominate this habitat type include various species of willow, sedge, cattail, bulrush (*Scirpus* sp.), rush, barnyard grass (*Echinochloa crusgalli*), slough grass (*Paspalum dilatatum*), and lycopus (*Lycopus americanus*).

Wildlife of the Lower American River

Previous studies have determined that the cottonwood-dominated riparian forest and areas associated with the backwater and off-river ponds are highest in wildlife diversity and species richness relative to other river corridor habitats (Sands, et al., 1985; Watson, 1985; USFWS, 1991). More than 220 species of birds have been recorded along the lower American River and more than 60 bird species are known to nest in the riparian habitats (USFWS 1991). Common species that can be found along the river include great blue heron, mallard, red-tailed hawk, red-shouldered hawk, American kestrel, California quail (*Callipepla californica*), killdeer, belted kingfisher (*Ceryle alcyon*), western scrub jay, ash-throated flycatcher, tree swallow (*Tachycineta bicolor*), and American robin (*Turdus migratorius*). Additionally, more than 30 species of mammals reside along the river, including beaver, striped skunk, Virginia opossum, brush rabbit (*Sylvilagus bachmani*), raccoon, western gray squirrel (*Sciurus griseus*), California ground squirrel, meadow vole (*Microtus pennsylvanicus*), muskrat, black-tailed deer, gray fox, coyote, and infrequently, mountain lion.

The most common reptiles and amphibians that depend on the riparian habitats along the river include western toad (*Bufo boreas*), Pacific tree frog, bullfrog, western pond turtle, western fence lizard, common garter snake (*Thamnophis sirtalis*), gopher snake, and western rattlesnake.

Along with providing food, cover, and nesting habitat for several species, the lower American River functions as a wildlife corridor for the movement of animals between the valley floor and the foothills of the Sierra Nevada.

River Channel Hydrology and Riparian Vegetation Relationships along the Lower American River

The type and distribution of riparian vegetation along a river is generally a function of the complex hydrologic and geomorphic conditions of the river (Watson, 1985). In particular, water availability and magnitude (i.e., flow regimes), floodplain geology, and channel morphology are the driving forces behind the ability of various riparian plants to germinate, establish, and grow. Flood flows mobilize bank and riverbed sediments that result in the deposition of nutrient-rich sediments on the floodplain that, when timed with the release of seeds in the spring, provides suitable areas for seed germination. High water (flushing) flows, usually occurring in late winter and early spring, are necessary to clear the river channel of debris, control the encroachment of vegetation, and unclog sediments. Water availability during the summer and early fall months can determine growth rates and plant types. The structure and composition of the channel bed and banks affects the rate of channel migration, the elevation of the water surface during low-flow periods, the lateral movement of groundwater into the banks, the transport and deposition of sediments, and how often certain areas are inundated by flood flows. These, in turn, affect overall plant diversity, growth, and generation.

History of Events Affecting the Riparian Corridor

From Folsom Reservoir to the confluence with the Sacramento River, the lower American River has undergone tremendous change over the past 100 years. The combination of gold mining, gravel dredging, levee building, land clearing, water diversion projects, and reservoir construction have dramatically altered the riverbed and channel, as well as overall flow regimes. Specifically, the construction of flood control levees reduced the width of the riparian corridor by isolating the floodplain from the river; these levees also changed channel erosion patterns and reduced migration. In addition, the construction of the Folsom and Nimbus Dams has significantly altered both the streamflow and sediment regime of the lower American River. In particular, the magnitude and frequency of flood flows has been effectively reduced, causing a reduction in the frequency of overbank flows that deposit sediments, conducive to seed germination, on the higher terraces. The dam complex also significantly reduced the amount of sediment supplied to the lower reaches of the river from its watershed.

The existing channel morphology of the lower American River spans a continuum from a meandering belt confined within relatively resistant terraces and bluffs in the upper reaches to a low gradient and semi-confined floodplain channel in the lower reaches (Watson 1985). Channel pattern and morphology in the upper 11 miles of the river, to the Folsom and Nimbus dam complex, is largely controlled by resistant bedrock exposures that characterize this portion of the river. Bank erosion and deposition of sediments is relatively minor, with most sediment being transported through or temporarily stored in the river channel. Point bars within this reach are forming in some areas, but are typically small. Prior to urbanization and levee construction, the American River deposited sediment in a floodplain belt that widens toward the confluence with the Sacramento River. Lateral migration of the river channel was slowly occurring over time. However, channel realignment and levee construction have confined the river to a substantially narrower belt. The low gradient and blockage of channel migration has allowed for the formation of gravel bars and sediment deposits throughout this portion of the river. Terraces, once commonplace and complex as a result of extensive overbank flooding, now only occur in specific areas between the levees.

The current composition of the riparian plant communities along the lower American River is a function of the resulting set of hydrologic, geomorphic, and substrate conditions that have occurred there over time; it is also a result of the adaptations of the riparian system to these conditions. In the upper reaches of the river near Nimbus Dam, steep banks of resistant soils and bedrock allow only a very slow rate of erosion and sediment deposition. In these areas, alder-dominated vegetation occurs as stringers along portions of the channel, particularly along the base of bluffs and steep banks. Further down the river where gravel bars and point bars occur as a result of sediment transport and storage along the channel bed, regeneration of willows occurs on scoured gravel bar sites. Cottonwoods also form small stringers on freshly deposited sediment on point bars as well as on less steep terraces with suitable seed beds, where even-aged stands of older cottonwoods occur.

Most of the riparian forest habitat immediately adjacent to the lower American River is dominated by cottonwood intermixed with willows. In addition, several backwater and off-river ponds occur at some of the bars along the river. Riparian zones support a greater abundance and diversity of wildlife than any other terrestrial habitat in California (Sands, et al., 1985). In addition, previous studies have determined that the riparian vegetation surrounding the backwater channels and off-river ponds ranked very high in overall wildlife diversity and species richness (Sands, et al., 1985). The following discussion focuses on the relationship of changes in river flows to both cottonwood trees and river-associated ponds, because of the biological importance of these areas.

Cottonwood Growth Along the Lower American River

The germination, establishment, growth, and long-term survival of Fremont cottonwoods along the lower American River is dependent upon the dynamic flow regimes and fluvial geomorphic processes of the river. In particular, the capacity of the river to erode, transport, and deposit alluvial materials is central to the structure and maintenance of cottonwood ecosystems. Cottonwood seed release and establishment has adapted over time to the flow regime and fluvial process of the lower American River, and consequently, maintenance of this regime is vital to maintain a viable cottonwood riparian system.

Successful regeneration of cottonwoods relies on the synchronous timing of seed dispersal and appropriate soil moisture levels to germinate and establish successfully (Stromberg, 1995). Cottonwoods disperse seeds over a 2- to 6-week period, typically in the early to mid-spring months. Dispersed seeds rapidly lose the ability to germinate, so seeds must encounter suitable germination sites soon after release. Germination takes place on freshly deposited alluvial soils in areas along the river bank low enough in elevation to provide adequate moisture but high enough to avoid subsequent same-year flooding after establishment. Peak water flows of sufficient magnitude are necessary, just prior to seed dispersal, to provide these suitable germination sites.

To survive, cottonwood seedlings require a continuous source of adequate moisture (Scott, et al., 1996). Consequently, river flows must decline at a rate that allows seedling roots to maintain continuous contact with saturated or sufficiently moist substrate. If river flows and the alluvial groundwater table drop too rapidly, seedling survival decreases appreciably (Scott, et al., 1993). Studies have shown that first-year seedlings of Fremont cottonwood survive only where the groundwater depth is less than one meter, and tolerate daily declines of no more than a few centimeters per day (Stromberg, et al., 1991; Segelquist, et al., 1993). Sufficient summer flows are critical to the continued survival of newly established seedlings and provide necessary moisture when evapotranspiration is highest (Scott, et al., 1993). Long-term survival of established cottonwoods is generally related to the depth of groundwater and to river flows. While cottonwoods can adapt to drought periods, overall growth and long-term maintenance of these trees depends on the ability of root systems to reach the groundwater table, which is recharged by adequate river flows.

While few studies have been conducted on the long-term flow regimes necessary for continued cottonwood regeneration and growth maintenance along the lower American River, several relatively short-term studies have provided insights into the relationship between river flows and cottonwood growth. In one study, the annual radial growth rate of young cottonwoods along a particular segment of the lower American River was found to be significantly related to the groundwater depth and to river flows during the March through October growing season (Stromberg 1995). The study found that cottonwoods had little or no radial growth when average river flows during the growing season dropped below 1,765 cfs. Monthly mean flows of 1,765 cfs are recommended by Stromberg (1995) as necessary for maintenance of radial growth. In order to assure some growth of cottonwoods, the USFWS recommends that an average minimum streamflow of 2,000 cfs occur during the March through October growing season.

A USFWS study concluded that an average flow of 3,000 cfs is required to provide "reasonable" growth and maintenance conditions for riparian vegetation (USFWS 1996). The USFWS (1997) correlated monthly mean flows of 3,000 cfs from April though June to peak inundation flows of 5,000 to 13,000 cfs, levels deemed critical to establishment of seedlings on riverine terraces.

Backwater Ponds of the Lower American River

Backwater ponds are areas adjacent to the mainstem of a river that may be connected to the river by surface water during high winter flood flows and by groundwater during other times of the year. Backwater pond areas along the American River Parkway are generally the result of naturally formed gravel deposits and man-induced dredging, although some are likely to be remnant oxbow lakes, such as Bushy Lake (Sands, et al., 1985). These backwater ponds and lagoons are known to occur throughout the lower American River system, but occur predominantly at Sacramento Bar, Arden Bar, Rossmoor Bar, and between Watt Avenue and Howe Avenue (Sands, et al., 1985).

Vegetation around these ponds is typical of the riparian associations in the area and is composed of mixed-age willow, alder, and cottonwood. Water is slower moving in backwater ponds, and these areas are isolated from human disturbances; consequently, backwater ponds tend to be of higher value to wildlife (Sands, et al., 1985). Wildlife species that have been recorded in these areas include: pied-billed grebe (*Podilymbus podiceps*), American bittern (*Botaurus lentiginosus*), green heron, common merganser (*Mergus merganser*), white-tailed kite (*Elanus leucurus*), wood duck, yellow warbler (*Dendroica petechia*), warbling vireo (*Vireo gilvus*), dusky-footed woodrat (*Neotoma fuscipes*), western gray squirrel, Pacific tree frog, and western toad.

Studies have been conducted to determine how these backwater ponds are influenced by flows in the lower American River (Sands et al., 1985). These ponds are located at varied distances from the river channel, have varied depths, and are at different elevations along the river. Ponds were studied in the spring 1985 at flow regimes of 1,300 cfs and 2,750 cfs. In general, these studies concluded the following: 1) while the interrelationships of the ponds with the river is complex, the ponds do respond to changes in water levels in the American River; 2) the response of ponds to changes in water flows and river levels is dependent upon the distance of the ponds from the river channel, the permeability of the soils surrounding the ponds, and the nature of intervening soils and gravels; 3) the impact of changes in pond water levels on vegetation and wildlife may differ in intensity between sites depending on local soil compaction and root distribution of individual plants; 4) flows of at least 2,700 cfs are required to adequately recharge the ponds closest to the river; 5) at sustained flows of 1,300 cfs or below, many of the ponds would become more shallow and smaller, hold very little water, and become choked with willows; 6) further reductions in river flows, to levels in the 500 cfs range, would result in these ponded areas becoming completely dry, resulting in deterioration of the riparian vegetation and quality wildlife habitats associated with the ponds; and 7) to provide continued recharge of off-river ponds, flows in the range of 2,750 to 4,000 cfs are needed (Sands et al., 1985; Sands 1986).

An important consideration for the maintenance of backwater pond habitats is the frequency and duration of the necessary recharge flows. Past studies have not come to definitive conclusions about specific frequency and duration needs. Historically, however, the flows high enough to allow recharge have occurred most often either in the winter or spring. This pattern allows the backwater ponds to be recharged prior to the important spring and summer growing seasons. Therefore, it appears that regular recharge flows during most of the winter or spring months are sufficient to maintain backwater pond habitats.

4.7.7. Special-Status Species

The following is a discussion of plant and wildlife species that have been afforded special recognition by federal, State, or local resource agencies and organizations. This discussion focuses on, and summarizes, species addressed in previous biological studies of the study area, and those species that have been added to State and federal special-status species lists since the time those studies were conducted. Special-status biological resources also include unique habitats or plant communities that are of relatively limited distribution, or are of particular value to wildlife. Sources for determination of the status of these biological resources are: Plants – CDFG (1996a), CNPS (1994), and Hickman (1993); and Wildlife – CDFG (1996b), CNDDB (1994), and Williams (1986).

A number of special-status plant and wildlife species are known to occur within the study area (USFWS, 1991a; USFWS, 1996). The following discussion focuses only on those species occurring or potentially occurring within the study area that could potentially be affected by the increases in diversions. A brief summary of the life history requirements of each species, and their occurrence within the study area, is included below.

Special-Status Plants

Sanford's Arrowhead (*Sagittaria sanfordi*)

This plant is a CNPS List 1B species, it has no federal or State status. Sanford's arrowhead (also known as Valley sagittaria) is a perennial herb that blooms from May to August and grows in shallow, slow-moving or standing water in ponds and ditches. This species is found in two locations along the American River, near Watt Avenue and Rio Americano High School (SAFCA and Reclamation 1994).

Special-Status Invertebrates

Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)

VELB was listed as Federally Threatened in 1980. It has no State status. Adult beetles feed and lay eggs on elderberry shrubs, where the larvae remain within the elderberry stems until they emerge as adults through newly formed exit holes. USFWS has designated the American River Parkway as critical habitat for this beetle (USFWS 1996). This species has been recorded in elderberry shrubs near backwater ponds along the lower American River.

Special-Status Amphibians

Foothill Yellow-legged Frog (*Rana boylii*)

Federal Species of Concern and California Species of Special Concern. This frog occurs in relatively fast moving shallow rocky streams. It is typically absent from areas where bullfrogs have been introduced. Potential habitat may occur along portions of the American River upstream of Folsom Reservoir, particularly in smaller tributaries off of the main channel. This species has occurred historically throughout the Sierra Nevada foothills. Although Sierra Nevada populations have greatly declined, this species may still be present in portions of the service area.

California Red-legged Frog (*Rana aurora draytonii*)

Federally Listed as Threatened and California Species of Special Concern. This frog typically occurs in deeper, slow moving portions of streams and in ponds and marshes. It is typically absent from areas where non-native fish (i.e., catfish, bass, sunfish) and bullfrogs are present.

Special-Status Reptiles

Western Pond Turtle (*Clemmys marmorata*)

California Species of Special Concern. This aquatic turtle generally occurs in still waters of ponds, freshwater marshes, and lakes, and in slow moving streams with sand bars or in stream emergent woody debris for basking sites. The western pond turtle is known to occur along the American and Sacramento rivers (Jennings and Hayes 1994).

Special-Status Birds

Bald Eagle (*Haliaeetus leucocephalus*)

De-listed. Even though they are de-listed, bald eagles are still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Their long-time listing status makes them worth noting here. Bald eagles winter throughout California, excluding the southern desert areas, and generally breed in the northern portion of the State. While most of the bald eagles in California are residents, many bald eagles migrate to the State for the winter. This species prefers mature wooded areas adjacent to or near large bodies of water or flowing rivers. Bald eagles feed primarily on fish, but will also eat birds, mammals, and carrion. Bald eagles are a common winter visitor to Folsom Reservoir and have been observed foraging along the lower American River (SAFCA and Reclamation 1994). Historically, bald eagles nested along the lower American River; however, there are no recent nest records for this species within the study area (USFWS 1991a).

<u>Swainson's Hawk (*Buteo swainsoni*)</u>

State Threatened. Swainson's hawk is a migratory raptor that breeds in western North America and winters primarily in South America. This species is associated with riparian corridors adjacent to agricultural fields and grasslands in the Central Valley. They nest in trees, forage over pastures and agricultural fields, and prey largely on small mammals and insects. Both foraging and nesting habitat for Swainson's hawk exist throughout the study area (USFWS 1991a). There are no recent records of nesting Swainson's hawks along the lower American River, most likely because of the predominance of developed urban areas and general lack of large grassland and agricultural areas along the river. However, a number of active nests occur along the Sacramento River, including some nest sites near the confluence of these two rivers (CNDDB 1994). Mature cottonwood, walnut, and willow trees along the Sacramento River, adjacent to agricultural areas, provide optimal nesting habitat for this species.

<u>Bank Swallow (*Riparia riparia*)</u>

California Threatened. Bank swallows winter in northern and central South America and migrate to the United States and Canada to breed. Nesting colonies are present in the Sacramento Valley along the Sacramento and Feather rivers. This species occurs almost exclusively along watercourses that have steep, vertical banks and bluffs for nesting. Preferred nesting sites are sandy-loam soils or compatible gravels. Bank swallows have occasionally nested along the lower American River. In 1985, nesting colonies were reported along the river north of Rancho Cordova and, in 1986, a colony was observed on the south side of the American River near Cal Expo (SAFCA and Reclamation 1994). As a result of major physical changes in the hydrology and stream channel conditions of the lower American River, limited steep cut-bank habitat is present (USFWS 1991a). The most suitable habitat for bank swallows now occurs along the river's edge near Discovery Park (USFWS 1991a).

<u>Tricolored Blackbird (*Agelaius tricolor*)</u>

California Species of Special Concern. A resident species in California, the tricolored blackbird is common locally throughout the Central Valley and in coastal districts south from Sonoma County. Preferred nesting habitat is dense cattails or tules associated with marsh and pond habitats. However, thickets of willows, blackberry, and wild rose may also be suitable (Zeiner 1990). Tricolored blackbirds are known to occur in the riparian habitats along the lower American River (SAFCA 1994). Most reported nesting occurrences have been in canals, ponds, and marshes located adjacent to the river channel (SAFCA 1994).

Yellow-breasted Chat (*Icteria virens*) and Yellow Warbler (*Dendroica petechia*)

Both California Species of Special Concern. These migratory species are summer visitors to riparian habitats. Both of these species are known to occur in the riparian habitats along the lower American River.

Other Raptors

Raptors are considered sensitive by the CDFG. Removal or destruction of active raptor nests is considered a violation of the California Fish and Game Code (Section 3503.5). In addition to the above-mentioned bald eagle and Swainson's hawk, raptors that are known to nest, or could potentially nest, in the study area include red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), white-tailed kite, American kestrel (*Falco sparverius*), and great horned owl (*Bubo virginianus*).

Special-Status Mammals

River Otter (Lontra canadensis)

California Species of Special Concern. River otters are an uncommon, yearlong resident of rivers, large streams, lakes, wetlands, estuaries, and coastal areas. Optimal habitat consists of riparian and other wetland vegetation associated with a large, permanent water source (Zeiner, et al. 1990). They feed primarily on fish, crayfish, and other crustaceans, but also eat amphibians, some mammals, and aquatic invertebrates. River otters are known to occur along both the Sacramento and American rivers (CNDDB 1994).

4.8. WATER-RELATED RECREATIONAL RESOURCES (DIRECT EFFECTS STUDY AREA)

This subchapter addresses existing recreational uses within the regional and local study areas that could be directly affected by the Proposed Action and its Alternatives. It provides the context upon which the analysis of potential diversion-related effects on water-related recreational resources can be made.

4.8.1. Affected Environment/Setting

The following describes the environmental setting related to recreation resources in areas potentially affected by the Proposed Action and alternatives. This subchapter addresses local environmental conditions that could be affected by diversions from the North Fork American River and Folsom Reservoir. Recreational and riverine parkway resources that could be affected by the diversions contemplated under the P.L.101-514 contract also include the upper and lower Sacramento River, lower American River and Sacramento-San Joaquin Delta.

4.8.2. Shasta/Trinity Reservoirs

Shasta, Keswick, Whiskeytown, and Trinity reservoirs are part of the Whiskeytown-Shasta-Trinity National Recreation Area administered by the U.S. Forest Service and National Park Service. Whiskeytown and Keswick reservoirs are regulating reservoirs for Shasta Reservoir and Trinity and

Lewiston Reservoirs, respectively, providing a relatively stable shoreline that is minimally affected by changes in upstream diversion and storage.

At full pool, Shasta Reservoir has 370 miles of shoreline. Recreational uses at Shasta Reservoir averages about 2.4 million visitor days per year, with an estimated 75 percent of the uses taking place between May and September. Recreation facilities include seven public boat ramps, 22 developed campsites, picnic areas, and numerous private marina resorts. Trinity Reservoir has many public and private recreation facilities including campgrounds, picnic areas, resorts, and marinas. Facilities at Trinity, Whiskeytown, and Keswick Reservoirs include boat ramps, campgrounds, picnic areas, and resorts.[153]

4.8.3. Upper and Lower Sacramento River

On the upper Sacramento River, water-dependent activities (swimming, boating, and fishing) account for approximately 52 percent of the recreation uses. While fishing is a year-round activity, boating, rafting, and swimming uses take place in summer months when temperatures are high. Between Colusa and Sacramento, major recreation facilities are located at Colusa-Sacramento River Recreation Area, Colusa Wier access, Tisdale Wier access, River Bend access, Knights Landing, Sacramento Bypass, and Elkhorn Boating Facility.

Recreational uses in the lower Sacramento River, between the American River confluence and the Delta, are closely associated with recreational use of Delta waterways. This reach of the river, which is influenced by tidal action similar to the Delta, is an important boating and fishing area with several private marinas.[154]

4.8.4. Sacramento-San Joaquin River Delta

As a complex of waterways affected by both fresh water inflows and tidal action, the Delta is an important recreation resource that provides a variety of water-dependent and water-enhanced recreation opportunities. The Delta supports about 12 million user days of recreation per year. Parks along the mainstem of the Sacramento River and Delta sloughs provided access for water-oriented recreation as well as picnic sites and camping areas. Brannan Island State Park and Delta Meadows River Park are major water-oriented recreational areas. Peak usage in the parks is typically in July.

Boating is the most popular activity in the Delta region, accounting for approximately 17 percent of the visits, with other popular uses including fishing, relaxing, sightseeing, and camping. Boating and related facilities are located throughout the Delta and include launch ramps, marinas, boat rentals, swimming areas, camping sites, dining and lodging facilities, and marine supply stores. [155]

153 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.3-161, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

154 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.3-162, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

155 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.3-162, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

4.8.5. Folsom Reservoir

The California Department of Parks and Recreation (CDPR) manage the Folsom Lake State Recreation Area (SRA) and surrounding facilities. The area's primary recreational uses are boating and fishing. In addition, the reservoir features approximately 75 miles of shoreline and 80 miles of trails that provide opportunities for hiking, horseback riding, nature studies, camping, and picnicking.

The water surface elevation of the reservoir can vary considerably, from 466 feet when its gross pool is full, to less than 375 feet during multiple dry years occur in a row. Reclamation attempts to maintain storage in Folsom Reservoir throughout the summer at sufficient levels to accommodate marina and boat access as much as possible. When full, Folsom Reservoir extends nearly 15 miles up the North Fork American River and 10.5 miles up the South Fork American River. Folsom Reservoir has 75 miles of undeveloped shoreline.

The primary commercial recreation facility on Folsom Reservoir is the Folsom Reservoir Marina on Brown's Ravine on the east side of the reservoir. Other major use areas are located at Granite Bay, Beals Point, Folsom Point, Peninsula, and Rattlesnake Bar. The predominant recreational activities at Folsom Reservoir are water-dependent uses, such as boating, water-skiing, personal watercraft use, swimming and fishing. The upper (easternmost) arms of the reservoir are designated as slow zones for quiet cruising, fishing, and nature appreciation.

The Folsom Lake (Reservoir) SRA is one of the most heavily used recreational facilities in the State Park system, with two to three million visitor days per year. The Folsom Reservoir SRA is an important regional resource because of its proximity to a heavily populated metropolitan area, the area's summer climate, the surrounding population's high interest in outdoor recreation, and the decrease in open space and recreational resources in neighboring areas.[156]

Water-enhanced activities (picnicking, relaxing, camping, and trail use) account for approximately 15 percent of the total recreational demand at the reservoir while water-related activities (boating, windsurfing, swimming, wading, rafting, boat camping, fishing) account for the remaining 85 percent. Of these recreational uses, boating (trailer and non-trailer launched) is the most popular and accounts for nearly 30 percent of the total recreational demand at Folsom Reservoir.

Lake Natoma is the downstream end of the Folsom Reservoir SRA and serves as a regulating reservoir for the releases from Folsom Reservoir. Recreation facilities and activities at Lake Natoma are operated by CDPR and include the California State University Sacramento Aquatic Center, day use areas, a campground, boat ramp, and an 8.4-mile segment of the American River Bicycle Trail.

The predominant recreational activity at Lake Natoma is trail use (e.g., jogging, bicycling, hiking and horseback riding). Due to the lake's stable water surface conditions, it is a popular destination for boating, rowing, canoeing, and wind surfing activities. Summer water temperatures are generally lower than Folsom Reservoir since water released into Lake Natoma generally comes from the

156 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.3-156 to 3-160, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

deeper portions of Folsom Reservoir; therefore, it is typically less intensely used for swimming and wading. The beaches at Negro Bar and Nimbus Flat are the primary swimming areas of the lake.

4.8.6. Lower American River

The lower American River begins below Nimbus Dam and flows along the valley floor until it reaches the Sacramento River at the City of Sacramento. The flow regime in the lower American River has been significantly altered since the completion of Folsom and Nimbus dams. The American River Parkway extends from Folsom Reservoir to Discovery Park in Sacramento. The Parkway consists of 14 interconnected parks, a continuous trail system, and approximately 5,000 acres of total land. Owned and managed by the County of Sacramento, the Parkway is linked to additional park lands, from Nimbus Dam to Folsom Reservoir which is managed by CDPR. Over five million visitors each year are estimated to use the parkway.[157]

Considered one of the nation's premiere urban parkways, the American River Parkway consists of 32 miles of paved bicycle and pedestrian trail along the American River from Discovery Park to Folsom Reservoir, known as the Jedediah Smith Memorial Bicycle Trail. Additional recreational facilities, including pedestrian and equestrian trails and picnic areas are located throughout the Parkway. No commercial recreational facilities are located within the Parkway, although raft rental outfitters are located near the Parkway at Sunrise Boulevard.

Water-enhanced (picnicking, camping, equestrian staging, and bicycle and pedestrian trails) and water-dependent (boat launching) facilities are provided throughout the Parkway, from Discovery Park upstream to Sailor Bar. The Parkway accommodates over 6 million visitors each year with visits projected to increase to almost 10 million by the year 2020. Peak use is typically from May through September with public use and visitations influenced by not only season, but also by air temperatures and river flow conditions. Water-enhanced activities account for about 70 percent of all recreation activities, with the remaining 30 percent geared towards water-dependent activities. The most popular activity of the Parkway is the category represented by nature study and site seeing, accounting for approximately 30 percent of the total recreational use. Within the Parkway, trail use (e.g., jogging, bicycling, hiking, and equestrian) accounts for approximately 27 percent of the remaining recreational use, with picnicking at 12 percent, boating at 11 percent, and swimming and fishing at 10 percent.

Rafting on lower American River is supported by commercial outfitters who provide services such as daily tours, shuttle buses, instructional services, and rental equipment for rafting, boating, and fishing activities. Two major outfitters, both located near Sunrise Boulevard, put-in rafts just downstream of Sunrise Boulevard and use either River Bend Park and/or the Harrington Drive access as the primary take-out points. The boating and rafting season is generally between April and October, with peak raft rentals occurring during the June through August period.

157 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

4.8.7. Middle and North Forks American River

Whitewater recreation in the Auburn State Recreation Area (SRA) is very popular on both forks of the river, with Class II, III and IV runs. Over 30 private outfitters are licensed to offer whitewater trips in Auburn SRA.[158]

Recreational use on the North Fork American River is concentrated upstream of the confluence of the North Fork and South Fork American River, outside of the Folsom Lake State Recreation Area. The North Fork supports commercial whitewater rafting upstream of Lake Clementine. On the Middle Fork, commercial rafting occurs upstream of the North Fork/Middle Fork confluence. Boating is prohibited downstream of the Middle/Fork North Fork confluence to the Folsom Reservoir high water line. Other recreation opportunities along the North Fork American River include hiking, mountain bicycling, and horseback riding on the Auburn-to-Cool Trail and Western States Trail.

4.8.8. Regulatory Framework

National Wild and Scenic Rivers Act

The National Wild and Scenic Rivers System was established in 1968 with the enactment of P.L. 90-542 (16 USC 1271 et seq.). The congressional declaration of policy stated the following:

> It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

The North Fork American River from below Lake Clementine to the former location of the old Auburn Dam bypass tunnel is eligible for listing for its recreational values. The lower American River from Nimbus Dam to its confluence with the Sacramento River was added to the National Wild and Scenic Rivers System based on the State's petition in 1981 and is designated a "recreational river." Recreational rivers are ones "that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past" (16 USC 1273[6][3]).

As a result of its designation under the act, federally assisted projects affecting the lower American River are subject to the Secretary of the Interior's determination that the project "will not invade the area or unreasonably diminish" the river's recreational value (16 USC 1278[a]; see also Swanson Mining Corporation v. VERC, 1790 F.2d 96 [D.C. Cir. 1986]; and the American River Parkway Plan). When seeking authorization or appropriations for a project that affects the protected values of the lower American River, the relevant federal agency must notify the Secretary of the Interior of its intent, and report to Congress on the project's conformity with the act and its effect on the protected values of the river (16 USC 1278[a].

158 www.cal-parks.ca.gov.

State Wild and Scenic Rivers Act

The State Wild and Scenic Rivers Act was passed by the California Legislature in 1972 (Public Resources Code (PRC) Section 5093.50 et seq.). The Legislature declared that it was the State's intent that "*certain rivers which possess extraordinary scenic, recreation, fishery, or wildlife values shall be preserved in their free-flowing state, together with their immediate environments, for the benefit and enjoyment of the people of the state*." The Act restricts the construction of dams, reservoirs, diversions, and other water impoundments. A diversion facility may be authorized if the Secretary of the Resources Agency determines that (a) it is needed to supply domestic water to the residents of the county through which the river flows, and (b) it will not adversely affect the natural character of the river (PRC Section 5093.33[a]; DWR 1994).

The North Fork American River from below Lake Clementine to location of the former the old Auburn Dam bypass tunnel is eligible for listing for its recreational values. The Middle Fork American River from Oxbow Dam to the confluence with the North Fork American River is eligible for listing for its scenic values (City of Sacramento 1993). The lower American River was included in the State Wild and Scenic River System and was given the classification of "recreational river" (PRC Sections 5093.54[e], 5093.545[h]). The State defines a recreational river as a river "readily accessible by road or railroad, that may have some development along [its] shorelines, and that may have undergone some impoundment or diversion in the past" (PRC Section 5093.53[c]).

Auburn State Recreation Area Interim Resource Management Plan

The CDPR, through a management agreement with Reclamation, manages the public use of the Reclamation lands in the Auburn SRA. The area supports and offers the potential for unique and diverse recreational opportunities. The Auburn Interim Resource Management Plan provides planning goals and objectives to address agency and public concerns of protection and enhancement of recreation and natural resources of the area. These efforts will include re-assessment of existing resources, public interests, and possible improvements to accommodate recreation while protecting the natural resources and primitive setting of the upper American River reaches.

American River Parkway Plan

The American River Parkway Plan was adopted by the County of Sacramento in 1985 (Sacramento County 1985). The plan is an element of the Sacramento County General Plan. It establishes goals and policies for the parkway, presents a description of parkway resources, and provides area plans to guide resource protection and development. Policy 3.1 of the plan discusses flow issues, as follows:

> Water flow in the lower American River should be maintained at adequate levels to permanently sustain the integrity of the water quality, fisheries, waterway recreation, aesthetics, riparian vegetation, wildlife, and other river-dependent features and activities of the Parkway. The required flow levels of the lower American River should be established at higher levels than those required under D-1400 of the SWRCB. State and federal policy should provide for the maintenance of flows in the optimum range in the lower American River.

The Plan explains that D-1400 flows (e.g. 1,500 cfs for recreation) are inadequate and that the decision has no legal effect without the completion of the Auburn Dam. It acknowledges that research is ongoing to establish adequate flows for the lower American River, including recreation flows. When required flows are determined, the plan states that "those flows will be incorporated into the policies of this Plan."

4.9. WATER-RELATED CULTURAL RESOURCES (DIRECT EFFECTS STUDY AREA)

This subchapter addresses existing cultural resources within the regional and local study areas and presents the affected environment context upon which an analysis of potential diversion-related effects of the proposed new CVP water service contract on water-related cultural resources can be made.

A Class I survey of the area of potential effects was conducted in 2008. This survey consisted of a literature review and records search; no field reconnaissance was conducted for the action described in this EIS/EIR. This Class I survey does not qualify as full compliance with the National Historic Preservation Act (NHPA) process for identifying cultural resources 36 CFR Part 800), but serves to aid in the initial stages of identification of cultural resources. As per NHPA provisions, no site locations are provided in the public version of this EIS/EIR; however, the document has been prepared for and reviewed by Reclamation's cultural resources staff.

4.9.1. Affected Environment/Setting

The following describes the affected environment/setting related to cultural resources in areas potentially affected by the proposed project and alternatives. This discussion addresses local environmental conditions that could be affected by a new diversion of water from the North Fork American River and Folsom Reservoir, as well as regional conditions that could be affected by way of hydrological changes that occur as a result of coordinated CVP/SWP operations.

4.9.2. Local Setting

Folsom Reservoir

Many studies have been carried out in and adjacent to the Folsom Reservoir basin, beginning with the Smithsonian Institution River Basin Surveys[159] and continuing into the 1990s.[160] These studies, and the sites recorded for them, are summarized in Scott, 1995, and Waechter and Mikesell, 1994. The consensus among these researchers was that the nature and extent of the effects on cultural resources from reservoir operation depended on several factors, most notably the location of a cultural property within the reservoir basin. Sites within the zone of seasonal fluctuation or drawdown suffered the greatest impacts, primarily in the form of erosion/scouring, deflation, hydrologic sorting, and artifact displacement, caused by waves and currents. Sites located lower in the reservoir, within the deep pool (including those adjacent to old river floodplains), were more likely to be covered with silt, which sometimes formed a protective cap. Sites at or near the high water

159 Drucker, 1948.
160 Waechter, S.A., *Folsom Reservoir Reoperation Study, El Dorado, Placer, and Sacramento Counties, California: Cultural Resources Survey*, 1992 and 1993.

line, and sites exposed during drawdown, suffered both erosion and vandalism. The various reservoir studies also indicated, however, that even sites that have been inundated for a few decades may still contain viable research data.[161]

There have nearly 200 sites recorded at the reservoir, and many more undoubtedly lie beneath the waterline. Among these are 126 prehistoric sites or components, some with remnant patches of midden.[162] Human burials are noted on a few of the early (1940s and 1950s) site records, but the present status of these burials is unknown. The 59 historic-period sites recorded at the reservoir are mostly related to Gold Rush-era mining, settlement, and transportation. Many of the sites show signs of adverse effects from wave action, inundation, and/or recreation use at the reservoir.[163] Any changes in water levels caused by increased or decreased diversions from the reservoir, or from points upstream, have the potential to impact many important or unevaluated cultural resources within the reservoir basin. It is also the case, however, that many of the cultural deposits in the upper part of the reservoir, where water-level fluctuation is greatest, have been scoured down to bare granitic sand. Conversely, sites below this zone have suffered much less from seasonal water-level fluctuations.

There are two kinds of potentially significant impacts/adverse effects on cultural resources from changes in water levels in Folsom Reservoir: *increased cycles of inundation and drawdown*, resulting in more erosion and scouring of sites, and more rapid breakdown of organic materials through more frequent wetting and drying; and *exposure of previously inundated resources*, subjecting these resources to increased weathering, vandalism, and other factors.[164] Under current operating conditions, the zone of greatest seasonal water-level fluctuation, and thus of greatest impact on cultural sites, is approximately 395-466 feet, where fluctuation events often exceed one per year. What this means, among other things, is that cultural sites at or above 395 feet already have suffered serious impacts that have greatly compromised their integrity and destroyed much of their data potential. Large-scale surveys by Far Western[165] observed that many, though not all, of the cultural deposits within this zone have been scoured down to bare granitic sand.

Lower American River

A 1999 records search revealed 36 recorded sites (22 prehistoric, 13 historic, 1 multi-component) on the American River between Folsom Dam and the Sacramento River. Of the 22 prehistoric sites, 4 have been determined eligible for the National Register of Historic Places (NRHP), 3 are ineligible, and 15 are unevaluated. These sites include village mounds and village middens, small camps, bedrock mortar stations, and flaked stone scatters. Several ethnographic Maidu settlements were

161 Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.
162 Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.
163 Waechter, S.A., *Folsom Reservoir Reoperation Study, El Dorado, Placer, and Sacramento Counties, California: Cultural Resources Survey*, 1992 and 1993; Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.
164 Waechter, S.A. and S.D. Mikesell, *Research Design for Prehistoric, Ethnographic, and Historic Cultural Resources at Folsom Reservoir, California*, 1994.
165 Waechter, S.A., *Folsom Reservoir Reoperation Study, El Dorado, Placer, and Sacramento Counties, California: Cultural Resources Survey*, 1992, and 1993.

located along the river, especially on the north bank;[166] at least some of the recorded villages undoubtedly represent these settlements.

> Historic sites recorded on the American River consist of dredge tailings, segments of the Western and Transcontinental railroads, bridge abutments, a pump house, features associated with the Folsom hydroelectric power system (CA-SAC-429H), stone foundations, a cemetery (CA-SAC-192/H), and segments of the historic levee system (LAR-16, LAR-18). Segment LAR-16 has been recommended as eligible to the NRHP; segment LAR-18 remains unevaluated (Nilsson, et al., 1995). In general, the lower American River is considered highly sensitive for archaeological and historical resources, especially historic mining remains.

4.9.3. Regional Setting

Shasta Reservoir

Archaeological records indicate that Native Americans used the forests and waters in the Shasta area for at least 7,000 years prior to European occupation. The Pit River and Wintu Indians were the predominant groups inhabiting the area around Shasta and Keswick reservoirs. Numerous prehistoric sites are known within the drawdown zone of Shasta Reservoir. Small camps in particular are known to exist within this zone, and with fluctuating water levels and the lack of vegetation, they are periodically exposed to wave and wind action that deteriorates the sites. Looting of exposed sites is also a problem in this area.[167]

In 1991, Reclamation consulted with the State Historic Preservation Officer regarding historical archaeological sites potentially affected by the Shasta Outflow Temperature Control Project.[168] It was determined that the dam itself, constructed in 1938, is eligible for inclusion in the National Register of Historic Places because of its historical and engineering significance.

Trinity Reservoir

Prior to the construction of Trinity Dam, the valley below Trinity Reservoir was inhabited by the Upper Trinity Wintu Indians. Prehistoric evidence dates back 2,000 to 3,000 years, although the area was probably inhabited even before that. Archaeological surveys during the 1950s documented very large village sites that are believed to have been inhabited year-round. These sites were destroyed when the valley was flooded after construction of the dam. As at Shasta Reservoir, many known prehistoric sites at Trinity Reservoir are subject to ongoing damage as a result of fluctuating water levels, which exposes them to wind and wave action, and consequently, looting.[169]

Extensive gold mining and logging took place in the Trinity Reservoir area during the historic period. The valley inundated by the construction of Lewiston Dam contains several large homestead areas and two, or possibly three, historic communities (M. Arnold, U.S. Forest Service, pers. comm. 1994).

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166 Wilson, N. and A. Towne, "Nisenan," in *Handbook of North American Indians, Volume 8: California*, edited by R.F. Heizer, 1978, p. 387-397.
167 M. Arnold, U.S. Forest Service, personal communication, 1994.
168 U.S. Bureau of Reclamation 1991.
169 M. Arnold, U.S. Forest Service, personal communication, 1994.

Sacramento River

The Sacramento River region is rich in historic and prehistoric resources. Considerable archaeological research has been conducted in the area, including early work that defined central California's prehistory. Of particular importance are the region's large, deep midden sites, which provide information on prehistoric culture extending over thousands of years. Historic archaeological sites and architectural resources are plentiful because this area was settled early in California's history. As in other parts of the Central Valley, resources related to agricultural development are prevalent.

Lower Sacramento River

At least 31 cultural resources studies have been conducted for the lower segment of the Sacramento River, and a minimum of 27 sites and 42 historic structures have been recorded. Three of the prehistoric sites, all burial mounds, are considered eligible for the National Register of Historic Places (NRHP): CA-SAC-16, CA-SAC-43, and CA-SAC-164. Burials were noted at two other prehistoric mound sites, but their status is unknown at this time. A 1990 survey of prehistoric site CA-SAC-268, originally recorded by Riddell in 1960, revealed no cultural material, and no further work was recommended.[170] The remaining 17 prehistoric sites, recorded in the 1930s and 1950s, were not relocated during more recent surveys/augering, and are believed to have been destroyed during levee construction.

The Natomas Main Drainage Canal (CA-SAC-430H) meets the Sacramento River on its northern bank, roughly 3/4 mile west of its confluence with the American River. This historic feature has not been evaluated. Two segments of the levee system at the confluence have been recorded as historical features (LAR-16 and LAR-18); the first has been determined eligible and the other is unevaluated.[171] In addition to these features, the tiny river town of Freeport, founded in the 1860s as an early tidewater railroad terminal,[172] has the potential to be determined an important historical resource.

Other eligible or potentially eligible historic resources along the lower Sacramento include a rural historic landscape district,[173] Washington Water Company Water Tower, Sacramento Weir and Yolo Bypass, St. Josephs Church and Rectory, Leonidis Taylor Monument, and 37 houses built between 1855 and 1900. Fifteen of these houses are part of the historic Lisbon District (YOL-HRI-9/287-301), a community settled by Portuguese immigrants during the 1850s. This district, which is characterized by early pioneer-style houses, became the largest Portuguese community in the area by 1900.[174] Of the 37 houses along this stretch of the river that are listed in the Historic Property Data File for Yolo County,[175] only one (John White House) was not recommended for the National Register; the other 36 are listed as "appears eligible" or "may become eligible," either as separate

170 Bouey, P.D., *Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project*, 1990.
171 Nilsson et al., 1995.
172 Thompson, J., *The Settlement Geography of the Sacramento-San Joaquin Delta, California*, 1957.
173 Reclamation District-1000.
174 K. Les, 1986.
175 State Historic Preservation Officer [SHPO].

properties or as contributors to a National Register district. All of these properties are on South River Road, adjacent to the river, but the distance of each from the riverbank cannot be determined at this time. It is safe to assume that they are located outside the river levees. The banks of the lower Sacramento River are considered highly sensitive for archaeological and historical resources.

4.9.4. Regulatory Framework

Cultural resources, also termed “historical resources” or “historic properties,” consist of remains and sites associated with past human activities. These include prehistoric and protohistoric Native American archaeological sites, historic archaeological sites, and historic sites, buildings, structures, or objects. Another category of cultural resources includes traditional cultural properties. These are areas that have been, and often continue to be, of economic and/or religious significance to peoples today. Traditional cultural properties may include Native American sacred areas where religious ceremonies are practiced, or landscapes, which are central to their origins or history as a people. Some historical resource sites may also be of cultural significance to contemporary Native Americans or other ethnic groups because they contain objects or elements important to their cultural heritage.

Significant historical resources and traditional cultural properties are afforded protection under existing federal, State and local laws. These laws and regulations were designed to protect significant cultural resources that may be affected by actions that they undertake or regulate. The National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA) and the California Environmental Quality Act (CEQA) are the basic federal and State laws governing preservation of historic and archaeological resources of national, regional, State and local significance.

Federal Laws

Federal laws for cultural resources are governed primarily by Section 106 of the NHPA of 1966 (amended 2006). The Code of Federal Regulations (CFR) includes specific information on the protection of historic resources. A historic property is defined to mean any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meet the National Register criteria. The term eligible for inclusion in the National Register includes both properties formally determined as such in accordance with regulations of the Secretary of the Interior and all other properties that meet the National Register criteria (36 CFR 800.16).

Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and affords the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The Council's implementing regulations, “Protection of Historic Properties” are contained in 36 CFR Part 800. The goal of the Section 106 review process is to offer a measure of protection to sites which are determined eligible for listing on the National Register of Historic Places. National Register criteria define an important cultural resource as one that is associated with important persons or events, or that embodies high artistic or architectural values, or that has scientific value (36 CFR 60.4). Amendments to the Act (1986 and 1992) and subsequent revisions to the implementing regulations have, among other things, strengthened the provisions for Native American consultation and participation in the Section 106 review process. For the proposed new CVP water service contracts, compliance with the NHPA will occur through Reclamation's coordination with the Advisory Council on Historic Preservation. Additonal information is presented in Subchapter 10.5.6.

State Regulations

Historical Resources

State historic preservation regulations affecting this project include the statutes and guidelines contained in the California Environmental Quality Act (CEQA; Public Resources Code Sections 21083.2 and 21084.1 and Section 15064.5 of the CEQA guidelines). CEQA requires lead agencies to carefully consider the potential effects of a project on historical resources.

The CEQA Guidelines (Section 15064.5[a] of the Title 14 of the CCR) identifies the following four categories of historical resources that lead agencies must consider in determining the significance of impacts on historical and unique archaeological resources:

1. A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historic Places.
2. A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Places, including the following:
   - A. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
   - B. Is associated with the lives of persons important in our past.
   - C. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
   - D. Has yielded, or may be likely to yield, information important in prehistory or history (PRC section 5024.1; 36 CFR 60.4).

> 4. The fact that a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources (pursuant to Section 5020.1(k) of the Public Resources Code, or identified in an historical resources survey (meeting the criteria in Section 5024.1(g) of the Public Resources Code) does not preclude a lead agency from determining that the resource may be an historical resource as defined in Public Resources Code Section 5020.1(j) or 5024.1.

Lead agencies must treat historical resources within the first three categories as protected by statute on either an unqualified or a presumptive basis. The first category is considered mandatory under statute. For the second category, this definition indicates that although any resource included in, or eligible for inclusion in, the State register must be treated as an historical resource. A resource included in a local register, but not in the State register, is only presumed to be an historical resource. Under the third category, the resources are presumed to be historically or culturally significant. The fourth category extends only to those resources that an agency chooses to consider "historical."

<u>Archaeological Resources</u>

The California Public Resources Code Section 21083.2 defines a "unique archaeological resource" as follows:

> An archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets the following criteria:
>
> 1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
> 2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
> 3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

A "non-unique archaeological resource" is one that does not meet the criteria for being "unique" (Public Resources Code 21083.2[h]). Public Resources Code 21083.2 provides that CEQA generally gives protection only to those "archaeological resources" that are "unique." An EIR is not required to address the issue of non-unique archaeological resources.

However, although an archaeological resource may not be "unique" for purposes of Section 21083.2, it may nevertheless qualify as an "historical resource" under Section 21084.1. That is, some resources are "historical resources" because they are "archaeologically significant." Section 15064.5(e) of the Title 14 CCR requires that the lead agency must first determine whether the archaeological site is an historical resource.

<u>Native American Burials</u>

California law protects Native American burials, skeletal remains and associated grave goods regardless of their antiquity and provides for the sensitive treatment and disposition of those remains

(California Health and Safety Code Section 7050.5, California Public Resources Code Sections 5097.94 *et seq*.). Section 7050.5(b) of the California Health and Safety code specifies protocol when human remains are discovered. The code states:

> In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.

4.10. LAND USE (INDIRECT EFFECTS STUDY AREA)

This subchapter addresses the context under which potential indirect, service area-related impacts on the existing land uses could result from the implementation of the new CVP water service contracts authorized under P.L. 101-514. The context of the affected environment description provides the background upon which subsequent analysis at a general, programmatic level were evaluated.

4.10.1. Affected Environment/Setting

El Dorado County is home to 173,407 people (DOF 2005). The primary communities are South Lake Tahoe, El Dorado Hills, Cameron Park, and Placerville, which together account for approximately 64 percent of the County population (DOF 2000). Two of the most rapidly growing areas are El Dorado Hills and Cameron Park, along the western slopes of the county. With its proximity to Folsom Reservoir (a CVP facility), EID's intended use of this new water will likely occur in the El Dorado Hills and Bass Lake Tank's service area (in the western portion Cameron Park). Similarly, for GDPUD, its allocation will be used within the western portion of its service area in the vicinity of Cool, Pilot Hill, Auburn Lakes Trail, and Greenwood. See Subchapter 3.5, under the "Subcontractor Service Areas" heading, for a complete discussion and description of these service areas.

The following describes the affected environment related to existing and planned land use in those Subcontractor service areas where this new water allocation will be used.

General Land Use Designations

Historically, growth in El Dorado County resulted in compact development patterns. Communities such as Cool, Georgetown, Mt. Aukum, and Placerville were small, mixed-use communities where residents lived, worked, and shopped. Recently, urban-like development has continued in the foothills; large lot, low-density residential development, while urban in character, has maintained the feeling of a rural lifestyle throughout the County and has slowly transformed traditional rural areas into areas characterized with dispersed residential uses.

In general, the land use pattern in El Dorado County concentrates urban uses in the vicinity of U.S. Highway 50 in the portion of the county west of the City of Placerville. Rural residential and agricultural uses are located throughout the non-urbanized western portion of the County.

Since the Proposed Action consists of an M&I contract, which cannot be served to agricultural land, only areas with a designation consistent with those that can receive M&I water are included in the proposed Subcontractor service areas. The only land use designations within the proposed Subcontractor service areas are low-, medium- and high-density residential,[176] commercial, industrial, and public services (e.g., firehouses, schools).

Future facilities, however, may necessitate the construction of transmission facilities between the Subcontractor service areas and either Folsom Reservoir for EID, or the North Fork American River for GDPUD. These facilities would likely pass through areas with a land use designation of open space, either along the shore of Folsom Reservoir, or in what would have been the inundation area of Auburn Reservoir, had Auburn Dam been constructed. The Government Code defines open space as any parcel or area of land or water that is essentially unimproved and designated for natural resource protection, managed production of natural resources, provision of outdoor recreation, or assurance of public health and safety.[177]

Lands considered suitable for agricultural production are found predominantly in the western half of the county, and comprise approximately 11 percent of the County's total acreage. Despite the relatively small percentage of land, agriculture is considered a valuable resource of the western slope.

Specific Approved/Planned Land Uses in EID Proposed Subcontractor Service Areas

El Dorado County has approved and construction has begun on six specific plans that establish significant amounts of the future land use within El Dorado Hills in the EID Subcontractor service areas, as summarized below.

- The Serrano El Dorado Hills community covers approximately 3,380 square acres and consists of 13 distinct residential villages, golf course, open space, and some commercial uses. Current development plans call for construction of homes on approximately 1,900 acres to accommodate approximately 4,500 residential units.
- The Promontory Specific Plan allows for mixed-use development on approximately 1,000 acres, which includes 115 acres of parks and open space and 1,100 residential units, and began construction in mid-January 2000.

176 It should be noted that El Dorado County has different definitions for the low-, medium- and high-density residential land use designations than those used in most areas. According to the El Dorado County 2004 General Plan, high-density residential areas are suitable for one to five dwelling units per acre, the medium-density residential designation permits one dwelling unit per 1- to 5-acre parcel, and low-density residential designation allows one dwelling unit per 5- to 10-acre parcel. The rural residential designation allows a density of one dwelling unit per 10 to 160 acres.

177 Government Code Section 65560(b).

- The Carson Creek Specific Plan provides 713 acres of mixed-use development, including 37 acres of park development and about 200 acres of open space. The Specific Plan was modified in 1999 to require a senior housing development, which would accommodate 1,700 dwelling units. The Carson Creek development is planned to include about 100 acres of industrial/R&D within its 713-acre site.
- The approximately 2,000-acre Valley View Specific Plan will ultimately contain 2,840 residential units and some non-residential development in a commercial town center; non-residential development is planned to include approximately 2.5 million square feet of retail and service-oriented development.[178]
- The Bass Lake Hills project is a 1,410-acre development consisting primarily of residential development, with portions in both the El Dorado Hills and Shingle Springs Market Areas. The plan includes 19 acres of parks and 151 acres of open space.
- The Northwest El Dorado Hills Specific Plan is a 915-acre residential development that was substantially completed in 1999, prior to the passage of Measure Y.[179]

Additionally, there are approximately 1,500 single-family lots in the Cameron Park/Shingle Springs area that are expected to be built out during the 2000 to 2010 timeframe, and a planned 80-unit multi-family apartment complex (Cameron Park Village).

4.11. TRANSPORTATION AND CIRCULATION (INDIRECT EFFECTS STUDY AREA)

This subchapter addresses the context upon which potential indirect, service area-related impacts on the existing traffic and circulation conditions that could result from the implementation of the P.L. 101-514 water service contract, and those that could occur under the various alternatives were analyzed.

4.11.1. Affected Environment/Setting

The following describes the affected environment to traffic and transportation within the EID and GDPUD Subcontractor service areas, potentially affected by the Proposed Action and Alternatives.

Regional Road and Highway System

The primary roadways serving the EID and GDPUD service areas are U.S. Highway 50, State Route 49, and State Route 193. U.S. Highway 50 serves east-west traffic through El Dorado County and is the main east-west transportation facility in the county. U.S. Highway 50 is a four-lane freeway west of the City of Placerville, and a four-lane highway east of that point. State Route 49 runs north-south through El Dorado County at the northern boundary of the county, near Auburn, to the southern boundary of the county, north of Plymouth. State Route 193 runs from Placerville to Cool, via Georgetown. Regional roadways in the service areas (U.S. Highway 50, State Route 193, State Route 49) are maintained by the California Department of Transportation (Caltrans).

178 Economic & Planning Systems, *El Dorado County "No Project" Land Use Scenario Final Report,* April 2001.
179 Economic & Planning Systems, *El Dorado County "No Project" Land Use Scenario Final Report,* April 2001.

Major arterials and connectors in the Subcontractor service areas include El Dorado Hills Boulevard, Cameron Park Drive, Salmon Falls Road, Deer Valley Road, Green Valley Road, Bass Lake Road, Country Club Drive, and, State Route 193 and 49, along with Garden Valley Road and Wentworth Springs Road. These roadways serve development in the El Dorado Hills, Bass Lake and Cameron Park areas. The El Dorado County Department of Transportation manages local transportation routes and enforces roadway standards for the unincorporated areas of the county.

There are existing LOS deficiencies on U.S. 50, El Dorado Hills Boulevard, and Green Valley Road, which comprise major roadways in the El Dorado Hills area, where the most growth is anticipated to occur. The deficiencies are caused largely by commuter traffic to and from Sacramento County. Roadway improvements across the county line in Sacramento County have not kept pace with the development in El Dorado County, creating LOS F conditions on these roadways near the county line.

Roadway Capacity and Level of Service

Level of Service (LOS) is a general measure of traffic operating conditions whereby a letter grade, from A (the best) to F (the worst), is assigned. These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving. The LOS grades are generally defined as follows:

- LOS A represents free-flow travel with an excellent level of comfort and convenience and the freedom to maneuver.
- LOS B has stable operating conditions, but the presence of other road users causes a noticeable, though slight, reduction in comfort, convenience, and maneuvering freedom.
- LOS C has stable operating conditions, but the operation of individual users is significantly affected by the interaction with others in the traffic stream.
- LOS D represents high-density, but stable flow. Users experience severe restriction in speed and freedom to maneuver, with poor levels of comfort and convenience.
- LOS E represents operating conditions at or near capacity. Speeds are reduced to a low but relatively uniform value. Freedom to maneuver is difficult with users experiencing frustration and poor comfort and convenience. Unstable operation is frequent, and minor disturbances in traffic flow can cause breakdown conditions.
- LOS F is used to define forced or breakdown conditions. This condition exists wherever the volume of traffic exceeds the capacity of the roadway. Long queues can form behind these bottleneck points with queued traffic traveling in a stop-and-go fashion.

These definitions are contained in the *Highway Capacity Manual* (HCM) (Transportation Research Board 2000). The HCM methodology is the prevailing measurement standard used throughout the United States.

Caltrans has completed transportation or route concept reports for a number of State highways in El Dorado County. These reports identify long-range improvements for specific State highway corridors and establish the "concept," or desired, LOS for specific corridor segments. The reports also identify long-range improvements needed to bring an existing facility up to expected standards needed to adequately serve 20-year traffic forecasts. Additionally, the reports identify the ultimate design concept for conditions beyond the immediate 20-year design period. El Dorado County highways that have concept reports are U.S. Highway 50, State Route 49, State Route 193, and State Route 153.

The *State Route 50 Transportation Concept Report* (Caltrans 1998) identifies the 20-year concept (through 2018) for the corridor as a six-lane freeway with two general-purpose lanes and one HOV lane in each direction from the county line to the future Silva Valley interchange. The ultimate facility concept (beyond 2018) for the corridor is an eight-lane freeway with three general-purpose lanes and one HOV lane in each direction from the county line to west of Placerville.

County Roadway-Related Initiatives and Programs

In November 1998, an initiative measure was approved by voters that modified the 1996 General Plan Policies relating to transportation. Measure Y prohibits discretionary approvals of residential development with five or more units that would result in LOS F conditions during weekday, peak-hour periods on any highway, roadway, interchange, or intersection, or further deteriorate operation where operation is already at LOS F. When the 1996 General Plan was set aside, the County continued to implement the Circulation Element as amended by Measure Y, as directed by the Court.[180] When the 2004 General Plan was developed, the Transportation and Circulation element was written so as to incorporate and build upon "the key principles of the measure and the County's experiences in its implementation", due to the public support for Measure Y.

Traffic Impact Fee Programs

The County has adopted four developer-funded traffic impact fee programs:

- The El Dorado Hills/Salmon Falls Area Road Impact Fees (RIF), Resolution 175-96, was adopted by the Board of Supervisors in July 1996 with major revisions adopted in December 2000.
- The West Slope Area of Benefit Traffic Impact Mitigation (TIM) Fees, Resolution No. 201-96, was adopted by the Board of Supervisors in August 1996.
- The Transportation Impact Fee for the State System's Capacity & Interchanges (State TIM), Resolution No. 202-96, was adopted by the Board of Supervisors in August 1996.
- The Interim Transportation Impact Fee for Highway 50 Corridor Improvements (Interim 50 TIM), Resolution 247-2002, was adopted by the Board of Supervisors in October 2002.[181]

Funds from these programs will pay a portion of the cost of transportation improvements in the County. However, complete funding has not yet been identified to cover the gap caused by the

180 El Dorado County Planning Department, *El Dorado County General Plan*. July 2004, p. 51.
181 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, pp. 5.4-16.

Measure Y restriction of the use of tax revenues to pay for traffic and road improvements to serve new development.

Other Transport Systems

Public transportation in western El Dorado County consists of the El Dorado County Transit Authority (EDCTA), commercial bus services, taxi service, vanpools and carpools, and park-and-ride facilities.[182] The County also contains a number of regional bikeways and trails, although these are used primarily for recreation, rather than for commuting.

There are four general-aviation airports within the County, two of which are in the vicinity of the Subcontractor service areas. The Georgetown Airport is owned and operated by the County; the Cameron Airpark Airport is operated by a special, non-County district. The airports are used by local residents and visitors for recreational purposes, and for training, rescue, and fire-suppression activities by government agencies and military personnel.[183]

4.12. AIR QUALITY (INDIRECT EFFECTS STUDY AREA)

This subchapter discussed the context upon which the potential indirect service area-related impacts on the existing air quality conditions that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.12.1. Affected Environment/Setting

The following describes the affected environment related to air quality in areas within the EID and GDPUD Subcontractor service areas potentially affected by the Proposed Action and Alternatives.

Sensitive Receptors

With respect to air quality, sensitive receptors represent portions of the population who are particularly susceptible to poor air quality. The term is also used to indicate land uses where people would be likely to remain for extended periods of time. Such uses include residential areas, schools, playgrounds, parks and recreational areas, hospitals and convalescent homes.

Sensitive receptors are present throughout the County and Subcontractor service areas. The Subcontractor service areas include a mixture of primarily residential land uses of varying density, and commercial, industrial, research and development, and public services land use designations. In addition to residential development, sensitive receptors present in the Subcontractor service areas include schools, playgrounds, parks, and long-term care facilities associated with mixed development.

182 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, pp. 5.4-8 to 5.4-10.

183 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, pp. 5.4-11.

Regional Overview

Climate and Meteorology

Western El Dorado County is located in a transition zone between the climate of the Central Valley and that of the Sierra Nevada. The western portion of the County is generally warmer year-round than the eastern portion and often experiences summer temperatures greater than 100 degrees Fahrenheit. Wind currents in this area are primarily from the west and southwest. Winds from the west facilitate local mixing but also bring air pollutants from urbanized areas to the west and southwest. In the winter, winds are typically from the east and southeast. The area experiences inversions that contribute to degraded air quality during the summer.[184]

Meteorology is often an important mediator of air pollutant impact severity. Atmospheric stability, wind speed, wind direction and the influence of local terrain control the speed with which pollutants disperse as one moves away from a pollutant release point towards a receptor. Episodes of high atmospheric stability (also known as temperature inversions) severely limit the ability of the atmosphere to disperse pollutants vertically, while low wind speeds and confining terrain have a similar effect attenuating the horizontal dispersion of airborne pollutants.

Air Quality

Monitoring data are used to designate areas according to their attainment status for criteria air pollutants. The purpose of the designations is to identify those areas with air quality problems and, thereby, initiate planning efforts for improvement. The three basic designation categories are: non-attainment, attainment, and unclassified. Unclassified is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California (State) designations include a subcategory of the non-attainment designation, called non-attainment-transitional. The non-attainment-transitional designation is given to non-attainment areas that are progressing and nearing attainment.

Western El Dorado County is located at the western edge of the Mountain Counties Air Basin (MCAB), and is under the jurisdiction of the El Dorado County Air Pollution Control District (APCD). The County is currently designated as a non-attainment area with respect to the State 1-hour ozone and PM_{10} standards, and is either in attainment or unclassified for the remaining State standards. With respect to the national standards, the County is designated as a severe non-attainment area for the 1-hour ozone standard and non-attainment for the 8-hour ozone standard. The County is either in attainment, unclassified, or unclassified/attainment for the remaining national standards. Based on current attainment status, lead, sulfates, hydrogen sulfide, and visibility-reducing particulate matter are not a primary concern in El Dorado County in comparison to ozone, PM_{10}, CO, and NO_2. Concentrations of sulfates, lead, and hydrogen sulfide are, consequently, not monitored by the ambient air quality monitoring stations in El Dorado County. The California Air Resources Board (CARB) does not yet have a measuring method with enough accuracy or precision to designate areas in the State as either “attainment” or “non-attainment.” The entire State is considered “unclassified” for visibility-reducing particulate matter. El Dorado County is in unclassified or

184 El Dorado County Planning Department, El Dorado County General Plan Environmental Impact Report, May 2003, p. 5.11-1.

unclassified/attainment for the State and national CO standards on a regional level. However, localized exceedances or CO "hot spots" can occur. Localized CO concentrations that exceed the applicable ambient air quality standards likely exist today because of the unacceptable level of service related to traffic, at which intersections currently operate in the county.[185]

Asbestos-Containing Rocks and Soils

Asbestos is a term used for several types of naturally occurring fibrous minerals. Chrysotile asbestos is the most common form, but tremolite asbestos is frequently present. Both types are associated with serpentine rock, but tremolite can also occur in certain other common rocks, especially near faults. Undisturbed, serpentine rock and soils derived from it do not present a substantial health risk, unless fibers from weathered or eroded material are transported by air currents and deposited elsewhere. Fibers may become airborne when the ground dries. When disturbed by human activity, however, asbestos can also be released into the air and become a health hazard. Dust from unpaved roads and construction activities that result in crushing or grading of serpentine rock or soils represent a typical source; and once airborne, asbestos fibers may be present in ambient air for long periods of time.

Asbestos poses a health risk as airborne fibers may become lodged in the respiratory or digestive tract and cause health problems. Breathing high levels of asbestos fibers can lead to an increase of: lung cancer; mesothelioma, a rare cancer of the lining of the chest and the abdominal cavity; and asbestosis, in which the lungs become scarred with fibrous tissue. Asbestos-related diseases may take decades to appear. Although there has been some scientific disagreement on the specific degree of hazard associated with each type of asbestos, all types of asbestos are considered hazardous by State and federal health professionals. There is not sufficient scientific information to support the identification of an exposure level that would be considered "safe." The most important way to reduce asbestos risk is to reduce exposure to airborne fibers.

Monitoring data gathered by the CARB as part of a study conducted in 1998 indicated that there is not widespread exposure to elevated levels of asbestos in ambient air. The general population does not appear to be exposed to significant risks from naturally-occurring asbestos. The report noted that increased health risk may occur near certain sources such as unpaved roads and quarries, and that construction activities in areas of serpentine or ultramafic rocks are a potential source of short-term, elevated asbestos exposures. The County has adopted an ordinance that regulates construction activities where asbestos-containing rock may be present.

Service Area-Related Air Quality Impact Sources

Fixed Sources

There are numerous stationary operations that can be sources of regulated emissions and particulates that may affect air quality (e.g., quarry operations, lumber mills, industrial facilities, rail yards, wood-burning stoves) dispersed throughout the county. Some, such as wood-burning stoves, are often located in urban settings and others, such as quarry operations, are sited in more rural

185 El Dorado County Planning Department, *El Dorado County General Plan Environmental Impact Report,* May 2003, p. 5.11-14.

locations. Some sensitive receptors, including schools, playgrounds, parks, may be located in the vicinity of these stationary sources that may affect air quality.

Non-stationary Sources

The primary non-stationary source of impacts on air quality in El Dorado County is vehicular traffic. Common commuter vehicles are emitters of carbon monoxide, NO_x (and thus ground-level ozone), and potentially particulate emissions. While zero-emission vehicles and partial zero-emission vehicles (PZEV) are becoming more common, it is not assumed that these and other low- or ultra-low emission vehicles will be enough to cause a significant reduction in vehicular emissions overall. Industrial traffic is also present in the County, and includes large delivery trucks and construction equipment, both of which generally run on diesel fuel. Emissions of concern from these vehicles include sulfur dioxide and particulates.

Temporary Sources

Construction-related activities are a notable temporary source of air quality impacts. Heavy machinery, pile driving, blasting, excavation activities, material transport, traffic related to additional worker trips, and constant delivery traffic all make construction a common producer of dust and diesel particulate-emissions in many locales. In rapidly growing areas, such as the western slopes of El Dorado County, it can be a prolonged source of emissions and particulates, as construction continually moves from one area to the next. Commercial/industrial, public utility, retail, roadway, or residential construction can be temporary sources of air quality problems.

4.13. NOISE (INDIRECT EFFECTS STUDY AREA)

This subchapter addresses the context upon which the potential indirect service area-related impacts on the existing noise environment that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.13.1. Affected Environment/Setting

The following describes the affected environment relative to noise conditions and sensitive receptors in areas within the EID and GDPUD Subcontractor service areas potentially affected by the Proposed Action and Alternatives.

Noise-Sensitive Receptors

Land-use types for which low ambient noise levels are integral to the use or value of the land are considered noise-sensitive receptors. These receptors typically include residences, hospitals, convalescent homes, schools, guest lodgings, libraries, and parks. The largest majority of noise-sensitive land uses located within the county is residential dwellings. Sensitive receptors, as identified, exist throughout the EID and GDPUD service areas.

Noise Sources

Several sources of noise that could affect local communities occur within El Dorado County. These sources include noise generated from stationary activities (e.g., commercial and industrial uses), aircraft operations, as well as traffic on major roadways and highways. In general, areas within EID and GDPUD that contain noise-sensitive land uses are relatively quiet except in the vicinity of traffic on major roadways and highways, near aircraft operations, or where stationary activities that generate noise (e.g., commercial and industrial uses) are present.

Traffic Noise

Ambient noise levels in many portions of the county are defined primarily by traffic on major roadways, including but not limited to U.S. Highway 50 (U.S. 50) and State Routes (SRs) 49, 193, and 89.[186] The 60-dBA CNEL/L_{dn} contour is typically considered the maximum “normally acceptable” noise level for the largest majority of noise-sensitive land uses located within the county (i.e., residential dwellings). Other noise-sensitive land uses, such as schools, hotels, convalescent care facilities, and hospitals, are typically considered “normally acceptable” at levels below 65 to 70 dBA CNEL/L_{dn}, depending on land-use designation.[187]

Fixed Noise Sources

There are numerous stationary noise sources (e.g., quarry operations, lumber mills, industrial facilities, rail yards) dispersed throughout the county. Some are located in urban settings and others, such as quarry operations, are sited in more rural locations. Noise-sensitive receptors located in the vicinity of these stationary sources consist primarily of residential properties and dwellings.

Other examples of stationary sources of noise include the Material Recovery Facility/Transfer Station (Diamond Springs), El Dorado Rod and Gun Club (El Dorado), and Pacific Western Pipe Extrusion (Shingle Springs). Major noise sources associated with the transfer station result from onsite heavy-duty mobile equipment.

Temporary Noise Sources

A significant temporary noise source is construction-related activities. The use of heavy machinery, pile driving, blasting, excavation activities, material transport, the intensity of on-site workers activities, and constant delivery traffic make construction the most widespread noise source in many locales. In rapidly growing areas such as the western slopes of El Dorado County, it can be a prolonged noise source, as construction continually moves from one area to the next. Whether commercial/industrial, public utility, retail, roadway, or residential, construction noise represents a significant concern.

4.14. GEOLOGY, SOILS, MINERAL RESOURCES, AND PALEONTOLOGICAL RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter discusses the context upon which the potential indirect, service area-related impacts on the existing geologic, seismic, mineral and paleontological resources, and soils

186 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p.5.10-12.

187 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p.5.10-12.

conditions that could result from the implementation of the P.L. 101-514 water service contract were analyzed.

4.14.1. Affected Environment/Setting

The following describes the affected environment relative to geology, soils, and mineral resources in areas potentially affected by the Proposed Action and alternatives.

Regional Geologic Setting

El Dorado County is located in the Sierra Nevada geomorphic province. Certain distinctive rock assemblages in the western Sierra Nevada can be interpreted as remnants of ancient volcanic areas, subduction zone complexes, and sequences of oceanic crust and upper mantle. The stratigraphic and structural data of the area suggest that the rock assemblages record the deposition of marine sediments and submarine volcanic rocks from the Paleozoic Era. The Mesozoic-Era collision with an oceanic island arc subsequently altered the marine sediments and volcanic rocks into metasedimentary and metavolcanic rocks that comprise the Calaveras Group. Marine sediments deposited near the end of the Mesozoic Era comprise the Mariposa Formation. Massive intrusions of igneous rocks (granitic materials of the Sierra Nevada batholith) subsequently folded and faulted the metasedimentary and metavolcanic rocks, at which time gold-bearing quartz veins and other precious metals were formed in the foothills. Volcanic activity in the Cenozoic Period on the east side of the Sierra Nevada deposited rocks, volcanic debris, and ash over the Sierra Nevada and foothills in El Dorado County. Approximately three million years ago, fault-generated uplift of the Sierra Nevada created west-flowing streams and deep canyons through the uplifted areas, removing much of the volcanic cover and exposing the metasedimentary and metavolcanic rocks.

The southwestern foothills, with elevations of less than 1,000 feet, are generally composed of rocks of the Mariposa Formation. The major groups of the Mariposa Formation in these areas are amphibolite, serpentine, and pyroxenite. The northwest parts of El Dorado County are underlain by an abundance of metamorphic rocks of the Calaveras Formation, including chert, slate, quartzite, and mica schist. Some amount of serpentine formations and asbestos soils are also found in this area. Naturally-occurring asbestos-related impacts pertaining to human health have been discussed previously. At the higher peaks, the surface geology in the county consists primarily of igneous and metamorphic rocks; and intruded into these rock masses is granite, which comprises much of the soil parent material at the higher elevations.[188] The western part of the EID service area is comprised of Copper Hill volcanics, the Pine Hill intrusive complex, and other metavolcanic and metasedimentary rocks associated with foothills development.[189]

Faults and Seismicity

The distribution of known faults is concentrated in the western portion of the county, with several isolated faults in the central county area and the Lake Tahoe Basin. Fault systems mapped in

188 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-110, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.
189 California Department of Conservation, Division of Mines and Geology, Geologic Map of the Sacramento Quadrangle, California, 1:250,000, DMG Regional Geologic Map Series, 1981, Sheet 1.

western El Dorado County include the West Bear Mountains Fault; the East Bear Mountains Fault; the Maidu Fault Zone; the El Dorado Fault; the Melones Fault Zone of the Clark, Gillis Hill Fault; and the Calaveras–Shoo Fly Thrust. There are no active fault-rupture hazard zones within the proposed GDPUD and EID Subcontractor service areas.

According to the most recent estimates published by the California Geological Survey (CGS, formerly Division of Mines and Geology), El Dorado County has a low to moderate potential for strong seismic groundshaking. Potential sources include earthquakes occurring in the Sierra Nevada, as well as seismic activity associated with earthquake faults in the San Francisco Bay Area and Coast Ranges to the west. No portion of El Dorado County is located in a Seismic Hazard Zone (regulatory zones that encompass areas prone to liquefaction and earthquake-induced landslides) based on the Seismic Hazards Mapping Program administered by CGS.[190] However, wet meadows on the western slope are areas where liquefaction could occur, but there are no specific assessments of these hazards.[191]

Mineral Resources

Metallic mineral deposits – and gold deposits in particular – are considered the most significant extractive mineral resource in El Dorado County. Other metallic minerals found include silver, copper, nickel, chromite, zinc, tungsten, mercury, titanium, platinum, and iron. Non-metallic mineral resources include building stone, limestone, slate, clay, marble, soapstone, sand, and gravel.[192]

One of the most historically productive gold-producing areas is located near Latrobe in southwestern El Dorado County. Chromite was historically mined in the Flagstaff District in northern El Dorado County east of Folsom Reservoir, and approximately three square miles is classified as MRZ-2b, highly likely to have economic concentrations of mineral deposits. There is a large active limestone quarry near Cool, along State Route 49, and another near Pilot Hill. Both are classified as MRZ-2a, areas of prime mineral importance with known economic mineral deposits.[193,194] An area surrounding a former quarry lake in the proposed Marble Valley Rezone and Subdivision Project a few miles east of El Dorado Hills and south of U.S. Highway 50 was classified by CGS as MRZ-2a for limestone in 1983-84, and actively mined until 1989.[195]

190 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-6.

191 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-110, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

192 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-23.

193 California Department of Conservation, Division of Mines and Geology, Mineral Land Classification of the Auburn 15' Quadrangle, El Dorado and Placer Counties, DMG Open-File Report 83-37, 1984, p.19.

194 El Dorado County, 1996 El Dorado County General Plan Background Information Report, 1996, p. 7-7.

195 El Dorado County Planning Department, Revised Marble Valley Rezone and Subdivision Project Draft Environmental Impact Report, June 1997, pp. 4.9-14 and 4.9-29/30.

Gold and other metallic resources are not considered to be exhausted in El Dorado County. Some mining operations are still active or may be active near Sly Park, Georgetown, Pilot Hill, Fairplay, and other locations in southwestern El Dorado County.[196]

Subsidence, Volcanic, Landslide, and Avalanche Hazards

Surface subsidence is generally caused by groundwater withdrawal, gas withdrawal, hydrocompaction, or peat oxidation. None of these types of subsidence are evident within El Dorado County,[197] and therefore subsidence would not be expected to affect locations in the proposed Subcontractor service areas that would be served by the water deliveries resulting from the Proposed Action.

Volcanic hazard potential exists in the Tahoe-Truckee area, but none has been identified in the western portions of El Dorado County.

Regarding landslide hazard, there are no current maps identifying landslide hazards in El Dorado County, as these mapping programs were discontinued in the mid-1990s.[198] Previous mapping efforts, however, have shown the areas with potential for landslides to be along the Foothills Fault Zone, and on the eastern slope of the Sierra Nevada.[199] Historically, landslides have occurred as recently as 1997 along U.S. Highway 50 in the American River Canyon[200] east of Placerville, but have primarily been associated with significant amounts of rainfall, rather than with seismic activity. Since this landslide, USGS, in cooperation with the El Dorado National Forest, has actively monitored landslide activity along this stretch of U.S. Highway 50.

Snow avalanches are not expected to occur in the proposed Subcontractor service areas because elevations in these parts of the EID and GDPUD service areas are under 2,500 feet – considerably lower than potential avalanche areas that normally receive significant snowfall (5,000 feet and above).

Soils and Erosion

A detailed survey of soil types in western El Dorado County and their suitability for agricultural production and other land uses was published in 1974. Focusing on agricultural uses, soil classifications range from Class I to Class VIII with soils being progressively less suited for agricultural uses the higher the classification number. Class I soils are best-suited to the widest range of production and cultivation. There are no Class I soils in El Dorado County. In general, the western slope has agricultural limitations that result primarily from steep slopes, shallow depth to

196 El Dorado County, 1996 El Dorado County General Plan Background Information Report, 1996, p. 7-6.

197 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-110 to 4-111, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

198 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-10.

199 California Department of Conservation, Division of Mines and Geology (CDMG). 1973. Generalized Map Showing Relative Amounts of Landslides in California. Sacramento, CA.

200 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-10.

bedrock, coarse fragments in the soil profile, low available water holding capacity, and rock outcrops.[201]

Soils in the EID and GDPUD service areas (private land below 5,000 feet) consist of well-drained silt and sandy and gravelly loams divided into two physiographic regions; the Lower and Middle Foothills and the Mountainous Uplands. In the Lower and Middle Foothills, there are five soil associations: Auburn-Argonaut, Boomer-Auburn, Rescue, Serpentine Rock Land-Delpiedra, and Auberry-Ahwanee-Sierra. Mountainous Upland soil associations are Mariposa-Josephine-Site, Holland-Musick-Chaix, and Cohasset-Aiken-McCarthy.

Except for the Musick soils, the soil associations have low to moderate shrink-swell (expansion) potential.[202] The Musick soils are not present in the proposed Subcontractor service areas.

El Dorado County soils are subject to erosion near road cuts and stream banks. The NRCS rates the erosion potential in the western county as low to moderate on most of the land with slopes less than 15 percent. Slopes in the El Dorado Hills, Shingle Springs/Cameron Park, and Diamond Springs/El Dorado areas range from 0 to 25 percent. Steeper slopes in excess of 25 percent are located along the river and stream canyons in the Coloma/Gold Hill, Cool/Pilot Hill, and Georgetown/Garden Valley, Pollock Pines, Camino, Pleasant Valley, Latrobe, and Somerset/Fairplay areas. The following areas in the EID and GDPUD service areas are characterized by predominantly steep slopes: Pollock Pines, Pleasant Valley, Georgetown/Garden Valley, American River, and Mosquito.[203] Of these steeper areas, only a small portion of the Georgetown/Garden Valley area lies within the Subcontractor service areas of this Proposed Action.

Paleontological Resources

Paleontology is the study of the remains, typically fossilized, of various plant or animal species such as dinosaurs and early mammals. While it is frequently associated with cultural sites and artifacts, paleontology does not encompass the study of traces of human cultural activity or human remains themselves. Paleontological remains may be found in numerous types of rock formations. However, vertebrate fossils are most commonly recovered from sedimentary and some volcanic rock formations, and can also be found in re-deposited stream and river gravels. Although no comprehensive paleontological studies have been conducted within the county, the paleontological sensitivity of rock units can be generally assessed based on the density of fossil remains previously documented within the rock unit and based on known unique, scientifically mportant fossils produced from that rock unit.

El Dorado County geology is fairly complex, with documented formations ranging from the Paleozoic era, dating to as early as 350 million years ago (Ma), to stream and gravel deposits still being

201 El Dorado County, 1996 El Dorado County General Plan Background Information Report, 1996, pp. 7-1 to 7-2.

202 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, p.4-111, included as Appendix D in PCWA American River Pump Station Project Draft EIS/EIR (SCH #1999062089), August 2001.

203 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.9-19.

deposited in recent times. Paleontological finds within most of these formations have been limited, with the exception of certain limestone cave deposits. Seven such localities have been discovered and recorded, mostly during the early 20th century, and consist of Pleistocene-age (1.8 Ma to 10 thousand years ago) vertebrates from caves near the town of Cool and along the Cosumnes River in the southern portion of the County. Other geological contexts from which a few vertebrate fossils have been discovered in the County include the Mehrten formation and Pleistocene channel deposits. The Mehrten is exposed in areas immediately surrounding Placerville to the north, south, and east. Pleistocene channel deposits occur in river tributaries in El Dorado County, and may appear underlying deposits mapped as Quaternary alluvium at shallow depth. While Quaternary alluvium is not prevalent in El Dorado County, primarily because of the topography, localized deposits are found within the County in stream and river channels, on the surface of valleys, and as alluvial fans.[204]

4.15. Recreation (Indirect Effects Study Area)

This subchapter discusses the context upon which the potential indirect service area-related impacts on existing recreational uses in the project vicinity that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.15.1. Affected Environment/Setting

The following describes the affected environment related to recreation and recreational resources in areas within the EID and GDPUD Subcontractor service areas, which could be potentially affected by the Proposed Action and Alternatives.

In-County Recreational Areas

The diverse natural characteristics of El Dorado County provide a wide range of recreational opportunities to residents and visitors alike. Many of the recreational resources located in the County have been developed by State and federal public agencies on public lands that are not directly subject to the County's General Plan. El Dorado County also owns and operates a number of regional recreation areas and is also involved in trail designation and construction as well as planning and administering the use of rivers flowing through the County for recreation activities.[205]

El Dorado County has a combined total of 106 existing and proposed parks and recreation areas encompassing more than 65,800 acres. The largest recreation areas include the approximately 17,718-acre Folsom Lake State Recreation Area (SRA), along the shores of Folsom Reservoir, and the 42,000-acre Auburn SRA in the North and Middle Fork American River Canyon. Of the 106 existing and proposed recreation areas, 38 are under the jurisdiction of El Dorado County, Cameron Park Community Services District, El Dorado Hills Community Services District, and Georgetown

204 El Dorado County Planning Department, *El Dorado County General Plan Final Environmental Impact Report* (SCH #2001082030), January 2004, p. 2-69.

205 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.7-63.

Divide Recreation District and lie within or adjacent to the service areas.[206] There are four County service area recreation zones of benefit on the western slope: Ponderosa, Gold Trail, Mother Lode, and Camino/Pollock Pines Recreation Districts. The County Parks and Recreation Division is responsible for the facilities located within the recreation service areas. There is a County-wide deficiency in required park acreage in all areas, and a high level of use for all existing park and recreation facilities within the service areas.[207]

Recreational use of open space lands within the County is managed under plans developed by the U.S. Forest Service (El Dorado National Forest), Bureau of Land Management (along the American River), or the California Department of Parks and Recreation (CDPR, Auburn SRA, Folsom Lake SRA).[208]

Sly Park, located at Jenkinson Lake, is the only recreational area in the County operated by EID, but lies outside the proposed Subcontractor service area. Another parcel of undeveloped land owned by EID that may be developed in the future is adjacent to Bass Lake in the El Dorado Hills area, and is within the Subcontractor service area.[209]

American River

Recreational use on the North Fork American River is concentrated upstream of the confluence of the North Fork and South Fork American River, outside of the Folsom Lake SRA. The North Fork supports commercial whitewater rafting upstream of Lake Clementine. On the Middle Fork, commercial rafting occurs upstream of the North Fork/Middle Fork confluence. Boating is prohibited downstream of the Middle/Fork North Fork confluence to the Folsom Reservoir high water line. Other recreation opportunities along the North Fork American River include hiking, mountain bicycling, and horseback riding on the Auburn-to-Cool Trail and Western States Trail.

4.16. VISUAL RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter discusses the context upon which the potential indirect service area-related impacts on existing visual and aesthetic resources within the project vicinity that could result from the implementation of the P.L.101-514 water service contract were assessed.

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206 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-85 to 4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

207 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-85 to 4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

208 SWRI, Draft American River Basin Cumulative Impact Report, August 2001, pp.4-85 to 4-86, included as Appendix D in PCWA American River Pump Station Project Draft EIR/EIS (SCH #1999062089), August 2001.

209 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, p. 5.7-68/69.

4.16.1. Affected Environment/Setting

The following describes the affected environment related to visual resources in the two Subcontractor service areas that could be potentially affected by the Proposed Action and Alternatives.

Regional Visual Setting

Undeveloped lands characterize much of El Dorado County included within the EID and GDPUD service areas. A variety of native environments exist, each represented by a distinct vegetative communities, geologic features, and landforms. These features contribute some of the most distinct visual resources in the County, providing numerous and varied short-range, mid-range, and long-range views. Gently rolling grassy foothills containing oak woodlands, orchards, and vineyards dominate views in the County's western and southern areas. Progressing east towards Lake Tahoe, north towards the American River, or south towards the Cosumnes River, the terrain and elevation changes dramatically. Views of the gently rolling foothills progressively change into landscapes consisting of steep, scenic river and stream corridors with dense woodlands, rugged valleys, and mid-range views of peaks along the crest of the Sierra Nevada. Traditions and styles linked to the Gold Rush are an integral part of the visual character of lands in the two service areas. Historic buildings, trails, and remnants of the early mining history of the County contribute significantly to the visual environment. Agricultural activities including ranching, orchards, vineyards and wineries, and grazing lands provide visual elements as well. The visual and aesthetic qualities of the County, including views of the Sierra Nevada, panoramas of agricultural land, forests, steep canyons, and woodlands are unique and integral components of the tourism industry.

The existing urban environment is as varied as the native environment. The U.S. Highway 50 corridor is characterized by newer high-density residential development, retail centers of varying size, commercial and business park development, and ranches. The largest portion of the proposed place of use for the P.L. 101-514 water lies within the more heavily-developed western portion of the county along Highway 50, including El Dorado Hills, Bass Lake, and Cameron Park. Areas along State Route 49 are characterized by rural communities with commercial cores with architectural styles reflecting Old West, Victorian, and contemporary design. This character, however, is more common in the GDPUD proposed Subcontractor service area than in the EID area.

Several highways in El Dorado County have been designated by Caltrans as scenic highways or are eligible for such designation. The following State scenic highways have been designated in the county:

- U.S. Highway 50 from the eastern limits of the Government Center interchange (Placerville Drive/Forni Road) in Placerville to South Lake Tahoe;
- all of SR 89 within the county; and
- those portions of SR 88 along the southern border of the county. SR 88 has also been designated under the USFS program as a national scenic byway.

Studies are pending for a similar designation under a Federal Highway Administration program. One of these portions of highway, however, are within or adjacent to the proposed Subcontractor service area for the Proposed Action.

American River and Folsom Reservoir

Folsom Reservoir is located within a landscape of rolling wooded foothills and provides a generally pleasing visual setting for numerous recreational uses, as viewed above the dam. The reservoir represents a significant visual component that contrasts sharply with the nearby foothill landscape, creating a vivid landscape feature. Folsom Reservoir levels are generally drawn down as summer progresses, creating exposed soil along the reservoir's shores, and affecting the overall visual quality; this effect is accentuated in dry years.

Upstream from Folsom Reservoir, many of the tributary streams flow into the forks of the American River in very steep terrain, creating cascades and waterfalls. These features provide notable scenic value to the area. Vegetation in the area is composed of oak woodland, chaparral, and ponderosa pine forest.

In September 1992, the Bureau of Land Management completed a study of the North and Middle forks of the American River and determined three segments of the river in this area to have significant scenic quality and, therefore, eligible for designation as National Wild and Scenic Rivers under Section 5(d) of the National Wild and Scenic Rivers Act. However, none of these Wild and Scenic River lie within the proposed Subcontractor service areas.

4.17. CULTURAL RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter discusses the affected environment context upon which the potential indirect service area-related impacts on existing cultural resources that could result from the implementation of the P.L.101-514 water service contract were evaluated.

4.17.1. Affected Environment/Setting

The following describes the affected environment related to cultural resources in areas within the EID and GDPUD Subcontractor service areas potentially affected by the Proposed Action and Alternatives.

Service Area-Related Cultural Resources

The Water Agency's planning area covers approximately 18,270 acres. According to the files at the North Central Information Center of the California Historical Resources Information System, housed at CSU Sacramento, roughly 4,252 acres, or about 23 percent of the area, had been subject to previous cultural resources studies as of 2006. These are of various ages and levels of completeness, and many of them may not be up to current standards. They are listed in the Class I Overview prepared for Reclamation (Waechter 2008). A review of the Information Center's files, published references, and historic-period maps has identified 325 recorded or potential cultural resources, of which 146 appear to lie within the planning area boundaries.

Prehistoric/Native American Resources

The most common element of prehistoric/Native American resources, which include ethnographic-period sites, are milling features: mortars and grinding slicks made on boulders or bedrock outcrops. These occur as isolated features and also in association with artifacts and midden. Complex occupation or "village" sites—usually including milling features—also are fairly frequent, no doubt because the project lies in the lower foothills, below the snow line, where people lived all-year-round. Lithic scatters are very common, since most prehistoric sites contain flaked stone tools and debitage. According to the records search results, none of the known prehistoric sites or components within the Plan Area has been formally evaluated for eligibility to the National Register of Historic Places or the California Register of Historical Resources.

Historic-Era (Non-Native) Resources

Historic-period resources make up two-thirds of the total, and these are dominated by mining remains, ditches/canals (which may also be related to mining), refuse deposits, and roads/trails. The high percentage of mining sites is not surprising, given the project's location in the foothills of the Mother Lode. Adits, shafts, tailings, and prospect pits (also called "glory holes" or "coyotes") cover much of El Dorado County, as well as adjacent Placer, Nevada, and Amador counties. Roads and trails were constructed to access mining sites and connect settlements, and these travel corridors join to form webs across the landscape, along which people built houses, farms, and commercial businesses. Refuse deposits, like prehistoric lithic scatters, are common elements of many sites. Few, if any, of these resources have been formally evaluated for eligibility to the National Register of Historic Places or the California Register of Historical Resources.

4.18. TERRESTRIAL AND WILDLIFE RESOURCES (INDIRECT EFFECTS STUDY AREA)

This subchapter describes the terrestrial resources and habitats within the Subcontractor service areas and presents the context under which the analyses of the potential indirect or secondary effects on these resources resulting from implementation of the new CVP water service contracts can be made. The information contained herein is taken from the El Dorado County General Plan EIR dated 2003, as amended (2004), and supplemented with updated information where relevant.

4.18.1. Affected Environment/Setting

The following describes the affected environment related to terrestrial resources and related habitats in areas potentially affected by the Proposed Action and Alternatives. El Dorado County possesses a diverse mix of native flora and fauna. This diversity can be attributed to a combination of unique physical characteristics that have resulted in a wide assortment of habitats. These unique physical features include a wide range of elevations and varied terrain, diverse substrate material, large tracts of contiguous natural habitat, and a broad range of climatic conditions. Habitats are generally distributed in an integrated mosaic pattern across the county. Coniferous forest is dominant at higher elevations in the eastern half; oak and hardwood habitats are found mostly in the central region; and annual grassland, chaparral, agriculture, and urban development is found primarily in the western third of the county.

Within the western foothill region (western slope) of the county, threats to biological diversity and sensitive biological resources are considered most serious. The impacts on biological resources are primarily the result of urbanization of the area, habitat fragmentation, water pollution, and conversion of natural land to agricultural uses. This area includes the proposed Subcontractor service areas.

Major Habitat Types

The following descriptions of major habitat types are summaries of detailed accounts presented in *A Guide to Wildlife Habitats in California* (Mayer and Laudenslayer 1988). For the General Plan EIR, the distribution of habitats in El Dorado County was defined using land-cover data developed as part of a cooperative effort between the California Department of Forestry and Fire Protection (CDF) Fire and Resource Assessment Program (FRAP) and USFS (CDF-FRAP El Dorado County General Plan EIR, May 2003). Habitat types were quantified using the GIS land-cover data developed by FRAP. The major habitats in El Dorado County have been grouped into five categories: coniferous forest habitats, woodland habitats, shrub-dominated habitats, herbaceous-dominated habitats, and other habitats.

Coniferous Forest Habitats

Coniferous forest habitats are the dominant vegetation type above 2,500 feet elevation. Coniferous forest habitats cover 613,200 acres, or more than half of the 1,145,400 acres in the county. The eight major coniferous forest habitats in El Dorado County are Douglas-fir, Jeffrey pine, lodgepole pine, ponderosa pine, red fir, Sierran mixed conifer, subalpine conifer, and white fir. Within the Subcontractor service areas, Sierran mixed confer is dominant of the coniferous forest habitats.

<u>Sierran mixed conifer</u> covers 304,100 acres and is the most common habitat type in El Dorado County. Generally occurring between 2,500 and 6,000 feet elevation, this habitat is comprises both hardwood and conifer species. Trees commonly occurring in Sierran mixed conifer include Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir, and black oak. Historically, burning and logging have caused wide variability in stand structure, resulting in both even-aged and uneven-aged stands. Forested stands form closed, multilayered canopies with nearly 100 percent overlapping cover. Virgin old-growth stands where fire has been excluded are often two-storied, with the overstory composed of mixed conifer and the understory white fir and incense cedar. Shrubs are common below openings in the canopy. Common shrub species are deer brush, manzanita, bush chinquapin, squawcarpet, mountain whitethorn, gooseberry, and mountain misery.

Woodland Habitats

Woodland habitats are located primarily at middle and lower elevations in the western half of El Dorado County. The four major woodland habitats are montane hardwood-conifer, montane hardwood, blue oak-foothill pine, and blue oak woodland. These habitats combined cover 252,400 acres in El Dorado County. Woodland habitats range in structure from open savannah to dense forest. Sensitive woodland habitats in the county include montane riparian, valley-foothill riparian, aspen, and valley oak woodland.

Montane hardwood-conifer, which covers 49,100 acres, includes vegetation associated with both coniferous and hardwood habitats and is a transitional habitat between the montane hardwood, mixed chaparral, and woodlands of low elevations and the coniferous forests of high elevations. Habitat composition is generally defined as including a minimum of one-third coniferous trees and one-third broad-leaved trees. Typically, conifers dominate the upper canopy, ranging up to 200 feet in height, and broad-leaved trees form a sub-canopy at 30–100 feet elevation. Common tree species associated within this habitat type include black oak, ponderosa pine, Douglas-fir, white fir, and incense cedar. In the northern Sierra Nevada, montane hardwood-conifer is found between 1,000 and 4,000 feet elevation.

Montane hardwood covers 155,900 acres. This habitat usually occurs at lower elevations than montane hardwood-conifer and is often associated with major river canyons. Montane hardwood is composed of a mixture of trees that occur on rocky, poorly developed and well drained soils. The structure ranges from dense to open tree cover with a poorly developed shrub understory. At low elevations, common species include canyon live oak, foothill pine, madrone, and California bay. Black oak and Douglas-fir may occur at higher elevations. Common shrubs in montane hardwood habitat include wood rose, snowberry, manzanita, and poison-oak.

Blue oak-foothill pine covers 4,200 acres and is characterized by a mixture of hardwoods, conifers, and shrubs. This habitat is found generally in the foothills where it intergrades with blue oak woodland and annual grassland at lower elevations, extending up to about 3,000 feet elevation, where it frequently intergrades with mixed chaparral. The understory is commonly characterized by clusters of mixed shrubs with interspersed openings dominated by annual grasses. Blue oaks are dominant at lower elevations but are usually outnumbered by foothill pines at higher elevations. Associated tree species include interior live oak, canyon live oak, and California buckeye. Interior live oaks are present on alluvial soils associated with river floodplains, low foothills, and upland slopes. Canyon live oaks are present on low foothills, mountain canyons, upland slopes, and exposed ridges.

Blue oak woodland covers 43,200 acres and is found mostly below 3,000 feet elevation on shallow, rocky, and infertile soils. Blue oak woodland includes an understory of annual grasses or a poorly developed shrubby understory featuring species such as poison-oak, California coffeeberry, and buckbrush. Interior live oaks and canyon live oaks are often found in blue oak woodland. These species can also be the dominant tree species where they may be considered as distinct habitats. Interior live oaks are often associated with river floodplains, low foothills, and upland slopes. In low-elevation foothill woodlands, interior live oaks occur as widely spaced trees or clumps that may be concentrated around rock outcrops. Interior live oak becomes a more significant part of the blue oak woodland canopy with increasing elevation, particularly on north-facing slopes. Canyon live oaks are found on low foothills, mountain canyons, upland slopes, and exposed ridges.

Shrub-Dominated Habitats

Shrub-dominated habitats exist at scattered locations throughout the county and include sagebrush, alpine dwarf-shrub, montane chaparral, chamise chaparral, and mixed chaparral. These five habitats cover a total of 84,100 acres. Although none of these habitats are considered sensitive, they are known to provide habitat for a number of special-status plant and wildlife species.

Alpine dwarf-shrub covers 1,200 acres above 8,500 feet elevation. The prostrate plants within this habitat are adapted to the thin, rocky soil, heavy snowpack, and short growing season. Common plants include pussy paws, Sierra primrose, Davidson's penstemon, and Indian paintbrush.

Chamise chaparral covers 3,700 acres and is usually found below 4,000 feet elevation often consists of nearly pure stands of chamise. The purest stands of chamise occur on xeric (dry), south-facing slopes. Toyon, sugar sumac, poison-oak, and California buckthorn are commonly found with chamise in drainages and on other relatively moist sites.

Herbaceous-Dominated Habitats

Annual grassland, which covers 81,100 acres, is the only major herbaceous-dominated habitat in El Dorado County. Annual grassland is fairly common at low elevations (i.e., below 2,500 feet elevation) in the western region of the county. This habitat comprises mostly non-native annuals, primarily of Mediterranean origin, but can also include a variety of native herbaceous species. Non-native grasslands have replaced most native perennial grasslands in El Dorado County and throughout most of California.

Wildlife

The complex array of habitats in El Dorado County supports abundant and diverse fauna because large tracts of land are covered by habitats known to have outstanding value for wildlife, such as mixed coniferous and hardwood forests. Sierran mixed conifer habitat alone, the most common habitat in the county, supports 355 species of animals (Verner and Boss 1980). Oak woodlands provide habitat for more than 100 species of birds, 60 species of mammals, 80 species of amphibians and reptiles, and 5,000 species of insects (Verner and Boss 1980, Pavlik et al. 1991). Blue oak-foothill pine, another major habitat type in El Dorado County, provides suitable breeding habitat for 29 species of amphibians and reptiles, 79 species of birds, and 22 species of mammals (Verner and Boss 1980).

Important wildlife habitat is found throughout the county. Large contiguous blocks containing multiple habitat types have the potential to support the highest wildlife diversity and abundance. Special-status wildlife occur in both large and small blocks of habitat, while some large mammals and other species that have large home ranges are generally found only on large undisturbed parcels. Generally, the lowest diversity of native wildlife species can be expected in densely urbanized areas as in much of the EID Subcontractor service area.

Wildlife diversity is generally high in the lower montane coniferous forest types. Amphibians and reptiles found in lower montane forest and woodlands include Pacific treefrog and rubber boa. Common resident birds in these forests include Stellar's jay and hairy woodpecker. Migratory species that use these forests for breeding during summer months include western tanager, Nashville warbler, and black-headed grosbeak. Common mammals in lower montane coniferous forests include mule deer and Douglas' squirrel.

Oak and other hardwood habitats at mid-elevations are important for a large percentage of the wildlife species found in El Dorado County. Reptiles and amphibians found in oak woodlands include California slender salamander, western fence lizard, and California kingsnake. Common birds in oak woodland include acorn woodpecker, western scrub-jay, and oak titmouse. Mammals that characterize oak woodland habitat include mule deer, western gray squirrel, gray fox, and bobcat.

Chaparral generally has lower wildlife diversity than most forest and woodland habitats. However, chaparral does provide habitat for many wildlife species, including some that are considered rare elsewhere. Reptiles found in chaparral include western rattlesnake, western fence lizard, and western whiptail. Common birds in chaparral at low elevations include wrentit, Bewick's wren, California towhee, and California quail. At higher elevations chaparral can provide habitat for mountain quail, fox sparrow, and green-tailed towhee. Mammals commonly associated with chaparral include and gray fox and mule deer.

Annual grasslands generally support lower wildlife diversity than woodland and shrub-dominated habitats but are invaluable to the grassland-dependent species found in El Dorado County. A great diversity and abundance of insects rely on grasslands. Reptiles found in annual grasslands include western fence lizard and gopher snake. Birds that are common in this habitat include western meadowlark, Say's phoebe, and savanna sparrow. Mammals known to use this habitat include California ground squirrel, black-tailed jackrabbit, pocket gopher, and coyote.

Agricultural land and lands dominated by urban development support many wildlife species, most of which are highly adapted to these disturbed environments. Agricultural land is not generally considered important wildlife habitat but is used by many species, particularly as foraging habitat. Wildlife found in agricultural areas varies by crop type and time of year. Common wildlife expected in most agricultural regions of El Dorado County include Brewers blackbird, American crow, red-tailed hawk, house finch, raccoon, striped skunk, and opossum.

Wildlife found in urban areas is often dependent upon surrounding land uses and the presence or absence of nearby natural vegetation. In densely urbanized areas such as El Dorado Hills, Cameron Park, and Shingle Springs, a large percentage of the wildlife can be made up of exotic species such as rock dove, European starling, house sparrow, house mouse, and brown rat. Urban areas provide habitat for species also found in agricultural areas, such as mourning dove, American robin, and western gray squirrel.

Sensitive Habitats

Sensitive habitats for El Dorado County and, specifically, in those areas delineated by the proposed Subcontractor service areas have been identified and described in detail in other documents. Most notably, the Draft Biological Assessment for listed terrestrial species associated with the ongoing informal consultation between Reclamation and USFWS for this action provides a thorough discussion of these habitats and potentially affected listed species (see Appendix G in this Draft EIS/EIR). A brief summary of some of the sensitive habitats includes those for montane and valley-foothill riparian habitat, valley oak woodland, and vernal pools.

Montane riparian habitat, which covers 700 acres, is associated with montane lakes, ponds, seeps, bogs, and meadows, as well as rivers and streams. This habitat is usually present below 8,000 feet elevation. Montane riparian vegetation is quite variable and often structurally diverse. Usually, the montane riparian zone occurs as narrow, often dense grove of broadleaved, deciduous trees. In the Sierra Nevada, characteristic species include thinleaf alder, aspen, black cottonwood, dogwood, wild azalea, willow, and white alder. Like all riparian habitats, montane riparian habitat supports rich fauna that include a high diversity of amphibians, reptiles, birds and mammals. Montane and other riparian habitats also provide important migration and dispersal corridors for wildlife (Mayer and Laudenslayer 1988). A few of the many common wildlife species associated with montane riparian habitat in El Dorado County include western aquatic garter snake, Pacific treefrog, Wilson's warbler, and mink. Several special-status wildlife species depend on montane riparian including willow flycatcher and yellow-legged frog.

Valley-foothill riparian habitat is typically found at lower elevations (i.e., below 3,000 feet elevation) in western El Dorado County. It is found along many of the rivers and streams that flow through the valleys and rolling foothills in this region. Plant diversity within valleyfoothill riparian varies considerably depending upon hydrological factors, soils, and other environmental conditions. Dominant tree species may include Fremont cottonwood, willow, and valley oak. The understory typically consists of a shrub and herbaceous layer. Common shrubs and vines include wild rose, blackberry, blue elderberry, poison-oak, wild grape, California coffeeberry, and willows. Common wildlife associated with valley-foothill riparian habitat include black-headed grosbeak, bushtit, striped skunk, raccoon, and gray fox. Special status wildlife species that depend on valley-foothill riparian habitat include the northwestern pond turtle, Cooper's hawk, and foothill yellow-legged frog.

Valley oak woodland covers 3,300 acres at lower elevations in El Dorado County. This habitat, which is dominated by valley oaks, varies from savanna-like to forest-like stands with partially closed canopies. Valley oak woodland is composed mostly of winter-deciduous, broad-leaved species. Denser stands typically grow in valley soils along natural drainages. In the foothills, valley oak woodland often intergrades with blue oak woodland or blue oak-foothill pine habitats. Trees frequently associated with this habitat include western sycamore, box elder, Northern California black walnut, blue oak, and interior live oak. Valley oak woodland, like most oak woodland habitats, supports numerous wildlife species. It is particularly important for species that feed on acorns, are cavity-nesters, or otherwise dependent on valley oaks for food and/or breeding habitat. Wildlife found commonly in valley oak woodland includes gopher snake, acorn woodpecker, oak titmouse, white-breasted nuthatch, California quail, and western gray squirrel. Valley oak woodland is classified by both the CNDDB and CWHR, and is listed as a high-priority community for inventory by the CNDDB.

Vernal pools are associated with annual grassland habitat in the westernmost region of the county. These ephemeral pools support many endemic species, including special-status plants, invertebrates, and amphibians. Suitable topographic and soil conditions are prerequisites for the occurrence of vernal pools. The topography requirement is a series of microdepressions that collect water from precipitation and runoff from the surrounding higher landforms during the rainy season. The important soil requirement is a subsoil hardpan or claypan, which prevents the draining of water from these pools by downward percolation, resulting in a perched water table. Vernal pools are typically characterized by a high percentage of native annuals such as goldfields, downingia, and meadowfoam.

Regulatory Framework

The regulatory setting for the preservation, protection, and long-term management of terrestrial wildlife and associated habitats is provided at the federal, State and local county levels. Where special status species and/or their habitats are listed under either the federal or State Endangered Species Acts, the provisions for protection and conservation are explicit (see Draft Biological Assessment for listed terrestrial species for this action under Appendix G). A review of the federal consultation requirements under Section 7(a) of the federal Endangered Species Act is not restated here.

Locally, El Dorado County has long considered the conservation of biological resources (e.g., wildlife and vegetation) an important part its resource management responsibilities. As part of its Conservation and Open Space Element of the General Plan, various Goals, Objectives, and Policies exist that address these resource protection issues. They are identified below:

GOAL 7.4: WILDLIFE AND VEGETATION RESOURCES

Identify, conserve, and manage wildlife, wildlife habitat, fisheries, and vegetation resources of significant biological, ecological, and recreational value.

