5. METHODS

5. METHODS

5.1 INTRODUCTION

This chapter describes the methods used in the analysis of the proposed project and its alternatives. Topics discussed include:

- Period of analysis;
- Environmental setting and baseline for analysis of proposed project;
- Analytical approach; and
- Analytical methods.

5.2 PERIOD OF ANALYSIS

The California Department of Water Resources (Department) analyzed the effects of the proposed project over a period extending from 1995 until 2020. The Monterey Amendment was executed in 1995 but was not implemented until the following year. The Department chose 1995 as the baseline year for the analysis because it represents conditions just prior to implementation of the Monterey Amendment. The Department chose the year 2020 as the end point for the analysis because many other Department programs and planning processes underway in 2003 were using 2020 as their planning horizon. Use of 2020 as the planning horizon is appropriate for analysis of the Monterey Amendment because it is expected that the SWP contractors will need their maximum Table A amounts before that date. Furthermore, it is expected that the Settlement Agreement will be fully implemented by 2020. Also, use of 2020 as the planning horizon does not require excessive speculation.

5.3 ENVIRONMENTAL SETTING AND BASELINE FOR ANALYSIS OF PROPOSED PROJECT

The environmental setting, the condition without the proposed project, typically serves as the baseline condition against which the environmental effects of the proposed project are compared. CEQA Guidelines, Section 15125 (a), state “An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published or, if no notice of preparation is published, at the time environmental analysis is commenced.” Furthermore, the CEQA Guidelines state “This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant.”

An important use of the baseline conditions is to provide a basis for the decision-making body to decide what action to take after considering the environmental impacts of the action and other factors. In the case of the Monterey Amendment, a decision to continue the current implementation of the Monterey Amendment, continue the current implementation with mitigation measures, or revert to one of the possible no project alternatives requires consideration of the impacts of the proposed project as compared to the appropriate baseline.

When, as with the Monterey Amendment and the Settlement Agreement, the proposed project is the modification of an ongoing operation, in this case the SWP, the baseline will be the

continuation of the ongoing, unmodified operation into the future (CEQA Guidelines 15126(e) (3) (A)). Thus, the baseline for the Monterey Plus EIR will be continued operation of the SWP in accordance with the long-term water supply agreements but adjusted to include events that are expected to occur over time that are not related to Monterey Amendment and the Settlement Agreement. The events expected to occur between 1995 and 2020, unrelated to the proposed project, include increased population growth and urban development in California, increased demand for water in the SWP service area and elsewhere and certain Table A transfers. The Table A transfers include transfers from MWDSC to Coachella Valley WD and Desert WA pursuant to the Colorado River Quantitative Settlement Agreement and transfers from Tulare Lake Basin WD to other SWP contractors. Table 5-1 provides a listing of the basic assumptions underlying the baseline and proposed project scenarios.

Use of the baseline for assessment of the proposed project is complicated by the fact that parts of the proposed project were implemented between the time the Monterey Amendment was executed (1995) and the issuance of the NOP for the Monterey Plus EIR (2003). The pre-Monterey Amendment condition no longer exists with respect to SWP operation and with respect to the physical and regulatory environments.

A question arises with respect to the baseline against which the environmental impacts of the proposed project should be judged: should the baseline be 1995 conditions before any parts of the Monterey Amendment were implemented, or should it be 2003 conditions? Both have advantages and disadvantages, but neither is ideal. The use of 2003 conditions as the baseline is conventional practice and technically simple, and it provides a relatively current basis for decisions by the Department on implementation of an alternative.

However, use of the 2003 conditions would not account for the impacts of those elements of the Monterey Amendment that have already been implemented. The use of 1995 conditions as the baseline provides an especially useful basis for analyzing the environmental impacts of the proposed project over the past decade, although it involves the potentially difficult task of characterizing environmental conditions that prevailed almost a decade ago. Consequently, the Department used two time periods to evaluate the proposed project:

- 1995 conditions serve as the baseline for analysis of direct impacts of the elements of the Monterey Amendment that have already been implemented; and
- 2003 conditions serve as the baseline for analysis of direct impacts of the Settlement Agreement and also provide a frame of reference for agency decision-making.

The impacts of the proposed project for the period 1996 through 2003 are part of the historical record. The impacts of the proposed project from 2003 into the future are known through the date of completion of this EIR, but are not known beyond that time and must be projected. The impacts for the two periods are considered individually for most impact categories, and the total change from 1996 to 2020 is evaluated to disclose the full impacts of the proposed project as compared to the 1995 baseline and to enable a determination of the significance of the impacts.