OBJECTIVE 7.4.1: RARE, THREATENED, AND ENDANGERED SPECIES

The County shall protect State and Federally recognized rare, threatened, or endangered species and their habitats consistent with Federal and State laws.

<u>Policies</u>

7.4.1.1 The County shall continue to provide for the permanent protection of the eight sensitive plant species known as the Pine Hill endemics and their habitat through the establishment and management of ecological preserves consistent with County Code Chapter 17.71 and the USFWS' Gabbro Soil Plants for the Central Sierra Nevada Foothills Recovery Plan (USFWS 2002).

7.4.1.2 Private land for preserve sites will be purchased only from willing sellers.

7.4.1.3 Limit land uses within established preserve areas to activities deemed compatible. Such uses may include passive recreation, research and scientific study, and education. In conjunction with use as passive recreational areas, develop a rare plant educational and interpretive program.

7.4.1.4 Proposed rare, threatened, or endangered species preserves, as approved by the County Board of Supervisors, shall be designated Ecological Preserve (-EP) overlay on the General Plan land use map.

7.4.1.5 Species, habitat, and natural community preservation/conservation strategies shall be prepared to protect special status plant and animal species and natural communities and habitats when discretionary development is proposed on lands with such resources unless it is determined that those resources exist, and either are or can be protected, on public lands or private Natural Resource lands.

7.4.1.6 All development projects involving discretionary review shall be designed to avoid disturbance or fragmentation of important habitats to the extent reasonably feasible. Where avoidance is not possible, the development shall be required to fully mitigate the effects of important habitat loss and fragmentation. Mitigation shall be defined in the Integrated Natural Resources Management Plan (INRMP) (see Policy 7.4.2.8 and Implementation Measure CO-M).

The County Agricultural Commission, Plant and Wildlife Technical Advisory Committee, representatives of the agricultural community, academia, and other stakeholders shall be involved and consulted in defining the important habitats of the County and in the creation and implementation of the INRMP.

7.4.1.7 The County shall continue to support the Noxious Weed Management Group in its efforts to reduce and eliminate noxious weed infestations to protect native habitats and to reduce fire hazards.

OBJECTIVE 7.4.2: IDENTIFY AND PROTECT RESOURCES

Identification and protection, where feasible, of critical fish and wildlife habitat including deer winter, summer, and fawning ranges; deer migration routes; stream and river riparian habitat; lake shore habitat; fish spawning areas; wetlands; wildlife corridors; and diverse wildlife habitat.

<u>Policies</u>

7.4.2.1 To the extent feasible in light of other General Plan policies and to the extent permitted by State law, the County of El Dorado will protect identified critical fish and wildlife habitat, as identified on the Important Biological Resources Map maintained at the Planning Department, through any of the following techniques: utilization of open space, Natural Resource land use designation, clustering, large lot design, setbacks, etc.

7.4.2.2 Where critical wildlife areas and migration corridors are identified during review of projects, the County shall protect the resources from degradation by requiring all portions of the project site that contain or influence said areas to be retained as non-disturbed natural areas through mandatory clustered development on suitable portions of the project site or other means such as density transfers if clustering cannot be achieved. The setback distance for designated or protected migration corridors shall be determined as part of the project's environmental analysis. The intent and emphasis of the Open Space land use designation and of the non-disturbance policy is to ensure continued viability of contiguous or interdependent habitat areas and the preservation of all movement corridors between related habitats. The intent of mandatory clustering is to provide a mechanism for natural resource protection while allowing appropriate development of private property. Horticultural and grazing projects on agriculturally designated lands are exempt from the restrictions placed on disturbance of natural areas when utilizing "Best Management Practices" (BMPs) recommended by the County Agricultural Commission and adopted by the Board of Supervisors when not subject to Policy 7.1.2.7.

7.4.2.3 Consistent with Policy 9.1.3.1 of the Parks and Recreation Element, low impact uses such as trails and linear parks may be provided within river and stream buffers if all applicable mitigation measures are incorporated into the design.

7.4.2.4 Establish and manage wildlife habitat corridors within public parks and natural resource protection areas to allow for wildlife use. Recreational uses within these areas shall be limited to those activities that do not require grading or vegetation removal.

7.4.2.5 Setbacks from all rivers, streams, and lakes shall be included in the Zoning Ordinance for all ministerial and discretionary development projects.

7.4.2.6 El Dorado County Biological Community Conservation Plans shall be required to protect, to the extent feasible, rare, threatened, and endangered plant species only when existing Federal or State plans for non-jurisdictional areas do not provide adequate protection.

7.4.2.7 The County shall form a Plant and Wildlife Technical Advisory Committee to advise the Planning Commission and Board of Supervisors on plant and wildlife issues, and the committee should be formed of local experts, including agricultural, fire protection, and forestry representatives, who will consult with other experts with special expertise on various plant and wildlife issues, including representatives of regulatory agencies. The Committee shall formulate objectives which will be reviewed by the Planning Commission and Board of Supervisors.

7.4.2.8 Develop within five years and implement an Integrated Natural Resources Management Plan (INRMP) that identifies important habitat in the County and establishes a program for effective habitat preservation and management. The INRMP shall include the following components:

A. Habitat Inventory. This part of the INRMP shall inventory and map the following important habitats in El Dorado County:

1. Habitats that support special status species;
2. Aquatic environments including streams, rivers, and lakes;
3. Wetland and riparian habitat;
4. Important habitat for migratory deer herds; and
5. Large expanses of native vegetation.

The County should update the inventory every three years to identify the amount of important habitat protected, by habitat type, through County programs and the amount of important habitat removed because of new development during that period. The inventory and mapping effort shall be developed with the assistance of the Plant and Wildlife Technical Advisory Committee, CDFG, and USFWS. The inventory shall be maintained and updated by the County Planning Department and shall be publicly accessible.

B. Habitat Protection Strategy. This component shall describe a strategy for protecting important habitats based on coordinated land acquisitions (see item D below) and management of acquired land. The goal of the strategy shall be to conserve and restore contiguous blocks of important habitat to offset the effects of increased habitat loss and fragmentation elsewhere in the county. The Habitat Protection Strategy should be updated at least once every five years based on the results of the habitat monitoring program (item F below). Consideration of wildlife movement will be given by the County on all future 4- and 6-lane roadway construction projects. When feasible, natural under-crossings along proposed roadway alignments that could be utilized by terrestrial wildlife for movement will be preserved and enhanced.

C. Mitigation Assistance. This part of the INRMP shall establish a program to facilitate mitigation of impacts on biological resources resulting from projects approved by the County that are unable to avoid impacts on important habitats. The program may include development of mitigation banks, maintenance of lists of potential mitigation options, and incentives for developers and landowner participation in the habitat acquisition and management components of the INRMP.

D. Habitat Acquisition. Based on the Habitat Protection Strategy and in coordination with the Mitigation Assistance program, the INRMP shall include a program for identifying habitat acquisition opportunities involving willing sellers. Acquisition may be by state or federal land management agencies, private land trusts or mitigation banks, the County, or other public or private organizations. Lands may be acquired in fee or protected through acquisition of a conservation easement designed to protect the core habitat values of the land while allowing other uses by the fee owner. The program should identify opportunities for partnerships between the County and other organizations for habitat acquisition and management. In evaluating proposed acquisitions, consideration will be given to site specific features (e.g., condition and threats to habitat, presence of special status species), transaction related features (e.g., level of protection gained, time frame for purchase completion, relative costs), and regional considerations (e.g., connectivity with adjacent protected lands and important habitat, achieves multiple agency and community benefits). Parcels that include important habitat and are located generally to the west of the Eldorado National Forest should be given priority for acquisition. Priority will also be given to parcels that would preserve natural wildlife movement corridors such as crossing under major roadways (e.g., U.S. Highway 50 and across canyons). All land acquired shall be added to the Ecological Preserve overlay area.

E. Habitat Management. Each property or easement acquired through the INRMP should be evaluated to determine whether the biological resources would benefit from restoration or management actions.

Examples of the many types of restoration or management actions that could be undertaken to improve current habitat conditions include: removal of non native plant species, planting native species, repair and rehabilitation of severely grazed riparian and upland habitats, removal of culverts and other structures that impede movement by native fishes, construction of roadway under and over-crossing that would facilitate movement by terrestrial wildlife, and installation of erosion control measures on land adjacent to sensitive wetland and riparian habitat.

F. Monitoring. The INRMP shall include a habitat monitoring program that covers all areas under the Ecological Preserve overlay together with all lands acquired as part of the INRMP. Monitoring results shall be incorporated into future County planning efforts so as to more effectively conserve and restore important habitats. The results of all special status species monitoring shall be reported to the CNDDB. Monitoring results shall be compiled into an annual report to be presented to the Board of Supervisors.

G. Public Participation. The INRMP shall be developed with and include provisions for public participation and informal consultation with local, state, and federal agencies having jurisdiction over natural resources within the county.

H. Funding. The County shall develop a conservation fund to ensure adequate funding of the INRMP, including habitat maintenance and restoration. Funding may be provided from grants, mitigation fees, and the County general fund. The INRMP annual report described under item F above shall include information on current funding levels and shall project anticipated funding needs and anticipated and potential funding sources for the following five years.

7.4.2.9 The Important Biological Corridor (-IBC) overlay shall apply to lands identified as having high wildlife habitat values because of extent, habitat function, connectivity, and other factors. Lands located within the overlay district shall be subject to the following provisions except that where the overlay is applied to lands that are also subject to the Agricultural District (-A) overlay or that are within the Agricultural Lands (AL) designation, the land use restrictions associated with the -IBC policies will not apply to the extent that the agricultural practices do not interfere with the purposes of the -IBC overlay.

- Increased minimum parcel size;
- Higher canopy-retention standards and/or different mitigation standards/thresholds for oak woodlands;
- Lower thresholds for grading permits;
- Higher wetlands/riparian retention standards and/or more stringent mitigation requirements for wetland/riparian habitat loss;
- Increased riparian corridor and wetland setbacks;
- Greater protection for rare plants (e.g., no disturbance at all or disturbance only as recommended by U.S. Fish and Wildlife Service/California Department of Fish and Game);
- Standards for retention of contiguous areas/large expanses of other (non-oak or non-sensitive) plant communities;
- Building permits discretionary or some other type of "site review" to ensure that canopy is retained;
- More stringent standards for lot coverage, floor area ratio (FAR), and building height; and
- No hindrances to wildlife movement (e.g., no fences that would restrict wildlife movement).

The standards listed above shall be included in the Zoning Ordinance.

Wildland Fire Safe measures are exempt from this policy, except that Fire Safe measures will be designed insofar as possible to be consistent with the objectives of the Important Biological Corridor

OBJECTIVE 7.4.3: COORDINATION WITH APPROPRIATE AGENCIES

Coordination of wildlife and vegetation protection programs with appropriate Federal and State agencies.

OBJECTIVE 7.4.4: FOREST AND OAK WOODLAND RESOURCES

Protect and conserve forest and woodland resources for their wildlife habitat, recreation, water production, domestic livestock grazing, production of a sustainable flow of wood products, and aesthetic values.

Policies

7.4.4.1 The Natural Resource land use designation shall be used to protect important forest resources from uses incompatible with timber harvesting.

7.4.4.2 Through the review of discretionary projects, the County, consistent with any limitations imposed by State law, shall encourage the protection, planting, restoration, and regeneration of native trees in new developments and within existing communities.

7.4.4.3 Utilize the clustering of development to retain the largest contiguous areas possible in wildland (undeveloped) status.

7.4.4.4 For all new development projects (not including agricultural cultivation and actions pursuant to an approved Fire Safe Plan necessary to protect existing structures, both of which are exempt from this policy) that would result in soil disturbance on parcels that (1) are over an acre and have at least 1 percent total canopy cover or (2) are less than an acre and have at least 10 percent total canopy cover by woodlands habitats as defined in this General Plan and determined from base line aerial photography or by site survey performed by a qualified biologist or licensed arborist, the County shall require one of two mitigation options: (1) the project applicant shall adhere to the tree canopy retention and replacement standards described below; or (2) the project applicant shall contribute to the County's Integrated Natural Resources Management Plan (INRMP) conservation fund described in Policy 7.4.2.8.

Option A. The County shall apply the following tree canopy retention standards:

Percent Existing Canopy Cover	Canopy Cover to be Retained
80–100	60% of existing canopy
60–79	70% of existing canopy
40–59	80% of existing canopy
20–39	85% of existing canopy
10-19	90% of existing canopy
1-9 for parcels > 1 acre	90% of existing canopy

Under Option A, the project applicant shall also replace woodland habitat removed at 1:1 ratio. Impacts on woodland habitat and mitigation requirements shall be addressed in a Biological Resources Study and Important Habitat Mitigation Plan as described in Policy 7.4.2.8. Woodland replacement shall be based on a formula, developed by the County, that accounts for the number of trees and acreage affected.

Option B. The project applicant shall provide sufficient funding to the County's INRMP conservation fund, described in Policy 7.4.2.8, to fully compensate for the impact to oak woodland habitat. To compensate for fragmentation as well as habitat loss, the preservation mitigation ratio shall be 2:1 and based on the total woodland acreage onsite directly impacted by habitat loss and indirectly impacted by habitat fragmentation. The costs associated with acquisition, restoration, and management of the habitat protected shall be included in the mitigation fee. Impacts on woodland habitat and mitigation requirements shall be addressed in a Biological Resources Study and Important Habitat Mitigation Plan as described in Policy 7.4.2.8.

7.4.4.5 Where existing individual or a group of oak trees are lost within a stand, a corridor of oak trees shall be retained that maintains continuity between all portions of the stand. The retained corridor shall have a tree density that is equal to the density of the stand.

OBJECTIVE 7.4.5: NATIVE VEGETATION AND LANDMARK TREES

Protect and maintain native trees including oaks and landmark and heritage trees.

Policies

7.4.5.1 A tree survey, preservation, and replacement plan shall be required to be filed with the County prior to issuance of a grading permit for discretionary permits on all high-density residential, multifamily residential, commercial, and industrial projects. To ensure that proposed replacement trees survive, a mitigation monitoring plan should be incorporated into discretionary projects when applicable and shall include provisions for necessary replacement of trees.

7.4.5.2 It shall be the policy of the County to preserve native oaks wherever feasible, through the review of all proposed development activities where such trees are present on either public or private property, while at the same time recognizing individual rights to develop private property in a reasonable manner. To ensure that oak tree loss is reduced to reasonable acceptable levels, the County shall develop and implement an Oak Tree Preservation Ordinance that includes the following components:

A. Oak Tree Removal Permit Process. Except under special exemptions, a tree removal permit shall be required by the County for removal of any native oak tree with a single main trunk of at least 6 inches diameter at breast height (dbh), or a multiple trunk with an aggregate of at least 10 inches dbh. Special exemptions when a tree removal permit is not needed shall include removal of trees less than 36 inches dbh on 1) lands in Williamson Act Contracts, Farmland Security Zone Programs, Timber Production Zones, Agricultural Districts, designated Agricultural Land (AL), and actions pursuant to a Fire Safe plan; 2) all single family residential lots of one acre or less that cannot be further subdivided; 3) when a native oak tree is cut down on the owner's property for the owner's personal use; and 4) when written approval has been received from the County Planning Department. In passing judgment upon tree removal permit applications, the County may impose such reasonable conditions of approval as are necessary to protect the health of existing oak trees, the public and the surrounding property, or sensitive habitats. The County Planning Department may condition any removal of native oaks upon the replacement of trees in kind. The replacement requirement shall be calculated based upon an inch for inch replacement of removed oaks. The total of replacement trees shall have a combined diameter of the tree(s) removed. Replacement trees may be planted onsite or in other areas to the satisfaction of the County Planning Department. The County may also condition any tree removal permit that would affect sensitive habitat (e.g., valley oak woodland), on preparation of a Biological Resources Study and an Important Habitat Mitigation Program as described in Policy 7.4.1.6. If an application is denied, the County shall provide written notification, including the reasons for denial, to the applicant.

B. Tree Removal Associated with Discretionary Project. Any person desiring to remove a native oak shall provide the County with the following as part of the project application:

- A written statement by the applicant or an arborist stating the justification for the development activity, identifying how trees in the vicinity of the project or construction site will be protected and stating that all construction activity will follow approved preservation methods;
- A site map plan that identifies all native oaks on the project site; and
- A report by a certified arborist that provides specific information for all native oak trees on the project site.

On May 6, 2008 the Board of Supervisors adopted the Oak Woodland Management Plan (OWMP) and its implementing ordinance, to be codified as Chapter 17.73 of the County Code (Ord. 4771. May 6, 2008). The primary purpose of this plan is to implement the Option B provisions of Policy 7.4.4.4 and Measure CO-P. These provisions establish an Oak Conservation In-Lieu Fee for the purchase of conservation easements for oak woodland in areas identified as Priority Conservation Areas.

5.0 ENVIRONMENTAL CONSEQUENCES

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5.0 ENVIRONMENTAL CONSEQUENCES

5.1. INTRODUCTION TO ANALYSIS

This chapter discusses the potential environmental consequences or impacts resulting from the alternatives, including the Proposed Action and proposed project under review. It describes those potential environmental effects including those that would be considered significant under CEQA. While CEQA requires that a determination of significant impacts be stated in an EIS/EIR, NEPA does not. Under NEPA, significance is used to determine whether an EIS or some other level of documentation is required, and once a decision to prepare an EIS is made, the magnitude of impact is evaluated and no further judgment of significance is required.

CEQA defines a significant effect as a substantial, or potentially substantial, adverse change in the environment (Public Resources Code § 21068). CEQA (Public Resources Code § 21083(b)(1)) stipulates that a "significant effect on the environment" could occur when:

> "A proposed project has the potential to degrade the quality of the environment, curtail the range of the environment, or to achieve short-term, to the disadvantage of long-term, environmental goals."

The Guidelines implementing CEQA direct that scientific data and factual data form the basis for significance determination. The impact discussion in each of the following subchapters identifies the specific criteria for determining the significance of a particular impact. The significance criteria are consistent with the Guidelines implementing CEQA.

The CEQA Guidelines (§ 15382) recognize a significant effect on the environment as:

> "….substantial, or potentially substantial adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant."

The Council on Environmental Quality (CEQ) NEPA Guidelines (40 CFR 1508.27) state that the use of the term "significantly" in reference to federal actions requires consideration of both "context" and "intensity". The "significance" of a federal action must be evaluated based on society as a whole and include affected interests, the affected region, and the local area in which the Proposed Action will occur. The NEPA Guidelines (40 CFR 1508.27(b)) provide guidance on how "intensity" or the severity of an impact can be applied in the determination of impacts on specific resources.

5.2. OVERVIEW OF IMPACT ANALYSIS

The Proposed Action, which is the execution of the P.L. 101-514 new CVP water service contract, represents a direct action on the part of Reclamation and EDCWA. Accordingly, an evaluation of the potential impacts of this new water contract was performed at the *project-level*. Project-level detailed analyses focused on the potential impacts of diverting the P.L 101-514 water at two points of diversion (EID's proposed new intake – with a Temperature Control Device to their El Dorado Hills Water Treatment Plant and the American River Pump Station on the North Fork American River). Under the project-level analyses, potential changes in the operation of the coordinated CVP/SWP were evaluated. Any diversion project, given the coordinated nature of the CVP/SWP, has the potential to affect reservoirs, watercourses, and the Delta. Hydrologic modeling (see Subchapter 5.3, Hydrologic Impact Framework, below) was undertaken to quantitatively determine the extent and frequency of any such changes in the hydrologic regime of the CVP/SWP and local area waterways. This modeling output was then used as the basis upon which impact analyses for water-related resources were performed.

The primary analyses, therefore, focused on the hydrological effects of the Proposed Action on potentially affected waterbodies and waterways including those of the local area and broader CVP/SWP, including the Delta.

Program-level analyses addressed more generally, the potential impacts on resources that were non-diversion related. New diversion, conveyance, and treatment facilities are not required to execute the P.L. 101-514 contract as previously noted in Chapter 3.0 (Alternatives Including the Proposed Action and Project Description). However, because of the potential for future construction of such facilities, the potential impacts of such facilities, to the extent known, are disclosed and discussed generally at the program-level. Additionally, the water use areas or Subcontractor service areas were also assessed at the program-level. This included the various facilities, activities, land uses and other potentially affected resources within the Subcontractor service areas that are typically part of ongoing development activities within urban and rural areas. Such activities, land uses and resources have already been analyzed in the adopted El Dorado County General Plan Update and EIR, upon which this EIS/EIR relies. A detailed analysis of those activities, land uses, and resources is not repeated here.

As noted previously in Chapter 1.0 (Introduction), given the Proposed Action as described, CEQA documentation likely will be required and prepared for future projects that would divert, convey, treat and deliver this new CVP water supply. These projects will result from local agencies (e.g., EID, GDPUD, etc.) making use of the new CVP water made available under this water service contract. The project proponents that will use this EIS/EIR will likely do so in one of two possible ways. First, they would be able to rely on the hydrologic, project-level analyses conducted here, thus avoiding any reassessment of instream hydrologic effects for their projects. Second, they could tier off of the more general, program-level analyses conducted in this EIS/EIR for their proposed facilities or, as part of a potential impact assessment associated with the use of this new water supply. In either case, the reliance on information contained in this EIS/EIR would likely be limited to future CEQA-only projects.

Reclamation involvement in these future projects is unlikely, unless there are issues with facility or infrastructure projects crossing or using Reclamation lands or easements. Reclamation has no land use authority and, therefore, would not be involved in future project actions addressing the potential impacts associated with development of water delivery facilities.

So, while a program-level analysis is undertaken for certain non-diversion related resources, activities, and land uses as described for this EIS/EIR, this is not a programmatic NEPA document because further action by Reclamation is not anticipated.

The potential resources and issues addressed in this EIS/EIR were identified through a series of public involvement actions regarding the Proposed Action. A series of informal sessions with various stakeholder groups and agencies was conducted by EDCWA as part of the early project scoping process. The results of this earlier process are reported in the *Preliminary Project Scoping Task Report: CVP Water Services Contract*. As noted previously, a subsequent NOP/NOI process was initiated in 1998 and, again, most recently in the fall of 2006). All processes generated public comment and helped shaped the scope of this EIS/EIR.

As noted previously, for this EIS/EIR, resource evaluations were broken into two categories; **Diversion-related Impacts**, and **Indirect or Non-Diversion-related Impacts**. Diversion-related impacts could potentially affect the following resources and represent the basis for the resource evaluations in this EIS/EIR:

- Water Supply
- Hydropower Generation
- Flood Control
- Water Quality
- Fisheries
- Riparian Resources
- Water-related Recreation
- Water-related Cultural Resources

Indirect or non-diversion related impacts could potentially affect the following resources and represent the basis for the resource evaluations in this EIS/EIR:

- Land Use/Urban Development
- Transportation/Traffic
- Air Quality
- Noise
- Geology, Soils, Mineral Resources, and Paleontological Resources
- Recreation
- Visual Resources
- Cultural Resources
- Terrestrial and Wildlife Resources

The analsyes included in the Impacts and Mitigations Measures for each resource area is also summarized and presented in the Executive Summary, Table ES-1.

5.3. HYDROLOGIC IMPACT FRAMEWORK

Diversion-related impacts relied upon a hydrologic impact framework to generate quantitative data with which to evaluate potential impacts on water-related resources. Such potential impacts were evaluated by comparing the existing hydrologic condition (or Base Condition) with that of the simulated system after implementation of the Proposed Action and alternatives (i.e., diversion of water for the P.L.101-514 contract) using the CALSIM II model. See Subchapter 5.3.2, CALSIM II Operation, for further detail on the underlying assumptions of this approach and some of the inherent constraints and limitations on its use.

The period of record used in the hydrologic modeling for this EIS/EIR extended from 1922 through 1993 (72-years) – data is generated to 1994, but 1994 is removed. The more recent hydrologic record now incorporated into CALSIM II operation (to 2005) was unavailable at the time of preparation of this EIS/EIR. The period of record for the water temperature modeling extended from 1923 through 1993 (71-years). Similarly, early life stage salmon mortality modeling also used a 71-year period of record. These periods, based on the historic hydrologic record, are deemed to be representative of the natural variation in hydrology that is characteristic of California in recent times. It includes dry-periods (1928-1934 and 1977), wet-periods (1986), and variations in between. Extended drought, periods of high precipitation and resultant runoff, as well as "normal" water years were included in this record.

5.3.1. <u>CALSIM II Model</u>

CALSIM II was jointly developed by Reclamation and the California Department of Water Resources (DWR) for planning studies relating to CVP and SWP operations. The primary purpose of CALSIM II is to evaluate the water supply reliability of the CVP and SWP at current or future levels of development (e.g. 2001, 2020), with and without various assumed future facilities, and with different modes of facility operations. An extensive model, CALSIM II simulates monthly operations of the following water storage and conveyance facilities:

- Trinity, Lewiston, and Whiskeytown reservoirs (CVP);
- Spring Creek and Clear Creek tunnels (CVP);
- Shasta and Keswick reservoirs (CVP);
- Oroville Reservoir and the Thermalito Complex (SWP);
- Folsom Reservoir and Lake Natoma (CVP);
- New Melones Reservoir (CVP);
- Millerton Lake (CVP);
- C.W. Jones (CVP), Contra Costa (CVP) and Harvey O. Banks (SWP) pumping plants; and
- San Luis Reservoir (shared by CVP and SWP).

To varying degrees, CALSIM II nodes also define CVP/SWP conveyance facilities including the Tehama-Colusa, Corning, Folsom-South, and Delta-Mendota canals and the California Aqueduct. Other non-CVP/SWP reservoirs or rivers tributary to the Delta also are modeled in CALSIM II, including:

- New Don Pedro Reservoir;
- Lake McClure; and
- Eastman and Hensley lakes.

CALSIM II uses a mass balance approach to simulate the occurrence, regulation, and movement of water from one river reach (computation point or node) to another. Various physical processes (e.g., surface water inflow or accretion, flow from another node, groundwater accretion or depletion, and diversion) are simulated or assumed at each node as necessary. Operational constraints, such as reservoir size, seasonal storage limits, and minimum flow requirements, also are defined for each node. Accordingly, flows are specified as a mean flow for the month, and reservoir storage volumes are specified as end-of-month values. In addition, modeled X2 (2 parts per thousand [ppt] near bottom salinity isohaline) locations are specified as end-of-month locations, Delta outflows are specified as mean outflows for each month, and Delta export-to-inflow (E/I) ratios are specified as mean ratios for each month.

CALSIM II typically simulates system operations for a 72-year period using a monthly time-step. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over this period, representing a fixed level of development (e.g., 2001 or 2020). The historical flow record of October 1921 to September 1994, adjusted for the influence of land use change and upstream flow regulation, is used to represent the possible range of water supply conditions. It is assumed in CALSIM II that past hydrologic conditions are a good indicator of future hydrologic conditions. As discussed later, this concept of stationarity in hydrologic conditions has come under significant scrutiny in recent years, both temporally and spatially, with climate change representing a key causal factor in this uncertainty.

The model simulates one month of operation at a time, with the simulation passing sequentially from one month to the next, and from one year to the next. Each estimate that the model makes regarding stream flow is the result of defined operational priorities (e.g., delivery priorities to water right holders, and water contractors), physical constraints (e.g., storage limitations, available pumping and channel capacities), and regulatory constraints (flood control, minimum instream flow requirements, Delta outflow requirements). Certain decisions, such as the definition of water year type, are triggered once a year, and affect water delivery allocations and specific stream flow requirements. Other decisions, such as specific Delta outflow requirements, vary from month to month. CALSIM II output contains estimated flows and storage conditions at each node for each month of the simulation period. Simulated flows are mean flows for the month, reservoir storage volumes correspond to end-of month storage (HDR/SWRI, 2007).

CALSIM II, together with associated environmental models (e.g., Reclamation's Trinity, Shasta, Whiskeytown, Oroville, and Folsom Reservoir Water Temperature Models; Reclamation's Trinity, Sacramento, Feather, and American (with Automated Temperature Selection Procedure [ATSP]) River Water Temperature Models; Reclamation's Feather, and Sacramento River Early Life Stage Chinook Salmon Mortality Models; the LongTermGen Model; and the General Purpose Output Generation Tool) provided the predictive hydrology and environmental outputs necessary to determine potential water-related resource impacts throughout the CVP/SWP as a result of the Proposed Action and alternatives.

A more detailed discussion of CALSIM II and the modeling impact framework used in this EIS/EIR is provided below (all modeling assumptions specific to the individual model simulations are provided in Modeling Technical Memorandum, included in Appendix H in this Draft EIS/EIR).

At the present time, CALSIM II is considered the best available tool for modeling the integrated CVP and SWP and is the only system-wide hydrologic model being used by Reclamation and DWR to conduct planning and impact analyses of potential projects. While these agencies developed the model for project-related purposes, the model also has been proposed and employed for various other purposes with varying degrees of success. These limitations are discussed in more detail later.

As the official model for California's two largest inter-regional projects with implications for state-wide and Central Valley water operations and planning, CALSIM II results are often at the center of many technical and policy controversies. As such, CALSIM II, not unlike its predecessors, PROSIM 2000 and PROSIM, warrants and, in fact, has received considerable scrutiny from the water resources and environmental communities. The range of issues raised has been diverse, and includes a variety of issues and perspectives related to water supply reliability, environmental management and performance, water demands, economics, documentation, changing hydrology and climate, software, and regulatory compliance.

A primary intended use of CALSIM II is to estimate the impacts and benefits of large-scale proposed projects and regulatory actions on the state-wide system. Much of the initial focus of system-wide modeling of this nature was intended to help determine export quantities and timing. Current analyses using CALSIM II include, among others, proposed CALFED storage projects, including In-Delta storage, North of Delta Off-stream Storage (Sites Reservoir), expansion of Los Vaqueros and Shasta reservoirs, storage in the Upper San Joaquin Basin, and conjunctive use both north and south of the Delta. CALSIM II is also being used to evaluate CALFED conveyance projects such as the proposed expansion of the Banks Pumping Plant to 8,500 cubic feet per second (and possibly 10,300 cfs). Still others address the California Aqueduct/Delta-Mendota Canal Intertie, and the San Luis Reservoir Low Point Improvement Project.

Many local agencies also rely on CALSIM II results to estimate potential impacts on the integrated system based on their own specific project actions. CALSIM II has been used on the Freeport Regional Project, the Lower Yuba River Accord, the Sacramento Area Water Forum Lower American River Flow Standard, to name but a few. Similar to the reliance on predecessor models, the use of CALSIM II and any of its future revisions is anticipated to continue in the future.

5.3.2. CALSIM II Operation

The operations of CALSIM II have been described in numerous documents. The following discussion is taken from DWR (2006, 2005, 2003a, 2003b); Ferreira et al. (2005); Draper et al. (2004); and the Freeport Regional Water Project EIS/EIR (2003).

CALSIM II utilizes optimization techniques to route water through a watershed network on a monthly time-step. A linear programming/mixed integer linear programming solver determines an optimal set of decisions for each time period given a set of weights and system constraints. A key component for specification of the physical and operational constraints is the WRESL language. The model user describes the physical system (e.g., dams, reservoirs, channels, pumping plants, etc.), operational rules (e.g., flood-control diagrams, minimum flows, delivery requirements, etc.), and priorities for allocating water to different uses in WRESL statements.

CALSIM II includes a hydrology developed jointly by Reclamation and DWR. Water diversion requirements of purveyors (demands), natural stream accretions and depletions, river basin inflows, irrigation efficiencies, return flows, non-recoverable losses, and groundwater operation are components that make up the hydrology used in CALSIM II. Sacramento Valley and tributary basin hydrology is developed using a process designed to adjust the historical sequence of monthly stream flows to represent a sequence of flows at either current or future levels of development. Adjustments to historic water supplies are determined by imposing land use on historical meteorological and hydrologic conditions. San Joaquin River basin hydrology is developed using fixed annual demands and regression analysis to develop accretions and depletions. The resulting hydrology represents the water supply available from Central Valley streams to the CVP and SWP at an established level of development.

CALSIM II uses DWR's Artificial Neural Network (ANN) model to simulate the flow-salinity relationships for the Delta. The ANN model correlates DSM2 model-generated salinity at key locations in the Delta with Delta inflows, Delta exports, and Delta Cross Channel operations. The ANN flow-salinity model estimates electrical conductivity at the following four locations for the purpose of modeling Delta water quality standards: Old River at Rock Slough, San Joaquin River at Jersey Point, Sacramento River at Emmaton, and Sacramento River at Collinsville. In its estimates, the ANN model considers antecedent conditions up to 148 days, and considers a "carriage-water" type of effect associated with Delta exports.

The delivery logic CALSIM II utilizes in determining deliveries to North-of-Delta and South-of-Delta CVP and South-of-Delta SWP contractors uses runoff forecast information that incorporates uncertainty and standardized rule curves (i.e., Water Supply Index versus Demand Index Curve) to estimate the water available for delivery and carryover storage. Updates of delivery levels occur monthly from January 1 through May 1 for the SWP and March 1 through May 1 for the CVP as water supply parameters become more certain. The South-of Delta SWP delivery is determined based upon water supply parameters and operational constraints. The CVP system wide delivery and South-of-Delta delivery are determined similarly upon water supply parameters and operational constraints with specific consideration for export constraints.

CALSIM II incorporates procedures for dynamic modeling of Section 3406(b)(2) of the CVPIA and the Environmental Water Account (EWA), under the CALFED Framework and Record of Decision (ROD). Per the October, 1999 Decision and the subsequent February, 2002 Decision, CVPIA 3406(b)(2) accounting procedures are based on system conditions under operations associated with SWRCB D-1485 and D-1641 regulatory requirements. Similarly, the operating guidelines for selection of actions and allocation of assets under the EWA are based on system conditions under operations associated with SWRCB D-1641 regulatory requirements. This requires sequential layering of multiple system requirements and simulations. CVPIA 3406(b)(2) allocates 800 TAF (600 TAF in Shasta critical years) of CVP project water to targeted *fish actions*. The full amount provides support for SWRCB D-1641 implementation. According to monthly accounting, 3406(b)(2) actions are dynamically selected according to an action matrix. Several actions in this matrix have defined reserve amounts that limit 3406(b)(2) expenditures for lower priority actions early in the year such that the higher priority actions can be met later in the year.

5.3.3. CALSIM II Simulations

The utility of CALSIM II in environmental analyses is based on its ability to provide comparative data results. This is an important point since CALSIM II, as with most gross-scale, long time-step (monthly) hydrologic simulations, are appropriate for the purposes upon which they were designed but not necessarily for other evolved and evolving applications. While CALSIM II has, and continues to be used for environmental analyses of specific project (or action) increments, its strength does not lie in those types of applications. Nevertheless, with an integrated CVP/SWP and coordinated operations throughout the many interconnecting watersheds, CALSIM II is a useful and accepted tool to gauge system-wide hydrological changes resulting from a particular action. Again, as noted, it does so within a comparative framework where, the results of the with-project condition are compared against the baseline or no-project condition.

Accordingly, the results from a single simulation may not necessarily represent the exact operations for a specific month or year, but should reflect long-term *trends*. Since CALSIM II is not designed to accurately predict operations and flows, results from individual months should be considered only in the context of overall trends and averages. CALSIM II represents operational or regulatory thresholds through the use of step functions. Due to CALSIM's dynamic responses to system conditions, slight changes in model inputs or operations could trigger responses which may significantly vary on an individual monthly basis between the Base Condition and “Project” simulation. These dynamic responses, however, often average out over longer time periods. It is these longer-term *trends* which are useful in determining potential effects of larger diversion projects on the coordinated CVP/SWP.

Table 5.3-1 identifies the comparisons that were made for this EIS/EIR between simulations to identify the potential effects associated with each of the action alternatives, including the Proposed Action and project. Base Condition denotes Current Conditions under existing hydrology, demands, and operations. As described previously, the nomenclature for the Alternatives uses descriptors identifying the various diversion scenarios included in this environmental analysis. In many of the CALSIM II tables included in the following subchapters, Proposed Action – Scenario A is identified.

This corresponds to Alternative 2A – Proposed Action Scenario A, but is shortened for brevity. Similarly, Alternative 2B corresponds to Proposed Action – Scenario B, and so on.

TABLE 5.3-1

CALSIM II MODELING COMPARISONS

Intended Analysis	Base Scenario	Compared Against
No-Action	(Base Condition – Current Level)	N/A
No-Project	(Base Condition – Current Level)	N/A
Proposed Action or Project (EID/GDPUD Split)	(Base Condition – Current Level)	Alternative 2A – Proposed Action – Scenario A
Proposed Action or Project (Max EID)	(Base Condition – Current Level)	Alternative 2B – Proposed Action – Scenario B
Proposed Action or Project (Max GDPUD)	(Base Condition – Current Level)	Alternative 2C – Proposed Action – Scenario C
Water Transfer Alternative	(Base Condition – Current Level)	Alternative 3 – Water Transfer
Reduced Diversion Alternatives	(Base Condition – Current Level)	Alternative 4C – Reduced Diversion
Future Cumulative	(Base Condition – Current Level)	Future Cumulative Condition
Proposed Action Increment within Future Cumulative[1]	Future No Action	Future Cumulative Condition
Proposed Action Increment within Future Cumulative[1]	(Base Condition) Vs Future Cumulative Condition Minus Proposed Action (Base Condition) Vs Future No Action	

Notes:
1. For increment of Proposed Action on the Future Cumulative Condition, there are two possible evaluations. Both were evaluated.
2. For the analysis of the Reduced Diversion Alternatives, modeling was performed on Alternative 4C – Reduced Diversion (7,500 AFA total) as this represented the largest reduction, relative to the full contract amount of 15,000 AFA. Separate model runs for Alternative 4A – Reduced Diversion (12,500 AFA) and Alternative 4B – Reduced Diversion (10,000 AFA) were not performed. This was considered appropriate given the accepted acuity of CALSIM II (i.e., inability to accurately depict increments of 2,500 AFA) and the fact that the “bookend” reduction of 7,500 AFA was modeled.

Source: Revised from HDR//SWRI (2007).

CALSIM II modeling undertaken for Reclamation’s Operations Criteria and Plan (OCAP) Biological Assessment for Delta Smelt was used to provide the foundation for CVP/SWP system-wide baseline conditions simulations used to represent the Base Condition and the Future No Action scenarios.

The modeling output, which total over 2,800 pages, are incorporated into this Draft EIS/EIR, as Appendix I. Due to the physical volume of the printed output, the data are provided on a separate CD within Volume 2 (Technical Appendices) of this Draft EIS/EIR. Alternately, the data CD may be requested from Reclamation or EDCWA during normal business hours.

The specific OCAP simulation relied upon as the initial foundation is identified as: OCAP_2001D10A_TodayEWA_012104, or the OCAP 3 simulation. It is an existing or Current Level simulation with many of the desired baseline assumptions. However, the OCAP 3 simulation did not include the higher Trinity River minimum flow requirements of the ROD for the Trinity River Main Stem Fishery Restoration Environmental Impact Statement/Environmental Impact Report (EIS/EIR). These new requirements were added, and the results reviewed by Reclamation, in a CALSIM II simulation commonly referred to as OCAP 3a. The Base Condition is based on the OCAP 3a simulation. The Future No Action simulation is based on the OCAP_2020D09D_FutureEWA5a simulation.

These two foundation or initial baseline simulations were modified to include updated inputs for lower Yuba River outflow to the Feather River, lower Yuba River diversions at Daguerre Point Dam, Trinity River instream flow requirements downstream of Lewiston Dam (by use of OCAP 3a), and

EID diversion at Folsom Reservoir, as required, and run to produce the existing (Current Level) and Future Level baseline simulations. These initial baseline simulations were then modified as required to implement the specific attributes of the Proposed Action and/or alternatives and, at the time of preparation, represented the most up-to-date renditions of CVP/SWP baseline hydrology.

5.3.4. CALSIM II Limitations

Regardless of the model, they only approximate natural phenomenon. In fact, most models are inherently inexact because the mathematical description is either imperfect and/or our understanding of the inherent processes is incomplete. The mathematical parameters used in models to represent real processes are often uncertain because these parameters are empirically determined or represent multiple processes. Additionally, the initial or starting conditions and/or the boundary conditions in a model may not be well known. CALSIM II, despite its powerful capabilities, remains a model and, as such, is subject to the same issues regarding limitations as any other model.

As noted previously, CALSIM II is able to simulate the integrated CVP/SWP system over the 72-year historical hydrology. In theory, such simulation allows model users to assess the effects that certain actions would have had on the system had they been implemented in any year of the historical record. The ability of the model to represent a *predictive* indicator of the effect of certain actions into the future, however, largely depends on the representative nature of historical hydrology, relative to likely future hydrology. This is a very important point. With growing concerns throughout the scientific community, past hydrology, it is felt, may not be a good indicator of the hydrological conditions one could expect in the future. A good example of this concern is related to global climate change. While most water practitioners accept climate change as an eventual reality and agree with its inevitability, the degree to which it will affect specific resources and the temporal pattern of that effect say, over a season, is still largely a subject of continuing debate. Water managers today have begun to consider global climate change in earnest when planning for the future. Unfortunately, at the time modeling for this Proposed Action was completed, CALSIM II was not well-suited to model perturbed hydrology or other future scenarios where non-stationarity in hydrologic or meteorologic processes are relevant. Current CALSIM II work, however, is moving towards including those types of analyses.

CALSIM II also lacks detailed documentation regarding the known limitations and weakness of the model. Without a clear understanding of the model's formulation, water managers have been wary of applying it in a predictive (absolute) mode. A long-standing issue is that error bars need to be specified for all CALSIM II output; this would be especially applicable where the model was being used in predictive mode (Ferreira et al., 2005).

From a temporal perspective, there is ongoing concern that CALSIM II's monthly time step cannot accurately capture hydrologic variability and, thus, does not compute water exports and export capacity accurately, both of which are significant factors in CVP/SWP operations. CALSIM II's inability to capture within-month variations often results in overestimates of the volume of water the projects can export from the Bay-Delta and makes it seem easier to meet environmental standards than it is in real-time operations. Many of the system's operations function, in fact, on a shorter time scale. CALSIM II cannot represent them well given its current formulation. On the other hand, it is unclear if reducing the time step would result in more accurate or more useful data results given the additional data and assumptions that would be needed to characterize the system at this finer temporal resolution. A daily time step might, in fact, worsen some problems due to questions regarding the precise timing of short events (Ferreira et al., 2005).

CALSIM is also limited by its geographic coverage. For CALSIM II to be a truly State-wide model, it needs to fully cover the Bay Area, Tulare Basin (including the Friant-Kern and Madera canals, eastside San Joaquin reservoirs, and Millerton), Yuba River Basin (for potential water transfer opportunities), Colorado River, Colorado River and Los Angeles aqueducts, and all local Southern California projects. Coupled with a need for greater geographic coverage, CALSIM II should also include management options available in California at both the regional and local levels. Inter– and intra-agency water transfers are now commonplace, as are other management options such as groundwater banking (e.g., aquifer-storage-recovery), conjunctive use, desalination, and water conservation. Accordingly, to effectively simulate the array of potential water operations available within the State, CALSIM II needs to include a wider range of management options, facilities, and regions. It is vital that those involved in the management of California's water be able to analyze how local, regional, and State facilities and options best go together. California does not currently have a model or modeling framework capable of such integrated analysis, to parallel the kinds of integrated management thinking being pursued at local, regional, and state-wide levels (Ferreira et al., 2005).

CALSIM II is also currently lacking in its ability to perform hydropower computations, which is an important component of the federal CVP system. This should ideally include risk-based power capacity evaluation, and possibly incorporate the indexed sequential hydrologic modeling method that Reclamation has used for many years in hydropower capacity analysis. Also, hydropower should not simply be an after-the-fact calculation as it is with the use of the Long-Term Gen Model, but explicitly included in the system objectives and incorporated into CALSIM II.

With respect to groundwater, CALSIM is acknowledged as being significantly limited. Groundwater is modeled as a series of inter-connected lumped-parameter basins. Groundwater pumping, recharge from irrigation, stream-aquifer interaction and inter-basin flow are calculated dynamically by the model. The purpose of the multi-cell groundwater model is to better represent groundwater levels in the vicinity of the streams to better estimate stream gains and losses to aquifers.

In the Sacramento Valley, groundwater is explicitly modeled in CALSIM II using a multiple-cell approach based on Drainage Service Area (DSA) boundaries. For the Sacramento Valley, there are a total of 14 groundwater cells. Currently, no multi-cell model has been developed for the San Joaquin Valley. Instead, stream-aquifer interaction is estimated from historical stream gage data. These flows are fixed and are not dynamically varied according to stream flows or groundwater elevation.

Groundwater availability from aquifers is poorly represented in the model. This results from the fact that aquifers in the northern part of the State (Sacramento Valley) have not been thoroughly investigated regarding their storage and recharge characteristics. Thus, in the model, upper bounds on potential pumping from aquifers remain undefined. Realistic upper bounds to pumping from any of the aquifers represented in the model need to be developed and implemented. In addition, historical groundwater pumping is used to estimate local groundwater sources in the model; however, the information on the historical pumping is very limited, causing these pumping rates to be very uncertain. Improved pumping information is required and an analysis of the effect of this uncertainty on model results needs to be conducted. In general, the level of representation of groundwater in CALSIM II is not optimal.

Finally, CALSIM II is still relatively new and many of today's users remain unfamiliar with its full capabilities and limitations. The fact that CALSIM II is priority-based rather than rule-based, adds to this uncertainty, since the model's structure and logic differ significantly from previous models (e.g., DWRSIM and PROSIM). The strengths and alleged weaknesses of CALSIM II are not only technical (software, data, and methods), but also institutional in how this model has been developed and utilized.

5.3.5. CALSIM III Development

In response to the December 2003 recommendations made by the CALFED Science Program review panel on improvements to the existing CALSIM II model, Reclamation and DWR jointly developed a program to enhance the capabilities of the model and improve on the applicability of the model in use for water resources planning in California. The highest priority in this phase of model development was given to overhauling the representation of the Sacramento Valley hydrology. Among the numerous features of this development project are the following: 1) defining new water budget area boundaries (WBAs) for a higher resolution representation of the physical system, 2) enhancement of methodologies for estimating local water supplies, 3) developing a more accurate representation of the CVP/SWP and non-project demands in the Sacramento Valley, 4) enhancement of procedures for allocating priorities to meet demands from multiple sources of surface water and groundwater, and 5) enhancement of current and/or development of new methodologies for simulating groundwater flow and the surface water-groundwater interaction. This effort will result in a new schematic representation of the water resources system (California Department of Water Resources, Bay-Delta Office, 2007).

5.4. WATER SUPPLY (DIVERSION-RELATED IMPACTS)

This subchapter presents an analysis of potential effects on water supply due to implementation of either the Proposed Action or alternatives. The enumeration of potential impacts addresses environmental conditions through the areas described in the Affected Environment that could be directly affected by the diversion of new CVP contract water from Folsom Reservoir or, through an exchange on the North Fork American River.

5.4.1. CEQA Standards of Significance

For the purposes of this EIS/EIR, impacts on water supply may be deemed significant if implementation of the Proposed Action or its alternatives would:

- Result in a substantial reduction in annual delivery allocations to CVP customers under all water-year types including dry-year sequences;

- Result in a substantial reduction in annual delivery allocations to SWP customers under all water-year types including dry-year sequences;
- Result in a substantial reduction in annual delivery allocations to purveyors of the Sacramento Area Water Forum under their individual Purveyor-Specific Agreements (PSAs);
- Result in a substantial reduction in pumping at the State pumps for annual delivery to South of Delta contractors;
- Result in operations inconsistent with the existing or anticipated CVP-OCAP or COA; and,
- Result in an inadvertent reduction in groundwater aquifer yields in any of the North, Central or South area aquifers

5.4.2. Impacts and Mitigation Measures

Please note that for this subchapter and all resource impact subchapters that follow, the analysis provided under Impacts and Mitigations Measures is summarized and presented in the Executive Summary, Table ES-1.

5.4-1 Effects on delivery allocations to CVP customers.

Alternative 1A – No Action Alternative

Under the No Action Alternative, the contract between Reclamation and EDCWA for delivery of the 15,000 AF would not be established. However, other water supply projects could and, would likely be pursued. These options could cover a range of supplies. For the purposes of this analysis, it was assumed that a non-CVP water supply (e.g., water right) would be acquired. CALSIM II modeling, therefore, could rely on the results from Alternative 3 – Water Transfer Alternative which showed no significant impacts on CVP customers. Similarly, there would be no significant impacts on CVP customers under the No Action Alternative.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no additional water supplies would be acquired. Since no new CVP contract(s), transfers, or independent water supplies (e.g., water rights) would be acquired, the hydrologic baseline for all waterbodies would remain static, at Base Condition levels. No impacts would result to CVP customers under the No Project Alternative.

Alternatives 2A, 2B, and 2C – Proposed Action – All Scenarios

Tables 5.4-1A through 5.4-1D illustrate the 72-year mean differences in simulated annual deliveries to CVP contractors between the Base Condition and Proposed Action – Scenario A, for CVP M&I (North of Delta), Ag (North of Delta), M&I (South of Delta), and Ag (South of Delta) contractors. For each of the CVP contractor categories, there was virtually no difference in the 72-year mean under the Proposed Action – Scenario A, relative to the Base Condition. As noted in Subchapter 5.3.3 (CALSIM II Simulations), the Proposed Action – Scenario A, as labeled in these tables and all ensuing tables in Chapters 5 and 6, correspond to Alternative 2A – Proposed Action - Scenario A, consistent with nomenclature used in the Executive Summary and Chapter 3.0 (Alternatives Including the Proposed Action and Project Description).

TABLE 5.4-1A

ALLOCATIONS TO CVP M&I CONTRACTORS (NORTH OF DELTA) (TAF)

	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
Mean	30.6	30.6	0.0	0.2
Median	25.3	25.3	0.0	0.0
Min.	8.0	8.0	-9.9	-30.0
Max.	59.4	59.4	7.7	38.0

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

TABLE 5.4-1B

ALLOCATIONS TO CVP AG CONTRACTORS (NORTH OF DELTA) (TAF)

	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
Mean	235.4	235.2	-0.2	0.0
Median	295.2	295.0	0.0	0.0
Min.	0.0	0.0	-7.7	-4.5
Max.	359.0	359.0	1.4	11.2

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

TABLE 5.4-1C

ALLOCATIONS TO CVP M&I CONTRACTORS (SOUTH OF DELTA) (TAF)

	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
Mean	123.2	123.2	0.0	0.0
Median	134.0	134.1	0.0	0.0
Min.	72.1	72.1	-0.9	-0.6
Max.	144.1	144.1	0.6	0.8

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

TABLE 5.4-1D

ALLOCATIONS TO CVP AG CONTRACTORS (SOUTH OF DELTA) (TAF)

	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
Mean	1090.5	1091.4	0.0	0.1
Median	1267.2	1263.9	0.0	0.0
Min.	0.0	0.0	-70.4	-4.9
Max.	1840.6	1840.6	109.6	11.2

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

CALSIM II modeling simulations, when reviewed over the entire 72-year period of record, however, showed maximum changes in modeled M&I deliveries for any one year ranging from a decrease of 9,900 AF to an increase of 7,700 AF and was confined to North of Delta water purveyors (see Proposed Action – Scenario A, Technical Appendix I, this Draft EIS/EIR). In these years, the deliveries generally corresponded to water year type and, equally important, previous year carryover storage. A careful inspection of individual year trends and relationships between years did not reveal distinguishable bias that would suggest the existence of a genuine impact (see Proposed Action – Scenario A, Technical Appendix I, this Draft EIS/EIR).

For example, the 1944 hydrologic year simulated deliveries to decrease by 9,900 AF North of the Delta. This was a dry water year with a Base Condition delivery allocation of 33,000 AF (above the 72-year mean) and followed three consecutive wet-years. The elevated Base Condition allocation could be achieved with the likely higher carryover storage that would have resulted from the three previous wet-years. By contrast, the 1962 hydrologic year showed a simulated increase in allocations, relative to the Base Condition of 7,700 AF. The 1962 hydrologic year was below-normal water year and followed two dry-years where, CVP M&I deliveries were substantively increased (but starting at a lower Base Condition allocation). North of the Delta, this would not be unusual since in drier years, with other supplies (e.g., water rights) would be restricted and contractors would have no other recourse but to call upon its CVP entitlements.

For all eleven critically-dry years contained in the 72-year simulation, no significant changes in allocations were observable in the modeled results between Alternative 2A – Proposed Action – Scenario A and the Base Condition.

CVP Ag deliveries showed a much wider range of potential single year increases and decreases (e.g., 70,000 AF and 109,000 AF). This is not surprising given the higher volatility in annual and inter-annual delivery consistency experienced by Ag contractors, relative to M&I contractors and, as previously described, is largely reflected in Reclamation water shortage policy.

Given the undetectable changes in simulated deliveries under Alternative 2A – Proposed Action – Scenario A, relative to the Base Condition as reflected in the long-term, 72-year mean, no significant water supply impacts on CVP customers would occur under the action defined by Proposed Action – Scenario A.

Under Alternatives 2B and 2C – Proposed Action – Scenarios B and C, the CALSIM II simulated modeling results were identical (see Proposed Action – Scenario B and C, Technical Appendix I, this Draft EIS/EIR). Alternatives 2B and 2C under the Proposed Action Scenarios B and C would, therefore, have no significant water supply impacts on CVP customers.

Alternative 3 – Water Transfer Alternative

Under Alternative 3 – Water Transfer Alternative, project water needs would be wholly replaced with other water supplies (i.e., assumed water transfer). As noted previously, for EDCWA to affect a water transfer, a willing purveyor with a reliable long-term water supply would have to be identified. While it is possible that a transfer could exist as a CVP water assignment, it is more likely that a water rights transfer would occur. Regardless, as a *transfer* alternative, no additional CVP diversions would occur under this alternative as previously described (i.e., at most, this would involve a re-allocation or shift in existing entitlements). While it is accepted that diversions of water rights do affect CVP yield, the precise manner with which Reclamation would choose to re-adjust its operations to accommodate a lower yield in any given year is highly variable. Whether system operations would be able to detect a change is questionable. In any case, CALSIM II modeling of this alternative revealed that CVP allocations to all categories and CVP areas would remain virtually unchanged from the Base Condition (see Water Transfer Alternative, Technical Appendix I, this Draft EIS/EIR). Alternative 3 – Water Transfer Alternative, therefore, would have no significant water supply impacts on CVP customers.

Alternative 4A – Reduced Diversion Alternative (12,500 AFA)

As shown for Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, the potential impacts on CVP contractors (M&I and Ag) both north and south of the Delta were negligible and were deemed unlikely to represent a significant impact. With a reduced diversion under this alternative to 12,500 AFA, the impacts would be less, than the full 15,000 AFA modeled for Alternatives 2A, 2B and 2C. Alternative 4A – Reduced Diversion Alternative (12,500 AFA), therefore, would result in no significant water supply impacts on CVP customers.

Alternative 4B – Reduced Diversion Alternative (10,000 AFA)

Alternative 4B – Reduced Diversion Alternative (10,000 AFA), with diversions reduced to 10,000 AFA would intuitive have less of a hydrologic effect on water supplies than any of the previous alternatives. As shown for Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, the potential impacts on CVP contractors (M&I and Ag) both north and south of the Delta were negligible and were deemed unlikely to represent a significant impact. With a reduced diversion under this alternative to 10,000 AFA, the impacts would be less, than the full 15,000 AFA modeled for Alternatives 2A, 2B and 2C. Alternative 4B – Reduced Diversion Alternative (10,000 AFA), therefore, would result in no significant water supply impacts on CVP customers.

Alternative 4C – Reduced Diversion Alternative (7,500 AFA)

Under Alternative 4C – Reduced Diversion Alternative (7,500 AFA), with the total diversions reduced by one-half, that is, to 7,500 AF total, the single year decreases under CVP M&I North of Delta were no longer detectable by CALSIM II modeling simulation. Alternative 4C – Reduced Diversion Alternative, therefore, would have no significant water supply impacts on CVP customers.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Alternatives including the Proposed Action – Scenarios.

5.4-2 Effects on delivery allocations to SWP customers.

Alternative 1A – No Action Alternative

Under the No Action Alternative, deliveries to SWP customers would mimic those simulated under Alternative 3 – Water Transfer Alternative. Consistent with the description of Alternative 3 – Water Transfer Alternative, this is a reasonable assumption. Accordingly, no significant impacts on SWP customers would occur under the No Action Alternative.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no additional water supplies would be acquired. Since no new SWP contract(s), transfers, or independent water supplies (e.g., water rights) would be acquired, the hydrologic baseline for all water bodies would remain static, at Base Condition levels. No impacts would result to SWP customers under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios

Table 5.4-2A reveals the CALSIM II simulated delivery allocations to SWP contractors under Alternative 2A – Proposed Action – Scenario A, relative to the Base Condition. Over the 72-year period of record, the mean delivery allocations to SWP customers would approximate 2,860,000 AF under the Base Condition.

TABLE 5.4-2A

ALLOCATIONS TO SWP CONTRACTORS (TAF)

	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
Mean	2858.9	2855.7	-3.2	-0.2
Median	3232.1	3231.5	0.0	0.0
Min.	173.8	173.8	-54.8	-3.9
Max.	3729.5	3729.5	32.6	1.9

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Simulated delivery allocations under Alternative 2A – Proposed Action – Scenario A would decrease annual allocations, on average by 3,200 AF (or 0.2 percent). Similar to CVP simulated allocations, there would be specific year changes that could either increase or decrease, relative to the Base

Condition. Substantial single year decreases occur during dry-year sequences such as the 1931-1934 period where, annual deliveries would be approximately 50,000 AF (or 3-4 percent) less than the Base Condition. The other hydrologic period of note is the 1960-1961 dry period. Simulated SWP delivery allocations would be 26,000 to 33,000 AF less (or 1-3 percent less) than the Base Condition (see Proposed Action – Scenario A, Technical Appendix I, this Draft EIS/EIR).

While the overall 72-year mean change in annual deliveries to SWP customers would not significantly be disrupted by the Proposed Action – Scenario A, as expressed by the 0.2 percent decrease, relative to the Base Condition, specific year decreases of substantial magnitude would occur. The most significant of these, however, are confined to the dry and critically-dry periods, for example 1931-1934 where, Base Condition deliveries would already be low; at approximately 50 percent of the 72-year mean. During these times, it is reasonable to expect that SWP contractors would be already aggressively investigating alternative dry-year supplies, with or without the Proposed Project effects. Accordingly, Alternative 2A – Proposed Action – Scenario A would not, in and of itself, result in significant impacts on SWP water customer deliveries.

For Alternatives 2B and 2C – Proposed Action – Scenarios B and C, the CALSIM II simulated modeling results were identical (see Proposed Action – Scenario B and C, Technical Appendix I, this Draft EIS/EIR) to that of Alternative 2A. Alternatives 2B and 2C – Proposed Action, under Scenarios B and C would, therefore, have no significant water supply impacts on SWP customers.

Alternative 3 – Water Transfer Alternative

Under Alternative 3 – Water Transfer Alternative, the simulated long-term 72-year mean SWP delivery allocation would decrease by 8,700 AF (or 0.5 percent) as shown in Table 5.4-2B. Similar to CVP contractors, notable decreases in SWP customer deliveries under this alternative, relative to the Base Condition were noted during the dry and critically-dry period of 1932-1934. Under this period's hydrology, modeled deliveries were reduced by approximately 113,000 AF (or about 8 percent), relative to the Base Condition (see Water Transfer Alternative, Technical Appendix I, this Draft EIS/EIR). The other hydrologic period of note is during the late 1980's, where CALSIM II model output showed decreases in SWP deliveries of about 16,000 AF and 25,000 AF in 1989 and 1990, respectively, under Alternative 3 – Water Transfer Alternative. Intuitively, decreases (or gains for that matter) of these magnitudes do not seem to comport with the increment of diversion contemplated by the project (i.e., 15,000 AF). This anomaly is explained in the discussion of CALSIM II simulations and its limitations in previous chapters. Due to CALSIM's dynamic responses to system conditions, slight changes in model inputs or operations could trigger responses which may significantly vary on an individual monthly basis between the Base Condition simulation and "Project" or "Action" simulation. Focusing on the 72-year mean, as an indicator of delivery trend under this alternative, the mean relative change (as a percent) is less than one percent. In most years, no changes were determined through modeling. It is reasonable to conclude that no significant impacts on SWP customers would occur under Alternative 3 – Water Transfer Alternative when contrasting the actual diversion amount of 15,000 AFA to the simulated CALSIM II output.

TABLE 5.4-2B

ALLOCATIONS TO SWP CONTRACTORS (TAF)

	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
Mean	2858.9	2855.7	-8.7	-0.5
Median	3232.1	3231.0	0.0	0.0
Min.	173.8	173.8	-118.8	-8.3
Max.	3729.5	3729.5	39.5	1.9

Notes:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Alternative 4A – Reduced Diversion Alternative (12,500 AFA)

As shown for Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, the potential impacts on SWP contractors were negligible and were deemed unlikely to represent a significant impact. With a reduced diversion under this alternative to 12,500 AFA, the impacts would be less, than the full 15,000 AFA modeled for Alternatives 2A, 2B and 2C. Alternative 4A – Reduced Diversion Alternative (12,500 AFA), therefore, would result in no significant water supply impacts on SWP contractors.

Alternative 4B – Reduced Diversion Alternative (10,000 AFA)

Alternative 4B – Reduced Diversion Alternative (10,000 AFA), with diversions reduced to 10,000 AFA would intuitive have less of a hydrologic effect on water supplies than any of the previous alternatives. As shown for Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, the potential impacts on SWP contractors were negligible and were deemed unlikely to represent a significant impact. With a reduced diversion under this alternative to 10,000 AFA, the impacts would be less, than the full 15,000 AFA modeled for Alternatives 2A, 2B and 2C. Alternative 4B – Reduced Diversion Alternative (10,000 AFA), therefore, would result in no significant water supply impacts on SWP contractors.

Alternative 4C – Reduced Diversion Alternative (7,500 AFA)

Under Alternative 4C, where diversions were reduced by one-half, CALSIM II modeling simulations could not detect any measurable long-term changes in mean annual delivery allocations. The absolute difference in the 72-year mean annual delivery allocations for SWP customers was 300 AF and, at the delivery volumes assumed, undetectable as a percentage (see Reduced Diversion Alternative, Technical Appendix I, this Draft EIS/EIR). Accordingly, Alternative 4C – Reduced Diversion Alternative (7,500 AFA) would have no significant impact on SWP customer delivery allocations.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Alternatives including the Proposed Action – Scenarios.

5.4-3 Effects of delivery allocations to purveyors of the Sacramento Water Forum Agreement as provided under their Purveyor-Specific Agreements (PSAs).

Alternative 1A – No Action Alternative

Under the No Action Alternative, anticipated effects on Water Forum Agreement purveyors would be similar to those captured by the modeling simulations under Alternative 3 – Water Transfer Alternative. This is because under the No Action Alternative, it is presumed that EDCWA (along with its member participants) would pursue alternative water supplies, most likely in the form of a long-term transfer or assignment. Moreover, such actions, if made with existing Water Forum Agreement purveyors would be made with the full knowledge by the issuing purveyor of what the implications to their water supply entitlements would be. Under the No Action Alternative, there are no significant perceived impacts on the water delivery allocations of the Water Forum Agreement purveyors.

Alternative 1B – No Project Alternative

Under the No Project Alternative, with no changes to water delivery allocations beyond current conditions anywhere, by EDCWA or its member agencies, there would be no impact on the water delivery allocations to the Water Forum Agreement purveyors.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios

Table 5.4-3A shows the delivery allocations at specific nodes with the CALSIM II model framework. The nodes identified include those for: D300 – North Fork American River at the Auburn/PCWA Pumps; D302 – American River at the City of Sacramento Fairbairn WTP (near Howe Avenue); D8 – Folsom Dam and Reservoir; and D167 – City of Sacramento's SWRTP on the Sacramento River just downstream from its confluence with the lower American River.

TABLE 5.4-3A

ALLOCATIONS TO WATER FORUM PURVEYORS IDENTIFIED BY CALSIM NODE
72-YEAR MEAN ANNUAL SIMULATED DIVERSIONS
(DELIVERY YEAR MARCH – FEBRUARY)
(TAF)

CALSIM Node	Base Condition	Proposed Action[1] Scenario A	Absolute Difference	Relative Difference (%)
D300	35.1	41.1	6.0	17.1
D8	123.7	129..9	6.2	5.0
D302	124.4	124.4	-0.1	0.0
D167	28.4	28.4	0.0	0.3

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Under Alternative 2A – Proposed Action – Scenario A, modeled delivery allocations at the American River Pump Station (D300) and Folsom Dam (D8) showed a long-term average annual increase (based on 72-year hydrologic modeling) of 6,000 AF and 6,200 AF, respectively. This is consistent with the Proposed Action, as defined, for the anticipated project diversions at these locations for both EID and GDPUD. These modeling results indicate that, over the long-term (based on 72-year historic hydrology) and, taking into consideration water availability (through Reclamation imposed shortage policy cutbacks), GDPUD could expect to receive 6,000 AF (or 80 percent) on an average annual basis and EID could expect to receive 6,200 AF (or 83 percent) of their allocated quantities under this action. Individual year allocations, however, would vary depending on water availability and Reclamation operational decisions.

From a water supply impact perspective, Table 5.4-3A confirms that local water purveyors who divert at other locations would not be affected by the Proposed Action; both the American River and Sacramento River diversions of the City of Sacramento remained unchanged, relative to the Base Condition. The Water Forum Agreement purveyors, who divert from Folsom Reservoir, the lower American River, and the Sacramento River would remain unaffected by Alternative 2A – Proposed Action – Scenario A.

A review of the other allocation scenarios (between EID and GDPUD) under Alternatives 2B and 2C indicate that similar results to those of Alternative 2A, based on separate CALSIM II modeling simulations, would also hold true. Table 5.4-3B shows the simulated allocations for each of the same CALSIM II nodes, but this time under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Under this scenario, all of the proposed new contract water is shifted to EID for diversion at Folsom (D8); the modeling results confirm this. No significant changes in the long-term anticipated delivery allocations at any other of the diversion locations are identified. Alternative 2C, with a shift of 11,000 AF to GDPUD and 4,000 AF to EID showed the same trends in the modeling results.

TABLE 5.4-3B

ALLOCATIONS TO WATER FORUM PURVEYORS IDENTIFIED BY CALSIM NODE
72-YEAR MEAN ANNUAL SIMULATED DIVERSIONS
(DELIVERY YEAR MARCH – FEBRUARY)
(TAF)

CALSIM Node	Base Condition	Proposed Action[1] Scenario B	Absolute Difference	Relative Difference (%)
D300	35.1	34.2	-1.0	-2.7
D8	123.7	136..4	12.7	10.2
D302	124.4	124.4	-0.1	0.0
D167	28.4	28.4	0.0	0.3

Note:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.

Under Alternatives 2A, 2B and 2C – Proposed Action – Scenarios A through C, no significant impacts on the anticipated water delivery allocations to any of the Water Forum Agreement purveyors would occur.

Alternative 3 – Water Transfer Alternative and Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives

Under the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), no significant impacts on water delivery allocations to any of the Water Forum Agreement purveyors would occur (see Reduced Diversion Alternative, Technical Appendix I, this Draft EIS/EIR, which was modeled for Alternative 4C). Under Alternative 3 – Water Transfer Alternative, the impacts on the long-term allocations to the same Water Forum Agreement purveyors remain unchanged. However, the actual long-term simulated diversions at both the American River Pump Station and Folsom Reservoir not only increase but, in the case of Folsom Reservoir, significantly so (see Water Transfer Alternative, Technical Appendix I, this Draft EIS/EIR). This is because of the fact that not all purveyors diverting from Folsom Reservoir have Purveyor-Specific Agreements defined under the Water Forum, (i.e., there are diversions occurring outside of those specifically tied to Water Forum PSAs). As far as any potential impacts on the Water Forum Agreement purveyors, however, the anticipated impacts based on modeled simulations would be less than significant under any of these alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Alternatives including the Proposed Action – Scenarios.

5.4-4 Reduction in pumping at the State pumps for annual delivery to South of Delta contractors.

All Alternatives including Proposed Action – All Scenarios

As illustrated previously in Tables 5.4-1C and 5.4-1D (Allocations to CVP M&I and Ag contractors South of Delta), simulated water deliveries to South of Delta CVP contractors would remain unchanged, relative to the Base Condition under Alternative A – Proposed Action – Scenario A. This condition in annual delivery allocations would be identical under the other scenarios as well as for each of the other alternatives. As noted previously, South-of Delta CVP and SWP delivery within CALSIM II modeling is determined based upon water supply parameters and operational constraints with specific consideration for export constraints; it (CALSIM II modeling output) represents the best indication of how exports have been allocated over the historical period of record. Exports have, are, and will likely continue to be dictated by in-Delta conditions and CALSIM II modeling provides the best available means of detecting long-term trends over an established hydrologic record of how those operational constraints would affect exports. With deliveries to South of Delta contractors unchanged, relative to Base Conditions under all CALSIM II modeling, it is reasonable to conclude that no significant reductions or impairment to pumping levels at the State pumps would occur as a result of the Proposed Action or any alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Alternatives including the Proposed Action – Scenarios.

5.4-5 Result in operations inconsistent with the existing or anticipated CVP-OCAP or COA.

All Alternatives including Proposed Action – All Scenarios

The proposed new CVP water service contract (including all subcontracts) would be consistent with Reclamation terms and conditions regarding CVP and coordinated CVP/SWP operations, the CVPIA, established Biological Opinions (BiOp), federal and State environmental regulations, and Reclamation law. No variances from these established conditions, specifically as they relate to the CVP-OCAP and COA are anticipated.

As discussed in Subchapters 5.3.3 and 5.3.4, CALSIM II Model, the internal coding of the model incorporates all existing and current operational rules consistent with the CVP-OCAP, COA, and other regulatory and institutional constraints (e.g., environmental regulations, BiOps, SWRCB Decisions, etc.). CALSIM II modeling relied upon for this EIS/EIR, used the modeling assumptions and revisions to the 2004 CVP-OCAP. As noted previously, this EIS/EIR modeling also updated the 2004 CVP-OCAP base CALSIM II modeling in various ways (e.g., City of Sacramento demands). The modeling for this EIS/EIR was completed in July 2007, representing the most up-to-date Reclamation version of CALSIM II available. Since then, work on the CVP-OCAP Biological Assessment(s) have continued; with work closely matching the latest Reclamation CVP-OCAP Biological Assessment on Delta Smelt (revised August, 2008 version). Accordingly, all hydrologic impact analyses and associated environmental evaluations incorporated each of the relevant CVP-OCAP and COA provisions.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Alternatives including the Proposed Action – Scenarios.

5.4-6 Result in an inadvertent reduction in groundwater aquifer yields in any of the North, Central or South area aquifers.

All Alternatives including Proposed Action – All Scenarios

Neither the Proposed Action nor any of the alternatives rely on groundwater supplies, either within El Dorado County or elsewhere. In El Dorado County, as has been discussed previously, no appreciable, commercial groundwater supplies exist that would warrant the municipal and industrial development of such resources by EDCWA or any of its member purveyors. Water transfer alternatives could, however, lead to groundwater pumping from local or adjacent water purveyors who enter into transfer or assignment agreements with EDCWA. For those water purveyors capable of providing a groundwater supply (perhaps as an offset to a direct surface water transfers), they would still be tied to the provisions of the Water Forum Agreement with respect to the basin sustainable yield targets established in the Groundwater Element of the Water Forum Agreement. Accordingly, no impacts on local groundwater aquifers are anticipated as a result of any aspect of this Proposed Action.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Alternatives including the Proposed Action – Scenarios.

5.5. HYDROPOWER (DIVERSION-RELATED IMPACTS)

This subchapter describes the existing hydropower infrastructure and operations of the CVP and includes discussion of the hydropower operations at Folsom Reservoir which, because of its uniquely based multi-purpose infrastructure, possesses important implications to hydropower generation as well as water supply and environmental considerations, namely, coldwater pool management and downstream thermal benefits. The proposed new CVP water service contract is evaluated in the context of its potential effects on CVP hydropower generation and capacity as well as pumping power at Folsom Reservoir.

5.5.1. CEQA Standards of Significance

Specific statutory criteria do not exist for determining impacts related to effects on power supply. Thus, significance standards have been developed specifically for this analysis to address the potential regional and local impacts of implementing the Proposed Action or alternatives.

Hydropower generation at CVP facilities is an important resource for contributing to the reliability of the electrical power system in California. Impacts on CVP hydropower operations can result from increased water diversions that result in both lower reservoir levels and less water flow through turbines.

Cost-related hydropower impacts on a regional scale may result from changes in hydropower generation or dependable capacity. In this environmental document, gross hydropower generation is evaluated, which is the amount of generation before project use. Generation from New Melones Dam is included and the values shown are reduced for transmission loss to represent the energy generation available at the load center near Tracy. The use of dependable hydropower capacity differs from previous environmental documents that used instantaneous hydropower capacity, which corresponds to current reservoir elevation. In response to the WAPA's concerns about the availability of electrical power in California, this document evaluates the amount of hydropower capacity available over a specified, extended period of time. Similar to generation, the dependable capacity in this document is gross (before project use), and includes capacity at New Melones and is adjusted for transmission to reflect capacity at the load center near Tracy.

On a regional scale, a reduction in CVP generation is considered a cost impact because WAPA may no longer have excess energy available for sale or would be required to purchase additional energy for its customers. A reduction in dependable capacity would produce similar cost impacts. This analysis assumed that impacts would be significant if hydropower generation or dependable capacity were substantially reduced by the implementation of the preferred or reduced diversion alternatives.

On a local scale, impacts on hydropower may result from changes in pumping requirements at the Folsom or EID pumping plants due to changes in reservoir elevation. A reduction in reservoir elevation would produce a cost impact because more energy would be required for pumping plants to lift water from Folsom Reservoir for distribution to treatment plants and subsequently, water users.

While hydropower impacts are not expected to have a direct physical environmental effect, implementation of the Alternatives may have economic consequences by reducing existing energy resources that could require replacement from other, less environmentally benign energy resources. It is likely that thermal generation resources that do emit air pollutants would supply some portion of the replacement energy. Estimating when, where and how “dirty” the replacement energy might be would be speculative and is beyond the scope of this EIS/EIR to predict, especially given the interconnection of electric utility generation in the western states. Economic consequences could also occur if the Proposed Action could result in an increase in pumping energy requirements and the passage of that additional cost on to customers.

To quantify the potential impacts on hydropower resources due to the Proposed Action or alternatives, the following specific standards of significance were employed. Impacts were considered significant if they:

- Result in a substantial reduction in CVP hydropower generation at load center (at Tracy) and capacity (including the 1,152 MW PG&E supportable capacity) that would lead to adverse economic impacts on the preference customers of the Western Area Power Administration.
- Result in a substantial increase in annual pumping power costs to purveyors relying on the Folsom Reservoir urban water supply intake (elevation 317 ft msl) due to lowered water levels; and
- Result in a substantial change in hydropower generation opportunities in the upper American River basin.

5.5.2. Impacts and Mitigation Measures

5.5-1 Effects on CVP hydropower generation and capacity.

Alternatives 1A and 1B – No Action Alternative and No Project Alternative

Under both the No Action and No Project alternatives, changes to CVP hydrology would either be identical to the Proposed Action or zero (under the No Project Alternative). Again, while the environmental effects would be less than significant, there would be a definable economic cost under the No Action Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios

Under Alternative 2A – Proposed Action – Scenario A, CVP system hydropower generation at load center would on average, over the 72-year period of record, be reduced by 3.3 GWH (or 0.1 percent), relative to the Base Condition. Long-Term Gen modeling results showed that in almost all hydrologic years (of the 72-year record), a reduction in CVP hydropower generation would occur, relative to the Base Condition (see Proposed Action – Scenario A, Technical Appendix I, this Draft EIS/EIR). These reductions, however, would be small and, as noted above, averaged about one-tenth of one percent of the total CVP system generation at load center. Table 5.5-1A illustrates the 72-year mean change in CVP hydropower generation under Alternative 2A – Proposed Action – Scenario A.

TABLE 5.5-1A

CVP SYSTEM GENERATION AT LOAD CENTER
DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED ACTION[1]

	Base Condition (GWH)	Proposed Action Scenario A (GWH)	Absolute Difference	Relative Difference (%)
Mean	4545.1	4541.8	-3.3	-0.1
Median	4421.1	4427.3	-3.0	-0.1
Min.	2256.9	2257.0	-38.2	-1.0
Max.	9672.0	9669.8	15.7	0.4

Note
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
Source: June 2007, Long-Term Gen Modeling Output – 72-year hydrologic record, Unpublished data.

Table 5.5-1B illustrates the anticipated long-term changes in CVP system project use as simulated by Long-Term Gen under Alternative 2A – Proposed Action – Scenario A. Over the 72-year period of record, project use, as defined previously, would increase by 0.7 GWH (an insignificant percentage of the total CVP project use).

TABLE 5.5-1B

CVP SYSTEM PROJECT USE AT LOAD CENTER
DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED ACTION[1]

Month	Base Condition (GWH)	Proposed Action Scenario A (GWH)	Absolute Difference	Relative Difference (%)
Mean	1265.7	1266.4	0.7	0.0
Median	1326.1	1324.8	0.3	0.0
Min.	519.2	520.7	-42.2	-3.6
Max.	1778.5	1778.0	38.2	2.3

Note:
1. Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
Source: June 2007, Long-Term Gen Modeling Output – 72-year hydrologic record, Unpublished data.

All other Alternatives under the various Proposed Action scenarios showed similar results with Alternative 2A – Proposed Action – Scenario A (see Proposed Action – Scenarios B and C). With the quantities of diversions contemplated under P.L.101-514, it is not unreasonable or unexpected for modeling results to show this level of change in either CVP hydropower generation or project use. Since the diversions contemplated by all of the Proposed Action scenarios involve varying quantities of allocation between EID and GDPUD, but all occurring from either Folsom Reservoir or a combination of Folsom Reservoir and points upstream, the net impacts on Folsom operations would remain unchanged. A 15,000 acre-foot total diversion from Folsom Reservoir and/or points upstream would also have similar effects on CVP hydropower generation at load center, regardless of how the allocations between EID and GDPUD would be split.

Overall, a net reduction in long-term CVP hydropower production of 3.3 GWH, relative to the annual average CVP energy production of 4,545 GWH is considered to be a less-than-significant impact. Alternatives 2A, 2B and 2c would, therefore, not result in significant impacts on CVP hydropower generation. Having said that, with any reduction in energy production, WAPA could be compelled to reduce surplus energy sales or increase purchases to meet its commitments. In either case, such conditions would represent a definable *economic cost* but an unidentifiable environmental impact. These conditions were discussed previously.

With respect to potential changes in capacity and its effects on preference customers, previous modeling under the Water Forum Agreement analyzed the effects of changing water surface elevations at Folsom Reservoir and the potential implications to increased energy requirements for diverters pumping from the reservoir. The modeling assumed 254,800 AF of *additional* water diverted from the American River basin alone, relative to the 1995 Base Condition and assumed full diversions by EID and GDPUD for the current P.L.101-514 new CVP water service contracts. This was the premise of the Water Forum EIR. Of that additional 254,800 AF, withdrawals from Folsom Reservoir and upstream assumed that 172,000 AF would occur, again with the inclusion of EID and GDPUD's P.L.101-514 contracts.

Despite the significant additional increment of water withdrawal from the American River Watershed under the entire Water Forum Agreement, modeling results (using the power subroutine of PROSIM at the time) showed that under the Water Forum Agreement, few infringements on the 1,152 MW criteria would occur, relative to the Base Condition. The environmental analysis concluded that no significant impact on net CVP capacity available to CVP preference customers would occur under the Water Forum Agreement, relative to the Base Condition (see Draft Environmental Impact Report for the Water Forum Proposal, January 1999). Since the P.L.101-514 new contracts, under the current Proposed Action, were included in the modeling for the Water Forum Agreement, it is not unreasonable to conclude that this action, would not, by itself, result in impacts on net CVP capacity available to CVP preference customers.

Alternative 3 – Water Transfer Alternative and Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives

Under these Alternatives, the results would be the same or less than those applicable to Alternatives 2A, 2B and 2C under the Proposed Action. Diversion quantities considered under these Alternatives were identical or less than those for Alternatives 2A, 2B and 2C. It is reasonable to assume that under any of the Alternatives 4A, 4B and 4C, modeled changes to CVP hydropower generation or capacity would be less than that simulated under Alternatives 2A, 2B and 2C because of the lesser quantities diverted. Accordingly, similar to the Alternative 2A, there would no significant environmental impacts on CVP hydropower generation or capacity under these Alternatives. As noted previously, there would, however, be a definable economic cost.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

All of the alternatives except for Alternative 1B – No Project Alternative would impart economic effects on power supply. There are no feasible mitigation measures that would reduce the economic impact to a less-than-significant level. Consequently, for full disclosure reasons, this EIS/EIR acknowledges that power supply impacts are considered economically significant and unavoidable. For purposes of CEQA, however, the effect is environmentally less than significant, and does not represent a significant unavoidable environmental impact.

5.5-2 Effects on annual pumping power costs to purveyors relying on the Folsom Reservoir urban water supply intake.

Alternative 1A and 1B – No Action Alternative and No Project Alternative

Under both the No Action and No Project alternatives, changes in Folsom Reservoir water surface elevations would either be identical to the Proposed Action or zero (under the No Project Alternative). Again, while the environmental effects would be less than significant, there would be a definable economic cost under the No Action Alternative since, as defined, it is presumed that a water transfer of some kind would be pursued with similar implications to water surface elevations at Folsom Reservoir.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios

Reductions in Folsom Reservoir levels caused by the new water service contract(s) may increase capacity and energy requirements to pump water at the Folsom Pump Plant and the EID pumping plant. Such impacts, like those for hydropower generation, would not be expected to cause direct environmental impacts, but would have economic consequences and increase the demand for other sources of power (depending on the degree of new energy requirements as reflected in reservoir elevation changes).

Under the Water Forum Agreement, analyses of the frequency of Folsom Reservoir water surface elevations during the non-irrigation (November – March) and irrigation (April – October) periods were made. Again, this analysis included the EID and GDPUD new CVP water service contracts under consideration in this action. Using Folsom Reservoir's water surface elevation pumping relationships (i.e., Folsom Reservoir elevations that inhibit gravity flow to the North Fork and Natomas pipelines), it was shown that under the Water Forum Agreement (e.g., where an additional 172,000 AF diversion was imposed, relative to Base Conditions), increased pumping requirements occurred at almost all key reservoir water surface elevations. While the increased frequency of pumping were small (e.g., from pumping requirements 79 percent of the time at water surface elevation below 425 feet msl to 80 percent), these changes would translate into some increased energy usage. Under the Water Forum Agreement, the average annual pumping energy requirements would increase by approximately 5,800 megawatt hours (MWh), relative to the Base Condition. EID's increment of increased energy costs would be subsumed in that 5,800 MWh increase, along with all other diverters from Folsom Reservoir.

Consistent with the Water Forum Agreement, this impact is considered to be less than significant from an environmental perspective, but would be an economically significant impact.

Alternative 3 – Water Transfer Alternative and Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives

Under these Alternatives, the results would be the same or less than those applicable to any of Alternatives 2A, 2B or 2C, all scenarios under the Proposed Action. Diversion quantities considered under these Alternatives were identical or less than those for Alternatives 2A, 2B and 2C. This would apply to Alternative 3 – Water Transfer Alternative. It is reasonable to assume that under any of the Alternatives 4A, 4B or 4C, modeled changes Folsom Reservoir water surface elevations would be less than that simulated under Alternative 2A. Accordingly, similar to Alternative 2A, there would no significant environmental impacts on pumping energy requirements at the Folsom or EID pumping plants. Consistent with the other Alternatives, there would, however, be a definable economic cost with each of these Alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

The economic impacts identified are unavoidable given that the process of delivering water using the Folsom Reservoir facilities necessitates pumping and consequently, the use of electrical energy. The relatively small size of Folsom Reservoir, coupled with a large storage reservation for flood control, constrains operations from achieving large carryover storage volumes. Any additional use of water from Reservoir that alters the timing of storage, affects pumping requirements and these new CVP water service contracts are no exception. Pumping energy economic impacts are unavoidable and are borne by the Folsom Reservoir water diverters themselves.

5.5-3 Change in hydropower generation opportunities in the upper American River basin.

Alternative 1A and 1B – No Action Alternative and No Project Alternative

Under both the No Action and No Project alternatives, upper American River basin hydrology would remain unaffected in regard to hydropower generation opportunities. Changes in upper basin hydrology would either be identical to Alternative 3 – Water Transfer Alternative or zero (under the No Project Alternative). No impacts on hydropower generation opportunities are anticipated under these two alternatives.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios

Alternatives 2A, 2B and 2C, as defined, would divert water either at Folsom Reservoir or, at a point upstream on the Middle Fork American River at the location of the current American River Pump Station. Upper American River basin hydropower generation, by SMUD (UARP) in El Dorado County or, PG&E and PCWA in Placer County, would remain unaffected by these water service contracts since all contemplated diversions would be well downstream of, or hydrologically disconnected to those hydropower generating projects. Reservoir storage for all hydropower generating facilities in the upper watershed would remain undiminished. Accordingly, Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, would have no impact on hydropower generation opportunities in the Upper American River watersheds.

Alternative 3 – Water Transfer Alternative and Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives

Similar to Alternatives 2A, 2B and 2C, – Proposed Action, All Scenarios, both of these alternatives would not affect upper watershed hydropower generation by virtue of their ability to divert water from Folsom Reservoir or at points well downstream, as is currently assumed. No impacts on upper basin hydropower generation opportunities would occur.

If, however, Alternative 3 – Water Transfer Alternative were to be pursued and ultimately succeed in implementing a new water transfer involving a diversion point on, for example, the South Fork Rubicon River, SMUD's hydropower generation could be affected. If a new diversion were to occur above either the Loon Lake or Robbs Peak powerhouses, SMUD would likely experience lost hydropower generation potential at these facilities. An economic impact on SMUD would occur under such situations. Environmentally, a new analysis would be required to evaluate the downstream effects of such a diversion.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.6. Flood Control (Diversion-Related Impacts)

This subchapter describes the existing flood control facilities and operations within the regional and local study areas, and presents an analysis of the potential effects of the new CVP water service contracts on these flood control elements. The enumeration of potential impacts addresses environmental conditions that could be directly affected by diversion of project water from the North Fork American River and Folsom Reservoir.

5.6.1. <u>CEQA Standards of Significance</u>

Impacts on flood control facilities and/or operations were considered significant if they would:

- Result in a substantial change in the ability to adhere to the flood control diagrams for Folsom Reservoir under current operation or to its long-term re-operation;
- Result in a substantial change in floodplain characteristics that would increase the exposure of persons or property to flood hazards;
- Result in a substantial change in the hydraulic stress imparted to lower American River levees or lower Sacramento River levees;
- Result in operations inconsistent with the Joint Federal Project for Folsom Dam (including the Folsom Dam Safety/Flood Damage Reduction Project); or
- Result in operations inconsistent with SAFCA and Water Forum levee improvement/ stabilization work in the lower American River corridor.

5.6.2. Impacts and Mitigation Measures

5.6-1 Substantial change in the ability to adhere to the flood control diagrams for Folsom Reservoir under current operation or to its long-term re-operation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, diversions from the CVP system would be identical to the existing condition. Consequently, CVP operations would remain unchanged, and Shasta and Folsom reservoirs would continue to provide the same level of flood control protection as under the existing condition. *No impact* would occur.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative

Folsom Reservoir is operated to provide flood control protection from November through April. Under any of the action alternatives (including the No Action Alternative, as defined), increased diversions from the American River Watershed would occur. On a monthly mean basis during the flood control period, the storage in Folsom Reservoir would generally be slightly lower or unchanged under any of the action alternatives (including all scenarios under the Proposed Action), relative to the existing condition (see Proposed Action – Scenarios A, B and C, Technical Appendix I, this Draft EIS/EIR). This would indirectly provide a flood control *benefit* to the region by assisting in the ability to provide or, at the very least, maintain existing flood control reservation space. No adverse effect on Folsom Reservoir's ability to meet or adhere to its flood encroachment curve would occur. Moreover, as a diversion project, by definition, these new contracts would, in no way, affect the long-term or permanent re-operation of Folsom Dam and Reservoir for flood control purposes.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.6-2 Substantial change in floodplain characteristics that would increase the exposure of persons or property to flood hazards including a substantial change in the hydraulic stress imparted to lower American River levees or lower Sacramento River levees.

Alternative 1B – No Project Alternative

Under the No Project Alternative, depletions to the CVP system would be identical to the existing condition. Consequently, no changes to riverine hydraulics or annual hydrology would occur. The resulting condition would that the same levels of flood control protection as under the existing condition would occur. Persons or property would be at no greater risk to flooding, relative to the current condition. This alternative would impart no additional impact threat.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative

Where any structural change to a natural levee, revetment, dike, or terrace embankment occurs, increased risk to flooding can result. Altered characteristics within a floodplain may, depending on the magnitude of change, impart an increased risk of flooding. Additionally, where water is re-routed and flows increased within confined or defined channels, an increase in hydraulic stress may be imparted. Levee stress, a primary causal factor in failure, is often promoted by high flows over prolonged periods of time. In addition to the kinetic energy imparted by high flows, which can generate substantial erosive potential along the wetted embankment, high flows can also act to saturate confining levees. With this saturation, positive pore water pressures can build within older levees. Such pressures in an elevated structure of unconsolidated material (levees) can promote significant structural risks that can result in failures.

Each of the Alternatives (including the No – Action Alternative) except Alternative 1B – No Action Alternative, however, involve a withdrawal of water, not an addition. Overall, from a reservoir storage and flood reservation perspective, these changes would be small, but the amount of water in storage would be less, not more. Hence, the proposed new contracts, by definition, would provide greater flood control protection, relative to existing or Base Conditions. Table 5.6-1 shows the mean monthly flow releases from Nimbus Dam under Alternative 2A – Proposed Action – Scenario A, for the period November through April (flood control period), relative to the Base Condition.

The modeling results confirm the overall long-term reduction in mean monthly flows for most months. Noted increases would be well within the normal operating ranges for lower American River channel flows. Perhaps more importantly, the results confirm the negligible overall change in mean monthly flows, based on CALSIM II hydrologic modeling.

Increased diversions at Folsom Reservoir or points upstream would not result in specific changes to the characteristics of the lower American River floodplain, and there would be no increased risk of flooding. Persons and property within the area protected by these facilities would not experience any significant increase in exposure to flooding hazards, relative to the existing condition. Therefore, there would be no impact.

TABLE 5.6-1

MEAN MONTHLY FLOWS BELOW NIMBUS DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] DURING THE NOVEMBER THROUGH APRIL FLOOD CONTROL PERIOD OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Project (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Nov	3345.6	3349.0	3.4	-0.1	-190.6 (-21.6)	189.0 (8.2)
Dec	3346.5	3353.1	6.6	0.1	-98.8 (-5.4)	369.6 (8.2)
Jan	4095.6	4094.7	-0.9	0.0	-229.8 (-5.4)	127.5 (8.2)
Feb	5121.6	5117.1	-4.5	-0.3	-321.8 (-21.7)	79.2 (3.2)
Mar	3746.0	3753.7	7.7	0.4	-7.5 (-0.6)	305.0 (12.8)
Apr	3824.6	3821.6	-2.9	-0.1	-247.2 (-6.5)	74.9 (3.0)

Notes:
1 Proposed Action modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2 Absolute Difference – difference between Base Condition and Proposed Project (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3 Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Project, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4 Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Project, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

While future continued development would contribute to losses in surface permeability, it is assumed that appropriate runoff control practices will be implemented as part of the development process to provide mitigation for such changes in the hydraulic characteristics of the floodplain. Therefore, impacts on floodplain characteristics and the associated risk of flooding would be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.6-3 Result in operations inconsistent with the Joint Federal Project for Folsom Dam (including the Folsom Dam Safety/Flood Damage Reduction Project).

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative, and Alternative 1B – No Project Alternative

As noted previously, the Joint Federal Project for Folsom Dam includes two elements; the dam safety element and the flood damage reduction element. The dam safety element focuses on the construction of a new large spillway near the Mormon Island abutment of the dam (along with other existing spillway modifications) and the flood damage reduction element primarily involves the revision to Folsom Reservoir's current Water Control Manual; the existing 400-670 flood encroachment curve. As a new diversion project, neither the new spillway nor the pending revision to the Folsom Reservoir empty space flood reservation curve would be affected by this project. No impacts are anticipated to occur under any of the Alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.6-4 Result in operations inconsistent with SAFCA and Water Forum levee improvement/stabilization work in the lower American River corridor.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative, and Alternative 1B – No Project Alternative

SAFCA and the Water Forum's levee improvement and stabilization work in the lower American River have included several completed and ongoing initiatives. These include, for the American River Common Features Project:

- American River Common Features - Slurry Wall Construction
- Installation of American River Basin Telemetry Gages
- Bank Protection along the American River Sites 1 through 5
- American River Revegatation Sites
- American River Common Features Jet Grout Contract 1
- American River Erosion Protection RM 1.8
- American River Erosion Sites 7.0R, 10.2L, 6.4L and 6.9
- American River 10.0 Bank Stabilization

And for the North Area/Natomas/NLIP:

- North Area Local Project
  - Garden Highway through levee seepage
  - East/West Levee improvements along Steelhead Creek (aka Natomas East Main Drainage Canal [NEMDC])
  - Cross Canal Levee Improvements Phase 1
  - Dry Creek North Levee
  - Robla Creek - Phase 1, 2, 3
  - Arcade Creek Phase 1
  - NEMDC Pump Station
- Natomas Levee Soil Boring Program
- Sand Cove Park Emergency Streambank Protection Project

- Dry Creek Debris Removal Project - Phase 1
- Sacramento River RM 60.0 Jibbom Street Park Levee Widening

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, including all action alternatives would, again have no effect on these completed and/or ongoing efforts. All project diversions contemplated under the new CVP water service contracts would occur upstream, at Folsom Reservoir or, points further upstream. Any changes to downstream hydrology in the lower American River and points further, would be observed as reductions in flow, to the extent that Reclamation operations at Folsom Dam would make these perceptible. Accordingly, none of the Alternatives would impart any adverse effect on levee improvement work being conducted in the lower American River.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.7. Water Quality (Diversion-Related Impacts)

This subchapter describes the existing water quality conditions within the regional and local study areas, and presents an analysis of potential effects on water quality due to implementation of the Proposed Action or alternatives. The enumeration of potential impacts addresses environmental conditions that could be directly affected by diversion of project water from the North Fork American River and Folsom Reservoir, as defined by the Proposed Action.

5.7.1. <u>CEQA Standards of Significance</u>

Impacts were considered significant if they would:

- Result in reduced dilution potential of known water quality contaminants in Folsom Reservoir, Lake Natoma, the lower American River, or Sacramento River due to increased diversions from the CVP; or,
- Result in reduced Delta water quality or operations contrary to the mandate of the Bay-Delta Water Quality Control Plan, California Inland Surface Waters Plan, Bay-Delta Pollutant Policy Document and Accord, Anti-Degradation Policy, and the pending Bay-Delta Conservation Plan.

5.7.2. <u>Impacts and Mitigation Measures</u>

5.7-1	**Effects of increased diversions and changes in CVP operations on water quality in reservoirs and rivers.**

Alternative 1A – No Action Alternative

As defined, under the No Action Alternative, diversions throughout the CVP and SWP system would increase, relative to the Base Condition, resulting in a decrease in dilution capacity of CVP and SWP rivers and reservoirs. These diversions, however, would not come from direct CVP or SWP allocations, but rather, from other water right holders within the American River Watershed, similar to Alternative 3 – Water Transfer Alternative. Hydrologically, therefore, the effect of the No Action Alternative on system-wide hydrologic variables would be identical to those of the Proposed Action scenarios described below. Accordingly, any impacts on water quality for waterbodies associated with the CVP project area resulting from reductions in Shasta Reservoir storage, Sacramento River flows, Folsom Reservoir storage or lower American River flows would be less than significant.

Alternative 1B – No Project Alternative

Diversions from the CVP system would be identical to existing conditions. The dilution capacity of CVP and SWP rivers and associated reservoirs, therefore, would remain unchanged under the No Project Alternative, relative to the existing condition. Consequently, there would be no impact on the water quality of CVP and SWP rivers and associated reservoirs.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios and Alternative 3 – Water Transfer Alternative

Increased diversions from Folsom Reservoir or points upstream could be expected to reduce operating storage levels in Folsom Reservoir and thus, also reduce flows in the lower American River. Since CVP reservoirs, in coordination with SWP reservoirs, are operated in an integrated fashion, reduced storage levels in Folsom Reservoir have the potential to also affect storage levels in other reservoirs as well as potentially affect flows in the Sacramento River and into the Delta. Table 5.7-1 shows the simulated mean end-of-month storage in Folsom Reservoir under the Proposed Action – Scenario A, over the 72-year hydrologic period of record.

Mean end-of-month storage changes from the Base Condition are small (e.g., the maximum long-term change in mean end-of-month storage was modeled at 1,600 AF representing a 0.3 percent change). Table 5.7-2 shows the same data for Shasta Reservoir. For Shasta Reservoir, mean end-of-month storage, over the 72-year period of hydrologic record would remain virtually the same, relative to the Base Condition. While absolute differences shown by CALSIM II modeling showed very slight increases (e.g., 1,100 AF), these are considered negligible when compared to total storage in the reservoir and are reflected in the small percentage increases. The influence of coordinated system operations are reflected in the modeling results for Shasta Reservoir where, slight storage changes (increases) are captured by CALSIM II, despite no direct diversions from the Proposed Action emanating in Shasta Reservoir.

Table 5.7-3 shows the mean monthly simulated flows in the lower American River below Nimbus Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, over the 72-year period of record. Slight decreases in long-term mean monthly flows were modeled for every month except April.

These small reductions in flows, acting indirectly as dilution on the concentrations or levels of water quality parameters, would have a small, and immeasurable potential to adversely affect water quality.

TABLE 5.7-1

MEAN END-OF-MONTH STORAGE IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (TAF)	Proposed Action (TAF)	Absolute Difference[2] (TAF)	Relative Difference (%)	Maximum Storage Decrease[3] (TAF and %)	Maximum Storage Increase[4] (TAF and %)
Oct	525.8	524.8	-1.0	-0.1	-34.1 (-5.8)	80.3 (19.8)
Nov	453.2	453.1	0.0	-0.1	-47.1 (-13.6)	74.3 (19.5)
Dec	464.9	465.4	0.5	0.1	-13.9 (-4.1)	61.9 (17.4)
Jan	481.6	482.6	1.0	0.3	-10.1 (-3.2)	57.7 (13.3)
Feb	503.2	503.0	-0.2	0.0	-6.2 (-1.4)	15.8 (3.9)
Mar	614.1	614.3	0.2	0.0	-6.5 (-1.5)	20.9 (4.1)
Apr	722.7	721.9	-0.7	-0.1	-11.1 (-1.8)	15.4 (2.0)
May	834.2	833.1	-1.1	-0.2	-10.2 (-2.0)	2.9 (0.3)
Jun	788.4	787.0	-1.4	-0.2	-40.7 (-5.9)	8.6 (1.2)
Jul	650.7	649.1	-1.6	-0.3	-25.9 (-4.5)	26.6 (6.3)
Aug	601.9	600.6	-1.4	-0.3	-28.5 (-6.5)	62.5 (11.8)
Sep	594.4	593.4	-1.0	-0.3	-30.0 (-7.6)	81.5 (19.3)

Notes:
1. Proposed Action – Scenario A, modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Storage Decrease – refers to the largest decrease in end-of-month storage under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Storage Increase – refers to the largest increase in end-of-month storage under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

TABLE 5.7-2

MEAN END-OF-MONTH STORAGE IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (TAF)	Proposed Action (TAF)	Absolute Difference[2] (TAF)	Relative Difference (%)	Maximum Storage Decrease[3] (TAF and %)	Notes[4]
Oct	2544.8	2545.6	0.8	0.0	-9.0 (-1.4)	1932 (D)
Nov	2593.2	2594.1	0.8	0.1	-12.9 (-0.4)	1973 (BN)
Dec	2727.4	2728.2	0.9	0.1	-4.1 (-0.1)	1981 (D)
Jan	2959.1	2959.9	0.8	0.1	-4.1 (-0.1)	1981 (D)
Feb	3208.2	3208.6	0.5	0.0	-15.4 (-0.6)	1990 (C)
Mar	3552.6	3553.1	0.6	0.0	-15.4 (-0.5)	1990 (C)
Apr	3829.4	3829.8	0.4	0.0	-15.1 (-0.6)	1990 (C)
May	3816.2	3816.4	0.2	0.0	-14.3 (-0.5)	1990 (C)
Jun	3536.6	3537.3	0.8	0.0	-7.4 (-0.4)	1933 (C)
Jul	3079.4	3080.5	1.1	0.0	-11.2 (-0.8)	1933 (C)
Aug	2736.8	2738.2	1.4	0.1	-4.2 (-0.2)	1989 (D)
Sep	2605.4	2606.6	1.1	0.1	-4.8 (-0.2)	1989 (D)

Notes:
1. Proposed Action modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Storage Decrease – refers to the largest decrease in end-of-month storage under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

TABLE 5.7-3

**MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Oct	2441.8	2427.7	-14.1	-0.7	-362.0 (-15.4)	440.8 (15.8)
Nov	3324.2	3299.2	-25.0	-0.3	-582.1 (-20.8)	704.4 (41.6)
Dec	3342.0	3322.9	-19.1	-0.1	-827.8 (-10.8)	446.1 (23.6)
Jan	4088.3	4073.4	-14.9	-0.8	-764.9 (-60.5)	334.6 (24.6)
Feb	5103.3	5115.7	12.4	0.9	-190.7 (-8.1)	720.7 (51.8)
Mar	3729.4	3715.3	-14.1	-0.5	-267.9 (-10.0)	24.8 (3.0)
Apr	3825.3	3829.0	3.7	0.4	-73.7 (-1.7)	339.5 (14.6)
May	3683.2	3675.2	-7.9	-0.2	-58.9 (-2.5)	239.7 (7.3)
Jun	3933.9	3910.4	-23.6	-0.8	-150.6 (-8.7)	531.75 (18.0)
Jul	3846.4	3820.4	-26.0	-0.9	-467.6 (-14.2)	77.2 (1.6)
Aug	2138.4	2103.7	-34.7	-1.7	-1467.9 (-63.9)	405.1 (17.2)
Sep	1503.2	1475.9	-27.4	-2.0	-1156.2 (-67.3)	67.2 (9.4)

Notes:
1. Proposed Action – Scenario B, modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3 Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4 Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Since flows in the Sacramento and American rivers would not be reduced substantially, concentrations of the water quality parameters of interest such as nutrients, pathogens, TDS, TOC, turbidity, and priority pollutants (e.g., metals, organics) would not be expected to be altered substantially, if at all, by the implementation of any of the diversion scenarios under the Proposed Action, or the Water Transfer Alternative, relative to existing conditions. Thus, any impacts on water quality for waterbodies associated with the CVP project area resulting from reductions in Shasta Reservoir storage, Sacramento River flows, Folsom Reservoir storage or lower American River flows would be less than significant under all of the alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.7-2 Effects on Delta water quality or operations contrary to the mandate of the Bay-Delta Water Quality Control Plan, California Inland Surface Waters Plan, Bay-Delta Pollutant Policy Document and Accord, Anti-Degradation Policy, and the pending Bay-Delta Conservation Plan.

Alternative 1A – No Action Alternative

Under the No Action Alternative, there would increases in the total amount of water diverted from the CVP/SWP system, similar to those assumed under Alternative 3 – Water Transfer Alternative (see discussion under Alternative 3 – Water Transfer Alternative). Consequently, there would be no measurable changes in the position of X2 or significant reductions in Delta outflow, relative to the Base Condition.

Alternative 1B – No Project Alternative

Diversions from the CVP system would remain unchanged from the Base Condition under the No Project Alternative. The amount of water flowing into the Delta, therefore, would remain unchanged under the No Project Alternative, resulting in an unchanged X2 position, export/inflow ratio, and dilution capacity within the Delta. Water quality within the Delta would not be affected under the No Project Alternative. Consequently, there would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, and Alternative 3 – Water Transfer Alternative

Table 5.7-4 shows the mean monthly simulated position of X2 (i.e., the position in kilometers eastward from the Golden Gate Bridge of the two parts per thousand [ppt] near-bottom isohaline) over the 72-year period of record under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition.

TABLE 5.7-4

MEAN MONTHLY DELTA X2
DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED PROJECT[1]

Month	Absolute Difference (km)	Relative Percent (%)	Maximum[2] (km)	Notes[3]
Oct	0.0	0.0	0.3	1938 (W) 88.1 km to 88.4 km
Nov	0.0	0.0	0.2	1937 (BN) 88.6 km to 88.8 km
Dec	0.0	0.0	0.1	1937 (BN) 83.4 km to 83.4 km
Jan	0.0	0.0	0.4	1937 (BN) 84.6 km to 85.0 km
Feb	0.0	0.0	0.9	1933 (C) 78.2 km to 79.1 km
Mar	0.0	0.0	0.6	1934 (C) 74.1 km to 74.2 km
Apr	0.0	0.0	0.4	1935 (BN) 69.9 km to 70.3 km
May	0.0	0.0	0.1	1934 (C) 76.2 km to 76.2 km
Jun	0.0	0.0	0.2	1932 (D) 74.1 km to 74.3 km
Jul	0.0	0.0	0.1	1932 (D) 75.8 km to 75.8 km
Aug	0.0	0.0	0.0	N/A
Sep	0.0	0.0	0.9	1937 (BN) 83.3 km to 84.2 km

Notes:
1. Proposed Project modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum – refers to the largest increase in distance from Golden Gate Bridge (in km) computed for that month (largest increase over 72-years).
3. Indicates the year where the maximum increase (adverse change) in X2 occurred for that month, identifying the water-year type and the actual mean monthly comparison between the base condition and proposed project in that year.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

For each month, while there were individual years (over the 72-year simulation period) that showed slight changes in X2 position, overall, the long-term mean position remained unchanged. As a surrogate, an unchanging X2 position is a positive indicator that proper export/inflow ratios are maintained in the Delta.

Based on CALSIM II modeling simulations, there would be no shift in the long-term average position of X2 under any of the diversion scenarios of the Proposed Action (see Proposed Action, Scenarios A, B and C, Technical Appendix I, this Draft EIS/EIR). The CALSIM II model simulations conducted included conformance with X2 requirements set forth in the SWRCB Interim Water Quality Control Plan, as well as the Department of the Interior's Final Administrative Proposal for the Management of 3406(b)(2) Water.

As shown in Tables 5.7-1 through 5.7-3, no significant hydrological changes would be expected to reservoir storage in Shasta, Folsom, as well as in lower American River flows. To the extent that any of the Bay-Delta Water Quality Control Plan, California Inland Surface Waters Plan, Bay-Delta Pollutant Policy Document and Accord, Anti-Degradation Policy, and the pending Bay-Delta Conservation Plan are influenced or rely on protective hydrologic regimes and implementable standards, the Proposed Action and all of the alternatives would not be inconsistent with the mandates or operations of those plans.

Accordingly, Alternatives 2A, 2B and 2C – Proposed Action, All Scenarios would have a less-than-significant impact on Delta water quality. Under any of Alternatives 4A, 4B or 4C, these changes would be even less. For Alternative 3 – Water Transfer Alternative, while increased water diversions, relative to the Base Condition are assumed, they would not exceed those simulated under Alternatives 2A, 2B or 2C – Proposed Action scenarios (see Water Transfer Alternative, Technical Appendix I, this Draft EIS/EIR).

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8. FISHERIES AND AQUATIC RESOURCES (DIVERSION-RELATED IMPACTS)

This subchapter describes the fisheries resources and aquatic habitats, including the regional and local area affected environments, and presents an analysis of the potential effects on these resources resulting from implementation of the new CVP water service contracts.

5.8.1. <u>CEQA Standards of Significance</u>

Fisheries and aquatic resources throughout the CVP integrated system, including those in Folsom Reservoir, the North Fork American River, and the lower American River could be adversely affected by implementation of the new CVP water service contracts. The criteria to determine those potential effects were based on a variety of hydrologic indices using CALSIM II, along with several other

Reclamation environmental models (see Subchapter 5.3 and 5.4 for complete discussion). The impact indicators and associated modeling criteria are set out in Table 5.8-1.

5.8.2. Impacts and Mitigation Measures

5.8-1 Effects on warmwater fisheries in Shasta and Trinity reservoirs.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in CVP/SWP hydrology, no changes from the Base Condition would result. Accordingly, no impacts on warmwater fisheries resources in Shasta and Trinity reservoirs are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Table 5.8-2 shows the long-term average end-of-month water surface areas within Shasta Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Decreases in end-of-month water surface area are small and likely undetectable (e.g., relative difference as a percentage is insignificant and virtually zero). Accordingly, there would be no change in the long-term average end-of-month water surface area in Shasta Reservoir during the March through September period based on simulated CALSIM II modeling results when warmwater fish spawning and initial rearing may be expected.

Hydrologically, no detectable changes in simulated reservoir operations or re-operations are anticipated as a result of the new CVP water service contracts proposed by this action. This is confirmed in CALSIM II hydrologic modeling which showed no detectable change in reservoir water surface area. Accordingly, no impacts on warmwater fisheries in Shasta Reservoir are expected.

Table 5.8-3 shows the mean monthly water surface elevations simulated for Trinity Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Modeled mean monthly water surface elevations remain unchanged, in the long-term, under Alternative 2B – Proposed Action – Scenario B.

Similarly, the CALSIM II modeling results showed that for Trinity Reservoir, there would be no long-term changes in water surface elevations under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Differences in the long-term average amount of littoral habitat potentially available to warmwater fish for spawning and/or rearing in either Shasta or Trinity reservoirs would be negligible. While small and infrequent reductions in the availability of littoral habitat would occur on an inter-annual basis, these would not be of sufficient magnitude to substantially reduce long-term average initial year-class strength of warmwater fish populations. Consequently, seasonal reductions in littoral habitat availability would constitute a less-than-significant impact on both Shasta and Trinity reservoir warmwater fisheries.

TABLE 5.8-1

FISHERIES AND AQUATIC RESOURCES DIVERSION-RELATED IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Impact Indicators	Modeling Criteria
Shasta and Trinity Reservoirs	
Warmwater Fisheries	
Mean number of acres of littoral habitat for each month of the primary spawning and rearing period (i.e., March through September).	Decrease in the long-term average quantity (acres) of littoral habitat, relative to the existing condition, to adversely affect long-term population levels of warmwater fish for any month of this period over the 72-year period of record.
End-of-month reservoir water surface elevation (feet/msl) occurring each month of the primary spawning and rearing period for nest-building warmwater fish (i.e., March through September).	Decrease in reservoir water surface elevation more than nine feet per month, relative to the existing condition, of sufficient frequency to adversely affect long-term population levels of warmwater fish for any month of this period over the 72-year period of record.
Coldwater Fisheries	
End-of-month storage (TAF) for each month of the April through November period.	Decrease in reservoir storage, relative to the existing condition, which also would reduce the coldwater pool, of sufficient magnitude to adversely affect long-term population levels of coldwater fish for any month of this period over the 72-year of record.
Sacramento River	
Monthly mean flows (cfs) released from Keswick Dam for each month of the year.	Decrease in flow, relative to the existing condition, of sufficient magnitude and frequency to decrease the relative habitat availability for upper Sacramento River fish for any month of this period over the 72-year period of record.
Monthly mean flows (cfs) at Freeport for each month of the year.	Decrease in flow, relative to the existing condition, of sufficient magnitude and frequency to decrease the relative habitat availability for lower Sacramento River fish for any month of this period over the 72-year period of record.
Monthly mean water temperatures (°F) at Keswick Dam and Bend Bridge for each month of the year.	Increase in water temperature, relative to the existing condition, of substantial magnitude and frequency to adversely affect spawning and rearing of anadromous salmonids for any month of the year for the 71-year period of record.
Number of years that water temperatures at Keswick Dam and Bend Bridge would exceed the temperature criteria identified by NMFS in its Biological Opinion for Winter-run Chinook Salmon (NMFS 1993).	Increase in the number of years that water temperatures exceed those stipulated in the NMFS Biological Opinion (i.e., 50°F and 60°F), relative to the existing condition, which would adversely affect winter-run Chinook salmon over the 71-year period of record.
Average annual early lifestage survival for fall-, late-fall-, winter-, and spring-run Chinook salmon.	Decrease in annual early lifestage survival for any run Chinook salmon (i.e., fall-, late fall-, winter-, and spring-run Chinook salmon), relative to the existing condition, of sufficient magnitude and frequency to adversely affect the long-term initial year-class strength over the 72-year period of record.
Monthly mean water temperatures (°F) at Freeport for each month of the year.	Increase in temperature, relative to the existing condition, to adversely affect spawning and rearing of anadromous salmonids for any month of the year for the 71-year period of record.
Delta	
Monthly mean Delta outflow (cfs) for each month of the year.	Decrease in Delta outflow, relative to the existing condition, of substantial magnitude and frequency to adversely affect Delta fish resources for any month of the year for the 72-year period of record.
Monthly mean location of X2 and Delta export/inflow ratios for all months of the year, with an emphasis on the February through June period.	Change in position of X2 and Delta export/inflow ratio, relative to the existing condition, to adversely affect spawning and rearing habitat and downstream transport flows over the 72-year period of record.

TABLE 5.8-1

FISHERIES AND AQUATIC RESOURCES DIVERSION-RELATED IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Impact Indicators	Modeling Criteria
Folsom Reservoir	
Warmwater Fisheries	
Mean number of acres of littoral habitat for each month of the primary spawning and rearing period (i.e., March through September).	Decrease in the long-term average quantity (acres) of littoral habitat, relative to the basis comparison, of sufficient magnitude and frequency to adversely affect long-term population levels of warmwater fish, for any month of this period over the 72-year period of record.
End-of-month reservoir water surface elevation (feet/msl) occurring each month of the primary spawning and rearing period for nest-building warmwater fish (i.e., March through September).	Decrease in reservoir water surface elevation of more than nine feet per month, relative to the existing condition, of sufficient frequency to adversely affect long-term population of warmwater fish, for any month of this period over the 72-year period of record.
Coldwater Fisheries	
End-of-month storage (TAF) for each month of the April through November period.	Decrease in reservoir storage, relative to the existing condition, which also would reduce the coldwater pool, of sufficient magnitude to adversely affect long-term population levels of coldwater fish, for any month of this period over the 72-year period of record.
Nimbus Hatchery	
Monthly mean water temperatures (°F) of water released from Nimbus Dam for each month of the year.	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency which would result in reduced hatchery production (using index temperatures of 60°F, 65°F, and 68°F) during any month of this period over the 71-year period of record.
Lower American River	
Fall-Run Chinook Salmon	
Monthly mean flow (cfs) at the mouth for each month of the adult immigration period (i.e., September through December).	Decrease in flow, relative to the existing condition, of sufficient magnitude and frequency to adversely affect upstream passage or olfactory response, for any month of this period over the 72-year period of record.
Lower American River (Continued)	
Monthly mean water temperature (°F) at the mouth of the American River and at Freeport on the Sacramento River for each month of the adult immigration period (i.e., September through December).	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency to adversely affect adult immigration, for any month of this period over the 71-year period of record.
Fall-Run Chinook Salmon (Continued)	
Monthly mean flows (cfs) below Nimbus Dam and at Watt Avenue for each month of the spawning and incubation and initial rearing period (i.e., October through February).	Decrease in flow, the existing condition, of sufficient magnitude and frequency to adversely affect long-term initial year-class strength, for any month of this period over the 72-year period of record.
Monthly mean water temperatures (°F) below Nimbus Dam and at Watt Avenue for each month of the spawning and incubation and initial rearing period (i.e., October through February).	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency to result in substantial egg and alevin loss (e.g., resulting temperatures >56°F), for any month of this period over the 71-year period of record.
Monthly mean flow (cfs) at Watt Avenue and the mouth for each month of the juvenile rearing and emigration period (i.e., February through June).	Decrease in flow, relative to the existing condition, of sufficient magnitude and frequency to adversely affect juvenile rearing and emigration, for any month of this period over the 72-year period of record.
Monthly mean water temperature (°F) at Watt Avenue, the lower American River mouth, and at Freeport for each month of the juvenile rearing and emigration period (i.e., March through June).	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency to adversely affect juvenile rearing and emigration (e.g., resulting temperatures >65°F) for any month of this period over the 71-year period of record.

TABLE 5.8-1

FISHERIES AND AQUATIC RESOURCES DIVERSION-RELATED IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Impact Indicators	Modeling Criteria
Average annual early lifestage survival.	Decrease in annual early lifestage survival, relative to the existing condition, of sufficient magnitude and frequency to adversely affect long-term initial year-class strength over the 72-year period of record.
Steelhead	
Monthly mean flow (cfs) at the mouth for each month of the adult immigration period (i.e., December through March).	Increase in flow, relative to the existing condition, of sufficient magnitude and frequency to adversely affect upstream passage or olfactory responses for any month of this period over the 72-year period of record.
Monthly mean water temperature (°F) at the mouth of the American River and at Freeport on the Sacramento River for each month of the adult immigration period (i.e., December through March).	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency to adversely affect adult immigration for any month of this period over the 71-year period of record.
Monthly mean water temperature (°F) below Nimbus Dam and at Watt Avenue for each month of the spawning and incubation period (i.e., December through March), as well as juvenile rearing (i.e., year-round).	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency to result in substantial egg and alevin loss (e.g., resulting temperatures >56°F) or substantial adverse affects to juvenile rearing (e.g., resulting temperatures >65°F) for any month of this period over the 71-year period of record.
Lower American River (Continued)	
Monthly mean flow (cfs) at Watt Avenue for the spawning and incubation period (i.e., December through March), as well as juvenile rearing (i.e., July through September).	Decrease in flow, relative to the existing condition, of sufficient magnitude and frequency to adversely affect initial year-class strength and juvenile rearing for any month of this period over the 72-year period of record.
Steelhead (Continued)	
Monthly mean flow (cfs) at Watt Avenue and the mouth for each month of the juvenile emigration period (i.e., February through June).	Decrease in flow, relative to the existing condition, of sufficient magnitude and frequency, to adversely affect juvenile emigration for any month of this period over the 72-year period of record.
Monthly water mean temperature (°F) at Watt Avenue and the mouth for each month of the juvenile emigration period (February through June).	Increase in water temperature, relative to the existing condition, of sufficient magnitude and frequency to adversely affect juvenile emigration (e.g., resulting temperatures >65°F) for any month of this period over the 71-year period of record.
Splittail	
Monthly mean acreage of flooded riparian habitat at Watt Avenue during each month of the February through May spawning period.	Decrease in long-term average quantity of inundated riparian habitat, relative to the existing condition, of sufficient magnitude and frequency to adversely affect potential splittail habitat availability for each month of this period over the 72-year period of record.
Monthly mean water temperatures (°F) at Watt Avenue and the mouth during each month of the February through May spawning period.	Increase in the frequency, relative to the existing condition, in which water temperatures exceed the reported upper temperature range for splittail spawning (i.e., 68°F) for any month of this period over the 72-year period of record.
American Shad	
Monthly mean flows (cfs) at the mouth during each month of the May through June spawning period.	Substantial decrease in the frequency, relative to the existing condition, in which flows at the mouth are above the CDFG recommended “attraction flow” of 3,000 cfs for American shad spawning migrations during each month of the identified period, over the 71-year period of record.
Monthly mean water temperatures (°F) below Nimbus Dam and the mouth during the May through June spawning period.	Increase in frequency, relative to the existing condition, in which water temperatures exceed the reported upper temperature range for American shad spawning (i.e., 70°F) for any month of the identified period over the 72-year period of record.

TABLE 5.8-1

FISHERIES AND AQUATIC RESOURCES DIVERSION-RELATED IMPACT INDICATORS AND SIGNIFICANCE CRITERIA

Impact Indicators	Modeling Criteria
Striped Bass	
Monthly mean flows (cfs) at the mouth	Decrease of flow, relative to the existing condition, of sufficient magnitude and frequency to adversely affect striped bass juvenile rearing for May and June over the 72-year period of record.
Monthly mean flows (cfs) at the mouth during the May through June striped bass sport fishery.	Substantial decrease in the frequency, relative to the existing condition, in which flows at the mouth are above the CDFG recommended “attraction flow” of 1,500 cfs for the striped bass sport fishery for each month of the identified period over the 72-year period of record.
Monthly mean water temperatures (°F) below Nimbus Dam and at the mouth during the May through June rearing period.	Increase in frequency, relative to the existing condition, in which water temperatures exceed the reported upper temperature range for striped bass rearing (i.e., 73°F) for any month of the identified period over the 71-year period of record.

TABLE 5.8-2

END-OF-MONTH WATER SURFACE AREA IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (acres)	Proposed Action (acres)	Absolute Difference[2] (acres)	Relative Difference (%)	Maximum Water Surface Area Decrease[3] (acres and %)	Maximum Water Surface Area Increase[4] (acres and %)
Oct	19899.1	19893.4	-5.6	0.0	-157.1 (-0.7)	150.1 (0.7)
Nov	20171.8	20164.4	-7.5	0.0	-106.1 (-0.5)	72.7 (0.4)
Dec	20949.8	20944.2	-5.6	0.0	-106.1 (-0.5)	61.4 (0.3)
Jan	22336.5	22331.0	-5.5	0.0	-106.0 (-0.5)	53.6 (0.3)
Feb	23676.8	23668.9	-7.8	0.0	-112.5 (-0.5)	9.8 (0.1)
Mar	25454.4	25451.2	-3.2	0.0	-105.8 (-0.4)	175.3 (0.6)
Apr	26674.0	26669.1	-4.9	0.0	-93.2 (-0.3)	34.4 (0.2)
May	26525.2	26517.7	-7.4	0.0	-179.3 (-0.3)	31.5 (0.2)
Jun	25171.8	25163.3	-8.4	0.0	-188.9 (-0.7)	76.2 (0.3)
Jul	22931.7	22918.6	-13.0	-0.1	-340.1 (-1.3)	75.8 (0.3)
Aug	21021.4	21009.2	-12.2	-0.1	-392.9 (-1.6)	110.3 (0.5)
Sep	20278.0	20267.9	-10.1	-0.1	-334.7 (-1.4)	56.7 (0.3)

Notes:
1. Proposed Action modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in acres), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Area Decrease – refers to the largest decrease in end-of-month water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Water Surface Area Increase – refers to the largest increase in end-of-month water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-3

MEAN MONTHLY WATER SURFACE ELEVATIONS IN TRINITY RESERVOIR DIFFERENCE BETWEEN BASE CYONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Notes[4]
Oct	2275.7	2275.6	-0.1	0.0	-2.7 (-0.1)	1964 (D)
Nov	2277.6	2277.5	-0.1	0.0	-1.1 (-0.1)	1992 (C)
Dec	2282.6	2282.5	-0.1	0.0	-1.1(-0.1)	1992 (C)
Jan	2288.0	2288.0	-0.1	0.0	-1.1 (-0.1)	1992 (C)
Feb	2299.8	2299.7	-0.1	0.0	-0.8 (0.0)	1992 (C)
Mar	2309.1	2309.0	-0.1	0.0	-0.8 (0.0)	1992 (C)
Apr	2321.2	2321.1	-0.1	0.0	-0.6 (0.0)	1947 (D)
May	2319.7	2319.7	-0.1	0.0	-0.6 (0.0)	1992 (C)
Jun	2315.5	2315.5	-0.1	0.0	-0.8 (0.0)	1992 (C)
Jul	2303.1	2303.1	0.0	0.0	-0.9 (0.0)	1992 (C)
Aug	2290.6	2290.6	0.0	0.0	-0.8 (0.0)	1991 (C)
Sep	2280.1	2280.0	-0.1	0.0	-2.7 (-0.1)	1963 (W)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Modeling results for the other Alternatives under the various Proposed Action scenarios showed similar results. Additionally, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term water surface area or water surface elevation would result from these alternatives. Accordingly, no significant impacts on the warmwater fisheries in these reservoirs are anticipated.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-2 Impacts on Shasta and Trinity reservoirs' coldwater fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in CVP/SWP hydrology, no changes from the Base Condition would result. Accordingly, no impacts on current coldwater fisheries resources in Shasta Reservoir are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Table 5.8-4 shows the long-term average in mean monthly storage in Shasta Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Modeling results confirm that long-term average monthly change in Shasta Reservoir storage would be immeasurable. Changes, relative to the Base Condition, would be virtually zero.

TABLE 5.8-4

MEAN MONTHLY STORAGE IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (TAF)	Proposed Action (TAF)	Absolute Difference[2] (TAF)	Relative Difference (%)	Maximum Storage Decrease[3] (TAF and %)	Notes[4]
Oct	2544.5	2543.5	-1.0	0.0	-29.4 (-0.9)	1966 (BN)
Nov	2593.0	2591.8	-1.3	0.0	-19.9 (-0.7)	1947 (D)
Dec	2727.3	2726.3	-1.0	0.0	-19.9 (-0.7)	1948 (BN)
Jan	2958.19	2957.9	-1.0	0.0	-19.8 (-0.7)	1947 (D)
Feb	3208.1	3206.7	-1.4	-0.1	-22.1 (-0.6)	1946 (BN)
Mar	3552.9	3552.2	-0.6	0.0	-22.1 (-0.6)	1946 (BN)
Apr	3829.4	3828.3	-1.0	0.0	-21.7 (-0.5)	1946 (BN)
May	3816.2	3814.5	-1.6	0.0	-41.8 (-0.9)	1965 (W)
Jun	3536.3	3534.5	-1.8	-0.1	-44.0 (-1.1)	1965 (W)
Jul	3079.3	3076.5	-2.7	-0.1	-79.3 (-0.8)	1965 (W)
Aug	2736.9	2734.7	-2.2	-0.1	-64.8 (-2.0)	1966 (BN)
Sep	2605.5	2603.7	-1.8	-0.1	-62.7 (-1.9)	1965 (W)

Notes:
1. Proposed Action modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Storage Decrease – refers to the largest decrease in end-of-month storage under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4 Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

While individual year increases would occur, relative to the Base Condition (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR), these would be negligible over the long-term. Long-term changes for any month simulated do not exceed one-tenth of one percent, relative to the Base Condition. With such immeasurable changes in reservoir storage during the reservoir refill months (March through May), the coldwater mass balance would likely remain unchanged. Moreover, anticipated changes in seasonal storage would not be expected to result in substantial adverse effects on the primary prey base used by the reservoir's coldwater fish populations. Potential effects on reservoir coldwater fisheries would be less than significant based on these hydrologic indices.

Modeling results for the other Alternatives under the Proposed Action showed similar results; there would be no measurable change in the long-term mean monthly reservoir storage. Additionally, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term water storage in Shasta Reservoir would result from the implementation of these alternatives. Accordingly, no significant impacts on the coldwater fisheries in Shasta Reservoir are anticipated.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-3 Flow-related impacts on fisheries resources in the upper Sacramento River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in CVP/SWP hydrology, no changes from the Base Condition would result. Accordingly, no impacts on current fisheries resources in the upper Sacramento River are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Additional American River diversions could potentially alter seasonal Sacramento River flows, which could change the relative habitat availability for Sacramento River fish. To assess such flow-related impacts on upper Sacramento River fish, monthly mean flows released from Keswick Dam under each of the alternatives and the existing condition were compared to releases from Keswick Dam under the existing condition for each month of the year. Potential flow-related impacts on lower Sacramento River fish were assessed in the same manner, except that this assessment used modeled flows at Freeport (RM 46).

Table 5.8-5 shows the long-term mean monthly flow releases below Keswick Dam into the upper Sacramento River under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition.

Based on these modeling results, it can be seen that certain months in individual years showed large variations (i.e., decreases) in mean monthly river flows, relative to the Base Condition. The maximums, in individual years, would be significant, however, these are more than offset by both the years when increases in flow releases would occur (based on simulated modeling) and, more importantly, the long-term average over the 72-year period of record. Long-term changes, as decreases as averaged mean monthly releases into the upper Sacramento River from Keswick Dam did not exceed two-tenths of one percent.

TABLE 5.8-5

MEAN MONTHLY SACRAMENTO RIVER FLOW RELEASES BELOW KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	5651.8	5645.8	-6.0	-0.1	-538.5 (-10.7)	1966 (BN)
Nov	5290.3	5286.6	-3.7	0.0	-534.0 (-5.7)	1964 (D)
Dec	6877.8	6870.1	-7.7	-0.1	-369.6 (-3.0)	1967 (W)
Jan	8033.1	8033.1	0.1	0.0	-42.7 (-0.3)	1969 (W)
Feb	10164.0	10172.6	8.5	0.1	-116.7 (-3.3)	1961 (D)
Mar	8313.3	8300.9	-12.4	-0.2	-664.9 (-7.1)	1963 (W)
Apr	7203.6	7211.8	8.2	0.0	-211.6 (-2.6)	1931 (C)
May	8241.9	8251.5	9.7	0.1	-23.0 (-0.3)	1947 (D)
Jun	10365.3	10369.0	3.7	0.0	-292.3 (-2.4)	1961 (D)
Jul	12708.9	12721.4	12.5	0.1	-233.1 (-1.7)	1947 (D)
Aug	10505.2	10497.7	-7.5	-0.1	-229.2 (-2.4)	1965 (W)
Sep	7035.7	7035.0	-0.7	0.0	-250.5 (-3.7)	1948 (BN)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Modeling results for the other Alternatives under the Proposed Action showed similar results; there would be no measurable change in the long-term mean monthly releases below Keswick Dam. Additionally, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term flows in the upper Sacramento River would result from the implementation of these alternatives. Accordingly, no significant impacts on the fisheries in the upper Sacramento as a result of instream flow (e.g. habitat conditions) changes are anticipated.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-4 Temperature-related impacts in the upper Sacramento River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in CVP/SWP hydrology, no changes in instream water temperatures from the Base Condition would result. Accordingly, no impacts on current fisheries sensitive to water temperature thresholds in the upper Sacramento River are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Additional diversions as proposed under this action could potentially alter Sacramento River water temperatures seasonally during some years. Changes in Sacramento River water temperatures that could occur as a result of implementation of any of the alternatives would not be expected to be sufficiently large to adversely affect fish species present in the upper Sacramento River, with the possible exceptions of Chinook salmon and steelhead. Elevated water temperatures could reduce spawning and rearing success of these anadromous salmonids because of their low thermal tolerance. For this reason, an assessment of changes to upper Sacramento River water temperatures focused on these fish species. This assessment focused quantitatively on Chinook salmon for the following reasons: (1) thermal requirements of Chinook salmon and steelhead are generally similar; (2) the NMFS BiOp for Winter-run Chinook salmon (NMFS 1993, as revised in 1995) has established quantitative temperature criteria for the upper Sacramento River to protect winter-run Chinook salmon; and (3) Reclamation has developed a Sacramento River Chinook Salmon Mortality Model applicable to all four runs of Chinook salmon. Impact findings for the four runs of Chinook salmon provide a technical basis from which to infer whether steelhead would be adversely affected by seasonal changes in water temperatures.

Table 5.8-6 shows the mean monthly simulated Sacramento River water temperatures at Keswick Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. No changes in modeled long-term water temperatures in the upper Sacramento River downstream of Keswick Dam were evident as a result of the additional 15 TAF diversion from Folsom Reservoir under this Alternative. Increases in water temperatures were simulated for some years (see Table 5.5-5; Maximum Temperature Decrease) and no consistent trend in water year types for these years were observed. Individual yearly maximums (by month) were shown for August and September. In the 1935 hydrologic year, Base Condition revealed water temperatures below Keswick Dam of 59.6°F. Under Alternative 2B – Proposed Action – Scenario B, water temperatures were simulated at 60.8°F; this represented the largest single year, single month increase in modeled water temperatures below Keswick Dam.

Table 5.8-7 shows the same data but for the upper Sacramento River at Bend Bridge. Again, no detectable changes resulted from the hydrologic/river water temperature modeling based on the long-term mean monthly averages. Maximum individual month and year increases occurred in August and September (consistent with the expected changes resulting from Alternative 2B modeled diversions during that period); these maximums were lower than those simulated for the upper Sacramento River below Keswick Dam.

NOAA Fisheries water temperature criteria for the upper Sacramento River are as follows:

- Daily average water temperature not in excess of 56°F at Bend Bridge from April 15 through September 30; and
- Daily average water temperature not in excess of 60°F at Bend Bridge from October 1 through October 31.

TABLE 5.8-6

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	53.8	53.8	0.0	0.1	0.7 (1.4)	1964 (D)
Nov	53.0	53.0	0.0	0.0	0.3 (0.6)	1928 (AN)
Dec	48.7	48.7	0.0	0.0	0.1 (0.2)	1961 (D) 1964 (D) 1967 (W) 1981 (D)
Jan	45.1	45.1	0.0	0.0	0.1 (0.2)	1948 (BN) 1967 (W)
Feb	47.4	47.4	0.0	0.0	0.1 (0.2)	1955 (D)
Mar	50.8	50.8	0.0	0.0	0.1 (0.2)	1977 (C) 1978 (AN) 1979 (BN) 1988 (C)
Apr	52.3	52.3	0.0	0.0	0.1 (0.2)	1931 (C)
May	51.6	51.6	0.0	0.0	0.0 (0.0)	n/a
Jun	50.8	50.8	0.0	0.0	0.0 (0.0)	n/a
Jul	51.3	51.3	0.0	0.0	0.2 (0.4)	1977 (C)
Aug	52.2	52.2	0.0	0.0	0.8 (1.5)	1988 (C)
Sep	53.4	53.4	0.0	0.0	1.2 (2.0)	1935 (BN)

Notes:

1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Largest specific year percent increase for any month shown in parentheses (may not be for the same year as the largest absolute monthly increase).
4. Indicates the year where the largest increase in mean monthly water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-7

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT BEND BRIDGE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	55.7	55.8	0.0	0.1	0.5 (0.9)	1929 (C)
Nov	52.2	52.2	0.0	0.0	0.1 (0.2)	1928 (AN) 1931 (D) 1972 (BN) 1973 (AN) 1979 (BN) 1980 (AN)
Dec	47.0	47.0	0.0	0.0	0.1 (0.2)	1964 (D)
Jan	44.8	44.8	0.0	0.0	0.0 (0.0)	n/a
Feb	48.0	48.0	0.0	0.0	0.1 (0.2)	1955 (D)
Mar	51.9	51.9	0.0	0.0	0.1 (0.2)	1977 (C) 1978 (AN) 1988 (C)
Apr	55.3	55.3	0.0	0.0	0.1 (0.2)	1931 (C) 1933 (C)
May	57.1	57.1	0.0	0.0	0.1 (0.2)	1931 (C) 1956 (W)
Jun	57.1	57.1	0.0	0.0	0.2 (0.3)	1961 (D)
Jul	57.0	57.0	0.0	0.0	0.1 (0.2)	1932 (D) 1933 (C) 1947 (D) 1977 (C) 1987 (D) 1988 (C) 1989 (D) 1992 (C)
Aug	57.4	57.4	0.0	0.0	0.6 (1.0)	1988 (C)
Sep	57.9	57.9	0.0	0.0	0.8 (1.3)	1935 (BN)

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Largest specific year percent increase for any month shown in parentheses (may not be for the same year as the largest absolute monthly increase).
4. Indicates the year where the largest increase in mean monthly water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Although the NOAA Fisheries (1993) temperature criteria are stated as daily averages, the available hydrologic and water temperature models allow only for monthly mean temperature analyses and output. Consequently, the assessment was based on monthly mean water temperature data output from Reclamation's existing models.

A close inspection of the 71-year inter-annual modeled water temperatures (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR), showed that, while water temperatures under Alternative 2B often exceeded these temperatures thresholds, the increment of change was both small and infrequent. Moreover, in those months and years where the water temperatures exceeded those criteria, the Base Condition temperatures (prior to the Proposed Action) were already above the stated thresholds. The most compelling indicator of potential water temperature and related thermal effects can be seen in the long-term deviations, from the Base Condition, in mean monthly water temperatures. No measurable changes were observed based on the modeling results.

Finally, Reclamation's Sacramento River Chinook Salmon Mortality Model was used to estimate annual, early lifestage losses (from egg potential) for fall-run, late-fall-run, winter-run, and spring-run Chinook salmon populations. Temperature input to the Sacramento River Chinook Salmon Mortality Model consists of monthly mean temperatures at nine locations between Shasta Dam and Vina Bridge. Mortality estimates for each of the four runs were modeled under each of the alternatives and the existing condition, which were then compared to modeled mortality estimated for each run under the existing condition. Potential impacts on the four Chinook salmon runs in the Sacramento River were evaluated using the same criteria established for the Lower American River Chinook Salmon Mortality Model (see discussion under Lower American River, Fall-Run Chinook Salmon) (Tables 5.8-8 through 5.8-11).

TABLE 5.8-8

SACRAMENTO RIVER
ANNUAL EARLY LIFE STAGE FALL-RUN CHINOOK SALMON SURVIVAL
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)
(PERCENT SURVIVAL)

Base Condition	Proposed Action	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
86.0	86.0	0.0	0.0	0.9 (1.4) 1988 (C)	-1.0 (-1.5) 1935 (BN)

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in % survival), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent increase, relative to the specific year, shown in parentheses.
4. Maximum Survival Decrease – refers to the largest decrease in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-9

SACRAMENTO RIVER
ANNUAL EARLY LIFE STAGE LATE FALL-RUN CHINOOK SALMON SURVIVAL
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)
(PERCENT SURVIVAL)

Base Condition	Proposed Action	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
98.4	98.4	0.0	0.0	0.2 (0.2) 1934 (C)	0.0

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in % survival), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent increase, relative to the specific year, shown in parentheses.
4. Maximum Survival Decrease – refers to the largest decrease in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-10

SACRAMENTO RIVER
ANNUAL EARLY LIFE STAGE WINTER-RUN CHINOOK SALMON SURVIVAL
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)
(PERCENT SURVIVAL)

Base Condition	Proposed Action	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
91.8	91.7	0.0	0.0	0.7 (1.0) 1988 (C) 1933 (C)	-3.3 (-3.5) 1935 (BN)

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in % survival), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent increase, relative to the specific year, shown in parentheses.
4. Maximum Survival Decrease – refers to the largest decrease in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-11

SACRAMENTO RIVER
ANNUAL EARLY LIFE STAGE SPRING-RUN CHINOOK SALMON SURVIVAL
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)
(PERCENT SURVIVAL)

Base Condition	Proposed Action	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
76.6	76.6	0.0	2.6	2.7 (245.2) 1988 (C)	-1.9 (-52.0) 1935 (BN)

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in % survival), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent increase, relative to the specific year, shown in parentheses.
4. Maximum Survival Decrease – refers to the largest decrease in annual early life stage fall-run Chinook salmon survival under the Proposed Action, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Modeling results from Reclamation's Sacramento River Chinook Salmon Mortality Model as shown in Tables 5.8-8 through 5.8-11 showed that, over the long-term 72-year hydrologic record, there would be no change in simulated early life-stage survival for any of the four runs of Chinook salmon under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. A close inspection of the 72-year results record revealed that inter-annual deviations from the Base Condition occurred, both as decreases as well as increases in early life-stage salmon survival estimates. Overall, these deviations were both small and infrequent as confirmed by the virtual unchanging long-term 72-year estimates for any of the four Chinook salmon runs (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR).

Modeling results for the other Alternatives under the Proposed Action showed similar results; there would be no measurable change in the long-term simulated annual early life-stage survival of any of the four Chinook salmon runs, relative to the Base Condition. Additionally, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term annual early life-stage survival of any of the four Chinook salmon would result from the implementation of these alternatives. Accordingly, no significant impacts on the fisheries in the upper Sacramento as a result of thermally induced adverse effects on early life-stage survival are anticipated under any of these alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-5 Temperature related impacts on fisheries resources in the lower Sacramento River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in CVP/SWP hydrology, no changes in instream water temperatures, from the Base Condition would result. Accordingly, no impacts on current fisheries sensitive to water temperature thresholds in the lower Sacramento River are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Table 5.8-12 shows the mean monthly simulated water temperatures in the lower Sacramento River at Freeport under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Long-term mean monthly water temperatures at this location showed no change under the modeled simulations. Individual month and yearly maximums were observed; these again, centered around the later summer months consistent with the diversion scenarios integrated into the CALSIM II and water temperature modeling (i.e., 15 TAF diverted in August through September).

Modeling results for the other Alternatives under the Proposed Action showed similar results; there would be no measurable change in the long-term mean monthly water temperatures at Freeport on the lower Sacramento River, relative to the Base Condition. Additionally, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term mean monthly water temperatures in the lower Sacramento River would result from the implementation of these alternatives. Accordingly, no significant impacts on fisheries resources in the lower Sacramento as a result of increased water temperatures are anticipated under any of these alternatives.

TABLE 5.8-12

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	60.9	60.9	0.0	0.0	0.2 (0.3)	1945 (BN)
Nov	52.9	52.9	0.0	0.0	0.2 (0.4)	1965 (W)
Dec	45.7	45.7	0.0	0.0	0.1 (0.2)	1948 (BN)
Jan	44.8	44.8	0.0	0.0	0.1 (0.2)	1941 (W) 1943 (D)
Feb	49.5	49.5	0.0	0.0	0.1 (0.2)	1931 (C)
Mar	54.2	54.2	0.0	0.0	0.1 (0.2)	1925 (D) 1926 (D) 1932 (D)
Apr	60.3	60.4	0.0	0.0	0.1 (0.2)	1925 (D) 1928 (AN) 1929 (C) 1946 (BN) 1972 (BN)
May	65.9	65.9	0.0	0.0	0.1 (0.2)	1923 (BN) 1930 (D) 1936 (BN) 1966 (BN) 1974 (W) 1989 (D)
Jun	70.1	70.1	0.0	0.0	0.2 (0.3)	1936 (BN) 1944 (D)
Jul	72.6	72.6	0.0	0.0	0.2 (0.3)	1947 (D)
Aug	72.2	72.2	0.0	0.0	0.3 (0.4)	1944 (D)
Sep	69.2	69.2	0.0	0.0	0.4 (0.6)	1947 (D)

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Largest specific year percent increase for any month shown in parentheses (may not be for the same year as the largest absolute monthly increase).
4. Indicates the year where the largest increase in mean monthly water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-6 Effects on Delta fisheries resulting from changes in inflow hydrology and water quality changes.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in CVP/SWP hydrology, no changes in instream water temperatures, from the Base Condition would result. Accordingly, no impacts on current listed (delta smelt) and other species relying on the Delta under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Increased surface water diversion under any of the alternatives could alter the quantity of freshwater flowing into and through the Delta. The abundance and distribution of several fish species of management concern that rely heavily upon the Delta for one or more of their lifestages as discussed previously, can be affected by total Delta outflow, the location of X2 (two parts per thousand (ppt) isohaline in the Delta), and the export/inflow ratio. From a water quality perspective, the "X2" salinity standard is a commonly used parameter to assess freshwater inflows to the Delta. It is assumed to be equivalent to an electrical conductivity (EC) of 2.64 mmhos/cm. As freshwater flows into the Delta are reduced, the X2 position shifts upstream, which can adversely affect certain Delta fish species.

To evaluate potential impacts on Delta fish resources, changes in monthly mean Delta outflow for the 72-year period of record under each of the alternatives were determined for each month of the year and were compared to monthly mean Delta outflow under the Base Condition. The frequency and magnitude of differences in Delta outflow were evaluated relative to life history requirements for Delta fish. In addition, changes in monthly mean X2 position were determined for all months of each year, with an emphasis on the February through June period.

Potential impacts on delta smelt, splittail, striped bass, and other Delta fishery resources were considered adverse if hydrology under any of the alternatives showed a substantial decrease in monthly mean Delta outflow, relative to hydrology under the Base Condition, during one or more months of the February through June period, if a substantial shift in the long-term monthly mean X2 position occurred (i.e., more than one kilometer (km)), or if Delta export/inflow ratios were increased to where allowable export limits would be exceeded. The USFWS and Reclamation have in past documents (i.e., *Draft Trinity River Mainstem Fishery Restoration EIS/EIR*) applied a 10 percent modeled exceedance in changes in X2 position during the February through June period to determine potentially significant impacts on fish populations in the Delta. Therefore, the significance criteria utilized in this investigation (i.e., 1 km or more shift in X2 position) to determine potentially significant impacts on Delta fish populations is very conservative (rigorous) relative to the significance criteria utilized by public trust resource agencies in previous documents.

Table 5.8-13 shows the mean monthly position of X2 under the Base Condition. As expected, during the high flow months (corresponding to Central Valley and Sierra Nevada runoff maximums), X2 is lowest (i.e., closest to Golden Gate Bridge). With the onset of summer and through the early to late fall months when tributary inflows decline, the position of X2 migrates further upstream as reduced freshwater flows are unable to maintain X2 at its spring position in the Delta.

Table 5.8-14 shows the mean monthly position of X2 under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, over the entire 72-year hydrologic simulation period.

TABLE 5.8-13

MEAN MONTHLY DELTA X2 POSITION UNDER THE BASE CONDITION

Month	72-year Mean X2 Position(km)
Oct	86.6
Nov	84.7
Dec	81.9
Jan	77.2
Feb	71.4
Mar	66.5
Apr	66.0
May	67.9
Jun	70.2
Jul	75.1
Aug	79.2
Sep	84.2

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-14

MEAN MONTHLY DELTA X2
DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (km)	Relative Percent (%)	Maximum[2] (km)	Notes[3]	
Oct	0.0	0.0	0.3	1952 (W) 1981 (D)	88.7 km to 88.0 km 86.3 km to 86.6 km
Nov	0.0	0.0	0.4	1948 (BN)	84.8 km to 85.2 km
Dec	0.0	0.0	0.3	1931 (C) 1961 (D) 1964 (D) 1966 (BN)	84.4 km to 84.7 km 84.9 km to 85.3 km 75.5 km to 75.8 km 76.7 km to 76.9 km
Jan	0.0	0.0	0.1	1928 (AN) 1931 (C) 1932 (D) 1938 (W) 1941 (W) 1942 (W) 1943 (W) 1964 (D) 1966 (BN) 1967 (W) 1973 (AN) 1981 (D)	80.3 km to 80.4 km 85.4 km to 85.5 km 76.7 km to 76.7 km 63.5 km to 63.6 km 68.1 km to 68.2 km 65.8 km to 66.0 km 72.1 km to 72.2 km 81.2 km to 81.3 km 76.6 km to 76.7 km 70.0 km to 70.1 km 73.5 km to 73.6 km 81.9 km to 82.1 km
Feb	0.0	0.0	0.3	1960 (D)	82.4 km to 82.7 km
Mar	0.0	0.0	0.1	1938 (W) 1948 (BN) 1964 (D)	52.0 km to 52.1 km 77.5 km to 77.5 km 75.2 km to 75.2 km
Apr	0.0	0.0	0.3	1981 (D)	69.5 km to 69.8 km
May	0.0	0.0	0.1	1966 (BN) 1981 (W)	73.9 km to 73.9 km 71.9 km to 72.0 km
Jun	0.0	0.0	0.1	1947 (D)	77.7 km to 77.7 km
Jul	0.0	0.0	0.1	1940 (AN)	75.1 km to 75.2 km
Aug	0.0	0.0	0.0		N/A
Sep	0.0	0.0	0.8	1980 (AN)	82.3 km to 83.2 km

Notes:
1. Proposed Action –Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum – refers to the largest increase in distance from Golden Gate Bridge (in km) computed for that month (largest increase over 72-years).
3. Indicates the year where the maximum increase (adverse change) in X2 occurred for that month, identifying the water-year type and the actual mean monthly comparison between the base condition and proposed project in that year.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

The CALSIM II modeling results show that the long-term simulated mean monthly position of X2 under Alternative 2B – Proposed Action – Scenario B, relative to Base Condition, would not change over the 72-year period of record. Individual monthly maximum increases were shown (by year).

During the February to June period, these maximums were simulated at 0.3 km; representing a 0.3 km upstream migration of X2 for that month of those specific years (see Notes on Table 5.8-14). Interestingly, the 0.3 km maximum upstream shift noted for February and April occurred in only one year of the entire 72-year period of record; 1960 and 1981 respectively, each a dry-year.

Table 5.8-15 shows the modeled mean monthly Delta outflow under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Modeling results confirm that, over the long-term, mean monthly Delta outflow would remain virtually unchanged after the implementation of the proposed new CVP water service contract, relative to the Base Condition. Mean monthly flow changes of these magnitudes are not considered significant (e.g., relative percentages at or less than two-tenths of one percent) to Delta hydrology.

TABLE 5.8-15

MEAN MONTHLY DELTA OUTFLOW
DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (cfs)	Relative Percent (%)	Maximum Outflow Decrease[2] (cfs)	Notes[3]
Oct	-2.8	-0.1	-326.6	1963 (BN) -1.2% Base Flow 26,396
Nov	-23.2	-0.2	-647.7	1964 (D) -3.7% Base Flow 17,419
Dec	-40.5	0.1	-1021.7	1942 (WN) -1.7% Base Flow 59,762
Jan	13.2	0.0	-324.7	1948 (BN) -4.3% Base Flow 7,593
Feb	-5.9	0.1	-622.3	1938 (W) -0.4% Base Flow 145,553
Mar	-22.4	-0.1	-820.0	1981 (D) -3.9% Base Flow 21,131
Apr	12.1	0.0	-67.5	1935 (BN) -0.1% Base Flow 52,066
May	-4.9	0.0	-82.9	1935 (BN) -0.3% Base Flow 26,777
Jun	-3.7	0.0	-102.5	1940 (AN) -1.4% Base Flow 7,419
Jul	12.0	0.1	-77.5	1966 (BN) -1.1% Base Flow 7,052
Aug	-7.2	-0.1	-518.2	1980 (AN) -10.2% Base Flow 5,073
Sep	-5.4	-0.1	-116.5	1951 (AN) -3.6% Base Flow 3,269

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Outflow Decrease – refers to the largest decrease in mean Delta outflow computed for that month (largest decrease over 72 years).
3. Indicates the year where the maximum decrease (adverse change) in Delta outflow occurred for that month, identifying the water-year type, the decrease in outflow as a percent of the base condition in that year, and the base condition Delta outflow during that month.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Table 5.8-16 shows the modeled mean monthly flows in the lower Sacramento River at Freeport under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition over the entire 72-year hydrologic period of record. The largest mean monthly flow change (i.e., decrease), relative to the Base Condition was simulated to be approximately 43 cfs and would occur in June; this represents three-tenths of one percent change, relative to baseflows. Interestingly, both the long-term mean monthly lower Sacramento River flows for July and September showed *increases*, relative the Base Condition a Maximum mean monthly flow decreases would; however, be substantive in certain months of certain years as illustrated in Table 5.8-16.

TABLE 5.8-16

MEAN MONTHLY SACRAMENTO RIVER FLOWS AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (cfs)	Relative Difference (%)	Long-Term Mean Monthly Flows (cfs)	Maximum Flow Decrease[2] (cfs)	Maximum Flow Decrease (%)	Notes[3]
Oct	-35.2	-0.3	12524.6	-871.0	-8.7	1931 (C)
Nov	-21.4	-0.1	15584.5	-647.7	-4.3	1964 (D)
Dec	-9.9	0.1	24725.7	-776.4	-1.1	1965 (W)
Jan	-9.7	-0.1	32503.3	-759.3	-6.3	1960 (D)
Feb	36.7	0.2	38815.3	-265.7	-0.4	1963 (W)
Mar	-26.1	-0.1	33667.2	-801.8	-2.5	1963 (W)
Apr	4.7	0.0	24349.2	-67.7	-0.2	1935 (BN)
May	-19.1	-0.1	19604.6	-1565.2	-8.4	1940 (AN)
Jun	-42.9	-0.3	17304.7	-1536.8	-8.9	1936 (BN)
Jul	17.3	0.1	18337.9	-625.5	-5.0	1931 (C)
Aug	-26.4	-0.2	14513.8	-970.4	-6.1	1944 (D)
Sep	7.7	0.2	12393.8	-1173.8	-9.4	1947 (D)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Flow Decrease – refers to the largest decrease in mean flow computed for that month (largest decrease over 72 years).
3. Indicates the year where the maximum decrease in Sacramento River flow (in cfs) occurred for that month, identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Nevertheless, such occurrences, when viewed over the entire 72-year period of record, would be infrequent (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Overall, the long-term changes in mean monthly lower Sacramento River flows at Freeport would not be significant under Alternative 2B – Proposed Action – Scenario B.

Based on these modeling results, neither the physical habitat availability for fish residing in the Delta, nor immigration of juvenile or adult anadromous fish through the Delta would be substantially affected, relative to the Base Condition based on modeled instream hydrology. Consequently, flow-related potential impacts on Delta fisheries resources or migrating anadromous fish (including listed species) are expected to be less than significant. Overall this constitutes a less-than-significant impact.

Modeling results for the other Alternatives under the Proposed Action showed similar results; there would be no measurable change in the long-term mean monthly X2 position, delta outflow, or lower Sacramento River flows at Freeport. Additionally, modeling results for Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term mean monthly X2 position, delta outflow, and Freeport flows would result from the implementation of these alternatives. Accordingly, no significant impacts on the fisheries in the Delta are anticipated under these alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-7 Flow impacts on fisheries resources of the North Fork American River downstream of the American River Pump Station.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in hydrology, no changes in flow patterns from the Base Condition would result. Accordingly, no impacts on current fisheries and aquatic resources in the North Fork American River along this reach are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

The hydrology of the North Fork American River is unaffected, directly, by the operations of the integrated CVP/SWP. Its reservoirs and operations are influenced, rather, by local operations between PCWA and, to a lesser degree by SMUD. The diversions contemplated under this action will, in part, be withdrawn from the North Fork American River. Potential hydrologic effects on downstream fisheries resources were evaluated based on instream, long-term changes in mean monthly flows in this reach of the North Fork.

Table 5.8-17 illustrates the long-term mean monthly flows in the North Fork American River under the Alternative 2C – Proposed Action – Scenario C, relative to the Base Condition. Alternative 2C assumes a preferential shift in total diversion allocation to GDPUD and, thereby, represents the most significant depletion from the North Fork of all of the alternative diversion scenarios under this action. This, more aggressive analysis, is considered prudent for environmental review and disclosure purposes.

The modeling results illustrate that, while simulated flow changes in the North Fork American River downstream of the American River Pump Station would be small and likely insignificant during the high flow winter months, these changes become more apparent through the summer months. For the July through September period, modeled mean monthly flow reductions approach 25 cfs or 4 percent. At flows in August and September typically between 600-700 cfs in this reach of the river, a 4 percent reduction could impart measurable effects on resident fisheries and aquatic resources. This would be a potentially significant impact.

When the diversion apportionment (between EID and GDPUD) is changed such that GDPUD's allocation is reduced to 7,500 AFA (as opposed to 11,000 AF), the modeling results reflect this change. Table 5.8-18 shows the simulated mean monthly flows in the North Fork American River

TABLE 5.8-17

MEAN MONTHLY NORTH FORK AMERICAN RIVER FLOWS BELOW THE AMERICAN RIVER PUMP STATION SITE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	675.6	662.6	-13.4	-2.8	-22.8 (-13.8)	1966 (BN)
Nov	936.5	929.4	-7.1	-1.5	-10.0 (-5.1)	1976 (C)
Dec	1788.8	1782.8	-6.0	-1.0	-8.6 (-4.7)	1971 (W)
Jan	2250.7	2244.4	-6.3	-0.8	-6.3 (-5.8)	Several
Feb	3061.5	3054.9	-6.5	-0.5	-7.8 (-4.7)	1991 (C)
Mar	3138.7	3132.0	-6.7	-0.4	-8.5 (-2.4)	1970 (W)
Apr	3272.7	3262.2	-10.5	-0.5	-11.1 (-3.2)	Several
May	3110.7	3099.3	-11.5	-0.7	-12.2 (-3.3)	Several
Jun	1829.4	1807.5	-21.9	-2.7	-24.0 (-20.4)	Several
Jul	913.1	891.3	-21.8	-3.4	-24.0 (-21.1)	Several
Aug	690.7	667.3	-23.4	-3.8	-28.2 (-23.6)	1966 (BN)
Sep	604.4	587.1	-17.3	-3.5	-29.4 (-21.9)	1981 (D)

Notes:
1. Proposed Action – Scenario C – modeled 11 TAF from PCWA Auburn Pump Station site on an August through October diversion pattern and 4 TAF diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-18

MEAN MONTHLY NORTH FORK AMERICAN RIVER FLOWS BELOW THE AMERICAN RIVER PUMP STATION SITE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	675.6	667.4	-8.2	-1.7	-16.8 (-9.3)	1966 (BN)
Nov	936.5	932.3	-4.2	-0.9	-7.1 (-3.5)	1976 (C)
Dec	1788.8	1785.3	-3.5	-0.6	-6.1 (-3.2)	1971 (W)
Jan	2250.7	2246.4	-4.3	-0.5	-4.3 (-3.9)	Several
Feb	3061.5	3057.3	-4.1	-0.3	-5.6 (-3.4)	1991 (C)
Mar	3138.7	3134.3	-4.4	-0.2	-6.2 (-1.7)	1970 (W)
Apr	3272.7	3265.6	-7.1	-0.3	-7.6 (-2.2)	Several
May	3110.7	3102.9	-7.8	-0.4	-8.3 (-2.2)	Several
Jun	1829.4	1814.5	-14.9	-1.9	-16.4 (-13.9)	Several
Jul	913.1	898.3	-14.8	-2.3	-16.3 (-14.3)	Several
Aug	690.7	675.2	-15.4	-2.5	-19.4 (-16.1)	1966 (BN)
Sep	604.4	594.4	-10.0	-2.1	-21.5 (-14.9)	1981 (D)

Notes:
1. Proposed Action – Scenario A – modeled 7.5 TAF from PCWA Auburn Pump Station site and 7.5 TAF from Folsom Reservoir at EID's existing intake; on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

under Alternative 2A – Proposed Action – Scenario A, relative to the Base Condition. Mid-summer modeled flows also show a reduction in long-term expected mean monthly flows under this allocation scenario, but not to the same extent as those under Alternative 2C. Simulated hydrology under this allocation scenario shows that the expected changes would not be large enough to represent a significant impact on resident fisheries and associated instream aquatic resources.

Modeling results under Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term mean monthly flows would occur in the North Fork American River downstream of the American River Pump Station. Under any of the Reduced Diversion Alternatives (Alternatives 4A, 4B or 4C), the diversions by GDPUD would noticeably decrease, relative to the Alternative 2A. By design, these alternatives were intended to offer a lesser hydrologic impact on the river by reducing diversions. Without modeling Alternatives 4A and 4B, it can be deduced from the modeling output from Alternative 2A, which showed a less-than-significant impact, that all of the Reduced Diversions Alternatives would also exhibit a less-than-significant impact.

Accordingly, no significant impacts on the fisheries and aquatic resources, based on modeled hydrology, are anticipated in the North Fork American River.

<u>Mitigation Measures</u>

Alternative 2C – Proposed Action – Scenarios C

Under Alternative 2C – Proposed Action – Scenario C, reductions in simulated mean monthly flows in the North Fork American River downstream of the American River Pump Station, relative to the Base Condition were noted. Although small, these flow reductions could represent a significant impact on resident fisheries and associated aquatic resources within this reach of the North Fork. Potential mitigation measures, which would reduce the impact to a less-than-significant level could include:

1. Altered seasonal diversion pattern; thus, avoiding a peaked mid-summer diversion (August through October as modeled);
2. Re-allocating the diversion quantities between EID and GDPUD, so as to follow Alternative 2A – Scenario A; or
3. Reduction in the overall diversion total as represented by any of the Reduced Diversion Alternatives (e.g., Alternatives 4A, 4B or 4C).

Alternatives 2A and 2B – Proposed Action – Scenarios A and B, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative, and Alternative 1B – No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-8 Flow impacts on fisheries resources of the North Fork American River upstream of the American River Pump Station site.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in hydrology, no changes in instream flows from the Base Condition would result. Accordingly, no impacts on current fisheries resources in the North Fork American River upstream of the American River Pump Station are anticipated under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Table 5.8-19 shows the modeled mean monthly flows in the North Fork American River under Alternative 2C – Proposed Action – Scenario C, relative to the Base Condition. As expected, without any proposed diversions upstream of the American River Pump Station site, no changes to the anticipated instream hydrology would occur. No impacts on fisheries and aquatic resources upstream of the American River Pump Station site are expected.

TABLE 5.8-19

**MEAN MONTHLY NORTH FORK AMERICAN RIVER FLOWS ABOVE THE AMERICAN RIVER PUMP STATION SITE
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	719.5	719.5	0.0	0.0	0.0	n/a
Nov	971.5	971.5	0.0	0.0	0.0	n/a
Dec	1817.2	1817.2	0.0	0.0	0.0	n/a
Jan	2270.9	2270.9	0.0	0.0	0.0	n/a
Feb	3086.3	3086.3	0.0	0.0	0.0	n/a
Mar	3173.0	3173.0	0.0	0.0	0.0	n/a
Apr	3302.5	3302.5	0.0	0.0	0.0	n/a
May	3165.6	3165.6	0.0	0.0	0.0	n/a
Jun	1904.0	1904.0	0.0	0.0	0.0	n/a
Jul	996.9	996.9	0.0	0.0	0.0	n/a
Aug	768.5	768.5	0.0	0.0	0.0	n/a
Sep	677.0	677.0	0.0	0.0	0.0	n/a

Notes:
1. Proposed Action – Scenario C – modeled 11 TAF from PCWA Auburn Pump Station site on an August through October diversion pattern and 4 TAF diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Modeling results for the other Alternatives under the Proposed Action showed similar results; there would be no change in the long-term simulated mean monthly flows of the North Fork American River upstream of the American River Pump Station. Similarly, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed, through hydrologic modeling, that no changes in flows within this reach of the North Fork would occur. Accordingly, no impacts on the fisheries resources in the North Fork upstream of the American River Pump Station are anticipated.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-9 Impacts on Folsom Reservoir warmwater fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur since no new diversions or depletions from the system are assumed. Without any change in reservoir hydrology, no changes in either water surface elevations or surface area would result. Littoral habitats and anticipated nesting success would proceed unimpeded. Accordingly, no impacts on Folsom Reservoir's warmwater fisheries would occur under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Changes in water surface elevation in Folsom Reservoir during the March through September period could result in measurable corresponding changes in the availability of reservoir littoral habitat containing inundated terrestrial vegetation (willows and button brush). Such shallow, near-shore waters containing physical structure are important to producing and maintaining strong year-classes of warmwater fish annually. Water surface area, in reservoirs supporting gentle sloping nearshore areas, is a good indicator of littoral habitat availability.

Table 5.8-20 shows the modeled end-of-month water surface area (in acres) for Folsom Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition over the 72-year hydrologic period of record (this is the same as Table 5.8-9). The maximum computed decrease in any end-of-month water surface area was approximately 15 acres (representing about a two-tenths of one percent reduction, relative to the Base Condition). This reduction would occur in July.

Reductions in the availability of littoral habitat could result in increased predation on young-of-the-year warmwater fisheries, thereby reducing long-term initial year-class strength of warmwater fish populations. Unless willows and other near-shore vegetation become established at lower reservoir elevations in the future in response to seasonal reductions in water levels, long-term year class production of warmwater fisheries could be reduced. From these modeling results, such changes in

TABLE 5.8-20

END-OF-MONTH WATER SURFACE AREA IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (acres)	Proposed Action (acres)	Absolute Difference[2] (acres)	Relative Difference (%)	Maximum Water Surface Area Decrease[3] (acres and %)	Maximum Water Surface Area Increase[4] (acres and %)
Oct	7924.0	7917.4	-6.6	-0.1	-286.0 (-3.6)	739.5 (10.7)
Nov	7384.8	7377.0	-7.8	-0.1	-561.0 (-9.0)	686.3 (10.3)
Dec	7432.8	7438.4	5.6	0.1	-151.4 (-2.4)	624.5 (9.8)
Jan	7601.7	7611.1	9.4	0.1	-120.5 (-2.0)	512.2 (8.7)
Feb	7797.9	7796.3	-1.6	0.0	-59.8 (-1.1)	156.5 (2.4)
Mar	8875.4	8879.2	3.8	0.0	-72.5 (-1.5)	191.2 (2.4)
Apr	9718.9	9711.2	-7.7	-0.1	-82.4 (-1.7)	44.5 (0.4)
May	10238.5	10229.9	-8.5	-0.1	-84.5 (-1.9)	16.9 (0.2)
Jun	9907.0	9996.5	-10.5	-0.1	-241.6 (-2.6)	51.0 (0.5)
Jul	8919.1	8903.6	-15.4	-0.2	-427.1 (-4.9)	245.4 (3.5)
Aug	8508.7	8497.7	-11.0	-0.2	-207.0 (-5.6)	575.4 (7.1)
Sep	8446.5	8438.2	-8.3	-0.1	-276.5 (-6.6)	751..2 (10.7)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Project (in acres), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Area Decrease – refers to the largest decrease in end-of-month water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Water Surface Area Increase – refers to the largest increase in end-of-month water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

water surface area would not significantly affect Folsom Reservoir's primary warmwater fish-spawning period (March through July) and initial rearing (July through September).

As previously discussed, adverse impacts on spawning from nest-dewatering are assumed to have the potential to occur when reservoir elevation decreases by more than nine feet within a given month. Modeling results from Table 5.8-21 indicate that long-term mean monthly water surface elevations would not measurably change, relative to the Base Condition for any month. Therefore, the frequency with which potential nest-dewatering events could occur in Folsom Reservoir would not increase, relative to existing or current conditions.

Consequently, there would be no adverse effects on available littoral habitat or warmwater fish nesting success. Overall, impacts on Folsom Reservoir warmwater fisheries are considered to be less than significant.

Modeling results for the other Alternatives under the Proposed Action scenarios showed similar results. Additionally, modeling results for Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in long-term mean monthly water surface elevation or end-of-month water surface area would result from the implementation of these alternatives. Accordingly, no significant impacts on the warmwater fisheries in Folsom Reservoir are anticipated.

TABLE 5.8-21

MEAN MONTHLY WATER SURFACE ELEVATIONS IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Maximum Water Surface Elevation Increase[4] (ft msl and %)
Oct	416.6	416.5	-0.2	0.0	-4.2 (1.0)	9.9 (2.5)
Nov	408.1	408.1	0.0	0.0	-7.7 (-2.0)	9.4 (2.3)
Dec	410.2	410.2	0.0	0.0	-2.3 (-0.6)	8.8 (2.2)
Jan	412.2	412.3	0.1	0.0	-1.6 (-0.4)	7.1 (1.7)
Feb	415.0	415.0	0.0	0.0	-0.8 (-0.2)	2.2 (0.6)
Mar	429.0	429.0	0.0	0.0	-0.8 (-0.2)	2.6 (0.6)
Apr	440.3	440.2	-0.1	0.0	-1.1 (-0.2)	1.5 (0.3)
May	451.2	451.1	-0.1	0.0	-1.0 (-0.3)	0.3 (0.1)
Jun	446.2	446.0	-0.2	0.0	-4.8 (-1.1)	0.8 (0.2)
Jul	430.9	430.7	-0.2	0.0	-3.2 (-0.8)	3.3 (0.8)
Aug	425.6	425.4	-0.2	-0.1	-3.5 (-1.0)	7.7 (1.8)
Sep	424.8	424.6	-0.1	0.0	-3.8 (-1.1)	10.1 (2.5)`

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Water Surface Elevation Increase – refers to the largest increase in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-10 Impacts on Folsom Reservoir's coldwater fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur. As no new diversions or depletions from the system are assumed, no change in reservoir storage and, therefore, coldwater pool volumes would occur in Folsom Reservoir. Without any change in reservoir storage, coldwater fisheries species relying on Folsom Reservoir's thermal regime would not be affected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative

Coldwater habitat for fisheries in Folsom Reservoir is largely a function of reservoir storage. This assumes wet-period filling and complete stratification by the onset of summer. Anticipated reductions in reservoir storage would not typically be expected to adversely affect the reservoir's coldwater fisheries because coldwater habitat would remain available within the reservoir during all months of most all years. Moreover, physical habitat availability is not believed to be among the primary factors limiting coldwater fish populations, and anticipated seasonal reductions in storage would not be expected to adversely affect the primary prey species utilized by coldwater fish. Nevertheless, coldwater pool volume, as a habitat characteristic is important.

Table 5.8-22 shows the mean long-term simulated end-of-month storage in Folsom Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Long-term modeled storage does not appreciably change with the implementation of the proposed new CVP contracts, relative to the Base Condition. Maximum mean end-of-month storage decreases approximate 1,400 to 1,600 AF (or three-tenths of one percent of the Base Condition storage) and occur during the months of June through August. Coldwater pool development during these months has already been established; recent isothermbaths for Folsom Reservoir have shown that the reservoir is well stratified by this time. Total reservoir storage decreases of these magnitudes (i.e., three-tenths of one percent of the Base Condition storage) would not measurably affect coldwater pool volumes in the reservoir.

TABLE 5.8-22

MEAN END-OF-MONTH STORAGE IN FOLSOM RESERVOIR
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (TAF)	Proposed Action (TAF)	Absolute Difference[2] (TAF)	Relative Difference (%)	Maximum Storage Decrease[3] (TAF and %)	Maximum Storage Increase[4] (TAF and %)
Oct	525.8	524.8	-1.0	-0.1	-34.1 (-5.8)	80.3 (19.8)
Nov	453.2	453.1	0.0	-0.1	-47.1 (-13.6)	74.3 (19.5)
Dec	464.9	465.4	0.5	0.1	-13.9 (-4.1)	61.9 (17.4)
Jan	481.6	482.6	1.0	0.3	-10.1 (-3.2)	57.7 (13.3)
Feb	503.2	503.0	-0.2	0.0	-6.2 (-1.4)	15.8 (3.9)
Mar	614.1	614.3	0.2	0.0	-6.5 (-1.5)	20.9 (4.1)
Apr	722.7	721.9	-0.7	-0.1	-11.1 (-1.8)	15.4 (2.0)
May	834.2	833.1	-1.1	-0.2	-10.2 (-2.0)	2.9 (0.3)
Jun	788.4	787.0	-1.4	-0.2	-40.7 (-5.9)	8.6 (1.2)
Jul	650.7	649.1	-1.6	-0.3	-25.9 (-4.5)	26.6 (6.3)
Aug	601.9	600.6	-1.4	-0.3	-28.5 (-6.5)	62.5 (11.8)
Sep	594.4	593.4	-1.0	-0.3	-30.0 (-7.6)	81.5 (19.3)

Notes:
1. Proposed Action – Scenario B, modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Storage Decrease – refers to the largest decrease in end-of-month storage under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Storage Increase – refers to the largest increase in end-of-month storage under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

These relatively small anticipated reductions in reservoir storage would not be expected to adversely affect the reservoir's coldwater fisheries because coldwater habitat would remain available within the reservoir during all months of all years and anticipated seasonal reductions in storage would not be expected to adversely affect the primary prey species utilized by coldwater fish.

Modeling results for the other Alternatives under the Proposed Action scenarios showed similar results; there would be no measurable change in the long-term mean end-of-month storage in Folsom Reservoir. To the extent that reservoir storage influences coldwater pool volume, the insignificant changes in storage would, likewise, translate into immeasurable effects on reservoir coldwater pool volume. Similar modeling results for Alternatives 4A, 4B and 4C – Reduced Diversion Alternative, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative also confirmed that no significant changes in reservoir storage would result from the implementation of any of these alternatives. Accordingly, impacts on the coldwater fisheries in Folsom Reservoir are anticipated to be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-11 Impacts on Nimbus Fish Hatchery.

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Consequently, flows and associated temperatures in the lower American River would be unchanged from existing conditions, and the temperature of flows entering into the Nimbus Hatchery would be identical to temperatures entering the hatchery under current conditions. Therefore, there would be no impact on water temperatures and resultant fish production at the Nimbus Fish Hatchery under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternatives, and Alternative 1A – No Action Alternative

Overall, water temperature modeling revealed that temperatures of water entering the Nimbus Fish Hatchery from Lake Natoma during the May through September period would remain unchanged, relative to the Base Condition. Table 5.8-23 shows the long-term mean monthly water temperatures below Nimbus Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. The maximum increases in mean monthly water temperatures occurred in September; a 1.6°F increase was simulated for one year (1944 hydrology). For the May through September period (when hatchery temperatures reach annual highs), the range of maximum increases in mean monthly water temperatures was 0.3 to 1.6°F, respectively. As shown in Table 5.8-23, these were single year, monthly maximums over the 72-year period of record. A close inspection of the entire period of record revealed both increases and decreases in modeled water temperatures.

Furthermore, there would be insignificant differences (up to one month increase) in the frequency with which temperatures exceed index temperatures of 60°F, 65°F and 68°F, relative to the existing condition.

TABLE 5.8-23

MEAN MONTHLY WATER TEMPERATURES BELOW NIMBUS DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	60.8	60.8	0.0	0.0	1.0 (1.7)	1945 (BN)
Nov	56.5	56.5	0.0	0.0	0.4 (0.7)	1928 (AN) 1945 (BN) 1948 (BN)
Dec	49.8	49.8	0.0	0.0	0.3 (0.6)	1945 (BN) 1948 (BN)
Jan	46.3	46.3	0.0	0.0	0.3 (0.6)	1945 (BN)
Feb	47.4	47.4	0.0	0.0	0.4 (0.9)	1945 (BN)
Mar	50.8	50.8	0.0	0.0	0.4 (0.8)	1932 (D)
Apr	54.8	54.8	0.0	0.0	0.1 (0.2)	1926 (D) 1929 (C) 1944 (D) 1947 (D) 1948 (BN) 1961 (D) 1972 (BN) 1977 (C) 1980 (AN) 1981 (D) 1983 (W) 1985 (D) 1987 (D) 1988 (C) 1990 (C) 1992 (C)
May	58.8	58.8	0.0	0.0	0.3 (0.4)	1931 (C)
Jun	62.2	62.2	0.0	0.0	0.3 (0.5)	1992 (C)
Jul	64.5	64.5	0.0	0.0	0.8 (1.3)	1947 (D)
Aug	64.9	64.9	0.0	0.0	0.6 (0.9)	1981 (D)
Sep	66.0	66.0	0.0	0.0	1.6 (2.6)	1944 (D)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in °F), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Percent increase, relative to the specific year, shown in parentheses.
4. Indicates the year where the largest decrease in water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Based on these modeling results, operations of Folsom Dam and Reservoir associated with implementation of the proposed water service contracts would have very little effect on the temperatures of water entering the Nimbus Fish Hatchery from Lake Natoma during the May through September period, relative to the Base Condition. Long-term average temperature of water released from Nimbus Dam would remain unchanged.

Similar changes would result under the other scenarios of the Proposed Action. These small and infrequent differences in water temperature would have little, if any, effect on hatchery operations and resultant fish production. Therefore, impacts on the operation of the Nimbus Hatchery would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.8-12 Impacts on fall-run Chinook salmon and steelhead in the lower American River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in system-wide hydrology would occur. Without any change in reservoir operations and, therefore, releases, lower American River flows at the mouth would remain unchanged under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Flow- and temperature-related impacts are discussed separately below by species and lifestage. Organizationally, flow- and temperature-related impacts on fall-run Chinook salmon and steelhead are discussed together, followed by impact discussions for splittail, American shad, and striped bass.

Minimal potential changes in lower American River flows and water temperatures under any of the Alternatives – Proposed Action Scenarios or other alternatives, relative to the Base Condition, would not be expected to adversely affect fall-run Chinook salmon and steelhead immigration, spawning and incubation, or juvenile rearing and emigration.

Flow-Related Impacts on Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)

Flows in the lower American River have rarely been at the minimums prescribed under D-893; typical flow releases follow modified D-1400 and AFRP targets as voluntarily set by Reclamation in cooperation with the Lower American River Operations (LAROPS) Group.

As assessment of flow-related impacts on Chinook salmon adult immigration is determined by reviewing projected flows at the mouth of the American River during the September through December period. This is the period when returning lower American River Chinook salmon adults migrate through the Sacramento River in search of their natal stream to spawn. The same would be true for steelhead during the December through March period. Reduced flows at the mouth are of concern primarily because less flow could result in insufficient olfactory cues for immigrating adult salmonids, thereby making it more difficult for them to "home" to the lower American River. Insufficient flow could result in higher rates of straying to other Central Valley rivers.

Table 5.8-24 shows the modeled mean month flows in the lower American River measured at the mouth under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, over the entire 72-year period of record. In each of the months, with the exception of February, modeling simulations revealed a long-term decrease in mean monthly flows. These decreases range from a high of about 35 cfs (for August) to a low of about 3 cfs (for April). Inter-annual variability is high; both between years and with respect to the range of maximum flow decreases and increases. The mid-summer period (i.e., June through September) showed the largest flow decreases over the long-term.

TABLE 5.8-24

**MEAN MONTHLY FLOWS AT THE MOUTH
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Oct	2248.3	2234.0	-14.2	-0.7	-356.7 (-17.3)	443.4 (17.5)
Nov	3175.8	3150.3	-25.5	-0.3	-585.7 (-22.5)	703.8 (44.8)
Dec	3233.0	3211.1	-21.8	-0.2	-833.9 (-11.3)	445.4 (25.3)
Jan	3990.3	3969.9	-20.4	-1.1	-764.9 (-65.4)	329.7 (26.2)
Feb	5010.8	5014.9	4.1	0.6	-190.0 (-8.1)	708.4 (55.8)
Mar	3632.4	3609.5	-22.9	-1.0	-267.6 (-10.8)	18.8 (1.6)
Apr	3698.9	3695.8	-3.1	-0.1	-73.6 (-2.0)	328.1 (15.1)
May	3470.0	3455.5	-14.5	-0.5	-59.2 (-4.3)	239.6 (8.0)
Jun	3674.9	3647.1	-27.8	-1.0	-150.3 (-10.7)	526.4 (19.4)
Jul	3475.2	3448.3	-26.9	-1.1	-466.9 (-16.0)	78.4 (1.8)
Aug	1797.7	1763.0	-34.7	-1.9	-1465.2 (-76.4)	405.1 (27.0)
Sep	1243.4	1216.4	-27.0	-2.5	-1152.2 (-75.4)	127.7 (14.6)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

August and September are the two months where Base Condition flows (current condition averages) are typically at their lowest. Long-term mean monthly flows at the mouth during September are typically around 1,200 cfs. Under Alternative 2B – Proposed Action – Scenario B, a 27 cfs (or 2.5 percent) decrease in flows would occur based on the CALSIM II modeling simulation. While a long-term 2.5 percent decrease in flows could be considered relatively small and, most likely represents an insignificant change in hydrology, the listed status of fall-run Chinook salmon compels a closer inspection of the modeling results over the entire 72-year period of record.

Modeled results showed that in two-thirds of the years (48 out of 72 years), decreases in mean monthly flows at the mouth would occur in September, relative to the Base Condition. Removing the largest negative outlier (i.e., a simulated 1947; with a 1,152 cfs decrease), the long-term mean monthly flow decrease is *relaxed* to about 11 cfs (or 0.9 percent) (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Alternatively, however, of those 48 years, seven years revealed mean monthly flow decreases, relative to the Base Condition, greater than 3 percent; with each of these years except one, having Base Condition flows well below the 72-year mean of 1,243 cfs. Exacerbation of instream flow conditions, especially during critically low flow periods would be of concern regarding the attraction of fall-run Chinook salmon adults immigrating into the lower American River. Accordingly, this is considered a potentially significant effect.

For steelhead, an inspection of the December through March flow results revealed that while long-term decreases in mean monthly lower American River flows at the mouth would occur, these would not be of sufficient magnitude to affect returning adults. Average base flow conditions during this time of year are already high (e.g., over 3,200 cfs for December) and the proposed diversions would not measurably affect instream flows (see Table 5.8-24).

Modeling results for the other Alternatives under the various Proposed Action scenarios showed similar results; there would be decreased long-term mean monthly flows in the lower American River at the mouth for the month of September. Modeling results for Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative; however, did not show the same degree of anticipated long-term flow decreases.

Mitigation Measures

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios

Under Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, reductions in simulated mean monthly flows in the lower American River at the mouth during the month of September, relative to the Base Condition were noted. Although small, these flow reductions could represent a significant impact on fall-run adult Chinook salmon immigration. Potential mitigation measures, which would reduce the impact to a less-than-significant level, could include:

1. Altered seasonal diversion pattern (e.g., a more evenly distributed monthly pattern); thus, avoiding a peaked mid-summer diversion (August through October as modeled); or,
2. Reduction in the overall diversion total as represented by the various Reduced Diversion Alternatives (Alternatives 4A, 4B or 4C) – although such reductions would not be necessary in all years.

Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative, and Alternative 1B – No Project Alternative

No mitigation would be required for any of the Alternatives.

Temperature-Related Impacts on Fall-Run Chinook Salmon/Steelhead Adult Immigration (September Through March)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Consequently, flows and associated temperatures in the lower American River and lower Sacramento River would remain unchanged from existing conditions. Accordingly, there would be no temperature-related impacts on fall-run Chinook salmon/steelhead adult immigration under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Reclamation's Lower American River Temperature Model does not account for the influence of Sacramento River water intrusion on water temperatures at the mouth. Therefore, the temperature assessments are based on temperatures modeled at the mouth of the lower American River and at Freeport on the Sacramento River. Tables 5.8-25 and 5.8-26 show the mean monthly water temperatures modeled at these two locations, respectively, under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition.

TABLE 5.8-25

MEAN MONTHLY WATER TEMPERATURES AT THE MOUTHDIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	61.2	61.2	0.0	0.0	0.8 (1.3)	1945 (BN)
Nov	55.6	55.6	0.0	0.0	0.5 (0.9)	1965 (W)
Dec	48.5	48.4	0.0	0.0	0.4 (0.8)	1945 (BN)
Jan	45.8	45.8	0.0	0.0	0.4 (0.9)	1945 (BN)
Feb	48.2	48.2	0.0	0.0	0.4 (0.8)	1945 (BN)
Mar	52.3	52.3	0.0	0.0	0.5 (0.9)	1932 (D)
Sep	68.0	68.0	0.0	0.0	2.8 (4.1)	1947 (D)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in °F), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures under the Proposed Action, relative to the Base Condition, computed for that month (over 71 years). Percent increase, relative to the specific year, shown in parentheses.
4. Indicates the year where the largest decrease in water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.8-26

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (°F)	Relative Difference (%)	Long-Term Mean Monthly Temperatures (°F)	Maximum Temperature Increase[2] (°F)	Number of Years with Temperature Increase[3]	Number of Years with Temperature Decrease[4]
Oct	0.0	0.0	60.9	0.2	1 (1.4%)	12 (16.9%)
Nov	0.0	0.0	52.9	0.2	1 (1.4%)	14 (19.7%)
Dec	0.0	0.0	45.7	0.1	1 (1.4%)	7 (9.8%)
Jan	0.0	0.0	44.8	0.1	2 (2.8%)	3 (4.2%)
Feb	0.0	0.0	49.5	0.1	1 (1.4%)	4 (5.6%)
Mar	0.0	0.0	54.2	0.1	3 (4.2%)	1 (1.4%)
Sep	0.0	0.0	69.2	0.4	1 (1.4%)	9 (12.7%)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures computed for that month (largest decrease over 71 years).
3. Indicates the number of years (and as a percentage) for that month where Sacramento River water temperatures would be increased by the increment shown in the Maximum Temperature Increase column over the 71-year period of water temperature record.
4. Indicates the number of years (and as a percentage) where there would be a decrease in Sacramento River water temperatures for that month over the 71-year period of water temperature record.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

Modeling results confirm that the long-term average water temperatures at both locations under Alternative 2B – Proposed Action – Scenario B, would remain virtually unchanged, relative to the Base Condition during all months of the September through March adult immigration period. Therefore, changes in water temperature under Alternatives 2A, 2B or 2C or under any of the Reduced Diversion Alternatives (Alternatives 4A, 4B or 4C) would be a less-than-significant impact on fall-run Chinook salmon/steelhead adult immigration.

Similar results would occur under Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative. Therefore, temperature-related impacts on fall-run Chinook salmon/steelhead adult immigration would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

Flow-Related Impacts on Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow-related impacts on fall-run Chinook salmon/steelhead spawning and incubation under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

All flow-related impact assessments regarding fall-run Chinook salmon spawning and incubation were based on flows below Nimbus Dam and at Watt Avenue, with a greater emphasis placed on flows below Nimbus Dam. Aerial redd surveys conducted by CDFG in past years have shown that 98 percent of all spawning occurs upstream of Watt Avenue, and 88 percent of spawning occurs upstream of RM 17 (located just upstream of Ancil Hoffman Park). Hence, the majority of spawning occurs upstream of RM 17.

Tables 5.8-27 and 5.8-28 show the modeled mean monthly flows at Nimbus Dam and at Watt Avenue under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition.

Modeled monthly mean flows in this reach of the lower American River would remain essentially unchanged from the Base Condition. Long-term flows would not be expected to change by more than one percent. Most importantly, flows at this time of year are at their highest.

Differences in flows in the lower flow ranges are more crucial for salmon survival. During October, November, and December, flows would be nearly identical to those under the Base Condition in almost all years. Flow reductions below 2,000 cfs could reduce the amount of available Chinook

TABLE 5.8-27

MEAN MONTHLY FLOWS BELOW NIMBUS DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Oct	2441.8	2427.7	-14.1	-0.7	-362.0 (-15.4)	440.8 (15.8)
Nov	3324.2	3299.2	-25.0	-0.3	-582.1 (-20.8)	704.4 (41.6)
Dec	3342.0	3322.9	-19.1	-0.1	-827.8 (-10.8)	446.1 (23.6)
Jan	4088.3	4073.4	-14.9	-0.8	-764.9 (-60.5)	334.6 (23.6)
Feb	5103.3	5115.7	12.4	0.9	-190.7 (-8.1)	720.7 (51.8)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-28

MEAN MONTHLY FLOWS AT WATT AVENUE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Project (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Oct	2402.7	2388.8	-13.9	-0.7	-362.0 (-16.0)	440.8 (16.1)
Nov	3399.7	3374.1	-25.5	-0.3	-586.1 (-21.3)	703.8 (42.0)
Dec	3337.4	3315.5	-21.8	-0.2	-833.9 (-10.8)	445.4 (23.8)
Jan	4107.3	4086.9	-20.4	-1.0	-764.9 (-59.4)	329.7 (24.0)
Feb	5134.9	5139.0	4.1	0.6	-190.0 (-7.7)	708.4 (50.8)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

salmon spawning habitat, which could result in increased redd superimposition during years when adult returns are high enough for spawning habitat to be limiting. For any year, minimal differences in flow would occur when flows under the existing condition are 2,000 cfs or less. Such reductions inflow, therefore, would not be expected to be of substantial magnitude or occur with sufficient frequency to have a significant adverse effect on long-term initial year-class strength of lower American River fall-run Chinook salmon. Overall, there would be no substantial adverse effects resulting from reduced flows that would result in potential flow-related impacts on fall-run Chinook salmon spawning and incubation.

Similar results would occur under the other Alternatives of the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative. Therefore, flow-related impacts on fall-run Chinook salmon/steelhead spawning and incubation would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

Temperature-Related Impacts on Fall-Run Chinook Salmon Spawning and Incubation (October Through February)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no water temperature-related impacts on fall-run Chinook salmon spawning and incubation under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Under Alternative 2B – Proposed Action – Scenario B, long-term average water temperatures would be equivalent to those under the Base Condition during October at Watt Avenue, and during the November through February period below Nimbus Dam, as shown in Tables 5.8-29 and 5.8-30. No long-term changes in mean monthly water temperatures were observed. Watt Avenue is the location of concern in October because air temperatures tend to warm the river as it moves downstream. Conversely, water temperatures below Nimbus Dam are usually warmer than water temperatures at Watt Avenue in the winter season.

The October water temperatures at Watt Avenue would be essentially equivalent or less than the Base Condition in 64 months of the 71 months included in the modeling analysis (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). The October water temperature at Watt Avenue would increase by more than 0.3°F in up to seven months of the simulation, with the greatest increase of 0.9°F (based on 1944 hydrology). The November through February monthly mean water temperatures below Nimbus Dam would be essentially equivalent to the existing condition in 275 of the 284 months included in the water temperature modeling analysis (Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). November water temperatures below Nimbus Dam would increase by more than 0.2°F in five years of the 71 years modeled, and by up to one year in February. However, December, January, and February water temperatures below Nimbus Dam would be below 56°F in all 71 years modeled.

The long-term average annual early lifestage survival for fall-run Chinook salmon in the American River, as shown in Table 5.8-31, would remain unchanged, relative to the Base Condition.

TABLE 5.8-29

MEAN MONTHLY WATER TEMPERATURES AT WATT AVENUE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	61.0	61.0	0.0	0.0	0.9 (1.5)	1945 (BN)
Nov	55.9	55.9	0.0	0.0	0.5 (0.9)	1965 (W)
Dec	49.0	48.9	0.0	0.0	0.3 (0.6)	1948 (BN)
Jan	46.0	46.0	0.0	0.0	0.3 (0.7)	1945 (BN)
Feb	47.9	47.9	0.0	0.0	0.4 (0.8)	1945 (BN)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in °F), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures under the Proposed Project, relative to the Base Condition, computed for that month (over 71 years). Percent increase, relative to the specific year, shown in parentheses.
4. Indicates the year where the largest decrease in water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.8-30

MEAN MONTHLY WATER TEMPERATURES BELOW NIMBUS DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Oct	60.8	60.8	0.0	0.0	1.0 (1.7)	1945 (BN)
Nov	56.5	56.5	0.0	0.0	0.4 (0.7)	1928 (AN) 1945 (BN) 1948 (BN)
Dec	49.8	49.8	0.0	0.0	0.3 (0.6)	1945 (BN) 1948 (BN)
Jan	46.3	46.3	0.0	0.0	0.3 (0.6)	1945 (BN)
Feb	47.4	47.4	0.0	0.0	0.4 (0.9)	1945 (BN)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in °F), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures under the Proposed Action, relative to the Base Condition, computed for that month (over 71 years). Percent increase, relative to the specific year, shown in parentheses.
4. Indicates the year where the largest decrease in water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.8-31

**AMERICAN RIVER
EARLY LIFE-STAGE FALL-RUN CHINOOK SALMON SURVIVAL
OVER THE 72-YEAR PERIOD OF RECORD (1922-1993)
(PERCENT SURVIVAL)**

	Base Condition	Proposed Action[1]	Absolute Difference	Relative Difference
Mean	84.9	84.9	0.0	0.0
Median	85.4	85.6	0.1	0.1
Minimum	73.8	73.9	-2.2	-2.6
Maximum	93.7	93.8	0.9	1.1

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
The period minimum (decrease in percent survival) occurred in 1944. Computed percent survival, however, in 1944 was 86.0% under the Base Condition and 83.8% under the Proposed Action.

Based on these modeling results, any small temperature changes in the lower American River resulting from Alternative 2B – Proposed Action – Scenario B, during the October through February period would not adversely affect spawning and incubation success of fall-run Chinook salmon. Therefore, potential temperature-related impacts on fall-run Chinook salmon spawning and incubation would be less than significant.

Similar results would occur under the Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative. Therefore, temperature-related impacts on fall-run Chinook salmon spawning and incubation would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

Flow– and Temperature-Related Impacts on Steelhead Spawning and Incubation (December Through March)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow- or water temperature-related impacts on steelhead spawning or incubation under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Monthly mean flows simulated over the long-term below Nimbus Dam and at Watt Avenue associated with Alternative 2B – Proposed Action – Scenario B, would be essentially equivalent to the Base Condition. These data are shown in Tables 5.8-32 and 5.8-33.

TABLE 5.8-32

MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Dec	3342.0	3322.9	-19.1	-0.1	-827.8 (-10.8)	446.1 (23.6)
Jan	4088.3	4073.4	-14.9	-0.8	-764.9 (-60.5)	334.6 (24.6)
Feb	5103.3	5115.7	12.4	0.9	-190.7 (-8.1)	720.7 (51.8)
Mar	3729.4	3715.3	-14.1	-0.5	-267.9 (-10.0)	24.8 (3.0)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.8-33

MEAN MONTHLY FLOWS AT WATT AVENUE
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Dec	3337.4	3315.5	-21.8	-0.2	-833.9 (-10.8)	445.4 (23.8)
Jan	4107.3	4086.9	-20.4	-1.0	-764.9 (-59.4)	329.7 (24.0)
Feb	5134.9	5139.0	4.1	0.6	-190.0 (-7.7)	708.4 (50.8)
Mar	3759.7	3736.9	-22.8	-0.9	-267.6 (-10.3)	18.8 (1.4)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

In addition, monthly mean water temperatures below Nimbus Dam and at Watt Avenue would be similar to the Base Condition in 279 and 280 months of the 284 months included in the modeling analysis, respectively (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Moreover, under each of the alternatives, water temperatures below Nimbus Dam would remain below 56°F for all months of the 71 years modeled for the spawning and incubation period for steelhead. December, January, February, and March water temperatures at Watt Avenue would be below 56°F in all 71 years modeled.

Based on these modeling results, flow- and temperature-related impacts on steelhead spawning or incubation under Alternative 2B – Proposed Action – Scenario B would be less than significant.

Similar results from CALSIM II and the Reclamation Water Temperature Model were observed for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative. Therefore, flow- and temperature-related impacts on steelhead spawning or incubation would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

Flow-Related Impacts on Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow-related impacts on fall-run Chinook salmon and steelhead juvenile rearing under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The majority of juvenile salmonid rearing is believed to occur upstream of Watt Avenue. Moreover, depletions generally exceed tributary accretions to the river throughout the March through June period (generally resulting in lower flows at Watt Avenue than below Nimbus Dam). Accordingly, all flow-related impact assessments for fall-run Chinook salmon and steelhead rearing are based on flows at Watt Avenue. Table 5.8-34 shows the simulated mean monthly flow at Watt Avenue under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition.

TABLE 5.8-34

**MEAN MONTHLY FLOWS AT WATT AVENUE
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Mar	3759.7	3736.9	-22.8	-0.9	-267.6 (-10.3)	18.8 (1.4)
Apr	3859.3	3854.9	-4.4	-0.1	-73.6 (-1.9)	328.1 (13.7)
May	3660.6	3646.0	-14.5	-0.5	-59.2 (-3.7)	239.6 (7.4)
Jun	3876.4	3848.6	-27.8	-0.9	-150.3 (-9.1)	526.4 (18.2)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Small changes in monthly mean flows would be expected to occur at Watt Avenue under the other Alternatives relative to the existing condition. The long-term average flow at Watt Avenue would be within 0.9 percent of the flow under the Base Condition for any given month during the March through June period. Such flow reductions are not of sufficient frequency or magnitude (i.e., generally 50 cfs or less) to result in significant adverse effects on long-term juvenile fall-run Chinook salmon or steelhead rearing success. Therefore, potential flow-related impacts on fall-run Chinook salmon and steelhead juvenile rearing under any alternative would be less than significant.

Similar results from CALSIM II were observed for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative. Therefore, there would be no flow-related impacts on either -run Chinook salmon and steelhead juvenile rearing.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

Temperature-Related Impacts on Fall-Run Chinook Salmon and Steelhead Juvenile Rearing (March Through June)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no water temperature-related impacts on fall-run Chinook salmon and steelhead juvenile rearing under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Modeling of Alternative 2B – Proposed Project – Scenario B indicated that the long-term average water temperature at Watt Avenue would not change during any month of the March through June period, relative to the existing condition (see Table 5.8-35).

Monthly mean water temperatures at Watt Avenue would be essentially equivalent to the Base Condition in 281 of the 284 months included in the water temperature modeling analysis (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Moreover, there would not be any additional occurrences during the March through April period for all the 71 years modeled in which water temperatures would be above 65°F, relative to the Base Condition (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). For May, there would be seven years where water temperatures would exceed 65°F; however, in each of these years, Base Condition temperatures would already be above 65°F. Alternative 2B – Proposed Action – Scenario

TABLE 5.8-35

MEAN MONTHLY WATER TEMPERATURES AT WATT AVENUE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Mar	51.8	51.8	0.0	0.0	0.4 (0.8)	1932 (D)
Apr	56.1	56.1	0.0	0.0	0.1 (0.2)	1925 (D) 1929 (C) 1944 (D) 1947 (D) 1961 (D) 1972 (BN) 1977 (C) 1980 (AN) 1981 (D) 1983 (W) 1984 (W) 1985 (D) 1987 (D) 1988 (C) 1990 (C) 1992 (C)
May	60.5	60.5	0.0	0.0	0.2 (0.3)	1930 (D) 1990 (C)
Jun	64.2	64.2	0.0	0.0	0.3 (0.5)	1990 (C)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in °F), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures under the Proposed Project, relative to the Base Condition, computed for that month (over 71 years). Percent increase, relative to the specific year, shown in parentheses.
4. Indicates the year where the largest decrease in water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

B does not add or increase the frequency with which the 65°F temperature threshold would be exceeded. For June, Base Condition water temperatures already exceed 65°F in 21 of the 71 years modeled. Based on the modeling results, Alternative 2B – Proposed Action – Scenario B, would actually result in one less year (for June) where water temperatures would exceed 65°F.

Consequently, although infrequent temperature increases at Watt Avenue would occur during the March through June period, resultant water temperatures would not exceed threshold temperature criteria for juvenile rearing (65°F). Consequently, impacts on juvenile salmon and steelhead rearing would be less than significant.

Water temperature modeling results for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative showed similar results. Therefore, temperature-related impacts on either -run Chinook salmon and steelhead juvenile rearing would be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

Flow-Related Impacts on Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow-related impacts on fall-run Chinook salmon and steelhead juvenile emigration under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The primary period of fall-run Chinook salmon juvenile emigration occurs from February to June, with the majority of juvenile steelhead emigration occurring during this same period. Generally little, if any, emigration occurs during July and August. Flow-related impacts on salmonid immigration discussed above addressed flow changes in February and March. As previously concluded for adult immigration, potential changes in flows under each of the alternatives during February through March would not adversely affect juvenile fall-run Chinook salmon or steelhead rearing and, therefore, also would not adversely affect emigration. Hence, this discussion focuses primarily on the April through June period.

Small decreases in monthly mean flows would be expected to occur at the American River mouth. Simulated long-term average flow at the mouth would decrease slightly (approximately 1 percent or less) in the April through June period (see Table 5.8-36).

TABLE 5.8-36

MEAN MONTHLY FLOWS AT THE MOUTH
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Apr	3698.9	3695.8	-3.1	-0.1	-73.6 (-2.0)	328.1 (15.1)
May	3470.0	3455.5	-14.5	-0.5	-59.2 (-4.3)	239.6 (8.0)
Jun	3674.9	3647.1	-27.8	-1.0	-150.3 (-10.7)	526.4 (19.4)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Juvenile salmonid emigration surveys conducted by CDFG have shown no direct relationship between peak emigration of juvenile Chinook salmon and peak spring flows (Snider et al. 1997). Moreover, emigrating fish are more likely to be adversely affected by events when flows are high, then ramp down quickly (resulting in isolation and stranding). Adverse changes in flow ramping rates would not be expected to occur under Alternative 2B – Proposed Action – Scenario B. Operational control for Nimbus Dam releases will still be maintained by Reclamation, through coordination and interaction with the LAROPS group. Consequently, although small flow reductions at the mouth would occur in a few years during the April through June period, resultant flows would not be expected to adversely affect the success of juvenile salmonid emigration. Therefore, potential flow-related impacts on fall-run Chinook salmon and steelhead juvenile emigration would be less than significant.

Similar results from CALSIM II were observed for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative. Therefore, there would be no flow-related impacts on either fall-run Chinook salmon and steelhead juvenile emigration.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

Temperature-Related Impacts on Fall-Run Chinook Salmon and Steelhead Juvenile Emigration (February Through June)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no temperature-related impacts on fall-run Chinook salmon and steelhead juvenile emigration under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

With the possible exception of a small percentage of fish that may rear near the mouth of the lower American River, potential impacts associated with elevated water temperatures at the mouth to fall-run Chinook salmon and steelhead would be limited to the several days that it takes emigrants to pass through the lower portion of the river and into the Sacramento River en route to the Delta. Water temperatures near the mouth during the primary emigration period (February into June) are often largely affected by intrusion of Sacramento River water, which is not accounted for by Reclamation's Lower American River Temperature Model. Consequently, actual temperatures near the mouth would likely be somewhere between temperatures modeled for the mouth, and temperatures modeled for the Sacramento River at Freeport (RM 46), located 14 miles downstream of the lower American River's confluence. For this reason, the long-term average temperatures are discussed for both of these locations. Tables 5.8-37 and 5.8-38 show the mean monthly water temperatures at the mouth of the American River and Freeport on the lower Sacramento River, respectively, as simulated under Alternative 2B – Proposed Action – Scenario B.

TABLE 5.8-37

MEAN MONTHLY WATER TEMPERATURES AT THE MOUTH DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Proposed Action (°F)	Absolute Difference[2] (°F)	Relative Difference (%)	Maximum Temperature Increase[3] (°F and %)	Notes[4]
Feb	48.2	48.2	0.0	0.0	0.4 (0.8)	1945 (BN)
Mar	52.3	52.3	0.0	0.0	0.5 (0.9)	1932 (D)
Apr	56.8	56.8	0.0	0.0	0.1 (0.2)	1925 (D) 1929 (C) 1947 (D) 1961 (D) 1972 (BN) 1976 (C) 1981 (D) 1983 (W) 1985 (D) 1987 (D) 1990 (C) 1992 (C)
May	61.4	61.4	0.0	0.0	0.2 (0.3)	1990 (C)
Jun	65.2	65.2	0.0	0.0	0.3 (0.4)	1990 (C) 1992 (C)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in °F), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures under the Proposed Action, relative to the Base Condition, computed for that month (over 71 years). Percent increase, relative to the specific year, shown in parentheses.
4. Indicates the year where the largest decrease in water temperatures occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.8-38

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (°F)	Relative Difference (%)	Long-Term Mean Monthly Temperatures (°F)	Maximum Temperature Increase[2] (°F)	Number of Years with Temperature Increase[3]	Number of Years with Temperature Decrease[4]
Feb	0.0	0.0	49.5	0.1	1 (1.4%)	4 (5.6%)
Mar	0.0	0.0	54.2	0.1	3 (4.2%)	0
Apr	0.0	0.0	60.4	0.1	5 (7.0%)	2 (2.8%)
May	0.0	0.0	65.9	0.1	6 (8.5%)	2 (2.8%)
Jun	0.0	0.0	70.1	0.2	2 (2.8%)	1 (1.4%)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Temperature Increase – refers to the largest increase in mean monthly water temperatures computed for that month (largest decrease over 71 years).
3. Indicates the number of years (and as a percentage) for that month where Sacramento River water temperatures would be increased by the increment shown in the Maximum Temperature Increase column over the 71-year period of water temperature record.
4. Indicates the number of years (and as a percentage) where there would be a decrease in Sacramento River water temperatures for that month over the 71-year period of water temperature record.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

Long-term monthly mean temperatures at the American River mouth would remain unchanged, relative to the Base Condition. Mean monthly water temperatures would remain essentially identical in 351 months of the 355 months included in the analysis (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR).

Long-term monthly mean temperatures at Freeport on the Sacramento River also remain unchanged, relative to the Base Condition. In only two months of two years, out of 355 months are temperature increases of 0.2°F or greater observed at Freeport (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR).

Based on the results discussed above, water temperatures would not adversely affect emigration during the February through June period, relative to the Base Condition. Therefore, potential temperature related impacts on fall-run Chinook salmon and steelhead juvenile emigration under any alternative would be less-than significant.

Reclamation Water Temperature Model results for both the American and Sacramento rivers for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative revealed similar trends. Accordingly, water temperature-related impacts on either fall-run Chinook salmon or steelhead juvenile emigration during the February to June period would be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

Flow-Related Impacts on Steelhead Rearing (July Through September)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow-related impacts on juvenile steelhead rearing success under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.8-39 shows the mean monthly flows below Nimbus Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition.

Small decreases in the long-term monthly mean flows would be expected to occur below Nimbus Dam, relative to the Base Condition. The long-term average flow below Nimbus Dam would decrease by less than two percent, relative to the Base Condition during the July through September period. September is a month of concern since flows in the lower American River are typically at, or near their lowest for the year. The long-term 72-year average mean monthly flows at this location are approximately 1,500 cfs.

As noted previously, three significant dry-years (1947, 1981, and 1989) reveal flow reductions of 1,156, 123, and 204 cfs, respectively, relative to the Base Condition for those years. A close inspection of the 72-year modeling output for September confirms that these years represented significant outliers. Without these years, the long-term mean monthly flows below Nimbus Dam

TABLE 5.8-39

MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Jul	3846.4	3820.4	-26.0	-0.9	-467.6 (-14.2)	77.2 (1.6)
Aug	2138.4	2103.7	-34.7	-1.7	-1467.9 (-63.9)	405.1 (17.2)
Sep	1503.2	1475.9	-27.4	-2.0	-1156.2 (-67.3)	67.2 (9.4)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

would change by less than 7 cfs or, 0.5 percent from Base Condition flows. The outlier years tend to skew the 72-year means; the mean, therefore, is not representative of the magnitude and frequency of deviation that would be expected over the entire period of hydrologic record.

Based on these findings, flow reductions are not expected to reduce juvenile steelhead rearing habitat. Further, steelhead populations in the lower American River are believed to be more limited by instream temperature conditions during the July through September period, rather than by flows. While the two are related, several factors influence their interrelated effects. Channel structure, wetted perimeter, tortuosity, and the presence of shaded riverine aquatic cover all play a role in affecting this relationship. Therefore, small and infrequent reductions in flow would not be expected to adversely affect long-term rearing success of juvenile steelhead. Therefore potential flow-related impacts on steelhead rearing would be less than significant.

CALSIM II modeling of river flows below Nimbus Dam for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternative 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative revealed similar trends. Accordingly, flow-related impacts on the rearing success of juvenile steelhead would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

Temperature-Related Impacts on Steelhead Rearing (July Through September)

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no temperature-related impacts on juvenile steelhead rearing success under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The long-term average water temperatures below Nimbus Dam, Watt Avenue, and the mouth would not increase during July, August and September under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Mean monthly water temperatures, over the 71-year period of record, would remain identical to the Base Condition at each of these three locations on the lower American River. As noted previously, maximum increases would occur below Nimbus Dam. From the water temperature modeling, individual month and year increases during this time period (July through September) would occur (e.g. 0.3°F at the mouth; 0.2°F at Watt Avenue; and 1.6°F below Nimbus Dam). These magnitudes of temperature increases at the mouth, Watt Avenue, and below Nimbus Dam would be rare; occurring in one, three, and one years, respectively, out of the 71-year period of water temperature modeling record.

Therefore, the small and infrequent increases in water temperature that would occur would not be expected to adversely affect long-term rearing success of juvenile steelhead. Therefore, potential temperature-related impacts on steelhead rearing would be less than significant.

Reclamation's American River Water Temperature modeling of river flows below Nimbus Dam to the mouth for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternative 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative revealed similar or reduced temperature trends. Accordingly, water temperature-related impacts on the rearing success of juvenile steelhead would be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.8-13 Impacts on splittail in the lower American River.

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow or temperature-related impacts on splittail habitat under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

River flows at Watt Avenue can be used as an indicator of the acreage of usable riparian vegetation inundated between RM 8 and RM 9. With unchanging flows, the amount of riparian habitat inundated in the lower portion of the river can be assumed to remain unaffected. Substantial changes (i.e., reductions) in flows, both in magnitude and frequency over the entire 72-year period of record would be necessary to impart significant effects on riparian habitats relied on by splittail.

Table 5.8-40 shows the modeled mean monthly flows in the lower American River at Watt Avenue under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Small reductions in the overall, long-term average mean monthly flows occur for the months of February through May. These reductions do not exceed one percent, relative to Base Condition flows.

TABLE 5.8-40

MEAN MONTHLY FLOWS AT WATT AVENUE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Oct	2402.7	2388.8	-13.9	-0.7	-362.0 (-16.0)	440.8 (16.1)
Nov	3399.7	3374.1	-25.5	-0.3	-586.1 (-21.3)	703.8 (42.0)
Dec	3337.4	3315.5	-21.8	-0.2	-833.9 (-10.8)	445.4 (23.8)
Jan	4107.3	4086.9	-20.4	-1.0	-764.9 (-59.4)	329.7 (24.0)
Feb	5134.9	5139.0	4.1	0.6	-190.0 (-7.7)	708.4 (50.8)
Mar	3759.7	3736.9	-22.8	-0.9	-267.6 (-10.3)	18.8 (1.4)
Apr	3859.3	3854.9	-4.4	-0.1	-73.6 (-1.9)	328.1 (13.7)
May	3660.6	3646.0	-14.5	-0.5	-59.2 (-3.7)	239.6 (7.4)
Jun	3876.4	3848.6	-27.8	-0.9	-150.3 (-9.1)	526.4 (18.2)
Jul	3768.7	3741.9	-26.9	-0.9	-466.9 (-14.4)	78.4 (1.7)
Aug	2058.6	2023.9	-34.7	-1.7	-1465.2 (-65.9)	405.1 (18.9)
Sep	1440.4	1413.8	-27.1	-2.0	-1152.2 (-69.5)	83.3 (12.9)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Substantial changes in the frequency of habitat reductions would not be expected to occur during February, March, April, or May of any year based on these modeling results. In some years, riparian vegetation would not be inundated at all. Inter-annual variability for these months, over the 71-year period of record is high. Modeling results confirm that maximum mean monthly flow increases significantly exceed the simulated maximum mean monthly flow decreases.

During the February through May splittail spawning period, the long-term average usable inundated riparian habitat between RM 8 and RM 9 would not decrease relative to the Base Condition. In addition, flow changes would have little, if any, effect on the availability of in-channel spawning habitat availability, or the amount of potential spawning habitat available from the mouth up to RM 5, the reach of the river influenced by Sacramento River stage. Ultimately, these reductions in flow would not be expected to be of substantial magnitude and/or to occur with enough frequency to have a significant adverse effect on the long-term population trends of lower American River splittail.

As shown previously, long-term monthly mean temperatures at Watt Avenue under the Alternatives are essentially equivalent to or less than the Base Condition. Over the 71-year period of simulation, there would be no additional occurrences where February through May water temperatures at Watt Avenue would be above 68°F; the upper limit of the reported preferred range for splittail spawning, relative to the existing condition. Therefore, temperature-related conditions to splittail spawning would be considered a less-than-significant impact**.**

Flows at Watt Avenue to the mouth simulated under the Alternatives under the various Proposed Action scenarios as well as for the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative revealed similar trends. Accordingly, flow- and temperature-related impacts on splittail spawning and riparian habitats would be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.8-14 Impacts on American shad in the lower American River.

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow- or temperature-related impacts on American shad under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The long-term average flow at the American river mouth would be reduced by one percent or less during May and June, relative to the Base Condition (see Table 5.8-41). Flow reductions in May and June could potentially reduce the number of adult shad attracted into the river during a few years. However, American shad spawn opportunistically where suitable conditions are found, so that production of American shad within the Sacramento River system would likely remain unaffected. Any flow-related impacts on American shad are considered to be less than significant.