CEQA requires that the impacts of the proposed project be compared to the existing or baseline condition. For this EIR, the baseline is a scenario that begins in 1995 and extends to 2020. The condition that existed in 1995 was adjusted as described above to include events that are expected to occur over time unrelated to the Monterey Amendment or the Settlement Agreement. Alternatives to the proposed project can also be compared to the baseline scenario

TABLE 5-1

ASSUMPTIONS FOR BASELINE AND PROPOSED PROJECT SCENARIOS

Issue	1995	2003		2020	
	Baseline	Baseline	Proposed Project	Baseline	Proposed Project
Level of development and SWP demands	1995	2003	2003	2020	2020
Allocation of SWP water	Per 1995 SWP contract provisions.	Same as 1995 Baseline.	Per Monterey Amendment provisions.	Same as 1995 Baseline.	Same as 2003 Proposed Project.
Table A amount changes and transfers	1995 Table A amounts.	a. Changes as specified in 1995 SWP contracts, and b. Other changes and transfers unrelated to the Monterey Amendment that occurred between 1996 and 2003 (including 22,273 AF of Table A transfers from TLBWSD to various agencies).	a. Same as 2003 Baseline, and b. Those Monterey Amendment transfers that occurred between 1996 and 2003 (114,000 AF from KCWA to various M&I agencies).	a. Same as 2003 Baseline, and b. Other changes and transfers unrelated to the Monterey Amendment that occurred since 2003 or are anticipated to occur by 2020 (including 100,000 AF of Table A transfers from MWDSC to Coachella Valley WD and Desert WA).	a. Same as 2020 Baseline, and b. 130,000 AF Monterey Amendment transfers from KCWA to various M&I agencies (including 114,000 AF that occurred between 1996 and 2003, and the remaining 16,000 AF).
Table A amount retirements	None.	Same as 1995 Baseline.	45,000 AF of Table A amounts retired (40,670 AF by KCWA and 4,330 AF by Dudley Ridge WD).	Same as 1995 Baseline.	Same as 2003 Proposed Project.

TABLE 5-1

ASSUMPTIONS FOR BASELINE AND PROPOSED PROJECT SCENARIOS

Issue	1995	2003		2020	
	Baseline	Baseline	Proposed Project	Baseline	Proposed Project
Water supply management practices	Practices that occurred or were approved under the 1995 SWP contract, including: • Conveyance in SWP facilities of non-SWP water for SWP contractors. • MWD participation in Semitropic Groundwater Banking Program.	Same as 1995 Baseline.	Monterey Amendment provisions for: • Storage outside contractors' service areas, including: o Expanded carryover storage in SWP conservation reservoirs. o Storage in groundwater banking programs. • Turnback Pool. • Transfer of Kern Fan Element property for local development as water bank. • Flexible storage use at terminal reservoirs Castaic Lake and Lake Perris.	Same as 1995 Baseline.	Same as 2003 Proposed Project.

as well as to each other so that the decision-makers and the public can evaluate the comparative merits of the alternatives.

5.4 ANALYTICAL APPROACH AND METHODS

The Department used two basic methods to analyze the effects of the proposed project and its alternatives on SWP operations and deliveries to SWP contractors. The methods were historical data analysis and modeling using CALSIM II. CALSIM II is a planning model developed to simulate SWP and CVP operations in the Central Valley of California.

Because the Monterey Amendment was implemented in 1996, post-Monterey Amendment SWP operations and deliveries to individual contractors in the period 1996 to 2005 are a matter of historical record. Consequently, it is possible to examine Monterey Amendment-induced changes in SWP operations by reviewing the historical record[1]. Monterey Amendment-induced changes in SWP operations were determined by comparing historical deliveries with the Monterey Amendment in effect with deliveries that would likely have been made under the baseline scenario.

Although the historical analysis provides useful information, its value is limited by the fact that the period between 1996 and 2004 or 2005 is representative of only a small portion of the hydrologic record. To evaluate the effects of the Monterey Amendment over a wider range of hydrologic conditions, CALSIM II was used to examine the effects of the Monterey Amendment on total annual deliveries to SWP contractors under 2003 and 2020 conditions. CALSIM II estimates of total annual deliveries were post-processed to estimate deliveries to individual contractors under 2003 and 2020 conditions.