TABLE 5.8-41

**MEAN MONTHLY FLOWS AT THE MOUTH
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
May	3470.0	3455.5	-14.5	-0.5	-59.2 (-4.3)	239.6 (8.0)
Jun	3674.9	3647.1	-27.8	-1.0	-150.3 (-10.7)	526.4 (19.4)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

In addition, analysis was performed to determine the frequency with which lower American River flows at the mouth in May and June would be reduced below 3,000 cfs, the flow level defined by CDFG as that which would be sufficient to maintain the sport fishery for American shad by implementation of the proposed new CVP water service contracts, relative to current conditions. The simulations showed that in May, one year (1953, a wet-year) would Alternative 2B – Proposed Action – Scenario B, reduce flows from the Base Condition to levels below 3,000 cfs. In June of that same hydrologic year (1953), simulated flows increased to over 5,400 cfs; potentially offsetting any reduction below 3,000 cfs experienced during that water year. An inspection of the June record revealed no year where flows at the mouth would be below 3,000 cfs as a result of Alternative 2B – Proposed Action – Scenario B. Flow-related adverse effects on American shad within the lower American are not considered significant given the hydrologic modeling results generated and relied upon.

Overall long-term monthly mean water temperatures in May and June below Nimbus Dam and at the mouth would remain unchanged from the Base Condition (e.g., 58.8°F and 62.2°F below Nimbus Dam and 61.4°F and 65.2°F at the mouth). Below Nimbus Dam, May and June water temperatures would be within the reported preferred range for American shad spawning of 60°F to 70°F in all 71-years. At the mouth, the same would apply for the month of May. For June, however, in three years, water temperatures under Alternative 2B – Proposed Action – Scenario B, would be above the 70°F threshold. In each of those three years, Base Condition water temperatures would already be above 70°F. The proposed new CVP water service contracts impart no additional incursions beyond the 70°F temperature threshold.

The frequency in which suitable temperatures for American shad spawning occurs would not substantially differ from the Base Condition and consequently, temperature-related impacts on American shad are considered to be less than significant. Overall, impacts associated with the implementation of the proposed new CVP water service contracts on American shad would be less than significant.

CALSIM II and Reclamation's American River Water Temperature modeling of river flows and water temperatures below Nimbus Dam to the mouth for the Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative revealed similar data trends. Accordingly, flow- or temperature-related impacts on American shad would be less than significant under these scenarios or alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.8-15 Impacts on striped bass in the lower American River.

Alternative 1B – No Project Alternative

There would be no additional diversions from the CVP system under the No Project Alternative. Accordingly, there would be no flow- or temperature-related impacts on the striped bass fishery under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The flow-related impact assessment conducted for fall-run Chinook salmon and steelhead adequately addresses potential flow-related impacts on striped bass juvenile rearing, which occurs during the months of May and June. In addition, analysis was performed to determine the frequency with which lower American River flows at the mouth in May and June would be reduced below 1,500 cfs, the attraction flow index level defined by CDFG as that which would be sufficient to maintain the sport fishery for striped bass.

The simulations showed that in May, Alternative 2B – Proposed Action – Scenario B would impart no flow reductions below 1,500 cfs from the Base Condition. For June, two years (1959, a Below Normal Year and 1981, a Dry Year), simulated flows decreased under Alternative 2B – Proposed Action – Scenario B, to below 1,500 cfs. In all other simulations, resultant flows below 1,500 cfs would only occur where the Base Condition flows had already been below 1,500 cfs. The proposed new CVP water service contracts are attributable to two additional years, in June, where flows at the mouth of the lower American River would be reduced to levels below 1,500 cfs. Neither the frequency nor magnitude of these occurrences would suggest a potentially significant flow-related impact (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR).

Flows at the mouth of the lower American River are believed to be at sufficient levels to maintain the striped bass fishery under current conditions, and would be met or exceeded in most years during both May and June. Furthermore, substantial changes in the strength of the striped bass fishery would not be expected to occur when May and/or June monthly mean flows periodically fall below

1,500 cfs, and consequently, flow-related impacts on the striped bass fishery would be less than significant.

The number of years that monthly mean water temperatures would be within the reported preferred range for striped bass juvenile rearing of 61°F to 73°F would not change substantially, relative to the Base Condition. For both the river reaches below Nimbus Dam and at the mouth of the lower American River, there would be no additional years, when the mean monthly May of June water temperatures would exceed the 73°F threshold (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR).

Thus, the frequency of suitable water temperatures for juvenile striped bass rearing in the lower American River would remain essentially unchanged. Accordingly, temperature-related impacts on juvenile striped bass rearing are considered to be less than significant, relative to current conditions. Overall, potential flow- or temperature-related impacts on striped bass would be less than significant.

CALSIM II and Reclamation's American River Water Temperature modeling of river flows and water temperatures below Nimbus Dam to the mouth for the other Alternatives under the various Proposed Action scenarios as well as the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative revealed similar results. Accordingly, flow- or temperature-related impacts on the striped bass fishery would be less than significant under these scenarios or alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9. RIPARIAN RESOURCES (DIVERSION-RELATED IMPACTS)

This subchapter describes existing riparian resources riparian resources, i.e., riparian and wetland vegetation and associated species that utilize it for habitat. The regional setting for these resources includes the lower American and Sacramento rivers and reservoirs that may be influenced by the new CVP water service contracts. The discussion identifies conclusions and determinations for each species and critical habitat. The impact assessment focuses on habitats and special-status species. Special-status species include those that are listed as threatened or endangered by the CDFG or the USFWS, species proposed for State or federal listing, species designated as "species of concern" by USFWS or "special concern species" by CDFG, and species tracked by the CNDDB or California Native Plant Society (CNPS).

5.9.1. <u>CEQA Standards of Significance</u>

Impacts on riparian resources were considered significant if they would:

- Result in significant effects on riparian vegetation due to changes in water surface elevations at Shasta, Trinity or Folsom reservoirs;

- Result in significant effects on riparian vegetation in the upper Sacramento River due to changes in river flows;
- Result in significant effects on riparian vegetation in the lower Sacramento River and Delta due to changes in river flows;
- Result in significant effects on sensitive-species relying on Delta habitats, including estuarine wetlands;
- Result in significant effects on riparian vegetation in the lower American River;
- Result in significant effects on backwater pond hydrology in lower American River and its subsequent effect on pond vegetation;
- Result in effects on special-status species dependent on lower American River riparian and open water habitats;
- Result in effects on species dependent on Folsom Reservoir nearshore and open water habitats; and,
- Result in direct hydrological impacts on the California red-legged frog (CRLF) and Foothill yellow-legged frog.

5.9.2. Impacts and Mitigation Measures

The analysis of potential diversion-related impacts on riparian vegetation, habitats, and associated sensitive species evaluates potential changes in reservoir water levels and river flows. CALSIM II modeling data were used to assess hydrologic changes in CVP system waterbodies using the comparative methodology of gauging the long-term 72-year differences between the Base Condition and the proposed implementation of the new CVP water service contracts and the various alternative actions.

5.9-1 Effects on vegetation associated with changes in water surface elevations in Folsom, Shasta, and Trinity reservoirs.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, Shasta, Trinity, and Folsom reservoir elevations and their inherent vegetative/weedy herbaceous plants would be identical to the existing condition, and there would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Folsom, Shasta, and Trinity reservoirs have water levels that fluctuate frequently on an annual basis due to joint operational prescriptions aimed at maintaining multiple beneficial uses. Non-native, disturbance-adapted (or weedy) vegetation becomes established in areas below the high water line during the growing season. The drawdown zone at each of these reservoirs due to flood control operations and seasonal depletions to consumptive demands and downstream releases is vegetated primarily with weedy herbaceous plants and scattered willow shrubs that do not form a contiguous riparian community. These areas are not considered to have high habitat value for typically associated terrestrial wildlife species. Due to the inherent fluctuations in reservoir water levels, quality nearshore vegetation, and the habitat it would provide, rarely establishes itself or persists. This condition is identical for all Alternatives including the various scenarios under the Proposed Action, Alternative 3 – Water Transfer Alternatives, the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C) and Alternative 1A – No Action Alternative. Accordingly, inherent conditions in these reservoirs with respect to weedy herbaceous plants and willow shrubs are not expected to be affected by the new CVP water service contracts; the impacts are considered to be less than significant.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-2 Effects on riparian vegetation of the upper Sacramento River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, inherent vegetative/weedy herbaceous plants within and along the upper Sacramento River would be identical to the existing condition, and there would be ***no impact***.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Much of the Sacramento River is confined by levees that reduced the natural diversity of riparian vegetation. Agricultural land (e.g., rice, dry grains, pastures, orchards, vineyards, and row and truck crops) is common along the lower reaches of the Sacramento River, but is less common in the upper portions (CDFG 1988). The bands of riparian vegetation that occur along the Sacramento River are similar to those found along the lower American River, but are somewhat narrower and not as botanically diverse. The riparian communities consist of Valley oak, Fremont cottonwood, wild grape, box elder, elderberry, and willow. Freshwater, emergent wetlands occur in the slow moving backwaters and are primarily dominated by tules, cattails, rushes, and sedges (SAFCA and Reclamation 1994). Although riparian vegetation occurs along the Sacramento River, these areas are confined to narrow bands between the river and the river side of the levee.

The wildlife species inhabiting the riparian habitats along the lower Sacramento River are essentially the same as those found along the lower American River. These include, but are not limited to, black phoebe, sora, great horned owl, Swainson's hawk, ash-throated flycatcher, wood duck, great blue heron, great egret, green heron, California ground squirrel, and coyote. The freshwater/

emergent wetlands represent habitat for many wildlife species, including reptiles and amphibians such as the western pond turtle, bullfrog, and Pacific tree frog. Agricultural areas adjacent to the river also provide foraging habitat for many raptor species.

The analysis for riparian vegetation evaluates potential changes in flows under any of the alternatives during the peak growing season. The peak growing season for riparian vegetation is typically March through July with the remainder of the growing season extending from August through October. The analysis of effects on riparian vegetation of the upper Sacramento River is based on changes in monthly mean river flows below Keswick Dam resulting from the implementation of the new CVP water service contracts.

Table 5.9-1 shows the modeled mean monthly flows in the upper Sacramento River below Keswick Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition over the entire 72-year period of simulated hydrologic record. Flow changes under Alternative 2B – Proposed Action – Scenario B are very minor; with mean monthly average changes, across the year, generally less than two-tenths of one percent, relative to Base Condition flows. These changes are considered negligible and immeasurable in the context of their potential effects on riparian vegetation and the species that depend on them within the upper Sacramento River.

TABLE 5.9-1

MEAN MONTHLY SACRAMENTO RIVER FLOW RELEASES BELOW KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	5651.8	5645.8	-6.0	-0.1	-538.5 (-10.7)	1966 (BN)
Nov	5290.3	5286.6	-3.7	0.0	-534.0 (-5.7)	1964 (D)
Dec	6877.8	6870.1	-7.7	-0.1	-369.6 (-3.0)	1967 (W)
Jan	8033.1	8033.1	0.1	0.0	-42.7 (-0.3)	1969 (W)
Feb	10164.0	10172.6	8.5	0.1	-116.7 (-3.3)	1961 (D)
Mar	8313.3	8300.9	-12.4	-0.2	-664.9 (-7.1)	1963 (W)
Apr	7203.6	7211.8	8.2	0.0	-211.6 (-2.6)	1931 (C)
May	8241.9	8251.5	9.7	0.1	-23.0 (-0.3)	1947 (D)
Jun	10365.3	10369.0	3.7	0.0	-292.3 (-2.4)	1961 (D)
Jul	12708.9	12721.4	12.5	0.1	-233.1 (-1.7)	1947 (D)
Aug	10505.2	10497.7	-7.5	-0.1	-229.2 (-2.4)	1965 (W)
Sep	7035.7	7035.0	-0.7	0.0	-250.5 (-3.7)	1948 (BN)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives (Alternative 4A, 4B and 4C), and Alternative 1A – No Action Alternative revealed similar inconsequential changes in mean monthly simulated flows in the upper Sacramento River, relative to

Base Condition flows (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

Based on these modeling results and the discussions herein, there would be no anticipated affect on riparian vegetation communities along the upper Sacramento River. This would be considered a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-3 Effects on riparian vegetation in the lower Sacramento River and Delta.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, flow changes in the lower Sacramento River and any hydrologically-induced changes in the position of X2 would be identical to the existing condition. Accordingly, there would be no impacts on riparian vegetation, habitats, and wetlands in these waterbodies.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The analysis of potential effects on riparian vegetation of the lower Sacramento River and the Delta is based on changes in river flows below Freeport caused by the implementation of the new CVP water service contracts. As discussed previously, the growing season for riparian vegetation is typically from March though October, with peak growing periods associated with the months of March through July. In addition to lower Sacramento River flows, the Delta wetlands are very sensitive to fluctuations in water salinity, which are determined by water flows into the Delta. The long-term position of X2 can also be examined to assess any changes in salinity that would potentially affect Delta vegetation.

Table 5.9-2 shows the modeled mean monthly flows in the lower Sacramento River at Freeport under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, for those growing season months (March through October) over the 72-year period of record. Overall, changes in mean monthly flows under Alternative 2B – Proposed Action – Scenario B, relative to Base Condition flows are negligible. There is no appreciable difference or change in mean monthly flows, over the long-term, throughout the growing season months or during the peak growing season months.

Table 5.9-3 reveals the mean monthly position of X2 under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, during the growing season, over the entire 72-year hydrologic period of simulation.

TABLE 5.9-2

MEAN MONTHLY SACRAMENTO RIVER FLOWS AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (cfs)	Relative Difference (%)	Long-Term Mean Monthly Flows (cfs)	Maximum Flow Decrease[2] (cfs)	Maximum Flow Decrease (%)	Notes[3]
Oct	-35.2	-0.3	12524.6	-871.0	-8.7	1931 (C)
Mar	-26.1	-0.1	33667.2	-801.8	-2.5	1963 (W)
Apr	4.7	0.0	24349.2	-67.7	-0.2	1935 (BN)
May	-19.1	-0.1	19604.6	-1565.2	-8.4	1940 (AN)
Jun	-42.9	-0.3	17304.7	-1536.8	-8.9	1936 (BN)
Jul	17.3	0.1	18337.9	-625.5	-5.0	1931 (C)
Aug	-26.4	-0.2	14513.8	-970.4	-6.1	1944 (D)
Sep	7.7	0.2	12393.8	-1173.8	-9.4	1947 (D)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Flow Decrease – refers to the largest decrease in mean flow computed for that month (largest decrease over 72 years).
3. Indicates the year where the maximum decrease in Sacramento River flow (in cfs) occurred for that month, identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

TABLE 5.9-3

MEAN MONTHLY DELTA X2 DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (km)	Relative Percent (%)	Maximum[2] (km)	Notes[3]	
Oct	0.0	0.0	0.3	1952 (W) 1981 (D)	88.7 km to 88.0 km 86.3 km to 86.6 km
Mar	0.0	0.0	0.1	1938 (W) 1948 (BN) 1964 (D)	52.0 km to 52.1 km 77.5 km to 77.5 km 75.2 km to 75.2 km
Apr	0.0	0.0	0.3	1981 (D)	69.5 km to 69.8 km
May	0.0	0.0	0.1	1966 (BN) 1981 (W)	73.9 km to 73.9 km 71.9 km to 72.0 km
Jun	0.0	0.0	0.1	1947 (D)	77.7 km to 77.7 km
Jul	0.0	0.0	0.1	1940 (AN)	75.1 km to 75.2 km
Aug	0.0	0.0	0.0	N/A	
Sep	0.0	0.0	0.8	1980 (AN)	82.3 km to 83.2 km

Notes"
1. Proposed Action –Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum – refers to the largest increase in distance from Golden Gate Bridge (in km) computed for that month (largest increase over 72-years).
3. Indicates the year where the maximum increase (adverse change) in X2 occurred for that month, identifying the water-year type and the actual mean monthly comparison between the base condition and proposed project in that year.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

CALSIM II modeling results show that, over the long-term, shifts in X2 upstream was undetectable. The data also indicate that the maximum shifts occurred only infrequently. Anticipated changes in Delta salinity; at least as reflected in simulated X2 positioning, would be virtually undetectable and would, therefore, have an insignificant effect on Delta vegetation and wetlands.

The CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives

(Alternatives 4A, 4B and 4C), and Alternative 1A – No Action Alternative revealed similar inconsequential changes in mean monthly X2 position, relative to Base Condition flows (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

Based on these modeling results and the discussions herein, there would be no anticipated affect on riparian vegetation communities within the Delta insofar as changing salinity effects and decreased inflows from the Sacramento River is concerned. Accordingly, this would be considered a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-4 Effects on Delta habitats of special-status species (non-fisheries).

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, flow changes in the lower Sacramento River and any hydrologically-induced changes in the position of X2 would be identical to the existing condition. Accordingly, there would be no impacts on special-status species relying on Delta habitats.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

A number of special-status species are known to occur in a range of Delta habitats. As discussed previously, Table 5.9-2 revealed the negligible extent to which flows in the lower Sacramento River (measured at Freeport) would be affected under the proposed new CVP water service contracts. Additionally, Table 5.9-3 showed the immeasurable extent to which X2 would also be affected. Table 5.9-4 shows the mean monthly changes in Delta outflow under Proposed Action – Scenario B, relative to the Base Condition, over the entire 72-year period of hydrologic record.

Consistent with the other CALSIM II modeling results, Table 5.9-4 confirms the inconsequential effect of the proposed new CVP water service contract on Delta outflow. Changes (i.e., decreases) in Delta outflow under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition are small (e.g., no individual mean monthly average, over the 72-year period, exceeded two-tenths of one percent of the corresponding Base Condition flows). Based on these hydrologic indices and, to the extent that Delta habitats for special-status species are influenced by water conditions, it is concluded that Delta habitats would not be significantly affected.

TABLE 5.9-4

**MEAN MONTHLY DELTA OUTFLOW
DIFFERENCE BETWEEN THE BASE CONDITION AND PROPOSED ACTION[1]**

Month	Absolute Difference (cfs)	Relative Percent (%)	Maximum Outflow Decrease[2] (cfs)	Notes[3]
Oct	-2.8	-0.1	-326.6	1963 (BN) -1.2% Base Flow 26,396
Nov	-23.2	-0.2	-647.7	1964 (D) -3.7% Base Flow 17,419
Dec	-40.5	0.1	-1021.7	1942 (WN) -1.7% Base Flow 59,762
Jan	13.2	0.0	-324.7	1948 (BN) -4.3% Base Flow 7,593
Feb	-5.9	0.1	-622.3	1938 (W) -0.4% Base Flow 145,553
Mar	-22.4	-0.1	-820.0	1981 (D) -3.9% Base Flow 21,131
Apr	12.1	0.0	-67.5	1935 (BN) -0.1% Base Flow 52,066
May	-4.9	0.0	-82.9	1935 (BN) -0.3% Base Flow 26,777
Jun	-3.7	0.0	-102.5	1940 (AN) -1.4% Base Flow 7,419
Jul	12.0	0.1	-77.5	1966 (BN) -1.1% Base Flow 7,052
Aug	-7.2	-0.1	-518.2	1980 (AN) -10.2% Base Flow 5,073
Sep	-5.4	-0.1	-116.5	1951 (AN) -3.6% Base Flow 3,269

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Outflow Decrease – refers to the largest decrease in mean Delta outflow computed for that month (largest decrease over 72-years).
3. Indicates the year where the maximum decrease (adverse change) in Delta outflow occurred for that month, identifying the water-year type, the decrease in outflow as a percent of the base condition in that year, and the base condition Delta outflow during that month.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

The CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), and Alternative 1A – No Action Alternative revealed similar inconsequential changes in hydrology having potential influence and implications to Delta habitats (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

Based on these modeling results and the previous discussions, there would be no anticipated significant effect on special-status species habitats within the Delta insofar as changing salinity, decreased inflows from the Sacramento River, and decreased Delta outflow are concerned. Accordingly, this would be considered a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-5 Effects on riparian vegetation of the lower American River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, flow changes in the lower American River and any hydrologically-induced changes to riparian communities would not occur. Accordingly, there would be no impacts on riparian vegetation in the lower American River.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As noted previously, channel and bank geomorphology strongly influences the composition and vegetative structure of riparian zones at any particular location along the river. Willow scrub and alders tend to occupy areas within the active channel of the river. These areas are subject to repeated inundation during elevated winter and spring flows. Cottonwood-willow thickets and cottonwood forests occupy the narrow belts along the active river channel. These communities can be disturbed by the occasional large seasonal flows. Fremont cottonwood dominates these riparian forest zones.

Table 5.9-5 shows the number of months of the May through September growing season when mean monthly flows in the lower American River would be below the 1,750 cfs threshold considered the minimum necessary to support the continued radial growth of cottonwoods. A comparison was made between the Base Condition and Alternative 2B – Proposed Action – Scenario B, over the entire 360 month period of record (five months over each of the 72-years). These results were derived from the same CALSIM II modeling simulations used to generate other hydrological impact indices.

TABLE 5.9-5

NUMBER OF MONTHS WHEN LOWER AMERICAN RIVER FLOWS ARE BELOW 1,750 CFS (MAY THROUGH SEPTEMBER PERIOD) UNDER THE PROPOSED ACTION[1]

	Base Condition	Proposed Action[1]	Difference[2]
Nimbus			
	92	95	3
Watt Avenue			
	112	115	3
H Street			
	129	132	3
LAR Mouth			
	129	132	3

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Difference represents the numerical difference in number of months between Base Condition and Proposed Action; percent differences shown in parentheses.

Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

The results showed that from Nimbus downstream to the mouth of the lower American River, the frequency with which mean monthly flows would be below the 1,750 cfs threshold during the May through September growing season would increase. On average, between 25-36 percent of the time, under current conditions, mean monthly flows in the lower American River (depending on location) are already below 1,750 cfs during the growing season. The proposed new CVP water service contracts would increase this frequency by less than one percent (e.g. 0.8 percent) (see

Table 5.9-5). It should be noted that mean monthly flows are generally indicative of the overall flow conditions that occurred during that particular time period; however, operational fluctuations at Folsom Dam and Reservoir dictate that daily and even hourly flow changes occur (largely dictated by LAROPS Group ramping rate criteria; these conditions also have significant bearing on instream fisheries resources which have been previously discussed).

As noted previously, an average flow of 3,000 cfs is thought to provide "reasonable" growth and maintenance conditions for riparian vegetation (USFWS 1996). Higher flows earlier in the growing season (i.e., April through June) are often critical to the establishment of seedlings on riverine terraces. Table 5.9-6 tabulates the number of years, for each month, when mean monthly flows in the lower American River below Nimbus Dam would be within the flow range considered optimal (i.e., between 2,700 and 4,000 cfs).

TABLE 5.9-6

NUMBER OF YEARS WHEN LOWER AMERICAN RIVER FLOWS BELOW NIMBUS DAM IN OPTIMAL RANGE (2,700 TO 4,000 CFS) UNDER THE PROPOSED ACTION[1]

Month	Base Condition	Proposed Action[1]	Difference
Oct	16	17	1
Nov	10	8	-2
Dec	2	2	0
Jan	6	6	0
Feb	7	7	0
Mar	11	11	0
Apr	14	14	0
May	20	20	0
Jun	21	21	0
Jul	19	17	-2
Aug	12	12	0
Sep	0	0	0

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.

Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

The modeling results show that in only one month, July, would Alternative 2B – Proposed Action – Scenario B, result in a fewer number of years, relative to the Base Condition, when mean monthly flows would be outside of the optimal flow range. A close inspection of the 72-year CALSIM II modeling output revealed that these two years (for July) occurred in 1947 (a dry-year) and 1958 (a wet-year). Base Condition flows in both cases were slightly above 2,700 cfs, but were decreased with the new contract diversions to flow levels below this threshold. The reductions in mean monthly flows for these two years represented a 2.5 and 1.2 percent decrease, respectively, for the simulated 1947 and 1955 hydrology (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Despite the fact that, under Alternative 2B – Proposed Action – Scenario B, two less years would provide mean monthly flows in the optimal range, relative to the Base Condition, the simulated flow reductions for these two years were small and considered less than significant.

The CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives (Alternative 4A, 4B and 4C) and Alternative 1A – No Action Alternative revealed similar inconsequential changes in hydrology that would negate any significant effects on riparian vegetation growth along the lower American River (see Alternatives 2A and 2C – Proposed Action – Scenarios A and C, Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

Based on these modeling results and the previous discussions, there would be no anticipated significant effect on the hydrology necessary to maintain riparian communities in good health in the lower American River. Accordingly, this would be considered a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-6 Effects on backwater pond hydrology in lower American River and its subsequent effect on pond vegetation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, flow changes in the lower American River and its potential effects on backwater pond hydrology and associated vegetative communities would be identical to that under the existing condition. Accordingly, there would be no impacts on backwater ponds along the lower American River corridor.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As discussed previously, backwater ponds along the lower American River support a variety of important riparian vegetation communities and associated wildlife. It has been determined that flows of at least 2,700 cfs are required to adequately recharge the ponds closest to the river. At sustained flows of 1,300 cfs or less, many of the ponds become more shallow and smaller, hold very little water, and become choked with willows. A minimum of 1,300 cfs is considered essential. Overall, it is acknowledged that in order to provide continuous recharge of off-river ponds, flows in the range of 2,750 to 4,000 cfs are needed (Sands et al., 1985; Sands 1986).

Table 5.9-7 shows the number of years, for each month, when mean monthly flows in the lower American River below Nimbus Dam would be within the threshold criteria for minimum backwater pond sustenance and continuous recharge under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Flows were set from the minimum, 1,300 cfs to 4,000 cfs. Tabulated years from CALSIM II hydrology output for the lower American River at this location show the variation between current conditions (Base Condition) and the simulated hydrology under Alternative 2B – Proposed Action – Scenario B.

TABLE 5.9-7

NUMBER OF YEARS WHEN LOWER AMERICAN RIVER FLOWS BELOW NIMBUS DAM IN MIN/OPTIMAL RANGE (1,300 TO 4,000 CFS) UNDER THE PROPOSED ACTION[1]

Month	Base Condition	Proposed Action[1]	Difference[2]
Oct	60 (83.3)	61 (84.7)	1 (1.4)
Nov	42 (58.3)	41 (56.9)	-1 (-1.4)
Dec	46 (63.9)	46 (63.9)	0 (0)
Jan	39 (54.2)	39 (54.2)	0 (0)
Feb	30 (41.7)	29 (40.3)	-1 (-1.4)
Mar	33 (45.8)	33 (45.8)	0 (0)
Apr	40 (55.6)	40 (55.6)	0 (0)
May	41 (56.9)	41 (56.9)	0 (0)
Jun	41 (56.9)	41 (56.9)	0 (0)
Jul	28 (38.9)	28 (38.9)	0 (0)
Aug	49 (68.1)	48 (66.7)	-1 (-1.4)
Sep	49 (68.1)	46 (63.9)	-3 (-4.2)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Difference represents the numerical difference in number of months between Base Condition and Proposed Action; percent differences shown in parentheses.

Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

The results showed that, on average, over the period of record, Alternative 2B – Proposed Action – Scenario B would impart very little change to the number of years of similar months when the mean monthly flows below Nimbus Dam would be outside of the 1,300 to 4,000 cfs threshold. The months of August and September revealed changes. Again, a careful inspection of the CALSIM II modeling output was made to determine the conditions surrounding these occurrences. In all cases, the variations existed as flow decreases to a level below the 1,300 cfs threshold. Water-year types covered most all categories, so no relationship could be drawn with water-year type. Most importantly were the magnitude of flow changes modeled; changes were small (i.e., less than 2 percent; see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Table 5.9-8 shows similar results, but for the lower American River at H Street.

The CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), and Alternative 1A – No Action Alternative revealed similar small and likely undetectable changes in hydrology. Such changes are unlikely to lead to significant effects on backwater pond recharging (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

Based on these modeling results and the previous discussions, there would be no anticipated significant effect on backwater pond recharging and the associated benefits to riparian and pond vegetation communities in those off-river areas of the lower American River. Accordingly, this would be considered a less-than-significant impact.

TABLE 5.9-8

NUMBER OF YEARS WHEN LOWER AMERICAN RIVER FLOWS AT H STREET IN MIN/OPTIMAL RANGE (1,300 TO 4,000 CFS) UNDER THE PROPOSED ACTION[1]

Month	Base Condition	Proposed Action[1]	Difference[2]
Oct	61 (84.7)	61 (84.7)	0 (0)
Nov	43 (59.7)	43 (59.7)	0 (0)
Dec	45 (62.5)	45 (62.5)	0 (0)
Jan	36 (50.0)	35 (48.6)	-1 (-1.4)
Feb	29 (40.3)	30 (41.7)	1 (1.4)
Mar	31 (43.1)	31 (43.1)	0 (0)
Apr	40 (55.6)	41 (56.9)	1 (1.4)
May	44 (61.1)	43 (59.7)	-1 (-1.4)
Jun	43 (59.7)	44 (61.1)	1 (1.4)
Jul	31 (43.1)	32 (44.4)	1 (1.4)
Aug	44 (61.1)	40 (55.6)	-4 (-5.6)
Sep	40 (55.6)	39 (54.2)	-1 (-1.4)

Notes:
1 Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2 Difference represents the numerical difference in number of months between Base Condition and Proposed Action; percent differences shown in parentheses.
Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-7 Effects on special-status species dependent on lower American River riparian and open water habitats.

Alternative 1B – No Project Alternative

Diversions from the CVP system would not change under the No Project Alternative, relative to the existing condition. The flow regime of the lower American River would be identical under No Project Alternative and existing conditions, and riparian vegetation and open water habitats of the lower American River would be not change from the Base Condition. Consequently, there would be no impact on habitat of special-status species dependent on lower American River riparian and open water habitats.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Bank swallow, yellow warbler, yellow-breasted chat, river otter, and several other species are special status species known to occur, nest, or periodically forage in open water and cottonwood forest habitats along the lower American River. The recently de-listed bald eagle is also worth mention here. Thus, potential impacts on cottonwood forests are commonly used to determine whether special-status species dependent on this habitat would be affected by project alternatives.

As discussed in Impacts 5.6-5 and 5.6-6, there would be no significant impact on the maintenance, growth, and establishment of cottonwood communities along the lower American River under any of the alternatives, relative to the Base Condition. This was based on CALSIM II hydrological modeling output that revealed no detectable change in river flows. The potential impacts on cottonwood radial growth maintenance, maximum growth, and establishment are less than significant under any alternative. Moreover, modeling output also showed that off-river open water habitats such as backwater ponds would also remain unaffected, relative to the Base Condition. Therefore, impacts on special-status species associated with riparian and open water habitats also would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-8 Effects on species dependent on Folsom Reservoir near shore and open water habitats.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, the water surface area for Folsom Reservoir and its potential to affect bald eagle and other raptor species foraging levels would be identical to that under the existing condition. Accordingly, there would be no impacts on their foraging activities.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As discussed previously, the bald eagle was de-listed from its federally Threatened status on June 28, 2007 in the lower 48 states. Its primary legal protection was transferred from the Endangered Species Act (ESA) to the Bald and Golden Eagle Protection Act (BGEPA). The bald eagle prefers habitats near seacoasts, rivers, large lakes, and other large bodies of open water with an abundance of fish. Along with other raptor species that depend wholly or in part on Folsom Reservoir's open water or nearshore habitats, CALSIM II modeling data was generated to look at the potential changes in reservoir water surface area.

Table 5.9-9 shows the end-of-month water surface area of Folsom Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, over the 72-year hydrologic period of record. With the new CVP water service contracts, water surface areas (in acres) were shown to decrease with the magnitude of area loss increasing into the summer months. The simulated acreage losses, however, are very small and likely undetectable. The maximum acreage loss, as a percent, is two-tenths of one percent of the total reservoir water surface area (and this would occur during July and August).

TABLE 5.9-9

END-OF-MONTH WATER SURFACE AREA IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (acres)	Proposed Action (acres)	Absolute Difference[2] (acres)	Relative Difference (%)	Maximum Water Surface Area Decrease[3] (acres and %)	Maximum Water Surface Area Increase[4] (acres and %)
Oct	7924.0	7917.4	-6.6	-0.1	-286.0 (-3.6)	739.5 (10.7)
Nov	7384.8	7377.0	-7.8	-0.1	-561.0 (-9.0)	686.3 (10.3)
Dec	7432.8	7438.4	5.6	0.1	-151.4 (-2.4)	624.5 (9.8)
Jan	7601.7	7611.1	9.4	0.1	-120.5 (-2.0)	512.2 (8.7)
Feb	7797.9	7796.3	-1.6	0.0	-59.8 (-1.1)	156.5 (2.4)
Mar	8875.4	8879.2	3.8	0.0	-72.5 (-1.5)	191.2 (2.4)
Apr	9718.9	9711.2	-7.7	-0.1	-82.4 (-1.7)	44.5 (0.4)
May	10238.5	10229.9	-8.5	-0.1	-84.5 (-1.9)	16.9 (0.2)
Jun	9907.0	9996.5	-10.5	-0.1	-241.6 (-2.6)	51.0 (0.5)
Jul	8919.1	8903.6	-15.4	-0.2	-427.1 (-4.9)	245.4 (3.5)
Aug	8508.7	8497.7	-11.0	-0.2	-207.0 (-5.6)	575.4 (7.1)
Sep	8446.5	8438.2	-8.3	-0.1	-276.5 (-6.6)	751..2 (10.7)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Project (in acres), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Area Decrease – refers to the largest decrease in end-of-month water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Water Surface Area Increase – refers to the largest increase in end-of-month water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Based on these hydrologic modeling results, little change would occur in Folsom Reservoir's water surface area. While individual months, in certain years, showed large acreage losses, a corresponding number of equally large acreage gains were also shown for certain months. It is difficult to precisely ascribe an overall effect based on individual years when, there is such variability between years. Folsom Reservoir operations, as part of a coordinated CV/SWP system and, as captured in CALSIM II operational modeling, show years where individual months will either gain or lose water (i.e., water surface area), relative to the Base Condition.

The CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), and Alternative 1A – No Action Alternative revealed similar small and likely undetectable changes in Folsom Reservoir water surface area over the long-term. Such changes are unlikely to lead to significant effects on foraging habitat or foraging behavior of the bald eagle and other raptor species dependent on open water and nearshore habitats (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

Based on these modeling results and the previous discussions, there would be no anticipated significant effect on Folsom Reservoir's open water or nearshore habitats. Accordingly, this would be considered a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.9-9 Direct impacts on the California red-legged frog and Foothill yellow-legged frog.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would be no new diversions from the CVP system, relative to the Base Condition. Consequently, flows in the North Fork American River would be identical to that under the existing condition. Accordingly, there would be no impacts on California red-legged frog (CRLF) and Foothill yellow-legged frog or their sensitive habitats in this reach of the North Fork.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Under Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative, GDPUD is assumed to divert from the North Fork American River at the site of the current American River Pump Station. Downstream of this location, there is the potential for altered flow regimes to affect both the CRLF and Foothill yellow-legged frog, to the extent that these species are present. As noted previously, potential habitat exists for both species upstream of Folsom Reservoir along these riparian corridors.

Table 5.9-10 shows the mean monthly flows in the North Fork American River below the American River Pump Station under Alternative 2C – Proposed Action – Scenario C, relative to the Base Condition. This Alternative was initially addressed since it represents the allocation split between EID and GDPUD where the latter would hold the largest proportion of the new CVP water service contract, therefore, holding the highest potential for hydrological effects on that part of the North Fork American River downstream from their diversion point. The model run for Alternative 2C assumed a GDPUD diversion of 11,000 AFA.

Modeling results showed that simulated mean monthly flows in the North Fork American River downstream of the American River Pump Station would decrease, relative to the Base Condition, with the largest decreases occurring during the June through August period. Interestingly, the maximum flow decreases identified for individual years (over the 72-year period of record) were similar to the long-term modeled changes in mean monthly flows. This implies that the overall mean monthly flow decrease is representative of a nearly consistent inter-annual lowering of flows over the entire period of record and not just a few years, with extremely large variations (see Proposed Action – Scenario C, Technical Appendix I, this Draft EIS/EIR).

TABLE 5.9-10

MEAN MONTHLY NORTH FORK AMERICAN RIVER FLOWS BELOW THE AMERICAN RIVER PUMP STATION DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	675.6	662.6	-13.4	-2.8	-22.8 (-13.8)	1966 (BN)
Nov	936.5	929.4	-7.1	-1.5	-10.0 (-5.1)	1976 (C)
Dec	1788.8	1782.8	-6.0	-1.0	-8.6 (-4.7)	1971 (W)
Jan	2250.7	2244.4	-6.3	-0.8	-6.3 (-5.8)	Several
Feb	3061.5	3054.9	-6.5	-0.5	-7.8 (-4.7)	1991 (C)
Mar	3138.7	3132.0	-6.7	-0.4	-8.5 (-2.4)	1970 (W)
Apr	3272.7	3262.2	-10.5	-0.5	-11.1 (-3.2)	Several
May	3110.7	3099.3	-11.5	-0.7	-12.2 (-3.3)	Several
Jun	1829.4	1807.5	-21.9	-2.7	-24.0 (-20.4)	Several
Jul	913.1	891.3	-21.8	-3.4	-24.0 (-21.1)	Several
Aug	690.7	667.3	-23.4	-3.8	-28.2 (-23.6)	1966 (BN)
Sep	604.4	587.1	-17.3	-3.5	-29.4 (-21.9)	1981 (D)

Notes:
1. Proposed Action – Scenario C – modeled 11 TAF from PCWA Auburn Pump Station site on an August through October diversion pattern and 4 TAF diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

The modeling results indicate that during the summer months, the long-term average decrease in mean monthly flows, relative to the Base Condition would approximate 3-4 percent. Flow changes approaching 5 percent of the Base Condition begin to impart increasingly significant implications to sensitive-species dependent on flow-based habitat conditions. To the extent the CRLF and Foothill yellow-legged frog are present in and around the areas downstream of this diversion location, there could be adverse impacts on these species.

As noted previously, marginally suitable habitat for the CRLF occurs on the project site. Minimal riparian and herbaceous streamside cover and the presence of exotic predators reduce the habitat values for the CRLF and the likelihood for occurrence. While summer surveys (non protocol) did not reveal the presence of the CRLF, a final determination of presence or absence cannot be made until the completion of spring surveys for adults and egg masses. Should the CRLF occur on project sites, then direct impacts from reduced river flows could negatively affect the species and could lead to its decline in those areas downstream from the diversion point. Under the simulated hydrology of Alternative 2C – Proposed Action – Scenario C, this is considered as a potentially significant impact.

Table 5.9-11, alternatively, shows the same mean monthly flows in the North Fork American River at this same location but under Alternative 2A – Proposed Action – Scenario A. Under this alternative allocation scenario, both EID and GDPUD would share equally, the water made available by the new CVP water service contract with GDPUD taking an assumed 7,500 AFA instead of 11,000 AFA.

Modeling results showed that, under this diversion scenario, long-term changes in flows were less, than those simulated under Scenario C.

TABLE 5.9-11

MEAN MONTHLY NORTH FORK AMERICAN RIVER FLOWS BELOW AUBURN DAM SITE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	675.6	667.4	-8.2	-1.7	-16.8 (-9.3)	1966 (BN)
Nov	936.5	932.3	-4.2	-0.9	-7.1 (-3.5)	1976 (C)
Dec	1788.8	1785.3	-3.5	-0.6	-6.1 (-3.2)	1971 (W)
Jan	2250.7	2246.4	-4.3	-0.5	-4.3 (-3.9)	Several
Feb	3061.5	3057.3	-4.1	-0.3	-5.6 (-3.4)	1991 (C)
Mar	3138.7	3134.3	-4.4	-0.2	-6.2 (-1.7)	1970 (W)
Apr	3272.7	3265.6	-7.1	-0.3	-7.6 (-2.2)	Several
May	3110.7	3102.9	-7.8	-0.4	-8.3 (-2.2)	Several
Jun	1829.4	1814.5	-14.9	-1.9	-16.4 (-13.9)	Several
Jul	913.1	898.3	-14.8	-2.3	-16.3 (-14.3)	Several
Aug	690.7	675.2	-15.4	-2.5	-19.4 (-16.1)	1966 (BN)
Sep	604.4	594.4	-10.0	-2.1	-21.5 (-14.9)	1981 (D)

Notes:
1. Proposed Action – Scenario A – modeled 7.5 TAF from PCWA Auburn Pump Station site and 7.5 TAF from Folsom Reservoir at EID's existing intake; on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Based on these hydrologic modeling results, mean monthly flows in the North Fork American River would not change significantly. While individual months, in certain years, showed flow decreases approximating 20 cfs, the over-all long-term decrease in mean monthly flows would be less than 3 percent.

The CALSIM II modeling results for Alternative 2B – Proposed Action – Scenarios B, along with Alternative 3 – Water Transfer Alternative, the Reduced Diversion Alternatives (Alternatives 4A, 4B and 4C), and Alternative 1A – No Action Alternative revealed similar small changes in North Fork American River flows over the long-term. Such changes would unlikely lead to significant effects on CRLF and Foothill yellow-legged frog or their sensitive habitats (see Proposed Action – Scenario B, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Accordingly, this would be considered a less-than-significant impact.

Mitigation Measures

Alternative 2C – Proposed Action – Scenario C

Potential impacts on the CRLF and Foothill yellow-legged frog could be significant in the portion of this reach of the North Fork American River. As shown by the hydrologic modeling output, Alternative 2C – Proposed Action – Scenario C, could impart flow-related effects on the sensitive habitats of these species. These effects, however, were shown to decrease under Alternative 2A. Potential mitigation measures for these hydrologic effects could include:

- Avoidance of Alternative 2C altogether (by selecting Alternatives 2A or 2B); or,
- Adjusting the summer diversion pattern assumed in the modeling to a more typical annual demand pattern (i.e., flatten the July – September peaks)

For the potential construction-related effects, which are not diversion-related, there is no legal authority requiring EDCWA to take action related to such speculative future projects that could be implemented by GDPUD. The obligation to adopt feasible mitigation measures only arises when an agency proposes to *approve a project* with significant environmental impacts.

Future and specific mitigation measures would be prepared at the time project-specific actions are initiated and would become a part of the project-level environmental documentation for that action. This current EIS/EIR does not provide the environmental analysis necessary to support all of the new facilities ultimately required by GDPUD, at the location of the American River Pump Station to divert water made available by the new CVP water service contract for GDPUD. At present, no details are available as to the nature of these required facilities that would lend themselves to a project-specific analysis.

Nevertheless, in the interests of full disclosure, it is prudent to identify the types of mitigation measures that would benefit and help offset the potential hydrological effects revealed by the simulation modeling, if Alternative 2C were chosen. In the future, when GDPUD actively proceeds with this new facility project, mitigation measures addressing the potential hydrological effects on either CRLF and Foothill yellow-legged frog could include:

- The EDCWA shall ensure that a spring survey in accordance with all applicable USFWS survey protocols is conducted by a qualified biologist during the appropriate spring survey window in areas with suitable habitat that will be affected.
- Should no CRLF adults or egg masses be observed during the spring survey, then no further mitigation shall be required. If CRLF are determined to be present, then the following mitigation measure could be implemented:
- Either a no jeopardy biological opinion or an incidental take permit shall be obtained from the USFWS for potential impacts on the CRLF. All the terms and conditions of the biological opinion or the incidental take permit from the USFWS shall be implemented. While at the discretion of the USFWS, the above-mentioned terms and conditions will likely include a requirement to avoid and minimize habitat impacts and measures to restore impacted areas and enhance other areas along the creeks or reservoirs to benefit the CRLF. Regardless of USFWS direction, however, GDPUD, at a minimum, commit to a no net loss [of CRLF habitat] performance standard, but shall defer to the USFWS to determine if a higher mitigation ratio is required, and to determine how the performance standard will be satisfied.
- Implementation of the above mitigation measure would reduce the potential impacts under Proposed Action – Scenario C, to less than significant.

5.10. WATER-RELATED RECREATIONAL RESOURCES (DIVERSION-RELATED IMPACTS)

This subchapter addresses existing recreational uses within the regional and local study areas that could potentially be directly affected by the Proposed Action and its Alternatives. It presents an analysis of the potential effects on water-related recreational resources. Mitigation measures for any impacts found to be significant are identified if feasible. Potential indirect effects of implementation of the Proposed Action and Alternatives on recreational resources within the Subcontractor service areas are addressed later in this chapter.

5.10.1. CEQA Standards of Significance

Impacts on water-related recreational activities or facilities were considered significant if they would:

- Result in a substantial conflict with established water-dependent or water-enhanced recreational uses of Folsom Reservoir, lower American River, as well as the upper and lower Sacramento River and Delta;
- Result in an inconsistent activity to the American River Parkway Plan;
- Result in a substantial change in river access or channel conditions that would decrease water-based recreational activities. For purposes of this analysis, the following thresholds are applicable;
- substantial decrease in the duration of Middle Fork American River flows below the 850 cfs threshold for whitewater boating;
- substantial change in lower American River flows above or below the 1,750 to 6,000 cfs minimum/maximum range of adequate recreational flows;
- substantial change in lower American River flows above or below the 3,000 to 6,000 cfs optimum range of adequate recreational flows;
- substantial decrease in upper or lower Sacramento River flows below 5,000 cfs;
- Shasta Reservoir boat launching criteria (reservoir elevation in msl; point at which boat launches must be closed);

    Sacramento Arm
    Antlers (995 ft)
    Sugarloaf #1 (955 ft)
    Sugarloaf #2 (918 ft)

    McLeod Arm
    Baily Cover (1,017 ft)
    Hirz Bay #1 (1,020 ft)
    Hirz Bay #2 (973 ft)
    Birz Bay #3 (941 ft)

<u>Pit Arm</u>
Packers Bay (951 ft)
Centimundi #1 (943 ft)
Centimundi #2 (876 ft)
Centimundi #3 (848 ft)
Jones Valley #1 (980 ft)
Jones Valley #2 (924 ft)
Jones Valley #3 (856 ft)

- Trinity Reservoir boat launching criteria (reservoir elevation in msl; point at which boat launches must be closed);
- Fairview – Trinity Dam area (2,310 ft);
- Main Arm – Trinity Center (2,295 ft);
- Stuart Fork Arm – Minersville (2,170 ft); and/or
- Folsom Reservoir recreational thresholds (reservoir elevation in msl) including:
  - When all boat ramps are usable (420 feet or higher);
  - When the marina wet slips are usable (412 feet or higher); and
- When the swimming beaches are usable (420 feet to 455 feet).

5.10.2. Impacts and Mitigation Measures

5.10-1 Result in a substantial conflict with established water-dependent or water-enhanced recreational uses in Folsom Reservoir, the lower American River, upper Sacramento River reservoirs, upper and lower Sacramento River, and the Delta or, result in activities inconsistent with the American River Parkway Plan.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in reservoir or river hydrology are anticipated since no new water diversions of any kind are assumed. Without changes in hydrology, no impacts on water-enhanced or water-dependent recreational activities or facilities would be expected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Alternatives 2A, 2B and 2C under the Proposed Action as well as the other Alternatives, including Alternative 1A – No Action Alternative, except for Alternative 1B, would result in increased diversions from CVP reservoirs. This is the defining nature of the Proposed Action itself. These new diversions, however, would not necessarily conflict with any established water-dependent or water-enhanced recreational uses but would depend on the extent of hydrological changes in the reservoirs and watercourses associated with these actions. These changes are fully evaluated and discussed under Impact 5.7-2, below.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.10-2 Result in a substantial change in river access or channel conditions that would decrease water-based recreational activities. For purposes of this analysis, the following thresholds are applicable:

1. **Substantial decrease in the duration of Middle Fork American River flows below the 850 cfs threshold for boating.**
2. **Substantial change in lower American River flows above or below the 1,750 to 6,000 cfs minimum/maximum range of adequate recreational flows; substantial change in lower American River flows above or below the 3,000 to 6,000 cfs optimum range of adequate recreational flows.**

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in reservoir or river hydrology are anticipated since no new water diversions of any kind are assumed. Without changes in hydrology, no impacts on water-enhanced or water-dependent recreational activities or facilities would be expected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

For the lower American River, the maximum and minimum monthly mean flows over the 72-year simulation were compared between the Base Condition and each of the alternatives. In order to estimate the magnitude and frequency of bank exposure and bank inundation along the lower American River, two locations were assessed: Nimbus Dam and the river mouth (confluence with the Sacramento River). A stage/discharge relationship has not been developed for the entire reach of the lower American River and such data have yet to be incorporated into CALSIM II modeling output. For this reason, it is difficult to quantify precisely the potential for exposure or inundation of recreation facilities along the banks of the lower American River. It is generally accepted, however, that higher water surface elevations occur under higher flows and lower water elevations occur under lower flows. A comparison of flows under the existing condition and each of the alternatives provides an estimate of the relative changes in river stage that could result. River flows, therefore, are used as surrogates for river stage (water surface elevations).

North Fork and Middle Fork American River Above and Below the American River Pump Station

Upper basin modeling showed that the long-term average mean monthly flows above the American River Pump Station would not change under any of the Alternatives, including the various Proposed

Action scenarios, relative to the Base Condition (see Proposed Action – Scenarios A, B and C, and All Alternatives, Technical Appendix I, this Draft EIS/EIR). Below the American River Pump Station, modeling results indicated that under Alternative 2A – Proposed Action – Scenario A, there would be slight, albeit undetectable changes in long-term mean monthly flows, relative to the Base Condition (see Table 5.10-1).

TABLE 5.10-1

MEAN MONTHLY FLOWS BELOW THE AMERICAN RIVER PUMP STATION DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	675.6	667.4	-8.2	-1.7
Nov	936.5	932.3	-4.2	-0.9
Dec	1,788.8	1,785.3	-3.5	-0.6
Jan	2,250.7	2,246.4	-4.3	-0.5
Feb	3,061.5	3,057.3	-4.1	-0.3
Mar	3,138.7	3,134.3	-4.4	-0.2
Apr	3,272.7	3,265.6	-7.1	-0.3
May	3,110.7	3,102.9	-7.8	-0.4
Jun	1,829.4	1,814.5	-14.9	-1.9
Jul	913.1	898.3	-14.8	-2.3
Aug	690.7	675.2	-15.4	-2.5
Sep	604.4	594.4	-10.0	-2.1

Notes:
1. Proposed Action – Scenario A – modeled at 7.5 TAF diverted from Folsom Reservoir and 7.5 TAF diverted from the Auburn Dam site for GDPUD on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Under Alternative 2B – Proposed Action – Scenario B, where the total diversions modeled are shifted completely to EID's intake on Folsom Reservoir, these changes in upper American River flows below the American River Pump Station are reduced to zero (see Proposed Action – Scenarios B, Technical Appendix I, this Draft EIS/EIR). As discussed previously, under Alternative 2C – Proposed Action – Scenario C, the modeled changes in long-term mean monthly flows would decrease more substantively than those under Scenario A (see Table 5.10-2). With a larger GDPUD diversion (i.e., 11,000 AF) under this particular modeling scenario, these results are not unexpected. Under Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, there were simulated decreases in long-term mean monthly flows; however, these changes were less than those reported under Alternative 2A – Proposed Action – Scenario A (see Table 5.10-1). Likewise, for Alternative 1A – No Action Alternative which assumed a corresponding water supply allocation (from a presumed water right acquisition or transfer), the modeled results were similar to those under Alternative 2A – Proposed Action – Scenario A (see Proposed Action – Scenarios A, Technical Appendix I, this Draft EIS/EIR).

TABLE 5.10-2

MEAN MONTHLY FLOWS BELOW AUBURN DAM SITE DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	675.6	662.2	-13.4	-2.8
Nov	936.5	929.4	-7.1	-1.5
Dec	1,788.8	1,782.8	-6.0	-1.0
Jan	2,250.7	2,244.4	-6.3	-0.8
Feb	3,061.5	3,054.9	-6.5	-0.5
Mar	3,138.7	3,132.0	-6.7	-0.4
Apr	3,272.7	3,262.2	-10.5	-0.5
May	3,110.7	3,099.3	-11.5	-0.7
Jun	1,829.4	1,807.5	-21.9	-2.7
Jul	913.1	891.3	-21.8	-3.4
Aug	690.7	667.3	-23.4	-3.8
Sep	604.4	587.1	-17.3	-3.4

Notes:
1. Proposed Action – Scenario C – modeled at 4 TAF diverted from Folsom Reservoir and 11 TAF diverted from the Auburn Dam site for GDPUD on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

While changes in mean monthly flows, over the 72-year period of record were observed in the hydrologic modeling output, these changes were small. From a recreational use perspective, long-term changes in river flows of these magnitudes would unlikely be observable or affect, in any measurable way, the water-enhanced activities that occur within this reach of the river. Therefore, changes in the upper American River would be a less-than-significant impact on recreation resources downstream of the American River Pump Station.

Recognizing the importance of rafting above the American River Pump Station, long-term changes in mean monthly flows were shown to have no effect on river hydrology, upstream of this site. The hydrologic modeling incorporated diversions at the site, as a reflection of GDPUD's future diversions from the American River Pump Station at this location. No changes in upstream hydrology would occur. The frequency with which flows would be below, at, or above the 850 cfs threshold considered necessary for rafting would not change between the Base Condition and any of the Alternatives.

Lower American River

CALSIM II modeling results confirmed that for the 5-month recreation season (May through September), Alternative 2B – Proposed Action – Scenario B would result in virtually the identical number of months, relative to the Base Condition, where mean monthly flows in the lower American River (below Nimbus Dam) would be less than 1,750 cfs. A careful examination of the entire 72-year period of record for these months (360 months in total) revealed that this would apply to all dry and critically-dry periods as well (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). At the mouth of the lower American River, modeling results showed that, under

Alternative 2B, 130 months of the 72-year recreational period would result in mean monthly flows below 1,750 cfs. This represents one additional month, relative to the 129 months simulated for the Base Condition. Such small changes in frequency would not constitute a significant impact on water-enhanced or water-dependent recreational activities.

Table 5.10-3 shows the mean monthly simulated CALSIM II flows for the lower American River below Nimbus Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition. Long-term changes in mean monthly flows are small; flow changes, as a percent difference would be undetectable from a recreational water-enhanced and water-dependent activities perspective. Under Alternative 2A – Scenario A, with an equitable split of diversion between EID and GDPUD, the modeling results showed a similar variation in magnitude and frequency, relative to the Base Condition.

TABLE 5.10-3

MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
May	3683.2	3675.2	-7.9	-0.2	-58.9 (-2.5)	239.7 (7.3)
Jun	3933.9	3910.4	-23.6	-0.8	-150.6 (-8.7)	531.7 (18.0)
Jul	3846.4	3820.4	-26.0	-0.9	-467.6 (-14.2)	77.2 (1.6)
Aug	2138.4	2103.7	-34.7	-1.7	-1467.5 (-63.9)	405.1 (17.2)
Sep	1503.2	1475.9	-27.4	-2.0	-1156.2 (-67.3)	67.2 (9.4)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

A careful examination of the individual year model results over the 72-year hydrologic record for the months of April through September showed that the number of months, under the Base Condition where, mean monthly flows in the lower American River below Nimbus Dam would be above the 3,000 cfs minimum boundary (defining the optimum flow range for recreational flows) would remain virtually unchanged with Alternative 2B – Proposed Action – Scenario B. Under the Base Condition, 432 months of the recreational season maintained mean monthly flows at or above 3,000 cfs. Under Alternative 2B, 431 months maintained these flows (see Proposed Action – Scenarios B, Technical Appendix I, this Draft EIS/EIR). With such small changes in the frequency with which the lower American River below Nimbus Dam would meet optimal recreational flow requirements, relative to the Base Condition, such impacts were deemed to be less than significant.

Table 5.10-4 shows the comparable results for the Water Transfer Alternative, relative to the Base Condition. Under this alternative, mean monthly flows in the lower American River below Nimbus

Dam would be reduced, relative to the Base Condition. The magnitude of these mean monthly long-term changes; however, from a relative percent perspective, would not be considered significant to recreational uses and facilities.

TABLE 5.10-4

MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND WATER TRANSFER ALTERNATIVE[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Water Transfer Alt. (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
May	3683.2	3665.8	-17.4	-0.5	-150.1 (-3.3)	358.9 (10.9)
Jun	3933.9	3881.4	-52.6	-1.8	-173.8 (-11.0)	513.3 (17.4)
Jul	3846.4	3796.5	-49.9	-1.8	-488.1 (-14.8)	40.9 (0.9)
Aug	2138.4	2089.3	-49.1	-2.4	-1485.0 (-66.4	633.3 (26.5)
Sep	1503.2	1473.7	-29.5	-0.7	-1159.4 (-67.4)	993.9 (174.9)

Notes:
1. Water Transfer Alternative – modeled 15 TAF of non-CVP water from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Water Transfer Alternative (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Water Transfer Alternative, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Water Transfer Alternative, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.10-3 Result in a substantial decrease in upper or lower Sacramento River flows below 5,000 cfs.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in reservoir or river hydrology are anticipated since no new water diversions of any kind are assumed. Without changes in hydrology, no impacts on water-enhanced or water-dependent recreational activities or facilities would be expected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.10-5 shows the modeled flows in the upper Sacramento River below Keswick Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition for the recreational months of May through September. Changes in mean monthly flows over the 72-year period of hydrologic record are unchanged. Long-term mean monthly flows under the Base Condition are over 5,000 cfs. For upper Sacramento River flows, these immeasurable changes in hydrology as demonstrated by CALSIM II modeling results under Alternative 2B – Proposed Action – Scenario B, indicate that no potential impacts on recreational uses and activities, both water-enhanced and water-dependent would occur.

TABLE 5.10-5

MEAN MONTHLY SACRAMENTO RIVER FLOW RELEASES BELOW KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
May	8241.9	8251.5	9.7	0.1	-23.0 (-0.3)	1947 (D)
Jun	10365.3	10369.0	3.7	0.0	-292.3 (-2.4)	1961 (D)
Jul	12708.9	12721.4	12.5	0.1	-233.1 (-1.7)	1947 (D)
Aug	10505.2	10497.7	-7.5	-0.1	-229.2 (-2.4)	1965 (W)
Sep	7035.7	7035.0	-0.7	0.0	-250.5 (-3.7)	1948 (BN)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

CALSIM II modeling results confirm that for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, similar, undetectable changes in mean monthly flows in the upper Sacramento River would occur. Simulated flows under Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative are similar to those of Alternatives 2A, 2B and 2C (see Water Transfer Alternative and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

For the lower Sacramento River, similar modeling results are evident. Table 5.10-6 presents the long-term mean monthly flows in the lower Sacramento River at Freeport under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, again, for those recreational months (May through September).

Long-term simulated mean monthly river flow changes under Alternative 2B – Proposed Action – Scenario B, would be imperceptible, relative to the Base Condition. Flows in the lower Sacramento River during these months are typically in the 12,000 to 19,000 cfs range, well above the threshold for water-dependent and water-enhanced recreational impact significance.

Simulated flows under Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative are similar to those of Alternative 2B, and the other various alternative Proposed Action scenarios (see Water Transfer Alternative and No Action Alternative, Technical Appendix I, this Draft EIS/EIR).

TABLE 5.10-6

MEAN MONTHLY SACRAMENTO RIVER FLOWS AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (cfs)	Relative Difference (%)	Long-Term Mean Monthly Flows (cfs)	Maximum Flow Decrease[2] (cfs)	Maximum Flow Decrease (%)	Notes[3]
May	-19.1	-0.1	19604.6	-1565.2	-8.4	1940 (AN)
Jun	-42.9	-0.3	17304.7	-1536.8	-8.9	1936 (BN)
Jul	17.3	0.1	18337.9	-625.5	-5.0	1931 (C)
Aug	-26.4	-0.2	14513.8	-970.4	-6.1	1944 (D)
Sep	7.7	0.2	12393.8	-1173.8	-9.4	1947 (D)

Notes:
1. Proposed Action – Scenario B modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Flow Decrease – refers to the largest decrease in mean flow computed for that month (largest decrease over 72-years).
3. Indicates the year where the maximum decrease in Sacramento River flow (in cfs) occurred for that month, identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Accordingly, the potential impacts on water-dependent and water-enhanced recreational uses, activities and facilities in both the upper and lower Sacramento River reaches would be less than significant under any of the Alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.10-4 Shasta Reservoir boat launching criteria (reservoir elevation in msl; point at which boat launches must be closed):

1. **Sacramento Arm: Antlers (995 ft) Sugarloaf #1 (955 ft) Sugarloaf #2 (918 ft).**
2. **McLeod Arm: Baily Cover (1,017 ft) Hirz Bay #1 (1,020 ft) Hirz Bay #2 (973 ft) Birz Bay #3 (941 ft).**
3. **Pit Arm: Packers Bay (951 ft) Centimundi #1 (943 ft) Centimundi #2 (876 ft) Centimundi #3 (848 ft) Jones Valley #1 (980 ft) Jones Valley #2 (924 ft) Jones Valley #3 (856 ft).**

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in reservoir hydrology are anticipated since no new water diversions of any kind are assumed. Without changes in hydrology, no impacts on boat launching availability, frequency or usage would be expected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.10-7 illustrates the long-term mean monthly water surface elevations at Shasta Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition for the summer recreational months. Mean monthly reservoir water surface elevations are all over 1,000 ft msl, except for the months of August and September when the long-term averages are 989 and 982 ft msl, respectively. The modeling data indicate that no measurable change, relative to the Base Condition would occur in summer period water surface elevations under Alternative 2B. Boat launch availability, therefore, would remain unaffected at the reservoir. Current conditions do, however, show that some boat launches are unusable on a long-term average, based on mean water surface elevations over the 72-year modeling simulation period. Still, boaters would have other options, primarily moving to those launches on the Pit Arm of the reservoir where all boat launches would have increased access, based on long-term hydrologic modeling.

TABLE 5.10-7

MEAN MONTHLY WATER SURFACE ELEVATIONS IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Notes[4]
May	1037.7	1037.6	-0.1	0.0	-1.5 (-0.1)	1965 (W)
Jun	1026.0	1025.9	-0.1	0.0	-1.6 (-0.2)	1965 (W)
Jul	1005.6	1005.5	-0.1	0.0	-3.4 (-0.3)	1965 (W)
Aug	989.0	988.9	-0.1	0.0	-2.8 (-0.3)	1965 (W)
Sep	982.4	982.3	-0.1	0.0	-2.7 (-0.3)	1965 (W)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

CALSIM II modeling results confirm that for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, similar, undetectable changes in mean monthly water surface elevations at Shasta Reservoir would occur. Simulated water surface elevations under Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative are similar to those of Alternatives 2A, 2B and 2C (see Water Transfer Alternative and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Accordingly, the potential impacts on boat launch availability at Shasta Reservoir would be less than significant under any of the Alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.10-5 Trinity Reservoir boat launching criteria (reservoir elevation in msl; point at which boat launches must be closed):

1. **Fairview – Trinity Dam area (2,310 ft)**
2. **Main Arm – Trinity Center (2,295 ft)**
3. **Stuart Fork Arm – Minersville (2,170 ft)**

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in reservoir hydrology are anticipated since no new water diversions of any kind are assumed. Without changes in hydrology, no impacts on boat launching availability, frequency or usage would be expected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.10-8 illustrates the long-term simulated mean monthly water surface elevations at Trinity Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, for the summer period (May through September). Similar to Shasta Reservoir, Alternative 2B would impart no measurable or detectable change in water surface elevation at the reservoir, relative to current or Base Conditions. This is based on a 72-year period of record for simulated hydrologic modeling of the reservoir's mean monthly water surface elevations. Nevertheless, even under existing conditions today, not all boat launches remain operable during all months of all water years. Over the long-term, as depicted by the data in Table 5.10-8, the Trinity Center and Minersville boat launches would be operable over approximately the entire summer recreation period. The boat launch at Fairview in the Trinity Dam area, however, would typically only be available during the earlier portion of the summer (i.e., May and June).

Overall, boating access at Trinity Reservoir would not be measurably affected by any of Alternatives 2A, 2B and 2C. Water surface elevations in the reservoir, as modeled, would remain unaffected. Simulated water surface elevations under Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative are similar to those of Alternatives 2A, 2B and 2C (see Water Transfer Alternative and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Accordingly, the potential impacts on boat launch availability at Trinity Reservoir would be less than significant under any of the Alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

TABLE 5.10-8

MEAN MONTHLY WATER SURFACE ELEVATIONS IN TRINITY RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Notes[4]
May	2319.7	2319.7	-0.1	0.0	-0.6 (0.0)	1992 (C)
Jun	2315.5	2315.5	-0.1	0.0	-0.8 (0.0)	1992 (C)
Jul	2303.1	2303.1	0.0	0.0	-0.9 (0.0)	1992 (C)
Aug	2290.6	2290.6	0.0	0.0	-0.8 (0.0)	1991 (C)
Sep	2280.1	2280.0	-0.1	0.0	-2.7 (-0.1)	1963 (W)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

5.10-6 Folsom Reservoir recreational thresholds (reservoir elevation in msl) including:

1. **When all boat ramps are usable (420 feet or higher).**
2. **When the marina wet slips are usable (412 feet or higher).**
3. **When the swimming beaches are usable (420 feet to 455 feet).**

Alternative 1B – No Project Alternative

Under the No Project Alternative, no changes in reservoir hydrology are anticipated since no new water diversions of any kind are assumed. Without changes in hydrology, no impacts on boat launching availability, frequency or usage would be expected under the No Project Alternative.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

CALSIM II modeling output showed that under Alternative 2B – Proposed Action – Scenario B, there would no change in the number of months, during the summer recreational period, when water surface elevations at Folsom Reservoir would be below 412 ft msl, relative to the Base Condition. Under both the Base Condition and Alternative 2B, there would be 75 months (out of 442 total months) or 17 percent of the time, when this condition would occur (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR). Over the five-month recreational season, reservoir elevations would be, on average, below 412 ft msl in one month.

Table 5.10-9 shows the simulated mean monthly water surface elevations in Folsom Reservoir under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition, for the summer recreation period (May through September). Over the long-term, there would be no measurable or detectable change in water surface elevations, based on modeled simulations. In some months, of some years, a more substantial change in water surface elevation would occur, but these occurrences would be infrequent and even when the maximum decreases are noted for any of the summer months, the relative percent changes are small (i.e., approximately 1 percent, relative to the Base Condition).

TABLE 5.10-9

MEAN MONTHLY WATER SURFACE ELEVATIONS IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Maximum Water Surface Elevation Increase[4] (ft msl and %)
May	451.2	451.1	-0.1	0.0	-1.0 (-0.3)	0.3 (0.1)
Jun	446.2	446.0	-0.2	0.0	-4.8 (-1.1)	0.8 (0.2)
Jul	430.9	430.7	-0.2	0.0	-3.2 (-0.8)	3.3 (0.8)
Aug	425.6	425.4	-0.2	-0.1	-3.5 (-1.0)	7.7 (1.8)
Sep	424.8	424.6	-0.1	0.0	-3.8 (-1.1)	10.1 (2.5)`

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Water Surface Elevation Increase – refers to the largest increase in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Folsom Reservoir, not unlike other CVP/SWP reservoirs which serve multiple functions, is typically at its highest storage volume at the end of the flood operating season (e.g., April/May). From this point forward, and depending on the demands placed on the reservoir for consumptive water demands, downstream flow release/thermal management, and weather conditions, reservoir volumes can diminish rapidly.

The data in Table 5.10-9 illustrate this clearly. Long-term mean monthly water surface elevations in Folsom Reservoir decline from over 451 ft msl in May, to about 425 ft msl in September; a 25 ft vertical drop in elevation over the course of the summer recreation season. The same data trends are true for Alternatives 2A and 2C. Based on these hydrologic data, recreational activities, facilities, and use of the reservoir for both water-dependent and water-enhanced activities would not be significantly affected by any of the scenarios under the Proposed Action.

Simulated water surface elevations under Alternative 3 – Water Transfer Alternative and Alternative 1A – No Action Alternative are similar to those of Alternatives 2A, 2B and 2C (see Water Transfer Alternative and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Accordingly, the potential impacts on boat launch availability, marina wet slips, and swimming activities at Folsom Reservoir would be less than significant under any of the Alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.11. WATER-RELATED CULTURAL RESOURCES (DIVERSION-RELATED IMPACTS)

This subchapter addresses existing cultural resources within the regional and local study areas and presents an analysis of potential effects of the proposed new CVP water service contract on water-related cultural resources.

5.11.1. CEQA Standards of Significance

Under 36 CFR 800.5, "An adverse effect [i.e., a significant impact] is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." The National Historic Preservation Act defines an adverse effect on an eligible resource as any of the following (36 CFR 800.5):

- Physical destruction, damage, or alteration, including moving the property from its historic location.
- Isolation from or alteration of the setting.
- Introduction of intrusive elements.
- Neglect leading to deterioration or destruction.
- Transfer, sale, or lease from federal ownership.

CEQA equates a substantial adverse change in the significance of an historical resource with a significant effect on the environment (PRC Section 21084.1). Under the CEQA Guidelines, impacts on cultural resources may be considered significant if a project alternative would result in any of the following:

- Cause a substantial adverse change in the significance of an historical resource as defined in Guidelines Section 15064.5
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Guidelines Section 15064.5
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature
- Disturb any human remains, including those interred outside of formal cemeteries.

Hydrologic modeling results from CALSIM II were used to determine whether the magnitude and frequency of changes in reservoir water surface elevations or river flows would adversely affect known or potential historical resources, or unique archaeological resources. The standards of impact significance, therefore, included the following:

- result in substantial elevation or lowering water level fluctuation zone, relative to the basis of comparison, which would result in increased inundation of previously exposed areas or exposure of previously inundated lands with sufficient frequency to adversely affect historic properties; or
- result in substantial increase in maximum monthly mean river flows or decrease in minimum monthly mean river flows, relative to the basis of comparison, which would result in increased inundation of previously exposed areas or exposure of previously inundated lands with sufficient frequency to adversely affect historic properties.

5.11.2. Impacts and Mitigation Measures

Fluctuations in surface water levels are considered an existing, and accepted, hydrological operation of reservoirs and river flows that could be affected by implementation of the new CVP water service contracts. A stage/discharge relationship, however, has not yet been developed for the entire reach of the lower American River as well as other rivers. For this reason, it is difficult to quantify precisely the potential for exposure or inundation of cultural resources along the banks of rivers. It is generally accepted that higher water surface elevations occur under higher flows and lower water elevations occur under lower flows. A comparison of flows under the current conditions and each of the Alternatives provides an estimate of the relative changes in river stage that could result. River flows, therefore, are used as surrogates for river stage (water surface elevations).

5.11-1 Effects of changes in water surface elevations in Folsom, Shasta, and Trinity reservoirs on cultural resources.

Alternative 1B – No Project Alternative

Under the No Project Alternative, there would no change in diversions from the CVP system, relative to the Base Condition. Consequently, Shasta, Trinity, and Folsom reservoir elevations would remain unchanged from existing conditions, and there would no impact on cultural resources resulting from erosion/scouring, deflation, hydrologic sorting, and artifact displacement, caused by waves and currents.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Prehistoric and historic sites within the zone of seasonal fluctuation or drawdown in reservoirs suffer the greatest affects under existing conditions, primarily in the form of erosion/scouring, deflation, hydrologic sorting, and artifact displacement, caused by waves and currents. Looting is also a problem. Studies at Folsom Reservoir have shown there are generally two kinds of potentially significant impacts/adverse effects on cultural resources that can occur from changes in water levels: *increased cycles of inundation and drawdown*, resulting in more erosion and scouring of sites, and more rapid breakdown of organic materials through more frequent wetting and drying; and *exposure of previously inundated resources*, subjecting these resources to increased weathering, vandalism, and other factors.

Folsom, Shasta, and Trinity reservoirs have water levels that fluctuate frequently on an annual basis. Tables 5.11-1 through 5.11-3 show the mean monthly simulated water surface elevations for Folsom, Shasta, and Trinity reservoirs under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition over the entire 72-year period of hydrologic simulation record.

TABLE 5.11-1

MEAN MONTHLY WATER SURFACE ELEVATIONS IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Maximum Water Surface Elevation Increase[4] (ft msl and %)
Oct	416.6	416.5	-0.2	0.0	-4.2 (1.0)	9.9 (2.5)
Nov	408.1	408.1	0.0	0.0	-7.7 (-2.0)	9.4 (2.3)
Dec	410.2	410.2	0.0	0.0	-2.3 (-0.6)	8.8 (2.2)
Jan	412.2	412.3	0.1	0.0	-1.6 (-0.4)	7.1 (1.7)
Feb	415.0	415.0	0.0	0.0	-0.8 (-0.2)	2.2 (0.6)
Mar	429.0	429.0	0.0	0.0	-0.8 (-0.2)	2.6 (0.6)
Apr	440.3	440.2	-0.1	0.0	-1.1 (-0.2)	1.5 (0.3)
May	451.2	451.1	-0.1	0.0	-1.0 (-0.3)	0.3 (0.1)
Jun	446.2	446.0	-0.2	0.0	-4.8 (-1.1)	0.8 (0.2)
Jul	430.9	430.7	-0.2	0.0	-3.2 (-0.8)	3.3 (0.8)
Aug	425.6	425.4	-0.2	-0.1	-3.5 (-1.0)	7.7 (1.8)
Sep	424.8	424.6	-0.1	0.0	-3.8 (-1.1)	10.1 (2.5)`

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Water Surface Elevation Increase – refers to the largest increase in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

TABLE 5.11-2

MEAN MONTHLY WATER SURFACE ELEVATIONS IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Notes[4]
Oct	979.2	979.1	-0.1	0.0	-1.3 (-0.1)	1966 (BN)
Nov	981.5	981.4	-0.1	0.0	-0.9 (-0.1)	1947 (D)
Dec	988.6	988.6	-0.1	0.0	-0.9 (-0.1)	1947 (D)
Jan	1000.7	1000.7	0.0	0.0	-0.9 (-0.1)	1947 (D)
Feb	1012.8	1012.8	-0.1	0.0	-1.0 (-0.1)	1946 (BN)
Mar	1027.8	1027.8	0.0	0.0	-0.9 (-0.1)	1947 (D)
Apr	1038.6	1038.5	0.0	0.0	-0.8 (-0.1)	1946 (BN)
May	1037.7	1037.6	-0.1	0.0	-1.5 (-0.1)	1965 (W)
Jun	1026.0	1025.9	-0.1	0.0	-1.6 (-0.2)	1965 (W)
Jul	1005.6	1005.5	-0.1	0.0	-3.4 (-0.3)	1965 (W)
Aug	989.0	988.9	-0.1	0.0	-2.8 (-0.3)	1965 (W)
Sep	982.4	982.3	-0.1	0.0	-2.7 (-0.3)	1965 (W)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

TABLE 5.11-3

MEAN MONTHLY WATER SURFACE ELEVATIONS IN TRINITY RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Proposed Action (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)	Maximum Water Surface Elevation Decrease[3] (ft msl and %)	Notes[4]
Oct	2275.7	2275.6	-0.1	0.0	-2.7 (-0.1)	1964 (D)
Nov	2277.6	2277.5	-0.1	0.0	-1.1 (-0.1)	1992 (C)
Dec	2282.6	2282.5	-0.1	0.0	-1.1(-0.1)	1992 (C)
Jan	2288.0	2288.0	-0.1	0.0	-1.1 (-0.1)	1992 (C)
Feb	2299.8	2299.7	-0.1	0.0	-0.8 (0.0)	1992 (C)
Mar	2309.1	2309.0	-0.1	0.0	-0.8 (0.0)	1992 (C)
Apr	2321.2	2321.1	-0.1	0.0	-0.6 (0.0)	1947 (D)
May	2319.7	2319.7	-0.1	0.0	-0.6 (0.0)	1992 (C)
Jun	2315.5	2315.5	-0.1	0.0	-0.8 (0.0)	1992 (C)
Jul	2303.1	2303.1	0.0	0.0	-0.9 (0.0)	1992 (C)
Aug	2290.6	2290.6	0.0	0.0	-0.8 (0.0)	1991 (C)
Sep	2280.1	2280.0	-0.1	0.0	-2.7 (-0.1)	1963 (W)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Water Surface Elevation Decrease – refers to the largest decrease in water surface elevation under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in end-of-month storage occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

The modeling results indicate that maximum mean monthly water surface elevations for any month over the 72-year simulation period would not change, relative to the Base Condition. Of the three reservoirs, Folsom Reservoir shows the largest inter-annual variation in maximum and minimum changes in water surface elevation, relative to the Base Condition. These changes, however, would not change by more than 5 feet (the maximum annual changes in Shasta and Trinity reservoirs are smaller). Such changes, at any of the reservoirs, are infrequent as confirmed by the 72-year modeling spread (see Proposed Action – Scenario B, Technical Appendix I, this Draft EIS/EIR).

For Folsom Reservoir, each of the mean monthly average water surface elevations under both the Base Condition and Alternative 2B – Proposed Action – Scenario B, are well within the 395 to 466 ft msl zone of historic maximum fluctuation as discussed earlier. Cultural sites at or above 395 ft msl already have suffered serious impacts that have greatly compromised their integrity and destroyed much of their data potential. These modeling results confirm that, long-term changes in water surface elevation, which could contribute to increased inundation or desiccation of cultural sites, would not occur at Folsom Reservoir; unchanging mean monthly water surface elevations are indicative of uniform operating conditions within those specific months. No additional increment of impact would result from the diversions contemplated under Alternative 2B – Proposed Action – Scenario B.

CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative revealed similar inconsequential changes in mean monthly simulated water surface elevations at all three reservoirs (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Changes in water surface elevation under any of Alternatives 4A, 4B or 4C would be less than those of Alternative 2B.

Thus, there would be no increase in exposure or inundation of cultural resources within the drawdown zone, relative to the existing condition. Consequently, impacts on cultural resources at Folsom, Shasta, or Trinity reservoirs resulting from changes in maximum and minimum water levels would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.11-2 Effects of changes in flows in the Sacramento River and Delta on cultural resources.

Alternative 1B – No Project Alternative

Under the No Project Alternative, diversions would be identical to those under the Base Condition. Consequently, there would be no change in the potential for exposure or inundation cultural resources that would result in significant adverse effects on an historic property within the upper and lower Sacramento River, including the Delta. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

CALSIM II modeling confirmed the insignificant changes in mean monthly flows under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition over the 72-year simulation period (see Tables 5.11-4 and 5.11-5). While some individual inter-annual fluctuations for specific months are large, these are infrequent occurrences as indicated by the virtually unchanging long-term mean monthly flows. Sacramento River flows in either the upper or lower reaches are substantive, given that this river represents the main northern California mainstem tributary to the Delta. Flows, by the time they reach Freeport are commonly in the 10,000 cfs range.

TABLE 5.11-4

MEAN MONTHLY SACRAMENTO RIVER FLOWS AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]

Month	Absolute Difference (cfs)	Relative Difference (%)	Long-Term Mean Monthly Flows (cfs)	Maximum Flow Decrease[2] (cfs)	Maximum Flow Decrease (%)	Notes[3]
Oct	-35.2	-0.3	12524.6	-871.0	-8.7	1931 (C)
Nov	-21.4	-0.1	15584.5	-647.7	-4.3	1964 (D)
Dec	-9.9	0.1	24725.7	-776.4	-1.1	1965 (W)
Jan	-9.7	-0.1	32503.3	-759.3	-6.3	1960 (D)
Feb	36.7	0.2	38815.3	-265.7	-0.4	1963 (W)
Mar	-26.1	-0.1	33667.2	-801.8	-2.5	1963 (W)
Apr	4.7	0.0	24349.2	-67.7	-0.2	1935 (BN)
May	-19.1	-0.1	19604.6	-1565.2	-8.4	1940 (AN)
Jun	-42.9	-0.3	17304.7	-1536.8	-8.9	1936 (BN)
Jul	17.3	0.1	18337.9	-625.5	-5.0	1931 (C)
Aug	-26.4	-0.2	14513.8	-970.4	-6.1	1944 (D)
Sep	7.7	0.2	12393.8	-1173.8	-9.4	1947 (D)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Maximum Flow Decrease – refers to the largest decrease in mean flow computed for that month (largest decrease over 72-years).
3. Indicates the year where the maximum decrease in Sacramento River flow (in cfs) occurred for that month, identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Unlike reservoirs, river channel flows are constrained within well defined channels. Their area of effect is much more limited than reservoirs, whose surface area is much more prone to changes in water elevation due to the more sloping bathymetry, relative to rivers. Changes in river flows, therefore, would have a much more limited effect on either inundating (through water elevation rise) or desiccating (through water level decline) cultural resource sites along the channel embankments.

More importantly, it is well known that over the 72-year hydrologic period of record, there have been episodes of extremely high flows within the Sacramento River and Delta. The mean monthly flow at Freeport in February 1986 for example, was over 78,000 cfs. At flows eight times higher than the long-term average for the month of February, any cultural resource sites along the channel would have historically been inundated through substantial river stage increases. Alternatively, in critically dry-years such as 1977 and 1991, mid-winter mean monthly flows in the Sacramento River at

TABLE 5.11-5

MEAN MONTHLY SACRAMENTO RIVER FLOW RELEASES BELOW KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Notes[4]
Oct	5651.8	5645.8	-6.0	-0.1	-538.5 (-10.7)	1966 (BN)
Nov	5290.3	5286.6	-3.7	0.0	-534.0 (-5.7)	1964 (D)
Dec	6877.8	6870.1	-7.7	-0.1	-369.6 (-3.0)	1967 (W)
Jan	8033.1	8033.1	0.1	0.0	-42.7 (-0.3)	1969 (W)
Feb	10164.0	10172.6	8.5	0.1	-116.7 (-3.3)	1961 (D)
Mar	8313.3	8300.9	-12.4	-0.2	-664.9 (-7.1)	1963 (W)
Apr	7203.6	7211.8	8.2	0.0	-211.6 (-2.6)	1931 (C)
May	8241.9	8251.5	9.7	0.1	-23.0 (-0.3)	1947 (D)
Jun	10365.3	10369.0	3.7	0.0	-292.3 (-2.4)	1961 (D)
Jul	12708.9	12721.4	12.5	0.1	-233.1 (-1.7)	1947 (D)
Aug	10505.2	10497.7	-7.5	-0.1	-229.2 (-2.4)	1965 (W)
Sep	7035.7	7035.0	-0.7	0.0	-250.5 (-3.7)	1948 (BN)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in TAF), representative of the mean difference over the 72-years (and subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flow releases under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Indicates the year where the largest decrease in mean monthly flow releases occurred for that month and identifying the water-year type.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Freeport were less than 8,000 cfs. Cultural resources sites along the channel during these times would have been at risk to exposure and the adverse effects of desiccation. While the Delta represents a much more dynamic water system and, to be sure, receives inflows from a number of additional tributaries, the data results from the Sacramento River at Freeport are noteworthy and applicable. For the Sacramento River side, flows at Freeport represent a good indicator of northern Delta inflows. The 72-year hydrologic record would impart similar effects on the Delta during these same corresponding periods of extreme wet-years and critically dry-years.

CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative revealed similar inconsequential changes in mean monthly simulated flows in the upper and lower Sacramento River (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Changes in river flows under any of Alternatives 4A, 4B or 4C would be less than those of Alternative 2B.

Based on these modeling results and the discussions herein, there would be no anticipated increase in exposure or inundation of cultural resources resulting from changing river flows, relative to the Base Condition. Consequently, impacts on cultural resources within the channel confines of the upper and lower Sacramento River, including the Delta that could result from changes in maximum and minimum water levels would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.11-3 Effects of changes in flows in the lower American River on cultural resources.

Alternative 1B – No Project Alternative

Under the No Project Alternative, diversions would be identical to those under the Base Condition. Consequently, there would be no change in the potential for exposure or inundation cultural resources that would result in significant adverse effects on historic properties within the lower American River. There would be *no impact.*

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

For the lower American River, the maximum and minimum monthly mean flows over the 72-year simulation were compared between the existing condition and each of the alternatives. In order to estimate the magnitude and frequency of bank exposure and bank inundation along the lower American River, two locations were assessed: Nimbus Dam and the river mouth (confluence with the Sacramento River).

As noted previously, a comparison of flows under the existing condition and each of the Alternatives provided an estimate of the relative changes in river stage that could result because of the new CVP water service contracts; river flows, therefore, were used as surrogates for river stage (water surface elevations). Table 5.11-6 shows the simulated mean monthly flows in the lower American River below Nimbus Dam under Alternative 2B – Proposed Action – Scenario B, relative to the Base Condition over the entire 72-year hydrologic period of record.

No significant sites are expected to have survived within the riverbed itself near Nimbus Dam because of the major impacts at this location from dam construction. Accordingly, lower flows would not expose previously submerged (and intact) cultural resources. It is possible that historic-era (post-1869) shipwrecks lie beneath the silty river bottom near the mouth, and that very low river flows could expose these resources; several nineteenth- and early twentieth-century shipwrecks have been documented immediately to the south in the Sacramento River channel (California State Lands Commission 1988). At least one wreck is documented in the lower American River: the *Pearl*, January 27, 1885.[210] However, the magnitude of the changes predicted is so small that this is highly unlikely. Also, known resources along the riverbank (two historic levees, a portion of the Natomas East Main Drainage Canal and prehistoric mound CA-SAC-26) lie outside the present river channel, and decreases in river flows would have no impact on these resources. Therefore, lower flows are not a concern with regard to cultural resources.

210 http://www.martimeheritage.org/ships/wrecks.html

TABLE 5.11-6

MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND PROPOSED ACTION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Proposed Action (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)	Maximum Flow Decrease[3] (cfs and %)	Maximum Flow Increase[4] (cfs and %)
Oct	2441.8	2427.7	-14.1	-0.7	-362.0 (-15.4)	440.8 (15.8)
Nov	3324.2	3299.2	-25.0	-0.3	-582.1 (-20.8)	704.4 (41.6)
Dec	3342.0	3322.9	-19.1	-0.1	-827.8 (-10.8)	446.1 (23.6)
Jan	4088.3	4073.4	-14.9	-0.8	-764.9 (-60.5)	334.6 (23.6)
Feb	5103.3	5115.7	12.4	0.9	-190.7 (-8.1)	720.7 (51.8)
Mar	3729.4	3715.3	-14.1	-0.5	-267.9 (-10.0)	24.8 (3.0)
Apr	3825.3	3829.0	3.7	0.4	-73.7 (-1.7)	339.5 (14.6)
May	3683.2	3675.2	-7.9	-0.2	-58.9 (-2.5)	239.7 (7.3)
Jun	3933.9	3910.4	-23.6	-0.8	-150.6 (-8.7)	531.7 (18.0)
Jul	3846.4	3820.4	-26.0	-0.9	-467.6 (-14.2)	77.2 (1.6)
Aug	2138.4	2103.7	-34.7	-1.7	-1467.5 (-63.9)	405.1 (17.2)
Sep	1503.2	1475.9	-27.4	-2.0	-1156.2 (-67.3)	67.2 (9.4)

Notes:
1. Proposed Action – Scenario B – modeled 15 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake.
2. Absolute Difference – difference between Base Condition and Proposed Action (in cfs), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Flow Decrease – refers to the largest decrease in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a negative value. Percent decrease shown in parentheses.
4. Maximum Flow Increase – refers to the largest increase in mean monthly flows under the Proposed Action, relative to the Base Condition, computed for that month (over 72 years). Shown as a positive value. Percent increase shown in parentheses.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Higher flows, using the same rationale previously described, would also be applicable for the lower American River. Again, using February 1986 as an example, mean monthly flow during that period was over 30,000 cfs below Nimbus Dam. The daily or hourly instantaneous peaks within that month, however, were significantly higher (approaching 115,000 cfs; the channel design capacity). At these extreme flows, any cultural resources along the river channel that would have normally been above the mean water surface elevation would have been at a severe risk of inundation. Other wet years (such as 1980, 1982, and 1983) also produced high flows, well above the mean monthly averages.

CALSIM II modeling results for Alternatives 2A and 2C – Proposed Action – Scenarios A and C, along with Alternative 3 – Water Transfer Alternative, and Alternative 1A – No Action Alternative revealed similar inconsequential changes in mean monthly simulated flows in the lower American River (see Proposed Action – Scenarios A and C, Water Transfer Alternative, and No Action Alternative, Technical Appendix I, this Draft EIS/EIR). Anticipated changes in lower American River flows under any of Alternatives 4A, 4B or 4C, with markedly reduced diversions, would be less than those of Alternative 2B.

Based on these modeling results and the discussions herein, there would be no anticipated increase in exposure or inundation of cultural resources within the riverine drawdown zone in the lower American River, relative to the Base Condition. Consequently, impacts on cultural resources within the channel confines of the lower American River that could result from changes in maximum and minimum water levels would be less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternative

5.12. Land Use (Service Area Indirect Impacts)

The indirect or service area-related effects are a secondary impact resulting from the *implementation* of the P.L.101-514 water service contract. As defined, the Proposed Action is the execution of the P.L.101-514 water service contract, a new water allocation for El Dorado County. Detailed project-level analyses (including mass balance, reservoir routing modeling), as presented in the preceding subchapters, address the potential direct effects of any hydrological changes of this new CVP water service contract on the CVP/SWP.

For this action, however, no new facilities, improvements to existing infrastructure, or construction activities are proposed. To the extent that construction of certain facilities are required to fully implement the P.L.101-514 contract, appropriate project-level environmental documentation would be prepared by those agencies at such time in the future when those decisions would be made. Any construction related impacts and site specific facility impacts would be the responsibility of those agencies proposing such future projects; they are not part of this EIS/EIR evaluation. Accordingly, for this EIS/EIR, service area-related effects are discussed in limited detail and, only where relevant.

Typical construction-related impacts such as traffic/transportation, noise, air quality, hazardous materials, etc., are given cursory attention in this EIS/EIR as individual resource areas potentially affected by the Proposed Action. Moreover, this EIS/EIR does not attempt to *re-examine* the precise impacts of growth on the environment anticipated to occur as a result of future development. This is because the physical environmental effects of urban development have already been appropriately evaluated in the El Dorado County General Plan and accompanying EIR. Chapter 6.0 (Growth-Inducing Impacts), however, provides a concise discussion of the potential *implications* of this new water contract on approved growth within El Dorado County.

This subchapter addresses potential indirect, service area-related impacts on the existing land uses that could result from the implementation of the new CVP water service contracts authorized under P.L. 101-514. The analysis presented here was conducted at a general, programmatic level, consistent with the framework and rationale described previously in the Overview of Impacts Analysis. Relevant policies from the El Dorado General Plan are presented where appropriate.

The Proposed Action, as defined, does not include construction of any new facilities, and thus there are no direct land use impacts resulting from the action. Any facilities such as specific diversion intakes, pipelines, storage facilities, pumping plants, and water treatment plants, to the extent they are needed in the future will exist as separate and independent projects from this action. Land use impacts from the construction and operation of any future facilities will be examined at a project-specific level in later, more detailed environmental documentation.

This indirect service area-related analysis focuses on the potential effect of this new water allocation to accommodate planned, but new growth within the Subcontractor service areas of EID and GDPUD.

5.12.1. CEQA Standards of Significance

For purposes of this EIS/EIR, land use impacts may be deemed significant if implementation of the Proposed Action or any of the alternatives would:

- Result in land uses that are incompatible with existing land use practices or land use policies as governed by the El Dorado County General and EIR;
- Result in alteration of the region's planned capacity to accommodate projected future population growth;
- Result in a physical change to the environment from changes in employment patterns; or
- Result in substantial conversion of agricultural lands to non-agricultural uses.

5.12.2. Impacts and Mitigation Measures

As noted previously, potential impacts were evaluated at the program level, focusing on the potential for land use pressures within the two proposed Subcontractor service areas. To the extent applicable, a program-level evaluation of potential land use impacts from future facilities is also included. Since the Proposed Action, its various diversion scenarios, and each of the alternatives were developed based on a reasonable range of imposed hydrological variations that could be implemented (as project actions), the potential effects on service area activities, facilities, land uses, and planning initiatives would be identical across all action alternatives. The only variations would be in the diversion allocations between EID and GDPUD, the total quantities and, where applicable, diversion location. All alternatives, except the No Project Alternative, would face similar impact types, levels of intensity, and spatiality. Accordingly, the discussions are equally applicable to all action alternatives, as defined, and are, therefore, made together.

5.12-1 Result in land uses that are incompatible with existing land use practices or land use policies.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or activities within the service areas of either EID or GDPUD as defined by this action. There would be no impact**.**

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Under all of the Alternatives as defined, except the Alternative 1B – No Project Alternative, water from the proposed CVP M&I water service contract would be restricted to deliveries within the proposed Subcontractor service areas only. Since these areas are already zoned for residential, commercial, and industrial uses, the delivery of M&I water in these areas would not necessitate any changes to current land-use zoning. Moreover, the new water supplies would be used only to supply areas where residential growth is already anticipated under the current General Plan. In and of itself, the proposed new CVP water service contracts, regardless of allocation and total quantities, will not affect current land uses. All future growth within these areas would occur in a planned manner, consistent with General Plan zoning and in full consideration of land use impacts already evaluated as part of the General Plan Update and associated EIR processes.

General Plan Policy 2.2.5.3 commits the County to evaluate any future rezoning based on the General Plan's general direction as to minimum parcel size or maximum allowable density; and whether changes in conditions support a higher density or intensity zoning district. The specific criteria to be considered include, but are not limited to, the following:

1. Availability of an adequate public water source or an approved Capital Improvement Project to increase service for existing land use demands;
2. Availability and capacity of public treated water system;
3. Availability and capacity of public waste water treatment system;
4. Distance to and capacity of the serving elementary and high school;
5. Response time from nearest fire station handling structure fires;
6. Distance to nearest Community Region or Rural Center;
7. Erosion hazard;
8. Septic and leach field capability;
9. Groundwater capability to support wells;
10. Critical flora and fauna habitat areas;
11. Important timber production areas;
12. Important agricultural areas;
13. Important mineral resource areas;
14. Capacity of the transportation system serving the area;
15. Existing land use pattern;
16. Proximity to perennial water course;
17. Important historical/archeological sites;
18. Seismic hazards and present of active faults; and
19. Consistency with existing Conditions, Covenants, and Restrictions.

El Dorado County has developed a work program that covers calendar year 2007 and fiscal year 2007-08. Below are the items from the Land Use Elements that are anticipated to be included in the work program.

- Review and Update the Zoning Ordinance (Title 17 of the El Dorado County Code) to identify revisions that provide consistency with General Plan land use designations and updated development standards. [Measures LU-A, LU-C, LU-D, LU-O, TC-P].
- Review and identify needed revisions to the County of El Dorado Design and Improvements Standards Manual**.** [Measure LU-E].
- Design Review Standards and Guidelines (Community and Historic). [Measures LU-F, LU-G].
- Preservation of Community Separation. As outlined in Policy 2.5.1.3. The program shall address provisions for a parcel analysis and parcel consolidation/transfer of development rights. [Measures LU-H].
- Potential Scenic Corridors. Inventory and prepare a Scenic Corridor Ordinance, which should include development standards, provisions for avoidance of ridgeline development, and off-premise sign amortization. This is to be included as part of the Zoning Ordinance Update. [Measure LU-I, LU-J].
- Develop and maintain an inventory of vacant lands within each Community Region and Rural Center. This would include working with community groups to identify appropriate uses for such parcels, including residential development and establishment of communities. Staff is looking into the possibility of linking the issuance of a building permit to an existing database of vacant parcels to maintain a current vacant lands inventory. [Measure LU-K].
- Monitor Development, Population, and Employment Trends. Develop a monitoring program and provide periodic updates to the Board of Supervisors. [Measure LU-L].
- Monitor General Plan Policies, Programs and General Plan Environmental Impact Report Mitigation Measures. Provide periodic updates to the Board of Supervisors and Planning Commission. [Measures LU-M].
- Request for Exemption from General Plan Policies Due To Economic Viability. Develop procedures to be used by applicants. [Measure LU-N].

No impacts on existing or planned land uses are anticipated to result from the Proposed Action and alternatives.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.12-2 Result in alteration of the region's planned capacity to accommodate projected future population growth.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or activities within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

El Dorado County has experienced rapid population growth since the 1970s. The County is projected to grow by an additional 30,000 households over the next 20 years. Future population growth is a reality that the General Plan acknowledges. Growth will continue but the County will attempt to retain the qualities of its natural resource base, both consumptive and environmental, in order to maintain its custom and culture and to assure its long-term economic stability. Moreover, the County General Plan recognizes the ecological and historic values of these lands while saving and conserving valuable lands for future economic benefits for all purposes. The rural character of the County has been called its most important asset. Careful planning and management can maintain this character while accommodating reasonable growth and achieving economic stability.

To ensure that projected housing needs can be accommodated, the County shall maintain an adequate supply of suitable sites that are properly located based on environmental constraints, community facilities, and adequate public services.

The General Plan provides an important requisite for planned growth with the County. The new long-term, firm water supply provided by this action is, however, only a part of the long-term water needs of the County. Based on the El Dorado County Water Agency's recent 2007 Water Resources Development and Management Plan, even without the P.L.101-514 CVP water service contracts, the County will require approximately an additional 34,000 AFA to meet its ultimate projected water supply needs by 2025 and over 100,000 AFA by buildout. The Proposed Action and alternatives would not affect the region's planned capacity.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.12-3 Result in a physical change to the environment from changes in employment patterns.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or activities within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Providing a water supply, regardless of source, location, or quantity, has no causal effect on employment patterns. Employment patterns are dictated by commercial, industrial, administrative and agrarian opportunities within the context of a stable and growing economic framework. Employment is further prompted by the intricate relationship between housing availability, transportation efficiency, reliable and cost effective public services, and a readily qualified employee base. A new reliable water supply, as a public service, is an important element in developing overall community structure, but it cannot influence or be affected by employment patterns.

Under Objective10.1.9 of the El Dorado General Plan Economic Development Element, the County has committed to monitoring the jobs-housing balance and emphasizing employment creation. Moreover, the County shall actively promote job generating land uses while de-emphasizing residential development unless it is tied to a strategy that is necessary to attract job generating land uses. There would be no impact associated with potential changes in employment patterns as a result of the Proposed Action or alternatives.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.12-4 Result in substantial conversion of agricultural lands to non-agricultural uses.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in risk to agricultural land conversions from current conditions.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As previously noted, water from the proposed CVP M&I water service contract would be delivered to the proposed Subcontractor service areas consistent with existing zoning entitlements for residential, commercial, and industrial land uses only. The water cannot be used for agricultural purposes.

El Dorado County is keenly aware of its rural and agricultural past and maintains a monitoring program as part of its planning process. As part of the February 2007, *General Plan Implementation Status Report for Elements of Agriculture and Forestry; Parks and Recreation; and Economic Development*, the following have been identified specific to agricultural practices:

- Measure AF-E: Develop and implement a method to identify and officially recognize rangelands currently used for grazing or suitable for sustained grazing of domestic livestock.

The identification methods of grazing lands are being developed in conjunction with the University of California Cooperative Extension (UCCE) and grazing land owners.

- Measure AF-G: Develop a procedure for the Agricultural Commission to review and provide recommendations regarding discretionary and capital improvement projects that may affect agricultural, grazing and forestry lands. This process has already been established with Development Services forwarding all discretionary and capital improvement projects to the Agricultural Commission for their review, recommendation and findings.
- Measure AF-J: Complete an inventory of agricultural lands in active production and/or lands determined by the Agricultural Commission to be suitable for agricultural production. Following inventory, perform suitability review and amend Agricultural District boundaries. Parcels were analyzed for soil type, slope (<50 percent), elevation (<3000'), parcel size (greater than 20 acres), current land use and their proximity to existing Agricultural District. Identified agricultural or potential agricultural parcels were ground verified using individuals knowledgeable in the specific areas. The final report will be forwarded to the Agricultural Commission for their review and recommendation.
- Measure AF-K: Develop Agricultural Best Management Practices (BMPs) for adoption by the Board of Supervisors and use by agricultural operations in complying with General Plan policies 7.1.2.1, 7.1.2.7, 7.3.3.4, and 7.4.2.2. This has been completed and adopted by the El Dorado Board of Supervisors with approximately 20 Best Management Practices.

The Proposed Action and alternatives would have no impact on agricultural land conversions.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.13. Transportation and Circulation (Service Area Indirect Impacts)

This subchapter addresses potential indirect, service area-related impacts on the existing traffic and circulation conditions that could result from the implementation of the P.L. 101-514 water service contract, and those that could occur under the various alternatives. The analysis presented here was conducted at a programmatic level, consistent with the Overview of Impacts Analysis.

5.13.1. CEQA Standards of Significance

For the purposes of this EIS/EIR, potential traffic and/or circulation impacts may be deemed significant if implementation of the Proposed Action or its alternatives would:

- Result in increased traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections);

- Result in the exceedance of the level of service standard established by the county congestion management agency for designated roads or highways;
- Result in additional hazards due to a design feature resulting in inadequate emergency access; or
- Result in conflicts with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks).

5.13.2. Impacts and Mitigation Measures

Transportation and circulation impacts related to the proposed new CVP water service contracts and the water delivered to the EID and GDPUD service areas were evaluated qualitatively by reviewing land use, growth, and transportation/circulation information developed for the 2004 El Dorado County General Plan, relative to the location of the EID and GDPUD Subcontractor service areas.

5.13-1 Result in increased traffic that is substantial in relation to the existing traffic load and capacity of the street system.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated traffic/circulation levels within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The Proposed Action and alternatives include no changes to land uses or transportation and circulation policies in the El Dorado County General Plan.

El Dorado County has numerous policies that consider and address traffic and circulation within the county. Much of this is centered on new development. Coordinated planning and implementation of roadway improvements with new developments are considered essential in order to maintain adequate levels of service on County roadways.

Policy TC-Xa, for example, includes the following provisions:

1. Traffic from residential development projects of five or more units or parcels of land shall not result in, or worsen, Level of Service F (gridlock, stop-and-go) traffic congestion during weekday, peak-hour periods on any highway, road, interchange or intersection in the unincorporated areas of the county.
2. The County shall not add any additional segments of U.S. Highway 50, or any other highways and roads, to the County's list of roads (shown in Table TC-2) that are allowed to operate at Level of Service F without first obtaining the voters' approval.
3. Developer-paid traffic impact fees shall fully pay for building all necessary road capacity improvements to fully offset and mitigate all direct and cumulative traffic impacts from new

development upon any highways, arterial roads and their intersections during weekday, peak-hour periods in unincorporated areas of the county.

4. County tax revenues shall not be used in any way to pay for building road capacity improvements to offset traffic impacts from new development projects.

Before giving approval of any kind to a residential development project of five or more units or parcels of land, the County shall make a finding that the project complies with the policies above. If this finding cannot be made, then the County shall not approve the project in order to protect the public's health and safety as provided by State law to assure that safe and adequate roads and highways are in place as such development occurs.

Various Implementation Measures focus on specific areas within the County. For example, Implementation Measure TC-V(2) states that the County shall implement a mechanism for all new discretionary and ministerial development (which includes approved development that has not yet been built) that would access Latrobe Road or White Rock Road. This mechanism shall be designed to ensure that the 2025 p.m. peak hour volumes on El Dorado Hills Boulevard, Latrobe Road, and White Rock Road do not exceed the minimum acceptable LOS thresholds defined in specific Policies with the circulation diagram improvements assumed in place. As such, the measure should consider a variety of methods that control or limit traffic. The County shall monitor peak hour traffic volumes and LOS beyond 2025 and, if necessary, shall implement growth control mechanisms in any part of the county where the LOS thresholds defined in the General Plan policies listed above cannot be maintained.

The Proposed Action and alternatives would have no impact on traffic and circulation levels, patterns, or long-ranging planning initiatives. The County, through its various General Plan policies and Implementation Measures have adequately evaluated, planned, and incorporated mechanisms to continuously gauge the effects of traffic and circulation levels within the County.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.13-2 Result in the exceedance of the level of service standard established by the county congestion management agency for designated roads or highways.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated traffic/circulation levels within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Increasing traffic congestion is a concern within the County. With ongoing new development and population growth, exceedance in the level of service standards for designated roads and highways is carefully monitored. The County, through its General Plan has acknowledged the importance of ensuring that ongoing planned development in the County does not exceed available road capacities. General Plan Policy TC-Xb, for example, provides that the County shall:

a. Prepare an annual Capital Improvement Program (CIP) specifying roadway improvements to be completed within the next 10 years to ensure compliance with all applicable level of service and other standards in this plan, identifying improvements expected to be required within the next 20 years, and specifying funding sources sufficient to develop the improvements identified in the 10-year plan;

b. Annually monitor traffic volumes on the county's major roadway system depicted in the Circulation Diagram; and

c. Review development proposals to ensure that the development would not generate traffic in excess of that contemplated by the Capital Improvement Program for the next ten years or cause levels of service on any affected roadway segments to fall below levels specified in this plan.

With U.S. Highway 50 serving such a vital function for El Dorado County, proper coordination with other neighboring agencies is important to ensure that this thoroughfare remains efficient. General Plan Policy TC-Xi, for example, acknowledges the need for planned the widening of U.S. Highway 50. Such an effort must be consistent with the policies of this General Plan and shall be a priority of the County. Under this Policy, the County shall coordinate with other affected agencies, such as the City of Folsom, the County of Sacramento, and Sacramento Area Council of Governments (SACOG) to ensure that U.S. Highway 50 capacity enhancing projects are fully and properly coordinated with these agencies with the goal of delivering these projects on a schedule to meet the requirements of the policies of this General Plan.

As shown, El Dorado County has a relatively complex highway and road transportation system, serving cars, heavy trucks, agricultural and commercial vehicles, buses, transit, bicycles, and pedestrian traffic. Coordinating these many forms of transportation is critical to achieving maximum road efficiency and minimizing costly road expansion or construction. Accordingly, the County has adopted a Transportation Systems Management (TSM); where the use of techniques to manage traffic circulation to maximize existing facilities and provide for the effective planning of new facilities is sought.

In general, TSM techniques are intended to provide economical, short-term improvements to increase efficiency and reduce congestion. Techniques include increasing the number of buses and routes, improving transit shelters, improving traffic signals, installing exclusive turn lanes, installing acceleration/deceleration lanes, resurfacing and widening of roads, and adding or improving bike lanes on new or existing roads. TSM measures can also conserve energy and decrease vehicular emissions leading to cleaner air. Finally, TSM is intended to emphasize improved transportation system efficiencies rather than road expansion or construction.

The Proposed Action and alternatives would have no impact on traffic and circulation levels, patterns, and would not result in the exceedance of level of service standards. As discussed, the County, through its various General Plan policies have, and continue to provide, the necessary planning and coordination mechanisms to ensure proper levels of service on roadways within the County.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.13-3 Result in additional hazards due to a design feature resulting in inadequate emergency access.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated traffic/circulation levels within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Roadway hazards often result from improper design features or from the interim, although significant disruptions stemming from construction-related projects. The County recognizes the importance of operational safety. As part of the General Plan Implementation Program, the County is committed to preparing and adopting a priority list of road and highway improvements for the CIP on a horizon of five years. The Board of Supervisors shall update the CIP every two years, or more frequently as recommended by the responsible departments. The CIP shall prioritize capital maintenance and rehabilitation, reconstruction, capacity, and operational and safety improvements.

The Proposed Action and alternatives would have no impact on traffic and circulation levels, patterns, and would not result in increase hazards or affect, in any way, existing emergency access. As discussed, the County, through its various General Plan policies have, and continue to provide, the necessary planning and coordination mechanisms to ensure proper levels of safety and emergency access on roadways within the County.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.13-4 Result in conflicts with adopted policies supporting alternative transportation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated traffic/circulation levels within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Alternative transportation is recognized and promoted in El Dorado County. General Plan Goal TC-2, for example, is stated as follows:

> "To promote a safe and efficient transit system that provides service to all residents, including senior citizens, youths, the disabled, and those without access to automobiles that also helps to reduce congestion, and improves the environment."

In fact, the County is committed to promoting transit services where population and employment densities are sufficient to support those services, particularly within the western portion of the County and along existing transit corridors in the rural areas. Additionally, the County shall implement a system of recreational, commuter, and inter-community bicycle routes in accordance with the County's *Bikeway Master Plan*. The plan is intended to designate bikeways connecting residential areas to retail, entertainment, and employment centers and near major traffic generators such as recreational areas, parks of regional significance, schools, and other major public facilities, and along recreational routes.

Finally, the County is committed, through General Plan Goal TC-5, to provide safe, continuous, and accessible sidewalks and pedestrian facilities as a viable alternative transportation mode. The policies under this Goal address the requirement for pedestrian sidewalks and curbs.

The Proposed Action and alternatives have no impact on traffic and circulation levels, patterns, and would not result in any impairment to alternative transportation modes. As noted above, the County, through its various General Plan goals and policies have, and continue to address, the need for alternative transportation as an integral part of the County's overall transportation framework.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.14. AIR QUALITY (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses the potential indirect service area-related impacts on the existing air quality conditions that could result from the implementation of the P.L.101-514 water service contract. The analysis presented herein was conducted at a programmatic level.

5.14.1. CEQA Standards of Significance

Air quality impacts may be deemed significant if implementation of the Proposed Action would:

- conflict with or obstruct implementation of the applicable air quality plan;
- Result in a cumulatively-considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- violate any air quality standard or contribute substantially to an existing or projected air quality violation; and
- substantially increase exposure of sensitive receptors to toxic air pollutants, or expose people to substantial levels of hazardous substance air emissions or create objectionable odors affecting a substantial number of people.

Appendix G of the CEQA Guidelines states that where available, the significance criteria established by the applicable Air Quality Management District (AQMD) or APCD may be relied upon to make a determination of significance using the standards listed above. The following thresholds have been established by the El Dorado County Air Quality Management District (EDCAQMD) for determining the significance of construction and operational emissions: 82 pounds per day for NO_x and 82 pounds per day for Reactive Organic Gas (ROG).[211]

The EDCAQMD evaluates operational PM_{10} emissions on the likelihood such emissions would cause or contribute significantly to a violation of the applicable State or national ambient air quality standards.

5.14.2. Impacts and Mitigation Measures

Air quality impacts in the EID and GDPUD service areas resulting from the Proposed Action were evaluated qualitatively by reviewing the El Dorado County General Plan, goals, policies, and associated planning documents, relative to their relevance to the EID and GDPUD Subcontractor service areas.

211 El Dorado County APCD, Guide to Air Quality Assessment, Draft, January 2002.

5.14-1 Conflict with or obstruct implementation of the applicable air quality plan.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect air quality within the service areas of either EID or GDPUD as defined by this action. There would be no impact**.**

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The El Dorado County General Plan identifies within its Public Health, Safety and Noise Element, Goal 6.7: Air Quality Maintenance. This co-equal goal states:

A. Strive to achieve and maintain ambient air quality standards established by the U.S. Environmental Protection Agency and the California Air Resources Board.

B. Minimize public exposure to toxic or hazardous air pollutants and air pollutants that create unpleasant odors.

Objective 6.7.1, the El Dorado County Clean Air Plan, specifically provides the mandate to:

A. Adopt and enforce the El Dorado County Clean Air Act Plan in conjunction with the County Air Quality Management District.

Nothing associated with the Proposed Action and alternatives would conflict with or otherwise be inconsistent with the existing guidance, directives, and air quality planning documents relied upon by the County. A new water supply contract, providing the capability to meet and support existing General Plan growth objectives, is not, in itself, inconsistent with these planning documents. El Dorado County, through its General Plan (and specific Goals, Objectives, and Policies of its Public Health, Safety and Noise Element) provide ample consideration and protection of ambient air quality. This would be a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.14-2 Result in a cumulatively-considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect air quality within the service areas of either EID or GDPUD as defined by this action. There would be no impact**.**

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Similar to Impact 5.14-1, the County's Clean Air Plan, implemented in cooperation with the County Air Quality Management District ensures that criteria pollutants and State ambient air quality standards are monitored and continuously addressed. For any new project-specific applications, County policies governing hazardous materials assessment, construction activities, and land uses that may affect air quality provide the necessary guidance and assurances that air quality standards are met. El Dorado County, through its General Plan (and specific Goals, Objectives, and Policies of its Public Health, Safety and Noise Element) provide ample consideration and protection of ambient air quality. This would be a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.14-3 Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect air quality within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Similar to Impact 5.14-1 and 5.14-2, the County's Clean Air Plan, implemented in cooperation with the County Air Quality Management District ensures that criteria pollutants and State ambient air quality standards are monitored and continuously addressed. For any new project-specific applications, County policies governing hazardous materials assessment, construction activities, and land uses that may affect air quality provide the necessary guidance and assurances that air quality standards are met. El Dorado County, through its General Plan (and specific Goals, Objectives, and Policies of its Public Health, Safety and Noise Element) provide ample consideration and protection of ambient air quality. This would be a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.14-4 Substantially increase exposure of sensitive receptors to toxic air pollutants, or expose people to substantial levels of hazardous substance air emissions or create objectionable odors affecting a substantial number of people.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect air quality within the service areas of either EID or GDPUD as defined by this action. There would be no impact*.*

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Sensitive receptors are located throughout the Subcontractor service areas of both EID and GDPUD. At this time, the specific locations and details of any potential new facilities that would be required to divert, convey, treat, and distribute the P.L.101-514 contract water are not generally known for GDPUD. Much depends on pending infrastructure sharing agreements between GDPUD and PCWA. EID on the other hand, with its more developed infrastructure, has fewer uncertainties. It is possible that new facilities could be located near sensitive receptors. The construction of these facilities would generate construction-related dust and vehicle emissions, which could be experienced by sensitive receptors. However, any impacts related to on-site construction-related air emissions, including emissions from additional construction vehicular traffic would be temporary and would not continue once construction was completed. Moreover, any construction activities would be bound by existing County policies and ordinances governing air quality concerns and would be addressed in project specific environmental documentation.

Objective 6.7.6: AIR POLLUTION-SENSITIVE LAND USES of the Public Health, Safety and Noise Element of the General Plan indicates that it is the intent of the County to:

> Separate air pollution sensitive land uses from significant sources of air pollution.

Two policies under this objective are relevant. They are:

> Policies
>
> 6.7.6.1. Ensure that new facilities in which sensitive receptors are located (e.g., schools, child care centers, playgrounds, retirement homes, and hospitals) are sited away from significant sources of air pollution.
>
> 6.7.6.2. New facilities in which sensitive receptors are located (e.g. residential subdivisions, schools, childcare centers, playgrounds, retirement homes and hospitals) shall be sited away from significant sources of air pollution.

Objective 6.7.7: Construction Related, Short-Term Emissions, of the Public Health, Safety and Noise Element of the General Plan indicates that it is the intent of the County to:

> Reduce construction related, short-term emissions by adopting regulations which minimize their adverse effects.
>
> Policy
>
> 6.7.7.1, in fact, provides the following:
>
> The County shall consider air quality when planning the land uses and transportation systems to accommodate expected growth, and shall use the recommendations in the most recent version of the El Dorado County Air Quality Management (AQMD) *Guide to Air Quality Assessment: Determining Significance of Air Quality Impacts Under the California Environmental Quality Act*, to analyze potential air quality impacts (e.g., short-term construction, long-term operations, toxic and odor-related emissions) and to require feasible mitigation requirements for such impacts. The County shall also consider any new information or technology that becomes available prior to periodic updates of the Guide. The County shall encourage actions (e.g., use of light-colored roofs and retention of trees) to help mitigate heat island effects on air quality.

Nothing associated with the Proposed Project and alternatives would conflict with or otherwise be inconsistent with the existing guidance, directives, and air quality planning documents relied upon by the County. A new water supply contract, providing the capability to meet and support existing General Plan growth objectives, is not, in itself, inconsistent with these planning documents. El Dorado County, through its General Plan (and specific Goals, Objectives, and Policies of its Public Health, Safety and Noise Element) provide ample consideration and protection of ambient air quality. This would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.15. NOISE (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses the potential indirect service area-related impacts on the existing noise environment that could result from the implementation of the P.L.101-514 water service contract. Mitigation measures are presented where appropriate.

Neither the Proposed Action or alternatives include construction of any new facilities, and thus there are no direct noise impacts resulting from the Proposed Action. Any facilities such as specific diversion intakes, pipelines, storage facilities, pumping plants, and water treatment plants, to the extent they are needed in the future, will exist as separate and independent projects from this action. Noise impacts from the construction and operation of any future facilities will be examined at a project-specific level in later, more detailed environmental documentation.

5.15.1. CEQA Standards of Significance

The significance of noise impacts may be determined by comparison of overall noise levels (including contributions from the Proposed Action) to applicable federal, State, or local standards and by the expected change in ambient noise levels that would occur as a result of the project. An increase of at least 3 dB is usually required before most people will perceive a change in noise levels, and an increase of 5 dB is required before the change will be clearly noticeable.

5.15.2. Impacts and Mitigation Measures

Noise impacts related to the project in the EID and GDPUD service areas resulting from the Proposed Action were evaluated qualitatively by reviewing land use and growth information developed for the El Dorado County General Plan, relative to the location of the EID and GDPUD Subcontractor service areas.

5.15-1 Substantially increase exposure of sensitive receptors to noise levels above established federal, State or local standards.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect noise sources (temporary or permanent), stationary and mobile sources, and their effects on sensitive receptors, within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Growth resulting indirectly from the implementation of the new CVP water service contract would add sensitive receptors to the EID and GDPUD service areas, primarily in the form of new residences. Consistent with General Plan zoning and growth expectations, this new development is not unanticipated. Potential impacts from construction-related noise and increases in noise from construction-related vehicular traffic associated with new development would, however, be temporary. By design, an indirect result of the Proposed Action would be the accommodation of new residents within the EID and GDPUD service areas. With an increased population, all of the typical day-to-day activities (e.g., school travel, work commute, home maintenance, errands, etc.) associated with urban/rural life would increase the overall magnitude of ambient noise levels within these areas.

The County has adopted a comprehensive suite of policies and provisions governing noise control and abatement in keeping with these expected increases in population. Goal 6.5: Acceptable Noise Levels, as identified in the Public Health, Safety and Noise Element of the General Plan states that it is the goal of the County to:

> Ensure that County residents are not subjected to noise beyond acceptable levels.

Objective 6.5.1: Protection of Noise-Sensitive Development in the Public Health, Safety and Noise Element of the General Plan additionally provides that it is an objective of the County to:

> Protect existing noise-sensitive developments (e.g., hospitals, schools, churches and residential) from new uses that would generate noise levels incompatible with those uses and, conversely, discourage noise-sensitive uses from locating near sources of high noise levels.

To provide a comprehensive approach to noise control, the County has adopted three key provisions that integrate other planning/approval mechanisms and processes. These include:

A. Develop and employ procedures to ensure that noise mitigation measures required pursuant to an acoustical analysis are implemented in the project review process and, as may be determined necessary, through the building permit process.

B. Develop and employ procedures to monitor compliance with the standards of the Noise Element after completion of projects where noise mitigation measures were required.

C. The zoning ordinance shall be amended to provide that noise standards will be applied to ministerial projects with the exception of single-family residential building permits if not in areas governed by the Airports Comprehensive Land Use Plans.

Various policies under the Noise Element are particularly applicable to long-term noise identification, abatement, and management. Acoustical analyses are required as part of the approval process for noise-sensitive land uses, noise mitigation measures shall be placed upon site planning and design, and assurances made that noise barriers are not incompatible with the surroundings. Setbacks shall be the preferred method of noise abatement for residential projects located along U.S. Highway 50 with noise walls discouraged within the foreground viewshed of U.S. Highway 50 and shall be discouraged in favor of less intrusive noise mitigation (e.g., landscaped berms, setbacks) along other high volume roadways.

New noise-sensitive uses shall not be allowed where the noise level, due to non-transportation noise sources, exceed established noise level standards. Furthermore, new development of noise sensitive land uses will not be permitted in areas exposed to existing or projected levels of noise from transportation noise sources which exceed established noise levels unless the project design includes effective mitigation measures to reduce exterior noise and noise levels in interior spaces.

A program-level analysis of the Proposed Action and alternatives confirm that, with proper implementation of the numerous goals, objectives, policies and implementation measures provided for the El Dorado County General Plan, Public Health, Safety and Noise Element, no significant noise impacts would result as an indirect consequence of executing the P.L.101-514 contract. Subsequent project-level analyses for any future projects would include a more detailed analysis based on project-specific details and design features. Appropriate mitigation measures would be identified and implemented, as necessary, at that time.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.16. GEOLOGY, SOILS, MINERAL RESOURCES, AND PALEONTOLOGICAL RESOURCES (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses potential indirect, service area-related impacts on the existing geologic, seismic, mineral resources, soils, and paleontological conditions that could result from the implementation of the P.L. 101-514 water service contract. Potential impacts within the EID and GDPUD Subcontractor service areas that could result indirectly from the Proposed Action were evaluated qualitatively by reviewing geologic and land use information developed for the El Dorado County General Plan and its associated documents.

The Proposed Action and alternatives do not propose the construction of any new facilities. Accordingly, there are no direct impacts on geology, soils, or mineral or paleontological resources resulting from this action. Subsurface geology, surficial overburden and arable soils will not be affected. The construction and operation of any facilities such as specific diversion intakes, pipelines, storage facilities, pumping plants, and water treatment plants, to the extent they are required in the future, will be separate projects proceeding independently from this current action.

Consequently, this indirect service area-related analysis focuses on the potential effect of this new water allocation on accommodating planned, but new growth within the Subcontractor service areas of EID and GDPUD.

5.16.1. CEQA Standards of Significance

A significant impact on geologic, soil, or mineral or paleontological resources would occur if the implementation of the Proposed Action would:

- expose people or structures to major geologic hazards, such as rupture of a known earthquake fault, as defined on the most recent Alquist-Priolo Earthquake Fault Zoning Act Map, seismic ground shaking, liquefaction, slope failure, or landslides;
- place structures on soils that are likely to collapse or subside, or be located on expansive soils (defined in Table 18-01-B of the Uniform Building Code) that could damage foundations or structures;
- substantially increase erosion or loss of topsoil due to site disturbance;
- result in the loss of availability of a known mineral resource that would be of value to the region and residents of the State, or result in the loss of availability of a locally important mineral resource recovery site delineated in the El Dorado General Plan; or

- directly or indirectly destroy a unique paleontological resources or site or unique geologic feature.

5.16.2. Impacts and Mitigation Measures

Potential indirect impacts on geologic, soils, and mineral and paleontological resources within the EID and GDPUD Subcontractor service areas that could occur as a result of the implementation of P.L.101-514 water service contract were qualitatively evaluated based on various land use, growth, and planning information developed for the El Dorado County General Plan.

5.16-1 Expose people or structures to major geologic hazards, such as rupture of a known earthquake fault, as defined on the most recent Alquist-Priolo Earthquake Fault Zoning Act Map, seismic ground shaking, liquefaction, slope failure, or landslides.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed or would occur. Consequently, there would be no change in land uses, no physical disturbance of any kind, or associated activities that could affect geological or pedologic (soils) or paleontological resources within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As noted previously, while the distribution of known faults is concentrated in the western portion of the county, there are no active fault-rupture hazard zones within the proposed GDPUD and EID Subcontractor service areas. Moreover, it is acknowledged that El Dorado County has a low to moderate potential for strong seismic ground shaking and no portion of El Dorado County is located in a Seismic Hazard Zone (regulatory zones that encompass areas prone to liquefaction and earthquake-induced landslides) based on the Seismic Hazards Mapping Program administered by CGS.

Under its current General Plan, the County has committed to keeping up-to-date on geologic, seismic, and other hazards. Policy 6.3.2.1 of the Public Health, Safety and Noise Element states that:

> The County shall maintain updated geologic, seismic and avalanche hazard maps, and other hazard inventory information in cooperation with the State Office of Emergency Services, California Department of Conservation--Division of Mines and Geology, U.S. Forest Service, Caltrans, Tahoe Regional Planning Agency, and other agencies as this information is made available. This information shall be incorporated into the El Dorado County Operational Area Multi-Hazard Functional Emergency Operations Plans.

Furthermore, implementation measures such as the following provide operational commitments to enact processes to maintain the most up-to-date informational database to support all planning efforts within the County having regard to geological, seismic, and other geological hazards.

General Plan Implementation Measure HS-C requires the County to develop a program to collect, maintain, and update geological, seismic, avalanche, and other geological hazard information. [Policy 6.3.2.1]. Measure HS-D requires development and adoption of standards to protect against seismic and geologic hazards. [Objective 6.3.1].

The Proposed Action and alternatives would have no direct impact on increasing the risks associated with geologic and seismic hazards or catastrophic mass wasting events. El Dorado County has numerous safeguards already in place to help identify, plan and protect persons from these hazards. This would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.16-2 Place structures on soils that are likely to collapse or subside, or be located on expansive soils (defined in Table 18-01-B of the Uniform Building Code) that could damage foundations or structures.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could increase structural risks due to geologic and soil instability within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The County's objective for building and site standards state that it is their intent to: Adopt and enforce development regulations, including building and site standards, to protect against seismic and geologic hazards.

Specifically, Policy 6.3.2.5 of the Public Health, Safety and Noise Element states that:

> Applications for development of habitable structures shall be reviewed for potential hazards associated with steep or unstable slopes, areas susceptible to high erosion, and avalanche risk. Geotechnical studies shall be required when development may be subject to geological hazards. If hazards are identified, applicants shall be required to mitigate or avoid identified hazards as a condition of approval. If no mitigation is feasible, the project will not be approved.

The Proposed Action and alternatives would have no direct impact on increasing the risks associated new structure development on unstable soils and subsurface geology. El Dorado County, through its General Plan, has numerous safeguards already in place to help identify, plan and protect persons from these hazards. This would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.16-3 Substantially increase erosion or loss of topsoil due to site disturbance.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could increase soil erosion or sedimentation within the service areas of either EID or GDPUD as defined by this action. There would be no impact***.***

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The Agriculture and Forestry Element of the General Plan acknowledges that agricultural land conservation is a top priority in the County. Goal 8.1 is for the: Long-term conservation and use of existing and potential agricultural lands within the County and limiting the intrusion of incompatible uses into agricultural lands.

The Conservation and Open Space Element includes Objective 7.1.2 (Erosion and Sedimentation) which identifies the mandate to: minimize soil erosion and sedimentation. Various policies exist to meet that objective. As an example, Policy 7.1.2.1 states that development or disturbance shall be prohibited on slopes exceeding 30 percent unless necessary for access. Other relevant policies include the following:

Policies

7.1.2.2. Discretionary and ministerial projects that require earthwork and grading, including cut and fill for roads, shall be required to minimize erosion and sedimentation, conform to natural contours, maintain natural drainage patterns, minimize impervious surfaces, and maximize the retention of natural vegetation. Specific standards for minimizing erosion and sedimentation shall be incorporated into the Zoning Ordinance.

7.1.2.3. Enforce Grading Ordinance provisions for erosion control on all development projects and adopt provisions for ongoing, applicant-funded monitoring of project grading.

7.1.2.4. Cooperate with and encourage the activities of the three Resource Conservation Districts in identifying critical soil erosion problems and pursuing funding sources to resolve such problems.

7.1.2.5. The Department of Transportation, in conjunction with the Resource Conservation Districts and Soil Conservation District, shall develop a road-side maintenance program to manage roads in a manner that maintains drainage and protects surface waters while reducing road-side weed problems.

7.1.2.6. The County shall encourage the Soil Conservation Service to update the 1974 Soil Survey and to digitize all soils mapping units on the Geographic Information System (GIS).

7.1.2.7. The County shall require agricultural grading activities that convert one acre or more of undisturbed vegetation to agricultural cropland to obtain an agricultural permit through the Agricultural Commissioner's office which may require approval of the Agricultural Commission. All erosion control measures included in the agricultural permit would be implemented. All agricultural practices, including fuel reduction and fire protection, that do not change the natural contour of the land and that use "best management practices" as recommended by the County Agricultural Commission and adopted by the Board of Supervisors shall be exempt from this policy.

The Proposed Action and alternatives would have no direct impact on increasing the risks of soil erosion and sedimentation. As noted, El Dorado County, through its General Plan, has numerous safeguards already in place to help identify, avoid, or otherwise mitigate for soil erosion and sedimentation risks. This would be a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.16-4 Result in the loss of availability of a known mineral resource that would be of value to the region and residents of the State, or result in the loss of availability of a locally important mineral resource recovery site delineated in the El Dorado General Plan.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect mineral resources within the service areas of either EID or GDPUD as defined by this action. There would be no impact**.**

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The El Dorado County General Plan recognizes the importance of in-county mineral resources. Goal 7.2, Mineral Resources, states that a goal of the County is for the conservation of the County's significant mineral resources. In accordance with California Code of Regulations, Sections 3675-3676, the County shall maintain all Mineral Land Classification reports produced by the State Department of Conservation, California Geological Survey, which pertain to El Dorado County. El Dorado County hereby recognizes, accepts, and adopts by reference those State Classification Reports as they currently exist and as may be amended, or supplemented, in the future.

Areas designated as Mineral Resource (-MR) overlay on the General Plan Land Use Map shall be identified by the -MR combining zone district on the zoning maps when the likely extraction of the resource through surface mining methods will be compatible with adjacent land uses. The County shall also request the State Department of Conservation to conduct a County-wide study to assess the location and value of non-metallic mineral materials. Once completed, the County may recognize them in the General Plan and zone them and the surroundings to allow for mineral resource management.

The County also recognizes the importance in protecting mineral resources from development. Policy 7.2.2.1 provides that:

> The minimum parcel size within, or adjacent to, areas subject to the -MR overlay shall be twenty (20) acres unless the applicant can demonstrate to the approving authority that there are no economically significant mineral deposits on or adjacent to the project site and that the proposed project will have no adverse effect on existing or potential mining operations. The minimum parcel size adjacent to active mining operations which are outside of the -MR overlay shall also be twenty (20) acres.

The Proposed Action and alternatives would have no direct impact on the mineral resources of the County. As noted above, El Dorado County, through its General Plan, utilizes numerous safeguards to help identify, avoid, or otherwise mitigate any potential adverse effects on mineral resources. This would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.16-5 Directly or indirectly destroy a unique paleontological resources or site or unique geologic feature.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land uses or associated activities that could affect mineral resources within the service areas of either EID or GDPUD as defined by this action. There would be no impact**.**

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The Conservation and Open Space Element of the El Dorado County General Plan identifies the preservation of cultural resources, including paleontological resources, as an important responsibility. As described in Impact 5.19-1, there are several relevant policies addressing preservation of the County's cultural resources, in general, and are not repeated here. However, more specifically for paleontological resources, relevant policies include:

> Policies
>
> 7.5.1.1. The County shall establish a Cultural Resources Ordinance. This ordinance shall provide a broad regulatory framework for the mitigation of impacts on cultural resources (including

historic, prehistoric and paleontological resources) by discretionary projects. This Ordinance should include (but not be limited to) and provide for the following:

B. A 100-foot development setback in sensitive areas as a study threshold when deemed appropriate.

C. Identification of appropriate buffers, given the nature of the resources within which ground-disturbing activities should be limited.

D. A definition of cultural resources that is significant to the County. This definition shall conform to (but not necessarily be limited to) the significance criteria used for the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR) and Society of Vertebrate Paleontology.

7.5.1.3. Cultural resource studies (historic, prehistoric, and paleontological resources) shall be conducted prior to approval of discretionary projects. Studies may include, but are not limited to, record searches through the North Central Information Center at California State University, Sacramento, the Museum of Paleontology, University of California, Berkeley, field surveys, subsurface testing, and/or salvage excavations. The avoidance and protection of sites shall be encouraged.

7.5.1.4. Promote the registration of historic districts, sites, buildings, structures, and objects in the National Register of Historic Places and inclusion in the California State Office of Historic Preservation's California Points of Historic Interest and California Inventory of Historic Resources.

7.5.1.5. A Cultural Resources Preservation Commission shall be formed to aid in the protection and preservation of the County's important cultural resources. The Commission's duties shall include, but are not limited to:

A. Assisting in the formulation of policies for the identification, treatment, and protection of cultural resources (including historic cemeteries) and the curation of any artifacts collected during field collection/excavation.

C. Reviewing all projects with identified cultural resources and making recommendations on appropriate forms of protection and mitigation.

7.5.1.6. The County shall treat any significant cultural resources (i.e., those determined California Register of Historical Resources/National Register of Historic Places eligible and unique paleontological resources), documented as a result of a conformity review for ministerial development, in accordance with CEQA standards.

As an indirect impact, El Dorado County, through its various policies and implementation measures identified in its Conservation and Open Space Element relevant to paleontological resources, there is guidance to help identify, avoid, or otherwise mitigate any potential future planned activities on these resources. The completion of the Cultural Resources Ordinance is intended to integrate all of these protective provisions into one overall guidance document. With the adherence to these policies within the context of the El Dorado County General Plan, the Proposed Action and alternatives would have no indirect impact on significant unique paleontological resources or unique geologic features within the County. Accordingly, with these measures in place, this would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives.

5.17. RECREATION (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses the potential indirect service area-related impacts on existing recreational uses in the project vicinity that could result from the implementation of the P.L.101-514 water service contract at a programmatic level.

5.17.1. CEQA Standards of Significance

For the purposes of this EIS/EIR, terrestrial recreation-related impacts may be deemed significant if implementation of the Proposed Action or Alternative would:

- result in permanent closure of recreation trails through the project area or result in a substantial increase in exposure to hazards for recreationists, for land-based activities due to project construction or operation; or
- 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.

5.17.2. Impacts and Mitigation Measures

5.17-1 Result in permanent closure of recreation trails through the project area or result in a substantial increase in exposure to hazards for recreationists, for land-based activities due to project construction or operation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in recreational trail use or the level of safety afforded existing recreationists within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Objective 9.1.2: County Trails of the Parks and Recreation Element of the El Dorado County General Plan states that the County will provide for a County-wide, non-motorized, multi-purpose trail system and trail linkages to existing and proposed local, State, and Federal trail systems. The County will, additionally, actively seek to establish trail linkages between schools, parks, residential, commercial, and industrial uses and to coordinate this non-motorized system with the vehicular circulation system. The County's vigilance in ensuring continued operation and maintenance of its recreational trails is provided in Measure PR-A which commits the County to prepare and implement a Parks Master Plan and Parks and Recreation Capital Improvement Program, focusing on, in relevant part: development of sufficient park and recreation land to serve the residents for neighborhood, community, and regional parkland.

Policy TC-4a of the Parks and Recreation Element provide that the County shall implement a system of recreational, commuter, and inter-community bicycle routes in accordance with the County's *Bikeway Master Plan*. The plan should designate bikeways connecting residential areas to retail, entertainment, and employment centers and near major traffic generators such as recreational areas, parks of regional significance, schools, and other major public facilities, and along recreational routes. Additionally, Policy TC-4i provides that, within Community Regions and Rural Centers, all development shall include pedestrian/bike paths connecting to adjacent development and to schools, parks, commercial areas and other facilities where feasible. In Rural Regions, pedestrian/bike paths shall be considered as appropriate.

In terms of safety considerations, the Parks and Recreation Element, Policy TC-4h states that, where hiking and equestrian trails abut public roads, they should be separated from the travel lanes whenever possible by curbs and barriers (such as fences or rails), landscape buffering, and spatial distance. Existing public corridors such as power transmission line easements, railroad rights-of-way, irrigation district easements, and roads should be put to multiple-use for trails, where possible.

California State Parks is collaborating with the Reclamation to prepare a joint General Plan/Resource Management Plan for the Auburn State Recreation Area (SRA). California State Parks manages Auburn SRA through a contract with Reclamation. Auburn SRA is comprised of forty miles of river canyon along the North and Middle Forks of the American River.

The General Plan/Resource Management Plan will define a long term vision for the park unit, will provide guidelines for the protection and management of natural and cultural resources, will determine the use and management of the many recreation activities which occur in the SRA and will identify any additional facility improvements. An Environmental Impact Report/Environmental Impact Statement will be prepared as part of this project.

The GP/RMP is a programmatic document that will outline broad goals and guidelines for management of Auburn SRA and will provide the basis for developing future focused management plans, specific project plans, and other proposals which implement the GP/RMP goals. However, the GP/RMP will not define detailed methods, plans or designs for fulfilling these goals

The Proposed Action and alternatives would have no direct impact on recreational trails, their use, or impart any increased risk to recreationists within the County. As noted, El Dorado County, through its Parks and Recreation Element of the General Plan, provide guidance to help identify, avoid, or otherwise mitigate the potential impacts of planned activities on these resources and activities. This, therefore, would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.17-2 Result in an increase in 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.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in recreational or park use within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The County, through its Parks and Recreation Element of its General Plan recognize its commitment to providing an adequate level of recreational parklands. Goal 9.1: Parks and Recreation Facilities state that it is the goal of the County to: provide adequate recreation opportunities and facilities including developed regional and community parks, trails, and resource-based recreation areas for the health and welfare of all residents and visitors of El Dorado County. In fact, the County shall assume primary responsibility for the acquisition and development of regional parks and assist in the acquisition and development of neighborhood and community parks to serve County residents and visitors. Proper oversight and planning will ensure that park usage is not exceeded concomitant with anticipated and approved growth. This principal has been firmly established in the El Dorado County General Plan, Parks and Recreation Element. Several policies are relevant in this context and include the following:

Policies

9.1.1.2. Neighborhood parks shall be primarily focused on serving walk-to or bike-to recreation needs. When possible, neighborhood parks should be adjacent to schools. Neighborhood parks are generally 2 to 10 acres in size and may include a playground, tot lot, turf areas, and picnic facilities.

9.1.1.3. Community parks and recreation facilities shall provide a focal point and gathering place for the larger community. Community parks are generally 10 to 44 acres in size, are for use by all sectors and age groups, and may include multi-purpose fields, ball fields, group picnic areas, playground, tot lot, multi-purpose hardcourts, swimming pool, tennis courts, and a community center.

9.1.1.4. Regional parks and recreation facilities shall incorporate natural resources such as lakes and creeks and serve a region involving more than one community. Regional parks generally range in size from 30 to 10,000 acres with the preferred size being several hundred acres. Facilities may include multi-purpose fields, ball fields, group picnic areas, playgrounds, swimming facilities, amphitheaters, tennis courts, multi-purpose hardcourts, shooting sports facilities, concessionaire facilities, trails, nature interpretive centers, campgrounds, natural or historic points of interest, and community multi-purpose centers.

The Proposed Project and alternatives would have no direct impact on recreational parks. The El Dorado County General Plan, through its Parks and Recreation Element, provide guidance to help identify, avoid, or otherwise mitigate the potential impacts of increased pressures placed on existing park/recreational facilities. This would be a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.18. VISUAL RESOURCES (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses the potential indirect service area-related impacts on existing visual and aesthetic resources within the project vicinity that could result from the implementation of the P.L.101-514 water service contract at a programmatic level. Potential impacts on aesthetics were evaluated qualitatively by reviewing visual resource information developed for the El Dorado County General Plan.

5.18.1. CEQA Standards of Significance

Any assessment of visual resources tends to be qualitative rather than quantitative. Aesthetics and visual resources are subjective in nature; what one person may identify as a visually-pleasing resource others may consider unattractive. Certain standards have been developed against which a project's effect on visual resources can be measured. These standards have been developed based on local general plan objectives and policies, CDPR guidelines, and the CEQA Guidelines Environmental Checklist (CEQA Appendix G). Therefore, for purposes of this EIS/EIR, impacts on visual resources may be deemed significant if implementation of the Proposed Action or its alternatives would:

- have a substantial adverse effect on a scenic vista or substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a State scenic highway;
- substantially degrade the existing visual character or quality of the site and its surroundings or create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area.

5.18.2. Impacts and Mitigation Measures

5.18-1 Result in a substantial adverse effect on a scenic vista or substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a State scenic highway.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in aesthetics or scenic vistas within the service areas of either EID or GDPUD as defined by this action. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The Land Use Element of the El Dorado County General Plan recognizes the importance of visual integrity and maintenance of aesthetics within the County. Protection and improvement of scenic values along designated scenic road corridors is the stated purpose of Goal 2.6: Corridor Viewsheds. The identification of scenic and historical roads and corridors is provided through several policies within the Land Use Element. According to Policy 2.6.1.1, A Scenic Corridor Ordinance shall be prepared and adopted for the purpose of establishing standards for the protection of identified scenic local roads and State highways. The ordinance shall incorporate standards that address at a minimum the following:

- Mapped inventory of sensitive views and viewsheds within the entire County;
- Criteria for designation of scenic corridors;
- State Scenic Highway criteria;
- Limitations on incompatible land uses;
- Design guidelines for project site review, with the exception of single family residential and agricultural uses;
- Identification of foreground and background;
- Long distance viewsheds within the built environment;
- Placement of public utility distribution and transmission facilities and wireless communication structures;
- A program for visual resource management for various landscape types, including guidelines for and restrictions on ridgeline development;
- Residential setbacks established at the 60 CNEL noise contour line along State highways, the local County scenic roads, and along the roads within the Gold Rush Parkway and Action Program;
- Restrict sound walls within the foreground area of a scenic corridor; and
- Grading and earthmoving standards for the foreground area.

Until such time as the Scenic Corridor Ordinance is adopted, the County shall review all projects within designated State Scenic Highway corridors for compliance with State criteria.

The Proposed Action and alternatives would have no direct impact on visual acuity, aesthetics, or any scenic vista within the County. As noted, El Dorado County, through its Land Use Element of the General Plan, have policies and implementation measures in place to help identify, avoid, or otherwise mitigate planned activities that may impart adverse effects on visual resources. This would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.18-2 Result in a substantial degradation to the existing visual character or quality of the site and its surroundings or create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in aesthetics or new sources of substantial light or glare within the service areas of either EID or GDPUD as defined by this action. There would be no impact**.**

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As noted previously for Impact 5.9-1, the Land Use Element of the El Dorado County General Plan contain provisions addressing the protection of visual resources including scenic vistas and other aesthetic values along scenic, historic roadway corridors. The County is committed to maintaining the characteristic natural landscape features unique to each area within the County (Goal 2.3: Natural Landscape Features). This is combined with an effort to provide for the retention of distinct topographical features and conservation of the native vegetation of the County (see Objective 2.3.1: Topography and Native Vegetation).

Significant effort is placed on the visual and physical separation of existing communities from new development. Various policies are in place that addresses these concerns. These include:

Policies

2.5.1.1. Low intensity land uses shall be incorporated into new development projects to provide for the physical and visual separation of communities. Low intensity land uses may include any one or a combination of the following: parks and natural open space areas, special setbacks, parkways, landscaped roadway buffers, natural landscape features, and transitional development densities.

2.5.1.2. Greenbelts or other means of community separation shall be included within a specific plan and may include any of the following: preserved open space, parks, agricultural districts, wildlife habitat, rare plant preserves, riparian corridors, and designated Natural Resource areas.

2.5.1.3. The County shall develop a program that allows the maintenance of distinct separators between developed areas (Community Regions and Rural Centers).

2.6.1.5. All development on ridgelines shall be reviewed by the County for potential impacts on visual resources. Visual impacts will be assessed and may require methods such as setbacks, screening, low-glare or directed lighting, automatic light shutoffs, and external color schemes that blend with the surroundings in order to avoid visual breaks to the skyline.

The Proposed Actiona and alternatives would have no direct impact on the visual or aesthetic character of development sites within the County. As noted, El Dorado County, through its Land Use Element of the General Plan, have policies and implementation measures in place to help identify, avoid, or otherwise mitigate planned activities that may impart adverse effects on visual resources including any increase in nighttime glare. This would be a less-than-significant impact.

<u>Mitigation Measures</u>

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.19. CULTURAL RESOURCES (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses the potential indirect service area-related impacts on existing cultural resources that could result from the implementation of the P.L.101-514 water service contract. As an indirect result of accommodating planned growth within the County, potential impacts on cultural resources are a concern.

The Proposed Action and alternatives, as defined, do not propose the construction of any new facilities or disturbance of any lands. Accordingly, there are no direct cultural resources impacts resulting from the action. The construction and operation of any future facilities such as specific diversion intakes, pipelines, storage facilities, pumping plants, and water treatment plants, to the extent that they are required in the future, will be separate projects proceeding independently from this current action. Cultural resources impacts resulting from their construction or long-term operation would be evaluated at a project-specific level in later, more detailed environmental documentation. Once the Record of Decision (ROD) for the current document has been signed, Reclamation will have no authority to perform Section 106 review for any projects resulting from its execution, except where such projects involve Reclamation facilities or permits. Other federal agencies may have Section 106 responsibilities, if future projects involve lands, facilities, or permits under their jurisdiction. For projects without federal agency jurisdiction, cultural resources should be managed as described below.

5.19.1. <u>CEQA Standards of Significance</u>

In general, significant impacts are those that diminish the integrity, research potential, or other characteristics that make a historical or cultural resource significant or important. For the purpose of this EIS/EIR, impacts on historical or unique archaeological resources may be deemed significant if implementation of the proposed project would:

- cause a substantial adverse change in the significance of an historical resource as defined in CEQA Guidelines Section 15064.5 and 36 CFR 60.4;
- cause a substantial adverse change in the significance of a unique archaeological resource pursuant to CEQA Guidelines Section 15064.5;
- disturb any human remains, including those interred outside formal cemeteries;

In addition to CEQA compliance, any project that involves federal undertakings, lands, funds, or permits must comply with Section 106 of the National Historic Preservation Act (NHPA). This Act defines important (significant) resources as those listed on, or eligible for listing on, the National Register of Historic Places. National Register criteria are very similar to those for the State Register, defining an important cultural resource as one that is associated with important persons or events, or that embodies high artistic or architectural values, or that has scientific value (36 CFR 60.6). State Historic Landmarks, and any cultural resource that has been determined eligible to the National Register, automatically qualify for the State Register. Where a cultural resource has not been evaluated for its importance, it is treated as potentially important until an evaluation can be done. For this project, Reclamation, as the federal lead agency, has responsibility for project compliance with the NHPA.

5.19.2. Impacts and Mitigation Measures

Cultural resources impacts related to the implementation of the proposed new CVP water service contracts in the EID and GDPUD service areas were qualitatively evaluated based on land use, growth, and environmental information developed for the El Dorado County General Plan, relative to the location of the EID and GDPUD Subcontractor service areas.

5.19-1 Result in a substantial adverse change in the significance of an historical or archaeological resource.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land use, development, and no ground disturbance activities. Accordingly, all cultural resources within the service areas of either EID or GDPUD would remain unaffected. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The Conservation and Open Space Element of the El Dorado County General Plan identifies the preservation of cultural resources as an important responsibility. Objective 7.5.3: Recognition of Prehistoric/Historic Resources notes that it is an objective of the County for: *Recognition of the value of the County's* prehistoric *and historic resources to residents, tourists, and the economy of the*

County, and promotion of public access and enjoyment of prehistoric and historic resources where appropriate. Goal 7.5: Cultural Resources, goes on to state that it is the goal of the County to: *Ensure the preservation of the County's important cultural resources*.

In the creation of an identification and preservation program for the County's cultural resources, several policies are relevant. They include and provide the following:

Policies

7.5.1.1. The County shall establish a Cultural Resources Ordinance. This ordinance shall provide a broad regulatory framework for the mitigation of impacts on cultural resources (including historic, prehistoric and paleontological resources) by discretionary projects. This Ordinance should include (but not be limited to) and provide for the following:

A. Appropriate (as per guidance from the Native American Heritage Commission) Native American monitors to be notified regarding projects involving significant ground-disturbing activities that could affect significant resources.

B. A 100-foot development setback in sensitive areas as a study threshold when deemed appropriate.

C. Identification of appropriate buffers, given the nature of the resources within which ground-disturbing activities should be limited.

D. A definition of cultural resources that is significant to the County. This definition shall conform to (but not necessarily be limited to) the significance criteria used for the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR) and Society of Vertebrate Paleontology.

E. Formulation of project review guidelines for all development projects.

F. Development of a cultural resources sensitivity map of the County.

Policies

7.5.1.2. Reports and/or maps identifying specific locations of archaeological or historical sites shall be kept confidential in the Planning Department but shall be disclosed where applicable.

7.5.1.3. Cultural resource studies (historic, prehistoric, and paleontological resources) shall be conducted prior to approval of discretionary projects. Studies may include, but are not limited to, record searches through the North Central Information Center at California State University, Sacramento, the Museum of Paleontology, University of California, Berkeley, field surveys, subsurface testing, and/or salvage excavations. The avoidance and protection of sites shall be encouraged.

7.5.1.4. Promote the registration of historic districts, sites, buildings, structures, and objects in the National Register of Historic Places and inclusion in the California State Office of Historic Preservation's California Points of Historic Interest and California Inventory of Historic Resources.

7.5.1.5. A Cultural Resources Preservation Commission shall be formed to aid in the protection and preservation of the County's important cultural resources. The Commission's duties shall include, but are not limited to:

A. Assisting in the formulation of policies for the identification, treatment, and protection of cultural resources (including historic cemeteries) and the curation of any artifacts collected during field collection/excavation;

B. Assisting in preparation of a cultural resources inventory (to include prehistoric sites and historic sites and structures of local importance);

C. Reviewing all projects with identified cultural resources and making recommendations on appropriate forms of protection and mitigation; and

D. Reviewing sites for possible inclusion in the National Register of Historic Places, California Register, and other State and local lists of cultural properties.

<u>Policy</u>

7.5.1.6. The County shall treat any significant cultural resources (i.e., those determined California Register of Historical Resources/National Register of Historic Places eligible and unique paleontological resources), documented as a result of a conformity review for ministerial development, in accordance with CEQA standards.

Maintaining the visual integrity of historic resources is amply guided by several policies and their associated provisions. These include:

<u>Policies</u>

7.5.2.1. Create Historic Design Control Districts for areas, places, sites, structures, or uses which have special historic significance.

7.5.2.2. The County shall define Historic Design Control Districts (HDCDs). HDCD inclusions and boundaries shall be determined in a manner consistent with National Historic Preservation Act (NHPA) Historic District standards:

A. The County shall develop design guidelines for each HDCD. These guidelines shall be compatible with NHPA standards.

B. New buildings and structures and reconstruction/restoration of historic (historic as per National Register of Historic Places [NRHP] and California Register of Historical Resources [CRHR] criteria) buildings and structures shall generally conform to styles of architecture prevalent during the latter half of the 19th century into the first decade of the 20th century.

C. Any historic building or structure located within a designated HDCD, or any building or structure located elsewhere in the county that is listed on the NRHP or CRHR, is designated a California Building of Historic Interest, or a California State Historic Landmark, or is designated as significant as per NRHP/CRHR criteria, shall not be destroyed, significantly altered, removed, or otherwise changed in exterior appearance without a design review.

D. In cases where the County permits the significant alteration of a historic building or structure exterior, such alteration shall be required to maintain the historic integrity and appearance of the building or structure and shall be subject to a design review.

E. In cases where new building construction is placed next to a historic building or structure in a designated HDCD or listed on the CRHR/NRHP, the architectural design of the new construction shall generally conform to the historic period of significance of the HDCD or listed property.

F. In cases where the County permits the destruction of a historic building or tearing down a structure, the building or structure shall first be recorded in a manner consistent with the standards of the NHPA Historic American Building Survey (HABS) by a qualified professional architectural historian.

G. The County shall mandate building and structure design controls within the viewshed of the Marshall Gold Discovery State Historic Park. These design controls shall be consistent with those mandated for designated Historic Design Control Districts.

As an indirect impact, El Dorado County, through its various policies and implementation measures identified in its Conservation and Open Space Element relevant to cultural and historic resources, there is guidance to help identify, avoid, or otherwise mitigate any potential future planned activities on these resources. The completion of the Cultural Resources Ordinance is intended to integrate all of these protective provisions into one overall guidance document. With the adherence to these policies within the context of the El Dorado County General Plan, the Alternatives would have no indirect impact on significant archaeological, cultural, or historic resources within the County. Accordingly, with these measures in place, this would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.19-2 Result in the disturbance of any human remains, including those interred outside formal cemeteries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land use, development, and no ground disturbance activities. Accordingly, any buried human remains within the service areas of either EID or GDPUD would remain unaffected. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As noted under Impact 5.16-1, the County possesses and adheres to numerous policies related to the protection of cultural resources. The Proposed Action and alternatives would have no direct impact on any human remains having archaeological importance within the County. As an indirect impact, El Dorado County, through its various policies and implementation measures identified in its Conservation and Open Space Element and, consistent with the provisions of the Cultural Resources Ordinance, guidance is provided to help identify, avoid, or otherwise mitigate any potential future planned activities on the possible discovery of past human remains. Accordingly, this would be a less-than-significant impact.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.20. TERRESTRIAL AND WILDLIFE RESOURCES (SERVICE AREA INDIRECT IMPACTS)

This subchapter addresses the potential indirect service area-related impacts on existing terrestrial and wildlife resources that could result from the implementation of the P.L.101-514 water service contract. As an indirect result of accommodating planned growth within the County, potential impacts on terrestrial and wildlife resources are a concern.

The Proposed Action and alternatives, as defined, do not propose the construction of any new facilities or disturbance of any lands. Accordingly, there are no direct impacts resulting from the action to any terrestrial or wildlife resources are anticipated. The construction and operation of any future facilities such as specific diversion intakes, pipelines, storage facilities, pumping plants, and water treatment plants, to the extent that they are required in the future, will be separate projects proceeding independently from this current action. Any terrestrial and/or wildlife resources impacts resulting from their construction or long-term operation would be evaluated at a project-specific level in later, more detailed environmental documentation.

5.20.1. CEQA Standards of Significance

For the purpose of this EIS/EIR, impacts on terrestrial and/or wildlife resources may be deemed significant if implementation of the proposed project would:

- Have a significant adverse effect, either directly through habitat modifications, on any species in local or regional plan, policies, or regulations, or by the California Department of Fish & Game or U.S. Fish & Wildlife Service; and
- Substantially affect a rare, threatened or endangered species of animal or plant or the habitat of those listed species.

5.20.2. Impacts and Mitigation Measures

Potential terrestrial and wildlife impacts related to the implementation of the proposed new CVP water service contracts in the EID and GDPUD service areas were qualitatively evaluated based on existing and foreseeable land use, growth, and environmental information developed for the El Dorado County General Plan, its EIR, and related documents, relative to the location of the EID and GDPUD Subcontractor service areas.

5.20-1 Have a significant adverse effect, either directly through habitat modifications, fragmentation, on any species in local or regional plan, policies, or regulations, or by the California Department of Fish & Game or U.S. Fish & Wildlife Service.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land use, development, and no ground disturbance activities. Accordingly, all terrestrial and wildlife resources within the service areas of either EID or GDPUD would remain unaffected. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The El Dorado County General Plan EIR noted that potentially significant secondary impacts on wildlife habitat associated with urbanization may include such effects as the reduction in water quality caused by urban runoff, erosion and siltation; increased noise and lighting that reduce habitat value for nocturnal wildlife; intrusion of humans and domestic animals and the resulting predation and disturbance of wildlife; increased uses of natural areas for recreational activities; impacts on tree canopy and understory from fire safety methods (defensible space); and introduction of non-native invasive species that would degrade existing habitats for native plant and wildlife species.

Impacts on these major habitat types would be considered significant because conversion for high- and medium-intensity land uses would remove and fragment a substantial amount of the existing wildlife habitat on the west slope. While low-density development reduces habitat quality much more than it reduces the amount of habitat, even low-density development, such as rural ranchettes, can have a substantial impact on habitat quality. One of the most significant impacts of low-density development and non-urban sprawl on wildlife is fragmentation of habitat patches by roads, structures, and fences. The negative consequences of habitat fragmentation are well known theoretically and have been documented in numerous studies. When habitat is fragmented from a few large patches to numerous small patches, wildlife diversity is expected to decrease even if the remaining parcels support similar vegetation and the decrease in the total amount of habitat is small.

The General Plan includes two policies that provide some degree of protection for wildlife habitat: (1) discourage development on slopes over 40 percent (Policy 7.1.2.1); and (2) oak canopy retention guidelines based on land use designation (Policy 7.4.4.4). Although these policies would provide some protection, they would be ineffective at reducing this impact to a less-than-significant level, because they do not include mandatory standards and apply only to discretionary projects.

Policy CO-12a addresses retention of native vegetation. Under this policy, development outside an approved building envelope on previously undisturbed sites shall retain existing, native vegetation to the greatest extent feasible. However, since this policy only requires preserving native vegetation if feasible, it is not expected to provide much guaranteed protection for wildlife habitat but it could reduce the overall amount of habitat loss and fragmentation. The effectiveness of the policy would be largely dependent upon the level of enforcement by the County.

Policy CO-11a requires that the County provide for Open Space lands through various mechanisms, including the designation of land as Open Space, Rural Lands, and Natural Resources. Policy CO-11b requires that Open Space, Natural Resources, and Rural land use designations on the General Plan Land Use Map be maintained in support of identification of natural-resource areas required for the conservation of important habitat resources, including habitat for special-status species; protection of streams, lakes, ponds, springs, wetlands, and adjacent riparian habitat; and protection of large and contiguous native habitats (including river canyons). Impacts on wildlife habitat can be reduced by applying less intensive land use designations to habitats that are important for plant and animal life, but this policy lacks sufficient specificity to ensure that impacts would be lessened, because the designations do not restrict timber harvesting, mining, or agricultural conversion.

Measure CO-I directs the County to develop an integrated natural resources management plan which it has initiated. The management plan would address a number of issues related to protection of wildlife habitat. Specific elements of the management plan would include:

- coordination among, local, state, and federal agencies having jurisdiction over natural resources within the county;
- public involvement in natural resource management planning and implementation;
- conservation and restoration of large and contiguous native habitats;
- thresholds of significance for the loss of various habitats and/or resources;
- connectivity of large and contiguous native plant communities, native habitats, and other
- important habitat features;
- permanent protection of important habitat features through means such as use of Open Space and Natural Resource land use designations or zoning, clustering, large lot design, setbacks, or other appropriate techniques;
- incentive programs;
- monitoring of the plan’s goals and objectives; and
- adaptive management.

The integrated natural resources management plan would be developed within 5 years of General Plan adoption.

As an indirect impact of the proposed action and alternatives, El Dorado County, through its various policies and implementation measures identified in its Conservation and Open Space Element relevant to terrestrial and wildlife resources, offers guidance to help identify, avoid, or otherwise mitigate any potential future planned activities on these resources. By buildout, however, much of the existing habitat at lower elevations could be fragmented or removed by urban and agricultural development. More habitat in the central part of the county could be removed or fragmented than at 2025, because development is expected to continue to spread east up the west slope as western El Dorado County becomes increasingly urbanized. This impact was considered a significant impact in the El Dorado County General Plan EIR. For the Proposed Action, however, the increment of indirect impact is considered less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.20-2 Substantially affect a rare, threatened or endangered species of animal or plant or the habitat of those listed species.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed. Consequently, there would be no change in land use, development, and no ground disturbance activities. Accordingly, any rare, threatened or endangered species within the service areas of either EID or GDPUD would remain unaffected. There would be no impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The Proposed Action and alternatives would have no direct impact on any rare, threatened or endangered species within the service areas of either EID or GDPUD. However, the El Dorado County General Plan EIR concluded that development of and projected increases in urban, agricultural, and mined areas under the General Plan would lead to loss of habitat and loss of individuals of both special-status plants and animals. This impact was considered significant for all of the four equal-weight alternatives assessed under the General Plan Update CEQA review process.

A thorough discussion, under Section 7 consultation of the ESA, is provided in the Draft Biological Assessment (Appendix G of this Draft EIS/EIR) regarding listed species within the EID and GDPUD service areas. Considerable focus was directed towards special-status plants within these areas.

The USFWS, EDCWA, EID, Reclamation, and other parties have been involved in ongoing efforts to preserve gabbro plants and their habitat. These efforts have been focused on regional planning for the protection of gabbro plants. Efforts to preserve these plants begain in 1979 when, under recommendation from the California Native Plant Society (CNPS), the California Department of

Forestry and Fire Protection (CDF) transferred 320 acres of habitat at Pine Hill to CDFG for ecosystem management. In 1992, the El Dorado Board of Supervisors formed a Rare Plant Technical Advisory Committee (RPTAC) with business, non-profit, and state and federal agency participation to advise the County on a rare plant policy. Also in 1992, Reclamation, CDFG, and the Bureau of Land Management signed a Memorandum of Understanding that acknowledged the importance of preservation of habitat for gabbro species. In 1995, USFWS conducted a critical needs analysis as part of its Biological Opinion for the67 interim CVP water service contracts (as part of the proposed action to renew these CVP contracts) and identified the need to establish a preserve for gabbro species.

Five gabbro plants were listed by the USFWS on October 18, 1996. In 2001, eight local, state, and federal agencies signed a Cooperative Management Agreement that formalized each participant's role in the management and protection of the gabbro plants.

The USFWS issued its Recovery Plan for Gabbro Soil Plants for the Central Sierra Nevada Foothills in 2002. The Recovery Plan provides a recommendation for a 5,000-acre preserve that would provide the best achievable protection for gabbro species in western El Dorado County. The location and prioritization for areas in the preserve was developed in conjunction with the RPTAC. The USFWS considered the following criteria in developing the preserve:

- Priority was given to areas occupied by several of the target species;
- Principles of preserve design (linkages, size of preserve) were considered;
- Developed lands were eliminated to the extent possible; and
- Proportion of private to public lands was considered

El Dorado County, state, and federal agencies have provided funding since the 1990s for the acquisition of properties for a gabbro plants preserve, called the Pine Hill Preserve. A draft Pine Hill Preserve Management Plan (PHPMP) was issued in December 2006 and has undergone public review and comment. The Preserve currently includes 4,042 acres in western El Dorado County, of which 3,114 acres lie within the 5,000 acres designated for the recovery of the gabbro species in the Recovery Plan. Ownership of the land is divided among the Bureau of Land Management, Reclamation, USFWS, CDFG, CDF, EDCWA, EID, El Dorado County, and the private non-profit, American River Conservancy (ARC). The Agreement is in effect until July 2011. The PHPMP will be formally reviewed and updated every 5 years.

The purpose of the PHPMP is to coordinate management activities at the Preserve with actions undertaken by federal, state and local agencies, conservation organizations, and private landowners to fulfill the objectives of the Preserve. The PHPMP outlines strategies for achieving the following objectives:

- Protect and manage gabbro soil rare plant habitat areas in western El Dorado County to ensure their conservation and recovery;

- Promote and conduct research to find the best management techniques to aid in the conservation and recovery of the gabbro soil rate plants;
- Treat vegetation to reduce fuel loads, maintain functional habitat for the rare gabbro soil plant species, and reduce the risks of wildfire damage to human life and property in areas adjacent to the Preserve;
- Provide the community with recreational, educational, and outreach opportunities concerning rare plants and their habitats; and
- Establish a solid mechanism for funding management activities at the Preserve.

To preserve and provide additional protection for special-status gabbro soil plants, the County, USFWS, and other state and federal agencies are currently attempting to conserve much of the remaining habitat for gabbro soil plants. Expansion of the Pine Hill Ecological Preserve is one of the goals of the USFWS recovery plan for gabbro soil plants. Implementation of the recovery plan is expected to reduce the possibility that gabbro soil plants would become extinct or extirpated from El Dorado County, but because USFWS has no specific legislative mandate to require federal and state agencies or private entities to comply with the goals of the recovery plan, some of the goals may not be reached.

Impacts on special-status plants and their habitat are expected to be most severe in the gabbro soil region outside of the protected Pine Hill Ecological Preserve, but direct and secondary impacts are also expected within designated preserve areas. There is already substantial development in the preserve area, and more development is anticipated. By 2025 the preserve would likely be substantially more isolated because it is almost entirely surrounded by high- and medium-intensity land designations.

As noted previously, El Dorado County and EDCWA have worked with federal and State agencies in the continued development towards a long-term protection and preservation strategy for gabbro soil special status species. These have included the following:

- Contribution to development of the Pine Hill Preserve

  <u>Funding</u>

  - $2.1M toward purchase of 525 acres
  - $2.9M toward purchase of land
  - $5.7M toward purchase of 236 acres and a preserve manager salary

  <u>Long-Term Management</u>

  - Cooperative Management Agreement
  - Fulfilling roles as part of the agreement

- Cooperation with USFWS
  - Development of MOA between USFWS, EDCWA, and El Dorado County regarding long-term protection of gabbro soils plants

As an indirect impact, El Dorado County, through its various policies and implementation measures identified in its Conservation and Open Space Element and, consistent with the provisions of the Cultural Resources Ordinance, guidance is provided to help identify, avoid, or otherwise mitigate any potential future planned activities on existing rare, threatened or endangered species within the service areas of either EID or GDPUD. Several General Policies address protection of special-status species; each with varying degrees of anticipated effectiveness.

Policy 7.4.1.1 states that the gabbro soil plants will be protected in perpetuity through the establishment of five preserve sites and that these preserve site shall be integrated into the overall open-space plan.

Policy 7.4.1.3 limits land uses within established preserve areas to activities that are compatible with rare plant protection and requires the County to develop an educational and interpretive program on rare plants. This policy would also reduce impacts on gabbro soil plant populations, particularly secondary impacts, such as degradation of existing habitat caused by inappropriate recreational uses.

Policy 7.4.1.4 requires that approved preserves be designated as Ecological Preserve on the General Plan land use map. The effectiveness of this policy would be dependent upon the degree to which land use restrictions associated with the Ecological Preserve land use designation would protect special-status species.

Policy 7.4.1.5 addresses preparation of natural community preservation/conservation strategies. In most cases, however, Policy 7.4.1.5 would do little to reduce the potential for significant impacts on special-status species since under this policy, mitigation would be required only for special-status species restricted to areas where discretionary development is proposed; mitigation would not be required as long as the species was found and protected elsewhere on public land or private Natural Resources land.

Policy 7.4.1.6 directs the County to, under certain circumstances, require comprehensive habitat restoration and/or offsite mitigation plans. This policy also does not require impacts to be reduced to less-than-significant levels and applies only to discretionary projects; therefore, the policy would not be applicable to projects on nearly a third of the land open to ministerial development approvals in the county.

Policy 7.4.2.1 requires the County to protect, to the extent feasible, special-status species by developing biological conservation plans. This would also be mostly ineffective in mitigating impacts on special-status species. This policy is applicable only when federal or state plans do not provide adequate protection on lands outside County control. This policy could be effective in avoiding or delaying extirpation of a particular special-status species, but because few species have approved conservation plans, many special-status species would receive no consideration.

These policies, however, combined with the current and anticipated future level of participation by EDCWA and El Dorado County in funding various preservation actions, would render this impact less than significant.

Mitigation Measures

Proposed Action – All Scenarios, All Reduced Diversion Alternatives, Water Transfer Alternative, No Action Alternative, and No Project Alternative

No mitigation would be required for any of the Proposed Action – Scenarios or Alternatives

5.21. CUMULATIVE IMPACT FRAMEWORK AND ASSUMPTIONS

Cumulative impacts are defined in federal CEQ Regulations pertaining to NEPA (40 CFR 1508.7) as follows:

> "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Under CEQA, an EIR must discuss the "cumulative impacts" of a project when its incremental effect will be cumulatively considerable. This means that the incremental effects of the individual project would be considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. Similar in intent with the CEQ, *CEQA Guidelines* Section 15355 defines cumulative impacts as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." This Section states further that:

> "[I]individual effects may be changes resulting from a single project or a number of separate projects." "The cumulative impact from several projects is [defined as] the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time."

Section 15130(a)(3) states also that an EIR may determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable, and thus not significant, if a project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.

Section 15130(b) indicates that the level of detail of the cumulative analysis need not be as great as for the project impact analyses, that it should reflect the severity of the impacts and their likelihood of occurrence, and that it should be focused, practical, and reasonable.

To be adequate, a discussion of cumulative effects must include the following elements:

> Either (a) a list of past, present and probable future projects, including, if necessary, those outside the agency's control (Section 15130[b][1][A], or (b) a summary of projections contained in an adopted general plan or related planning document, or in a prior adopted or certified environmental document, which described or evaluated regional or area-wide conditions contributing to the cumulative impact, provided that such documents are referenced and made available for public inspection at a specified location (Section 15130[b][1][B];
>
> A summary of the individual projects' expected environmental effects, with specific reference to additional information stating where such information is available (Section 15130[b][2]); and
>
> A reasonable analysis of all of the relevant projects' cumulative impacts, with an examination of reasonable, feasible options for mitigating or avoiding the project's contribution to such effects (Section 15130[b][3]).

For some projects, the only feasible mitigation measures will involve the adoption of ordinances or regulations, rather than the imposition of conditions on a project-by-project basis (Section 15130[c]).

5.21.1. Past and Present Actions

Significant actions (and projects) have shaped the physical, natural, and socioeconomic environment of the Central Valley to date. Hydrologically, the range of actions that have covered CVP/SWP water supply, Delta conveyance, flood control, water quality protection, refuge supply, and coordinated federal/State operations, to but name a few, has been significant over the years. From an infrastructure perspective, new dams and reservoirs, water treatment facilities, canals, water intakes, fish screens, and other water purveyor facilities have also strongly influenced water resources management throughout the various localities and regions of the State. Finally, environmentally, the range of past actions is equally large, with BiOps, joint watershed agreements, river restoration projects, SWRCB minimum flow standards along with a whole suite of other environmental improvement efforts.

To fully describe all of the past and present actions defining the hydrologic and environmental conditions that make up the CVP/SWP, its operations, as well as Sierra Nevada source area hydrology is far beyond the scope of this EIS/EIR. Analytical simulations, through system-wide hydrologic modeling, attempt to capture the primary aspects of these operations as a means of providing an assessment platform to evaluate potential changes to the system. This modeling, through the use of the Reclamation planning and operation model CALSIM II has been described previously and, its context within the cumulative impact assessment is discussed later in this subchapter.

For the purposes of this EIS/EIR, a discussion of the salient State-wide actions that govern operational control of the CVP/SWP, Folsom Reservoir, and the lower American River are provided.

Central Valley Project Improvement Act (CVPIA)

The implementation of the CVPIA has significantly changed the operations of the CVP. It directs Reclamation to give fish and wildlife protection, restoration, and mitigation equal priority with irrigation and municipal water uses and power generation. Through its various programs, as noted in other parts of this EIS/EIR, it is intended to enhance fish, wildlife, and associated habitats throughout the Central Valley and Trinity River basins. It is also directed to increase the water-related benefits provided by the CVP by expanding the use of voluntary water transfers and increased water conservation practices. Key among its various provisions is Section 3406(b)(2) which calls for the dedication of up to 800,000 AFA of CVP yield on CVP-controlled streams to meet the Bay-Delta Plan and also meet Section 3406(b)(1) Anadromous Fish Restoration Program (AFRP) target flow goals. The goal of the AFRP is to "…develop within three years of enactment and implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991." Since 1995, the AFRP has helped implement over 195 projects to restore natural production of anadromous fish.

In 2003, the Department of the Interior issued its Final Decision Accounting of CVPIA 3406(b)(2). This guidance defined the metrics to be used in accounting for CVPIA operations under 3406(b)(2).

Coordinated Operations Agreement (COA) and CVP-OCAP

In 1986, Reclamation and the Department of Water Resources signed the Coordinated Operations Agreement (COA). This Agreement defined the rights and responsibilities of each agency in operating the CVP and SWP facilities. Adherence to the COA ensures that each CVP/SWP project obtains its share of water from the Delta and bears its share of the obligations necessary to provide for system-wide beneficial use. A CVP/SWP apportionment of 75/25 is implemented to meet in-basin demands when the Delta is under balanced conditions and when the projects are using storage withdrawals to meet the in-basin demands. When the unstored flow is available for export under balanced conditions, the apportionment ratio is 55/45. There is no apportionment when the Delta is under excess flow conditions. The COA contains considerable flexibility in the manner with which Delta conditions in the form of flow standards, water quality standards, and export restrictions are met. Since that time, these coordinated operations have evolved to reflect, among other things, changing facilities, delivery requirements, and regulatory restrictions. The most recent and applicable document addressing how the COA is implemented in light of these continually evolving circumstances is the CVP-OCAP. First prepared in 1992, it has been recently revised and updated as of June 30, 2004.

Bay-Delta Plan

In December, 1994, a Principles of Agreement (Delta Accord) was formulated between several agencies including CALFED and representatives from various urban, agricultural, and environmental interests. The groups represented the key interests in the SWRCB Hearings to develop a new Bay-Delta Water Quality Control Plan (Bay Delta Plan). The Bay-Delta Plan contains a number of flow objectives for the Bay-Delta, based on water-year type as well as non-flow measures to be undertaken. The Bay-Delta Plan was adopted in May 1995 and established a number of new Bay-Delta water quality objectives, including flow objectives. The 1995 Bay-Delta Plan recommended habitat enhancement projects, modifications of fishing regulations, and plans to control the further introduction and proliferation of exotic species. This plan and effort was ratified through SWRCB Order WR 95-06.

CALFED Bay-Delta Program

The CALFED Bay-Delta Program began in May 1995 to address the complex issues that surround the Bay-Delta. The CALFED Bay-Delta Program is a cooperative, interagency effort of 18 State and Federal agencies with management or regulatory responsibilities for the Bay- Delta. Several program elements represents the cornerstone of the CALFED Bay-Delta Program; these include, Water Supply Reliability Program; Ecosystem Restoration and Watershed Program Elements; Levee System Integrity Program; and a Water Quality Program. These program components were recently described in the document entitled *California's Water Future: A Framework for Action*, issued on June 9, 2000. The California Bay-Delta Authority was created to oversee the program's implementation and Congress adopted the plan in 2004.

Monterey Agreement

In January 20, 1960, when the Contracting Principles for Water Service Contracts was published, Article 18 of the ensuing water supply contracts was intended to address the question of how to allocate water during periods of supply deficiencies. While Article 18 provisions covered several situations in which SWP water supply shortages might occur, Article 18(a) eventually became the most significant provision for allocating SWP water in times of insufficient water supply. During water shortages, Article 18(a) reduces water supply for agricultural contractors by a percentage not to exceed fifty percent (50 percent) in any one year or a total of one hundred percent (100 percent) in a series of seven consecutive years before any cut is made in municipal and industrial water supplies.

In 1994, DWR and some of the contractors, meeting in Monterey, executed the Monterey Agreement to modify the long-term water supply contracts. These modifications were incorporated into the long-term water supply contracts in what became known as the Monterey Amendment. The Monterey Agreement originated in Monterey, California, among DWR and the SWP contractors to address fundamental contract issues by amending the long-term water supply contracts. This understanding produced a set of guidelines, known as the Monterey Principles, to amend the contracts to resolve some long-standing concerns of SWP contractors and provide more flexibility in administering those contracts. Despite careful crafting, the contracts could not easily accommodate the shifts in water policy and management that occurred since their execution.

Lower Yuba River Accord

The Yuba County Water Agency (YCWA) has developed an innovative set of agreements that together form a framework – the proposed Lower Yuba River Accord (Yuba Accord) – that will resolve nearly 15 years of controversy and litigation over instream flow requirements for the lower Yuba River. Working with a broad coalition of 17 agricultural, environmental, and fisheries interests, including State and federal agencies, YCWA facilitated a science-based, consensus-oriented process that proposes new instream flow requirements for the lower Yuba River that will significantly increase protection for the river's fisheries resources over the long-term. These requirements will range from 260,000 AF in a dry year to over 574,000 AF in a wet year, and are intended to improve habitat conditions for the lower Yuba River Chinook salmon and steelhead – among the last remaining wild populations in California's Central Valley.

SWRCB Revised Water Right Decision 1641

The State Water Resources Control Board adopted Decision 1641 on December 29, 1999. The Decision, intended to provide for operations of the CVP/SWP to protect Bay-Delta water quality, implemented flow objectives for the Bay-Delta, approved a petition to change points of diversion of the CVP and SWP in the Southern Delta, and approved a petition to change places of use and purposes of use of the CVP. The SWRCB received 21 timely petitions for reconsideration of D-1641, and on March 15, 2000 the Board adopted Order WR 2000-02. Order WR 2000-02 denies the petitions for reconsideration of D-1641, clarifies findings made in D-1641, and amends several conditions of the order in D-1641.

Trinity River Record of Decision

The Trinity River Record of Decision (Trinity ROD) was signed on December 19, 2000. It was the result of at least 20 years of studies of the Trinity River and its fisheries. The Trinity River Mainstem Fishery Restoration EIS/EIR (Trinity EIS/EIR) was the NEPA/CEQA document upon which the Trinity ROD was based. The Trinity ROD included the following items: a variable flow regime between 369,000 AFA and 815,000 AFA of water from Lewiston Dam based on 5 water-year types, providing a weighted average annual flow of 594,500 AFA.

Sacramento Area Water Forum

In the early 1990s, the City-County Office of Metropolitan Water Planning formally initiated the Sacramento Area Water Forum process. Bringing together a diverse array of business, water industry, government agency, environmental, and public stakeholder interests, an agreement was developed based on two co-equal objectives for the long-term maintenance and protection of the lower American River and its valued resources. Long-term water supply reliability and managed ecosystem protection and restoration were the two co-equal goals. The Agreement was developed around seven elements. Of particular importance to new water allocations from the American River basin was the dry-year "wedge"; purveyor-specific voluntarily imposed cutbacks based on unimpaired inflow forecasts to Folsom Reservoir defined into three water-year types.

The Water Forum Agreement included purveyor-specific agreements (PSAs) for numerous water purveyors signatory to the Agreement. While participating in the Water Forum process, neither EID nor GDPUD executed purveyor-specific agreements. Additionally, as a non-purveyor, EDCWA could not enter into a purveyor-specific agreement since, as designed, the PSAs were intended to permit water purveyors to divert specific quantities under existing rights/entitlements to meet demands based on water year type. EDCWA currently holds no water entitlements, nor is it authorized under its founding legislation to provide water service. A PSA for EDCWA would serve no useful purpose.

The dry-year "wedge" of the Water Forum Agreement was, and still is, a significant element of the Agreement. Purveyors have met their obligations under the dry-year "wedge" provisions of their individual PSAs. Currently, Reclamation and the Water Forum are negotiating inclusion of the PSAs into the modeling assumptions for the pending new revised CVP-OCAP.

Folsom Dam and Reservoir Interim Re-Operation

In 1996, the Interim Flood Control Plan Diagram for Folsom Reservoir (a.k.a. Interim Flood Operations) was developed cooperatively between Reclamation and the Sacramento Area Flood Control Agency (SAFCA). A significant component of the Interim Flood Operations is the variable 400,000 to 670,000 AF empty space storage requirements for Folsom Reservoir which changed the then authorized storage space which was fixed at 400,000 AF. As a 5-year Interim Agreement, this was intended to increase the available flood storage space in Folsom Reservoir to a maximum of 670,000 AF depending on upstream storage conditions providing ostensibly, greater flood storage relief during times of high runoff or reservoir inflow. Upon expiration in 2000, this Interim Agreement was extended for 2-years. From 2002 to 2004, however, no agreement was in place.

In 2004, a new agreement was negotiated between Reclamation and SAFCA to continue with the 400,000-670,000 AF *variable flood storage* operation unless and until such time as the Corps implemented a new water control manual and associated new flood control diagram. Under this current agreement, the operational criteria (e.g., 400,000-670,000 AF variable flood storage) will expire in 2018.

New Shutter Re-Configurations at the Folsom Power Penstock Intakes

Reclamation's operational strategies at Folsom Dam are, in part, directed toward water temperature preservation (i.e., Folsom Reservoir coldwater pool). Virtually all water released into the lower American River passes through Folsom Dam's three hydropower penstock intake shutters, of which there are nine. Reclamation has the ability to preferentially access various levels of the reservoir at these three hydropower penstock intake shutters. These were originally designed in a 1-1-7 configuration; where the top shutter could be opened independent of the others, as could the second shutter, while the remaining 7 shutters could only be opened as one unit. Reconfigured in 1994 under a 3-2-4 ganging configuration, these shutters now provide greater control over the depth of intake, and thus, the temperature of the water being released from the dam. Reclamation also has the ability to "blend" water between the three hydropower penstock intakes, adding yet more operational flexibility towards optimizing coldwater pool management and resultant downstream temperatures.

PCWA Middle Fork Project

In the mid-1960s, the Placer County Water Agency (PCWA) developed the Middle Fork Project (MFP), a multi-purpose water development project designed to use water from the Middle Fork American River and Rubicon River for domestic and commercial water supplies and hydroelectric generation. The MFP is operated first to meet required fish flows, then to meet PCWA's water demands, and finally to maximize hydroelectric generation. Most of PCWA's water is diverted from Folsom Reservoir, and upstream flows are controlled by power production operations. The construction of the MFP has altered the natural flow cycles of the Middle Fork American River, the Rubicon River, and the North Fork American River.

To realize benefits from this new CVP contract, it is necessary for GDPUD to enter into an exchange agreement with another purveyor. This is because, without a direct diversion from Folsom Reservoir, GDPUD is constrained in its ability to gain access to the new water supply source. An exchange, however, would provide that ability. In considering and pursuing an exchange of this sort, several factors are important. These typically include: an available and reliable exchange supply that meets one's objectives, the necessary infrastructure (or shared capacity) to divert and convey any exchanged water, acceptable terms within an exchange agreement (e.g., diversion rate, seasonal timing, etc.), and the identification and willingness of a water purveyor (or purveyors) to enter into an exchange agreement.

Under such an exchange, GDPUD would acquire a water supply capable of being diverted at a location more conducive to its needs in *exchange* for water made available under this current project (i.e., new water rights) at a location or locations defined by the project (i.e., Folsom Reservoir).

While it is not the intent of this EIS/EIR to presuppose a consummated agreement between GDPUD and PCWA, several factors make it at least a reasonable assumption given the history of such an agreement and the best available information today.

The American River Pump Station on the North Fork American River near the old Auburn coffer dam in Knickerbocker Canyon was completed by PCWA in 2007. It now provides PCWA with a permanent diversion and pumping structure from which to pump water out of the North Fork. This project was completed after many years of relying on seasonal temporary pumps under Reclamation oversight. With the American River Pump Station, GDPUD already has the benefit of a completed diversion (intake) and pumping infrastructure. The overall American River Pump Station project included closing the by-pass tunnel, restoring the channel in the area of the old coffer dam to its original condition, and constructing a new permanent pump station.

Design of the pump station included the assumption that GDPUD would share, in part, in its capacity needs; in fact, a vacant pumping bay currently is being reserved for GDPUD just for that purpose. Moreover, as part of the design and construction of the project, PCWA constructed an under-river caisson which is stubbed at the eastern bank of the river (the location where GDPUD would take control of any water diverted at the intake to the pump station). All environmental reviews and permitting associated with the American River Pump Station including CEQA, NEPA, and ESA compliance were completed by PCWA in 2003. From both a feasibility and plausibility perspective, providing GDPUD with a new water supply via the American River Pump Station appears reasonable. For these reasons, the MFP will serve as the most likely supply for which GDPUD can exchange for its CVP entitlement at Folsom Reservoir.

PCWA American River Permanent Pump Station

The completion of the environmental review and approval for the Reclamation/PCWA American River Pump Station Project which were based on the desire to discard the temporary pumps in favor of a permanent pumping plant on the North Fork American River was a significant accomplishment for Reclamation and PCWA. PCWA will now have permanent access to their North Fork American River diversion location. This project, currently under construction, will pave the way for GDPUD to also gain access to the American River at the location of the American River Pump Station; the site of a potential exchange with PCWA for GDPUD's portion of the new CVP water service contract. As noted previously, there are several agreements and regulatory provisions that GDPUD and PCWA would have to negotiate and initiate in order for GDPUD to begin planning their own infrastructure at this location. A detailed discussion of the rationale behind the GDPUD/PCWA potential exchange for this new CVP water supply (with MFP water rights water) has been provided in the previous paragraph.

American River Basin Cumulative Report

The American River Basin Cumulative Report (Cumulative Report) was prepared by Reclamation in August 2001, as part of the PCWA American River Permanent Pump Station Project Draft EIS/EIR (State Clearinghouse No. 1999062089).

The Cumulative Report was prepared to supplement the analysis provided in environmental impact statements (EIS), environmental assessments (EA), environmental impact reports (EIR), and biological assessments for Reclamation's identified reasonably foreseeable actions within the American River Watershed, which includes the EDCWA P.L. 101-514 CVP water service contract. Reasonably foreseeable actions defined in this Report were defined as federal or other projects/agreements that are likely to take place within the same timeframe as the project under consideration. These actions were evaluated collectively for their potential cumulative impacts on environmental resources. Reclamation and U.S. Fish and Wildlife Service (USFWS) participated in several coordination meetings to discuss and determine the scope of the cumulative impact analysis for the PCWA project and other Reclamation actions in the American River Basin.[212]

The stated purpose of the Cumulative Report is to serve as an integral component of NEPA, CEQA, and ESA compliance documentation for Reclamation's CVP American River Division actions identified as reasonably foreseeable. The evaluation includes an assessment of the diversion-related and service area impacts of past and future water diversions, CVP facility operations affecting those diversions, and land-based resources of the American River Watershed. The Cumulative Report provides a broad assessment of potential environmental consequences that may occur under future (2030) conditions based on the best available information at the time the analysis was prepared. The analyses performed and presented in the Cumulative Report go beyond the environmental analyses requirements of both CEQA and NEPA.[213] The Cumulative Report is incorporated by reference in its entirety; a summary is provided in this EIS/EIR.

212 Placer County Water Agency, PCWA American River Pump Station Final EIS/EIR (SCH #1999062089), June 2002, Appendix C, Responses to Comments on the Draft EIS/EIR, Section 3.0, Master Responses, Subsection 3.1.14, Cumulative Impact Analysis, p. C1-107.

213 Placer County Water Agency, PCWA American River Pump Station Final EIS/EIR (SCH #1999062089), June 2002, Appendix C, Responses to Comments on the Draft EIS/EIR, Section 3.0, Master Responses, Subsection 3.1.14, Cumulative Impact Analysis, p. C1-106.

This EIS/EIR relies, in part, on the analyses and conclusions of the Cumulative Report, recognizing its collaboratively based acceptance and recent updates to include all known Reclamation American River Division actions, including the EDCWA P.L. 101-514 CVP water service contract.

The past and present actions included in the Cumulative Report include all those incorporated into the CALSIM II modeling for this EIS/EIR and included CVP water service contracts (new, amended and renewal contracts), Warren Act contracts, CVP assignments, Folsom Dam re-operation for flood control, and Water Forum "dry year" actions that could affect aquatic and terrestrial resources of the American River Watershed and places of water (POU) use.

Other past actions include the following:

- Reclamation – Auburn Dam Construction
- SWRCB – San Francisco Bay-Sacramento-San Joaquin Delta Estuary Pollutant Policy Statement
- SWRCB – California Inland Surface Water Plan
- USFWS – Biological Opinion for Delta Smelt – Los Vaqueros
- NMFS – Biological Opinion for Winter-run Chinook Salmon – pursuant to the Bay-Delta Accord
- NMFS – Conference/Biological Opinion for Sacramento Splittail – Long-term OCAP
- NMFS – Listing for Spring-run Chinook Salmon and Steelhead
- NMFS – Biological Opinion for Steelhead
- City of Roseville – Pumping Plant Expansion, Water Treatment Plant Expansion
- City of Sacramento – Water Treatment Facilities Expansion, Fish Screen Replacement Project
- SJWD – Water Facilities Plan and Water Master Plan
- SCWA – Application to Appropriate Water from the American and Sacramento Rivers

Reasonably Foreseeable Future Actions

Future actions that could effect CVP/SWP operations, local area hydrology in Folsom Reservoir, the lower American River, or the upper American River basin include a range of initiatives and projects that are either ongoing, in the developmental stages, or committed to but not yet initiated. These are described below.

Revised CVP-OCAP

The most recent CVP-OCAP, completed in 2004 was opposed by several intervenors who challenged the 2005 BiOps that were prepared in support of this newly updated OCAP (see, *NRDC et al., v. Dirk Kempthorne, Secretary of the Interior, California Department of Water Resources, et al.,* Case 1:05-CV-01207-OWW-GSA; and *Pacific Coast Federation of Fisherman's Association/*

Institute for Fisheries Resources et al., v. Carlos Gutierrez, Secretary of Commerce, William Hogarth, National Marine Fisheries Service, NOAA, San Luis & Delta Mendota Water Authority et al., Case 1:06-CV-00245-OWW-GSA).

As part of its response, Reclamation has voluntarily reinitiated consultation on the CVP-OCAP, submitting its final Biological Assessment in August, 2008. Since then, the USFWS has released its final BiOp (on December 15, 2008) and NOAA Fisheries released its draft BiOp on December 11, 2008 with a final Opinion expected in June, 2009. A complete description of the consultative history and applicability to this action is provided in Chapter 10.0 (Consultation/Coordination and Applicable Laws).

The revised BiOps for the CVP-OCAP represent a significant undertaking having the potential to influence the entire State's water management and operational framework. It is involving a comprehensive analysis of system operations and the modeling relied upon to support those decisions. The final outcome of the collaborative discussions with which Reclamation, the Department of Water Resources and the various resource agencies are working on the implementation of the Reasonable and Prudent Alternatives, provisions of the Incidental Take Statements, associated terms and conditions, and conservation measures will determine the long-term viability of these affected listed species and may change existing operations of the CVP/SWP.

CALSIM III

At the same time that the CVP-OCAP and its support modeling are being refined, work is also underway at Reclamation and the Department of Water Resources on the next version of CALSIM (i.e., CALSIM III). Currently, this effort remains in the developmental stage, but will likely continue to gain interest over the next year. A thorough documented analysis of the differences between it and the current CALSIM II model is not yet publicly available. No means of incorporating a vested and approved CALSIM III modeling platform currently exists.

Lower American River Flow Management Standard

A notable new action for the American River is the proposed Lower American River – Flow Management Standard (or LAR FMS). Resulting from one of the seven elements of the Water Forum Agreement, the LAR FMS is the culmination of several years of continued work on developing a fish-friendly flow pattern for the lower American River; its predecessors included several iterations during the development of the Water Forum Agreement (e.g., F-Pattern).

As background, in 1990, the SWRCB stated its conclusions that, "*the existing flow requirements do not provide an adequate level of protection to the uses in the lower American River*," and set forth a work plan to modify relevant water right permits (SWRCB Work Plan – Review of Water Rights on the American River, August, 1990). The existing flow requirements are embedded in Reclamation's water right permit(s) for the lower American River and were prescribed in 1958 by SWRCB Decision 893 (D-893).

The Water Forum Agreement, executed in January 2000, includes the signatories' commitment to "*actively endorse permanent implementation of an Improved Pattern of Fishery Flow Releases from Folsom Reservoir*." (Water Forum Agreement, pg. 75).

Following execution of the Water Forum Agreement, the Water Forum embarked on the process of developing the LAR FMS jointly with Reclamation, and with participation of the USFWS, NOAA Fisheries, and CDFG. The intent of the process was to reach consensus on the substance of the LAR FMS to be included in a joint petition to the SWRCB to amend Reclamation's water right permit(s) as they are embodied in D-893.

In October, 2004, Reclamation, the Water Forum and the USFWS entered into a Memorandum of Understanding (MOU) documenting the parties intent to work together to reach agreement on a new LAR FMS that would be the subject of a petition to be filed with the SWRCB. A schedule in the MOU provided that Reclamation would file a petition with the SWRCB on September 15, 2005. The discussion among the participants resulted in consensus on the LAR FMS, described in a technical report titled, *Lower American River Flow Management Standard*, dated July 31, 2006.

In the ensuing years, the Water Forum and Reclamation were working on draft language to the petition; by spring 2008, Reclamation and the Water Forum agreed to pursue the approach of entering into a contract for implementation of the LAR FMS. An updated version of the July 2006 technical report was made available at the same time. Subsequent to meetings and discussions between Reclamation and the Water Forum, including publicly-noticed contract negotiation sessions, Reclamation stated that, because of the uncertainty regarding the pending CVP-OCAP BiOps, Reclamation considered substantive work on the LAR FMS to be impractical. Discussions to reach agreement on a contract and/or petition to the SWRCB embodying the LAR FMS was not considered possible to resume until the final NOAA Fisheries BiOp on the CVP-OCAP would be released, expected sometime in June, 2009.

The Water Forum has initiated the environmental studies necessary to support implementation of the LAR FMS. This work is consistent with the LAR FMS as agreed to by Reclamation in 2006, with appropriate modifications that have been discussed with, but not yet agreed to by Reclamation. The Water Forum has completed its definition of the LAR FMS program, which includes various studies, alternatives, modeling scenarios, and environmental impact review, including an EIR expected to get underway in 2009.

Delta Vision

Pelagic Organism Decline (POD) in the Delta issues rank as one of the top issues facing California water resources management today. There is overwhelming consensus that the Delta is now critically challenged regarding how best to manage the system among these competing interests. The Governor's *Delta Vision* Blue Ribbon Task Force is a testament to the importance being placed on collaboratively working to resolve this long-standing challenge.

Established by Governor Schwarzenegger's Executive Order S-17-06, the Delta Vision Blue Ribbon Task Force was to "*develop a durable vision for the sustainable development of the Delta with the* *goal of ...managing the Delta over the long term to restore and maintain identified functions and values that are determined to be important to the environmental quality of the Delta and the economic and social wellbeing of the people of the state*." The Delta Vision's 12 Integrated and Linked Recommendations include efforts to significantly increase conservation and water system efficiency, new facilities to move and store water, and likely reductions in the amount of water taken out of the Delta watershed. The Task Force also recommends a new governing structure for the Delta that would have secure funding and the ability to approve spending, planning and water export levels. In addition, the Task Force recommends several near-term actions. These focus on preparing for disasters in or around the Delta, including emergency flood protection and disaster planning, protecting the Delta ecosystem and water supply system from urban encroachment, and making immediate improvements to protect the environment and the system that moves water through the Delta.

Bay-Delta Conservation Plan

Bay Delta Conservation Plan (BDCP) is being prepared as a habitat conservation plan and a natural community conservation plan for the Delta pursuant to the ESA and the Natural Community Conservation Planning Act (NCCPA). The long-term approach to achieving the goals and objectives of the BDCP is under the direction of the Steering Committee. The Committee agrees that a phased implementation of key elements of the long-term approach will be necessary. Key elements of the Framework include: Habitat Restoration and Enhancement; Water Conveyance Facilities; Water Operations; Other Conservation Actions; Adaptive Management and Monitoring; Scientific Input; Cost and Funding; and Implementation Structure and Decision Making.

Folsom Dam and Reservoir Joint Federal Project – Water Control Manual Update

As part of the joint federal effort between Reclamation and the Corps of Engineers to implement long-term flood damage safety and flood damage reduction for Folsom Reservoir and its operations, the Corps will be developing an Updated Flood Management Plan and Flood Control Manual (e.g., a new flood control diagram) for the reservoir. As noted previously, the current interim operating agreement regarding Folsom Reservoir encroachment space is 400,000-670,000 AF. The Updated Flood Management Plan and Flood Control Manual will re-assess long-term operational flood protection in Folsom Reservoir, given the new auxiliary spillway and ongoing downstream levee improvements.

El Dorado Water & Power Authority Supplemental Water Supply Project

The El Dorado Water & Power Authority (EDWAPA), including the El Dorado Irrigation District, Georgetown Divide Public Utility District, El Dorado County, and the El Dorado County Water Agency (EDCWA) have filed an application with the SWRCB for partial assignment of an existing State filed water right from the upper American River Watershed. The application has been recently accepted by the SWRCB, with a notice pending sometime over the next 6 months. A cooperation agreement is in place between EDWAPA and the Sacramento Municipal Utility District (SMUD) for storage utilization of the latter's Upper American River Project (UARP). Water allocations under this action would be 30,000 AF to EID and 10,000 to GDPUD for a total filed application of 40,000 AFA. Diversions by EID would occur at the Whiterock Penstock or Folsom Reservoir while GDPUD would need to negotiate and implement a water exchange in order to take new water from the American River Pump Station on the North Fork. This 40,000 AFA diversion has not been assessed in previous Reclamation documentation or in the Water Forum Agreement. The CEQA environmental review is underway; an NOP/Initial Study was released on October 24, 2008 with the comment period closing on December 5, 2008. Two public scoping meetings and workshops were held during the month of November in Placerville and in Sacramento. A Draft EIR is anticipated to be released by October 2009.

El Dorado Irrigation District – Long-Term Warren Act Contract for Project 184

The El Dorado Irrigation District holds a 17,000 AFA water right from FERC Project 184. On October 18, 2006, FERC issued a new 40-year license for Project 184. The new license, which expires October 1, 2046, contains conditions for operating the 21-megawatt El Dorado hydroelectric power generation project, that are estimated to cost EID approximately $40 million over the 40 years. They include provisions for maintaining year-round minimum flows and existing recreation, regulating lake levels, monitoring of aquatic conditions, enhancing fish habitat, adding a boat launch facility at Caples Lake, and other actions. EID has yet to secure a long-term Warren Act contract from Reclamation that would permit diversions of Project 184 water from Folsom Reservoir; though it has been negotiated in public sessions and drafted, and is awaiting completion of the OCAP re-consultation.

In-Delta Improvements and Related Actions

Several actions are pending related to operations affecting the Delta including, but not limited to, maximum allowable diversions at the Banks Pumping Plant, South Delta Improvement Program (SDIP), Delta-Mendota Canal/California Aquaduct Intertie, Long-Term Environmental Water Account (EWA), and new and renewed long-term CVP water service contracts. These actions are pending final rulings by the U.S. District Court, Eastern District of California in the matters of *NRDC et al., v. Dirk Kempthorne, Secretary of the Interior, California Department of Water Resources, et al.,* Case 1:05-CV-01207-OWW-GSA; and *Pacific Coast Federation of Fisherman's Association/Institute for Fisheries Resources et al., v. Carlos Gutierrez, Secretary of Commerce, William Hogarth, National Marine Fisheries Service, NOAA, San Luis & Delta Mendota Water Authority et al*., Case 1:06-CV-00245-OWW-GSA. Other large, State-wide water actions have an entirely different level of potential future impact and, while not definitively known at this time, are receiving considerable debate and public exposure. These include a new Peripheral Canal (or some version of it) and new off-site storage reservoirs at Sites and Temperance Flat.

El Dorado Irrigation District TCD

The El Dorado Irrigation District has committed to installing a new temperature control device (TCD) on its current water supply intake at Folsom Reservoir. Several design concepts have been reviewed and are still under development. When completed, EID will be able to selectively withdraw water from any one of a range of elevations within the reservoir corresponding to specifically targeted thermal layers. As one of the two primary diversion points within the reservoir (the other being Folsom Dan's urban water supply intake and the inlets to the power penstocks), this ability will significantly improve coldwater pool management with Folsom Reservoir.

Climate Change

Numerous actions are ongoing at the local, region, and State-wide levels regarding climate change and its potential effects on hydrology. These are discussed thoroughly later in this document. At present, all efforts have been and continue to be investigative in nature, meaning that they have addressed (or are addressing), to varying degrees, the potential effects of variable climate forcings on specific attributes of California's water resources. These have included the Sierra Nevada snowpack, Delta and San Francisco Bay water levels, CVP/SWP operations, flooding frequency, purveyor water supplies, and some of the important socioeconomic considerations with each of these. While there is general consensus over the likely broad-scale and long-term trends, significant temporal and spatial refinements are still necessary. Improved techniques for GCM downscaling to managed watershed scales are urgently needed. The manner with which climate change ultimately is incorporated into operational planning at the CVP/SWP level is, at this time, still uncertain.

Other future actions, some of which are pending, while others are more distant, are not influenced by the present Proposed Action. Some are already captured hydrologically by current modeling of the future cumulative condition, while others do not influence system-wide hydrology above what has already been assessed. These various actions under the latter category include the following:

- Sacramento River Water Reliability Study (SRWRS)
- Freeport Regional Water Project
- City of Folsom Joint Conveyance Project

Future Modeling and Cumulative Impact Framework

Currently proposed or future anticipated diversion projects along with various environmental initiatives compete and will continue to do so for the limited water supplies in the American and Sacramento river basins. These include, but are not necessarily limited to the past, present, and reasonably foreseeable actions that were previously described. These actions and projects collectively could result in cumulatively considerable environmental impacts within the American and Sacramento river basins.

In considering the development of the future cumulative impact framework, it was acknowledged that the array of past, present, and reasonably foreseeable actions could have the following types of effects:

- Increased demands to serve environmental purposes;
- Increased demands for municipal and industrial water;
- More restrictive operation requirements for the CVP (e.g., minimum stream flow releases, reservoir storage requirements); and
- Changes in CVP or SWP system resulting from changes in water demand, changes in operational requirements, and new or modified CVP or SWP facilities.

Consistent with the hydrologic modeling framework and impact assessment approach discussed previously, the future cumulative analysis followed a similar methodology. Hydrologic modeling relied upon Reclamation's CALSIM II and its associated environmental models. A comparative framework was set up to contrast relative differences between modeling scenarios. The modeling scenarios represented two distinct time horizons; a Base Condition (the same Base Condition used for the current-level studies) and a Future Cumulative Condition. Again, for the same reasons discussed previously (in Subchapter 5.3.3, CALSIM II Simulations), while the base models used in this analysis were taken from the latest CVP-OCAP published versions with their nomenclature retained, little or no reliance should be placed on the precise year identifier (i.e., the 2020 *label* does not represent exact 2020 conditions). The Future Cumulative Condition was developed and based on the best information available as to the likely future actions that, consistent with NEPA and CEQA, are reasonably foreseeable. A third simulation was used, the Future No Action, which represented the Future Cumulative Condition, without the Proposed Action. The three simulations used for the future cumulative analysis, therefore, were as follows:

- Future Cumulative Condition
- Future No Action
- Base Condition

The Future No Action simulation is based on the OCAP_2020D09D_FutureEWA5a simulation. These two simulations (i.e., Future No Action and OCAP_2020D09D_FutureEWA5a) were modified to include updated inputs for lower Yuba River outflow to the Feather River, lower Yuba River diversions at Daguerre Point Dam, Trinity River instream flow requirements downstream of Lewiston Dam (by use of OCAP 3a), and EID diversion at Folsom Reservoir (assuming existing federal and non-federal entitlements planned for diversion at the reservoir) as required and run to produce the Base Condition and Future Condition *baseline* simulations. These simulations were then modified as required to implement the Proposed Action to produce the modeling scenarios (i.e., Future Cumulative Condition, Future No Action, and Base Condition).

The final CALSIM II simulations were then used as the basis for the temperature, salmon mortality, and hydropower modeling. The required outputs for each comparison were created by an automated process that creates a Microsoft Excel file with all desired output tables for each comparison.

A number of assumptions in the foundation simulations not directly related to the Proposed Action required modification or updating based on changes since the OCAP foundation simulations were performed. Table 5.21-1 summarizes these assumptions.

TABLE 5.21-1

MAJOR DIFFERENCES IN ASSUMPTIONS BETWEEN FOUNDATION AND BASELINE SIMULATIONS

Assumption	OCAP5a	Future Level Baseline
Level of Demand	Future	Future
Trinity ROD	Yes	Yes
Yuba River Operation	HEC-3	Yuba Accord
Water Forum Agreement Cuts (Pl 101 Water)	Yes	No
Lower American River Flow Management Study	No	Yes
Banks Pumping Capacity	6,680 cfs	6,680 cfs
Supplemental Water Rights Project	No	Yes
EID Temperature Control Device [1]	No	Yes
Non EID American River Demands	Same	SRWRS
UARM		SRWRS

Four updates were made to the OCAP 5a simulation for use as the Future Condition *baseline*.

- Yuba River Operation – The Yuba River inflow to and diversion from Daguerre Point Dam in the OCAP 5a simulation were based on a HEC-III model of the Upper Yuba River Basin. The inflow and diversion at Daguerre Point Dam were updated with values based on D-1644 standards on the river and Future Level demands on the diversion developed in support of the Proposed Yuba Accord EIS/EIR.
- Water Forum Agreement Cuts – OCAP 5a included P.L. 101-514 water diversions for EID and GDPUD that were assumed subject to cuts based on the Water Forum Agreement. Neither EID nor GDPUD are signatory to the Water Forum Agreement at this time. For this analysis, the assumption was made that they would not become signatories and their total entitlements would not be subject to the cuts. Any CVP water would still be subject to the CVP North of Delta system cuts computed by CALSIM II. This assumptions means that simulation of slightly higher diversions in the driest years (FUI <=400 TAF) could occur, which could slightly overestimate impacts in those years.
- Lower American River Flow Management Standard – The Lower American River Flow Management Standard (FMS) was not included in the OCAP 5a simulation. This standard is intended to benefit fall-run Chinook salmon, steelhead and other fish species in the lower American River. The new recommended minimum flow requirements in the lower American River below Nimbus Dam vary throughout the year in response to the hydrology of the Sacramento and American River basins and based on various indices within those watersheds. The October 1 through December 31 minimum flow requirements range between 800 and 2,000 cubic feet per second (cfs), the January 1 through Labor Day minimum flow requirements range between 800 and 1,750 cfs and the post-Labor Day through September 30 minimum flow requirements range between 800 and 1,500 cfs. Nimbus Dam releases may drop below 800 cfs to avoid depletion of water storage in Folsom Reservoir when extreme dry or critical hydrologic conditions are forecasted.
- Banks Pumping Capacity – When the OCAP modeling was performed the South Delta Improvement Program (SDIP) was well underway but not finalized. One of the major

components of the SDIP was to increase the allowable Banks Pumping Plant pumping limit to 8,500 cfs instead of the 6,680 cfs limit at that time. Since this would have a major impact on the CVP/SWP Delta operations, the OCAP modeling included the 8,500 cfs capacity in the future level OCAP 5 simulation to allow evaluation of the potential impacts of the project. However, since the project was not finalized and implemented at the time, a second simulation, with Banks Pumping Plant limited to 6,680 cfs was also performed (OCAP 5a).

- Currently the SDIP project has not been implemented and is now under a legal challenge that could prevent it from ever being implemented. For this analysis the assumption was made that the SDIP will not be in place in the future and Banks pumping capacity is limited to 6,680 cfs.
- EDWAPA Supplemental Water Supply Project – The Supplemental Water Supply Project is assumed to be in place for all future level simulations. This diversion was not included in the OCAP 5a simulation. This new consumptive demand was allocated at 30,000 AFA to EID from Folsom Reservoir and 10,000 AFA to GDPUD, assumed exchanged at the American River Pump Station, therefore, resulting in a corresponding depletion of 10,000 AFA from Folsom Reservoir via the exchange. The net depletion is 40,000 AFA.
- American River Demands – As in the Base Condition, the American River Demands were taken from the SRWRS modeling. The demands from the SRWRS Study 6, the SRWRS No Action alternative, were selected for use in this simulation. Figure 5.21-1 compares the American River demands between the OCAP 5a foundation study and the SRWRS Study 6.
- The same shift of the City of Sacramento demands from the Sacramento River to the American River is present as in the Base condition simulation. The Placer County Water Agency (PCWA) diversion has also been split from all at Node 300, the American River Pump Station upstream of Folsom Reservoir, to about half there and half from Folsom Reservoir.
- UARM Simulations – Similar to the Non-EID American River Demands, these have been updated in the CVP-OCAP Common Assumptions modeling development process. The result of the updates is very small and probably has little or no effect on the impacts of the alternatives, but is included for consistency within the American River Basin.
- EID Temperature Control Device – EID plans to construct a TCD on the Folsom Reservoir Intake to allow them to make withdrawals from the reservoir at different elevations to preserve the coldwater pool in Folsom Reservoir. CALSIM II only models water operations, not temperature, so this assumption does not impact the CALSIM II simulations.

The future cumulative impact analysis addressed the “action” alternatives in a collective fashion; that is, they were looked at as a single action involving a new 15,000 AFA diversion from the CVP/SWP. No separate modeling was conducted for each alternative, under the future cumulative condition evaluation.

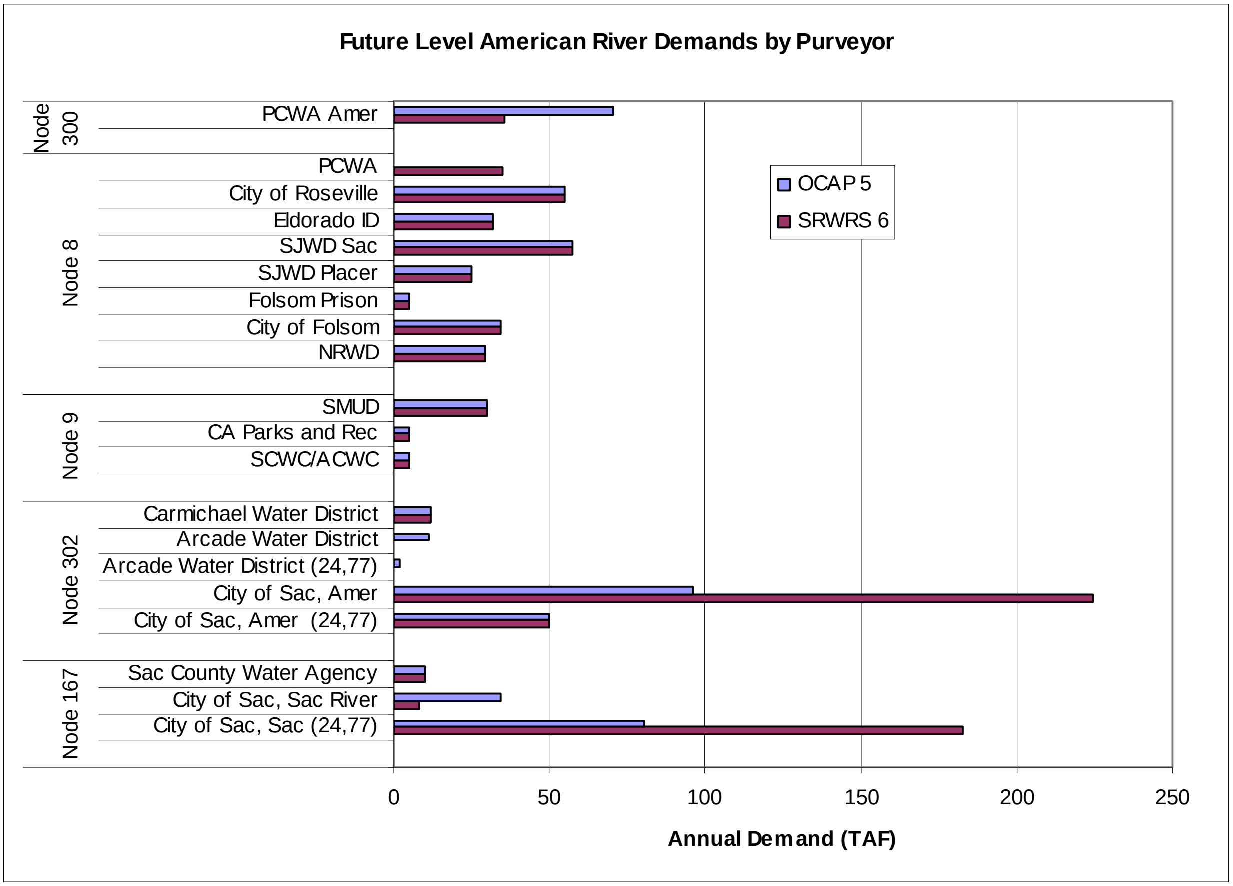

FIGURE 5.21-1 COMPARISON OF OCAP 5 AND SRWRS 6 AMERICAN RIVER DEMANDS

This is because, in the future (under a future cumulative condition modeling analysis), there is no distinction between the alternatives hydrologically. Unlike large operational projects such as the OCAP, Yuba River Accord, South Delta Improvement Program (SDIP) or, even the Sacramento River Water Reliability Study (SRWRS), the various alternatives for this new contracting action are indistinguishable from one another. A 15,000 AFA new diversion, regardless of how it is allocated between EID and GDPUD is simply not large enough to show measurable changes in hydrology in the various river reaches and reservoirs simulated by CALSIM II. This is especially true in the future (under the future cumulative condition) where, increased demands across the system tend to mask smaller diversion projects. In the future, under a cumulative impact analysis, this difficulty is accentuated by the numerous assumptions that are made regarding various operational, new programs, and anticipated legislative changes that might govern CVP/SWP coordinated operations in the future. If any of these assumptions are incorrect, the resultant hydrological changes that any modeling exercise might generate may easily significantly overwhelm the volumes considered under this new contracting action.