Several studies were made using the two basic analytical methods, historical data analysis and CALSIM II modeling. The studies are listed, together with their purposes, in Table 5-2. The studies themselves are contained in various appendices as shown in Table 5-2.

The goal of Study No. 2, No. 3 No. 4, and No. 5 was the identification and characterization of Monterey Amendment-induced changes in deliveries, which would then result in hydrologic changes (changes in river flow or Delta outflow). The hydrologic changes are the primary factors in determining the environmental impacts of the proposed project and its alternatives on other environmental elements such as terrestrial biology and fisheries resources. The goals of Study No. 6 and No 7 was to estimate the effects of the Monterey Amendment on Joint Point of Diversion (cooperative use of SWP and CVP Delta pumping facilities) and on the Environmental Water Account.

Proposed project-induced changes in SWP operations determined as described above are detailed in Chapter 6. Chapter 7 contains a description of the environmental impacts of the proposed project including its impacts on river flow and Delta outflow. Chapter 11 contains a description of alternatives to the proposed project, including no project alternatives, and a description of the environmental impacts of the alternatives. Most, but not all, of the environmental impacts of the proposed project and its alternatives, stem from proposed project- or alternative-induced changes in SWP operations.

TABLE 5-2

ANALYTICAL STUDIES

Study	Method	Purpose
Study No.1 - Historical Allocation Analysis (Appendix I)	Analysis of historical operations data from 1995-2005	Estimate allocation of Table A water to SWP contractors if Monterey Amendment had not been implemented 1996-2005
Study No. 2 – Historical Operations Analysis (Appendix K)	Analysis of historical operations data from 1996-2004	Estimate effects of most Monterey Amendment provisions on SWP deliveries and Delta pumping 1996-2005
Study No. 3 – Historical Operations Analysis (Appendix K)	Analysis of historical operations data from 1996-2004	Estimate effects of water supply management practices on SWP deliveries and Delta pumping under 2020 conditions
Study No. 4 - Water Allocation Modeling (Appendix F)	CALSIM II and post-processing of CALSIM II output	Estimate deliveries of water to SWP contractors as a result of altered water allocation procedures and transfers and retirements of Table A amounts under 2003 and 2020 conditions
Study No. 5 - River/Delta Flow Analysis (Appendix H)	CALSIM II and spreadsheet analysis	Estimate effects of altered water allocation procedures and transfers and retirements of Table A amount on river flow and Delta outflow under 2003 and 2020 conditions
Study No. 6 - JPOD Analysis (Appendix L)	Historical operations analysis, CALSIM II and spreadsheet analysis	Estimate effects of Monterey Amendment on Joint Point of Diversion (Cooperative use of CVP and SWP Delta pumping facilities).
Study No. 7 – Environmental Water Account Analysis (Appendix M)	Analysis of historical operations from 1996-2004	Estimate effects of Monterey Amendment on Environmental Water Account

5.5 ANALYSIS OF PROPOSED PROJECT ELEMENTS

SWP Allocations, Table A Retirements, and Table A Transfers

Effects on Water Allocations

The altered allocation method and Table A retirements and transfers were analyzed as one combined action. In the historical allocation analysis (Study No. 1), the total amount of Table A water actually allocated in 1996-2005 was tabulated for the proposed project and then adjusted to restore Table A retirements and reverse certain Table A transfers as appropriate to construct the baseline and alternative scenarios. The resulting allocations were then recomputed for each SWP contractor using the actual base amount of Table A water allocated by the Department in each of the historical years, redistributed in accordance with the allocation rules specific to the baseline scenario and each alternative. The difference between the proposed project and baseline scenarios provides an indication of the effects of the altered allocation method and the Table A retirements and transfers on Table A allocations.

The CALSIM II model and post-processing of CALSIM II output (Study No. 4) were used to estimate the effects of the altered allocation method and the Table A retirements and transfers on deliveries to individual contractors under 2003 and 2020 conditions. More information on the CALSIM II model is provided in Section 5.6.

Effects on River Flow and Delta Outflow

The altered allocation procedures, and Table A retirements and transfers cause a change in the proportion of total deliveries to SWP contractors that are made north and south of the Delta. The change in the proportion of deliveries north and south of the Delta could affect flow in the Feather and Sacramento rivers and outflow from the Delta. Changes in flow in the rivers and in Delta outflow could affect water quality and aquatic life. For the period from 2003 to 2020, the changes in river flow and Delta outflow were analyzed in two parallel ways: (1) using the CALSIM II model and analyzing its output; and (2) by tabulating the allocation differences between alternatives in a spreadsheet format and comparing the differences to the total flow in the affected rivers upstream of the Delta.