As discussed in detail earlier in this chapter, the model is limited in its ability to show small changes in system hydrology accurately; accepting the fact; however, that it is highly precise. It is accepted that CALSIM II, the most advanced modeling tool currently available, cannot distinguish between increments of this magnitude (i.e., 15,000 AFA), relative to a large operational pool (CVP/SWP) under the future condition. This future condition is the basis for the cumulative impact evaluation.

5.22. WATER SUPPLY – CUMULATIVE IMPACTS

5.22-1 Effects on CVP Allocations.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in long-term hydrology resulting from this action anywhere in the CVP/SWP including the Delta. As shown in the following discussion, while there would likely be potential impacts on CVP Ag contractors (South of Delta) in terms of expected long-term delivery shortfalls, this new contract would not have a measurable effect on that impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Tables 5.22-1A through 5.22-1D illustrate the 72-year mean differences in simulated annual deliveries to CVP contractors between the Base Condition and the Future Cumulative Condition for CVP M&I (North of Delta), Ag (North of Delta), M&I (South of Delta), and Ag (South of Delta) contractors. Based on the CALSIM II modeling results, of these CVP contractor categories, CVP M&I (North of Delta) would increase their expected long-term allocations, relative to the Base Condition, while CVP Ag contractors (South of Delta) would experience a long-term average decrease in annual allocations. This would be a potentially significant future cumulative impact on south of Delta CVP Ag contractors. The Alternatives defined by the various scenarios under the Proposed Action would not, by virtue of their immeasurable effects illustrated by CALSIM II modeling output, incrementally contribute to this potentially significant future cumulative impact.

Little change from the Base Condition would occur to CVP Ag contractors (North of Delta) or CVP M&I contractors (South of Delta).

TABLE 5.22-1A

ALLOCATIONS TO CVP M&I CONTRACTORS (NORTH OF DELTA) (TAF)

	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference (%)
Mean	30.6	56.6	26.0	97.2
Median	25.3	56.7	24.9	73.6
Min.	8.0	18.2	5.7	38.0
Max.	59.4	112.0	68.2	845.9

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

TABLE 5.22-1B

ALLOCATIONS TO CVP AG CONTRACTORS (NORTH OF DELTA) (TAF)

	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference (%)
Mean	235.4	238.7	3.3	-2.2
Median	295.2	293.5	9.6	4.2
Min.	0.0	0.0	-64.3	-99.9
Max.	359.0	367.1	31.7	51.0

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

TABLE 5.22-1C

ALLOCATIONS TO CVP M&I CONTRACTORS (SOUTH OF DELTA) (TAF)

	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference (%)
Mean	123.2	123.0	-0.2	-0.3
Median	134.0	135.8	0.0	0.0
Min.	72.1	72.1	-19.7	-19.8
Max.	144.1	144.1	18.3	14.9

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

TABLE 5.22-1D

ALLOCATIONS TO CVP AG CONTRACTORS (SOUTH OF DELTA) (TAF)

	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference (%)
Mean	1090.5	1067.2	-23.4	-4.8
Median	1267.2	1276.4	0.0	0.0
Min.	0.0	0.0	-322.2	-100.0
Max.	1840.6	1840.7	228.8	47.5

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

CALSIM II modeling presumed a level of future demand by the various water purveyors and interests and, as part of the analytical process, implemented known or reasonably foreseeable future environmental and preservation actions that might occur. In fact, in the future, several actions or conditions pertaining to more aggressive shortage provisions, new instream flow constraints, refuge or wildlife allocations, new river management agreements, or changing long-term hydrology (due to climate change or other natural or man-induced climate forcings) might all contribute to affect how mass balance hydrological simulations determine water availability. Today, many of these remain unknown and cannot be reasonably implementable in any reliable forecasting procedure.

5.22-2 Effects on SWP Allocations.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in long-term hydrology resulting from this action anywhere in the CVP/SWP including the Delta. As shown in the following discussion, while there would likely be potential benefits to SWP contractors in terms of expected long-term delivery shortfalls.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.22-2 reveals the CALSIM II simulated delivery allocations to SWP contractors under the Future Cumulative Condition and the differences, relative to the Base Condition. Over the 72-year period of record, the mean expected future delivery allocations to SWP customers would be approximately 145,000 AF higher than that under the Base Condition. An overall percent increase of 4.3 percent, relative to the Base Condition, would be expected in delivery allocations in the future. This would be a *benefit* as opposed to an adverse future cumulative impact.

TABLE 5.22-2

ALLOCATIONS TO SWP CONTRACTORS (TAF)

	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference (%)
Mean	2858.9	3003.8	144.9	4.3
Median	3232.1	3360.0	143.2	7.6
Min.	173.8	197.5	-859.7	-31.0
Max.	3729.5	4041.7	768.8	25.4

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

5.22-3 Effects of delivery allocations to purveyors of the Sacramento Water Forum Agreement as provided under their Purveyor-Specific Agreements (PSAs).

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in long-term American River hydrology resulting from this action. As shown in the following discussion, while there would likely be no adverse effect in terms of anticipated shortfalls to Water Forum purveyors.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.22-3 shows the modeled future anticipated delivery allocations for each of the diversion nodes (as characterized by CALSIM II) applicable to the various water purveyors under the Water

Forum Agreement, relative to the Base Condition. At each of the nodes, anticipated future delivery allocations are greater than current conditions. This is not surprising given the nature of the primary element of the Water Forum Agreement; Increased Surface Water Diversions. Clearly, Folsom Reservoir (D8) represents the waterbody where most of the anticipated future water diversions, relative to current conditions, will be diverted from by the various purveyors of the Water Forum Agreement. From a water supply perspective, there is no future cumulative impact associated with the expected allocations to Water Forum purveyors.

TABLE 5.22-3

ALLOCATIONS TO WATER FORUM PURVEYORS IDENTIFIED BY CALSIM NODE 72-YEAR MEAN ANNUAL SIMULATED DIVERSIONS (DELIVERY YEAR MARCH – FEBRUARY) (TAF)

CALSIM Node	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference (%)
D300	35.1	67.1	32.0	91.0
D8	123.7	240.4	116.7	94.5
D302	124.4	166.8	42.4	31.6
D167	28.4	85.0	56.7	237.7

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

5.23. HYDROPOWER – CUMULATIVE IMPACTS

5.23-1 Effects on CVP hydropower generation and capacity.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in long-term CVP hydropower generation and capacity resulting from this action. As shown in the following discussion, however, while there would likely be indefinable environmental effects, reductions in projected CVP hydropower generation would translate into *economic* costs.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Under the Future Cumulative Condition, CVP system hydropower generation at load center would on average, over the 72-year period of record, be reduced by approximately 52 GWH (or 1.2 percent), relative to the Base Condition. Long-Term Gen modeling results showed that in 25 out of the 72-years (35 percent of the time), a reduction in CVP hydropower generation would occur, relative to the Base Condition (see Future Cumulative Condition, Technical Appendix I, this Draft EIS/EIR). These reductions, in most years, are less than 2 percent. Table 5.23-1A illustrates the anticipated future mean change in CVP hydropower generation under the Future Cumulative Condition.

TABLE 5.23-1A

**CVP SYSTEM GENERATION AT LOAD CENTER
DIFFERENCE BETWEEN THE BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]**

	Base Condition (GWH)	Future Cumulative Condition[1] (GWH)	Absolute Difference	Relative Difference (%)
Mean	4545.1	4493.3	-51.8	-1.2
Median	4421.1	4413.3	-52.4	-1.2
Min.	2256.9	2208.5	-304.7	-11.4
Max.	9672.0	9627.1	123.5	5.0

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Source: June 2007, Long-Term Gen Modeling Output – 72-year hydrologic record, unpublished data.

As noted previously, with any reduction in energy production, WAPA could be compelled to reduce surplus energy sales or increase purchases to meet its commitments. Such conditions would represent a definable *economic cost* but an unidentifiable future cumulative environmental impact. Table 5.23-1B shows the anticipated long-term change in CVP system Project Use at Load Center under the Future Cumulative Condition, relative to the Base Condition. Overall, CVP system Project Use changes little, if at all, over the long-term. Without any new CVP facilities contemplated in the near or mid-term, this is not unexpected.

TABLE 5.23-1B

**CVP SYSTEM PROJECT USE AT LOAD CENTER
DIFFERENCE BETWEEN THE BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]**

Month	Base Condition (GWH)	Future Cumulative Condition[1] (GWH)	Absolute Difference	Relative Difference (%)
Mean	1265.7	1266.4	0.7	0.0
Median	1326.1	1324.8	0.3	0.0
Min.	519.2	520.7	-42.2	-3.6
Max.	1778.5	1778.0	38.2	2.3

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Source: June 2007, Long-Term Gen Modeling Output – 72-year hydrologic record, unpublished data.

5.24. FLOOD CONTROL – CUMULATIVE IMPACTS

5.24-1 Substantial change in the ability to adhere to the flood control diagrams for Folsom Reservoir under current operation or to its long-term re-operation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in long-term American River basin hydrology or inflows to Folsom Reservoir resulting from this action. As shown in the following discussion, ongoing actions would likely result in no adverse future cumulative impact on flood control operations.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As noted previously, Folsom Reservoir, under the purview of the Corps of Engineers and Reclamation are initiating the Flood Damage Reduction portion of the Joint Federal Project. This portion of the project is intended to update the current Water Control Manual which has, as one of its primary objectives, the redesign of the current flood encroachment curve (i.e., flood control diagram) for the reservoir. It is likely that the current 400,000 AF to 670,000 AF "variable" space flood control diagram will be revised under this ongoing effort.

Increased future diversions from the American River Watershed are planned and anticipated. In fact, CALSIM II modeling as part of the Water Supply evaluation for this EIS/EIR confirms the quantities with which increased allocations would occur from Folsom Reservoir. On a monthly mean basis during the flood control period, the storage in Folsom Reservoir would be expected to be lower in the future, all other considerations being equal. Any additional diversions would provide a flood control *benefit* to the region by assisting in the ability to maintain existing flood control reservation space. Accordingly, no significant adverse future cumulative impact on Folsom Reservoir's ability to meet or adhere to its flood encroachment curve is expected. The Alternatives would provide an incremental, albeit small, *benefit* towards this goal.

5.24-2 Substantial change in floodplain characteristics that would increase the exposure of persons or property to flood hazards including a substantial change in the hydraulic stress imparted to lower American River levees or lower Sacramento River levees.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in long-term American River basin hydrology, Folsom Reservoir flood control risk or alterations to downstream floodplain characteristics resulting from this action. As discussed, ongoing actions between Reclamation and the Corps would likely result in no adverse future cumulative impact on existing floodplain characteristics.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Long-term changes in floodplain characteristics typically result from natural fluvial processes associated with a river's hydraulic energy gradient as it maintains its longitudinal profile and adjusts laterally, as reflected in its channel sinuosity. Changes in the long-term flow regime will alter the kinetic energy available, spatially, throughout a river reach, thus, affecting the magnitude of erosional and depositional processes. The degree to which a river adjusts will affect its floodplain characteristics. Table 5.24-1 shows the modeled future mean monthly flows in the lower American River below Nimbus Dam, relative to the Base Condition.

TABLE 5.24-1

**MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
DURING THE NOVEMBER THROUGH APRIL FLOOD CONTROL PERIOD**

Month	Base Condition (cfs)	Future Cumulative Condition[1] (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Nov	3324.2	2541.6	-782.6	-14.9
Dec	3342.0	3335.2	-6.8	-3.5
Jan	4088.3	4026.8	-61.5	-2.6
Feb	5103.3	4919.7	-183.6	-9.8
Mar	3729.6	3632.1	-97.3	-1.3
Apr	3825.3	3302.4	-522.9	-13.8

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Modeled results of the Future Cumulative Condition show that, relative to the Base Condition, mean monthly flows in the lower American River below Nimbus Dam during the flood control season (November through April) would be significantly less in most months during this period. Reduced flows during this period over the long-term would not increase hydraulic conditions within the river, relative to current conditions. No future cumulative impacts on floodplain characteristics are anticipated. Similarly, under reduced future flow conditions, relative to the Base Condition, the future cumulative impacts associated with increased levee stress would be less than those experienced today.

Unaccounted for in this assessment, however, is the magnitude of individual storm events that, while masked by overall mean monthly flow values, could impart flows under extreme events much greater than that currently experienced. Recent studies on the potential effects of climate induced changes in winter and early-spring runoff hydrology point to this possibility. CALSIM II, as a monthly time-step model has no ability under its current format to address this issue.

5.25. WATER QUALITY – CUMULATIVE IMPACTS

5.25-1 Effects of increased diversions and changes in CVP operations on water quality in reservoirs and rivers.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in CVP withdrawals (diversions) resulting from this action. As discussed in the following paragraphs, however, under the anticipated future cumulative condition, because of reduced reservoir storage and resulting releases to maintain river flows, combined with the expected increases in various forms of direct and non-point source discharges, water quality is expected to be significantly affected.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Water quality in reservoirs and rivers are influenced by a large number of factors. Long-term assessment of water quality, given this range of factors is a highly complex endeavor and not something any one particular model can easily or accurately undertake. Nevertheless, at least from a hydrological perspective, storage and instream flows can provide a measure of dilution capacity.

Table 5.25-1 shows the simulated future mean end-of-month storage in Folsom Reservoir, relative to the Base Condition, using the past 72 years as the hydrologic period record. Mean end-of-month storage decline in all months with the largest decreases observed in late summer and early fall.

TABLE 5.25-1

MEAN END-OF-MONTH STORAGE IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (TAF)	Future Cumulative Condition[1] (TAF)	Absolute Difference[2] (TAF)	Relative Difference (%)
Oct	525.8	472.2	-53.6	-10.7
Nov	453.2	443.2	-10.0	-3.7
Dec	464.9	452.0	-12.9	-3.7
Jan	481.6	468.1	-13.5	-3.3
Feb	503.2	487.1	-16.0	-3.4
Mar	614.1	587.6	-26.4	-4.7
Apr	722.7	710.4	-12.3	-2.1
May	834.2	829.9	-4.3	-0.7
Jun	788.4	779.9	-8.6	-0.9
Jul	650.7	635.4	-15.3	-1.8
Aug	601.9	559.1	-42.8	-7.4
Sep	594.4	501.4	-93.1	-15.2

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Water quality in Folsom Reservoir is generally acceptable for the beneficial uses currently defined for the facility. Surface water quality in Lake Natoma and the lower American River depends primarily on the mass balance of various water quality constituents from groundwater inputs, tributary inflow, permitted discharges from municipal and industrial sources, indirect watershed runoff (unchannelized flow), urban runoff, and stormwater discharges. Water quality varies somewhat among years and seasonally within a year based primarily on these and related factors.

Modeling output, as shown in Table 5.25-1 reveal that long-term end-of-month storage in Folsom Reservoir would be less, relative to the Base Condition, in all months, with the greatest decrease in late summer or early fall (i.e., September and October). This implies a reduced ability or flexibility to maintain downstream flows that, as noted, could affect dilution capabilities in Lake Natoma and the lower American River. Further discussion of the modeling output for the lower American River is provided below.

Table 5.25-2 shows the same data for Shasta Reservoir. A more uniform yearly decline in mean end-of-month storage is observed with slightly higher reductions noted again, for the late summer and early fall.

TABLE 5.25-2

MEAN END-OF-MONTH STORAGE IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (TAF)	Future Cumulative Condition[1] (TAF)	Absolute Difference[2] (TAF)	Relative Difference (%)
Oct	2544.8	2503.0	-41.6	-2.5
Nov	2593.2	2552.0	-41.0	-2.4
Dec	2727.4	2689.9	-37.3	-2.3
Jan	2959.1	2926.2	-32.7	-1.9
Feb	3208.2	3179.2	-28.9	-1.5
Mar	3552.6	3520.2	-32.7	-1.3
Apr	3829.4	3794.1	-35.3	-1.3
May	3816.2	3779.7	-36.5	-1.4
Jun	3536.6	3492.9	-43.4	-1.9
Jul	3079.4	3034.2	-45.1	-2.6
Aug	2736.8	2686.0	-50.9	-3.0
Sep	2605.4	2557.4	-48.1	-2.9

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Table 5.25-3 shows the simulated mean monthly future flows in the lower American River below Nimbus Dam, relative to the Base Condition for the entire year. Substantial declines in modeled river flows are noted for the late spring and early- to mid-summer, although the declines are reversed in August and September; two critical months for instream aquatic resources.

TABLE 5.25-3

MEAN MONTHLY FLOWS BELOW NIMBUS DAM DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Future Cumulative Condition[1] (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	2441.8	1571.3	-870.5	-29.1
Nov	3324.2	2541.6	-782.6	-14.9
Dec	3342.0	3335.2	-6.8	3.5
Jan	4088.3	4026.8	-61.5	2.6
Feb	5103.3	4919.7	-183.6	9.8
Mar	3729.4	3632.1	-97.3	1.3
Apr	3825.3	3302.4	-522.9	-13.8
May	3683.2	3321.4	-361.8	-13.1
Jun	3933.9	3704.7	-229.2	-7.8
Jul	3846.4	3620.5	-225.9	-6.7
Aug	2138.4	2254.3	115.9	15.4
Sep	1503.2	2031.6	528.3	45.0

Note:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

As noted in earlier discussions, the principal water quality parameters of concern for the lower American River (e.g., pathogens, nutrients, total dissolved solids (TDS), total organic carbon (TOC), priority pollutants, and turbidity) are primarily affected by urban land use practices and associated runoff and stormwater discharges. The stormwater discharges to the river temporarily elevate levels of turbidity and pathogens during and immediately after storm events.

Although urban land use practices, urban runoff and stormwater discharges all contribute priority pollutants to the river, recent monitoring has not identified any priority pollutant at concentrations consistently above State water quality objectives. However, water quality objectives for dissolved oxygen, temperature, and pH are not always met in the lower American River even today.

The lower American River is included on the federal Clean Water Act Section 303(d) list of waters that do not meet the Clean Water Act national goal of "fishable, swimmable." For listed water bodies, such as the lower American River, total maximum daily loads (TMDLs) must be developed by the State Water Resources Control Board to achieve water quality standards. Group A pesticides (e.g., aldrin, chlordane, lindane, and others), mercury, and pollutants/stressors of unknown toxicity are listed as the pollutants of concern in the lower American River.[214] A 2001 RWQCB staff report is recommending, however, that the Group A pesticides be deleted from the list.[215]

As areas contributing stormwater flows to the American River continue to be developed, the increase in the rate and amount of stormwater runoff from new impervious surfaces is assumed to carry increased concentrations of urban pollutants that could affect water quality. Runoff from construction sites can also affect water quality by increasing sediment loads. These two types of non-point source discharges are regulated under the federal NPDES program, administered at the State level by the RWQCB and SWRCB.

Based on modeling of the future cumulative condition, increased reductions in flows, acting indirectly to lower dilution of the concentrations or levels of water quality parameters, could have a noticeable affect on long-term water quality.

In the future, since flows in the Sacramento and American rivers could, on average, be reduced substantially in certain months of certain years, concentrations of the water quality parameters of interest such as nutrients, pathogens, TDS, TOC, turbidity, and priority pollutants (e.g., metals, organics) could be expected to be altered substantially, relative to the Base Condition. This would be a significant future cumulative impact. As illustrated in earlier analyses into the specific effects of the various Alternatives, this new contracting action would not contribute significantly to this overall effect on future water quality.

214 California Environmental Protection Agency, Central Valley Regional Water Quality Control Board, 1998 California 303(d) List.

215 California Environmental Protection Agency, Central Valley Regional Water Quality Control Board, Final Staff Report on Recommended Changes to California's Clean Water Act Section 303(d) List, December 14, 2001.

5.25-2 Effects on Delta water quality.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in CVP hydrology resulting from this action that would affect Delta water quality. As discussed in the following paragraph, under the future cumulative condition, despite ongoing efforts at aggressively addressing Delta ecosystem function, health, and long-term sustainability, it is likely that Delta water quality will represent a significant cumulative impact in the future.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As one hydrologic indicator of Delta water quality, X2 position provides a useful gauge for assessing Delta outflow and, hence, water quality effects related to saltwater intrusion. Table 5.25-4 shows the modeled future mean monthly position of X2 as a difference from the Base Condition, as well as the maximum yearly increase (i.e., upstream X2 migration) over the 72-year period of hydrologic record.

TABLE 5.25-4

MEAN MONTHLY DELTA X2
DIFFERENCE BETWEEN THE BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]

Month	Absolute Difference (km)	Relative Percent (%)	Maximum[2] (km)
Oct	-0.6	-0.8	1.4
Nov	0.6	0.8	3.1
Dec	0.4	0.5	3.6
Jan	0.1	0.2	2.1
Feb	0.1	0.1	2.6
Mar	0.0	0.0	1.2
Apr	-0.1	-0.1	0.9
May	0.1	0.1	1.5
Jun	0.2	0.3	2.5
Jul	0.0	0.0	1.6
Aug	0.0	-0.1	-0.1
Sep	0.0	0.0	1.3

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Maximum – refers to the largest increase in distance from Golden Gate Bridge (in km) computed for that month (largest increase over 72-years).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

CALSIM II modeling results showed that the long-term mean monthly position of X2 in the future would generally migrate further upstream (i.e., worsen), relative to the Base Condition. Of particular concern are the monthly and yearly maximums, which are significantly larger than those simulated for the various Alternatives. This implies that, based on the modeling assumptions relied upon, the Future Cumulative Condition would impart larger extreme events where X2 upstream migration would be more noticeable and significant on an individual month basis. It is acknowledged that current State-wide efforts at addressing long-term Delta water quality sustainability and improvement will continue to be aggressively pursued; the Governor's Delta Vision Blue Ribbon Task Force Recommendations, the ongoing Bay Delta Conservation Plan, the pending CVP-OCAP, and the current SWRCB Water Quality Objectives are a few examples of ongoing initiative to address this important issue. Given the extreme sensitivity of the Delta, such shifts in modeled X2 position would be of significant magnitude to result in potentially significant future cumulative impacts on Delta water quality. The various Alternatives, including the scenarios under the Proposed Action would contribute incrementally to this future cumulative impact; however, not significantly.

5.26. FISHERIES AND AQUATIC RESOURCES – CUMULATIVE IMPACTS

5.26-1 Effects on CVP reservoir warmwater fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in CVP reservoir hydrology resulting from this action that would affect reservoir warmwater fisheries. As noted in the following discussions, while the larger reservoirs such as Shasta, while likely to experience loss of littoral habitat, maintain an active littoral shoreline that would still provide suitable habitat to warmwater fish species. No significant future cumulative impact is expected. For Folsom Reservoir, however, potential nest-dewatering events could occur in the months of the March through July warmwater fish-spawning period; this could represent a significant long-term cumulative impact on the reservoir's warmwater fisheries.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Warmwater fisheries throughout CVP reservoirs are dependent on water temperature and shallow water littoral habitat, among other factors. Simulated long-term future changes in reservoir water surface area in Shasta and Folsom reservoirs, and water surface elevations in Trinity Reservoir, relative to the Base Condition are provided in Tables 5.26-1A through 5.26-1C.

In the future, under the modeling simulations performed, mean end-of-month water surface area and water surface elevations are reduced in each of Shasta, Trinity, and Folsom reservoirs, relative to current conditions. Shasta Reservoir would lose, on average, a minimum of 160 acres for every month of the year, relative to its Base Condition, approximating a 2 percent reduction. The maximum reduction would occur in late summer or early fall. Shasta Reservoir's large water surface area; however, would still provide ample nearshore littoral habitat for warmwater fish species and their prey base. Similarly, for Trinity Reservoir, anticipated future reductions in water surface elevation are small, relative to the Base Condition (e.g., no more then a two-tenths of one percent change) for any month over the long-term. For both Shasta and Trinity reservoirs, no significant future cumulative impacts on warmwater fisheries are anticipated based on hydrology.

TABLE 5.26-1A

END-OF-MONTH WATER SURFACE AREA IN SHASTA RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (acres)	Future Cumulative Condition[1] (acres)	Absolute Difference[2] (acres)	Relative Difference (%)
Oct	19899.1	19646.2	-252.8	-1.7
Nov	20171.8	19921.8	-250.0	-1.7
Dec	20949.8	20715.1	-234.6	-1.6
Jan	22336.5	22121.7	-214.7	-1.4
Feb	23676.8	23516.8	-160.0	-1.0
Mar	25454.4	25267.5	-186.9	-0.9
Apr	26674.0	26485.8	-188.2	-0.9
May	26525.2	26325.5	-199.6	-1.0
Jun	25171.8	24936.2	-235.6	-1.3
Jul	22931.7	22656.8	-274.9	-1.8
Aug	21021.4	20713.2	-308.2	-2.1
Sep	20278.0	19977.7	-300.3	-2.0

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in acres), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.26-1B

MEAN MONTHLY WATER SURFACE ELEVATIONS IN TRINITY RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Future Cumulative Condition[1] (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)
Oct	2275.7	2270.4	-5.2	-0.2
Nov	2277.6	2273.2	-4.3	-0.2
Dec	2282.6	2278.6	-4.0	-0.2
Jan	2288.0	2284.5	-3.6	-0.2
Feb	2299.8	2296.5	-3.3	-0.2
Mar	2309.1	2306.3	-2.8	-0.1
Apr	2321.2	2318.8	-2.3	-0.1
May	2319.7	2317.4	-2.3	-0.1
Jun	2315.5	2313.0	-2.6	-0.1
Jul	2303.1	2300.4	-2.7	-0.1
Aug	2290.6	2287.4	-3.2	-0.1
Sep	2280.1	2275.9	-4.2	-0.2

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in feet msl), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.26-1C

END-OF-MONTH WATER SURFACE AREA IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (acres)	Future Cumulative Condition[1] (acres)	Absolute Difference[2] (acres)	Relative Difference (%)
Oct	7924.0	7372.3	-551.7	-7.4
Nov	7384.8	7143.5	-241.3	-4.0
Dec	7432.8	7266.2	-166.5	-2.7
Jan	7601.7	7474.9	-126.8	-2.0
Feb	7797.9	7656.0	-141.9	-2.1
Mar	8875.4	8612.2	-263.2	-3.1
Apr	9718.9	9644.5	-74.5	-0.9
May	10238.5	10182.8	-55.7	-0.6
Jun	9907.0	9848.9	-58.1	-0.4
Jul	8919.1	8805.0	-114.1	-1.0
Aug	8508.7	8168.6	-340.1	-4.3
Sep	8446.5	7708.7	-737.8	-9.0

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in acres), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

For Folsom Reservoir, mean monthly reductions in water surface area would occur in every month under the Future Cumulative Condition. Late summer and early fall reductions in water surface area are particularly significant with over 735 acres lost in September, representing a 9 percent reduction, relative to the Base Condition. The frequency with which potential nest-dewatering events could occur in Folsom Reservoir would also increase in the remaining months of the March through July warmwater fish-spawning period, and consequently, impacts on warmwater fish nesting success may be cumulatively significant. Such reductions in habitat availability could, in turn, lead to increased predation on young-of the year warmwater fish, thereby reducing the long-term initial year-class strength of the population. Unless willows and other near-shore vegetation, in response to long-term seasonal reductions in water levels, become established at lower reservoir elevations in the future, future year-class production of warmwater fisheries could be reduced. Consequently, seasonal reductions in littoral habitat availability represent a potentially significant cumulative impact on Folsom Reservoir warmwater fisheries. Such losses are considered to represent a significant future cumulative impact. The Alternatives, including the various scenarios under the Proposed Action would contribute incrementally to this future cumulative impact; however, not significantly.

5.26-2 Impacts on Folsom Reservoir's coldwater fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in Folsom Reservoir hydrology or its coldwater pool reservoirs resulting from this action that could affect the reservoir coldwater fisheries. As noted in the following discussions, while reservoir storage in the future is expected to be significantly lower than that under the current Base Condition, this condition would be most prevalent during the late summer to early periods. While this period is important to downstream fisheries lifestages, the reservoir coldwater pool would already have been established at this point and coldwater habitat would remain available within the reservoir during most months of most years.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As shown previously in Table 5.25-1, simulated future mean end-of-month storage in Folsom Reservoir, relative to the Base Condition, declined in all months with the largest decreases observed in late summer and early fall. Coldwater pool resources are particularly important during the latter part of each summer. By this time, development of the reservoir coldwater pool has already been established with thermal stratification between the epilimnion and hypolimnion occurring well before; during the spring. Total reservoir storage decreases of these magnitudes (i.e., 7, 15, and 11 percent, respectively, for August, September, and October) represent considerable depletions in reservoir storage. However, as noted, the reservoir coldwater pool is already established by this time and coldwater habitat would remain available within the reservoir during most months of most years. Future reductions in seasonal storage would not be expected to adversely affect the primary prey species utilized by coldwater fish. Finally, future operation of the Folsom TCD, ongoing shutter manipulation and optimal temperature target release procedures, planned improvements to the Folsom outlet works, continued reliance on the Folsom Coldwater Pool Management Model (CPMM) for predictive planning, Reclamation and Water Forum's proposed new Lower American River Flow Management Standard, and EID's pending new TCD will all contribute to preserving the reservoir's coldwater pool into the future. Future cumulative impacts on Folsom Reservoir's coldwater fisheries are not anticipated to be significant.

5.26-3 Flow- and Temperature-related effects on upper Sacramento River fisheries.

Alternative 1B - No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in river flows or water temperatures in the upper Sacramento River resulting from this action that could affect those fisheries using those waterbodies. As noted in the following discussions, future anticipated reductions in upper Sacramento flows would not likely result in a significant cumulative impact, however, water temperature increases, even though slight, would likely constitute a significant cumulative impact on spawning and rearing success of Chinook salmon.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.26-3A shows the modeled future mean monthly Sacramento River flow releases below Keswick Dam, relative to the Base Condition. Flow reductions are observed for fall and winter months, although these reductions are approximately 1 to 2 percent. Mean monthly flow increases, however, resulted for the remaining months of the year. The reductions observed are considered

TABLE 5.26-3A

MEAN MONTHLY SACRAMENTO RIVER FLOW RELEASES BELOW KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Future Cumulative Condition[1] (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	5651.8	5683.5	-68.3	-0.8
Nov	5290.3	5271.9	-18.4	0.4
Dec	6877.8	6796.6	-81.2	-0.7
Jan	8033.1	7944.9	-88.1	-1.4
Feb	10164.0	10095.4	-68.6	-1.5
Mar	8313.3	8385.5	72.2	1.6
Apr	7203.6	7218.6	15.0	0.3
May	8241.9	8253.6	11.7	0.2
Jun	10365.3	10532.9	167.6	1.7
Jul	12708.9	12728.3	19.4	0.4
Aug	10505.2	10676.4	171.2	1.7
Sep	7035.7	6998.2	-37.5	-0.3

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

small, relative to the Base Condition flows and are not expected to significantly affect habitat conditions for fisheries. Accordingly, no significant future cumulative impacts on the fisheries in the upper Sacramento as a result of instream flow (e.g. habitat conditions) changes are anticipated.

Table 5.26-3B shows the modeled mean monthly Sacramento River water temperatures at Keswick Dam, relative to the Base Condition. Small changes (i.e., increases) were observed for the summer and late-summer months, but these increases in long-term mean monthly water temperatures do not exceed two-tenths of one degree Fahrenheit. As noted previously, both Chinook salmon and steelhead, however, possess low thermal tolerance and elevated water temperatures could reduce spawning and rearing success of these anadromous salmonids. The slight changes in temperatures, coupled with the lower baseline temperatures suggest that water temperature alone would not necessarily constitute a significant cumulative impact in this reach of the Sacramento River.

Tables 5.26-3C through 5.26-3F show the long-term future modeled annual early life stage survival of all four runs of Chinook salmon, relative to the Base Condition. Modeling results from Reclamation's Sacramento River Chinook Salmon Mortality Model showed that for both winter-run and spring-run, early life stage survival under the Future Cumulative Condition decrease by approximately one percent, relative to the Base Condition. Such decreases in estimated long-term survival of these listed species are considered a significant future cumulative impact. As discussed earlier, however, neither the Alternatives nor the various scenarios under the Proposed Action would significantly contribute to these anticipated long-term impacts.

TABLE 5.26-3B

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (°F)	Future Cumulative Condition[1] (°F)	Absolute Difference[2] (°F)	Relative Difference (%)
Oct	53.8	54.0	0.2	0.4
Nov	53.0	53.1	0.1	0.2
Dec	48.7	48.7	0.0	-0.1
Jan	45.1	45.1	0.0	-0.1
Feb	47.4	47.3	-0.1	-0.1
Mar	50.8	50.8	-0.1	-0.1
Apr	52.3	52.4	0.1	0.1
May	51.6	51.6	0.0	0.0
Jun	50.8	50.8	0.0	0.0
Jul	51.3	51.5	0.2	0.4
Aug	52.2	52.3	0.1	0.2
Sep	53.4	53.6	0.2	0.3

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in acres), representative of the mean difference over the 71-years (and subject to rounding).

TABLE 5.26-3C

**SACRAMENTO RIVER
ANNUAL EARLY LIFE STAGE FALL-RUN CHINOOK SALMON SURVIVAL
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)
(PERCENT SURVIVAL)**

Base Condition	Future Cumulative Condition[1]	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
86.0	85.4	-0.6	0.8	1.3 (2.3) 1933 (C)	-9.0 (-11.6) 1929 (C)

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in % survival), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage fall-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent increase, relative to the specific year, for which the highest percent increase occurred, shown in parentheses.
4. Maximum Survival Decrease - refers to the largest decrease in annual early life stage fall-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.26-3D

SACRAMENTO RIVER ANNUAL EARLY LIFE STAGE LATE FALL-RUN CHINOOK SALMON SURVIVAL DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993) (PERCENT SURVIVAL)

Base Condition	Future Cumulative Condition[1]	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
98.4	98.3	-0.1	-0.1	0.7 (0.7) 1933 (C)	-3.5 (-3.7) 1934 (C)

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in % survival), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage late fall-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent increase, relative to the specific year, for which the highest percent increase occurred, shown in parentheses.
4. Maximum Survival Decrease - refers to the largest decrease in annual early life stage late fall-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.26-3E

SACRAMENTO RIVER ANNUAL EARLY LIFE STAGE WINTER-RUN CHINOOK SALMON SURVIVAL DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993) (PERCENT SURVIVAL)

Base Condition	Future Cumulative Condition[1]	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
91.8	90.5	-1.3	-5.4	5.0 (7.8) 1932 (D)	-42.8 (-97.7) 1933 (C)

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in % survival), representative of the mean difference over the 71-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage winter-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent increase, relative to the specific year, for which the highest percent increase occurred, shown in parentheses.
4. Maximum Survival Decrease - refers to the largest decrease in annual early life stage winter-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

TABLE 5.26-3F

**SACRAMENTO RIVER
ANNUAL EARLY LIFE STAGE SPRING-RUN CHINOOK SALMON SURVIVAL
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)
(PERCENT SURVIVAL)**

Base Condition	Future Cumulative Condition[1]	Absolute Difference[2]	Relative Difference (%)	Maximum Survival Increase[3]	Maximum Survival Decrease[4]
76.6	75.5	-1.1	-3.1	0.6 (41.8) 1970 (W)	-21.0 (-96.2) 1990 (C)

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in % survival), representative of the mean difference over the 72-years (subject to rounding).
3. Maximum Survival Increase – refers to the largest increase in annual early life stage fall-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent increase, relative to the specific year, for which the highest percent increase occurred, shown in parentheses.
4. Maximum Survival Decrease - refers to the largest decrease in annual early life stage fall-run Chinook salmon survival under the Future Cumulative Condition, relative to the Base Condition. Percent decrease, relative to the specific year, shown in parentheses.

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

5.26-4 Flow- and Temperature-related effects on lower Sacramento River fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in river flows or water temperatures in the lower Sacramento River resulting from this action that could affect those fisheries using those waterbodies.

As noted in the following discussions, future anticipated reductions in lower Sacramento flows would not likely result in a significant cumulative impact, however, water temperature increases, even though slight, would likely constitute a significant cumulative impact on anadromous fish using this reach of the river as an immigration route to upstream spawning habitats or as emigration route to the Delta.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.26-4A shows the simulated long-term future mean monthly flows in the Sacramento River at Freeport, relative to the Base Condition. Mean monthly flow both decrease and increase over the course of 12 months, however, in October, flows would decrease by approximately 855 cfs on average, as applied over the 72-year period of modeled hydrology. This would be a 6 percent reduction, relative to Base Condition flows and, occur during the month when flows in the Sacramento River are typically at their lowest. Such flow reductions could, however, would be offset to some degree by the long-term increases in mean monthly flows in September, relative to the Base Condition.

TABLE 5.26-4A

MEAN MONTHLY SACRAMENTO RIVER FLOWS AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR PERIOD OF RECORD (1922-1993)

Month	Absolute Difference (cfs)	Relative Difference (%)	Long-Term Mean Monthly Flows (cfs)
Oct	-855.6	-6.0	11669.0
Nov	-361.5	-2.0	15223.0
Dec	292.0	2.3	25017.7
Jan	198.5	1.4	32701.9
Feb	176.2	0.9	38991.5
Mar	375.5	1.2	34042.7
Apr	-216.8	-1.0	24132.5
May	-282.8	-1.7	19321.8
Jun	102.1	0.7	17406.8
Jul	-23.3	0.1	18314.5
Aug	-90.4	-0.9	14423.4
Sep	466.0	3.6	12859.8

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Long-term future water temperatures in the lower Sacramento River show little change, relative to the Base Condition. Table 5.26-4B shows the mean monthly water temperatures at Freeport under the Future Cumulative Condition. Slight increases occur in April and May. Such increases, over the long-term are unlikely to significantly affect fish species (e.g., Sacramento splittail and striped bass) that make little to no use of the upper river (i.e., upstream of RM 163). Native and introduced warmwater fish species primarily use the lower river for spawning and rearing, with juvenile anadromous fish species also using the lower river, to some degree, for rearing.

As previously noted, many of the fish species utilizing the upper Sacramento River also use the lower river to some degree, even if only as a migratory corridor to and from upstream spawning and rearing grounds. Adult Chinook salmon and steelhead, for example, primarily use the lower river as an immigration route to upstream spawning habitats and an emigration route to the Delta. While the long-term average mean monthly water temperatures may not significantly change, the extent to which inter-annual increases may affect various life-stages of listed species is important to consider. Accordingly, the modeling results also revealed that the number of years that temperatures at this location would exceed 56°F, 60°F, and 70°F would be greater (i.e., one more occurrence for the 56°F index, 3 more occurrences for the 60°F index, and 8 occurrences more often for the 70°F index), relative to the Base Condition (see Future Cumulative Condition, Technical Appendix I, this Draft EIS/EIR). Based on these overall findings, fish species within the lower Sacramento River would experience a potentially significant future cumulative impact. As discussed earlier, however, neither the Alternatives nor the various scenarios under the Proposed Action would significantly contribute to these anticipated long-term impacts.

TABLE 5.26-4B

MEAN MONTHLY SACRAMENTO RIVER WATER TEMPERATURES AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 71-YEAR HYDROLOGIC PERIOD (1923-1993)

Month	Base Condition (°F)	Future Cumulative Condition (°F)	Absolute Difference[2] (°F)	Relative Difference (%)
Oct	60.9	60.9	0.0	0.0
Nov	52.9	52.7	-0.2	-0.3
Dec	45.7	45.6	-0.1	-0.1
Jan	44.8	44.7	0.0	0.0
Feb	49.5	49.6	0.0	0.1
Mar	54.2	54.2	0.0	0.1
Apr	60.3	60.5	0.2	0.3
May	65.9	66.2	0.2	0.4
Jun	70.1	70.3	0.1	0.2
Jul	72.6	72.8	0.1	0.2
Aug	72.2	72.3	0.0	0.0
Sep	69.2	69.2	0.0	0.0

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in F), representative of the mean difference over the 71-years (and subject to rounding).

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output – 71-year hydrologic record, unpublished data.

5.26-5 Effects on Delta fisheries.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in Delta hydrology resulting from this action that could affect fisheries using those waterbodies.

As noted in the following discussions, future anticipated the upstream shift in the position of X2 under the cumulative condition would meet or exceed one-half km 13 percent of the time during the February through June period. This period is considered important for providing appropriate spawning and rearing conditions and downstream transport flows for various fish species. This would be considered a significant cumulative impact on Delta fisheries.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.25-4 showed the modeled position of X2 under the Future Cumulative Condition, relative to the Base Condition. Late fall X2 migration upstream, as an average mean monthly variation from current conditions was notable, as were the individual month and year extremes. Table 5.26-5 shows the simulated future mean monthly Delta outflow, relative to the Base Condition. Percent decreases, relative to current conditions are small, except for October. The maximum outflow decreases for each month are large, but upon closer inspection of the modeling results show that they occur in years when base Delta outflows are well above the long-term means. Large reductions

TABLE 5.26-5

**MEAN MONTHLY DELTA OUTFLOW
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 72-YEAR HYDROLOGIC RECORD (1922-1993)**

Month	Absolute Difference (cfs)	Relative Percent (%)	Maximum Outflow Decrease[2] (cfs)
Oct	-815.8	-9.6	-7801.0
Nov	-190.6	-0.9	-4181.3
Dec	-251.4	0.7	-3377.7
Jan	-294.8	0.0	-5424.6
Feb	-136.1	0.1	-5104.1
Mar	168.3	1.0	-4440.0
Apr	-247.3	-1.1	-2773.6
May	-397.2	-2.2	-4164.9
Jun	-9.3	0.8	-3093.1
Jul	49.7	1.2	-1605.9
Aug	351.2	8.3	-549.2
Sep	351.4	6.9	-1114.5

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

in those years would have little effect on Delta fisheries (see Future Cumulative Conditions, Technical Appendix I, this Draft EIS/EIR).

The modeling results under the Future Cumulative Condition reveal that while October would incur potentially significant decreases in Delta outflow, the X2 position would experience significant upstream migrations in November and December.

Under the Future Cumulative Condition, the long-term average position of X2 would move upstream less than one km, relative to the Base Condition, for any given month of the year. However, during the February through June period considered important for providing appropriate spawning and rearing conditions and downstream transport flows for various fish species, the upstream shift in the position of X2 under the cumulative condition would meet or exceed one-half km 13 percent of the time (46 months out of the 360 months included in the analysis).

The model simulations conducted for the cumulative condition included conformance with X2 requirements set forth in the SWRCB Interim Water Quality Control Plan. Furthermore, Delta export-to-inflow ratios under the cumulative condition would not exceed the maximum export ratio as set by the SWRCB Interim Water Quality Control Plan. Although the cumulative condition would not cause X2 or Delta outflow standards to be violated, there would be a decrease in long-term average outflow and an upstream shift in the position of X2, relative to the Base Condition.

Overall, with these results combined, the potential future cumulative impacts on Delta fisheries are considered to be significant. As demonstrated earlier, the Alternatives including the various scenarios under the Proposed Action, while contributing to this potential significant future cumulative impact would not impart a significant increment.

5.26-6 Effects on lower American River fall-run Chinook salmon and steelhead.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in lower American River flows or temperatures resulting from this action that could affect fall-run Chinook salmon or steelhead.

As noted in the following discussions, future anticipated changes in lower American River flows and water temperatures would, when combined, act to significantly impact both fall-run Chinook salmon and steelhead. This would be considered a significant cumulative impact on these two important fisheries.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Potential effects on lower American River fall-run Chinook salmon and steelhead were evaluated through hydrologic, water temperature, and early life-stage mortality modeling under a Future Cumulative Condition, compared to an existing or Base Condition. As described earlier, the Future Cumulative Condition was developed on the best set of known actions and reasonably foreseeable projects that are incorporated into the CALSIM II model. As either operational rules or depletions, these collective actions dictate the mass balance hydrology that is produced from the modeling.

Flows and water temperatures are the primary indicators from which impacts, if any, were derived. A broad assessment of the future flows and water temperatures at select points within the lower American River were simulated and are presented. These data were then applied to known life stage requirements for fall-run Chinook salmon and steelhead to serve as the basis for the impact assessments. It should be noted that CALSIM II and its related water temperature and early life stage salmon survival models generate output data under a coarse-scale, future level scenario. Future level scenarios, by definition, are rough approximations of what could occur in the future. As discussed in detail previously, they are premised on not only anticipated institutional, regulatory, and environmental controls, but also CVP/SWP operational rules, and changing depletion/accretion assumptions. All of this is made more uncertain given the extent to which the 72-year hydrologic period of record (e.g., that used to provide the inter-annual variability in natural precipitation and water availability) remains representative of future hydrologic conditions.

Given known future depletions contemplated from the American River basin, it is expected that lower American River flows and water temperatures will be affected under the Future Cumulative Condition, relative to the Base Condition. The extent to which these reductions could adversely affect fall-run Chinook salmon and steelhead immigration, spawning and incubation, or juvenile rearing and emigration are discussed below.

Table 5.26-6A through 5.26-6C show the modeled future mean monthly flows in the lower American River, relative to the Base Condition, for the reach below Nimbus Dam, Watt Avenue, and the mouth. The modeling results show significant long-term mean monthly decreases in flows during the fall (October and November) and spring (April and May) months. Mid-winter mean monthly flows are not affected, nor are the late summer flows. An approximate 30 percent decrease in anticipated future, long-term mean monthly flows in October would have significant effects on fall-run Chinook salmon and steelhead adult immigration and could also affect early spawning and egg incubation. Such reductions in flows would reduce the amount of available Chinook salmon spawning habitat, which could result in increased redd superimposition during years when adult returns are high enough for spawning habitat to be limiting.

Simulated mean monthly flows at Watt Avenue and at the mouth under the Future Cumulative Condition show similar, if not accentuated conditions, with flow decreases more pronounced during these months. At both locations, these mean monthly flow reductions extend well into the summer months. Both fall-run Chinook salmon and steelhead may be adversely affected in terms of their long-term juvenile rearing habitat availability under such flow reductions. Equally significant is the juvenile emigration period (February through June) where long-term flows at Watt Avenue would be significantly reduced, relative to the Base Condition.

The flow reductions that would occur under the cumulative condition are of sufficient magnitude and frequency to reduce juvenile steelhead summer (July through September) rearing habitat, relative to the amount available under the existing condition. These could affect the long-term rearing success of juvenile steelhead.

TABLE 5.26-6A

**MEAN MONTHLY FLOWS BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Future Cumulative Condition (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	2441.8	1571.3	-870.5	-29.1
Nov	3324.2	2541.6	-782.6	-14.9
Dec	3342.0	3335.2	-6.8	3.5
Jan	4088.3	4026.8	-61.5	2.6
Feb	5103.3	4919.7	-183.6	9.8
Mar	3729.4	3632.1	-97.3	1.3
Apr	3825.3	3302.4	-522.9	-13.8
May	3683.2	3321.4	-361.8	-13.1
Jun	3933.9	3704.7	-229.2	-7.8
Jul	3846.4	3620.5	-225.9	-6.7
Aug	2138.4	2254.3	115.9	15.4
Sep	1503.2	2031.6	528.3	45.0

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir for EID and 7.5 TAF from PCWA Auburn Pump Station for GDPUD; modeled on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.26-6B

**MEAN MONTHLY FLOWS AT WATT AVENUE
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Future Cumulative Condition (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	2402.7	1526.4	-876.3	-29.7
Nov	3399.7	2523.0	-776.6	-15.1
Dec	3337.4	3325.9	-11.4	3.3
Jan	4107.3	4017.3	-90.0	1.7
Feb	5134.9	4900.1	-234.8	7.1
Mar	3759.7	3596.6	-163.0	-2.5
Apr	3859.3	3253.5	-605.8	-16.7
May	3660.6	3255.9	-404.7	-14.3
Jun	3876.4	3630.2	-246.2	-8.2
Jul	3768.7	3541.4	-227.3	-6.9
Aug	2058.6	2176.0	117.3	17.3
Sep	1440.4	1967.0	526.7	48.1

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir for EID and 7.5 TAF from PCWA Auburn Pump Station for GDPUD; modeled on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.26-6C

**MEAN MONTHLY FLOWS AT THE MOUTH
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)**

Month	Base Condition (cfs)	Future Cumulative Condition (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
Oct	2248.3	1328.8	-919.4	-33.1
Nov	3175.8	2361.4	-814.4	-15.4
Dec	3233.0	3218.6	-14.4	4.2
Jan	3990.3	3890.5	-99.8	2.7
Feb	5010.8	4772.3	-238.5	11.1
Mar	3632.4	3439.6	-192.8	-3.1
Apr	3698.9	3027.4	-671.5	-19.6
May	3470.0	2978.9	-491.0	-17.1
Jun	3674.9	3373.8	-301.1	-10.1
Jul	3475.2	3076.2	-399.0	-13.2
Aug	1797.7	1798.7	1.0	17.5
Sep	1243.4	1698.2	454.8	56.3

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir for EID and 7.5 TAF from PCWA Auburn Pump Station for GDPUD; modeled on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.26-6D

**MEAN MONTHLY WATER TEMPERATURES BELOW NIMBUS DAM
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 71-YEAR HYDROLOGIC PERIOD (1923-1993)**

Month	Base Condition (°F)	Future Cumulative Condition[1] (°F)	Absolute Difference[2] (°F)	Relative Difference (%)
Oct	60.8	59.4	-1.4	-2.2
Nov	56.5	56.5	0.0	0.0
Dec	49.8	49.8	-0.1	-0.2
Jan	46.3	46.3	-0.1	-0.1
Feb	47.4	47.3	-0.1	-0.1
Mar	50.8	50.9	0.0	0.0
Apr	54.9	55.2	0.3	0.6
May	58.8	59.1	0.3	0.5
Jun	62.2	62.3	0.1	0.2
Jul	64.5	64.1	-0.4	-0.6
Aug	64.9	64.3	-0.6	-1.0
Sep	66.0	65.4	-0.6	-0.8

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir for EID and 7.5 TAF from the PCWA Auburn Pump Station for GDPUD; diverted on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in°F), representative of the mean difference over the 71-years (subject to rounding).

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output 71-year hydrologic record, unpublished data.

TABLE 5.26-6E

**MEAN MONTHLY WATER TEMPERATURES AT WATT AVENUE
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 71-YEAR HYDROLOGIC PERIOD (1923-1993)**

Month	Base Condition (°F)	Future Cumulative Condition[1] (°F)	Absolute Difference[2] (°F)	Relative Difference (%)
Oct	61.0	60.1	-1.0	-1.5
Nov	55.9	55.9	-0.1	-0.1
Dec	49.0	48.9	-0.1	-0.2
Jan	46.0	45.9	-0.1	-0.1
Feb	47.9	47.8	-0.1	-0.1
Mar	51.8	51.9	0.0	0.1
Apr	56.1	56.6	0.4	0.8
May	60.5	61.0	0.5	0.8
Jun	64.2	64.5	0.3	0.4
Jul	66.5	66.4	-0.2	-0.2
Aug	67.6	67.0	-0.7	-1.0
Sep	67.3	66.5	-0.7	-1.1

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir for EID and 7.5 TAF from the PCWA Auburn Pump Station for GDPUD; diverted on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in°F), representative of the mean difference over the 71-years (subject to rounding).

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output 71-year hydrologic record, unpublished data.

TABLE 5.26-6F

**MEAN MONTHLY WATER TEMPERATURES AT THE MOUTH
DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1]
OVER THE 71-YEAR HYDROLOGIC PERIOD (1923-1993)**

Month	Base Condition (°F)	Future Cumulative Condition[1] (°F)	Absolute Difference[2] (°F)	Relative Difference (%)
Oct	61.2	60.4	-0.7	-1.1
Nov	55.6	55.5	-0.1	-0.2
Dec	48.5	48.4	-0.1	-0.2
Jan	45.8	45.8	-0.1	-0.1
Feb	48.2	48.1	0.0	-0.1
Mar	52.3	52.4	0.1	0.1
Apr	56.8	57.3	0.5	0.9
May	61.4	62.0	0.6	1.0
Jun	65.2	65.5	0.3	0.5
Jul	67.6	67.7	0.0	0.0
Aug	69.0	68.5	-0.5	-0.7
Sep	68.0	67.2	-0.7	-1.1

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir for EID and 7.5 TAF from the PCWA Auburn Pump Station for GDPUD; diverted on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Proposed Action (in°F), representative of the mean difference over the 71-years (subject to rounding).

Source: June 2007, CALSIM II Based/Water Temperature Modeling Output 71-year hydrologic record, unpublished data.

Modeled future water temperatures in the lower American River, relative to the Base Condition are provided in Table 5.26-6D through Table 5.26-6F. They cover the reach of the lower American River below Nimbus Dam, Watt Avenue, and the mouth. For all three locations, the late-spring (April through June) represent the period where long-term mean monthly water temperatures are expected to increase the greatest, relative to current conditions. At the mouth, mean monthly water temperatures for April and May were simulated to increase by approximately 0.5°F. At Watt Avenue, long-term mean monthly water temperatures would be 0.3°F or greater for each of April, May and June. Such temperature increases would impart significant effects on fall-run and steelhead juvenile rearing in the upper portions of the river. It would also likely significantly affect juvenile emigration during this period.

Table 5.26-6G shows the long-term anticipated early life-stage fall-run Chinook salmon survival, relative to the Base Condition. The modeling results reveal that, over the long-term, survival of the early life-stage fry and smolts from egg mass would increase, relative to the Base Condition by 2 percent. When comparing these data with the instream water temperature modeling results, these results can be explained by the fact that modeled water temperatures during the fall-run Chinook salmon spawning and egg incubation period (October through February) and the steelhead spawning and egg incubation period (December through March) remain outside of the period when river water temperatures would show long-term increases.

TABLE 5.26-6G

AMERICAN RIVER EARLY LIFE-STAGE FALL-RUN CHINOOK SALMON SURVIVAL DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR PERIOD OF RECORD (1922-1993) (PERCENT SURVIVAL)

	Base Condition	Future Cumulative Condition[1]	Absolute Difference	Relative Difference
Mean	84.9	86.9	2.0	2.4
Median	85.4	88.5	1.9	2.3
Minimum	73.8	75.0	-3.5	-4.4
Maximum	93.7	93.8	7.7	9.8

Note:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF for EID from Folsom Reservoir and 7.5 TAF for GDPUD from the PCWA Auburn Pump Station; all diverted on an August through October diversion pattern.

The Salmon Mortality Models produce a single estimate of early life stage Chinook salmon mortality in each river for each year of the simulation. The overall salmon mortality estimate consolidates estimates of mortality for three separate Chinook salmon early life stages: (1) pre-spawned (in utero) eggs; (2) fertilized eggs; and (3) pre-emergent fry. The mortality estimates are computed using output water temperatures from Reclamation’s water temperature models as inputs to the Salmon Mortality Models. Thermal units (TUs), defined as the difference between river water temperatures and 32°F, are used by the Salmon Mortality Models to track life stage development, and are accounted for on a daily basis. For example, incubating eggs exposed to 42°F water for one day would experience 10 TUs. Fertilized eggs are assumed to hatch after exposure to 750 TUs. Fry are assumed to emerge from the gravel after being exposed to an additional 750 TUs following hatching.

Since the models are limited to calculating mortality during early life stages, they do not evaluate potential impacts on later life stages, such as recently emerged fry, juvenile out-migrants, smolts, or adults. Additionally, the models do not consider other factors that may affect early life stage mortality, such as adult pre-spawn mortality, instream flow fluctuations, redd superimposition, and predation. Simulation output from the Salmon Mortality Models provides estimates of annual (rather than monthly mean) losses of emergent fry from egg potential (i.e., all eggs brought to the river by spawning adults).

Overall, based on the hydrologic, water temperature and salmon survival modeling output and, in consideration of the listed status of fall-run and steelhead, modeled flow reductions and increased water temperatures during any one of the several life-stages of these fish species are sufficient to impart a potentially significant future cumulative impact on this resource. The future cumulative impact on fall-run Chinook salmon and steelhead is considered potentially significant. As shown earlier, the potential effects of the various Alternatives on fall-run Chinook salmon and steelhead in the lower American River varies. The Alternatives that contemplate the full 15,000 AFA diversion (e.g., Alternatives, 2A, 2B and 2C; Alternative 3, and Alternative 1A) were shown to impart slight, but notable potential effects. The Alternatives that proposed reduced diversions (e.g., Alternatives 4A, 4B and 4C) did not. Identified mitigation for the Alternatives, 2A, 2B and 2C; Alternative 3, and Alternative 1A included a shift in diversion pattern (from that modeled). With this mitigation, the

Alternatives, therefore, while contributing to this significant future cumulative impact, would have a less-than-significant incremental contribution.

5.26-7 Effects on lower American River splittail.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in lower American River flows resulting from this action that could affect splittail.

As noted in the following discussions, future anticipated changes in lower American River flows at Watt Avenue during the splittail spawning months (February – May) would be of sufficient magnitude and frequency to significantly affect usable spawning habitat. This would be considered a significant cumulative impact on splittail.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As shown in Table 5.26-6B, modeled mean monthly flows in the lower American River at Watt Avenue, under the Future Cumulative Condition, would be significantly reduced during the February through July period, relative to the Base Condition. April and May showed the largest mean monthly reductions; approximating 15 percent. These modeling data suggest that the splittail spawning period (February through May) would experience a long-term decline in average usable riparian habitat. Given the uncertainty regarding the magnitude and extent of splittail spawning habitat in the lower American River, and the actual amount of potential spawning habitat available at specific flow rates throughout the river, the effects of flow reductions during the February through May period are also uncertain, and therefore, represent a potentially significant future cumulative impact on this federally species. As demonstrated earlier, the Alternatives including the various scenarios under the Proposed Action, while contributing to this potential significant future cumulative impact would not impart a significant increment.

5.26-8 Effects on striped bass.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in lower American River flows resulting from this action that could affect striped bass.

As noted in the following discussions, future anticipated changes in lower American River flows at the mouth during the spring and early months would be of sufficient magnitude and frequency to significantly affect striped bass rearing. This would be considered a significant cumulative impact on splittail.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Table 5.26-6C showed the mean monthly flows at the mouth of the lower American River under the Future Cumulative Condition. Modeled flows were shown to decrease throughout the spring and early summer months. Such flow reductions, over the long-term, could have potentially significant impacts on striped bass juvenile rearing, which occurs during the months of May and June. Using the CDFG attraction flow index of 1,500 cfs, the Future Cumulative Condition would result in several additional years where flows would be less than the 1,500 cfs target, relative to the Base Condition. There would be 12 occurrences in May, representing a 17 percent increase in the frequency with which flows would be less than the 1,500 cfs target, and 5 occurrences in June, representing a 7 percent increase in frequency. Overall, based on the modeled future flow conditions in the lower American River, there would be a significant future cumulative impact on the striped bass recreational sport fishery. As demonstrated earlier, the Alternatives including the various scenarios under the Proposed Action, while contributing to this potential significant future cumulative impact would not impart a significant increment.

5.27. RIPARIAN RESOURCES – CUMULATIVE IMPACTS

Riparian resources throughout the CVP are dependent on system-wide hydrological operations to ensure adequate flows both in volume and seasonally. Long-term future changes in reservoir and instream operations have the potential to affect riparian diversity, sustenance, and expansion in reservoirs and river reaches throughout the CVP, including the highly sensitive Delta. CALSIM II modeling was used as the primary simulation tool to predict hydrological changes and relate those changes to riparian resource communities throughout the CVP.

5.27-1 Effects of changes in water surface elevations on Folsom, Trinity, and Shasta reservoir vegetation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in CVP reservoir hydrology or operations resulting from this action. Under the future cumulative condition, this impact would be less than significant.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Long-term average end-of-month storage and/or water surface elevations for Folsom and Shasta reservoirs would be reduced, relative to the Base Condition, with the most significant reductions occurring during the fall period (October and November) (see Table 5.25-1 for Folsom Reservoir; Table 5.25-2 for Shasta Reservoir end-of-month storages). Trinity Reservoir showed slight, albeit insignificant long-term changes in water surface elevations (see Table 5.27-1). The most significant changes occurred outside of the growing season months of March through September.

TABLE 5.27-1

MEAN MONTHLY WATER SURFACE ELEVATIONS IN TRINITY RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Future Cumulative Condition[1] (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)
Oct	2275.7	2270.4	-5.2	-0.2
Nov	2277.6	2273.2	-4.3	-0.2
Dec	2282.6	2278.6	-4.0	-0.2
Jan	2288.0	2284.5	-3.6	-0.2
Feb	2299.8	2296.5	-3.3	-0.2
Mar	2309.1	2306.3	-2.8	-0.1
Apr	2321.2	2318.8	-2.3	-0.1
May	2319.7	2317.4	-2.3	-0.1
Jun	2315.5	2313.0	-2.6	-0.1
Jul	2303.1	2300.4	-2.7	-0.1
Aug	2290.6	2287.4	-3.2	-0.1
Sep	2280.1	2275.9	-4.2	-0.2

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in feet msl), representative of the mean difference over the 72-years (and subject to rounding).

For most reservoirs, weedy vegetation, rather than vegetation that would provide higher quality wildlife habitat, typically establishes in the drawdown zone, due to the constant fluctuations in reservoir elevation that result from annual/seasonal reservoir drawdown. Consequently, reductions in reservoir elevations that would occur in the future would not affect areas of high and consistent habitat value that are available for species associated with the reservoir. Accordingly, the future cumulative impact on reservoir riparian vegetation in Shasta, Trinity, and Folsom reservoirs would be less than significant.

5.27-2 Flow-related effects on upper and lower Sacramento River riparian vegetation.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in upper Sacramento River flows resulting from this action. Under the future cumulative condition, this impact would be less than significant.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Under the Future Cumulative Condition, upper Sacramento River long-term average flows during the March through October growing season remain unaffected, relative to the Base Condition. In fact, the early months of the growing season showed long-term mean monthly flow increases, as releases from Keswick Dam, relative to the Base Condition (see Table 5.26-3A). In the upper Sacramento River, simulated future reductions in mean monthly flow releases from Keswick Dam occurred in the months of January and February. Accordingly, anticipated long-term flow reductions that would occur under the Future Cumulative Condition would not be of sufficient magnitude and/or frequency to significantly alter upper Sacramento River riparian vegetation and related species.

Modeled reductions in long-term average flows of the lower Sacramento River at Freeport under the Future Cumulative Condition revealed only slight changes, relative to the Base Condition (see Table 5.26-4A). No long-term changes in mean monthly flows were observed over the growing season in early spring and mid-summer months. Therefore, significant adverse effects on riparian habitats of the lower Sacramento River would not be expected under the Future Cumulative Condition.

5.27-3 Flow-related effects on Delta riparian vegetation and special-status species.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in Delta hydrology resulting from this action. Under the future cumulative condition, flow-related effects on Delta riparian vegetation and special-status species was deemed to be less than significant.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Modeled Delta outflow conditions under the Future Cumulative Condition showed that while there would be slight mean monthly reductions in outflow during April and May (peak riparian growing season), by mid-summer, simulated outflows would increase, relative to the Base Condition (see Table 5.26-5). The month of October revealed the largest simulated reduction in long-term average mean monthly Delta outflow.

As noted previously, the long-term average reduction in lower Sacramento River flow would not affect the growing season months. Potential shifts in the long-term average position of X2 were slight, under the Future Cumulative Condition with the mid-winter months of November and December revealing the largest upstream migrations of X2. Water quality conditions, at least in terms of the X2 salinity surrogate for riparian vegetation would not be significantly affected under the Future Cumulative Condition. Overall, anticipated flow reductions and the general maintenance of the X2 position during the critical growing season would be considered minor perturbations and would not adversely affect Delta vegetation or special-status species dependent upon Delta habitats. The future cumulative impact on Delta riparian vegetation and special-status species relying upon those botanical communities would be less than significant.

5.27-4 Flow-related effects on lower American River riparian vegetation and special-status species dependent upon riparian and open water habitats.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in lower American River hydrology resulting from this action that would affect riparian vegetation and special-status species. Under the future cumulative condition, sufficient changes anticipated in the future in riverine hydrology would be a significant cumulative impact on riparian vegetation and special-status species in the lower American River.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Riparian plant communities along the lower American River are maintained through hydrologic, geomorphic, and substrate conditions that have occurred there over time. Spatially, they are varied along the longitudinal profile of the river with alder-dominated vegetation occurring as stringers along the upper reaches of the river while, further down, gravel bars and point bars occur as a result of sediment transport and storage along the channel bed. Regeneration of willows occurs on scoured gravel bar sites. Cottonwoods also form small stringers on freshly deposited sediment on point bars as well as on less steep terraces with suitable seed beds, where even-aged stands of older cottonwoods occur. As noted previously, most of the riparian forest habitat immediately adjacent to the lower American River is dominated by cottonwood intermixed with willows. Several backwater and off-river ponds occur at some of the bars along the river.

Long-term future changes in lower American River flows could result in more frequent occurrences where flow indices for cottonwood growth and terrace inundation are not met. As an example, flows could be below the radial growth maintenance index more frequently than that occurring presently.

Table 5.27-1A shows tabulations from modeled future simulations of the number of months under the Future Cumulative Condition when mean monthly lower American River flows (at four locations) would be below 1,750 cfs, the threshold flow considered necessary to support the continued radial growth of cottonwoods during the growth season (May through September). Significant increases in the number of months were observed under the Future Cumulative Condition (e.g., a 19 percent increase in the number of months from the Base Condition was tabulated for Watt Avenue). This would be a potentially significant future cumulative impact on cottonwood growth along the lower American River.

Higher flows earlier in the growing season (i.e., April through June) are often critical to the establishment of seedlings on riverine terraces. Table 5.27-1B tabulates the number of years, for each month under the Future Cumulative Condition, when mean monthly flows in the lower American River below Nimbus Dam would be within the flow range considered optimal (i.e., between 2,700 and 4,000 cfs) and compares the Base Condition with the Future Cumulative Condition. The early growing season (May) shows a noticeable reduction in the number of months, relative to the Base Condition, when mean monthly flows would be within the 2,700 to 4,000 cfs range considered optimal for riparian growth and sustenance. This would be a potentially significant future cumulative impact on riparian growth along the lower American River.

TABLE 5.27-1A

NUMBER OF MONTHS WHEN LOWER AMERICAN RIVER FLOWS ARE BELOW 1,750 CFS (MAY THROUGH SEPTEMBER PERIOD) UNDER THE FUTURE CUMULATIVE CONDITION[1]

	Base Condition	Future Cumulative Condition[1]	Difference[2]
Nimbus			
	92	101	9
Watt Avenue			
	112	133	21
H Street			
	129	157	28
LAR Mouth			
	129	158	29

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled 7.5 TAF for EID diverted from Folsom Reservoir and 7.5 TAF for GDPUD diverted at the PCWA Auburn Pump Station; on an August through October diversion pattern.
2. Difference represents the numerical difference in number of months between Base Condition and Future Cumulative Condition.

Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

TABLE 5.27-1B

NUMBER OF YEARS WHEN LOWER AMERICAN RIVER FLOWS BELOW NIMBUS DAM IN OPTIMAL RANGE (2,700 TO 4,000 CFS) UNDER THE FUTURE CUMULATIVE CONDITION[1]

Month	Base Condition	Future Cumulative Condition[1]	Difference
Oct	16	2	-14
Nov	10	8	-2
Dec	2	2	0
Jan	6	5	-1
Feb	7	10	3
Mar	11	9	-2
Apr	14	13	-1
May	20	12	-8
Jun	21	24	3
Jul	19	22	3
Aug	12	12	0
Sep	0	17	17

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled at 7.5 TAF for EID diverted from Folsom Reservoir and 7.5 TAF for GDPUD diverted at the PCWA Auburn Pump Station; diverted on an August through October diversion pattern.

Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

Table 5.27-1C shows the number of years, for each month under the Future Cumulative Condition, when mean monthly flows in the lower American River at H Street would be within the threshold criteria for minimum backwater pond sustenance and continuous recharge. Tabulated years from CALSIM II hydrology output for the lower American River at this location show the variation between current conditions (Base Condition) and the simulated hydrology under the Future Cumulative Condition. The largest reduction occurs in October, although May also reported 6 fewer occurrences (or an 8 percent reduction) when flows would be within the minimal/optimal range for backwater pond sustenance and continuous recharge. This would be a potentially significant future cumulative impact on backwater pond maintenance along the lower American River.

TABLE 5.27-1C

NUMBER OF YEARS WHEN LOWER AMERICAN RIVER FLOWS AT H STREET IN MIN/OPTIMAL RANGE (1,300 TO 4,000 CFS) UNDER THE FUTURE CUMULATIVE CONDITION[1]

Month	Base Condition	Future Cumulative Condition1	Difference[2]
Oct	61 (84.7)	39 (54.2)	-22(-30.6)
Nov	43 (59.7)	47 (65.3)	4 (5.6)
Dec	45 (62.5)	38 (52.8)	-7 (-9.7)
Jan	36 (50.0)	38 (52.8)	2 (2.8)
Feb	29 (40.3)	28 (38.9)	-1 (1.4)
Mar	31 (43.1)	36 (50.0)	5 (6.9)
Apr	40 (55.6)	40 (55.6)	0 (0)
May	44 (61.1)	38 (52.8)	-6 (-8.4)
Jun	43 (59.7)	43 (59.7)	0 (8.3)
Jul	31 (43.1)	33 (45.8)	2 (2.8)
Aug	44 (61.1)	37 (51.4)	-7 (-9.7)
Sep	40 (55.6)	44 (61.1)	-4 (5.6)

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled at 7.5 TAF for EID from Folsom Reservoir and 7.5 TAF for GDPUD at the PCWA Auburn Pump Station; diverted on an August through October diversion pattern.
2. Difference represents the numerical difference in number of months between Base Condition and Future Cumulative Condition; percent differences shown in parentheses.

Based on CALSIM II 72-year hydrologic period of record (1922-1993).
Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Overall, the modeling results for the Future Cumulative Condition show that lower American River hydrology would be affected substantially during portions of the riparian growth seasons. Such changes in hydrology are considered sufficient to represent a potentially significant future cumulative impact on riparian communities and backwater pond and wetlands. The Alternatives, along with the various scenarios under the Proposed Action, while contributing to this potentially significant future cumulative impact would not impart a significant increment. This was illustrated earlier in the project-specific effects of the proposed new contract.

5.28. WATER-RELATED RECREATIONAL RESOURCES – CUMULATIVE IMPACTS

Future changes in system hydrology have the potential to affect water-related recreational facilities and activities in various reservoirs, waterways, and in the Delta through reduced water surface elevations, water surface area, and river flows.

5.28-1 Impacts on recreational facilities and activities at Shasta and Folsom reservoirs.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in reservoir storage, water surface elevations or reservoir surface area in Shasta or Folsom reservoirs resulting from this action. Under the future cumulative condition, while Shasta and Trinity reservoirs showed changes in long-term end-of-month water surface area these were not considered significant. For Folsom Reservoir, however, projected end-of-month water surface area and water surface elevations occurring within the recreational season would be considerable and constitute a significant future cumulative impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Tables 5.26-1A through 5.26-1C, as shown previously, provided output data for future simulated reservoir water surface areas for Shasta, Trinity, and Folsom reservoirs, respectively, relative to the Base Condition. Shasta Reservoir showed slight mean, long-term, end-of-month water surface area changes, relative to the Base Condition, but these monthly reductions did not exceed 2 percent. Trinity Reservoir showed no measurable changes in water surface elevations; most mean monthly long-term changes were less than one-tenth of one percent of Base Condition elevations. Folsom Reservoir showed the most noticeable changes with September revealing a 9 percent reduction in mean end-of-month water surface area, relative to the Base Condition, with an 11.2 ft reduction in long-term water surface elevation in September (see Table 5.28-1).

TABLE 5.28-1

MEAN MONTHLY WATER SURFACE ELEVATIONS IN FOLSOM RESERVOIR DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] DURING THE MAY – SEPTEMBER RECREATIONAL SEASON OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (ft msl)	Future Cumulative Condition[1] (ft msl)	Absolute Difference[2] (ft msl)	Relative Difference (%)
May	451.2	450.6	-0.6	-0.1
Jun	446.2	445.3	-0.9	-0.2
Jul	430.9	429.3	-1.6	-0.4
Aug	425.6	420.3	-5.3	-1.2
Sep	424.8	413.6	-11.2	-2.6

Notes:
1. Future Cumulative Condition assumed Proposed Action – Scenario A – modeled at 7.5 TAF for EID diverted from Folsom Reservoir and 7.5 TAF for GDPUD diverted at the PCWA Auburn Pump Station; diverted on an August through October diversion pattern.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in ft msl), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, unpublished data.

At Shasta Reservoir, the slight long-term reductions in water surface area and corresponding elevations are unlikely to represent a significant future cumulative impact given the size of the reservoir and, therefore, the ability of recreationists to seek our alternative locations for activity (e.g., boat launching, swimming, fishing access, etc.). At Folsom Reservoir, however, to the extent that September represents an important end of season recreational month (e.g., Labor Day weekend), the magnitude and frequency of the simulated reductions in water surface elevations and surface area would likely have a significant future cumulative impact on recreational activities and facilities. As shown in earlier analyses of the specific Alternatives, the Alternatives and various scenarios under the Proposed Action, while contributing to this future cumulative impact; would not impart a significant incremental contribution.

5.28-2 Impacts on recreational activities along the lower American River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in Folsom Reservoir releases or lower American River flows resulting from this action. Under the future cumulative condition, the expected frequency of mean monthly flows in the lower American River being below that considered optimal for water-related recreation during the May through September period would increase substantively. This would be considered a significant future cumulative impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As previously shown in Table 5.27-1A, the frequency with which mean monthly flows all along the lower American River would be below the minimum 1,750 cfs necessary for water-related recreational activities would increase, relative to current conditions. At Watt Avenue, for example, mean monthly river flows under the Future Cumulative Condition would be below 1,750 cfs during the May through September recreational season, approximately 20 percent more often than today. This alone, would be a significant future cumulative impact on lower American River water-dependent recreational activities. As illustrated in analyses presented earlier for the specific Alternatives, the Alternatives including the various Proposed Action scenarios, while contributing to this future cumulative impact, would not impart a significant increment.

5.28-3 Impacts on recreational activities in and along the upper and lower Sacramento River.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in Folsom Reservoir releases or lower American River flows resulting from this action. Under the future cumulative condition, flows in the upper and lower Sacramento River would change, however, flows are not typically limiting for recreational purposes. There is no anticipated significant cumulative impact on water-related recreational activities in and long the upper and lower Sacramento River.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Riverine recreational activities depend on adequate flows. While recreationists have the ability to choose when and where they recreate and so, would tend to avoid conditions unsuitable for water-related activities, summer time flows are an important determinant of recreational activity. In the Sacramento River, flows are rarely limiting during the May through September recreational season. As shown in Table 5.28-3A, long-term mean monthly flows, on average, were simulated to increase, relative to Base Condition levels in the upper Sacramento River, with the exception of September. The mean monthly flow reduction for September, however, is not significant and long-term September flows under the Future Cumulative Condition are still well above 6,000 cfs.

TABLE 5.28-3A

MEAN MONTHLY SACRAMENTO RIVER FLOW RELEASES BELOW KESWICK DAM DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] DURING THE MAY TO SEPTEMBER RECREATIONAL SEASON OVER THE 72-YEAR HYDROLOGIC PERIOD (1922-1993)

Month	Base Condition (cfs)	Future Cumulative Condition[1] (cfs)	Absolute Difference[2] (cfs)	Relative Difference (%)
May	8241.9	8253.6	11.7	0.2
Jun	10365.3	10532.9	167.6	1.7
Jul	12708.9	12728.3	19.4	0.4
Aug	10505.2	10676.4	171.2	1.7
Sep	7035.7	6998.2	-37.5	-0.3

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

In the lower Sacramento River, mean monthly flows under the Future Cumulative Condition showed similar trends with that occurring upstream. Slight changes, over the long-term, are predicted. Any reductions in mean monthly, long-term averaged flows, would be less than significant. Future cumulative condition flows in the lower Sacramento would remain well above 10,000 cfs throughout the summer recreational period (Table 5.28-3B).

TABLE 5.28-3B

MEAN MONTHLY SACRAMENTO RIVER FLOWS AT FREEPORT DIFFERENCE BETWEEN BASE CONDITION AND FUTURE CUMULATIVE CONDITION[1] DURING THE MAY TO SEPTEMBER RECREATIONAL SEASON OVER THE 72-YEAR PERIOD OF RECORD (1922-1993)

Month	Absolute Difference (cfs)	Relative Difference (%)	Long-Term Mean Monthly Flows (cfs)
May	-282.8	-1.7	19321.8
Jun	102.1	0.7	17406.8
Jul	-23.3	0.1	18314.5
Aug	-90.4	-0.9	14423.4
Sep	466.0	3.6	12859.8

Notes:
1. Future Cumulative Condition assumed implementation of Proposed Action – Scenario A – modeled 7.5 TAF from Folsom Reservoir on an August through October diversion pattern – diverted at EID's existing intake and 7.5 TAF from the Auburn Pumps for GDPUD.
2. Absolute Difference – difference between Base Condition and Future Cumulative Condition (in cfs), representative of the mean difference over the 72-years (and subject to rounding).

Source: June 2007, CALSIM II Modeling Output – 72-year hydrologic record, Unpublished data.

Overall, the future cumulative impacts on upper and lower Sacramento River water-dependent recreational activities would be less than significant.

5.29. WATER-RELATED CULTURAL RESOURCES – CUMULATIVE IMPACTS

River flow fluctuations and reservoir levels are influential hydrologic factors possessing the ability to potentially affect cultural resources in those waterbodies. Long-term reservoir elevation and river flow decreases could expose previously submerged resources, while reservoir and flow increases could damage or submerge existing exposed resources.

5.29-1 Effects of changes in magnitude and/or frequency of Folsom reservoir elevations on cultural resources.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in Folsom Reservoir water surface elevations resulting from this action. Under the future cumulative condition, while modeled changes in end-of-month water surface area would decline appreciably, the extent to which the reservoir has fluctuated historically and, thereby, already affected cultural resources suggests that no additional effects on cultural resources would occur under the Future Cumulative Condition.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

For Folsom Reservoir, each of the mean monthly average water surface elevations under both the Base Condition and under the Future Cumulative Condition, are well within the 395 to 466 ft msl zone of historic maximum fluctuation as discussed earlier. A review of the entire 874 monthly record shows that, under the Future Cumulative Condition, there would be 37 additional months when Folsom Reservoir water surface elevations would be below 395 ft msl, relative to the Base Condition. This represents an approximate 4 percent increase in the frequency with which water elevations would be below 395 ft msl. Nevertheless, as discussed previously, the maximum long-term mean monthly water surface elevation decrease for Folsom Reservoir was approximately 11 ft msl. An 11 ft vertical drop in water surface, depending on reservoir slope and bathymetry, could affect a large area of shoreline. As shown in Table 5.26-1C, the maximum reduction in mean end-of-month water surface area for Folsom Reservoir was 740 acres (or 9 percent of the reservoir's water surface area for that month, under the Base Condition). Such reductions could represent a significant impact; however, the extent to which Folsom Reservoir has undergone numerous wetting and drying cycles (i.e., lowering and raising water levels as a part of its historic operations) suggests that no additional effects on cultural resources would occur under the Future Cumulative Condition. Accordingly, insofar as Folsom Reservoir is concerned, future changes in hydrology are considered to represent a less-than-significant future cumulative impact on cultural resources.

5.29-2 Effects of changes in magnitude and/or frequency of lower American River and Sacramento River flows on cultural resources.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in lower American River or Sacramento River flows resulting from this action. Under the future cumulative condition, while changes in river flows are anticipated, it unlikely that such changes would significantly affect the remaining cultural resources along these waterways that would have already been subject to the full range of inundation and exposure. This is considered to be a less-than-significant future cumulative impact.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Modeling data for the Future Cumulative Condition confirm that, overall, long-term flow reductions are anticipated through CVP watercourses. As explained previously, however, changes in river flows, therefore, would have a much more limited effect on either inundating (through water elevation rise) or desiccating (through water level decline) cultural resource sites along the channel embankments. More importantly, the 72-year hydrologic period of record includes numerous episodes of extremely high flows within both in the lower American and Sacramento rivers. At such flows, any cultural resource sites along the river channels would have historically been inundated through substantial river stage increases. Accordingly, while future flow changes (i.e., reductions) are anticipated to occur, it is unlikely that such changes would significantly affect the remaining cultural resources along these waterways that would have already been subject to the full range of inundation and exposure. Potential future cumulative impacts on cultural resources along these waterways is considered to be less than significant.

5.30. LAND USE – CUMULATIVE IMPACTS

As discussed previously, for this action, no new facilities, improvements to existing infrastructure, nor construction activities are proposed. To the extent that construction of certain facilities are required to fully implement the P.L.101-514 contract, appropriate project-level environmental documentation would be prepared by those agencies at such time in the future when those decisions would be made. Accordingly, for this EIS/EIR, service area-related effects including those associated with future cumulative effects can only be discussed in limited detail and, only where relevant. Much of this analysis and discussion has already been provided as part of the County's most recent General Plan and EIR process. This process effectively provided a future cumulative assessment of the various plans, programs, policies, ordinances and planning process applicable to El Dorado County under anticipated future growth pressures. It also accommodated, at the time, a full inspection of the contentious issues under the Writ of Mandate which, after additional work, was successfully lifted by the court in 2006. This new contracting action does not, in any way, conflict with or circumvent those policies and committed obligations and mitigation measures made by the County. In fact, much of the discussions provided herein are taken from the General Plan EIR.

This subchapter and the ensuing subchapters address the potential indirect, service area-related future cumulative impacts related to the implementation of the project. As noted, it defers significantly to the already completed County General Plan EIR which, as an out-year (or cumulative assessment) in its own right, provided a future assessment of the anticipated activities, levels of service, facilities, and growth-related issues and pressures facing the County as it proceeds towards buildout.

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Land use is generally a County-specific issue, except where land uses may interact with surrounding jurisdictions. Continued concentration of urban development along the U.S. 50 corridor under the County's General Plan would extend a corridor of urban land uses east from Sacramento County. It is now likely that future urbanization will occur south of U.S. 50 in the City of Folsom, given the recent sphere of influence boundary expansion for that city. However, it would be speculative to assign any land use assumptions to that area because there are no current plans for its development. Extending an urban pattern along a freeway corridor, by itself, would not cause significant land use impacts that interact with development in other counties of the region to cause cumulative land use impacts.

There is the potential, however, that as the U.S. 50 corridor continues to urbanize, the separation between El Dorado County and the City of Folsom will become less distinct, to the point where they merge together. This could alter the community identity/character of the county and the city. The urban development in El Dorado County north of U.S. 50 that is adjacent to the city of Folsom, Promontory, is covered by a development agreement and is adjacent to the approved Russell Ranch project in Folsom. Both projects include a mix of housing product type, and it is likely that once developed, the separation between Folsom and El Dorado County will be difficult to distinguish. Both these projects are approved; therefore, this impact is considered potentially significant and unavoidable. South of U.S. 50 is Carson Creek in El Dorado County, which is also approved under a development agreement with a mixture of residential and research and development land uses. This area abuts open space/agricultural land in Sacramento County, and this area is within the newly expanded Folsom sphere of influence. If it were to develop with uses similar to Carson Creek, the area to the south of U.S. 50 would also lose the physical separation between communities. Given that there currently no plans for this area of Sacramento County, it would be speculative to conclude whether any impacts would occur.

The El Dorado County General Plan is intended to guide the location and intensity of land uses in El Dorado County. In the County's General Plan EIR, the four equal-weight alternatives that were considered differed with respect to their land use maps; however, they all considered existing land use patterns, and specifically, areas that have already been developed with residential uses. The potential for land use incompatibility would continue into the future, primarily as a result of the range of uses allowed by right. Incompatibilities could be created by the Low-Density Residential designations; siting of government buildings in inappropriate zoning districts; lack of compatibility review for the wide variety of uses allowed by right; and conflicting uses permitted in Rural Regions (e.g., ranch marketing, timber harvesting, mining, agriculture, residential). Development intensity and density could be more widespread at buildout because all available developable land could already be in use by that time. The potential for incompatibilities that could be encountered throughout the County in 2025 could be fully realized at buildout. Moreover, the General Plan acknowledged that the discretionary review process could allow development near existing mining operations resulting in land use compatibilities. This impact was considered significant and represents a significant cumulative impact.

The County committed to following shall be considered when reviewing capital improvement plans and proposals for new facilities by other agencies:

A. Schools shall be considered incompatible on land designated Industrial, Research and Development, Agriculture, Natural Resources and Open Space;

B. Active parkland (i.e., playgrounds and ball fields) shall be considered incompatible on land designated Natural Resources and Open Space;

C. Fire stations, public service buildings, and other similar public facilities shall be considered appropriate in all land use designations except Natural Resources and Open Space.

5.31. Transportation and Circulation – Cumulative Impacts

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Traffic impacts are a regional concern. As regional growth continues, development patterns will affect traffic and circulation in El Dorado County, and planned growth in the county resulting from the equal-weight alternatives would affect the regional road network, including the U.S. 50 corridor. Growth may foster increased improvements to the County's roadway system, but would also cause greater levels of traffic and a greater level of improvement need.

Jobs created in El Dorado County would result in employees commuting from Sacramento and Placer counties. Similarly, housing opportunities in western El Dorado County resulting from General Plan implementation would increase peak-hour trips into Sacramento, Rancho Cordova, Folsom, and other areas of Sacramento County where most of the regional area jobs are concentrated.

The Metropolitan Transportation Plan (MTP) is intended to respond to the cumulative traffic effects that local plans have on the circulation system of the entire Sacramento region. These significant General Plan impacts would also cause a considerable contribution to significant regional traffic impacts. Much of the cumulative traffic impact outside of El Dorado County would occur in Sacramento County as a result of the increased commute traffic along the U.S. 50 corridor. The SACOG MTP projected a regional (SACOG-wide) increase in population of 928,048 between 2000 and 2025. The MTP allocated a share of this population growth, 69,500, to El Dorado County. To the degree that the county does not accommodate this level of growth, it is possible that this growth would occur in the adjacent counties, Sacramento, Placer, and Amador. This would place higher traffic levels in these counties.

The various alternatives considered by the County as part of their General Plan concluded that by 2025, a range of shortfalls relative to the MTP allocation would occur. A potential shift of traffic volume to adjacent counties traffic that would otherwise have occurred in El Dorado County could result. This is a potentially significant cumulative impact, although surrounding jurisdictions retain land use authority and authority over the approval of land uses that may result in significant traffic impacts. It is not feasible to mitigate such an impact because it is not known where; or whether it would occur, and mitigation would be the responsibility of whichever surrounding county would approve development that would cause the impact. The only other means available to mitigate this impact would be to increase the development potential of the County's growth alternatives, and this would require substantially modifying land use maps and/or altering the basic conditions that defined the alternatives contemplated in the General Plan EIR (no new subdivisions of residential land under the No Project Alternative and maximum subdivision of four parcels under the Roadway Constrained 6-Lane "Plus" Alternative). This was considered infeasible because it would entirely redefine these alternatives. Therefore, this impact was considered potentially significant and unavoidable under the General Plan alternatives considered by the County.

The proposed Shingle Springs Rancheria Casino/Hotel project was projected to add additional traffic impacts on U.S. 50 and other county roads. The traffic associated with the casino would have a considerable contribution to cumulatively significant regional traffic impacts.

Implementation of various mitigation measures by the County would minimize El Dorado County's contribution to cumulative traffic impacts, but would not reduce them to less-than significant levels. Consequently, cumulative regional traffic impacts are considered significant and unavoidable.

The adopted General Plan includes concurrency policies. As a result, roadway improvements are expected to generally keep pace with new development. However, even under the concurrency policies, some new traffic could occur in advance of transportation improvements.

There are numerous uncertainties involved in modeling traffic in the buildout scenario. For example, while maximum buildout of any given area of the county is always a possibility, it is much less realistic to assume that maximum buildout of available land would occur countywide. Economic, environmental, physical, political, and other constraints are likely to limit maximum development in parts of the county, either as a practical matter or through application of the policies in the General Plan reflecting those constraints. In fact, many factors are indeed uncontrollable such as the current state of the housing market, economic vitality, job growth, and the overall financial health of the County and State.

5.32. AIR QUALITY – CUMULATIVE IMPACTS

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Air quality is a regional environmental issue, with the majority of air pollutant emissions being created by motor vehicle use within the county's air basins and other air basins in the region. As noted previously, the designated growth areas of the county are on the west slope, which is in the MCAB. The MCAB is designated as non-attainment for the State and national ozone standards and the State particulate (PM10) standard. Ozone pollution is the primary air quality impact of cumulative concern, because precursor emissions of ozone can occur throughout the region and combine to exacerbate attainment of air quality standards in El Dorado County. Pollutants transported from the San Francisco Bay area also contribute to regional air quality impacts. The County AQMD participated with other AQMDs in the Sacramento area to prepare the 1991 Air Quality Attainment Plan, which includes strategies for achieving the State and national air quality standards. The various alternatives of the County's General Plan include policies and mitigation measures to support reduction of air emissions and help attain the standards, in keeping with the attainment plan. While various mitigation measures designed to address potential air pollutant emissions related to stationary and mobile sources resulting from implementation of County growth were proposed, it was determined that the significant impacts on regional air quality could not be avoided, despite the inclusion of all feasible mitigation measures. The significant air quality impact in El Dorado County would contribute to a cumulative significant air quality in the region, which also could not be avoided.

Implementation of the County General Plan would result in planned development, leading to increases in motor vehicle travel, wood fire stoves/fireplaces, and other sources. These would contribute cumulatively to the significant impact on air quality in the region. Although all feasible policies and mitigation measures were included in the General Plan EIR, this cumulative impact was, and is still considered significant and unavoidable.

The construction of 21,434 new dwelling units, nonresidential development (to support 36,188 new jobs), and other supporting infrastructure would generate emissions of ROG, NO_X, and PM_{10}. As noted in previous discussions, such emissions would be caused by site grading and excavation, paving, application of architectural coatings (e.g., paint, stucco), motor vehicle exhaust associated with construction equipment and construction employee commute trips, material transport (especially on unpaved surfaces), demolition, and other construction operations. Construction of nonresidential development and other supporting infrastructure would result in some new ROG, NO_X, and PM_{10} emissions, but residential construction, which would occur at a rate of about 1,000 units per year, would account for the majority of construction and this would contribute the majority of construction-related emissions.

Increased development and related resident transportation needs would result in regional emissions of ROG, NO_X, CO, and PM_{10} due to vehicle trips, use of natural gas, burning, use of maintenance equipment and consumer products that exceed the applicable thresholds and thus would contribute to a violation of applicable NAAQS or CAAQS. Most recently, diesel exhaust particulate was added to the CARB list of TACs. Activities involving the long-term use of diesel-powered equipment and heavy duty trucks, such as gravel mining and landfilling activities are, therefore, of particular concern. In addition, the attainment plan would potentially be conflicted with due to the increase in population and employment growth, which consequently leads to an increase in VMT and mobile-source emissions. As a result, this impact is considered cumulatively significant.

Odor impacts are also affected by meteorological conditions, in which case some odor emission sources (e.g., agriculture operations, landfills, rendering plants, food-processing facilities, wastewater treatment facilities) can affect sensitive receptors at distances of more than a mile from the source. Emission sources common within urbanized settings, such as fast-food restaurants particularly those using charbroiling equipment, and dry-cleaning establishments, are not typically considered major odor emission sources. Though such sources often do not affect large numbers of people, sensitive receptors located within close proximity can be exposed to odors on a frequent basis. Odor-generating sources can reduce impacts by modifying operations or by installation of odor-controlling equipment. However, for sensitive receptors, mitigation measures are limited. In fact, in some instances, the only measures available to sensitive receptors is to relocate upwind or further downwind from a source.

Continued development within the County would result in the location of sensitive receptors near odor-generating sources. Continued enforcement of AQMD Rule 205 and implementation of general plan policies to limit development near odor emission sources would reduce this impact, but would not eliminate exposure of sensitive receptors to nuisance odors. As a result, this impact is considered cumulatively significant.

5.33. NOISE – CUMULATIVE IMPACTS

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Noise is generally a county issue, except for roadways that carry significant traffic between counties. As noted previously, for most noise-related impacts, the location of the impact is site specific and influenced by local rather than regional conditions (e.g., traffic on a roadway, local topographic conditions, and adjacent stationary noise sources). As overall development within the County occurs, ambient noise levels will increase. Compliance with standards that define noise impacts, however, will continue to be invariably controlled by traffic levels and site-specific development.

Potential cumulative noise impacts that warrant consideration are traffic noise on the regional freeway, U.S. 50, and aircraft noise from Mather Field in Sacramento County. Increases in traffic noise on U.S. 50 resulting from growth would affect adjacent land uses in Sacramento and El Dorado counties. The source of traffic noise in El Dorado County on U.S. 50 is from a broader regional area (Sacramento County and other areas), not just El Dorado County. These cumulative traffic noise levels were evaluated in the County General Plan EIR. In addition to traffic noise in El Dorado County, traffic from development of any of the General Plan alternatives in combination with other regional growth would increase noise levels adjacent to U.S. 50 in Sacramento County.

The Draft Program EIR on the Final Draft MTP 2025 evaluated, among other things, increases in noise levels on several regional roads as a result of growth in the six-county SACOG region, including El Dorado County. The MTP EIR predicts a 3 dBA increase in traffic noise along U.S. 50 from Prairie City Road to the El Dorado County line. The General Plan would contribute to this cumulatively significant impact, and the contribution would slightly exceed (in 2025) what was predicted in the MTP EIR. The MTP EIR identifies mitigation measures for these cumulative impacts, including construction of sound walls as needed (to a limit) and other noise barriers, and specifies that such measures are the responsibility of the implementing agency for specific road projects. SACOG acknowledges that this impact may not be able to be fully reduced, and concludes it would be significant and unavoidable.

From an air traffic noise perspective, noise from continued aircraft operations at Mather Field in Sacramento County would add to the noise impact on El Dorado County residents through exposure to aircraft overflights. As residential development increases south of U.S. 50 near the Sacramento County line, more residences would be under one or more of the common aircraft approach paths to this airfield. A greater number of El Dorado County residents would be exposed to aircraft noise because of the location of residential development, but this would be a direct General Plan-related effect, rather than a contribution to a regional, cumulative impact concern.

As additional development occurs throughout the county, the potential exists for new noise-sensitive land uses to encroach upon existing or proposed stationary noise sources. Development of new stationary noise sources, such as industrial and commercial operations, may also result in a noticeable increase in ambient noise levels at nearby existing noise-sensitive land uses. To the extent that new development is discretionary, noise-related impacts associated with many of these uses, such as new shopping centers, industrial uses, emergency sirens associated with fire stations, etc. would be considered by the County during project review. As previously discussed, many of the major stationary sources of noise, such as mining and lumber mill operations, are located in the more rural areas of the county.

Implementation of the relevant General Plan goals and policies would help to protect both existing and proposed noise-sensitive land uses from non-transportation noise sources. Nonetheless, even though sources may not exceed the applicable maximum allowable noise standards, increased development would likely still result in substantial increases in ambient noise levels at some existing and future noise-sensitive land uses. Consequently, this impact is considered a cumulatively significant.

Finally, under 2025 conditions, additional development throughout the County may lead to incompatibility between noise-sensitive land uses and stationary noise sources. Implementation of the relevant General Plan goals and policies would help to protect both existing and proposed noise-sensitive land uses from non-transportation noise sources, but would not prevent impacts related to increases in ambient noise levels caused by non-transportation noise sources. This impact is considered significant.

5.34. GEOLOGY, SOILS, MINERAL RESOURCES, AND PALEONTOLOGICAL RESOURCES – CUMULATIVE IMPACTS

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

By virtue of higher levels of anticipated development in the future, potential impacts associated with the loss in accessibility of mineral resources would be more severe at buildout than under current or even 2025 conditions. This impact is considered significant cumulative impact.

In general, the adoption of and adherence to various General Plan policies and implemented mitigation measures can offset soil erosion, mass wasting, and other soil loss events from occurring. Also, differing acreage thresholds and/or a slope thresholds could help mitigate soil loss through erosion. Agricultural activities, however, by definition would continue to allow erosion effects. This impact would remain significant and unavoidable.

A significant issue relates to those projects outside of the CEQA and permitting where discretionary and ministerial development could still occur on steep slopes, the primary factor influencing the rate and extent of erosion, and because agricultural grading activities are generally exempt from the grading permit process, this impact is considered significant. Nondiscretionary development could occur in areas prone to landslides and avalanches, this impact is also considered significant as the proposed policies and the County Building Code would not fully mitigate impacts associated with potential development in areas subject to landslides and avalanches. Therefore, this impact is considered a significant cumulative impact.

Implementation of the General Plan can result in conversion of farmland (Important Farmland, land currently in agricultural production, grazing land, or land under Williamson Act contract) to nonagricultural uses both directly and indirectly. Direct conversion could occur by designating farmlands for nonagricultural (e.g., residential or commercial) uses. Indirect conversion can occur by allowing incompatible uses, either near or directly on land designated for agricultural uses, without adequate safeguards in place to protect the farmlands from conversion.

Through its various policies and implementation measures identified in its Conservation and Open Space Element relevant to paleontological resources, there is guidance to help identify, avoid, or otherwise mitigate any potential future planned activities on these resources.

5.35. RECREATION – CUMULATIVE IMPACTS

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Projected new development within the County would increase the demand for park and recreation facilities. Since it is not certain that adequate new park and recreation facilities would be developed concurrent with new development based on potential funding limitations, there may be a degradation in existing facilities.

The provision of adequate parkland to serve new population growth is an objective of all of the General Plan growth scenarios. The definition of "adequate" parkland is based on county-wide standards of 5 acres per 1,000 persons within the residential development context. Based on the level and distribution of anticipated residential development, the amount of parkland needed to serve new growth to meet County standards would be approximately 268 acres through 2025.

In order to meet parkland standards for this level of projected growth, a range of between approximately 404 and 984 acres of developed parks would be required through 2025 and/or buildout.

The provision of parkland under Quimby Act requirements does not ensure the development of parks to serve the population. Substantial funding would be required to develop and also to operate and maintain parks. Limited funding, however, has historically been made available to local service providers (i.e., El Dorado Hills CSD, Cameron Park CSD, and the GDRD) through property tax revenue; these funds are typically used for operation and maintenance of parks, and are not always sufficient for these purposes. The potential inability to meet established park standards could result in the potential overuse of existing park facilities, which may lead to substantial physical deterioration of existing facilities. The lack of adequate funding for maintenance of park facilities coupled with increased use could further accelerate their deterioration. This impact would be considered a significant cumulative impact.

It should be noted that park and recreation facility development may also require land use permits in some instances since the development of park facilities could potentially result in adverse physical effects on the environment. Parks that are developed in response to population growth could result in adverse physical impacts on the environment. However, because specific locations for new park facilities have not been identified, the specific physical impacts of constructing new parks cannot be determined at this time. It is reasonable to assume that construction and operation of park facilities would not result in significant impacts apart from the impacts of other types of development that are allowed within the various land use categories. The developed park facilities needed to serve the future population growth could be developed on all lands in the County, regardless of General Plan land use designation, as a matter of right.

5.36. VISUAL RESOURCES – CUMULATIVE IMPACTS

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

The continued urbanization of the U.S. 50 corridor through Sacramento County, the City of Folsom, and into western El Dorado County would have a significant cumulative effect on the visual resources of that region, because of a change in landscape from one with a more rural, pastoral character to one of urban and suburban development. This change is already in process, and the change in visual character is significant and unavoidable.

This corridor plays an important scenic role as the gateway to El Dorado County from the west. Conversion of the rural landscape to a suburban appearance would result in the reduction of the natural aesthetic qualities of the corridor. While the visual impacts in the U.S. 50 corridor would be reduced by policies and mitigation measures set forth in the General Plan, they cannot feasibly be avoided or reduced to a less-than-significant level. Therefore, the cumulative reduction in the natural aesthetic qualities of the U.S. 50 corridor is considered a significant and unavoidable impact.

While the County generally encourages the design of new development to emulate the best characteristics of existing nearby development and provide for design review, the visual character of some areas will inevitably change and, in some cases, change substantially. The County, as a whole, could begin to take on a different character, but lower densities and protected sensitive resource areas could allow relatively higher amounts of open space and scenic resources to be retained. Nevertheless, based on the fact that substantial residential growth could occur, the County is unlikely to retain its rural character. This impact is considered cumulatively significant.

While the availability of clustered development in and near Community Regions and Rural Centers would provide a disincentive for large amounts of dispersed residential development in Rural

Regions, the anticipated absolute level of residential development would result in the visual character of some specific areas of the county to change. New subdivisions in areas that are currently relatively undeveloped can be expected to change the rural character to one that is more sub-urban in nature. While certain General Plan Policies, such as LU-3a through LU-3, would require that new subdivisions be designed to provide open space, avoid important natural resources, incorporate design elements of nearby development, encourage pedestrian circulation and transit access, and locate services near high-density residential areas, the overall trend towards urban, as opposed to rural character, would make this a visual long-term and unavoidable cumulative impact.

In addition, each subdivision's Design Improvement Standards Manual would identify structural design, landscaping, and infrastructure design standards for that development.

5.37. Cultural Resources – Cumulative Impacts

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

Cultural resources are a site-specific resource in the County, and although there is potential for the cumulative loss of such resources throughout the region, policies contained in the various growth scenarios associated with the General Plan contain mitigation measures that, in general, would adequately protect those resources in El Dorado County. No cumulative impacts on cultural resources have been identified.

As discussed in the Conservation and Open Space Element of the El Dorado County General Plan, numerous policies and goals have been identified by the county to protect and preserve cultural resources. Over the years, numerous county and private organizations and commissions have endeavored to heighten public awareness of El Dorado County's prehistoric and historic cultural heritage and to preserve and manage numerous cultural resource sites in the area. These include the County Historical Museum, County Historical Society, and County Pioneer Cemetery Commission. These organizations and commissions serve in an advisory capacity to the county and assisted in the development of some of the policies contained in the Conservation and Open Space Element.

5.38. Terrestrial and Wildlife Resources – Cumulative Impacts

Alternative 1B – No Project Alternative

Under the No Project Alternative, no project-induced actions are proposed either currently or in the future. Consequently, there would be no change in any service area related activities, land uses, facilities, or services resulting from this action.

Alternatives 2A, 2B and 2C – Proposed Action – All Scenarios, Alternatives 4A, 4B and 4C – Reduced Diversion Alternatives, Alternative 3 – Water Transfer Alternative, Alternative 1A – No Action Alternative

As a result of planned development in foothill counties, including El Dorado County, a cumulative loss and fragmentation of natural habitats is a growing impact concern in this important ecologic area. Foothill woodland and chaparral habitats are two habitat types experiencing substantial cumulative loss and fragmentation as a result of growth pressures. Additionally, riparian habitats are also experiencing encroachment by urban uses, vegetation loss, and fragmentation. The populations of special-status species that occupy these habitats, such as rare plant communities and the California red-legged frog are experiencing cumulative loss of habitat and reduction in numbers of individuals.

The County General Plan contains various policies to protect habitats and special-status species; however, development permitted in El Dorado County under any of the anticipated growth scenarios would contribute to the cumulatively significant impact of the loss and fragmentation of woodland and chaparral habitats, riparian corridors, and other important biological resources of the Sierra Nevada foothills and impacts on special-status species. At the time the General Plan policies and mitigation measures were identified, it was deemed that they would reduce the habitat and special-status species effects to the extent feasible. However, the impact of habitat loss and fragmentation was considered significant and unavoidable. As discussed earlier, the County, along with various partnering El Dorado interests including EDCWA have participated in, and continue to participate in various programs and efforts to address the long-term resource management threats related to these important species/habitats.[216]

5.39. Significant Unavoidable Adverse Impacts

The CEQA Guidelines 15126.2(b) state that any significant impacts, including those which can be mitigated but not reduced to a level of insignificance must be described. For the delivery of the new CVP water service contract supplies to El Dorado County as described in Chapter 5.0 (Environmental Consequences), no significant unavoidable adverse impacts on the environment were identified. For CVP hydropower generation/capacity and local pumping power impacts at Folsom Dam, such effects were deemed to be significant and unavoidable, but were considered economic impacts and not environmental.

There would be significant and unavoidable impacts resulting from growth that would be accommodated by the proposed water supply contracts. These significant and unavoidable impacts were fully evaluated in the certified General Plan EIR. Resources that would be affected are: land use, agriculture and forestry, visual resources, traffic and circulation, water, utilities, public services, human health and safety, noise, air quality, and biological resources. For additional description, please see Chapter 6.0 (Growth-Inducing Impacts).

216 The Proposed Action is in informal consultation with the USFWS under Section 7 of the ESA for listed species within the Subcontractor service areas. In light of the relationship between the Biological Assessment and this EIS/EIR, additional discussion pertaining to special-status species within El Dorado County is provided in this Draft EIS/EIR as it relates to approved General Plan growth in the County. The reader is referred to Subchapter 6.7 (Growth-Inducing Impacts).

5.40. SIGNIFICANT IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The CEQA Guidelines 15126.2(c) note that uses of non-renewable resource during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or non-use, thereafter, unlikely. Any irretrievable commitment of resource should be evaluated to assure that such currently proposed consumption is justified. Typically, these provisions are relevant in projects involving construction, infrastructure development, land conversions, or resource extraction.