CALSIM II is a planning model developed to simulate SWP and CVP operations in the Central Valley of California. The model operates on a monthly time step and is typically run using a 73-year period of historical hydrologic record as input data. Other input data reflects certain assumptions regarding water demand, facility size and operating constraints, Delta environmental and flow constraints, and other variables. In this EIR, CALSIM II was initially used to estimate SWP deliveries, river flows, and reservoir storage levels in typical wet, above normal, below normal, dry and critically dry years under conditions prevailing or expected to prevail in 1995, 2003, and 2020.

Actual day-to-day operations of the SWP and CVP depend on continuous collection of, and response to, real-time data. Thus actual daily project operations will differ from the monthly simulations provided by CALSIM II or any other similar model.

Any proposed project-related changes in river flow upstream of the Delta are due to allocation changes and Table A transfers affecting the five SWP contractors located north of the Delta (Plumas County FC&WCD, Butte County, Yuba City, Napa County FC&WCD, and Solano County WA). The pre- and post-Monterey Amendment Table A amounts of these contractors

are relatively small and represent less than three percent of the total Table A amounts for the 29 contractors. Thus, proposed project-related changes in deliveries to these contractors would be expected to have only small effects on river flow.

CALSIM II models operations of the SWP and CVP where SWP diversions typically range from two to four million AF and Delta inflows typically range from 10 to 20 million AF. The model is a useful tool for evaluating the effects of operational changes or new facilities on total SWP deliveries but it cannot accurately predict the effects of minor shifts in deliveries to individual contractors and the consequent small changes in river flow. In this case, the changes in river flow are a fraction of one percent of total river flow.

For the reason noted above, the Department decided to use a spreadsheet tabulation analysis rather than CALSIM II to evaluate the effects of the proposed project on river flow (Study No. 5). The spreadsheet tabulation analysis provides a more direct and intuitive basis for comparing the effects of the allocation changes, Table A retirement, and Table A transfers on flow in the Feather and Sacramento rivers. No impacts are computed for the American River in this latter analysis, as there are no SWP service areas in the American River watershed and the allocation changes and Table A transfers and retirements have no direct effect on the operation of the American River. The spreadsheet tabulation analysis shows the differences in diversions upstream of the Delta as a result of the Table A retirements, transfers, and different allocation formulas to be extremely minor in all months of all year types. This is the method used in this EIR to provide the basis for characterizing the impacts of these actions on the potentially affected rivers upstream of the Delta and on Delta inflow for this element of the proposed project and the alternatives.

Kern Fan Element Transfer

Under the proposed project, the Kern Water Bank was developed as a locally owned facility on land transferred from the Department as part of the Monterey Amendment. The creation of the Kern Water Bank increased the total water storage capacity south of the Delta and could affect Delta outflow if the water placed into storage in the Kern Water Bank would otherwise have flowed out of the Delta. Analysis of historical data was used to examine this possibility (Study No. 2).

Under certain no project alternative scenarios, it was assumed that the Department would use the property to develop a state owned water bank that would provide storage for SWP water. The CALSIM II model was used to examine the effects of a state owned water bank in the Kern Fan Element property, with a capacity of 350,000 AF in 2003 and 500,000 AF in 2020 on SWP deliveries (Study No. 4).

Water Supply Management Practices

Article 56 out-of-service-area water storage programs have increased the amount of water the contractors have stored both in groundwater banking programs and as extended carryover in San Luis Reservoir. In addition, the turnback pool established under Article 56 has shifted deliveries among contractors and Article 54 enables flexible storage in Castaic Lake and Lake Perris. These water supply management practices have the potential to increase pumping from the Delta, increase deliveries to the contractors and reduce Delta outflow. Article 54 could also have local effects at Castaic Lake and Lake Perris.

Effects on Delta

Historical operations data from the period 1996 through 2004 were used to evaluate the effects of the water supply management practices and the Table A retirements on Delta pumping (Study No. 2). Monterey Amendment-induced changes in SWP operations were examined by comparing historical deliveries with deliveries that would likely have been made if the Monterey Amendment had not been implemented and then assessing how the delivery changes would have affected storage in San Luis Reservoir and Delta pumping. The potential impact on the Delta was evaluated by determining when (by month and year) additional water was pumped from the Delta at the Banks Pumping Plant compared to the baseline scenario. The estimated effects of the water supply management practices and Table A retirements on Delta outflow were used to determine likely effects on water quality and fisheries. The analysis also used to address whether any other diverters would have been affected by Monterey Amendment-induced changes in Delta pumping.

Future impacts of the water supply management practices were determined by repeating the historical operations study but using assumptions more reflective of future conditions (Study No. 3). In this case, the analysis examined the effects of the water management practices in isolation and did not include the effects of the Table A retirements. The analysis accounted for the increasing water demands of SWP contractors, the probable increase in available groundwater storage south of the Delta and the likely reduction in availability to the contractors of storage other than groundwater storage outside their service areas. Estimates of future pumping from the Delta at the Banks Pumping Plant were made in a similar to the estimates for the period 1996 through 2004.

Effects at Castaic Lake and Lake Perris

Flexible storage in Castaic Lake and Lake Perris could affect Delta outflow but would also have local impacts at the two reservoirs. The proposed project allows those contractors that were participating in the repayment of these reservoirs to withdraw up to about 50 percent of the total volume of water in the reservoirs, subject to Department approval and contractual requirements to replace the water within five years. The analysis of the impacts was conducted in two ways: first, by tabulating actual exercise of flexible storage by the three contractors allowed to access the water, and second by assuming a maximum exercise of the right during potential future drought conditions. The second method provides a worst case analysis of potential impacts at the two reservoirs.

Lake Perris is currently drawn down because of concern about seismic safety of its dam. It is likely to remain drawn down until the seismic safety issues are resolved. For the purposes of this EIR, it was assumed that the issues will be resolved and the operations at the reservoir will return to normal.

5.6 USE OF CALSIM II

The CALSIM II model was used to estimate SWP deliveries under various conditions (see Chapters 6 and 11). It was also used to estimate the effects of the proposed project on storage in Lake Oroville and San Luis Reservoir. The Department determined that it was appropriate to use the model for these purposes. A more detailed discussion of where and how the CALSIM II was used is contained in Section 6.4.1. A report containing the results of CALSIM II simulations and associated post-processing is contained in Appendix F.

There has been considerable discussion in the Monterey Plus EIR Committee meetings about the Department's use of the current SWP and CVP operations model (CALSIM II) for analyzing the effects of the Monterey Amendment. CALSIM II is an important tool used by the Department and other State and federal agencies to study many technical and policy issues related to water supply reliability, environmental management and performance, water demands, economics, hydrology and climate, and regulatory compliance. Several studies currently being conducted by the Department are using, or will use, the CALSIM II model to estimate how new actions, projects, or programs could potentially affect the operations of the SWP and CVP, local and regional hydrology, and SWP and CVP water deliveries.

CALSIM II has received considerable public scrutiny because it is the model selected for assessing water projects of statewide significance and for Central Valley water operations. Since release of *The State Water Project Delivery Reliability Report 2002,* the Department and Reclamation have performed several studies and analyses to advance acceptance and build additional broad support and confidence in the CALSIM II model and modeling studies. An important step in this process was an external peer review of CALSIM II conducted by the CALFED Bay-Delta Program in 2003. The CALFED Science Program's peer review panel published its results in *A Strategic Review of CALSIM II and its Use for Water Planning Management and Operations in Central California* (Strategic Review) in December 2003. (This document is available at: http://science.calwater.ca.gov/pdf/CALSIM_Review.pdf). The Strategic Review discussed strengths and weaknesses of the model. The panel considered a variety of CALSIM II issues and how future model development activities can be managed to assure quality results for current and proposed applications.

The key questions assessed by the review panel were:

- Has the CALFED program adopted an appropriate approach to modeling the CVP/SWP Central Valley system?
- Is the general CALSIM II modeling approach appropriate for predicting the performance of the system and for use in allocation planning, assessing water supply reliabilities, and carrying out operational studies?

The Strategic review's findings included:

- A unique aspect of CALSIM II is the level of cooperation between federal (i.e. Reclamation) and State (Department) interests in its development. This kind of cooperation is rare, and in fact this may be the only such example of such coordination for a system of this scale and complexity. CALSIM II can provide a showcase for other states as to what can be accomplished with federal and State cooperation for river basin management.
- The use of an optimization engine for simulating the hydrology and for making allocation decisions is an appropriate approach and is in fact the approach many serious efforts of this kind are using.
- CALSIM II represents a state-of-the-art modeling system that is similar in general concept, while differing in specific details, to other data-driven river basin modeling.