Under NEPA (40 CFR 1502.16), the discussion of environmental consequences shall include any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented. [43 FR 55994, Nov. 29, 1978; 44 FR 873, Jan. 3, 1979]

The proposed new CVP water service contracts under this Proposed Action represent a long-term consumptive use of CVP water. A new water allocation is being committed under the P.L.101-514 contract. Hydropower generation, pumping power, and CVP water would, in specified quantities and, during specified periods of time, no longer be available for use by Reclamation and others. Unlike other resource extraction projects, CVP water supplies along with all other non-federal water supplies are replenished annually and naturally. While physical constraints (e.g., reservoir size) of existing infrastructure may act to limit the adequacy of this inter-annual replenishment, the hydrologic water balance of the State confirms that precipitation totals are orders of magnitude greater than consumptive demands. Hydrologically, therefore, as far as precipitation inputs State-wide are concerned, water is renewable on an inter-annual basis. An altered hydrometeorologic regime such as those potentially occurring under forced climatic perturbations may, however, change this balance over the long-term.

For potential future project-specific actions associated with the diversion, conveyance, treatment and distribution of new treated water, an irretrievable and irreversible commitment of resources may occur. It is normally assumed that resources such as fossil fuels will be expended during any construction project, primarily for earth moving operations, and other vehicular transport. In addition, the operation and maintenance of new water facility infrastructure (e.g. river intake pumps, water treatment plants, booster pump stations, pipelines) would require the commitment of energy resources. Depending on the energy source, such energy expenditure could be irretrievable.

Finally, different types of materials would also be used during the construction of any new water facilities. For example, concrete, asphalt, steel, wire, wood, plastics, etc. would be used in varying amounts in the construction of both new water infrastructure and support facilities and buildings. The longevity of these materials (designed to maximize longevity) and their recyclable qualities would determine the extent to which such resource materials would be irretrievable lost. Finally, where new facilities require land clearing (especially in currently undeveloped areas), a loss of topsoil and vegetation would occur. Topsoil loss would, in most cases, be irretrievable, however, vegetative re-plantings and off-site mitigation measures may avoid an irreversible and irretrievable loss of trees and shrubs.

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6.0 GROWTH-INDUCING IMPACTS

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6.0 GROWTH-INDUCING IMPACTS

6.1. INTRODUCTION

While NEPA offers no specific guidance with respect to growth-inducing impacts, Section 15126(g) of the CEQA guidelines require an EIR to discuss how a project may "*foster economic or population growth, or the construction of additional housing . . . in the surrounding environment . . . [and] the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment*."

Section 15126.2(d) of the CEQA Guidelines states that an EIR must, "…[d]iscuss the ways in which a proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." Growth must not be assumed to be necessarily beneficial, detrimental or of little significance in an EIR. The EIR must address what, if any, obstacles to growth and development the project would remove, thereby inducing growth to occur. The project may have other characteristics, might foster economic or population growth that might affect the environment, and these too must be discussed in the EIR.

6.2. GROWTH CONCEPTS

Growth rates and patterns are influenced by various local, regional, and national forces that reflect ongoing social, economic, and technological changes. Ultimately, the amount and location of population growth and economic development that occur in a specific area are controlled, to some extent, by local and county governments through zoning, land use plans and policies, and decisions regarding development applications. Local government and other regional, State, and federal agencies also make decisions about infrastructure (such as roads, water facilities, and sewer facilities) that may influence growth rates and the location of future development.

Growth-inducing impacts fall into two general categories, direct and indirect. Direct growth inducing impacts are generally associated with the provision of urban services to an undeveloped area. The provision of these services to a site, and the subsequent development, can serve to induce other landowners in the vicinity to convert their property to urban uses. Indirect, or secondary growth-inducing impacts consist of growth induced in the region by the additional demands for housing, goods, and services associated with the population increase caused by, or attracted to, a new project. Typically, the purpose of a General Plan is to guide growth and development in a community and, accordingly, the General Plan is premised on the acknowledgement that a certain amount of growth will take place over a defined time horizon. The focus of the General Plan, then, is to provide a framework in which the growth can be managed and to tailor it to suit the needs of the community and surrounding area.

6.3. El Dorado County General Plan

The El Dorado County General Plan acknowledges that the County will continue to grow but will attempt to retain the qualities of its natural resource base, both consumptive and environmental, in order to maintain its custom and culture and to assure its long-term economic stability. The Plan acknowledges the ecological and historic values of these lands while saving and conserving the lands for future economic benefits for all purposes. The County and its Plan recognize that the rural character of the County is its most important asset. Accordingly, with careful planning and management, it is felt that the County can maintain this character while accommodating reasonable growth and achieving economic stability.

The vision for future growth in the County includes the following:

1. Maintain and protect the County's natural beauty and environmental quality, vegetation, air and water quality, natural landscape features, cultural resource values, and maintain the rural character and lifestyle while ensuring the economic viability critical to promoting and sustaining community identity.
2. Where appropriate, encourage clustered development as an option to maintain the integrity and distinct character of individual communities, while protecting open space and promoting natural resource uses.
3. Make land use decisions in conjunction with comprehensive transportation planning and pursuing economically viable alternative transportation modes, including light rail. Adopt a Circulation Element providing for rural and urban flows that recognize limitations of topography and natural beauty with flexibility of road standards.
4. Promote a better balance between local jobs and housing by encouraging high technology activities and value added activities tied directly to available resource based industries such as the timber industry, tourism, agriculture, mining, and recreation.
5. Increase the amount of affordable housing by providing a variety of housing types and encouraging residential projects to reflect affordability in light of the existing local job base and/or infrastructure.
6. Encourage efforts to locate a four-year college and support the ability of elementary, middle, and high schools to keep pace with population growth.
7. Improve and expand local parks and recreational facilities throughout the County.
8. Recognize that the General Plan is a living document which must be updated periodically, consistent with the desires of the public, and provide for public involvement in the planning process.

Various General Plan strategies have also been developed that help provide for methods of achieving the visions and goals and to carry forward the Plan's principle purposes. These include:

1. Recognize urban growth in Community Regions while allowing reasonable growth throughout the rural areas of the County.

2. Promote growth in a manner that retains natural resources and reduces infrastructure costs.
3. Encourage growth to reflect the character and scale of the community in which it occurs and recognize that planned developments are an effective planning tool to maximize community identity and minimize impact on the surrounding area.
4. Require new growth to fully fund its on-site services and apportioned share of off-site services.
5. Provide that Plan goals, objectives, and policies reflect the significant differences in characteristics between the principal land use planning areas of Community Regions, Rural Centers, and Rural Regions.
6. Provide sufficient land densities and land use designations throughout the County to accommodate the projected growth for all categories of development.
7. Support the ability of the private sector to create and provide housing for all residents regardless of income, race, sex, age, religion, or any other arbitrary factor to accommodate the County's projected share of the regional housing needs.
8. Recognize economic development as an integral part of the development of existing communities and new communities by allowing for a diverse mix of land use types which would facilitate economic growth and viability.

Guidance provided by the General Plan regarding interpretation of some of the major policies affecting or otherwise controlling "disorderly" growth, include the following:

- AG and Timberland Setbacks
  - Policy 8.1.3.2 AND 8.4.1.2 Interim Interpretive Guidelines (July 31, 2007)
- Development on 30 percent slopes
  - Policy 7.1.2.1 - Interim Interpretive Guidelines (October 24, 2006)
- Housing Element
  - Evaluating General Plan Consistency in Relation to Density and Affordable Housing Policies (September 28, 2006)
- Integrated Natural Resources Management Plan (INRMP)
  - INRMP Development & Supporting Documentation
- Oak Woodlands
  - Oak Woodlands Planning/Oak Woodlands Ordinance
- Riparian areas and wetlands - buffers and setbacks
  - Policy 7.3.3.4 Interim Interpretive Guidelines (June 22, 2006)

6.4. EL DORADO COUNTY POPULATION

El Dorado County's 2000 population was 156,299. Population within the county has grown approximately 2.4 percent annually since 1990; this can be compared with the State annual growth rate of nearly 1.4 percent. The net increase in number of jobs in El Dorado County was 59,939 (a

380 percent increase) between 1970 and 2000, with the service and professional sector generating 43,231 new jobs.

In March 2002, Economic & Planning Systems (EPS) completed a detailed land use forecast for the West Slope of El Dorado County. EPS estimated that, based on market research, historical growth patterns, and SACOG projections, El Dorado County could support an additional 78,000 persons by 2025. According to the EPS projections, it is expected that the West Slope population would increase 64 percent between 2000 and 2025. [217]

6.5. PROMOTION OF ECONOMIC EXPANSION

El Dorado County, through the Economic Development Element of its General Plan appreciates the importance of fostering new and sustainable economic development. Objective 10.1.5 of this Element: Business Retention and Expansion states that it is the County's objective to: [a]*ssist in the retention and expansion of existing businesses through focused outreach and public and private incentive programs and target new industries which diversify and strengthen our export base*. [Emphasis added]

Several policies are relevant in this context and confirm the County's genuine intent at promoting new economic development. Policy 10.1.5.1 provides for the assistance to industries to remain, expand, or to locate in El Dorado County. Programs under this policy include:

Program 10.1.5.1.1: Identify and attract selected targeted industries that are consistent with the County's goal of balancing economic vitality and environmental protection.

Program 10.1.5.1.2: Develop an action plan for each targeted industry to encourage retention and expansion of businesses including special needs of each targeted industry and location assistance for expansion or relocation. Incubator space within commercial/industrial parks is an important component of these action plans.

Program 10.1.5.1.3: The Economic Development Providers Network shall establish a system for annually inventorying existing industries and businesses in order to provide early warning of businesses that are at risk and are considering moving or expanding out of the County.

Program 10.1.5.1.4: Annually dedicate and budget County staff to implement programs under Objective 10.1.5 and/or coordinate County efforts with the private sector and Economic Development Providers Network.

Program 10.1.5.1.5: The County shall monitor land availability through five-year reviews of the General Plan to assure a sufficient supply of commercial and industrial designated lands.

Program 10.1.5.1.6: El Dorado County, in cooperation with the Economic Providers Network, shall develop a comprehensive regional economic development program to attract industry to the County at a rate higher than the Sacramento Area Council of Governments (SACOG) and/or County

217 El Dorado County Planning Department, *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003, Chapter 4, Land Use Forecasts and Development Estimates.

employment forecasts. The economic development program should consider the employment needs of the resident labor force as well as more traditional measures of progress/stability as the jobs/housing balance.

Deliberate attempts at targeting specific industries and expanding value added industries are reflected in the following policies and programs:

Policy 10.1.5.3 Conduct outreach to targeted industries for potential location in El Dorado County.

Program 10.1.5.3.1: Develop an information system on significant potential vacancies in office, commercial, and industrial space to facilitate the movement of business from one facility to another. The information system should include data which characterizes the type and source of utilities available at each vacancy.

Policy 10.1.5.4 Recognize and promote agricultural based industries in El Dorado County and provide for the expansion of value added industries in an economically viable manner consistent with available resources.

Program 10.1.5.4.1: The Zoning Ordinance shall provide for agriculture dependent commercial and industrial uses on lands within Rural Regions.

Program 10.1.5.4.2: The Zoning Ordinance shall allow the sales and marketing of products grown in El Dorado County and crafts made in El Dorado County in areas designated for agricultural use.

Policy 10.1.5.5 Recognize and promote the need to create greater opportunities for El Dorado County residents to satisfy retail shopping demands in El Dorado County.

Program 10.1.5.5.1: Designate sufficient lands of a size and at locations to accommodate needed retail and commercial development.

Policy 10.1.5.6 Encourage the locating of new employment base industries that provide for additional employment opportunities for existing residents currently employed by industries with declining job potential to provide for a better employment future and business climate for the County.

Prior to approval of a General Plan amendment to Tourist Recreational or a zone change to implement this land use designation, when a site is adjacent to a residential, agricultural, or Natural Resource designation, a finding shall be made which concludes that the development project will have no significant growth inducement effect on adjacent lands.

It is important to note that it is the responsibility of public planning agencies to foresee future needs for development and to try to implement land use development strategies that, to the extent possible, meet those needs in a manner that is environmentally sound and takes into consideration other objectives and overall needs of the community. It is the responsibility of the County Board of Supervisors to adopt and uphold such policies.

6.6. WATER SUPPLY PROVISIONS – GENERAL PLAN CONTEXT

Regarding the availability of water supplies, the El Dorado County General Plan is premised on the following assumptions:

a) An adequate supply of water will be available to serve the County's current population.

b) Additional water supplies will be developed to support the projected growth.

c) Lack of water availability may change the period of time over which this Plan remains valid.

d) The designation of the American or Cosumnes Rivers as "Wild and Scenic" or their drainage basins as "National Recreation Areas" would be incompatible with the County's water storage objectives.

Pertaining to water supply, the Public Services and Utilities Element of the General Plan, GOAL 5.2: WATER SUPPLY states:

> The development or acquisition of an adequate water supply consistent with the geographical distribution or location of future land uses and planned developments.

A clear goal of the General Plan is the development or acquisition of an adequate water supply to meet future needs. Of particular relevance is Policy 5.2.1.15, which states:

> "The County shall support the efforts of the County Water Agency and public water providers to retain existing and acquire new surface water supplies for planned growth and existing and planned agricultural uses within El Dorado County. New surface water supplies may include wastewater that has been reclaimed consistent with state and federal law." [Emphasis Added]

Other notable policies within the Public Services and Utilities Element pertaining to water supply can be found in the following:

Policy 5.2.1.1	The El Dorado County Water Agency shall support a County-wide water resources development and management program which is coordinated with water purveyors and is consistent with the demands generated by the General Plan land use map.
Policy 5.2.1.13	The County shall encourage water purveyors to design water supply and infrastructure projects in a manner that avoids or reduces significant environmental effects to the maximum extent feasible in light of the water supply objectives of a given project.
Policy 5.2.1.14	The County, in cooperation with the Water Agency and water purveyors, shall collect and make available information on water supply and demand.

EDCWA has recently updated its final *Water Resources Development and Management Plan*. This Plan is designed to coordinate water planning activities within El Dorado County and provide a blueprint for actions and facilities needed to meet the County's water needs into the future. The major water agencies participating in development of the plan are: EDCWA, EID, GDPUD, Grizzly Flat Community Services District, South Tahoe Public Utility District and the Tahoe City Public Utility District. The Plan addresses the water supply needs of the entire County including those areas presently not served by a purveyor, and identifies potential technical, environmental and institutional constraints for each water resource alternative.

Existing water supply infrastructure and operations have been able to absorb substantial urban growth in western El Dorado County, primarily within the EID service area. However, water demand forecasts indicate that considerably more water will be needed to support approved growth in the County and projected increases in agricultural demands. Based on the approved 2004 General Plan and refinements made to the agricultural projections, the estimated total water demand in the County in 2025 will be roughly 125,445 AF. Most of this demand would occur on the western slope of the county, while about 10 percent of the future demand would be in the Tahoe Basin.

Buildout of the General Plan will require a total water supply of about 194,820 AF. Based on the 2004 General Plan and refinements made to the agricultural projections, the additional water supply needed by 2025 is calculated to be 34,276 AF, and a total of 103,518 AF of additional water supplies will be needed to meet projected buildout demands. Accordingly, without these new CVP contracts in place, an additional 34,000 AF of new water supplies are needed to meet the County's 2004 General Plan growth projections to 2025 and associated water needs.

6.7. GROWTH-INDUCING IMPACTS

Growth inducing impacts, both direct and indirect, have been thoroughly addressed in the El Dorado County General Plan, its supporting EIR, and the several policies and interpretive guidelines that have been prepared in support of specific General Plan Policies (e.g., INRMP, Oak Woodlands, Development of 30 percent Slopes, Riparian Areas and Wetland Buffers, etc.). The new CVP water service contracts authorized by P.L.101-514 are intended to meet, in part, the long-term water supply needs of El Dorado County. An inability to obtain this or, other water supplies, would inhibit and delay projected and approved growth within the County.

As noted in each of the secondary, or service area related resource impact discussions (i.e., non-diversion related) provided previously, anticipated impacts will occur within El Dorado County as the General Plan is fully implemented and growth continues, as planned and expected. Many such effects are, in fact unavoidable. As provided in the various General Plan Policies and, in particular, the mitigation measures identified and adopted by the County as part of its General Plan EIR, various means to avoid, offset, reduce or otherwise mitigate these significant adverse impacts have been made. Still, certain impacts, owing to their nature, existing baseline conditions, and lack of available technologies to address these effects on a broad scale imply that several impacts will remain significant and unavoidable. The County has made specific findings on what these impacts are and, in this EIS/EIR, references to those impacts have been provided in previous sections.

The implementation of the General Plan would likely result in or contribute to the following irreversible environmental changes:

- Relatively low-density (primarily residential) suburban land use patterns that would likely preclude future higher density development except where designated. This would likely preclude efficient, cost-effective full-service transit services.

- Conversion of existing undeveloped land and open vistas to developed land uses, thus precluding other alternate land uses in the future, and precluding preservation of the existing land use pattern and vistas.
- Irreversible loss of agricultural land and timberland.
- Commitment of water resources to serve development and degradation of water quality from suburban runoff.
- Commitment of municipal resources to the provision of services and operations of infrastructure for future suburban development.
- Surfacing of substantial areas of important soils and mineral resources with impermeable surfaces associated with semi-rural and suburban development.
- Increased ambient noise and background air emissions.
- Conversion of existing habitat and irreversible loss of wildlife.

In addition to these irreversible changes, other more general irreversible changes would be expected, and the magnitude would be generally tied to population growth. Population related, irreversible changes would be as follows:

- Irreversible consumption of goods and services associated with the future population.
- Irreversible consumption of energy and natural resources associated with the future population.
- Possible demand for and use of goods, services, and resources by the county to the exclusion of development in other locations in the region.

Various significant and unavoidable impacts of the General Plan alternatives were identified in the General Plan EIR. This assessment is consistent with NEPA (40 CFR 1502.16) requiring, in part, a discussion of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented. Such discussions should consider: (f) natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures; and (g) urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures.

Without this new water supply, future growth would be curtailed within the Subcontractor service areas of EID and GDPUD as defined by this Proposed Action. In this sense, the project is growth-inducing. Without the 15,000 AFA associated with the project, some of growth contemplated by the El Dorado County General Plan may not occur.

In summary, the significant and unavoidable impacts included the following, by resource category:

Land Use and Housing

5.1-2: Substantial Alteration or Degradation of Land Use Character in the County or Subareas.

Agriculture and Forestry

5.2-1: Potential for Conversion of Important Farmland, Grazing Land, or Land Currently in Agricultural Production or for Conflict that Results in Cancellation of a Williamson Act Contract.

Visual Resources

Impact 5.3-2: Degradation of Existing Visual Character or Quality of the Area or Region.

Traffic and Circulation

5.4-1: Potential Inconsistencies with LOS Policies. Depending on which mitigation is adopted, impact may or may not be mitigated to less than significant.

5.4-2: Increase in Daily and Peak Hour Traffic.

5.4-3: Short-Term Unacceptable LOS Conditions Related to Generation of New Traffic in Advance of Transportation Improvements.

5.4-4: Insufficient Transit Capacity.

Water Resources

5.5-1: Increased Water Demand and Likelihood of Surface Water Shortages Resulting from Expected Development.

5.5-2: Potential Environmental Impacts Associated with the Development of New Surface Water Supplies and Related Infrastructure.

5.5-3: Increase in Groundwater Demand and Related Impacts.

5.5-4: Increase in Wastewater Flows and Related Infrastructure Impacts.

5.5-7: Increase in Surface Water Pollutants from Additional Wastewater Treatment Plant Discharges.

Utilities

5.6-3: Potential Noncompliance with State-Mandated Solid Waste Diversion Rate.

5.6-5: Potential for Land Use Incompatibility and Other Impacts of New and Expanded Solid Waste and Hazardous-Waste Facilities.

5.6-6: Potential for Land Use Incompatibility and Other Impacts of New and Expanded Energy Supply Infrastructure.

5.6-7: Potential for Impacts Associated with New and Expanded Communications Infrastructure.

Public Services

5.7-3: Potential Land Use Incompatibility Associated with Development and Expansion of Public School Facilities.

Human Health and Safety

5.8-2: Increased Incidents of Illegal Dumping of Household Hazardous Wastes.

5.8-3: Increased Risk of Accidental Release of Hazardous Materials.

5.8-6: Risk of Exposure to Flood Hazards Inside Dam Inundation Area.

5.8-7: Exposure to Electromagnetic Fields Generated by New Electric Energy Facilities at School Locations.

5.8-10: Increased Potential for Fire Incidents and Fire Hazards.

Noise

5.10-1: Exposure of Noise-Sensitive Land Uses to Short-Term (Construction) Noise.

5.10-2: Exposure to Ground Transportation Noise Sources.

5.10-3: Exposure of Noise-Sensitive Land Uses to Fixed or Non-transportation Noise Sources.

5.10-4: Exposure to Aircraft Noise.

Air Quality

5.11-1: Construction Emissions of ROG, NOx, and PM10.

5.11-2: Long-Term Operational (Regional) Emissions of ROG, NOx, and PM10.

5.11-3: Toxic Air Emissions.

5.11-4: Local Mobile-Source Emissions of Carbon Monoxide (CO).

5.11-5: Odorous Emissions.

Biological Resources

5.12-1: Loss and Fragmentation of Wildlife Habitat.

5.12-2: Impacts on Special-Status Species.

5.12-3: Impacts on Wildlife Movement.

5.12-4: Removal, Degradation, and Fragmentation of Sensitive Habitats.

The Proposed Action is in informal consultation with the USFWS under Section 7 of the ESA for listed species within the Subcontractor Service Areas. In light of the relationship between the Biological Assessment and this EIS/EIR, the following is provided as it pertains to special-status species within El Dorado County.

The El Dorado County General Plan EIR concluded that development of and projected increases in urban, agricultural, and mined areas under the General Plan would lead to loss of habitat and loss of individuals of both special-status plants and animals. This impact was considered *significant* for all of the four equal-weight alternatives assessed under the General Plan Update CEQA review process.

To preserve and provide additional protection for special-status gabbro soil plants, the County, USFWS, and other State and federal agencies are currently attempting to conserve much of the remaining habitat for gabbro soil plants. Expansion of the Pine Hill Ecological Preserve is one of the goals of the USFWS recovery plan for gabbro soil plants. Implementation of the recovery plan is expected to reduce the possibility that gabbro soil plants would become extinct or extirpated from El Dorado County, but because USFWS has no specific legislative mandate to require federal and State agencies or private entities to comply with the goals of the recovery plan, some of the goals may not be reached.

Impacts on special-status plants and their habitat are expected to be most severe in the gabbro soil region outside of the protected Pine Hill Ecological Preserve, but direct and secondary impacts are also expected within designated preserve areas. There is already substantial development in the preserve area and more development is anticipated. By 2025 the preserve would likely be substantially more isolated because it is almost entirely surrounded by high- and medium-intensity land designations.

Several General Policies address protection of special-status species; each with varying degrees of anticipated effectiveness.

Policy 7.4.1.1 states that the gabbro soil plants will be protected in perpetuity through the establishment of five preserve sites and that these preserve site shall be integrated into the overall open-space plan.

Policy 7.4.1.3 limits land uses within established preserve areas to activities that are compatible with rare plant protection and requires the County to develop an educational and interpretive program on rare plants. This policy would also reduce impacts on gabbro soil plant populations, particularly secondary impacts, such as degradation of existing habitat caused by inappropriate recreational uses.

Policy 7.4.1.4 requires that approved preserves be designated as Ecological Preserve on the General Plan land use map. The effectiveness of this policy would be dependent upon the degree to which land use restrictions associated with the Ecological Preserve land use designation would protect special-status species.

Policy 7.4.1.5 addresses preparation of natural community preservation/conservation strategies. In most cases, however, Policy 7.4.1.5 would do little to reduce the potential for significant impacts on special-status species since under this policy, mitigation would be required only for special-status species restricted to areas where discretionary development is proposed; mitigation would not be required as long as the species was found and protected elsewhere on public land or private Natural Resources land.

Policy 7.4.1.6 directs the County to, under certain circumstances, require comprehensive habitat restoration and/or offsite mitigation plans. This policy also does not require impacts to be reduced to less-than-significant levels and applies only to discretionary projects; therefore, the policy would not be applicable to projects on nearly a third of the land open to ministerial development approvals in the county.

Policy 7.4.2.1 requires the County to protect, to the extent feasible, special-status species by developing biological conservation plans. This would also be mostly ineffective in mitigating impacts on special-status species. This policy is applicable only when federal or state plans do not provide adequate protection on lands outside County control. This policy could be effective in avoiding or delaying extirpation of a particular special-status species, but because few species have approved conservation plans, many special-status species would receive no consideration.

El Dorado County and EDCWA have worked with federal and State agencies in the continued development towards a long-term protection and preservation strategy for gabbro soil special status species. These have included the following:

- Contribution to development of the Pine Hill Preserve
  - Funding

    $2.1M toward purchase of 525 acres

    $2.9M toward purchase of land

    $5.7M toward purchase of 236 acres and a preserve manager salary
  - Long-Term Management

    Cooperative Management Agreement

    Fulfilling roles as part of the agreement
- Cooperation with USFWS
  - Development of MOA between USFWS, EDCWA, and El Dorado County regarding long-term protection of gabbro soils plants

7.0 CLIMATE CHANGE

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7.0 CLIMATE CHANGE

7.1. OVERVIEW

This chapter provides a discussion on the background of climate change science, its technical underpinnings, some of the implications to long-term California water resources management including CVP/SWP operations, and some of the recent policy and regulatory initiatives. It includes the most recent scientific literature and discusses some of the focused areas of research and their interim findings that will likely affect California's natural, socio-economic, and cultural environments in the future.

7.2. BACKGROUND

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by World Meteorological Organization (WMO) and the United Nations Environmental Programme (UNEP) to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation. Several hundred experts from all over the world are involved in the drafting of the continuing series of IPCC reports. In addition, several hundred experts participate in the review process. The IPCC represents the preeminent body of technical experts on climate change and its potential effects on the environment in the world today.

The First IPCC Assessment Report was completed in 1990 and played an important role in establishing the Intergovernmental Negotiating Committee for a UN Framework Convention on Climate Change by the UN General Assembly. The UN Framework Convention on Climate Change (UNFCCC) was adopted in 1992 and entered into force in 1994. It provides the overall global policy framework under which the issue of climate change can be addressed.

The IPCC has continued to provide scientific, technical and socio-economic advice to the world community, and in particular to the Parties to the UNFCCC through its periodic assessment reports and special reports. Its Second Assessment Report, Climate Change 1995, provided key input to the negotiations, which led to the adoption of the Kyoto Protocol to the UNFCCC in 1997. The Third Assessment Report (TAR), Climate Change 2001, was completed in 2001. It was submitted to the 7th Conference of the Parties to the UNFCCC and Parties agreed that it should be used routinely as a useful reference for providing information for deliberations on agenda items of the Conference of the Parties. The IPCC has continued to prepare comprehensive assessment reports and released the contribution from Working Group I to the Fourth Assessment Report of the IPCC in February, 2007 describing progress in our understanding of the human and natural drivers of climate change, observed climate change, climate processes and attribution, and estimates of future climate change. It effectively builds upon past IPCC assessments and incorporates new findings from the past six years of research. Scientific progress in the field of climate change since the TAR has been based upon large amounts of new and more comprehensive field and modeling data, more sophisticated means of data analyses, improvements in understanding the physical processes and their simulation in models, and more extensive exploration as to where the remaining uncertainties lie (IPCC, 2007).

Early interest in climate change focused on how rapidly increasing and intensifying human activities including industrial processes, fossil fuel combustion, and changes in land use, such as deforestation could alter the atmospheric radiative energy balance. Carbon dioxide, as well as water vapor and methane were known to be absorbers of emitted longwave radiation from the earth's surface. Without the ability of the atmosphere to allow emitted longwave radiation back out into space, air temperatures would increase along with all of the associated ecosystem and societal effects that such temperature rise would impart. The contemporary recognition of the atmospheric *greenhouse effect* was born. Thorough discussions of the greenhouse effect and its implications to climate change are provided in Karnosky et al., (2001); IPCC (2001c; 1994); and Bates (1990). It should be noted here that *global warming* is not the equivalent to climate change. Significant, societally important climate change, due to both natural- and human- climate forcings, can occur without any global warming or cooling.

7.2.1. Milankovitch Theory

While human-induced climate change factors have received the most focus and attention, astrophysical theories of planetary motion (with later inference to long-term climate change) date back to the nineteenth century. In the last century, variations in orbital eccentricity, axial obliquity, and precession (of the equinoxes) were advanced by Milutin Milankovitch, a Serbian mathematician, who developed a complex theory for long-term climate change based on earlier work by J.A. Adhemar and James Croll in the mid-1800's. Using these three orbital variations, Milankovitch, in his book, titled in translation as, "*Record of Radiation on Earth and Its Application to the Problem of Ice Ages*", strove to connect the cycles of ice ages on Earth to small changes in our planet's motions in space. He was able to formulate a comprehensive mathematical model that calculated latitudinal differences in hemispheric "insolation" and the corresponding surface temperature for 600,000 years prior to the year 1800.

Empirical evidence to test his theories, at the time, was difficult to obtain. With the advent of advanced sampling techniques, however, studies of paleoclimatology now often use the analysis of trapped gases in deep ice cores to reconstruct climate conditions that existed hundreds of thousands of years ago. Ratios between oxygen and nitrogen and between the stable isotopes of oxygen (i.e., O^{18} and O^{16}) provide an indication of air temperatures at the time the ice was formed. Our knowledge of oxygen fractionization in water vapor over time has helped develop present day paleoclimatological methodologies.

Some long-term events (glacials and inter-glacials) determined through ice core sampling match up with Milankovitch's theory, but others at shorter time intervals (e.g., 21,000 y.a. and 40,000 y.a.) are not as clear. Certainly, climatologists are aware that small changes in solar heating arise from cycles of planetary motion; more precisely, they can calculate the small variations that arise from differences in solar heating throughout the Milankovitch cycles. They cannot, however, as yet explain clearly how those variations can affect Earth's climate so strongly that an ice age arises or recedes (Goldsmith, 2007).

A corollary to the Earth's planetary motion is the periodic intensification of solar activity that occurs approximately every decade as the Sun enters a new phase of magnetic activity (peaking at what astronomers call the solar maximum) (Woods and Lean, 2007). This cycle creates significant observable effects on Earth. Total ozone concentration, for example, increase by a few percent during solar maximums. Solar activity also appears to alter the interactions between the atmosphere and surface that drive the Earth's fundamental circulation cells, especially in the north-south Hadley and Ferrell cells and the east-west Walker circulation. The predominant global wind patterns are governed by these cells.

Moreover, since the Sun's photons provide virtually all of the energy that warms the Earth's surface and atmosphere (which in turn drives atmospheric and oceanic circulations), even relatively small changes in the total radiative output of the Sun can affect the Earth's surface due to the amplifying effect in how the atmosphere responds to solar changes (Woods and Lean, 2007).

This 11-year solar cycle was first discovered by Samuel Heinrich Schwabe in 1843. A Swiss astronomer, Rudolf Wolfe, later used Schwabe's data to reconstruct solar cycles dating back to the middle 1700s. Scientists have labeled Wolfe's reconstruction of the 1755-1766 cycle as "solar-cycle 1". Today, we are in the solar minimum that effectively ends solar cycle 23 and marks the beginning of cycle 24 (Woods and Lean, 2007).

Clearly, while solar variability (solar cycles) compete with other natural processes such as volcanic eruptions and the El Nino-Southern Oscillation (ENSO), it will become increasingly important to better our knowledge of all "natural" forcings in the context of human activities such as greenhouse gas production, so that we may fully appreciate the wide range of terrestrial variations that can affect our weather and climate.

7.2.2. Climate Modeling

The first assessments of the potential climatic effects resulting from increased CO_2 were performed using simplified climate models, namely, energy balance models (EBMs) and radiative-convective models (RCMs). The feedback processes in RCMs include water vapor feedback, moist adiabatic lapse rate feedback, cloud altitude feedback, cloud cover feedback, cloud optical depth feedback, and surface albedo feedback. However, these feedbacks can be predicted credibly only by physically based models that include the essential dynamics and thermodynamics of the feedback processes. Such physically based models are represented by the general circulation models (GCMs) in use today (Schlesinger and Mitchell, 1987).

The GCM's purpose is to numerically simulate changes in climate as a result of slow changes in some boundary condition (such as the solar constant) or physical parameters (such as greenhouse gas, or GHG concentrations). State-of-the-art GCMs exist as coupled atmosphere-ocean models, that is, a model simulating surface and deep ocean circulations is 'coupled' to an atmospheric GCM. The interface is the ocean surface: this is where the transfers of water (evaporation/precipitation) and momentum occur. An accurate coupling of the *fast* atmosphere to the *slow* ocean (e.g., with longer memory) is essential to simulate such dynamic processes like ENSO. GCM's can further be coupled to dynamic models of sea ice and conditions on land (Hadley Center, 2007).

GCMs derive their utility from assumptions on the level of assumed future GHG emissions (and therefore, loadings in the atmosphere) that will occur at prescribed times into the future. In general, the various GCMs assume one of three levels of potential future emissions:

- The *lower emissions* scenarios are characterized an assumed doubling (560 ppm) of CO_2 concentrations in the atmosphere by the year 2100, relative to pre-industrial levels (280 ppm). Projected temperatures from GCMs associated with lower emission scenarios range from 3º to 5.5º F.
- The *medium-high* emissions scenarios are characterized by an assumed tripling (840 ppm) of CO_2 concentrations in the atmosphere by the year 2100, relative to pre-industrial levels (280 ppm). Projected temperatures from GCMs associated with medium-high emission scenarios range from 5.5º to 8º F.
- The *high* emissions scenarios are characterized by CO_2 concentrations in the atmosphere by the year 2100 that are in excess of three-times that of pre-industrial levels. Projected temperatures from GCMs associated with high emission scenarios range from 8º to 10º F.

Local climate change is influenced significantly by local features such as mountains, which are not well represented in global models because of their coarse resolution. Models of higher resolution, however, cannot practically be used for global simulation of long periods of time. To overcome this dichotomy, regional climate models, with a higher resolution (typically 50 km) are constructed for limited areas and run for shorter periods (20 years or so). RCMs (regional circulation model, not be confused with radiative convective models mentioned previously) take their input at their boundaries and for sea-surface conditions from the global coupled atmosphere-ocean general circulation models (AOGCMs). The Hadley Centre in the U.K., the leading world institution on climate change modeling, has run RCMs for three regions, Europe, the Indian subcontinent and southern Africa and has developed an RCM to run on PCs for any region as part of a regional climate modeling system, PRECIS (Hadley Centre, 2007).

As a result of the coarse resolution of traditional GCMs, downscaling techniques have emerged as a means of relating macro-scale atmospheric variables to grid- and sub-grid-scale surface variables or, from large-scale atmospheric variables to watershed- and sub-watershed-scale surface variables (Christensen et al., 2007; Schaer et al., 1996). The modeling process for climate change analysis on natural resources, therefore, requires a multi-step approach that downscales climate data (e.g., air temperature and precipitation) from large-scale GCMs, to more regionally-based models.

The matter of scale can also be applied in the temporal context. Hydrologic analyses and land-atmosphere interaction studies, in general, require the specification of rainfall forcing at time scales of the order of 1 hour or less. The resolution must be a suitably small fraction of the characteristic concentration time of the watershed since coarse rainfall observations (e.g., weekly or daily) average out short and intense rainfall events, thus often resulting in the underestimation of runoff due to the well accepted non-linearity of runoff-generating mechanisms (Philip, 1957). Today, there is a large and continually growing body of research aimed at the development of techniques allowing the disaggregation of rainfall at hydrological relevant scales (Marani and Zanetti, 2007).

The regionally-based models, depending on the particular resource issue of interest (e.g., water supply, water quality, vegetation, fisheries health, etc.) use climate data as inputs to drive their physically-based models, the latter defining process interactions characteristic of that particular resource. Downscaling techniques can range from simple interpolation of climate model output, through the use of empirical/statistical relationships between watersheds and regional climate, to the use of nested regional climate models (IPCC 2001).

Yet, despite all of the extensive work that has been undertaken with GCMs, the envelope of uncertainty which remains in climate projections has not narrowed appreciably over the past 30 years. Fully understanding the entire spectrum of highly coupled, and tightly interactive processes is an enormous undertaking that, when looked at objectively, will always lead to uncertainty. This has resulted, despite the tremendous increases in computer power, observations, and in the number of scientific specialists studying the problem. This continuing challenge might suggest that our underlying understanding of the climate system may still be incomplete in important areas (Roe and Baker, 2007).

Allen and Frame (2007) discuss a fundamental problem in the identification of *climate sensitivity*. They note that the IPCC's most recent climate sensitivity as that ranging between 2º to 4.5º C; with a one-in-three chance that it will be outside this range. While they point out that the lower boundary is slightly higher than earlier estimates of 1.6º C, made in the 1970s, progress on the upper bound has been minimal (in fact, they suggest that the upper bound of climate sensitivity has become a sort of *holy grail* in climate research). The problem, they claim, lies in the fact that the observable atmospheric properties today, do not, and cannot, distinguish between a climate sensitivity of 4º C and that greater than say 6º C. A warming of 4º C would result in conditions so different from anything we can currently observe, that it is almost impossible to gauge when this warming would stop. By showing how a symmetric constraint on the strength of the atmospheric feedback parameter (i.e., how much energy is radiated to space per degree of surface warming) results in a strongly asymmetrical constraint on climate sensitivity, Allen and Frame (2007) have captured this important relationship. Their hypothesis; as the atmospheric feedback parameter approaches 1, climate sensitivity approaches infinity.

7.2.3. Current State of Knowledge

As discussed previously (see Section 5.5.1, Milankovitch Theory), climate change can be driven by both natural and human forcings. Defining the natural state and variability of the earth's climate is important. Yet, as discussed previously, even natural climate changes are not well enough understood to constitute a baseline against which we might realistically measure human-induced effects. A broad spectrum of observations, including both instrumental records and paleoclimate data (the former possibly contaminated by anthropogenic change, the latter not) has revealed substantial variability in the earth's climate on time scales of decades to centuries. It should be noted that this natural variability alone has considerable socioeconomic impact, particularly with its potential to affect agriculture, fisheries, and water resources. The evidence of natural variations in the climate system, which was once assumed to be relatively stable, clearly reveals that our climate has changed, is changing, and will continue to do so with or without anthropogenic influences.

These changes will occur at decadal-century timescales and, accordingly, has been referred to as the Dec-Cen variability.

The climate record for the past 100,000 years indicates that the climate system has undergone periodic and often extreme shifts, sometimes in as little as a decade or less. The causes of abrupt climate changes have not been clearly established, but the triggering of events is likely to be the result of multiple natural processes. As alluded to previously, events or processes that may have led to these climate shifts include; solar energy variation (both direct and indirect), internal oscillations (e.g., Pacific Decadal Oscillation or El Nino Southern Oscillation), ocean variation (e.g., thermocline circulation), biospheric variation (e.g., carbon exchange), cryogenic variation (e.g., sea ice transport, land-ice interactions), surface versus atmospheric temperature interactions, and aerosol forcing mechanisms. Additionally, there are astrophysical explanations which were also discussed previously (see Milankovitch Theory).

Regarding human-induced climate change, there is a broad scientific consensus that this is a real phenomenon and that it is altering the natural air, sea, land and water cycles and their interactions in a variety of important ways (IPCC, 2007; 2001a; 2001b; 2001c; 1995). During the past decade, research on climate change induced impacts on the natural and human environments has grown considerably. The continually growing body of research has progressively added to what we now know regarding the potential vulnerabilities facing a wide range of ecological systems (e.g., forests, grasslands, wetlands, rivers, lakes and marine environments) as well as human systems (e.g., agriculture, water resources, coastal resources, human health, financial institutions, and human settlements) (Parker et al., 1994; Vose et al., 1992; Mitchell, 1989).

It is estimated that the temperatures at the earth's surface increased by an approximate 1.4°F (0.8°C) between the years 1900 and 2005. The past decade was the hottest of the past 150 years and perhaps the past millennium. The hottest 22 years on record have occurred since 1980, and 2005 was the hottest on record (Figure 7.1-1). As noted previously, the growing scientific consensus for this warming trend is based largely on the notion that increasing emissions of carbon dioxide and other GHGs have affected the earth’s net radiative energy balance. Keeping in mind previous discussion on the limitations of climate sensitivity, projections of future warming suggest a global increase of as much as 2.5ºF (1.4ºC) to 10.4ºF (5.8ºC) by 2100, with warming in certain parts of the United States, for example, potentially even higher.

While changes in air temperature itself are noteworthy and have led to regional characterizations of changing long-term climate (e.g., a more arid U.S. southwest) (Seager et al., 2007), the related or affected changes in other natural processes and ecosystem functions are equally striking. Studies have shown the potential for shifting climatic regimes to alter snowpack accumulation in the western U.S. (Miller et al., 2003; Mote et al., 1995; Pupacko, 1993; Roos; 1991; 1990; and 1988) as well as the accumulation/ablation dynamics of high altitude glaciers, such as those in the Himalayas (Prasad and Singh, 2007).

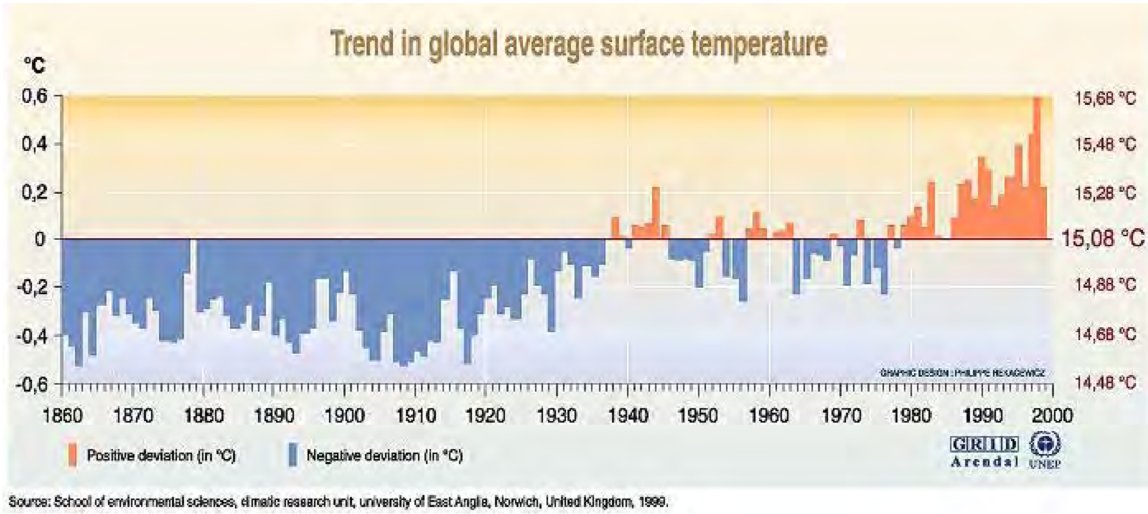

FIGURE 7.1-1 TREND IN GLOBAL AVERAGE TEMPERATURE FROM 1860 TO 2000

The figure depicts global average combined land-surface air and sea surface temperatures from 1861 to 1998 relative to the average temperature between 1961 and 1990. The left vertical scale is in degrees Celsius. Source: United Nation's Environment Programmed Global Resource Information Database - Arendal website at: http://www.grida.no/climate/vital/17.htm.

Changing runoff hydrology from source area watersheds and their potential effects on downstream environments is an important consideration for many reasons. Knox (1993) showed a high sensitivity of flood events to climate change induced peak runoffs resulting from earlier snowpack melt coupled with warm winter rain-on-snow events. Peterson et al., (1995) addressed changing flow dynamics in estuaries and Inman et al., (2002) has modeled cliff and shoreline erosion due to changing sea levels. In fact, recent studies even suggest that data available for the period since 1990 raise concerns that the climate system, and in particular sea level, may be responding more quickly to climate change than our current generation of GCMs indicate (Rahmstorff et al., 2007). Such changes, if true, could have significant repercussions. Maury Roos (Chief Hydrologist, California Department of Water Resources) has shown that a modest 0.3 m rise in sea level would redefine the 100-year storm surge flood event in San Francisco Bay to a more frequent and disturbing, 10-year event.

More recent studies have, on the other hand, cautioned that at-risk areas have, on many occasions been identified on the basis of mean sea level, ignoring the effects of tides. The use of only mean sea level to determine flood risk represents a significant limitation to risk analyses primarily because the actual flooding process involves the level of high water, which is linked to tides and storm surges. Depending on the region, the level of high water can be several meters above mean sea level (Marbaix and Nicholls, 2007).

Warming of surface waters in the California Current since the 1950s has also coincided with significant declines in zooplankton production and volume. This has been explained by the relaxation of North Pacific anticyclonic gyre causing onshore movement of warmer, less saline waters, and reduced upwelling of cool, nutrient-rich waters (Weinheimer et al., 1999). The Pacific

Decadal Oscillation (PDO) has also been attributed to increasing water temperatures in watercourses draining to the Pacific Ocean. The Klamath River, in California, for example, showed water temperature increases of 0.5º C since the early 1960's potentially affecting the recovery of anadromous salmonids in that important north coast fishery (Bartholow, 2005).

In the Arctic polar region, enhanced transport of warmer air from lower latitudes has led to increased Arctic surface air temperatures. Concurrent reductions in Arctic ice extent and thickness have also been documented. The first evidence of warming in the intermediate Atlantic Water (defined as that between 150 and 900 meters) in the Arctic Ocean was noted in 1990. In 2004, another anomaly was observed suggesting that the Arctic Ocean is in a transition state towards a new, warmer state (Polyakov et al., 2007). The magnitude of this warming is unprecedented. The depth range and horizontal extent are exceptional, extending from the surface to almost 1,000 meters and occupying a vast area of the Barents Sea slope.

In the subsurface environment, responses in the vadose zone and groundwater to inter-annual, inter-decadal and multi-decadal climate variability has shown to exhibit important implications for long-term groundwater resource sustainability (Gurdak et al., 2007). In temperate climatic regions where snowmelt or springmelt represents the primary groundwater recharge event of the year, this can have significant repercussions to water resource management planning.

Climatic change has also been studied relative to its potential effects on biotic communities. Climate modeling suggests a long-term shift in ecotones in all hemispheres as species migrate to, and evolve in, more favorable ecosystems. Responses of both flora and fauna span an array of ecosystems and organizational hierarchies, and from the species to the community levels (Gian-Reto et al., 2002). In particular, ecosystems at high latitudes and altitudes are recognized as being very sensitive to climate change. Latitudinal tree-line advance as has been noted by Lloyd (2005) along with higher shrub density (Tape et al., 2006). While rising temperatures have shown to be responsible for increased plant growth in northern high latitudes (Myneni, et al., 1997), an upward shifting of plant species in high mountain systems has also been predicted for the near future. Under such conditions, the habitats of the alpine and nival vegetation could be restricted drastically, which may result in extinctions, particular of summit floras (Pauli, et al., 1996). More recently, Bunn et al., (2007) also referenced some non-intuitive responses, including those for tree-ring width decline in some locations, flat to declining trends in boreal forest greenness, and declines in terrestrial vegetation productivity.

While long-term mean temperature increases would certainly be influential, others submit that the potential effects of climate change on biotic communities may be due to changing maximum and minimum temperatures rather than annual means (Strachowic et al., 2002). From these changes, it is held that surviving species may reshuffle into entirely new combinations, creating completely new ecosystems or, as noted by Fox (2007) "no-analog" ecosystems.

Historically, increasing variability in moisture conditions (i.e., wet/dry oscillations promoting biomass growth, then burning), and/or a trend of increasing drought frequency, and/or warming temperatures have led to periods of increased wildfire activity. This transition was marked by a shift toward unusually warm springs, longer summer dry seasons, drier vegetation (which provoked more and longer burning large wildfires), and longer fire seasons. Reduced winter precipitation and an early spring snowmelt played an important role in this shift. Increases in wildfire were particularly strong in mid-elevation forests (Westerling et al., 2006). Robust statistical associations between wildfire and hydroclimate in western U.S. forests indicate that increased wildfire activity over recent decades reflects sub-regional responses to changes in climate. Historical wildfire observations exhibit an abrupt transition in the mid-1980s from a regime of infrequent large wildfires of short (average of 1 week) duration to one with much more frequent and longer burning (5 weeks) fires (Westerling, 2006).

7.2.4. Climate Change Effects on Water Resources

The potential effects of climate change on water resources have been extensively studied. Perhaps no other natural resource has been investigated as thoroughly. Globally, this effort is warranted when one considers that a large proportion of the world's population is currently experiencing water stress, a situation that will only become more challenging as the world's population continues to grow. Comprehensive reviews of the effects on water resources across the scientific literature are provided in IPCC (2001) and, regarding water management, by Gleick (1998). Early recognition of the potential effects of climate change on U.S. water resources is provided in Waggoner (1990). A summarization of the potential impacts on western U.S. water resources has been prepared by Frost (2004) with Chalecki and Gleick (1999) providing a review of the existing data.

Since climate change is largely driven by changes in the net radiative energy balance (the solar incoming flux being constant, but for the astrophysical variations explained by Milankovitch), this can alter the magnitude and frequency of hydrologic cycling processes. It should be noted, however, that due to the complex interactions between the hydrologic cycle and general global circulation patterns as well as local weather systems, an increase in temperature would not necessarily translate into an increase in precipitation in all regions (IPCC, 2001). It is generally accepted that the difficulty in predicting future changes in regional precipitation patterns owes much to inherently high spatial variability of, and between, the factors causing precipitation (the issue of rainfall disaggregation was discussed previously).

Evaporation is generally driven by meteorological controls (e.g., air temperature, wind speed, gradient of saturation vapor pressure) whereas evapotranspiration, while influenced by those same factors, is also affected by soil moisture and vegetative water availability. Changes in meteorological controls may increase or offset rises in temperature, and it is possible that increased water vapor content and lowered net radiation could lead to lower evaporation demands. It is projected that in those areas where evaporation increases more than precipitation, soils will become drier, lake levels and reservoirs will drop, and river flows diminished.

Vegetation cover, type, and structural properties play an important role in evaporation. Interception of precipitation is very much influenced by vegetation type (i.e., canopy storage capacity). Differing vegetation types also generate different degrees of turbulence above the canopy; the greater the turbulence, the greater the evaporation. Climate induced changes in vegetation type and density, therefore, may directly or indirectly affect the water balance within watersheds. Coarse scale modeling has shown that soil moisture in the Northern Hemispheric mid-latitudes would experience reduced soil moisture during summer months (Gregory et al., 1997). For areas in agricultural production, this could have important implications. Duffy et al (2007), for example, in describing recent temperature trends in California, have noted the effect of soil moisture and their cooling affect on local summer daytime temperatures. They discuss the effect of irrigation practices which, by keeping the soil surface wet, can shut off a positive feedback in which atmospheric warming would otherwise reduce soil moisture and amplify warming.

Climate change effects on soil moisture will depend on not only the degree of climatic change, but also on soil structure characteristics. Changes in the frequency and duration of soil saturation, desiccation, and freeze-thaw cycles would have an affect on the long-term structural composition of some soils, possibly altering its hydraulic properties over time (e.g., infiltration capacity, percolation rate, transmissivity).

There is unfortunately, at present, a paucity of information regarding the effects of climate change on groundwater resources, at least relative to other water elements. Intuitively, a change in precipitation will alter potential groundwater recharge, but it can also alter the recharge season. Increased winter precipitation, as projected by most climate modeling scenarios for the mid-latitudes, is likely to increase. This will shift the recharge period for groundwater aquifers to earlier in the year. Overall recharge may be reduced if recharge potential exceeds soil infiltration and percolation rates; with a shorter more intense melt/rainy season, the overlying soil matrix must convey the same volume of water over a shorter period of time. If soil infiltration and/or percolation rates are exceeded, surface runoff or saturation overland flow would occur where, under a prolonged longer (and slower) melt/rainy season, this water flux would not have exceeded the soil's ability to infiltrate and transmit.

By far, the greatest number of studies on climate change induced effects on water resources have focused on runoff and streamflow. Under changing climatic conditions such as increases in temperature, the amount and duration of snow cover would be decreased which, in turn, can affect the timing of runoff. Peak streamflow, therefore, would shift from late spring, as is the general case currently in snow dominated regions, to early spring or late winter in those areas where the annual snowpack is an important component in the water balance.

Such hydrologic changes could increase competition for reservoir storage between hydropower and instream flow targets developed pursuant to Endangered Species Act requirements. Payne et al., (2004) for example, examined several alternative reservoir operating policies designed to mitigate reservoir system performance losses. In general, the combination of earlier reservoir refill with greater storage allocations for instream flow targets mitigated some of the negative impacts on flow, but only with significant losses in firm hydropower production (power forgone).

Shifts in the timing of peak flows, coupled with a magnification of water availability (i.e., more water is made available in winter, since a lesser proportion of winter precipitation would occur as snow) could exacerbate flood risk in those areas dependent on snow accumulation. Under such a situation, flood risk may increase even though overall precipitation in a particular area decreases (see Schreider et al., 1996). Alternatively, if overall precipitation increases, flood magnitudes can increase since, in larger watersheds, it is the total volume of precipitation over several days, not the peak intensity of rainfall that is important (IPCC, 2001).

While it is true that most large urban centers are protected from flooding by levees and upstream reservoir storage capacity, hydraulic and simple storage encroachments resulting from increased streamflow or reservoir inflow over shorter time intervals may also increase flooding risk. Rising sea levels also can impart increased flood risks to low lying estuarine areas and along coastal flatlands.

Increased drought risks resulting from climate change is considerably more difficult to quantitatively define than flooding since the criterion to establish droughts is more varied and discretionary. How is a drought defined? Does it refer to strict rainfall/runoff ratios, total rainfall, soil moisture deficits, low summer time instream flows, or lowered groundwater levels? Watersheds with large amounts of groundwater storage would tend to have higher summer flows under a changed climate because additional winter rainfall would tend to result in greater groundwater recharge (the additional rainfall offsetting the shorter recharge period). Summer flows in watersheds with little storage tend to be reduced because these watersheds do not experience the benefits of increased winter groundwater recharge. Watershed subsurface geology and storage can significantly influence the effects of climate change on summer flows. Proportionately, summer flows would be more prone to change than seasonal or annual flows (Dvorak et al., 1997).

Potential water quality impacts as a result of climate change are primarily related to streamflows. Chemical river quality is largely a function of the chemical loadings to the river, water temperature, and the flow volume. While the incipient chemical loading is a function of watershed geology and soil type, human activities such as mining, land use (residential, commercial and industrial) development, forestry, and agricultural practices have all shown to be more influential, especially over the last century. Each one of these human activities possesses feedback loops to river and reservoir water quality that would result from direct climate change effects.

Water temperature, as a water quality parameter, is a very important consideration in the evaluation of potential climate change effects on water resources. Numerous biological (e.g., fish spawning, rearing, holding, outmigration and emigration) and chemical/physical (e.g., eutrophication, nutrient transport and uptake, thermal stratification) processes in waterbodies are dictated by water temperature. Streamflow temperatures are projected to increase by a slightly lesser magnitude than air temperatures under a future warming climate. Elevated water temperatures in the future would lead to increases in certain concentrations of some chemical components and, at the same time, reductions in others. Dissolved oxygen concentrations, a key component to aquatic floral and faunal life would, however, be lower.

Changes in streamflow can have important implications for water and flood management, water quality, irrigation, and land use planning. If water supplies are reduced or their flow regime altered, the primary off-stream users of water such as urban/rural residents, industry, irrigated agriculture and in-stream users such as hydropower, recreation, and navigation, could be most directly affected (IPCC, 2001).

Gleick (1998) noted that while research continues, there is little absolute certainty about the form that many of these changes will take, or precisely when they will be unambiguously detected. As a result, while global climatic changes are likely to begin to appear in earnest within the next several decades, or even earlier, we are unable as of yet to *precisely* determine how such changes will affect water-supply systems or water demands. For example, changes in seasonal precipitation and intense rainfall frequency are difficult to predict because of, as was noted previously, the high degree of spatial and temporal variability associated with precipitation. Since precipitation, and precipitation forecasting drives so much of the water balance, accuracy in depicting this critical physical process becomes imperative.

7.2.5. Climate Change Effects on California Water Resources

Water resources are vital to California. The diverse and intricate character of the natural ecosystems and the importance of these systems to the economic viability, health, and livelihood of the nation's most populous State make sustainable long-term water resources a priority. A thorough summary and overview of potential climate change effects on California's water resources is provided by Kiparksy and Gleick (2003); see also Wilkinson, 2002. It is recognized that climatic warming will have a significant impact on water resources within the 20 to 90-year planning period of many water projects within the State. Semi-arid regions, especially those characteristic of Southern California are especially vulnerable to the anticipated negative impacts of future warming on water resources (Buehler, 2003).

Early recognition of the hydrological effects under the influence of climate change has been provided in Knox (1989) and Gleick (1986). Early water balance modeling associated with a climate change analysis for the Sacramento River watershed was conducted by Gleick in 1989. Water resources and their importance to California has, and continues to generate a number of climate change related studies (Vicuna et al., 2007; Vicuna, 2006; Vicuna et al., 2006; Zhu et al., 2007; Hanemann et al., 2006; Barnett, et al., 2004; Hayhoe et al., 2004; VanRheenen et al., 2004; Buehler, 2003; Lund et al., 2003; Roos, 1989).

The existing literature suggests that global warming is likely to have notable impacts on the hydrological cycle that can, in turn, affect many aspects of the California water system (Christy et al., 2006). Relative to preindustrial CO_2 conditions (280 ppm), doubled preindustrial CO_2 conditions (560 ppm) have shown to produce increased temperatures of up to 4°C on an annual average basis and of up to 5°C on a monthly basis. Temperature increases modeled are greatest in the central and northern regions of the State. On a monthly basis, the temperature response was greatest in February, March, and May for nearly all regions (Snyder et al., 2004). There is evidence that some changes in the magnitude of certain hydrological cycle components have already occurred, such as an earlier beginning date of spring snowmelt (Roos 1991; 1990; 1988), an increase in winter runoff as a fraction of total runoff, and a corresponding increase in winter flooding frequency.

Lettenmaier and Gan (1990) looked at four watersheds (in the Sacramento-San Joaquin basin) indexed to CO_2 doubling scenarios. Results showed a major seasonal shift in the snow accumulation pattern. Under alternative climate scenarios, more winter precipitation fell as rain instead of snow, and winter runoff increased while spring snowmelt runoff decreased. In addition, large increases in the annual flood maxima were simulated, primarily due to an increase in rain-on-snow events, with the time of occurrence of many large floods shifting from spring to winter. Such shifts in streamflow could significantly lower water deliveries from the CVP/SWP which traditionally ramps up in spring. Reduced deliveries could occur because of the increased winter spills from the reservoirs. Instead of winter precipitation being stored in the snowpack, operational reservoir flood control rules would dictate earlier spills. Such depletions in overall annual water availability could result even though the mean annual runoff increased slightly under some climate scenarios. While annual flows entering the Sacramento-San Joaquin Bay Delta would increase, the timing would be such that flows would be substantially increased in winter and somewhat decreased in spring and summer (Lettenmaier and Sheer, 1991). The modeling work of Chung et al., (2005) appears to confirm this conclusion. Modeled flows in the Feather River based on climate change induced elevation increases of the snowline revealed that peak runoff from winter storms increased by 23 percent, 83 percent and 131 percent, as the snowline rises from 4,500 feet msl to 5,000, 6,000, and 7,000 feet msl, respectively. Such increases in Feather River runoff could result in significant increased flood risk within the Sacramento Valley.

Alternatively, as noted by Brekke et al., (2004) separate modeling results in the San Joaquin basin showed that there could be decreased reservoir inflows, decreased storage and releases, and therefore, decreased deliveries from the reservoirs. Impacts under either climate change projection cannot be regarded as more likely than the other. As noted previously, most of the impact uncertainty is attributable to the divergence in the precipitation projections (Brekke et al., 2004). An equally valid explanation could lie in the selection of the physically-based watershed runoff model or in the temporal period of selection. Chung et al., (2005) in fact, showed that median inflows to Shasta, Oroville and Folsom reservoirs during the 2035-2064 modeled period were virtually identical with the historical record (1922-1994), however, when extended to the 2079-2099 period, median inflows for these reservoirs decreased by 15 percent, 25 percent and 33 percent, respectively.

Pupacko (1993) noted that, for the northern Sierra Nevada, the trend of increasing and more variable winter streamflow began as early as the mid-1960s. Mean monthly streamflow during December through March was substantially greater for water years 1965–1990 compared to the water years 1939–1964. Increased winter and early-spring streamflow during the later period is attributed to small increases in temperature, which increase the rain-to-snow ratio at lower altitudes and cause the snowpack to melt earlier in the season at higher altitudes. The timing of snowmelt runoff on the western slope of the Sierra Nevada is more sensitive than it is on the eastern slope to changes in temperature, owing to predominantly lower altitudes on the west side. This difference in sensitivity suggests that watersheds on the east side of the Sierra Nevada have, and could continue to have a more reliable water supply (as snow storage) than western-slope watersheds during future warming trends. An important conclusion that is generally supported for most snowmelt driven runoff watersheds in California, is that late winter snow accumulation could decrease by as much as 50 percent or more toward the end of this century (Miller et al., 2003).

Since about 1950, snow accumulation was already showing losses on the order of 10 percent in April 1 snow water equivalent (SWE) across the western U.S. (Mote et al., 2005). Over this period, the onset of the snowmelt spring freshet has shifted by 10-30 days, with the largest shifts in the western U.S. observed in the Pacific Northwest and in the Sierra Nevada. In California, the 100-

year, 3-day peak flows for rivers such as the American, Tuolumne, and Eel has more than doubled between the first and latter halves of the last century. Moreover, the annual peak 3-day mean discharges from these rivers are becoming more variable and larger for most sites in California (Hanemann et al., 2006).

With regard to flooding, in addition to rising sea level concerns, snowmelt-related streamflow represents a particular problem in California. As noted previously, modeling studies have indicated that there could be an approximate 50 percent decrease in snow pack by 2100. This potential deficit must be fully recognized and plans put in place well in advance to address this shortfall. In addition, with a warmer atmosphere capable of holding more water vapor and resulting in more intense warm winter-time precipitation events, the risk to flooding could increase substantially. Under our current reservoir infrastructure and operating rules, anticipated future high flow periods could impart significant downstream flood risks, since reservoirs are mandated to release water to maintain their structural integrity (Miller, 2003). With an altered hydrology, but no changes in physical infrastructure, how will current operating rules for flood control (e.g., encroachment curves) in CVP/SWP facilities adjust in the future in order to accommodate new flood risks?

Snyder et al., (2004) confirms that snow accumulation significantly decreases in all months and regions, with the greatest reduction occurring in the Sacramento River region under future modeling scenarios. However, their precipitation results indicate drier winters for all regions, with a large reduction in precipitation from December to April and a smaller decrease from May to November. The result is a wet season that is slightly reduced in length. These findings suggest that the total amount of water in the State will decrease. If water needs continually increase, the timing of water availability will be greatly perturbed (Snyder et al., 2004).

With changing precipitation, shifting snowlines, and altered inflows to source area reservoirs and primary CVP/SWP reservoirs, the potential effects of climate change on water supply obligations, both in the short- and long-term is a very important consideration. Modeled reductions in overall inflows to reservoirs have shown that the median delivery to SWP contractors (i.e., the quantity that is delivered at least 50 percent of the time) south of the Delta, declines by approximately 11 percent, relative to the historical record. Correspondingly, median deliveries to CVP contractors south of the Delta would fall by approximately 15 percent. These projections are for the more *moderate* climate change period 2035-2064. Under the 2070-2099 period, median deliveries to SWP contractors would decrease by 27 percent and CVP contractors by 31 percent (Hanemann et al., 2006; Chung et al., 2005). Any anticipated or ultimately realized shortfalls would likely be distributed unevenly, in deference to the variability and differences between contractor established water right priorities. The potential implications of such future shortfalls to CVP/SWP contractors can be put into perspective if one considers that in 1991, the CVP cut agricultural deliveries by 75 percent and M&I deliveries by 25 percent. At the same time, the SWP cut M&I deliveries by 70 percent and completely cut all deliveries to agricultural contractors.

The potential effects of climate change on the State’s water resources and some of the expected consequences are presented in Table 7.1-1, created by the California Department of Water Resources (California Department of Water Resources, 2006).

TABLE 7.1-1

POTENTIAL EFFECTS OF CLIMATE CHANGE ON CALIFORNIA'S WATER RESOURCES AND EXPECTED CONSEQUENCES

Potential Water Resource Impact	Expected Consequence
Changes in the timing, intensity, location, amount, and variability of precipitation	• Potential increased storm intensity and increased potential for flooding • Possible increased potential for droughts
Long-term changes in watershed vegetation and increased incidence of wildfires	• Changes in the intensity and timing of runoff • Possible increased incidence of flooding and increased sedimentation
Sea level rise	• Inundation of coastal marshes and estuaries • Increased salinity intrusion into the Sacramento-San Joaquin River Delta • Increased potential for Delta levee failure • Increased potential for salinity intrusion into coastal aquifers (groundwater) • Increased potential for flooding near the mouths of rivers due to backwater effects
Increased water temperatures	• Possible critical effects on listed and endangered aquatic species • Increased environmental water demand for temperature control • Possible increased problems with foreign invasive species in aquatic ecosystems • Potential adverse changes in water quality, including the reduction of dissolved oxygen levels
Changes in urban and agricultural water demand	• Changes in demand patterns and evapotranspiration rates

Source:
1. From Table 3.1. California Department of Water Resources, *Progress on Incorporating Climate Change into Management of California's Water Resources*, Technical Memorandum Report, July 2006.

Additionally, the possible effects of climate change on precipitation in California and its potential consequences are presented in Table 7.1-2 below.

7.2.6. Climate Change Modeling in El Dorado County

With EID, El Dorado County initiated a climate change investigation for its western slope purveyors in 2006 with a focus on analyzing the effects of a prolonged drought. The Shared Vision Model (SVM) was developed that incorporated water purveyor supplies and constraints, future anticipated water demands, and possible long-term climate change effects, taking into account needs and concerns voiced by members of the public. Staff from the El Dorado County Water Agency, El Dorado Irrigation District, Georgetown Divide Public Utility District, Grizzly Flat Community Service District and the City of Placerville also participated as stakeholders in this process.

Under a cooler and drier GCM scenario, available water supplies would be reduced by 11 percent for the El Dorado Irrigation District, 19 percent for Grizzly Flats Community Services District, and by 28 percent for the Georgetown Divide Public Utility District (El Dorado County Water, 2006).

Like all GCM application and forecasting exercises, reliance on a singular scenario has notable risks and must be viewed with caution. Leaving aside the hydrometeorological functions within the model (which have their own confidence limits), other parameters must be set; assumptions for wind speed, storm track vector, changes in ground cover (affecting surface albedo), changes in ground

TABLE 7.1-2

POSSIBLE EFFECTS OF CLIMATE CHANGE ON PRECIPITATION IN CALIFORNIA AND POTENTIAL CONSEQUENCES

Possible Changes in Precipitation	Potential Consequences
Amount	Increased precipitation could benefit water supplies and improve environmental conditions in some areas, especially where water supply diversions have significantly affected streamflow. Increased precipitation could also increase the incidence of flooding, depending on the timing and intensity of precipitation. Decreased precipitation could have serious consequences for water supplies and the environment.
Form	Climate warming is expected to increase minimum snow elevations in California's mountains and cause more precipitation to fall in the form of rain rather than snow. This will result in reductions of annual snowpack and reduce effective water storage for maintaining spring and summer streamflow/water supply diversions. Reductions in snowpack could also negatively affect hydroelectric power generation and flood control operations.
Intensity, Duration, and Timing of Precipitation Events	Increased intensity or duration of precipitation events could increase the frequency and severity of flooding. Decreases could reduce flooding. Climate change could affect the incidence of precipitation events where rain falls on accumulations of snowpack. If the incidence or severity of such events increase, it could have serious flood control and water supply implications.
Variability	Increased variability in annual precipitation could present significant challenges for water managers in meeting water demands and providing flood control. Increased surface storage capacity, operational changes for reservoirs and additional use of groundwater storage could be required. Decreased variability could benefit water management.
Location	Shifts in the annual average distribution of precipitation in the State, due to possible changes in regional circulation patterns or other possible causes, could benefit some regions and negatively affect others. California's major water storage and conveyance systems are located and designed in accordance with the historic distribution of precipitation. Significant shifts in the distribution of precipitation could pose serious water management challenges, jeopardize the effectiveness of the State's existing water supply infrastructure and alter ecosystems.

Source:
1. From: Table 2.3 California Department of Water Resources, *Progress on Incorporating Climate Change into Management of California's Water Resources*, Technical Memorandum Report, July 2006.

roughness (affecting the turbulent exchanges), degree-days, and the gradient for saturation vapor pressure, to name but a few. Moreover, a base hydrological record must be selected upon which these assumptions, collectively representing a climatological *perturbation factor*, must be applied. Depending on the scenario of interest, differing hydrological periods can be selected. In water supply planning, it is common to use historic drought periods (e.g., 1928-1932, 1977, or 1991-1992). The SVM, for example, used the 1977 water year, applied a second identical 1977 (to create a highly conservative boundary condition) and increased overall mean air temperatures.

Numerous combinations of scenario permutations are possible in climate change modeling depending on element of interest. More recently, EID has worked with the Stockholm Environmental

Institute (SEI) in applying the WEAP model, an interactive, user-friendly modeling platform in addressing watershed and hydrological changes. The model is also being used in the IRWMP for the Cosumnes, American, Bear and Yuba rivers (CABY). As previously described, CALSIM II is a system-wide reservoir routing model designed to integrate CVP/SWP operations, including all regulatory controls (e.g., Biological Opinions and water quality provisions). It uses hindcasted hydrology to predict changes in system-wide hydrology resulting from changes to various elements of CVP/SWP operation. WEAP has been used on a smaller scale, has a more physically based runoff logic than CALSIM II, and is intended for completely different purposes than CALSIM II.Its intention, developed originally for watershed planning purposes, is to observe changes in hydrology within a watershed based on user-developed alterations in watershed infrastructure and instream restoration activities.

Some of the possible drought mitigation measures implemented by the various water purveyors would have the following effects (EDCWA 2007 Water Resources Development and Management Plan, Chapter 10: Long-Term Outlook and Recommendations):

- El Dorado Irrigation District could almost completely offset projected 2030 water supply shortfalls under the modeled design drought conditions by, 1) fully utilizing the new CVP water service contract water under this Proposed Action and that identified under the Supplemental Water Supply Project such that 92 percent reliability would be achieved, or, 2) fully utilizing the new CVP water service contract water under this Proposed Action, groundwater banking, and implement the Alder Creek Reservoir Project where, 94 percent would be achieved;
- Georgetown Divide Public Utility District could expect shortfalls in meeting demands about 5 percent of the time with drought conditions being prevalent about 50 percent of the time. These conditions would occur despite a new Rubicon River diversion and fully utilizing the new CVP water service contract water under this Proposed Action; and
- Grizzly Flats Community Services District could almost completely offset projected 2030 shortfalls under the modeled design drought conditions with the use of a 350 TAF off-stream storage reservoir that was 50 percent full at the time of drought onset. This would provide 97.8 percent reliability under the design drought condition assumed by the SVM modeling.

7.2.7. Climate Change Effects on CVP/SWP

As the primary water storage and delivery system in California, the coordinated CVP/SWP represents a critical component within the State's overall water resources management structure. Any potential effects on the hydrology upon which CVP/SWP operation rely will have important implications to virtually all sectors of the California economy.

Effects on CVP/SWP operations are noteworthy in that they represent the third step in a multi-step hydrological assessment process of climate change. As described earlier, the first step involves development of coarse scale GCM generated atmospheric data (e.g., temperature and precipitation); these data are input into watershed snowmelt/runoff models at the regional or sub-regional level. Watershed models, primarily simulated in headwater catchments upstream of CVP/SWP reservoirs provide the inflow data that then can be input into hydrologic routing models (e.g., CALSIM II) for the entire coordinated CVP/SWP system.

Various studies on the effects of climate change on the CVP/SWP and the water dependent resources that rely on its operations have been undertaken. Climate change effects on the salinity of San Francisco Bay (also Sacramento-San Joaquin river system) was investigated by Smith and Tirpak (1989); Central Valley agriculture, by Hanemann et al., (2006); levees and the joint effects of climate change, economic costs, and regional growth by Zhu et al., (2007). Climate induced hydrological changes and their long-term implications to irrigated agriculture (Schlenker et al., 2007), perennial crops (Lobell et al., 2006), and on flood control, hydropower generation, and low flow augmentation at Folsom Reservoir (Carpenter and Georgakakos, 2001) are also included in the literature on CVP/SWP effects resulting from climate change.

A comprehensive study by Lund et al., (2003) using the integrated economic-engineering optimization model of California's inter-tied water system, CALVIN (CALifornia Value Integrated Network), looked at how well the water infrastructure of California could adapt and respond to changes in climate, in the context of higher future populations, changes in land use, and changes in agricultural technology. CALVIN is unconstrained by current day operational rules for the CVP/SWP.

The main conclusions of Lund et al., (2003) are as follows:

1. Methodologically, it is possible, reasonable, and desirable to include a wider range of hydrologic effects, changes in population and water demands, and changes in system operations in impact and adaptation studies of climate change than has been customary. Overall, including such aspects in climate change studies provides more useful and realistic results for policy, planning, and public education purposes.

2. A wide range of climate warming scenarios for California shows significant increases in wet season flows and significant decreases in spring snowmelt. This conclusion, confirming many earlier studies, is made more generally and quantitatively for California's major water sources. The magnitude of the climate's warming effect on water supplies can be comparable to water demand increases from population growth in the coming century.

3. California's water system can adapt to the population growth and climate warming modeled, which are fairly severe. This adaptation will be costly in absolute terms, but, if properly managed, should not threaten the fundamental prosperity of California's economy or society, although it can have major effects on the agricultural sector. The water management costs are a tiny proportion of California's current economy.

4. Agricultural water users in the Central Valley are the most vulnerable to climate warming. While wetter hydrologies could increase water availability for these users, the driest climate warming hydrology would reduce agricultural water deliveries in the Central Valley by about a third. Some losses to the agricultural community in the dry scenario would be

compensated by water sales to urban areas, but much of this loss would be an uncompensated structural change in the agricultural sector.

5. Water use in Southern California is likely to become predominantly urban in this century, with Colorado River agricultural water use being displaced by urban growth and diverted to serve urban uses. This diversion is limited only by conveyance capacity constraints on the Colorado River Aqueduct deliveries of Colorado River water and California Aqueduct deliveries of water from the Central Valley. Given the small proportion of local supplies in southern California, the high willingness-to-pay of urban users for water, and the conveyance-limited nature of water imports, this region is little affected by climate warming. Indeed, even in the dry scenario, Southern California cannot seek additional water imports. Population growth, conveyance limits on imports, and high economic values lead to high use of wastewater reuse and lesser but substantial use of seawater desalination along the coast.

6. Flooding problems could be formidable under some wet warming climate scenarios flood flows indicated by the HCM2100 scenario would be well beyond the control capability of existing, proposed, and probably even plausible reservoir capacities. In such cases, major expansions of downstream floodways and changes in floodplain land uses might become desirable.

7. While adaptation can be successful overall, the challenges are formidable. Even with new technologies for water supply, treatment, and water use efficiency, widespread implementation of water transfers and conjunctive use, coordinated operation of reservoirs, improved flow forecasting, and the close cooperation of local, regional, state, and federal government, the costs will be high and there will be much less "slack" in the system compared to current operations and expectations. The economic implications of water management controversies will be greater, motivating greater intensity in water conflicts, unless management institutions can devise more efficient and flexible mechanisms and configurations for managing water in the coming century.

8. The limitations of this kind of study are considerable, but the qualitative implications seem clear. It behooves us to carefully consider and develop a variety of promising infrastructure, management, and governance options to allow California and other regions to respond more effectively to major challenges of all sorts in the future.

9. Further climate change work on water in California should be expanded from this base to include flood damage costs, sea level rise, other forms of climate change, such as various forms of climate variability, some refinements in hydrologic representation, and some operations model improvements discussed in the report.

10. Tanaka et al., (2006) used this same approach (i.e., a state-wide economic-engineering optimization model of water supply management) and modeled two climate warming scenarios to determine the effects on California's water supply system. The results showed that California's water supply system appears physically capable of adapting to significant changes in climate and population, albeit at a significant cost. Such adaptation would entail

large changes in the operation of California's large groundwater storage capacity, significant transfers of water among water users, and some adoption of new technologies.

The current operations and planning model relied upon by the U.S. Bureau of Reclamation and California Department of Water Resources is CALSIM II (see previous description in Subchapter 5.3.1, CALSIM II Model). Climate change effects on water CVP/SWP water resources using CALSIM II have been undertaken in several studies (California Department of Water Resources, 2006; 2005; 2003a; 2003b; Easton et al., 2006; and Vicuna, 2006). These results corroborate recurring trends; lower summer and late-spring runoff for practically all watersheds, higher mid-winter streamflows, and under the higher emission scenarios, up to 50 percent of the future years would be categorized as critically-dry, relative to the historical record of 18 percent, whereas, under the lower emission scenarios, little or no change in the frequency of critically-dry years would be expected (Vicuna, 2006). Chung et al., (2005) provide prior clarification, noting that while the shift in distribution between wet or above normal water years and dry or critically dry years only changes slightly (shifting towards drier) during the 2035-2064 modeled period, a significant shift towards drier years is modeled for the 2070-2090 period.

Vicuna (2006) goes on to note that reservoir storage levels, water supply deliveries, and variables that can document key environmental parameters in the Bay-Delta and elsewhere, could be used as performance indicators to better gauge the effects of climate change on California’s water resource system.

Modeling of potential climate change effects in the Sacramento-San Joaquin River basin showed that progressive reductions in winter, spring, and summer streamflow were less severe in the northern part of the Central Valley than in the south. In the south (i.e., south of Delta), a distinct seasonality shift in streamflows was apparent. Results from the water resources system model indicated that achieving and maintaining status quo (control scenario climate), system performance in the future would be nearly impossible, given the altered climate scenario hydrologies. The most comprehensive of the mitigation alternatives examined, satisfied only 87–96 percent of environmental targets in the Sacramento system, and less than 80 percent in the San Joaquin system. Van Rheenen et al., (2004) concluded that demand modification and system infrastructure improvements will be required to account for the volumetric and temporal shifts in flows predicted to occur with future climates in the Sacramento–San Joaquin River basins.

In 2006, the California Department of Water Resources (2006) completed a climate change study using CALSIM II. Streamflows were generated using the University of Santa Clara developed, macro-scale hydrologic model, Variable Infiltration Capacity (VIC) model for watershed runoff. VIC converted the GCM precipitation data into runoff data at a 1/8th degree grid (quite large for watershed-level studies, but appropriate for macro-scale analyses). Both rainfall and snowmelt runoff were represented in this model. The runoff data was further processed to produce regional scale streamflow data centered on the following locations:

- Smith River at Jedediah Smith State Park
- Sacramento River at Shasta Reservoir

- Feather River at Oroville Reservoir
- Yuba River
- North Fork American River
- American River at Folsom Reservoir
- Stanislaus River at New Melones Reservoir
- Tuolumne River at New Don Pedro Reservoir
- Merced River at Lake McClure
- Kings River at Pine Flat Reservoir

While streamflow data were available, the regional scale of the data was still too coarse for direct CALSIM II input. Miller, et al., (2003) has used perturbation ratios to transfer regional scale climate change behavior to local scale historic data. This technique was used to transfer average climate change effects observed in VIC regional runoff to historic CALSIM II reservoir inflows.

The projected time references were selected – 1976 and 2050 respectively. VIC monthly streamflows were averaged around these years. To adequately represent the effects of climate change, the period of average was thirty years - a recognized climatological time-scale – centered on the reference year; 1976 average monthly streamflows were calculated using the 1961-1990 VIC data, and 2050 average monthly streamflows were calculated using the 2035-2064 VIC data. Finally, perturbation ratios were calculated by dividing the 2050 VIC average monthly streamflows by their respective 1976 VIC average monthly streamflows. The climate change perturbations generally resulted in higher flows in the winter and lower in the spring and early summer as expected.

Current research has alluded to some interesting findings. As with any scientific endeavor, while the results of an investigation are important, its future recommendations are just as valuable. The California Department of Water Resources (2005) has identified some areas of interest for future research, including:

- the accuracy of forecasts for higher elevation watersheds,
- the statistical correlation between snowpack and forecast accuracy,
- the difference in the range of forecasts between higher elevation watersheds and lower elevation watersheds,
- the faster and more uniform convergence of forecasts for higher elevation watersheds as compared to those for lower elevation watersheds, and
- the discrepancy in the 50 percent exceedance forecasts, which show that these forecasts tend to slightly underestimate actual deliveries for higher elevation watersheds and overestimate deliveries for lower elevation watersheds.

As part of its evaluation in the Biological Assessment for the CVP-OCAP, Reclamation has more recently conducted an analysis of the potential implications of climate change for the CVP and SWP that was intended to examine the sensitivity of CVP/SWP operations and system conditions to a range of future climate conditions. A detailed explanation of the methodology and assumptions is provided in Appendix R to the Biological Assessment; *Sensitivity of Future CVP/SWP Operations to Potential Climate Change and Associated Sea Level Rise*. The description and summary that follows is the most current summarization available; it is taken from the *Draft Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations and Criteria Plan*, by NOAA Fisheries, dated December 11, 2008.

The study develops four climate change scenarios intended to bookend the range of possibilities arising from available climate projection information. The bookends span the range of outcomes developed under the assumptions of the future cumulative condition with respect to two variables: precipitation and temperature. All four scenarios are based on the assumptions, derived from published sources, that sea level will rise approximately 30 cm by 2030, and that the tidal range will increase by 10 percent. Since this evaluation was implemented for the CVP-OCAP Biological Assessment, it was designed to address the possibility that changes in habitat and entrainment rates might affect listed salmonids and green sturgeon under possible change scenarios. Four climate change scenarios were used and this evaluation consisted of six separate model runs. These runs were:

Study 9.0 Baseline conditions without sea level rise (SLR). Conditions are based on Study 8 but with only D1641 regulatory constraints.

Study 9.1 Baseline conditions with 1 foot SLR.

Study 9.2 Climate projection #1 “Wetter, less warming” climate with SLR.

Study 9.3 Climate projection #2 “Wetter, more warming” climate with SLR.

Study 9.4 Climate projection #3 “Drier, less warming” climate with SLR.

Study 9.5 Climate projection #4 “Drier, more warming with SLR.

The purpose of Study 9.1 is to convey information on the impact of SLR on the future of OCAP operations before addressing climate change scenarios.

The general results of the models indicate that future warming is expected to cause a greater fraction of the annual runoff from the Central Valley watersheds to occur during winter and early spring and a reduced fraction of the annual runoff to occur during late spring and summer. This reflects the predicted change from less snowmelt derived runoff to greater precipitation driven runoff in the region’s watersheds, particularly those watersheds originating in lower elevations (*i.e.*, northern Sierra and Cascade mountain ranges) and is consistent with other studies. The climate change models predict that factors affecting the annual precipitation levels, rather than changes in air temperature, would have a greater effect on annual runoff. The models also predicted that changes in the mean-annual deliveries and carryover storage were more sensitive to the annual precipitation changes than the changes in air temperature. SLR created greater salinity intrusion into the western delta which created significant decreases in the amount of CVP and SWP deliveries. Although the salinity intrusion created more variability in the X2 position, this intrusion was mitigated in the “wetter” scenarios by increased upstream runoff and delta outflow.

The climate modeling for the four different combinations of air temperature and precipitation indicated that for the “wetter” climates (Studies 9.2 and 9.3), the frequency of “wet” hydrological years increased over the baseline conditions, while dry and critically dry years were reduced. Hydrologic year types classified as above normal increased marginally over the baseline conditions, while years classified as below normal were essentially unchanged. Conversely, the climate models for drier climates (Studies 9.4 and 9.5) showed a substantial decrease in “wet” years and a substantial increase in “critically dry” years. Above normal year types were slightly more frequent in the drier climate scenarios than in the baseline conditions, while below normal year types were significantly lower in the drier, less warming climates compared to the control baseline.

The results from the climate modeling show that climate change typically had more effect on Delta flows during wetter years than during drier years. This result seems related to how CVP and SWP operations occur with more flexibility during wet years, within the constraints of flood control requirements, compared to drier years when the CVP and SWP operations may be more frequently constrained to maintain in-stream flows and other environmental objectives. For key locations in the Delta, the following results were apparent:

Head of Old River Flows

- Remained positive (oceanward) for all scenarios
- Decreased in winter and spring of wetter years for the drier climate change scenarios (Studies 9.4 and 9.5)
- Increased in winter of wetter years for the wetter climate change scenarios (Studies 9.2 and 9.3)
- Changes were minor during drier years for all climate change scenarios

Old and Middle River Flows

- Flows were typically negative (landward) except for a flow reversal in winter of wetter years for the wetter, less warming scenario (Study 9.2)
- Fall and winter flows are the most sensitive to climate change
- Negative winter flows decreased for the wetter scenarios and increased for the drier scenarios
- Negative fall flows increased for the wetter scenarios and decreased for the drier scenarios

QWEST Flows [westward flows from the Delta towards the ocean]

- Magnitude and direction of QWEST is affected by climate change scenario and season
- Flow direction is typically positive during wetter water years except for summer

  - for the drier climate change scenarios always positive in the spring
  - typically negative in the summer of drier years except for the drier, more warming scenario
  - positive in the fall of drier years for the drier climate change scenarios and negative in fall of drier years for the wetter climate change scenarios
- Winter flows are the most sensitive to climate change and response varies by scenario

Cross Delta Flows

- Winter flows were the most sensitive to climate change, flows decreased for the drier climate scenarios and increased for the wetter climate scenarios
- Results show that climate change typically had more effect on Delta velocities during wetter years than during drier years. This result is consistent with the Delta flow results

Head of Old River Velocities

- Are positive (oceanward) for all scenarios
- Increased in winter and spring of wet years for the wetter climate change scenarios
- Decreased in winter and spring of wet years for the drier climate change scenarios
- Changes were typically less than 0.05ft/s during drier years for all climate change scenarios

Middle River at Middle River Velocities

- Are negative (landward) for all scenarios except for a slight reverse flow in winter of the wetter, less warming scenario
- During wetter years, negative winter velocities decreased for the wetter climate change scenarios and increased for the drier climate change scenarios
- Changes were typically less than 0.05ft/s for drier climate change scenarios

San Joaquin River at Blind Point Velocities

- Are positive (oceanward) for all scenarios
- Changes were typically less than 0.05ft/s

Cross Delta Velocities (Georgiana Slough)

- Are positive (oceanward) for all scenarios
- Increased in winter for the wetter climate change scenarios and decreased in winter for the drier climate change scenarios

The fall and winter periods appear to have the most sensitivity to climate changes. In general, the pattern of study results suggests that OMR flow during January through June becomes more negative during dry years in the drier/less warming and drier/more warming scenarios, but with some substantial changes that are mostly either an increase in negative flow or a decrease in positive flow compared to the other scenarios. In other words, in the drier climate change scenarios, it is expected that fish in the channels surrounding the CVP and SWP projects will be exposed to higher entrainment risks during the January through June time frame than under projected future conditions without climate change.

Wetter climate patterns appear to present less entrainment risk during the January through June period in wet and above normal water year types, but elevated risks during the below normal, dry and critically dry water year types. The late fall period (October through December) also had consistently higher risks of entrainment in the wetter climate scenarios than the base case modeled in Study 9.0 for the future climate change models.

Table 7.1-3 shows the modeled trends for average changes in flow for the simulated climate change scenarios, relative to the base case. Trends and flow directions are based on 50 percent values with tends rounded to nearest 250 cfs. No shading (white) indicates locations with positive (oceanward) flows. Dark shading (blue) indicates locations with negative (landward) flows. Light shading (yellow) indicates locations with mixed flow regimes (sometimes positive and sometimes negative). Seasons are defined as winter is Jan-Mar, spring is Apr-Jun, summer is Jul-Sep, and fall is Oct-Dec. Wetter year types are those classified as wet or above normal. Drier year types are those classified as below normal, dry or critically dry.

TABLE 7.1-3

TRENDS FOR AVERAGE CHANGES IN FLOW FOR CLIMATE CHANGE SCENARIOS RELATIVE TO THE BASE CASE

Name	Year Type	Wetter, Less Warming	Wetter, More Warming	Drier, Less Warming	Drier, More Warming
		Flow	Flow	Flow	Flow
Head of Old River	Wetter	Increased by 1750cfs in spring, 1000cfs in summer, 250cfs in fall, and 750cfs in winter	Increased by 500cfs in winter, decreased by 1500cfs in spring, decreases were less than 250cfs in summer and fall	Decreased by 3500cfs in winter and spring, and decreased by 250cfs in summer and fall	Decreased by 2750cfs in winter and 3000cfs in spring, decreases were less than 250cfs in summer and fall
	Drier	Changes were less than 250cfs	Changes were less than 250cfs	Changes were less than 250cfs	Changes were less than 250cfs
	Wetter	In winter flows changed from negative 3200cfs (landward) to positive 100cfs (oceanward). The rest of the year, negative (landward) flows decreased by 750cfs in spring, 250cfs in summer, and increased by 500cfs in fall	Negative (landward) flows decreased by 2500cfs in winter, 750cfs in spring, and 250cfs in summer. Negative flows increased by 750cfs in fall.	Negative (landward) flows increased by 3250cfs in winter, 500cfs in spring and 1000cfs in summer. Negative flows decreased by 500cfs in fall.	Negative (landward) flows increased by 1250cfs in winter. Negative flows decreased by 250cfs in spring and by 1750cfs in fall. Summer flow changes were less than 250cfs.

TABLE 7.1-3

TRENDS FOR AVERAGE CHANGES IN FLOW FOR CLIMATE CHANGE SCENARIOS RELATIVE TO THE BASE CASE

Name	Year Type	Wetter, Less Warming	Wetter, More Warming	Drier, Less Warming	Drier, More Warming
		Flow	Flow	Flow	Flow
	Drier	Negative (landward) flows increased by less than 250cfs in winter, 750cfs in spring, 1000cfs in summer and 1750cfs in fall.	Negative (landward) flows increased by 500cfs in winter, spring, fall, and 750cfs in summer.	Changes were less than 250cfs in spring and fall. Negative (landward) flows decreased by 750cfs in summer and increased by 500cfs in winter.	Negative (landward) flows decreased by 250cfs in winter, 500cfs in spring, 1000cfs in summer and 750cfs in fall
QWEST	Wetter	Increased by 4000cfs in winter, 3000cfs in spring, 1500cfs in summer and 500cfs in fall	Increased by 3750cfs in winter, changes were less than 250cfs in spring, increased by 250cfs in summer, and decreased by 500cfs in fall	Positive (oceanward) flows decreased by 6500cfs in winter, 1750cfs in spring, 750cfs in summer, and 250cfs in winter.	Positive (oceanward) flows decreased by 4250cfs in winter and 1250cfs in spring, 250cfs in summer. Positive fall flows increased by 250cfs.
	Drier	Negative (landward) winter flows of 0cfs changed to positive (oceanward) flows of 400cfs. Positive spring flows increased by 250cfs. Summer flow changes were less than 250cfs. Positive flows of 200 fall flows changed to negative flow of 300cfs.	Changes were less than 250cfs	Flow changes were less than 250cfs in winter. Positive flows increased by 250cfs in spring and fall, 750cfs in summer.	Flow changes were less than 250cfs in winter. Positive (oceanward) flows increased by 750cfs in spring, summer, and fall.
Cross Delta	Wetter	Increased by 1000cfs in winter, decreased by 250cfs in spring and summer, changes were less than 250cfs in fall	Increased by 2000cfs in winter, 750cfs in spring, and decreased by 750cfs in summer and 500cfs in fall	Decreased by 1250cfs in winter, 500cfs spring and fall, increased by 250cfs in summer	Decreased by 2250cfs in winter, 500cfs in spring, 250cfs in summer and 1000cfs in fall
	Drier	Increased by 250cfs in winter and summer, 750cfs in fall, changes were less than 250cfs in spring	Increased by 500cfs in winter, 250cfs in fall, changes were less than 250cfs in spring and summer	Decreased by 250cfs in winter, summer and fall, decreased by 500cfs in spring	Decreased by less than 500cfs in winter, spring and fall, decreased by 750cfs in summer

Notes: No shading (white) indicates locations with positive (oceanward) flows. Dark shading (blue) indicates locations with negative (landward) flows. Light shading (yellow) indicates locations with mixed flow regimes (sometimes positive and sometimes negative).

Source: From Table 6-21. Trends for Average Changes in Flow for Climate Change Scenarios Relative to the Base Case, Draft Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations and Criteria Plan, NOAA Fisheries, December 11, 2008.

From a fisheries perspective in the Sacramento River, NOAA Fisheries reported that in comparing climate change scenarios (Study 9.0 base vs Study 9.5 drier, more warming) average winter-run and fall-run mortality increased from 15 percent to 25 percent, and average spring-run mortality increases from 20 percent to 55 percent. Reclamation's mortality model was not run for Central Valley steelhead. However, if late-fall run Chinook salmon is used as a surrogate for Central Valley steelhead (since they spawn at similar times in the winter), late-fall mortality increases in Study 9.5 (drier, more warming) and Study 9.3 (wetter, more warming) under all water year types on average 4 percent over baseline (Study 9.0).

September carryover storage is less than 1.9 MAF during average dry years (1928 to 1934) in all scenarios except Study 9.2 wetter, less warming. Under these conditions, winter-run and spring-run would experience a loss of spawning habitat as water temperatures below dams become harder to control and the coldwater pool in Shasta diminishes. Central Valley steelhead would experience less of a loss on the Sacramento River since they spawn in the late winter when water temperatures are not as critical to incubation. However, resident forms of *O. mykiss* spawn in May when water temperatures exceed 56ºF at Bend Bridge in 25 percent of future water years. It is likely that given warmer water temperatures resident *O. mykiss* would move upstream closer to Keswick Dam where temperatures are cooler, or into smaller tributaries like Clear Creek.

Water temperatures in the Sacramento River at Balls Ferry increase under all climate change scenarios except for Study 9.2 (wetter, less warming). Temperatures exceed the 56ºF objective at Balls Ferry in July, August, September, and October. The highest water temperatures approach 60ºF in September in Study 9.5 (drier, more warming), which is when spring-run salmon begin spawning.

The climate change scenarios do not incorporate day-to-day adaptive management decisions. Given the current prioritization of using cold water first for winter-run salmon during the summer, it would be logical to assume that spring-run and fall-run would experience greater impacts then those modeled. In order to overcome the impacts of climate change, NOAA Fisheries concluded that new operating criteria needs to be developed that allows for greater storage of water earlier in the year. This would involve the cooperation of the U.S. Corps of Engineers in developing new flood control curves and integration with State and federal reservoirs. DWR has recommended investigating the feasibility of fish passage over dams to access colder water at higher elevations.

7.2.8. Uncertainties in Future Climate Change Projections

Previous discussions have touched on this issue. Clearly, there has been an increasingly robust effort directed towards investigating the potential effects of climate change over the past several decades. Yet even today, there is continuing investigative work being undertaken to better understand atmospheric processes that govern the interactions and relationships between GHG (both natural and human-induced) and our climate. Some of this work has pointed to possible shortcomings in past GCM development theories. Work by Schwartz and Andrea (1996) and, more recently, by Kerr (2007) have noted the seeming omission of aerosols in the consideration of GCM simulations. Most GCMs also focus exclusively on the troposphere (up to 10 km in altitude) but neglect the stratosphere (between 10 and 50 km) which supports the critical ozone layer. The ozone layer is particularly important in any assessment of climate change in that it affects the energy balance of the lower atmosphere (Baldwin, et al., 2007). In fact, there is admittedly a less than perfect understanding of the mechanisms by which stratospheric circulation changes are communicated with the surface. This is important since any long-term changes in stratospheric winds and temperatures are likely to affect surface climate variability (Baldwin et al., 2007). Still other investigations have noted that while GCMs provide a solid basis for generalized temperature prediction, projected precipitation levels do not necessarily match with projected future atmospheric moisture modeling (Wentz et al., 2007) – as has been noted previously.

Some of the countervailing evidence has included the fact that the stratosphere has in fact cooled since 1979, the year in which the Montreal Protocol was ratified (WMO/UNEP 2007). The Montreal Protocol was signed in an effort to control aerosol emissions to the upper atmosphere. Consequently, other documentation has identified an overall cooling in the upper atmosphere in the high latitudes, over the polar region. One can hope that as climate change research continues, sensitivity will be encouraged in how these results are conveyed. It is important that we strive to avoid coming to hard and fast conclusions based solely on what Huntingford and Lowe (2007) refer to as “overshooting scenarios”. Caution must be continually exercised when applying what we know today and assuming that it is universal and unconstrained.

Others maintain, however, that the complexity of the climate system, its influencing factors, and the delicate balance that exists, in fact, warrants an <u>overly</u> cautious approach. There may exist fine, though as yet undefined, thresholds which, once crossed, can not be reversed. This is what Schellnhuber et al., (2006) refer to as “dangerous climate change”. The balance of taking action now compared to the future, although uncertain of the consequences of no action, is an area of active and increasing debate (see Stern, 2007). Still, with climate change research at the forefront of many hydrometeorological disciplines and pursuits and, propelled by the public’s ever increasing concern over this issue, we can expect even more studies in the future focusing on the various limitations, boundary conditions, drivers, and interactive processes that define climate change. Fewer and fewer studies will be drawn to testing countervailing hypotheses.

In the midst of our uncertainties, however, current climate change modeling projections exhibit some key commonalities that demand near-term attention from California’s resource management communities. First, even the most benign of the projected climate-change scenarios are sufficient to significantly alter the California’s landscape, hydrology, and land and water resources. Second, those alterations are likely to become significant within roughly the next 25 years (Barnett et al. 2004; Dettinger et al. 2004; van Rheenen et al. 2004). Thus, California, like the rest of society, is faced with a variety of possible climate changes that are likely to develop within the same time frames as the resource-management decisions necessary to respond to them. In fact, even if we are able to reduce emissions of GHGs locally at their source, further changes in the climate that we will experience are unavoidable.

The Pew Center (2007) maintains that action is needed now in order to adapt to the changes that will be apparent as the climate continues to change. Most projections of future climate change do not address what could happen if changes (e.g., warming) continues beyond 2100, which is inevitable if steps to reduce emissions (worldwide) are not taken, or if the rate of change accelerates. Furthermore, the longer warming persists and the greater its magnitude, the greater the risk of climate “surprises” such as abrupt or catastrophic changes in the global climate (Pew Center, 2007; Schellnhuber et al., 2006).

7.2.9. Climate Change Management Implications

To date, technical responses to this dilemma of how to best manage for climate change has primarily involved the development and preliminary applications of tools for assessing the potential climate-change impacts. The efficacy of various possible adaptation or accommodation strategies has not received as much attention as the tools developed to define the problem. In part, this response has been motivated by the assumption that projection uncertainties will be reduced sufficiently in the near term to justify postponing more intensive and detailed assessments until later. A comprehensive overview of GHG and climate change relationships along with cost-effective control technologies and the issues related to their implementation is provided by CALEPA (2004). Bosello et al., (2007) describe the economic effects of climate change in this future context. Cox and Stephenson (2007) discuss the role of mitigation banking credits.

The projected changes to our environment include sufficiently important near-term impacts, and the chances that projection uncertainties will decline precipitously in the near term are small enough, so that delays may not be warranted. For example, two highly respected climate modelers, David Randall and Akio Arakawa, recently opined that "*a sober assessment suggests that with current approaches the cloud parameterization problem [the most vexing aspect of climate and climate-change modeling at present] will not be 'solved' in any of our lifetimes*" (Randall et al. 2003). Thus, we should not assume that large reductions of projection uncertainty will arrive in time to allow confident planning of responses to climate change. Consequently, new strategies for more completely accommodating projection uncertainties are needed (Dettinger, 2005).

There has been long-standing acknowledgment that policy decisions, in some capacity, will have to address climate change (Dowlatabadi and Morgan, 1993; Jackson 1995), yet even as early as the late 1980's, at least a few researchers were becoming aware of the challenges for water managers to account for climate change within traditional management approaches. The dynamic qualities of maturing water systems, socially imposed constraints, and climate extremes made this unique for its time. A dual pattern of crisis/response and gradual adjustment emerges, and specific mechanisms for effecting adjustment of water management systems are being identified. The broader trends in U.S. and California water development, suggest that oversized structural capacity, the traditional adjustment to climate variability in water resources, may prove less feasible in the future as projects become smaller and new facilities are delayed by economic and environmental concerns (Riebsame, 1988). In light of these uncertainties, policy-makers should consider expanding research into abrupt climate change, improving monitoring systems, and taking actions designed to enhance the adaptability and resilience of ecosystems and economies (Alley et al., 2003).

As noted by Chalecki and Gleick at the turn of this century, while considerable progress had been made in the modeling of climate change effects on first-order systems such as regional hydrology, significant work remained to be done in understanding subsequent effects on the second-, third-, and fourth-order economic and social systems (e.g., agriculture, trade balance, and national economic development) that are affected by water resources. They go on; however, to maintain that in order to remedy a recently-revealed lack of understanding about climate change on the part of the public, climate and water scientists should collaborate with social scientists (Chalecki and Gleick, 1999). It was deemed important to illuminate the effects of climate change and variability on a variety of systems that affect how and where most people live. So, while the effects of climate change on water resources, for example, are noteworthy, rising water demands resulting from anticipated future population growth, greatly outweighs any climate warming in defining the state of global water systems to 2025 (Vorosmarty et al., 2003).

Finally, with the global changing socio-political environment, climate change should also be looked at within the context of future national security issues. Potential increases in violence and disruption stemming from the stresses created by abrupt changes in the climate pose a different type of threat to national security than we are accustomed to today. Military confrontation may be triggered by a desperate need for natural resources such as energy, food and water rather than by conflicts over ideology, religion, or national honor. The shifting motivation for confrontation would alter which countries are most vulnerable and the existing warning signs for security threats (Schwartz and Randall, 2003).

7.2.10. California Actions

On June 1, 2005, Governor Arnold Schwarzenegger issued Executive Order S-3-05 establishing GHG emissions targets for California and requiring biennial reports on potential climate change effects on several areas, including water resources. The Governor established a Climate Action Team (CAT) to guide the reporting efforts. The CAT selected four climate change scenarios that reflect two GHG emissions scenarios represented by two Global Climate Models (GCMs). The CAT requested that those four climate change scenarios be used whenever possible in the climate change reporting efforts.

As September 2006 drew to a close, Governor Schwarzenegger signed three pieces of legislation intended to reduce overall California GHG emissions. Governor Schwarzenegger signed the most comprehensive of the new laws, the landmark Global Warming Solutions Act (AB 32) on September 27. This law caps the State's GHG emissions at 1990 levels by 2020. This emissions target is approximately equal to a 25 percent reduction from current levels and is the first state-wide program in the country to mandate an economy-wide emissions cap that includes enforceable penalties.

AB 32 requires the State Air Resources Board to establish a program for state-wide GHG emissions reporting and to monitor and enforce compliance with this program. It also authorizes the State board to adopt market-based compliance mechanisms including emissions cap-and-trade, and allows a one-year extension of the targets under extraordinary circumstances. Two days later, on September 29, Governor Schwarzenegger signed SB 1368, authored by State Senator Don Perata. This new law directs the California Energy Commission to set a GHG performance standard for electricity procured by local publicly owned utilities, whether it is generated within state borders or imported from plants in other states, and will apply to all new long-term electricity contracts. The standard will discourage the purchasing of electricity produced from high-emissions sources, whether in-state or out-of-state. It will push utilities to rely more on clean sources, including coal with carbon capture and sequestration, and renewables.

Earlier that same week, on September 26, Governor Schwarzenegger signed SB 107, which requires California's three major utilities – Pacific Gas & Electric, Southern Edison, and San Diego Gas & Electric – to produce at least 20 percent of their electricity using renewable sources by 2010.

On January 9, 2007, Governor Schwarzenegger pledged that he would establish the world's first Low Carbon Fuel Standard (LCFS). It will apply to all transportation fuels sold in California, with the goal of reducing the carbon intensity of California's passenger vehicle fuels at least 10 percent by 2020. The LCFS includes provisions for market-based mechanisms, such as carbon credit trading that will allow fuel providers to meet the new requirements in the most cost-effective manner. The standard is expected to substitute low-carbon fuels for up to 20 percent of current vehicle gasoline consumption and greatly expand the number of alternative and hybrid vehicles in California.

California Energy Commission

The California Energy Commission (CEC) develops and implements both building and appliance energy efficiency standards, prepares California's GHG inventory, develops transportation fuel policy and programs, and manages climate change research programs. In conjunction with the California Public Utility Commission, the CEC also coordinates the Renewable Portfolio Standard and a variety of energy efficiency programs.

A significant program undertaken by the CEC is its Public Interest Energy Research (PIER) Program. It is intended to support public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

Under the PIER Program, up to $62 million are awarded annual for the most promising public interest energy research. This is facilitated through partnerships with various research and development organizations, including individuals, businesses, utilities, and public or private research institutions.

The California Climate Change Center (CCCC) is sponsored by the PIER Program and coordinated by one of its Energy-Related Environmental Research areas:

- Buildings End-Use Energy Efficiency
- Energy-Related Environmental Research
- Energy Systems Integration
- Environmentally Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies

The Center is managed by the CEC, Scripps Institution of Oceanography at the University of California at San Diego, and the University of California at Berkeley. The Scripps Institution of Oceanography conducts and administers research on climate change detection, analysis, and modeling; and the University of California at Berkeley conducts and administers research on economic analysis and policy issues. The Center also supports the Global Climate Change Grant Program, which offers competitive solicitations for climate research.

California Public Utilities Commission

In addition to coordinating with the CEC on energy efficiency programs and the Renewable Portfolio Standard, the California Public Utilities Commission (CPUC) requested that its regulated energy utilities address key issues pertaining to climate change. The CPUC requires regulated utilities to employ a “greenhouse gas adder” when evaluating competitive bids to supply energy. This adder is designed to capture the financial risk of emitting GHGs. The CPUC is also investigating the creation of a “carbon cap” on each regulated facility.