In general, the panel concluded that the current modeling was appropriate and addressed many of the complexities of the CVP/SWP system and its water management decisions. To balance the competing needs of those who require greater detail from the model and those who require less detail, the panel recommended steps to achieve a more comprehensive, modular, and

flexible approach in modeling practices and tools. To increase user confidence in model results and to provide a basis for gauging the model's ability to produce absolute predictive results of system behavior, the panel suggested calibration and verification of the model, as well as analyses in sensitivity and uncertainty.

Traditional model calibration and verification process is difficult to apply to a planning model, such as CALSIM II, that simulates operations and water supplies at a fixed level of development. A specially designed study to evaluate performance of CALSIM II under recent historical conditions was conducted to simulate the historical 24 year period of 1975 through 1998. In this study, model parameters such as historical land use, the Delta standards, and water demands were allowed to vary to mimic the historical trend. Results of this study demonstrated quite well the adequacy of CALSIM II. A technical report on the results of this effort was published in November 2003 and is available at:
http://science.calwater.ca.gov/pdf/CalSimII_Simulation.pdf.

In August 2004, the Department and Reclamation jointly responded to the questions, comments, and recommendations of the review panel in a report, *Peer Review Response: A Report by DWR/Reclamation in Reply to the Peer Review of the CALSIM II Model Sponsored by the CALFED Science Program in December 2003 Peer Review Response,* available at http://baydeltaoffice.water.ca.gov/modeling/hydrology/Peer Review Response (August 2004).pdf. The agencies' report outlined model development plans and the agencies' priorities for improving CALSIM II. The report also highlighted the ongoing and planned efforts to establish trust in and credibility for the model by improving documentation, conducting sensitivity and uncertainty analyses of the model parameters and results, enhancing the level of detail in the geographic representation of the system, and improving hydrologic input and software development.

Many of the elements of model development features outlined in the *Peer Review Response* are in progress and will be implemented in the updated version of the model, CALSIM III. The current version of CALSIM II was used in support of the analyses in this EIR.

In preparing this EIR, a modeling subcommittee was formed early in the planning process to review assumptions that would be input to the model. All documentation and data sets were made available and reviewed by the subcommittee as they were developed and changes were made based on input from the subcommittee. The assumptions used in the model runs for this EIR are shown in Table 5-3.

One criticism of the CALSIM II model is that it overestimates water deliveries to SWP contractors. To minimize the potential for overestimated deliveries in this EIR, the Department reviewed the demand estimates for the SWP's M&I municipal contractors for 1995 and 2003 conditions that are used as input to the CALSIM II model. The demand estimates were revised based on their actual historical SWP deliveries. More information on the estimation of demand is contained in Appendix F.

TABLE 5-3

CALSIM II ASSUMPTIONS

CALSIM II Input			Assumptions for Level-of-Development Year
Hydrology	Period of Simulation		73 years (1922-1994)
	Initial Conditions (reservoir storage)		1922
	Land Use Level of Development		Assume that 1995 is equal to 2001 level (2001 Level from California Department of Water Resources (DWR) Bulletin 160-98) and that 2003 level is equal to 2001. 2020 Level from DWR Bulletin 160-98
Demands	North of Delta (except American R.)	CVP	1995 and 2003 based on 2001 land use, limited by full CVP contract. 2020 based on 2020 land use
		SWP—Feather River Service Area	1995 and 2003 based on 2001 land use, 2020 based on 2020 land use. All years limited by full Settlement Contract
		SWP—FVB Cities (Fairfield, Vacaville, and Benicia)	No demand in 1995; contract-specified in 2003 and 2020
		Non-Project	Based on land use
		CVP Refuges	Firm Level 2
	American River Basin	Water rights	2001 for 1995 and 2003, 2020 for 2020
		CVP	2001 for 1995 and 2003, 2020 for 2020
	San Joaquin River Basin	Friant Unit	Regression of historical
		Lower Basin	Fixed annual demands
		Stanislaus River Basin	1997 New Melones Interim Operations Plan
	South of Delta	CVP	Full Contract
		Contra Costa Water District	124 TAF/YR in 1995 & 2003, 158 TAF/YR in 2020
		SWP (w/ North Bay Aqueduct)	Varies based on hydrology for 1995 and 2003; equals sum of Table A amounts for 2020
		SWP Article 21 Demand	Varies based on hydrology for 1995, 2003 and 2020
Facilities	CVP		Existing CVP
	SWP	Existing & new facilities	Existing SWP facilities with Coastal Branch Phase II in operation and without the East Branch Enlargement for 1995 & 2003; 2020 adds East Branch Enlargement
		South Bay Aqueduct	Existing Capacity (300 cfs)
		SWP Kern Fan Element	Kern Fan Element facilities not included
		Banks Pumping Plant	1995 Capacity for 1995, 2003, and 2020
Regulations	Trinity River	Minimum Flow below Lewiston Dam	1995 limit is 340 TAF/Yr, 2003 limit is Interim (369-453 TAF/Yr), and 2020 limit is 369-815 TAF/Yr (Trinity EIS Preferred Alternative)
		Trinity Reservoir End-of-September Minimum Storage	No 1995 limit; 600 TAF as able in 2003 & 2020 (Trinity EIS Preferred Alternative)
	Clear Creek	Minimum Flow below Whiskeytown Dam	Downstream water rights, 1963 USBR Proposal to USFWS and NPS, and USFWS discretionary use of CVPIA 3406(b)(2)
	Upper Sacramento River	Shasta Lake End-of-September Minimum Storage	SWRCB WR 1993 Winter-run Biological Opinion (1900 TAF)
		Minimum Flow below Keswick Dam	Flows for SWRCB WR 90-5 and 1993 Winter-run Biological Opinion temperature control, and USFWS discretionary use of CVPIA 3406(b)(2)
	Feather River	Minimum Flow below Thermalito Diversion Dam	1983 DWR, DFG Agreement (600 CFS)
		Minimum Flow below Thermalito Afterbay outlet	1983 DWR, DFG Agreement (1000 – 1700 cfs)

TABLE 5-3

CALSIM II ASSUMPTIONS

CALSIM II Input			Assumptions for Level-of-Development Year
	American River	Minimum Flow below Nimbus Dam	SWRCB D-893 and USFWS discretionary use of CVPIA 3406(b)(2)
		Minimum Flow at H Street Bridge	SWRCB D-893
	Lower Sacramento River	Minimum Flow near Rio Vista	SWRCB D-1641
	Mokelumne River	Minimum Flow below Camanche Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (100 – 325 cfs)
		Minimum Flow below Woodbridge Diver. Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (25 – 300 cfs)
	Stanislaus River	Minimum Flow below Goodwin Dam	1987 USBR, DFG agreement, and USFWS discretionary use of CVPIA 3406(b)(2)
		Minimum Dissolved Oxygen	SWRCB D-1422
	Merced River	Minimum Flow below Crocker-Huffman Diversion Dam	Davis-Grunsky (180 – 220 CFS, Nov – Mar), and Cowell Agreement
		Minimum Flow at Shaffer Bridge	FERC 2179 (25 – 100 CFS)
	Tuolumne River	Minimum Flow at La Grange Bridge	FERC 2299-024, 1995 (Settlement Agreement) (94 – 301 TAF/YR)
	San Joaquin River	Maximum Salinity near Vernalis	SWRCB D-1641
		Minimum Flow near Vernalis	SWRCB D-1641, and Vernalis Adaptive Management Program per San Joaquin River Agreement
	Sacramento River-San Joaquin River Delta	Delta Outflow Index (Flow and Salinity)	SWRCB D-1641
		Delta Cross Channel Gate Operation	SWRCB D-1641
		Delta Exports	SWRCB D-1641, USFWS discretionary use of CVPIA 3406(b)(2) for 1995, 2003, & 2020; 2003 & 2020 add CALFED Fisheries Agencies discretionary use of EWA
Operations Criteria	Upper Sacramento River	Flow Objective for Navigation (Wilkins Slough)	Discretionary 3,250 – 5,000 CFS based on Shasta storage condition
	American River	Folsom Dam Flood Control	Variable 400/670 flood control diagram (without outlet modifications)
		Flow below Nimbus Dam	Discretionary operations criteria corresponding to SWRCB D-893 required minimum flow
		Sacramento Water Forum Mitigation Water	No limits in 1995 & 2003; 2020 uses Sacramento Water Forum standard (up to 47 TAF/YR in dry years)
	Stanislaus R.	Flow below Goodwin Dam	1997 New Melones Interim Operations Plan
	San Joaquin River	Flow near Vernalis	San Joaquin River Agreement in support of the Vernalis Adaptive Management Program
	CVP Water Allocation	CVP Settlement and Exchange	100% (75% in Shasta Critical years)
		CVP Refuges	100% (75% in Shasta Critical years)
		CVP Agriculture	100% - 0% based on supply (SOD allocations are reduced due to D1641 and 3406(b)(2) related export restrictions)
		CVP Municipal & Industrial	100% - 50% based on supply (SOD allocations are reduced due to D1641 and 3406(b)(2) related export restrictions)
	SWP Water Allocation	Feather River Service Area	Specified by Settlement Contract
		Fairfield, Vacaville, and Benicia	No allocation in 1994, specified by Settlement Contract in 2003 & 2020