California Climate Change Registry

The Registry is a public/private partnership created by the State of California to encourage companies, governmental agencies and other organizations that do business in California to voluntarily measure and report their GHG emissions. To date, Registry has over 45 members including all major utilities, a number of California companies, cities, government entities and non-governmental organizations.

Sustainable Silicon Valley

The group of Silicon Valley manufacturers, including ALZA, Calpine Hewlett-Packard, Lifescan, Lockheed, Oracle, and PG&E, has pledged to reduce GHG emissions in Santa Clara County to 20 percent below 1990 levels by 2010.

California Cities

The Cities for Climate Protection Campaign goal is to reduce GHG emissions resulting the burning of fossil fuels and other human activities. Over 25 California cities have joined the campaign including Los Angeles, Sacramento, San Francisco and Chula Vista.

7.2.11. U.S. Support and Progress

In the future, the U.S., together with other international partners will need to continue our aggressive pursuit at addressing and filling-in both the technical gaps (i.e., physical sciences) as well as the social implications (i.e., impacts on the natural, social, cultural, and financial environments) of climate change. Clearly, this will continue to be multi-faceted endeavor; bringing together all aspects of our national and international societies. Notwithstanding these pressing needs, the National Academies’ National Research Council (NRC) have recently expressed serious concern about the management, funding and emphasis of the $1.7 billion-a-year Climate Change Science Program (CCSP) here in the U.S. To date, only two of the 21 synthesis and assessment reports due from the CCSP have been produced. According to the CCSP Chair, the program has demonstrated only “limited success” in assessing climate change impacts on human well-being and their adaptive capacities. More effort is needed to support both the modeling spatiality issues as well as the social science studies necessary to gauge human adaptive change.

7.2.12. Potential Effects of the Proposed Action on Climate Change

Much has been written about the potential effects of climate change on a variety of natural and human-related resources including those specific to California. The previous discussions focus on this particular aspect of the climate change issue. Equally important, however, are the potential effects of projects and human activities, either specifically, or collectively, on climate change. As a potential indirect impact on the "environment", such a discussion is noteworthy in the context of this EIS/EIR.

Water diversion projects, *per se*, have virtually no direct effect on *climate change*, as it has been defined in this subchapter. Even a potentially large water diversion project with the capability of significantly depleting a reservoir will have no discernible direct effect on regional changes in climate. This is because climate change is driven primarily by the net radiative energy balance of the atmospheric layers (e.g., troposphere and stratosphere), whose interactive processes are unaffected by the singular action of diverting water at the ground surface. Assuming that a residual water supply remains in the waterbody after diversion, the continued presence of ongoing exchange mechanisms (e.g., gradient of saturated vapor pressure) between the water surface and atmosphere will remain. By all of the atmospheric, hydroclimatological and climatological processes known and accepted, water diversions, in and of themselves, cannot affect global climatic forcings.

For this Proposed Action, a 15,000 AFA maximum diversion from Folsom Reservoir or, from points upstream, will have no direct measurable effect on local climate.

The energy balance in the atmosphere controls, interacts, and manifests itself with other meteorological, hydrological, biological, vegetative, and pedological processes at the surface. This fact, as discussed at length earlier in this subchapter is the driving mechanism by which climate change effects on natural systems can be investigated. Climate, as defined, is a system involving the oceans, land, atmosphere and continental ice sheets with interfacial fluxes between these components (National Research Council, 2005). It must include and consider, therefore, these other physical processes. In the example provided, a water diversion, while depleting the overall storage within a waterbody cannot, by itself, alter the exchange mechanisms between the water surface and the atmosphere. The gradient of saturated vapor pressure exists prior to, during, and after diversions.

However, when considering the matter of the *indirect* effects of water diversion projects on climate, the issue becomes more intriguing and certainly not as clear. As an action that can been viewed as accommodating approved growth (i.e., development, urbanization, land clearing, etc.), the indirect effects of water diversions can be *tied,* at least in some manner, to a variety of land activities to which it serves. These can include:

- Removal of vegetation (land conversions)
- Soil disturbance
- New highways, roads, and parking lots
- Commercial/retail development

- Residential development
- Recreational facilities
- Industrial development
- Institutional development

These activities can, by their influence on the net radiative energy balance and the exchange mechanisms with the overlying atmosphere, have a collective effect on climate in varying degrees. In El Dorado County, each of these land uses are controlled, for the most part, by the Community and Development Department of El Dorado County as part, and through its standard land use designation and project approval processes. The El Dorado County Water Agency, El Dorado Irrigation District, or the Georgetown Divide Public Utility District, do not control, direct, propose, or otherwise influence large scale land use changes associated with development. In the case of the two purveyors, individually small infrastructure facility projects are periodically constructed, but in terms of land area conversions, these are insignificant, relative to county and city approved development initiatives.

As land uses change, the physical processes between the land and atmosphere (e.g., evaporation, sensible heat exchange, latent heat exchange) will change. This is largely due to changing net radiation at the surface (i.e., solar shortwave reflectivity), surface roughness, moisture availability, and momentum uptake. Different surfaces also emit longwave radiation in varying amounts as per the Stefan-Boltzmann law. With land use changes, the entire net radiative energy balance is altered.

Land use changes (e.g., clearing land for logging, ranching, and agriculture), lead to varying amounts of carbon dioxide emissions, depending on the intensity of the land use change. Vegetation contains carbon that is released as carbon dioxide when the vegetation decays or burns. Under natural regeneration, lost vegetation would normally be replaced by re-growth with little or no net emission of carbon dioxide, however, over the past several hundred years, deforestation and other land use changes in many countries have contributed substantially to atmospheric carbon dioxide increases. Land use changes are responsible for 15 to 20 percent of current carbon dioxide emissions.

Methane (natural gas) is the second most important of the GHGs resulting from human activities. It is produced by rice cultivation, cattle and sheep ranching, and by decaying material in landfills. Methane is also emitted during coal mining and oil drilling, and by leaky gas pipelines. Human activities have increased the concentration of methane in the atmosphere by about 145 percent above what would be present naturally.

Nitrous oxide is produced by various agricultural and industrial practices. Human activities it is estimated have increased the concentration of nitrous oxide in the atmosphere by about 15 percent above what would be present naturally.

Chlorofluorocarbons (CFCs) have been used in refrigeration, air conditioning, and as solvents. However, the production of these gases is being eliminated under existing international agreements (i.e., Montreal Protocol), rationalized because of their effect on the stratospheric ozone layer. Other fluorocarbons that are also GHGs are being used as substitutes for CFCs in some applications, for example in refrigeration and air conditioning. Although currently very small, their contributions to climate change are expected to rise in the future.

Ozone in the troposphere is another important GHG resulting from industrial activities. It is, however, also created naturally and also by reactions in the atmosphere involving gases resulting from human activities, including nitrogen oxides from motor vehicles and power plants. Based on current data, tropospheric ozone is an important contributor to an enhanced greenhouse effect. However, in part because ozone is also produced naturally, and because of its relatively short atmospheric lifetime, the magnitude of this contribution remains uncertain.

The most dramatic of the human activities in terms of being the largest contributor to GHGs is the burning of fossil fuels. Of that category of emissions, those generated from fossil fuel run automobiles and other vehicles represent the most significant contribution. It is estimated that in California, approximately 41 percent of the GHG emissions result from transportation (see Rio Del Oro Specific Plan, DEIS/DEIR). Together, the burning of fossil fuels and land use changes, have increased the abundance of small airborne particles in the atmosphere. These particles can change the amount of energy that is absorbed and reflected by the atmosphere; and hence, the net radiative energy balance. Particulates are also believed to modify the properties of clouds, changing the amount of energy that they absorb and reflect.

It is evident that changes in land use and land cover are important contributors to climate change and variability. Reconstructions of past land-cover changes and projections of possible future land-cover changes are needed to better understand past climate changes and to more accurately project possible future climate changes. Additionally, changes in land use and land cover can affect ecosystems, biodiversity, and the many important goods and services they provide to society, including carbon sequestration. Land-cover characteristics, therefore, are important inputs to climate models.

Determining the effects of land-use and land-cover change on the Earth’s ecosystems depends on an understanding of past land-use practices, current land-use and land-cover patterns, and projections of future land use and cover, as affected by human activities, population size and distribution, economic development, technology, and other factors.

Dietz et al. (2001) provide a compelling argument regarding growth of the human population and consumption as a principal factor affecting climate change. Their findings suggest the impact of these two environmental stressors is so profound that they may, in fact, outpace any potential environmental benefits from industrial modernization and improving technologies. Through the creation of a research program called STIRPAT, a highly refined way of systematically and empirically assessing the human-generated factors that drive adverse environmental impacts, they examined various GHGs and their "ecological footprints." This represented a quantitative measurement of the stress placed on the environment by demands for available lands and resources to meet the need for food, housing, transportation, consumer goods and services. Urbanization, economic, age of population, and other analyzed factors have little effect, according to their research. Population growth and consumption were the principal factors affecting climate change.

Other studies (see Changnon, 1992) maintained that the rate and amount of urban climate change approximate those being predicted globally using climate models. Large metropolitan areas in North America, home to 65 percent of the nation's population, have created major changes in their climates over the past 150 years. Urbanization, in this case, was a major factor in localized climate change. It is difficult, however, to clearly differentiate between the effects of urbanization, per se, relative to population growth since the two are inextricorably linked.

While most environmental impact research use single indicators of impact, such as CO_2 emissions or deforestation rates, a sound measure of impact must take account of several factors. As noted by Dietz et al., (2001), first, there can be tradeoffs among impacts. GHG emissions will be lower for nations that make substantial use of hydroelectric power and nuclear power, but each of those energy sources have their own environmental impacts. Second, environmental impacts can be "off-shored" in the sense that consumption in one part of the world is linked via world trade to changes in the biophysical environmental in another part of the world. In accounting for impacts, it is difficult to know how much of such impacts should be attributed to the site where the impacts occur and how much to the site where the consumption occurs.

This latter point is an important one. A significant complicating factor when assessing the potential effects of existing or planned activities on climate change is that, given current impact metrics (e.g., GHG loadings), it is virtually impossible to ascribe the increment of impact from a single activity to potential climate change effects either at that location, regionally, or in some transboundary context. The highly complex nature of atmospheric dynamics are such that GHG emissions in one location may, depending on a multitude of variables, spatially (in three-dimensions) and temporally, contribute to or affect a climate change related parameter (e.g., temperature or precipitation) that may be observed, but more likely that not, remain unobserved.

8.0 ENVIRONMENTAL JUSTICE

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8.0 ENVIRONMENTAL JUSTICE

8.1. BACKGROUND

Environmental Justice refers to the inequitable environmental burdens born by groups such as racial minorities, women, residents of economically disadvantages areas, or residents of developing nations. Environmental justice proponents generally view the environment as encompassing "where we live, work and play" (in some instances, "pray" and "learn" are also included). Proponents seek to redress inequitable distributions of environmental burdens (e.g., pollution, industrial facilities, crime, etc.) and equitably distribute access to environmental goods such as nutritious food, clean air and water, parks, recreation, health care, education, transportation, safe jobs, etc. Self-determination and participation in decision-making are key components of environmental justice. Root causes of environmental injustices are long-standing and include institutional racism: the commodification of land, water, energy and air; unresponsive, unaccountable government policies and regulation; and a lack of resources and power in affected communities. Critics contend that any such "unjust" effects are unintentional and area due to a variety of other factors.

In the early 1980s, environmental justice emerged as a concept in the United States. On February 11, 1994, President Clinton issued Executive Order 12898 entitled, "*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*". This Executive Order was designed to focus the attention of federal agencies on the human health and environmental conditions in minority and low-income communities. It required federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations. In an accompanying Presidential Memorandum, the President emphasized existing laws, including NEPA as providing the opportunities for federal agencies to address environmental hazards in minority and low-income communities.

In April 1995, the U.S. Environmental Protection Agency released the document titled, "*Environmental Justice Strategy: Executive Order 12898*". In August 1997, the EPA Office of Environmental Justice released the "*Environmental Justice Implementation Plan*". The Implementation Plan supplements the EPA environmental justice strategy. It provides estimated time frames for undertaking revisions, identifying the lead agents and determining the measures of success for each action item. Several EPA offices have since developed more specific plans and guidance to implement Executive Order 12898.

The National Environmental Policy Act of 1969 (42 U.S.C. §4321 et seq.) serves as the nation's basic environmental protection charter. A primary purpose of NEPA is to ensure that federal agencies consider the environmental consequences of their actions and decisions as they conduct their respective missions. For major federal actions significantly affecting the quality of the human environment, the federal agency must prepare a detailed environmental impact statement (EIS) that assesses the Proposed Action and all reasonable alternatives. These documents are required to be broad in scope, addressing the full range of potential effects of the Proposed Action on human health and the environment. Regulations established by both the Council on Environmental Quality (CEQ) and EPA require that socio-economic impacts associated with significant physical environmental effects also be addressed in the EIS. The Memorandum accompanying the Executive Order identifies four important ways to consider environmental justice under NEPA:

1. Each Federal Agency should analyze the environmental effects, including human health, economic and social effects of federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA;

2. Mitigation measures identified as part of an Environmental Assessment (EA), or a Record of Decision (ROD), should, wherever feasible, address significant and adverse environmental effects of proposed federal actions on minority populations, low-income populations, and Indian tribes;

3. Each Federal agency must provide opportunities for effective community participation in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of public meetings;

4. Review of NEPA compliance must ensure that the Lead Agency preparing NEPA analyses and documentation has appropriately analyzed environmental effects on minority populations, low-income populations, or Indian tribes, including health, social, and economic effects.

The Office of Secretary's Office of Environmental Policy and Compliance (OEPC) provides national leadership and direction in the coordination and development of environmental policy and program evaluation. It provides for a coordinated and unified approach and response to environmental issues that affect multiple bureaus in order to ensure that the U.S. Department of Interior speaks as one entity with respect to these important issues. It provides guidance for the Department's compliance with the full range of existing environmental statutes, executive orders, regulations and other requirements.

The principles of environmental justice considerations under NEPA recognize that environmental justice issues may arise at any step of the NEPA process and, that agencies should consider these issues at each and every step of the process, as appropriate. Environmental justice issues cover a broad range of impacts covered under NEPA, including impacts on the natural or physical environment and interrelated social, cultural and economic effects. Environmental justice concerns may arise from any of these concerns. Agencies should recognize that the question of whether an agency's action raises environmental justice issues is highly sensitive to the history or circumstances of a particular community or population, the particular type of environmental or human health impact, and the nature of the Proposed Action itself. There is no standard formula for how environmental justice issues should be identified or addressed. However, six principles provide general guidance:

- Agencies should consider the composition of the affected area, to determine whether minority populations, low-income populations, or Native American tribes are present in the area affected by the Proposed Action and, if so, whether there may be disproportionately high and adverse human health or environmental effects on these populations;

- Agencies should consider relevant public health data and industry data concerning the potential for multiple or cumulative exposure to human health or environmental hazards in the affected population and historical patterns of exposure to environmental hazards to the extent such information is reasonably available. For example, data may suggest that there are disproportionately high and adverse human health or environmental effects on a minority population, low-income population, or Native American tribe from an agency action. Agencies should consider these multiple, or cumulative effects, even if certain effects are not within the control or subject to the discretion of the agency proposing the action;
- Agencies should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural or physical environmental effects of the proposed agency action. These factors should include the physical sensitivity of the community or population to particular impacts; the effects of any disruption on the community structure associated with the Proposed Action; and the nature and degree of impact on the physical and social structure of the community;
- Agencies should develop effective public participation strategies. Agencies should, as appropriate, acknowledge and seek to overcome linguistic, cultural, institutional, geographic, and other barriers to meaningful participation, and should incorporate active outreach to affected groups;
- Agencies should assure meaningful community representation in the process. Agencies should be aware of the diverse constituencies within any particular community when they seek community representation and should endeavor to have complete representation of the community as a whole. Agencies should also be aware that community participation must occur as early as possible if it is to be meaningful; and,
- Agencies should seek tribal representation in the process in a manner that is consistent with the government-to-government relationship between the United States and tribal governments, the federal government's trust responsibility to federally-recognized tribes, and any treaty rights.

It is important for agencies to recognize that the impacts within minority populations, low-income populations, or Native American groups may be different from impacts on the general population due to a community's distinct cultural practices. For example, data on different patterns of living, such as subsistence fish, vegetation, or wildlife consumption and the use of well water in rural communities may be relevant to the analysis. Where a proposed agency action would not cause any adverse environmental impacts, and therefore would not cause any disproportionately high and adverse human health or environmental impacts, specific demographic analysis of these sensitive groups may not be warranted. However, where environments or Native American tribes may be affected, agencies must consider pertinent treaty, statutory, or executive order rights and consult with tribal governments in a manner consistent with the government-to-government relationship.

8.2. U.S. BUREAU OF RECLAMATION

Within the context of the special relationships between the United States and various Indian tribes, Reclamation has Native American Affairs Offices in Washington, D.C, the Regions, and many Area offices. These offices are primarily concerned with making Reclamation services readily available to tribes and, to ensure that Native American concerns are considered by Reclamation in their various programs. Reclamation has implemented numerous procedures to ensure that its actions do not adversely affect Indian trust assets. Reclamation staff produces and review all NEPA and related documents in order to ensure their clarity and ready accessibility to all affected parties. Notices of public meetings are published in news media and through electronic media (e.g. radio and television) as well as the Federal Register. NEPA documents requiring public review are made available for display in public libraries and distributed to all upon request.

Reclamation's four goals pertaining to environmental justice issues include the following:[218]

> **Goal 1**
>
> The Department will involve minority and low-income communities as we make environmental decisions and assure public access to our environmental information.
>
> **Goal 2**
>
> The Department will provide its employees environmental justice guidance and with the help of minority and low-income communities develop training which will reduce their exposure to environmental health and safety hazards.
>
> **Goal 3**
>
> The Department will use and expand its science, research, and data collection capabilities on innovative solutions to environmental justice-related issues (for example, assisting in the identification of different consumption patterns of populations who rely principally on fish and/or wildlife for subsistence).
>
> **Goal 4**
>
> The Department will use our public partnership opportunities with environmental and grassroots groups, business, academic, labor organizations, and Federal, Tribal, and local governments to advance environmental justice.

While some highly specialized technical work such as hydraulic and hydrologic modeling have been referred to universities, Reclamation tends to use its own personnel in research, technical development, communication, and leadership efforts. To further augment environmental justice, Reclamation has partnered with the Bureau of Indian Affairs and Hispanic-serving institutions throughout the U.S.

218 U.S. Department of the Interior, Office of Environmental Policy and Compliance, Environmental Justice Strategic Plan, 1995. website: http://www.doi.gov/oepc/ej_goal1.html; http://www.doi.gov/oepc/ej_goal2.html; http://www.doi.gov/oepc/ej_goal3.html; http://www.doi.gov/oepc/ej_goal4.html.

8.3. PRINCIPLES OF ANALYSIS

When a disproportionately high and adverse human health or environmental effect on a low-income population, minority population, or Native American tribe has been identified, agencies should analyze how environmental and health effects are distributed within the affected community. Displaying available data spatially, through a GIS platform for example, can provide the agency and the public with an effective visualization of the distribution of health and environmental impacts among demographic populations. This type of data should be analyzed in light of any additional qualitative information gathered through the public participation process.

Where a potential environmental justice issue has been identified, the agency should state clearly in the EIS or EA whether, in light of all of the facts and circumstances, a disproportionately high and adverse human health or environmental impact on minority populations, low-income populations, or Native American tribe is likely to result from the Proposed Action and any alternatives. This statement should be supported by sufficient information for the public to understand the rationale for the conclusion. The underlying analysis should be presented as concisely as possible, using language that is understandable to the public and that minimizes the use of technical acronyms or jargon.

Agencies should encourage the members of the communities that may suffer a disproportionately high and adverse human health or environmental effect from a proposed agency action to help develop and comment on possible alternatives to the proposed agency action as early in the process as possible.

8.3.1. P.L.101-514 Effects

The Congressionally mandated new CVP water service contract authorized by P.L.101-514 was granted to the El Dorado County Water Agency and would be facilitated through Reclamation. This new water service contract was intended to represent a new federal long-term water supply. The legislation did not, by design, specify the manner of delivery, locations of use, intended recipients or other restrictions pertaining to its implementation. El Dorado County interests were identified and accommodated insofar as the legislation only stipulated that the new water supply be used in El Dorado County. This was consistent with the overarching intent of P.L.101-514 (Section 206[b]) which, as early as 1990, focused on the immediate new water needs of El Dorado County. No preference was placed on socio-economic standing, racial, cultural, historic, or ethnic special-status peoples.

The Agency, acting as the prime contractor with Reclamation will enter into subcontracts with both EID and GDPUD for each of the latter's share of the new CVP M&I contract water. An equitable distribution of the 15,000 AFA between EID and GDPUD was originally assumed, proposed, and implemented as part of the NEPA.CEQA analysis. The Proposed Action, in fact, as defined within this EIS/EIR is designed to equally share the 15,000 AFA between EID and GDPUD. While shifted allocations (e.g., via NEPA/CEQA alternatives) of the 15,000 AFA between EID and GDPUD were identified as procedural alternatives and thoroughly reviewed as part of the environmental review, they were only analyzed and presented in this EIS/EIR in order to address the potential environmental benefits of such partitioning as required under NEPA/CEQA. No pre-judged allocation of this new CVP water was made; moreover, no specific entities, neighborhoods, commercial enterprises, special interest groups, or industries were designated as recipients of this new federal water supply.

The Agency, under the edicts of both (the State) Water Code and Reclamation Law (as a new CVP contractor) is compelled to ensure that the maximum beneficial use of this new water supply as envisioned by P.L.101-514 is maintained; this has temporal implications. As water demands grow within the County, the two intended recipient water purveyors (i.e., EID and GDPUD) will differ in their anticipated and realized growth rates. This is due to the fact that within El Dorado County, it is acknowledged that growth is not spatially uniform. Growth follows numerous stimuli; available infrastructure, transportation access and efficiency, industrial/commercial opportunities, workforce availability, and physical/geographic constraints or barriers, among others. EID's service area, in particular its El Dorado Hills, Bass Lake, Cameron Park, and Shingle Springs areas have, and continue to represent the high growth epicenters of the County. Facilitated by ready access to State Highway 50, these areas are situated along a major commercial/economic corridor that provides an effective linkage with the greater Sacramento metropolitan area, South Lake Tahoe and, more distantly, the Central Valley and Bay Area. As a ready commuter source for the employment-diverse Sacramento region, this area has experienced considerable growth over the past decade.

The GDPUD service area, by contrast, is located more remotely: centered on the Georgetown Divide between the South and Middle/North forks of the American River. More rural in character, this area is not as easily accessible as the western areas of the EID service area. Accordingly, anticipated growth opportunities within the GDPUD service area are significantly more constrained.

As noted, the new water made available under this contracting action will be put to beneficial use as required by State and Reclamation water law. Since this new CVP water cannot be sold out of County, the Agency will exercise control over how its use will best meet existing and foreseeable future needs within the County, as new demands are generated. For certain areas, this may occur over a period of time, relative to other areas which may have a more pressing immediate need. As long as a verifiable in-County demand exists, the Agency, together with Reclamation will make these supplies available to EID and GDPUD on a long-term annual basis.

As previously described, there exists no pre-condition on the use of this water other than its defined use for municipal and industrial purposes (as set forth in Reclamation contracting) and, its limitations within certain portions of the EID and GDPUD service areas (i.e., Subcontractor service areas). The new surface water supply (diverted from Folsom Reservoir and/or exchanged with upper Middle Fork water rights) will have no effect on those rural communities relying on local area groundwater wells, nor will it affect any rivers or waterbodies relied upon for subsistence fish, vegetation or wildlife. Unimpaired inflow to Folsom Reservoir (the source of this new CVP water allocation) does not affect these resources. Moreover, use of this new water supply is not restricted to or prohibited from any one particular socio-economic, ethnic, or cultural group; water supplies held by both EID and GDPUD are managed in a commingled fashion. Service extensions, connection fees, hook-up charges, etc. are administered uniformly, without bias or preference, and on a first come first served basis. Finally, the implementation of this new water service contract does not require facility or construction activities that would remove, displace, cause to disrupt or otherwise adversely affect minority, low-income, or Native American groups or communities.

Accordingly, this action poses no deliberate or inadvertent adverse effect upon minority, low-income, or Native American communities, groups, or persons. Human health or environmental impacts associated with these groups or, their practices and livelihoods are not anticipated to be affected by this action or its alternatives.

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9.0 INDIAN TRUST ASSETS

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9.0 INDIAN TRUST ASSETS

9.1. AFFECTED ENVIRONMENT

Indian Trust Assets (ITAs) are legal interests in property held in trust by the U.S. for federally-recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. The characterization and application of the U.S. trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," Bureau of Reclamation (Reclamation) assesses the effect of its programs on tribal trust resources and federally-recognized tribal governments. Reclamation is tasked to actively engage federally-recognized tribal governments and consult with such tribes on government-to-government level (59 Federal Register 1994) when its actions affect ITAs. The U.S. Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (DOI 1995). Reclamation will comply with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs.

Further, DOI is required to "protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (DOI 2000). It is the general policy of the DOI to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible (Bureau of Reclamation 2000.

A review of the Proposed Action was conducted to determine whether the Proposed Action has potential to affect ITAs. The Proposed Action is to execute a new long-term water service contract between the El Dorado County Water Agency (EDCWA) and Reclamation to implement those parts of Public Law 101 514, Section 206, pertaining specifically to EDCWA. Under this contract, up to 15,000 AFA of CVP water would be provided to EDCWA for diversion from Folsom Reservoir or for exchange on the American River upstream from Folsom Reservoir (Proposed Project). The contract would provide water that would serve M&I water needs in El Dorado County. EDCWA would, in turn, make water available to EID and GDPUD for M&I use within their respective service areas. Based on the information provided it is determined the Proposed Action does not have a potential to affect Indian Trust Assets. The nearest ITA's to the proposed project site is the Auburn Rancheria which is approximately 11miles NW of the project location and the Shingle Springs Rancheria which is approximately 12 miles east of the project location.

9.2. ENVIRONMENTAL CONSEQUENCES

9.2.1. No Action

Under the no action alternative, there are no impacts on Indian Trust Assets, as no new facilities would be constructed and existing operations would continue to operate as has historically occurred.

9.2.2. Proposed Action

There are no tribes possessing legal property interests held in trust by the United States in the water involved with this action, nor is there such a property interest in the lands designated to receive the water proposed in this action. The nearest ITA to the proposed project site is the Auburn Rancheria which is approximately 11miles NW of the project location and the Shingle Springs Rancheria which is approximately 12 miles east of the project location.

9.2.3. Cumulative Effects

There are no impacts on Indian Trust Assets as a result of the Proposed Action therefore the Proposed Action would not contribute to cumulative impacts on Indian Trust Assets.

10.0 CONSULTATION/COORDINATION AND APPLICABLE LAWS

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10.0 CONSULTATION/COORDINATION AND APPLICABLE LAWS

10.1. OVERVIEW

This chapter describes the consultation and coordination activities undertaken as part of the preparation of this joint EIS/EIR. Starting in late 1991, after the passing of P.L.101-514 (on November 4, 1990), Reclamation and EDCWA began discussions on the scope of the effort to be implemented in developing this EIS/EIR. Extensive public scoping followed the early noticing of the project in 1993. The project was put on hold during the late 1990s until 2005 when the El Dorado County General Plan Update was suspended. Since 2006, public scoping and agency consultation were re-initiated, and new technical work (i.e., CALSIM II modeling) was incorporated into this EIS/EIR.

10.2. BACKGROUND

A Notice of Preparation (NOP) for this EIS/EIR was prepared for the Proposed Action and circulated in April 1993 (with an assigned State Clearninghouse Number; SCH#1993052016). A Notice of Intent (NOI) was also prepared for the action and published in the Federal Register (Vol. 58, No.90, May 12, 1993). Subsequently, new information regarding potential project alternatives was identified and made available, warranting issuance of another revised NOP distributed on May 22, 1998. Since 1998, a number of events transpired that prompted EDCWA to issue a Supplemental NOP in September 2006. Specifically, in 1999, the El Dorado County General Plan Update was suspended by a Writ of Mandate, and additional environmental review of the General Plan was required. El Dorado County completed the supplemental environmental review, and approved the General Plan in July 2004; in March 2005, El Dorado County voters approved the referendum on the General Plan adopted by the Board of Supervisors. In September 2005, the Sacramento County Superior Court discharged the Writ of Mandate that previously limited development approvals in El Dorado County pending completion of the new General Plan. Additionally, water needs for this region of the County have been re-verified, and focused information on the potential alternatives, including the intended service areas have been established. Through the alternatives development process, key public trust resource agencies have been identified as potential Responsible Agencies under CEQA; these include the State Water Resources Control Board (SWRCB) and the Placer County Water Agency (PCWA). As of the result of these latter developments and, in deference to the amount of elapsed time since the previous public scoping efforts, Reclamation and EDCWA opted to re-initiate public scoping in 2006. A new NOP/NOI was prepared and released on September 15, 2006. This EIS/EIR has undergone several public scoping and stakeholder outreach efforts over the past 20 years; the lead agencies have maintained duly diligent in keeping abreast of new policy, technical, and legal changes that, at the time, may affected the environmental analysis of this joint document. This current EIS/EIR reflects all of those earlier concerns and includes, adopts, and/or incorporates changes and advances that have occurred since the passing of the original legislation in 1990.

10.3. EARLY PUBLIC OUTREACH

An initial scoping phase was developed to help refine the Proposed Action and identify the major issues of concern. In August 1994, a list of organizations, public trust resource agencies, and interested stakeholders was developed. A questionnaire was prepared covering 13 standard questions to be asked at a series of interviews with the identified parties. A series of interviews was conducted in September, 1994. The interviewees included:

- Fisheries Resource Agencies: California Department of Fish & Game, U.S. Fish & Wildlife Service, and National Marine Fisheries Service;
- PG&E
- El Dorado County Business Community (A. Hazbun, Murray & Downs, K. Russell)
- Friends of the River/CA Sportfishing Alliance
- American River Land Trust
- El Dorado County Parks and Recreation Division
- Western States Endurance Run
- California Department of Boating and Waterways
- El Dorado County Assessor's Office
- El Dorado County River Management Advisory Committee
- American Whitewater Association

The questionnaire and interview responses are included in Appendix A in this Draft EIS/EIR.

10.4. PUBLIC SCOPING MEETINGS

Subsequent to the May 22, 1998 NOP/NOI, two public scoping meetings were held on August 6, 1998 and August 7, 1998 to formally solicit comment on the EIS/EIR. These sessions were lightly attended by the public; oral comment by only one member of the public was tendered at these meetings. Written comments were received by: the U.S. Environmental Protection Agency (Region IX), The Center for Sierra Nevada Conservation, and a joint submittal from the El Dorado County Taxpayers for Quality Growth and Sierra Club – Maidu Group, Mother Lode Chapter.

In September, 2006, subsequent to the supplemental NOP/NOI distributed on September 15, 2006, two additional public scoping meetings were held; on September 26 and 27. These meetings were also lightly attended. Comment letters were received from the Planning and Conservation League, Westlands Water District, El Dorado County, Environmental Management Department – Air Quality Management District, Regional Water Quality Control Board, and the California Native Plant Society in response to the NOP/NOI. Appendix B of this Draft EIS/EIR contains the comment letters.

10.4.1. 2006/2007 Outreach Efforts

As part of the 2006/2007 scoping efforts (see Appendix C in this Draft EIS/EIR for noticing materials and responses), additional briefing meetings were held with various agencies to provide updates of the revised Proposed Action and solicit comments that would help guide preparation of the environmental review documentation. Meetings were held with: California Department of Fish & Game, California Department of Parks & Recreation, California Department of Water Resources, CALFED, Sacramento Area Water Forum, State Water Resources Control Board, U.S. Environmental Protection Agency – Region IX, Sierra Nevada Conservancy, and the Planning and Conservation League.

The Planning and Conservation League provided extensive and thorough comments and suggested actions. In particular, discussion of the potential effects of climate change has been incorporated into this EIS/EIR. An extensive scientific literature review, discussion of current trends, and cited reference analyses on climate change; its effects on California water resources, the CVP/SWP, upper basin ecosystem function, snowpack and wildlife, Bay-Delta, and sea level changes was prepared and included in this EIS/EIR. The new discussion includes an explanation of climate change modeling, the various scaling considerations (i.e., spatiality) that govern climate modeling application at the watershed scale, what the State has committed to in addressing part of the climate change challenge, and ongoing risks, issues, and challenges for the future.

10.5. CONSULTATIONS/COORDINATION AND APPLICABLE LAWS

Numerous laws and regulations at the federal, State and local levels apply to this Proposed Action. As described previously and, as defined by the Proposed Action itself, there are two elements that make up the environmental analysis for this action and, therefore, the regulatory framework upon which its approval is predicated. First, is the execution and approval of the new CVP M&I water service contract. Second, is the future likelihood that new facilities and/or infrastructure will be required by the contractors to fully implement (i.e., divert, convey, treat and distribute treated water) the Proposed Action. In an effort to fully disclose all of the potentially likely laws and regulations that are, or may be associated with this Proposed Action and its implementation, a broad discussion is provided.

10.6. FEDERAL LAWS

10.6.1. National Environmental Policy Act

The National Environmental Policy Act (NEPA, 42 USC 4321; 40 CFR 1500.1) was established in 1969 to ensure that Federal agencies consider potential environmental effects of their actions, cooperate with other agencies, and disclose potential effects in a public forum. NEPA requirements always include the preparation of the appropriate environmental document, and may also include:

- Publishing public notice of hearings, public meetings, and availability of environmental documents;
- Holding public hearings or meetings;
- Soliciting comment and input from the public; and

- Making documents and comments available to the public according to the Freedom of Information Act.

The U.S. Bureau of Reclamation serves as the federal lead agency under NEPA. Reclamation will use this joint EIS/EIR to comply with NEPA requirements.

Section 46.100 of Subtitle A of Title 40 of the CFR

CEQ regulations provide that federal agencies review their NEPA regulations and procedures and, in consultation with CEQ, revise them as necessary to ensure full compliance with the purposes and provisions of NEPA (40 CFR 1507.3). The CEQ reviewed the proposed conversion of the Department of Interior's (DOI) NEPA procedures from Chapters 1-6 of Part 516 of the Department Manual to regulations at a new Part 46 to Subtitle A of Title 43 of the Code of Federal Regulations. The proposed changes and conversion of the procedures as regulations was published in the Federal Register for comment on January 2, 2008 (73 FR 126). The final rule was published in the Federal Register on October 15, 2008.

In relevant part, Section 46.100 addresses the incorporation of consensus-based management as part of the Department of Interior's NEPA process. While the DOI acknowledges that neither NEPA nor the CEQ regulations require consensus, and that consensus may not always be achievable or consistent with policy decisions, it requires the *use* of consensus-based management whenever practicable. Consensus-based management is not inconsistent with the intent of NEPA and the CEQ regulations. Recognizing that consensus-based management may not be appropriate in every case, the final rule does not set consensus-based management requirements; timelines or documentation of when parties must become involved in the process. Similar to collaborative processes, consensus-based management, like public involvement and scoping, will vary depending on the circumstances surrounding a particular proposed action.

This EIS/EIR, including its primary components, the Proposed Action and alternatives underwent extensive public outreach and community input efforts (see Subchapter 10.2 and following, provided earlier) in their development. Consistent with Section 46.100, the alternatives identification and development process provided full opportunity for the evaluation of reasonable alternatives presented by persons, organizations or communities who may have had (or have) interest in the Proposed Action. Limited by the number of authorized points of diversion, legal water permit conditions (e.g., water right and CVP), and the physical constraints of moving water from one point to another based on geography, a set number of alternatives were possible. Still, the alternatives identification process identified, described, screened, and ultimately evaluated the widest range of alternatives across several broad categories (see Chapter 3.0). These included completely new alternative water supplies to those authorized under this congressional action, variations in the amounts, allocations, and diversion patterns of those supplies, and potential demand reduction or water supply offsetting actions (e.g., reclaimed water use) up to and including possible growth moratoriums.

Under Section 46.100, the Responsible Official (RO) as defined by the Department of Interior, was intimately involved in all steps of the alternatives identification, screening criteria selection, screening process, and impact evaluation framework development for the alternatives (e.g., correlating alternatives with the use of CALSIM II hydrologic modeling simulations).

10.6.2. Federal Endangered Species Act

Reclamation's Long-Term Coordinated Operations of the CVP and SWP will dictate how CVP, SWP, and related actions will be managed, controlled, and implemented. CVP water service contracts are an important part of CVP operations. Any new CVP water service contract must take into account how it could affect or otherwise be integrated into Reclamation's existing contracting program, including any environmental effects. For this reason, the current deliberations and ultimate outcome of the ESA consultations having regard to the Long-Term Coordinated Operations of the CVP and SWP are relevant to the Proposed Action.

In February 2005, the USFWS issued a Biological Opinion (BiOp) that analyzed the potential effects of the coordinated, long-term operation of the CVP and SWP, as part of Reclamation's revised CVP-OCAP action on delta smelt, and referred to as the Long-Term Coordination Operations of the CVP and SWP. As part of the litigation in the matter of *Natural Resources Defense Council et al., v. Dirk Kempthorne, San Luis & Delta Mendota Water Authority et al.,* (Case No. 05-CV-01207 OWW), the court held, on May 25, 2007, that the BiOp was "arbitrary and capricious" and "contrary to law". The court maintained that an appropriate interim remedy must be implemented. The court ordered that the USFWS issue a new BiOp by September 15, 2008 (and later postponed to December 15, 2008). The USFWS issued its final BiOp on December 15, 2008. After reviewing the current status of the delta smelt, the effects of the Proposed Action and the cumulative effects, it was the USFWS's biological opinion that the long-term coordinated operations of the CVP and SWP, as proposed, are likely to jeopardize the continued existence of the delta smelt.

On October 22, 2004, NOAA Fisheries issued its Opinion on the proposed long term CVP and SWP CVP-OCAP. Within that document was a consultation history that dated back to 1991, which is incorporated here by reference. On April 26 and May 19, 2006, Reclamation requested reinitiation of consultation on the CVP-OCAP based on new listings and designated critical habitats. In a June 19, 2006, letter to Reclamation, NOAA Fisheries stated that there was not enough information in Reclamation's request to initiate consultation. NOAA Fisheries provided a list of information required to fulfill the initiation package requirements [50 CFR 402.14(c)]. From May 2007, until May 29, 2008, NOAA Fisheries participated in the following interagency forums, along with representatives from Reclamation, DWR, USFWS, and CDFG, in order to provide technical assistance to Reclamation in its development of a Biological Assessment and initiation package.

- Biweekly interagency OCAP meetings;
- Biweekly five agencies management meetings;
- Weekly directors' meetings; and
- Several modeling meetings.

In addition, NOAA Fisheries provided written feedback on multiple occasions:

- Multiple e-mails from the USFWS (submitted on behalf of USFWS, NOAA Fisheries, and CDFG) providing specific comments on various chapters of the CVP-OCAP Biological Assessment, including the legal setting (Chapter 1.0, Introduction) and project description (Chapter 3.0, Alternatives Including the Proposed Action and Project Description);
- February 15, 2008, e-mails from NOAA Fisheries to Reclamation, transmitting comments on species accounts for the anadromous salmonid species and green sturgeon (Chapters 3.0-5.0, and 10.0);
- A February 21, 2008, letter providing comments with regard to the development of the CVP-OCAP Biological Assessment, and in particular, the draft project description; and
- An April 22, 2008, species list.

On May 19, 2008, NOAA Fisheries received Reclamation's May 16, 2008, request to initiate formal consultation on the CVP-OCAP. On May 30, 2008, Reclamation hand-delivered a revised Biological Assessment containing appendices and modeling results. On June 10, 2008, NOAA Fisheries issued a letter to Reclamation indicating that an initiation package was received, and that it would conduct a 30-day sufficiency review of the Biological Assessment received on May 30, 2008. On July 2, 2008, NOAA Fisheries issued a letter to Reclamation, indicating that the Biological Assessment was not sufficient to initiate formal consultation. In that letter, NOAA Fisheries described the additional information necessary to initiate consultation. In addition, on July 17, 2008, NOAA Fisheries offered additional comments on the CVP-OCAP Biological Assessment via e-mail.

Throughout July 2008, NOAA Fisheries continued to participate in the interagency forums listed above to continue to provide technical assistance to Reclamation on its development of a final Biological Assessment and complete initiation package. In addition, meetings were held between NOAA Fisheries and Reclamation staff on August 8, September 9, and September 19, 2008, to discuss and clarify outstanding concerns regarding the modeling, Essential Fish Habitat (EFH), and project description information contained in the draft Biological Assessment. On August 20 and September 3, 2008, NOAA Fisheries received additional versions of the draft Biological Assessment, hand delivered to the NOAA Fisheries Sacramento Area Office on DVD.

On October 1, 2008, the Sacramento Area Office received a hand-delivered letter from Reclamation, transmitting the following documents: (1) final Biological Assessment on a DVD, (2) Attachment 1: Comment Response Matrix, (3) Attachment 2: errata sheet; (4) Attachment 3: Additional modeling simulation information regarding Shasta Reservoir carryover storage and Sacramento River water temperature performance and exceedances; and (5) Attachment 4: American River Flow Management Standard 2006 Draft Technical Report. The letter and enclosures were provided in response to our July 2, 2008, letter to Reclamation, indicating that the Biological Assessment was not sufficient to initiate formal consultation.

In its October 1, 2008, letter, Reclamation also committed to providing, by mid-October 2008: responses to comments and initiating consultation related to Pacific Coast Salmon EFH within the

Central Valley, and (2) a request for conferencing and an analysis of effects of the continued long-term operation of the CVP and SWP on proposed critical habitat for green sturgeon. On October 20, 2008, Reclamation provided to NOAA Fisheries via e-mail the analysis of effects on the proposed critical habitat of Southern DPS of green sturgeon. In addition, on October 22, 2008, Reclamation provided to NOAA Fisheries via e-mail supplemental information regarding the EFH assessment on fall-run Chinook salmon. On November 21, 2008, NOAA Fisheries issued a letter to Reclamation, indicating that Reclamation had provided sufficient information to initiate formal consultation on the effects of the CVP-OCAP, with the understandings that: (1) Reclamation is committed to working with NOAA Fisheries staff to provide any additional information determined necessary to analyze the effects of the proposed action; and (2) NOAA Fisheries was required to issue a final Opinion on or before March 2, 2009.

On December 11, 2008, NOAA Fisheries released its Draft BiOp on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). The request for formal consultation was received on October 1, 2008. The final version of the Draft BiOp will supersede the 2004 CVP-OCAP BiOp. The Draft BiOp was based on (1) the initiation package provided by Reclamation, including the CVP-OCAP Biological Assessment, received by NOAA Fisheries on October 1, 2008; (2) the supplemental analysis of effects on the proposed critical habitat of Southern DPS of green sturgeon and supplemental information regarding the EFH assessment on fall-run Chinook salmon; (3) other supplemental information provided by Reclamation; (4) declarations submitted in court proceedings pursuant to Pacific Coast Federation of Fishermen Association (PCFFA) *et al*. v. Gutierrez *et al*.; and (5) scientific literature and reports.

The purpose of the Draft BiOp was to determine, based on the best scientific and commercial information available, whether the Central Valley Project and State Water Project Operations Criteria and Plan, as proposed by Reclamation, is likely to jeopardize the continued existence of the following species: Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*, hereafter referred to as winter-run); Central Valley spring-run Chinook salmon (*O. tshawytscha*, hereafter referred to as spring-run); Central Valley (CV) steelhead (*O. mykiss*); Central California Coast (CCC) steelhead (*O. mykiss*); Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*, hereafter referred to as Southern DPS of green sturgeon); and Southern Resident killer whales (*Orcinus orca*, hereafter referred to as Southern Residents) or, destroy or adversely modify the designated critical habitat of the above salmon and steelhead species, or proposed critical habitat for Southern DPS of green sturgeon.

NOAA Fisheries concluded that, as proposed, the long-term continued operation of the CVP and SWP is not likely adversely affect Central California Coast steelhead and their designated critical habitat. However, the long-term CVP and SWP OCAP is likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and Southern DPS of North American green sturgeon. The long-term CVP and SWP OCAP is also likely to destroy or adversely modify critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead, and proposed critical habitat for the Southern DPS of green sturgeon. The consultation on the effect of that proposed action on Southern Resident killer whales is ongoing. Therefore, no conclusion was reached for that species.

The final BiOp with the required Reasonable and Prudent Alternatives, Incidental Take Statements, and associated conservation recommendations were released on June 4, 2009.

Reclamation, while continuing to have concerns, has provisionally accepted the RPA contained in the Biological Opinion on the long-term coordinated operations of the CVP and SWP dated, June 4, 2009. Reclamation will immediately implement the near- term elements of the RPA by modifying the operations as required and continue with the planning and implementation associated with several major actions called for in the RPA, including construction of the Red Bluff Pumping Plant, replacement of the Whiskeytown Reservoir temperature curtain and fish passage improvements on Battle Creek. The provisional acceptance is conditioned on the need to further evaluate and develop many of the longer term actions. These actions are subject to future appropriations, and may be beyond Reclamation's authority, or require agreements from outside parties to implement, which are outside of Reclamation's control. Accordingly, Reclamation anticipates that re-initiation of Section 7 consultation may be needed as these actions are further developed.

Specifically, for the American River, the NOAA Fisheries Biological Opinion RPA identified a flow management standard for implementation. Reclamation is still evaluating this flow standard. The RPA also includes a requirement to develop a genetic management plan for Nimbus Fish Hatchery, a new target temperature objective of 65°F at Watt Avenue and a flow threshold of 4,000 cfs. Specific cold water pool temperature management facilities and actions have been identified in the RPA for study and implementation as well as the planning and implementation of fish passage facilities at both Nimbus and Folsom Dams. Reclamation is working to better understand, in detail, how all of the RPA requirements CVP wide, may affect the CVP and its operations.

Reclamation has been informally consulting with the USFWS and NOAA Fisheries on the Proposed Action. Staff of the USFWS and NOAA has been meeting independently with Reclamation and its project team to determine the scope of the consultation and develop an appropriate approach framework to address listed and proposed species as part of the Section 7 requirements under this statute. These consultations, however, have been delayed pending Reclamation’s ongoing consultations with USFWS and NOAA Fisheries on the CVP-OCAP. The Proposed Action, as defined in the CALSIM II modeling for the CVP-OCAP Biological Assessment was included and, therefore, represents an assumed part of the long-term CVP/SWP operation by Reclamation action. The two current CVP-OCAP BiOps have been prepared and issued inclusive of the P.L.101-514 new CVP water service contract proposed under this action.

Separate meetings have been held with USFWS staff that focused on the listed terrestrial species within the Subcontractor service areas proposed under this action. A Biological Assessment for these species has been prepared and is included in Appendix G of this Draft EIS/EIR.

10.6.3. Fish and Wildlife Coordination Act

Under the Fish and Wildlife Coordination Act (16 USC 661-666c), Reclamation is required to consult with USFWS and NOAA Fisheries before approving water projects that will affect surface water bodies supporting fish and wildlife species. As noted previously, Reclamation has been engaged in informal consultation with USFWS and NOAA Fisheries on this Proposed Action; the reports and recommendations of these agencies, if determined to be necessary, will be integrated into any document prepared.

While the USFWS did prepare a Coordination Act Report (CAR) for the Sacramento County Water Agency (SCWA) portion of the P.L.101-514 new CVP water service contract EIS/EIR, there is no intention of preparing a CAR for this Proposed Action.

10.6.4. Magnuson-Stevens Fishery Conservation and Management Act

This legislation requires consultation with NOAA Fisheries regarding actions that may adversely affect "essential fish habitat", by way of a reduction in quantity or quality of habitat needed for spawning, breeding, feeding or maturation. Reclamation has been in informal consultation with NOAA Fisheries on this Proposed Action, and will continue consultations, in compliance with the Magnuson-Stevens Fishery Conservation and Management Act.

10.6.5. Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 makes it unlawful to "take" (i.e., kill, harm, or harass) any migratory bird listed in 50 CFR 10, including their nests, eggs, or products. Migratory birds include geese, ducks, shorebirds, raptors, songbirds, and many others. The Migratory Bird Executive Order of January 11, 2001, directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act, and defines the responsibilities of each federal agency taking actions that have, or are likely to make, a measurable affect on migratory bird populations. Reclamation has been in informal consultation with the USFWS on the terrestrial species potentially affected by the Proposed Action and have considered the Migratory Bird Treaty Act.

10.6.6. National Historic Preservation Act

"Cultural resources" is a term used to describe both archaeological sites depicting evidence of past human use of the landscape; and the built environment, which is represented in structures such as dams, roadways, and buildings. The National Historic Preservation Act (NHPA) of 1966 is the primary federal legislation which outlines the federal government's responsibility for cultural resources. Section 106 of the NHPA requires the federal government to take into consideration the effects of an undertaking on cultural resources listed in or eligible for inclusion in the National Register of Historic Places (National Register); such resources are referred to as "historic properties."

The Section 106 process is outlined in the federal regulations at 36 CFR Part 800. These regulations describe the process that the federal agency (Reclamation) takes to identify cultural resources and the level of effect that the proposed undertaking will have on historic properties. In summary, Reclamation must first determine if the action is the type of action that has the potential to affect historic properties. If the action is the type of action to affect historic properties, Reclamation must identify the area of potential effects (APE), determine if historic properties are present within that APE, determine the effect that the undertaking will have on historic properties, and consult with the State Historic Preservation Office, to seek concurrence on Reclamation's findings. In addition, Reclamation is required through the Section 106 process to consult with Indian Tribes concerning the identification of sites of religious or cultural significance, and consult with individuals or groups who are entitled to be consulting parties or have requested to be consulting parties. Consultation correspondence is included in Appendix J in this Draft EIS/EIR.

A Class I survey of the area of potential effects was conducted in 2008. This survey consisted of a literature review and records search; no field reconnaissance was conducted for the action described in this EIS/EIR. This Class I survey does not qualify as full compliance with the NHPA, but serves to aid in the initial stages of identification of cultural resources. Relevant information from this document is summarized in Subchapter 4.9 (Water-Related Cultural Resources).

Project-level analyses of future facilities projects, not a part of this Proposed Action may, however, require additional SHPO coordination at the time they are undertaken, including Class III (on-ground examination) surveys to further investigate the potential for impact on cultural resources on a project level. Such project-level, facilities-oriented consultations are premature at this time and, accordingly, have not been initiated.

10.6.7. Archaeological Resources Protection Act

The Archaeological Resources Protection Act of 1979 defines archaeological resources; requires federal permits for excavation; provides for curation of materials, records, and other data; provides for confidentiality of archaeological site locations; and, in the 1988 amendment, requires the inventorying of public lands for archaeological resources. In addition, Section 110 of the NHPA specifies that archaeological resources must be taken into consideration before implementing any federal action. Reclamation, as part of its NHPA Section 106 consultation, has incorporated requirements under the Archaeological Resources Protection Act into its approval process.

10.6.8. American Indian Religious Freedom Act

The American Indian Religious Freedom Act of 1979 (PL 95-341) directs that Native American groups, who might use or have direct or indirect interest in the project be invited to participate in the planning process. Reclamation has coordinated with the Bureau of Indian Affairs and solicited input and comments from various rancherias and Native American groups as part of its consultation process under the NHPA.

10.6.9. Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act of 1990 (PL 101-601; 104 Stat. 3049) as amended, outlines the federal government's responsibility for the treatment and ultimate disposition of human burials and grave-related materials. The Act requires consultation with certain Native American communities if circumstances regarding human remains, associated artifacts, or objects of cultural patrimony arise.

10.6.10. Indian Trust Assets and Native American Consultation

Reclamation is undertaking compliance procedures and documentation of the new P.L.101-514 CVP water service contract consistent with Section 106 of the NHPA. A Class I survey report has been prepared and will be used by Reclamation in its consultation with the State Office of Historical

Preservation (SOHP). Reclamation has solicited input and comment from Native American Heritage Commission (NAHC) and will review the federal action area for Indian Trust Assets.

10.6.11. Clean Water Act

As noted previously, the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB), are responsible for ensuring implementation and compliance with the provisions of the federal Clean Water Act (CWA) and California's Porter-Cologne Water Quality Control Act. Along with the SWRCB and RWQCB, water quality protection is the responsibility of numerous water supply and wastewater management agencies, as well as city and county governments, and requires the coordinated efforts of these various entities.

A Section 401 CWA Water Quality Certification or waiver from the RWQCB is required before a Section 404 permit becomes valid. Associated with possible future facilities and infrastructure needs, the specific CWA requirements may apply at such time as these facilities/infrastructure projects are proposed.

10.6.12. Other Federal Statutes and Regulations of Relevance

Various laws, directives and orders have been promulgated over time, which collectively, serve to guide the operations of the CVP. These include:

- Rivers and Harbors Act (1935, 1937, 1940)
- Reclamation Project Act (1939)
- Flood Control Act (1944)
- CVP Water Service Contracts (1944)
- Water Rights Settlement Contracts (1950)
- Grasslands Development Act (1954)
- Trinity River Act (1955)
- Reclamation Project Act (1956, 1963)
- Auburn-Folsom South Unit Authorization Act (1965)
- Power Contract 2948A (1967)
- SWRCB Decision 1485 (1978)
- Energy and Water Development Appropriation Act (1980)
- Suisun Marsh Development Appropriation Act (1980)
- Corps of Engineers Flood Control Manuals for Shasta (1977), Folsom (1959) and New Melones (1980)
- Reclamation Reform Act (1982)
- Coordinated Operating Agreement (COA) (1986)

- The Proposed Action is consistent with each of these federal statutes. As noted earlier, potential future actions associated with implementation of the Proposed Action and delivery of the P.L. 101-514 contract water, such as facilities construction, may require additional federal permits or compliance at the project-level at the time they are undertaken.

10.7. Executive Orders

10.7.1. Executive Order 12898 (Environmental Justice)

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” directs federal agencies to assess whether their actions have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. This is discussed in greater detail in Chapter 8.0 (Environmental Justice).

10.7.2. Executive Order 11988 (Floodplain Management)

Executive Order 11988 directs federal agencies to enhance floodplain values, to avoid development in floodplains whenever there is a practicable alternative, and to avoid to the extent possible adverse impacts associated with occupancy or modification of floodplains. The Proposed Action, as defined, does not involve any new development activities. In the future, if any of the potentially required facilities or infrastructure were to traverse floodplain areas under Reclamation ownership or easements, the provisions of this Executive Order would apply.

10.7.3. Executive Order 11990 (Protection Of Wetlands)

Executive Order 11990 directs federal agencies to enhance wetlands values, to avoid development in wetlands whenever there is a practicable alternative, and to avoid to the extent possible adverse impacts associated with occupancy or modification of wetlands. The Clean Water Act regulatory process requires compliance with Federal “no net loss of wetlands” policies, and includes a public and agency review process and a Clean Water Act Section 404 (b)(1) alternatives analysis that would in practice be likely to require avoidance of impacts on aquatic habitats or compensation for losses in extent and values. The Proposed Action, as defined, does not purport to alter any existing land areas. Existing wetlands, therefore, would not be affected by this action. Similar to Executive Order 11988, in the future, if any of the potentially required facilities or infrastructure were to affect wetland areas under Reclamation ownership or easements, the provisions of this Executive Order would apply.

10.7.4. Executive Order 11593 (Historic Properties)

Executive Order 11593 and Section 110 of the NHPA) provide direction for inventorying and evaluation of historic properties, and for initiating measures and procedures to provide for the maintenance, through preservation, rehabilitation, or restoration, of federally owned and registered sites at professional standards prescribed by the Secretary of the Interior. Reclamation, in its preparation of a Class I Survey has fully complied with this Executive Order.

10.8. State Laws

10.8.1. California Environmental Quality Act

Under the California Environmental Quality Act (CEQA), El Dorado County Water Agency is the Lead Agency preparing the EIR; it is a joint EIS/EIR. EDCWA intends this joint EIS/EIR to be consistent with CEQA Guidelines. When this Draft EIS/EIR is completed, EDCWA will provide public notice in accordance with Section 15087 of the CEQA Guidelines. Upon certifying the Final EIS/EIR, EDCWA will adopt a reporting or monitoring program for the implementation of mitigation measures which were adopted, as necessary, and to record any changes to the project that it is considering. The program will be designed to ensure compliance during project implementation. The public record for the Final EIS/EIR will be completed by the filing of a Notice of Determination (NOD) and appropriate disposition of the Final EIS/EIR (CEQA Guidelines, Sections 15094-15095.)

10.8.2. California Endangered Species Act

The California Department of Fish and Game (CDFG) is responsible for implementation of the California Endangered Species Act (CESA). The Lead Agencies have been in informal consultation with CDFG, to keep it appraised of the project and environmental document progress. Upon review of the environmental documentation, CDFG will issue a written Finding of its determination of whether the Proposed Action poses a threat to survival of any species that CDFG lists as endangered, through adverse modification or destruction of the specie's essential habitat. Also included in the CDFG finding will be a determination of whether the Proposed Action will result in take of any of threatened or endangered species (as listed by CDFG).

The CDFG findings will also be given to the SWRCB for review with the petition for a change in place of use for El Dorado County's Middle Fork Project water, an action to be taken by PCWA before the Proposed Action can be fully implemented on behalf of GDPUD.

10.8.3. Porter-Cologne Water Quality Control Act

In 1969, the California Legislature enacted the Porter-Cologne Water Quality Control Act (the Act) to preserve, enhance and restore the quality of the State's water resources. The Act established the State Water Resources Control Board and nine Regional Water Quality Control Boards as the principal State agencies with the responsibility for controlling water quality in California. Under the Act, water quality policy is established using Water Quality Control Plans (also known as Basin Plans); using standards described in these plans, water quality standards are enforced for both surface and ground water and the discharges of pollutants from point and non-point sources are regulated. Under State law, the permit is officially called waste discharge requirement. Under federal law, the permit is officially called a NPDES permit. In the future, where new facilities or infrastructure are necessary to take, convey, treat or distribute the new water made available under this Proposed Action, close review of the requirements under this Act will be forthcoming. Any facilities requiring a waste discharge requirement will be acquired by the project proponent.

10.8.4. Section 1602 of the Fish and Game Code

CDFG regulates work that will substantially affect resources associated with rivers, streams, and lakes in California, pursuant to Fish and Game Code Sections 1600–1607. Any action from a public project that substantially diverts or obstructs the natural flow or changes the bed, channel, or bank of any river, stream, or lake or uses material from a streambed must be previously authorized by CDFG in a Lake or Streambed Alteration Agreement under Section 1602 of the Fish and Game Code. This requirement may, in some cases, apply to any work undertaken within the 100-year floodplain of a body of water or its tributaries, including intermittent streams and desert washes. As a general rule, however, it applies to any work done within the annual high-water mark of a wash, stream, or lake that contains or once contained fish and wildlife or that supports or once supported riparian vegetation.

Activities indirectly associated with this project that could require Section 1602 authorization and a Streambed Alteration Agreement include the eventual construction or alteration of diversion facilities, service-area related development that could have impacts on streams or drainages in El Dorado County, and potential conveyance improvements. These actions would result in the alteration of the flow within water bodies and occur within the annual high-water mark of water bodies that contain wildlife and support riparian vegetation. Prior to any activities that could affect rivers, streams or lakes, applications will submitted to CDFG for authorization of activities under a new Streambed Alteration Agreement (California Fish and Game Code 1600 et seq.). In the future, where certain facilities or infrastructure are proposed that intend to cross a stream or waterbody, the project proponent at the time, will facilitate discussions with CDFG to acquire the necessary approvals under this Section of the Fish & Game Code.

10.8.5. Natural Community Conservation Planning Act

In 1991, the State's Natural Community Conservation Planning Act (NCCPA) was passed. The NCCPA is broader in its orientation and objectives than the California and Federal Endangered Species Acts, and is designed to identify and protect individual species that have already declined in number significantly. The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land use. The program seeks to anticipate and prevent the controversies and gridlock caused by species' listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

An NCCP identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. El Dorado County is currently in the process of developing an HCP/NCCP document, the Integrated Natural Resources Implementation Plan (INRMP) which has, and continues to include wide-ranging interagency support including Reclamation, Bureau of Land Management, and the USFWS.

10.8.6. Government Code Section 65040.12(e), Environmental Justice

State law defines environmental justice in Government Code Section 65040.12(e) as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations and policies. Government Code Section 65040.12(a) designates the Governor’s Office of Planning and Research (OPR) as the coordinating agency in State government for environmental justice programs, and requires OPR to develop guidelines for incorporating environmental justice into general plans. There is currently no State requirement that environmental justice be addressed as a part of the CEQA review process for individual projects; however, this statute may be applicable to future facility-construction projects that could occur during the implementation of the Proposed Action.

10.8.7. Williamson Act (California Land Conservation Act)

The California Legislature passed the Williamson Act in 1965 to preserve agricultural and open space lands by discouraging premature and unnecessary conversion to urban uses. The Act creates an arrangement whereby private landowners contract with counties and cities to voluntarily restrict land to agricultural and open-space uses. The vehicle for these agreements is a rolling term 10 year contract (i.e. unless either party files a "notice of non-renewal" the contract is automatically renewed annually for an additional year). In return, restricted parcels are assessed for property tax purposes at a rate consistent with their actual use, rather than potential market value. Currently, nearly 16.9 million of the State's 29 million acres of farm and ranch land are protected under the Williamson Act. Williamson Act provisions are embodied in the land use zoning, allocation and development process. They are not part of the approval process for new CVP water service contracts. However, in the future, where new facilities and/or infrastructure are planned that may affect certain land uses and land areas, the provisions contained in the Williamson Act would be part of those environmental review and approval processes.

10.9. NOTIFICATION AND DISTRIBUTION

During the preparation of this EIS/EIR and, specifically, regarding the public noticing that has occurred, an extensive list of contacts including; public trust resource agencies, non-governmental organizations, local and regional politicos, environmental groups, and other special interest associations and individual stakeholders were notified.

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12.0 REFERENCES

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12.0 REFERENCES

12.1. Documents Cited

Allen, M.R. and D.J. Frame, "Call Off the Quest", SCIENCE, Vol. 318, 2007.

Alley, R.B., J. Marotzke, W.D. Nordhaus, J.T. Overpeck, D.M. Peteet, R.A. Pielke, Jr., R.T., Pierrehumbert, P.B. Rhines, T.F. Stocker, L.D. Talley and J.M. Wallace, "Abrupt Climate Change", SCIENCE, Vol. 299, Number 5615, 2003.

Baldwin, M.P., M. Dameris and T.G. Shepherd, "How will the Stratosphere Affect Climate Change?", SCIENCE, Vol. 316, 2007.

Barnett, T., R. Malone, W. Pennell, D. Stammer, B. Semptner and W. Washington, "The Effects of Climate Change on Water Resources in the West: Introduction and Overview", CLIMATIC CHANGE, Vol. 62, Numbers 1-13, 2004.

Bartholow, J.M., "Recent Water Temperature Trends in the Lower Klamath River, California", NORTH AMERICAN JOURNAL OF FISHERIES MANAGEMENT, Vol. 25, Issue 1, 2005.

Bates, A.K., "Climate in Crisis; The Greenhouse Effect and What We Can Do", Book Publishing Company, TN, 1990.

Bell, M.C. 1986. Fisheries Handbook of Engineering Requirements and Biological Critiera. U.S. Army Corps of Engineers, Office of Chief Engineers, Fish Passage and Development Program, Portland, Oregon.

Bosello, F., R. Roson and R.S.J. Tol, "Economy-wide Estimates of the Implications of Climate Change: Sea Level Rise" ENVIRONMENTAL AND RESOURCE ECONOMICS, Vol. 37, Number 3, 2007.

Bouey, P.D., Intensive Cultural Resources Survey and National Register Evaluation: Sacramento Urban Area Flood Control Project, 1990.

Bovee, K.D. 1978. Probability-of-Use Criteria for the Family Salmonidae. U.S. Fish and Wildlife Service Instream Flow Information Paper 12, FWS/OBS-78-07.

Brekke, L.D., N.L. Miller, K.E. Bashford, N.W.T. Quinn and J.A. Dracup, "Climate Change Impacts Uncertainty for Water Resources in the San Joaquin River Basin, California", JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION, Vol. 40, Number 1, 2004.

Brown and Caldwell and others. 1995. Study of Drinking Water Quality in Delta Tributaries. Prepared for California Urban Water Agencies.

Buehler, M., "Potential Impacts of Global Warming on Water Resources in Southern California", WATER SCIENCE TECHNOLOGY, Vol. 47, Number 7-8, 2003.

Bunn, A.G., S.J. Goetz, J.S. Kimball and K. Zhang, "Northern High-Latitude Ecosystems Respond to Climate Change", EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION, Vol. 88, Number 24, 2007.

CALEPA, "Climate Change", Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles, California Air Resources Board, 2004.

California Department of Conservation, Division of Mines and Geology (CDMG). 1973. Generalized Map Showing Relative Amounts of Landslides in California. Sacramento, CA.

_____ , Division of Mines and Geology, Geologic Map of the Sacramento Quadrangle, California, 1:250,000, DMG Regional Geologic Map Series, 1981.

_____ , Division of Mines and Geology, Mineral Land Classification of the Auburn 15' Quadrangle, El Dorado and Placer Counties, DMG Open-File Report 83-37, 1984.

California Department of Fish and Game 1991, 1992, 1993, 1993a, 1994, 1995.

_____ , *Anadromous Fish Conservation Act Project AFS-17, Management Plan for American Shad in Central California, Final Report*, 1980.

California Department of Fish and Game, *A Report to the State Water Resources Control Board on the Fish and Wildlife Resources of the American River to be Affected by the Auburn Dam and Reservoir and the Folsom-South Canal and Measures Proposed to Maintain These Resources*, 1971.

_____ , *Endangered and Threatened Animals of California*, 1986.

_____ , *Requirements of American Shad in the Sacramento-San Joaquin River System, Exhibit 23, State Water Resources Control Board 1987 Water Quality/Water Rights Proceeding on the San Francisco Bay/Sacramento-San Joaquin Delta*, 1987.

_____ , *Stream Evaluation Report No. 86-1, Instream Flow Requirements of the Fish and Wildlife Resources of the Lower American River*, 1986.

California Department of Water Resources, "CALSIM II Simulation of Historical SWP-CVP Operations", Technical Memorandum Report, CALFED Bay-Delta Office, 2003.

______, "A Strategic Review of CALSIM II and Its Use for Water Planning, Management, and Operations in Central California", California Department of Water Resources, California Bay-Delta Authority Science Program, 2003.

______ "CALSIM II Model - Sensitivity Analysis Study", Technical Memorandum Report, CALFED Bay-Delta Office, October 2005.

______, "CALSIM II San Joaquin Peer Review Response", 2006.

______, "Progress on Incorporating Climate Change into Management of California's Water Resources", Technical Memorandum Report, 2006.

_____ , data as transmitted by R. Woodard, 1996.

_____ , May 2006. *Bulletin 120*. American River below Folsom Lake 50-year average unimpaired runoff.

_____ , *Sacramento-San Joaquin Delta Atlas*, 1993.

California Environmental Protection Agency, Central Valley Regional Water Quality Control Board (RWQCB). 1994. Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin. 4^{th} edition, revised 1998.

California Environmental Protection Agency, Central Valley Regional Water Quality Control Board, 1998 California 303(d) List.

_____ , Central Valley Regional Water Quality Control Board, Final Staff Report on Recommended Changes to California's Clean Water Act Section 303(d) List, December 14, 2001.

CALFED. 1997. Central Valley Project Improvement Act, *Programmatic Environmental Impact Statement*.

Carpenter, T.M. and K.P. Georgakakos (2001) "Assessment of Folsom Lake response to Historical and Potential Future Climate Scenarios: 1. Forecasting", JOURNAL OF HYDROLOGY, Vol. 249, Issues 1-4, 2001.

Central Valley Project Water Supply Contracts Under Public Law 101-514 (Section 206) Final Environmental Impact Report. U.S. Bureau of Reclamation. November 1998.

Chalecki, E.L. and P.H. Gleick, " A Framework of Ordered Climate Effects on Water Resources: A Comprehensive Bibliography", JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION, Vol. 35, Issue 6, 1999.

Changnon, S.A., "Inadvertent Weather Modification in Urban Areas: Lessons for Global Climate Change", BULLETIN OF THE AMERICAN METEOLOGICAL SOCIETY, Vol. 73, Issue 5, 1992.

Christensen, J.H, T.R. Carter, M. Rummukainen and G. Amanatidis, "Evaluating the Performance and Utility of Regional Climate Models: the PRUDENCE project", CLIMATE CHANGE, Vol. 81, Supplement, 2007.

Christy, J.R., W.B. Morris, K. Redmond and K.P. Gallo, "Methods and Results of Calculating Central California Surface Temperature Trends: Evidence of Human-Induced Climate Change?" JOURNAL OF CLIMATE, Vol. 19, Number 4, 2006.

Chung F. et al., "Progress on Incorporating Change into Management of California's Water Resources", Early Manuscript, 2005.

City of Sacramento, *Relative Risks of the Sacramento and American Rivers as Sources of Water Supply*, 1993.

Cox, P. and D. Stephenson, "A Changing Climate for Prediction", SCIENCE, Vol.317, 2007.

D. Goldsmith, "Ice Cycles: Long-Term Fluctuations in Ocean Temperature Lend Support to Milutin Milankovitch's Theory of Climate Change - But Can His Theory Account for the Ice Ages?", NATURAL HISTORY, March 2007, http://findarticles.com/p/articles/mi_m1134/is_2_116/ai_n18646467/

DeHaven, R.W., An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 2, 1977.

_____ , An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 3, 1978.

_____ , An Angling Study of Striped Bass Ecology in the American and Feather Rivers, California, Unpublished Progress Report No. 4, 1979.

Dettinger, M.D., "From Climate Change Spaghetti to Climate-Change Distributions for 21st Century California", SAN FRANCISCO ESTUARY AND WATERSHED SCIENCE, Vol. 3, Issue 1, Article 4, 2005.

Dietz, T., R. York and E.A. Rosa, "Ecological Democracy and Sustained Development", Paper presented at the 2001 Open Meeting of the Human Dimensions of Global Environmental Change Research Community, Rio de Janeiro, Brazil, 8 October 2001.

Dowlatabadi, H. and M.G. Morgan, "Integrated Assessment of Climate Change", SCIENCE, Vol. 259, Issue 5103, 1993.

Draper, A. J., Munévar, A., Arora, S.K., Reyes, E., Parker, N.L., Chung, F.I., and Peterson, L.E., JOUR. WATER RESOURCE PLANNING AND MANAGEMENT., Volume 130, Issue 6, 2004.

Drucker, P. 1948. Preliminary Appraisal of the Archaeological Resources of Folsom Reservoir, Placer, Eldorado, and Sacramento Counties, California. Washington D.C.: Pacific Coast Area River Basin Surveys, Smithsonian Institution.

Duffy, P.B., C. Bonfils and D. Lobell, "Interpreting Recent Temperature Trends in California", EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION, Vol. 88, Number 41, 2007.

Dvorak, V., J. Hladny and L. Kasparek, "Climate Change Hydrology and Water Resources Impact and Adaptation for Selected River Basins in the Czech Republic", CLIMATIC CHANGE, Vol. 36, 1997.

Easton D., M. Ejeta, A. Olson and R. Yaworksy, "Preliminary Climate Change Impacts Assessment for State Water Project and Central Valley Project Operations", Chapter 4, In: Progress on Incorporating Climate Change into Management of California's Water Resources, 1st Progress Report, July 2006.

Economic & Planning Systems, El Dorado County "No Project" Land Use Scenario Final Report, April 2001.

El Dorado County Air Quality Management District (AQMD). Guide to Air Quality Assessment, Draft, January 2002.

El Dorado County Planning Department, *El Dorado County General Plan*. July 2004.

_____ , *El Dorado County General Plan Draft Environmental Impact Report* (SCH #2001082030), May 2003.

_____ .*El Dorado County General Plan Final Environmental Impact Report* (SCH #2001082030), January 2004.

_____ , *El Dorado County General Plan, Volume II, Background Information*, January 23, 1996.

_____ , *Revised Marble Valley Rezone and Subdivision Project Draft Environmental Impact Repor*t, June 1997.

El Dorado County Water Agency, "El Dorado County Western Slope Drought Analysis - Phase I Report", April, 2006.

______, "El Dorado County Western Slope Drought Analysis - Phase I Report," April, 2006.

______, *Water Resources Development and Management Plan*, April 2007.

_____ , *Water Resource Development and Management Plan, Agricultural Water Demand*, December, 2007.

El Dorado Irrigation District. *Final Urban Water Management Plan, 2005 Update*. January 2006.

_____ , Press Release. July 20, 2006.

_____ , Recycled Water Supply Data. Unpublished.

Energy and Water Development Appropriations Act of 1991, H.R. 5019.

Ferreira, I.C., Tanaka S.K., Hollinshead, S.P., Lund JR, "Musings on a model: CALSIM II in California's water community", SAN FRANCISCO ESTUARY AND WATERSHED SCIENCE, Vol. 3, Issue 1, Article 1, 2005.

Fox, D., "Back to the No-Analog Future", SCIENCE, Vol.316, 2007.

Freeport Regional Water Authority, *Modeling Technical Appendix, Freeport Regional Water Project, Draft EIR/EIS*, 2003.

Frost, R.F., "SCIENCE," Vol. 303, 2004.

Georgetown Divide Public Utility District. *Urban Water Management Plan 2005-2010, Including a: Water Shortage Contingency Plan*. 2005.

Gian-Reto, W., E. Post, P. Convey, A. Menzel, C. Parmesan, T.J.C. Beebee, J.M. Fromentin, O. Hoegh-Guldburg and F. Bairlein, "Ecological Responses to Recent Climate Change", NATURE, 416, 2002.

Gleick, P.H., "Regional Water Availability and Global Climatic Change: The Hydrologic Consequences of Increases in Atmospheric Carbon Dioxide and Other Trace Gases", Ph.D. Dissertation, University of California, Berkeley, California, 1986.

______, "Development and Testing of a Water Balance Model for Climate Impact Assessment Modeling the Sacramento Basin", WATER RESOURCES RESEARCH, Vol. 23, Issue 6, 1989.

______, "Water Management and Planning Under Climate Change", Unpublished, portions of this article appeared in a piece prepared by P.H. Gleick for the JOURNAL OF THE AMERICAN WATER WORKS ASSOCIATION ("Climate Change and Water Resources") in November 1997, and in Chapter 5 of the new book THE WORLD'S WATER 1998-1999, Island Press, Washington, D.C.

Gregory, J.M., J.F.B. Mitchell and A.J Brady, "Summer Drought in Northern Midlatitudes in a Time-Dependent CO2 Climate Experiment", JOURNAL OF CLIMATE, Vol. 10, 1997.

Gurdak, J.J., R.T. Hanson, P.B. McMahon, B.W. Bruce, J.E., McCray, G.D. Thyne and R.C. Reedy, "Climate Variability Controls on Unsaturated Water and Chemical Movement, High Plains Aquifer, USA", VADOSE ZONE JOURNAL, Vol. 6, 2007.

Hadley Centre, "Types of Models", Met Office, Hadley Center for Climate Prediction and Research, UK, website, 2007.

Hallock, R.J. and F.W. Fisher, *Status of the Winter-run Chinook Salmon (Onchorynchus tshawytscha) in the Sacramento River*, 1985.

Hanemann, M., L. Dale, S. Vicuna, D. Bickett and C. Dyckman, "The Economic Cost of Climate Change Impact on California Water: A Scenario Analysis", PIER Project Report, California Energy Commission, California Climate Change Center Report Series Number 2006-005, 2006.

Hayhoe, K., D. Cayan, C.B. Field, P.C. Frumhoff, E.P. Mauer, N.L. Miller, S.C. Moser, S.H. Schneider, K.N. Cahill, E.E. Cleland, L. Dale, R. Drapek, R.M. Hanemann, L.S., Kalkstein, J. Lenihan, C.K. Lunch, R.P. Neilson, S.C. Sheridan and J.H. Verville, "Emission Pathways, Climate Change and Impacts on California", PROC. NATIONAL ACADEMY OF SCIENCES, Vol. 101, Number 34, 2004.

HDR/SWRI, Modeling Technical Memorandum, U.S. Bureau of Reclamation/El Dorado County Agency New CVP Water Service Contract Draft EIS/EIR, 2007.

Herbold, B., A.D. Jassby and P.B. Moyle, *Status and Trends Report on the Aquatic Resources in the San Francisco Estuary, San Francisco Estuary Project Public Report*, 1992.

Huntingford, C. and J. Lowe, "'Overshoot' Scenarios and Climate Change", SCIENCE, Vol. 316, 2007.

Inman, D.L., P.M. Masters and S.A. Jenkins, "Facing the Coastal Challenge: Modeling Coastal Erosion in Southern California", Presented at California and the World Ocean 02 Conference, Santa Barbara, California, October 27-30, 2002.

Intergovernmental Panel on Climate Change (IPCC), "Special Report - Radiative Forcing of Climate Change and An Evaluation of the IPCC IS92 Emissions Scenarios" IPCC Special Report 1994, J.T. Houghton, L.G. Meira Filho, J. Bruce, Hoesung Lee, B.A. Callander, E. Haites, N. Harris and K. Maskell (Eds.), Cambridge University Press, UK,.1994.

______, "Climate Change 1995: The Science of Climate Change", Contribution of Working Group I to the Second Assessment of the Intergovernmental Panel on Climate Change, J.T. Houghton, L.G. Meira Filho, B.A. Callender, N. Harris, A. Kattenberg and K. Maskell (Eds.), Cambridge University Press, UK, 1985.

______, "Climate Change 2001: A Synthesis Report", Contribution of Working Groups I, II and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Watson, R.T. and the Core Writing Team (Eds.), Cambridge University Press, UK, 2001.

______, "Climate Change 2001: Impacts, Adaptation and Vulnerability", Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change, J.J. McCarthy, O.F. Canziani, N.A. Leary, D.J. Dokken and K.S. White (Eds.), Cambridge University Press, UK, 2001.

______, "Climate Change 2001: The Scientific Basis", Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change, J.T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P. J. van der Linden and D. Xiaosu (Eds.), Cambridge University Press, UK, 2001.

______, "Climate Change 2007: The Physical Science Basis - A Summary for Policy Makers", Contribution of Working Groups I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, (Final corrections made February 5, 2007).

Jackson, T., "Joint Implementation and Cost-Effectiveness under the Framework Convention on Climate Change", ENERGY POLICY, Vol. 23, Number 2, 1995.

Karnosky, D.F., R. Ceulemans, G.E., Scarascia-Mugnozza and J.L. Innes (Eds.), "The Impact of Carbon Dioxide and Other Greenhouse Gases on Forest Ecosystems", IuFRO Research Series 8, CABI Publishing, 2001.

Kerr, R.A., "Another Global Warming Icon Comes Under Attack", SCIENCE, Vol. 317, 2007.

Kiparsky M. and P.H. Gleick, "Climate Change and California Water Resources: A Survey and Summary of the Literature", Pacific Institute for Studies in Development, Environment and Security, 2003.

Knox, J.B., "Introduction to Background Materials for Workshop No. 1: Global Climate Change and its Effects on California", U.S. Department of Energy, Technical Report, UCID-21631, 1989.

Knox, J.C., "Large Increases in Flood Magnitude in Response to Modest Changes in Climate", NATURE, Vol. 361, 1993.

Larry Walker Associates. 1991. Sacramento Regional Wastewater Treatment Plant Master Plan Report, Task 400 Technical Memorandum No.3: Background Water Quallity.

Larry Walker and Associates and Brown and Caldwell. 1995. *Sacramento Coordinated Water Quality Monitoring Program 1994 Annual Report*.

Larry Walker and Associates and Brown and Caldwell. 1996. *Sacramento Coordinated Water Quality Monitoring Program 1994 Annual Report*.

Leggett, W.C., and R.R. Whitney. 1972. Water temperature and the migration of American shad. U.S. Fish. Bull. 70: 659-670.

Lettenmaier, D. P. and D.P. Sheer, "Climatic Sensitivity of California Water Resources", JOURNAL OF WATER RESOURCES PLANNING AND MANAGEMENT, Vol. 117, Number 1, 1991.

Lettenmaier, D. P. and T.Y. Gan, "Hydrologic Sensitivities of the Sacramento-San Joaquin Basin, California, to Global Warming", WATER RESOURCES RESEARCH, Vol. 6, Number 1, 1990.

Lloyd, A.H., "Ecological Histories, Ecological Futures, What Recent Changes at Treeline Reveal About the Future", ECOLOGY, Vol. 86, 2005.

Lobell, D.B., C.B. Field, C.N. Cahill and C. Bonfils, "Impacts of Future Climate Change on California Perennial Crop Yields: Model Projections with Climate and Crop Uncertainties", AGRICULTURAL AND FOREST METEOROLOGY, Vol. 141, Issues 2-4, 2006.

Lund, J, R. Howitt, M. Jenkins, T. Zhu, S. Tanaka, M. Pulido, M. Tauber, R. Ritzema, and I. Ferreira. 2003. Climate Warming and California's Water Future. Report for the California Energy Commission by the University of California at Davis Departments of Civil and Environmental Engineering and Agricultural and Resource Economics. Report 03-1 Center for Water Resources and Environmental Engineering, University of California, Davis, CA. March 20, 2003.

Marani, M. and S. Zanetti, “Downscaling Rainfall Temporal Variability", WATER RESOURCES RESEARCH, Vol. 43, Number 9, W09415, 2007.

Marbaix, P. and R.J. Nicholls, "Accurately Determining the Risks of Rising Sea Level", EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION, Vol. 88, Number 43, 2007.

Mayer, K. E., and W. F. Laudenslayer, Jr. (eds.). A Guide to Wildlife Habitats of California. California Department of Fish and Game. Sacramento, CA, 1988.

McConnell, J.R., R. Edwards, G.L. Kok, M.G. Flanner, C.S. Zender, E.S. Saltzman, J.R. Banta, M.M. Carter and J.D.W. Kahl, "20th-Century Industrial Black Ice Carbon Emissions Altered Arctic Climate Forcing", SCIENCE, Vol. 7, 2007.

Mead & Hunt, Joint Benefit Investigation Plan, Technical Analysis of Preliminary Alternatives, Prepared for Joint Benefit Investigation Team, El Dorado County Water Agency, El Dorado Irrigation District, Sacramento Municipal Utility District, and Georgetown Divide Public Utility District, July 2004.

Miller, N.L., "California Climate Change, Hydrologic Response, and Flood Forecasting", International Expert Meeting on Urban Flood Management, Rotterdam, The Netherlands, November 20-21, 2003.

Miller, N.L., K.E. Bashford and E. Stern, "Potential Impacts of Climate Change on California Hydrology", JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION, Vol. 39, Issue 4, 2003.

Mitchell, J.F. B, "The Greenhouse Effect and Climate Change", REVIEW OF GEOPHYSICS AND SPACE PHYSICS, Vol.27, 1989.

Mote, P.W., A.F. Hamlet, M.P. Clark and D.P. Lettenmaier, "Declining Mountain Snowpack in Western North America", AMERICAN METEOROLOGICAL SOCIETY, January 2005, 2005.

Moyle, P.B., *Inland Fishes of California*, 1976.

Myneni, R.B., C.D. Keeling, C.J. Tucker, G. Asrar and R.R. Nemani, "Increased Plant Growth in the Northern High Latitudes from 1981 to 1991", NATURE, Vol. 36, 1997.

National Marine Fisheries Service, *Biological Opinion on the Winter-run Chinook Salmon*, 1993.

National Research Council, "Radiative Forcing of Climate Change: Expanding the Concept and Addressing the Uncertainties", National Research Council of the National Academies, The National Academies Press, Washington, D.C., 2005.

Nilsson, E., J. J. Johnson, M. S. Kelly, and S. Flint. 1995. Archaeological Inventory Report, Lower American River Locality: American River Watershed Investigation, California (Draft). Prepared for U.S. Army Corps of Engineers, Sacramento District, California.

NOAA Fisheries, *Draft Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations and Criteria Plan*, December 11, 2008.

Parker, D.E., C.K. Holland, A. Bevan and P.D. Jones, "Interdecadal Changes in Temperature since the Late Nineteenth Century", JOURNAL OF GEOPHYSICAL RESEARCH, Vol. 99, Issue D7, 1994.

Pauli, H., M. Gottfried and G. Grabherr, "Effects of Climate Change on Mountain Ecosystems - Upward Shifting of Alpine Plants", WORLD RESOURCE REVIEW, Vol. 8, Issue 3, 1996.

Pavlik B. M, P. C. Muick, S. Johnson, and M. Popper, “Oak in California,” Cachuma Press, Los Olivos, CA, 1991.

Payne, J.T., A.W. Wood, A.F. Hamlet, R.N. Palmer and D.P. Lettenmaier, "Mitigating the Effects of Climate Change on the Water Resources of the Columbia River Basin", CLIMATIC CHANGE, Vol. 62, Numbers 1-3, 2004.

Peterson, D., D. Cayan, J. DiLeo, M. Noble and M. Dettinger, "The Role of Climate in Estuarine Variability", AMERICAN SCIENTIST, Vol. 83, Issue 1, 1995.

Pew Center, Fact Sheet: Pew Center on Global Climate Change, 2007.

Philip, J., "The Theory of Infiltration: 4. Sorptivity and Algebraic Infiltration Equations", SOIL SCIENCE, Vo.84, 1957.

Placer County Water Agency and U.S. Bureau of Reclamation, *American River Pump Station Project Final EIS/EIR*, June 2002.

Polyakov, I., Timokhov, L., Dmitrenko, I., Ivanov, V., Simmons, H., Besczynska-Moller, A., Dickson, R., Fahrbach, E., Fortier, L., Gascard, J.C., Holeman, J., Holliday, P., Hansen, E., Mauritzen, C., Piechura, J., Pickart, R., Schauer, U., Steele, M. and Walczowski, W., "Observational Program Tracks Arctic Ocean Transition to a Warmer State", EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION, Vol. 88, Number 40, 2007.

Prasad, A.K. and R.P Singh, Changes in Himalayan Snow and Glacial Cover Between 1972 and 2000, EOS Trans. Amer. Geophysical Union, Vol.88, Number 33, 2007.

Pupacko, A., "Variations in Northern Sierra Nevada Streamflow: Implications of Climate Change", JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION, Vol. 29, Number 2, 199.

Rahmstorf, S., A, Cazenave, J.A. Church, J.E. Hansen, R.F. Keeling, D.E. Parker and R.C.J. Somerville, "Recent Climate Observations Compared to Projections", SCIENCE, Vol. 316, Number 5825, 2007.

Raleigh, R.F., W.J. Miller, and P.C.Nelson. 1986. Habitat Suitability Index Models and Instream Flow Suitability Curves: Chinook Salmon. U.S. Fish and Wildlife Service Biol. Rep. 82 (10.1222).

Randall, D., M. Khairoutdinov, A. Arakawa, and W. Grabowski. 2003. Breaking the cloud parameterization deadlock. Bull. Am. Meteorol. Soc. 1547-1564.

Reclamation Grey literature, Central Valley Project (CVP) Water Needs Assessments Purpose and Methodology.

Reclamation, "Long-Term Central Valley Project – Operations Criteria and Plan – CVP-OCAP, U.S Department of the Interior, Bureau of Reclamation, Mid-Pacific Region, Sacramento, California, June 30, 2004.

Reiser, D. W., and T. C. Bjornn. 1979. Habitat requirements of anadromous salmonids. In: Influence of forest and rangeland management on anadromous fish habitat in the western United States and Canada. Pacific Northwest Forest and Range Experiment Station. USDA Forest Service, Gen. Tech. Rep. PNW-96. Portland, Oregon. 54 pp.Reynolds, F.L, R.L. Roberts and J. Shuler, *Central Valley Salmon and Steelhead Restoration and Enhancement Plan*, 1990.

Rich, A. A. 1987. Establishing temperatures which optimize growth and survival of the anadromous fishery resources of the lower American River. Prep. for McDonough, Holland and Allen, Sacramento, CA. 25 pp.

Riebsame, W.E., "Adjusting Water Resources Management to Climate Change", CLIMATIC CHANGE, Vol. 13, Number 1, 1988.

Roe, G.H. and M.B. Baker, "Why is Climate Sensitivity So Unpredictable?" SCIENCE, Vol. 318, 2007.

Roos, M., "Climate Change and Changes in California Snowmelt-Runoff Patterns", Water Use Data for Water Resources Management, PROCEEDINGS OF A SYMPOSIUM, American Water Resources Association, Bethesda, MD, 1988.

______, "Possible Climate Change and its Impact on Water Supply in California", OCEANS 89: PROCEEDINGS, Vol. 1, 1989.

______, "Possible Climate Change and its Impact on Snowmelt and Water Supply in California", PROCEEDINGS OF THE 58th ANNUAL WESTERN SNOW CONFERENCE, 1990.

______, "Trend of Decreasing Snowmelt Runoff in Northern California", PROCEEDINGS OF THE 59th ANNUAL WESTERN SNOW CONFERENCE, 1991.

______, "The Effects of Global Climate Change on California Water Resources" A report to the California Energy Commission's Public Interest Energy Research Program (PIER), Sacramento, September 2002.

Sacramento County, *Draft Sacramento County General Plan Update Environmental Impact Report, Volume I, Sacramento County*, Department of Environmental Review and Assessment,1992.

San Francisco Estuary Project, *State of the Estuary: A Report on Conditions and Problems in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1992.

Schaer, C., C. Frei, D. Luethi and H.C. Davies, "Surrogate Climate Change Scenarios for Regional Climate Models", GEOPHYSICAL RESEARCH LETTERS, Vol. 23, Issue 6, 1996.

Schellnhuber, H.J., W. Cramer, N. Nakicenovic, T. Wigley, G. Yohe (Eds.), "Avoiding Dangerous Climate Change", Cambridge University Press, Cambridge, 2006.

Schlenker, W., W.M. Hannemann and A.C. Fisher, "Water Availability, Degree Days, and the Potential Impact of Climate Change on Irrigated Agriculture in California", CLIMATIC CHANGE, Vol. 81, Number 1, 2007.

Schlesinger, M.E. and J.F.B. Mitchell, "Climate Model Simulations of the Equilibrium Climatic Response to Increased Carbon Dioxide", REV. GEOPHYSICS, Vol. 25:4, 1987.

Schreider, S.Y., A.J. Jakeman, A.B. Pittock and P.H. Whetton, "Estimation of the Possible Climate Change Impacts on Water Availability, Extreme Flow Events and Soil Moisture in the Goulburn and Ovens Basins, Victoria", CLIMATIC CHANGE, Vol. 34, 1996.

Schwartz, P. and D. Randall, "An Abrupt Climate Change Scenario and Its Implications for United States National Security", October, 2003 Global Business Network, Prepared for the U.S. Department of Defense, 2003.

Schwartz, S.E. and M.O. Andrea, "Uncertainty in Climate Change caused by Aerosols", SCIENCE, Vol. 272, 1996.

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H.P. Huang, N. Harnik, A, Leetmaa, N.C. Lau, C. Li, J.Velez and N.Naik, "Model Predictions of an Imminent Transition to a More Arid Climate in Southwestern North America", SCIENCE, Vol.316, 2007.

Smith, J.B. and D.A. Tirpak, "The Potential Effects of Global Climate Change on the United States", Hemisphere Publishing, New York, NY, 1990.

Snider W.M., and E. Gerstung, *Instream Flow Requirement of the Fish and Wildlife Resources of the Lower American River, Sacramento County, California, California Department of Fish and Game Stream Evaluation Report*, 1986.

Snider, W. M., and R. Titus. 1996. Fish Community Survey: Lower American River, January through June, 1995. California Department of Fish and Game, Environmental Services Division.

Snider, W.M., R.G. Titus, and B.A. Payne. 1997. Lower American River Emigration Survey: November 1994-September 1995. Final Report. California Department of Fish and Game, Environmental Sciences Division, Streams Evaluation Program.

Snyder, M.A., L.C. Sloan and J.L. Bell, "Modeled Regional Climate Change in the Hydrologic Regions of California: A CO2 Sensitivity Study", JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION, Vol. 40, Issue 3, 2004.

Stern, N., "The Economics of Climate Change: The Stern Review", Cambridge University Press, Cambridge, 2007.

Strachowicz, J.J., J.R. Terwin, R.B. Whitlatch and R.W. Osman, "Linking Climate Change and Biological Invasions: Ocean Warming Facilitates Indigenous Species Invasions", PROC. NATIONAL ACADEMY OF SCIENCES, Vol. 99, Number 24, 2002.

SWRI, *Draft American River Basin Cumulative Impact Report*, August 2001, included as Appendix D to *PCWA American River Pump Station Project Draft EIS/EIR* (SCH #1999062089), August 2001.

State Water Resources Control Board, *2006 CWA Section 303(d) List of Water Quality Limited Segments*. Approved By U.S. EPA. Sacramento, CA, July 2007.

______, *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, Environmental Report*, Appendix I, 1995.

______, *Draft Environmental Report Appendix to Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, 1994.

______, 1992.

______ Work Plan, *Review of Water Rights on the American River*, August 1990.

Stevens, D., “When do winter-run Chinook salmon smolts migrate through the Sacramento-San Joaquin Delta?”, unpublished memorandum, 1989.

Tanaka, S.K., T. Zhu, J.R. Lund, R.E. Howitt, M.W. Jenkins, M.A. Pulido, M. Tauber, R.S. Ritzema and I.C. Ferreira, "Climate Warming and Water Management Adaptation for California", JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION, Vol. 76, Issue 3-4, 2006.

Tape, K., M. Sturm and C. Racine, "The Evidence for Shrub Expansion in Northern Alaska and the Pan-Arctic", GLOBAL CHANGE BIOL., Vol. 12, 2006.

Thompson, J., *The Settlement Geography of the Sacramento-San Joaquin Delta*, California, 1957.

U.S. Army Corps of Engineers. 1991. Existing fisheries and wildlife conditions for the acramento/Trinity River reach, American River reach, and Sacramento-San Joaquin Delta. Unnamed Report Excerpt.

U.S. Army Corps of Engineers, 1994. Environmental Evaluation South Sacramento County Streams Investigation, California: Reconnaissance Report. March 1994.

_____ , *Achieving Efficient Water Management - A Guidebook for Preparing Agricultural Water Management Plans, Second Edition*, 2003.

_____ , *Biological Assessment for U.S. Bureau of Reclamation, Central Valley* Operations, 1992.Wood Rogers. *El Dorado County Water Management Plan*. March 2003.

______, *Lower American River Flow Management Standard*, July 31, 2006.

VanRheenen, N.T., A.W. Wood, R.N. Palmer and D.P. Lettenmaier. 2004. "Potential Implications of PCM Climate Change Scenarios for Sacramento-San Joaquin River Basin Hydrology and Water Resources", CLIMATIC CHANGE, Vol. 62, Issues 1-3, pp. 257-281

Vicuna, S. 2006. "Predictions of Climate Change Impacts On California Water Resources using CALSIM II: A Technical Note", Report for California Climate Change Center, CEC-500-2005-200-SF.

Vorosmarty, C.J., P. Green, J. Salisbury and R.B. Lammers (2003) "Global Water Resources: Vulnerability from Climate Change and Population Growth", SCIENCE, Vol. 289, Number 5477, pp. 284-288.

Verner, J., and A. S. Boss, California Wildlife and Their Habitats: Western Sierra Nevada, Gen. Tech. Rep. PSW-37, Pacific Southwest Forest and Range Experiment Station, 1980.

Waggoner, P.E., "Climate Change and U.S. Water Resources", (Ed.) Wiley Interscience, New York, NY, 1990.

Water Forum, “Draft Environmental Impact Report for the Water Forum Proposal”, January 1999, State Clearinghouse Number 95082041, City of Sacramento Control No. 8810, County of Sacramento Control Number 98, 1999.

Weinheimer, A.L., J.P. Kennett and D.R. Cayan, "Recent Increase in Surface-Water Stability During Warming off California as Recorded in Marine Sediments", GEOLOGY, Vol. 27, Number 11, 1999.

Wentz, F.J., L. Ricciardulli, K. Hilburn, and C. Mears, "How Much More Rain Will Global Warming Bring?" SCIENCE, Vol. 317, 2007.

Westerling, A.L., H.G. Hidalgo, D.R. Cayan and T.W. Swetman, "Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity", SCIENCE, Vol. 313, Number 5789, 2006.

Wilkinson, R., "Preparing for a Changing Climate: the Potential Consequences of Climate Variability and Change, California Regional Assessment". A Report of the California Regional Assessment Group for the U.S. Global Change Research Program, 2002.

WMO/UNEP, "Scientific Assessment of Ozone Depletion", ozone.unep.org/Assessment_Panel /SAP/Scientific_Assessment_2006/index.shtml, 2007.

Woods, T.N. and J. Lean, "Anticipating the Next Decade of Sun-Earth System Variations", EOS Trans. Amer. Geophysical Union, Vol.88, Number 44, 2007.

Zhu, T., J.R. Lund, M.W. Jenkins, G.F. Marques and R.S. Ritzema, "Climate Change, Urbanization, and Optimal Long-term Floodplain Protection", WATER RESOURCES RESEARCH 43, WO6421, 2007.

12.2. Personal Communications

Arnold, M., U.S. Forest Service. 1994.

Corcoran, D. September 2, 2008.

Roos, M., Chief Hydrologist, California Department of Water Resources

Slavin, T. U.S. Bureau of Reclamation. April 17 and 25, 2006.

Tegelman, D.E., U.S. Bureau of Reclamation). July 27, 2004.

12.3. Legal Cases Cited

Building Industry Association of Northern California v. Marin Municipal Water Dist. (1991) 235 Cal. App. 3d 1641, 1648-1649.

City of Del Mar v. City of San Diego (1982) 133 Cal.App.3d 410, 417

County of Amador v. El Dorado County Water Agency et al. (1999) 76 Cal.App.4th 931.

Glenbrook Development Co. v. City of Brea (1967) 253 Cal. App. 2d 267, 277.

Lukrawka v. Spring Valley Water Co. (1915) 169 Cal. 318, 332.

Natural Resources Defense Council et al., v. Dirk Kempthorne, Secretary of the Interior, California Department of Water Resources, San Luis & Delta Mendota Water Authority et al., (E.D. Cal. Case No. 05-CV-01207 OWW), *Pacific Coast Federation of Fisherman's Association/Institute for Fisheries Resources et al., v. Carlos Gutierrez, Secretary of Commerce, William Hogarth, National Marine Fisheries Service, NOAA, San Luis & Delta Mendota Water Authority et al.,* (E.D. Cal. Case No. 1:06-CV-00245-OWW-GSA).

Sequoyah Hills Homeowners Assn. v. City of Oakland (1993) 23 Cal.App.4th 704, 715

Swanson v. Marin Municipal Water District (1976) 56 Cal. App. 3d 512, 524.

13.0 LIST OF ABBREVIATIONS

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13.0 LIST OF ABBREVIATIONS

AF	acre-feet
AFA	acre-feet per annum
AFRP	Anadromous Fish Restoration Program
Ag	Agricultural
ANN	Artificial Neural Network
AOGMCs	atmosphere-ocean general circulation models
APCD	Air Pollution Control District
APE	Area of Potential Effect
AQMD	Air quality Management District
ARFCP	American River Flood Control Project
AROG	American River Operations Group
ASR	Aquifer Storage and Recovery
BDCP	Bay Delta Conservation Plan
BGEPA	Bald and Golden Eagle Protection Act
BiOp	Biological Opinion
BMP	Best Management Practice
CABY	Cosumnes, American, Bear, and Yuba rivers
CALSIM II	California Simulation II Model
Caltrans	California Department of Transportation
CALVIN	California Value Integrated Network
CAR	Coordination Act Report
CARB	California Air Resources Board
CAT	Climate Action Team
CCAO	Central California Area Office
CCC	Central California Coast
CCCC	California Climate Change Center
CCSP	Climate Change Science Program
CDFG	California Department of Fish & Game
CDPR	California Department of Parks & Recreation
CEC	California Energy Commission
CEQ	Council on Environmental Quality

CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFC	Chlorofluorocarbon
cfs	cubic feet per second
CGS	California Geological Survey
CIP	Capital Improvement Program
CNPS	California Native Plant Society
COA	Coordinated Operations Agreement
CPMM	Coldwater Pool Management Model
CPUC	California Public Utilities Commission
CRF	Code of Federal Regulations
CRHP	California Register of Historic Places
CRLF	California red-legged frog
CUWCC	California Urban Water Conservation Council
CV	Central Valley
CVP	Central Valley Project
CVP CPOU	CVP Consolidated Place of Use
CVPIA	Central Valley Project Improvement Act
CVP-OCAP	Central Valley Project Operations Criteria and Plan
CWA	Clean Water Act
DMC	Delta Mendota Canal
DMMs	Demand Management Measures
DOC	Dissolved Organic Carbon
DOE	Department of Energy
DPS	distinct population segments
DSA	Drainage Service Areas
DWR	California Department of Water Resources
E/I	export-to-inflow
EA	Environmental Assessment
EBMs	energy balance models
EC	Electrical Conductivity
EDCTA	El Dorado County Transit Authority
EDCWA	El Dorado County Water Agency
EDWAPA	El Dorado Water & Power Authority
EFH	Essential Fish Habitat

EID	El Dorado Irrigation District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENSO	El Nino-Southern Oscillation
EPA	Environmental Protection Agency
EPS	Economic & Planning Systems
ERP	Ecological Restoration Program
ERPP	Ecosystem Restoration Program Plan
ESA	Endangered Species Act
ET	Evapotranspiration
EWA	Environmental Water Account
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRMs	Flood Insurance Rate Maps
FMS	Flow Management Standard
FMS	Flow Management Standard
GCM	Global (or General) circulation model
GCMs	Global Climate Models
GDPUD	Georgetown Divide Public Utility District
GHG	Greenhouse gases
GIS	Graphic Information System
GPCD	gallons-per-capita-per-day
GWh	Gigawatt Hour
HCM	Highway Capacity Manual
INI	Impaired Nimbus Inflow Index
INRMP	Integrated Natural Resources Implementation Plan
IPCC	International Panel on Climate Change
km	kilometer
kW	kilowatts
LAFCO	Local Agency Formation Commission
LAR FMS	Lower American River Flow Management Standard
LAROPs	Lower American River Operations Groups
LCFS	Low Carbon Fuel Standard
M&I	Municipal & Industrial
MAF	million acre-feet

MCAB	Mountain Counties Air Basin
MES	mass emission strategy
MFP	Middle Fork Project
-MR	Mineral Resource
msl	mean sea level
MTP	Metropolitan Transportation Plan
MW	Megawatt
MWh	Megawatt Hour
NAHC	Native American Heritage Commission
NCCPA	Natural Community Conservation Planning Act
NDA	National Defense Authorization
NEMDC	Natomas East Main Drainage Canal
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMWC	Natomas Mutual Water Company
NOAA	National Oceanic and Atmospheric Administration
NOC	Notice of Completion
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
OCAP	Operations Criteria and Plan
OEPC	Office of Environmental Policy and Compliance
OPR	Office of Planning and Research
PAH	Polynuclear aromatic hydrocarbon
PCFFA	Pacific coast Federation of Fishermen Association
PCWA	Placer County Water Agency
PDO	Pacific Decadal Oscillation
PEIS	Programmatic Environmental Impact Statement
PG&E	Pacific Gas and Electric Company
PIER	Public Interest Energy Research

POD	Pelagic Organism Decline
POTW	Publicly Owned Treatment Works
POU	Place of Use
PPD	Pollutant Policy Document
ppt	parts per thousand
PROSIM	Project Simulation Model
PSA	Purveyor Specific Agreement
PZEV	Partial and zero-emission vehicles
RCM	Regional circulation model
RCMs	radiative-convective models
RIF	Road Impact Fees
RM	River Mile
ROD	Record of Decision
ROG	Reactive Organic Gas
RPA	Reasonable and Prudent Alternative
RWQCB	Regional Water Quality Control Board
SACOG	Sacramento Area Council of Governments
SAFCA	Sacramento Area Flood Control Agency
SCWA	Sacramento County Water Agency
SDIP	South Delta Improvement Program
SEI	Stockholm Environmental Institute
SFAR	South Fork American River Project
SHPO	State Historic Preservation Officer
SJWD	San Juan Water District
SMUD	Sacramento Municipal Utility District
SOFAR	South Fork American River
SRA	State Recreation Area
SRAC	Shaded Riverine Aquatic Cover
SRFCP	Sacramento River Flood Control Project
SRI	Sacramento River Index
SRWRS	Sacramento River Water Reliability Study
SSWD	Sacramento Suburban Water District
SVM	Shared Vision Model
SWE	snow water equivalent
SWP	State Water Project

SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TAR	Third Assessment Report
TCD	Temperature Control Device
TDS	Total Dissolved Solids
THM	trihalomethanes
TIM	Traffic Impact Mitigation
TMDLs	total maximum daily loads
TOC	Total Organic Carbon
TRD	Trinity River Division
TSM	Transportation Systems Management
TUs	thermal units
UARM	Upper American River Model
UARP	Upper American River Project
UCCE	University of California cooperative Extension
UNEP	United Nations environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
USFWS	U.S. Fish & Wildlife Service
UWMP	Urban Water Management Plan
VAMP	Vernalis Adaptive Management Plan
VIC	Variable Infiltration Capacity
WAPA	Western Area Power Administration
WBAs	water budget area boundaries
WMO	World Meteorological Organization
WNA	Water Needs Assessment
WOMT	Water Operations Management Team
WTP	Water Treatment Plant
WY	Water Year
X2	Two- part per thousand near bottom isohaline line
YCWA	Yuba County Water Agency

14.0 INDEX

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14.0 INDEX