TABLE 5-3

CALSIM II ASSUMPTIONS

CALSIM II Input			Assumptions for Level-of-Development Year
		South of Delta	Based on SWP supply; varies with EIR alternative
	Delta Pumping	Banks Pumping Plant	6,680 cfs, can increase up to 8,500 cfs Dec. 15-Mar 15 (min. 300cfs)
		Tracy Pumping Plant	1995 & 2003 use 4,200 cfs + deliveries upstream of DMC constriction; 2020 adds CVP-SWP Intertie
	CVP/SWP Coordinated Operations	Sharing of Responsibility for In-Basin-Use	1986 Coordinated Operations Agreement (FRWP EBMUD and 2/3 of North Bay Aqueduct diversions are considered as Delta Export, 1/3 of the North Bay Aqueduct diversion is considered as In-Basin-Use)
		Sharing of Surplus Flows	1986 Coordinated Operations Agreement
		Sharing of Restricted Export Capacity	Equal sharing of export capacity under SWRCB D-1641; use of CVPIA 3406(b)(2) only restricts CVP exports; EWA use restricts CVP and/or SWP as directed by CALFED Fisheries Agencies
		Dedicated CVP Conveyance at Banks	No 1995 or 2003 conveyance; SWP to convey 100,000 af/year of Level 2 refuge water through Banks P.P. (Jul & Aug) in 2020 studies
		North of Delta Accounting Adjustments	No adjustments in 1995 or 2003; in 2020, CVP to provide SWP a maximum of 75,000 AF to meet in-basin requirements through adjustments in COA accounting
		Sharing of Export Capacity for Lesser Priority and Wheeling Related Pumping	Cross Valley Canal wheeling (max of 128 TAF/Yr), CALFED ROD defined Joint-Point-of-Diversion
CVPIA 3406(b) 2)	Allocation		Per May 2003 Dept of Interior Decision: 800 taf/yr, 700 taf/yr in 40-30-30 dry years, and 600 taf/year in 40-30-30 critical years
	Actions		1995 WQCP, Fish flow objectives (Oct-Jan), VAMP (Apr 15- May 15) CVP export restriction, 3000 CFS CVP export limit in May and June (D1485 Striped Bass cont.), Post (May 16-31) VAMP CVP export restriction, Ramping of CVP export (Jun), Upstream Releases (Feb-Sep)
	Accounting Adjustments		Per May 2003 Interior Decision, no limit on responsibility for non-discretionary D1641 requirements with 500 TAF target, no Reset with the Storage metric and no Offset with the Release and Export metrics
CALFED Environmental Water Account	Actions		1995 has none; 2003 and 2020 have export cuts of 50 taf Dec-Feb, VAMP (Apr 15- May 15) export restriction, post (May 16-31) VAMP export restriction, and ramping of export (Jun)
	Assets		1995 has none; 2003 and 2020 have fixed water purchases of 250 TAF/yr, 230 TAF/yr in 40-30-30 dry years, 210 TAF/yr in 40-30-30 critical years. The purchases range from 0 TAF in Wet Years to approximately 153 TAF in Critical Years NOD, and 57 TAF in Critical Years to 250 TAF in Wet Years SOD. Variable assets include the following: used of 50% JPOD export capacity, acquisition of 50% of any CVPIA 3406(b)(2) releases pumped by SWP, flexing of Delta Export/Inflow Ratio (post-processed from CALSIM II results), dedicated 500 CFS pumping capacity at Banks in July to September

TABLE 5-3

CALSIM II ASSUMPTIONS

CALSIM II Input		Assumptions for Level-of-Development Year
	Debt Restrictions	1995 has none; for 2003 and 2020 delivery debt is paid back in full upon assessment; storage debt paid is back over time based on asset/action priorities; SOD and NOD debt carryover is allowed; SOD debt carryover is explicitly managed or spilled; NOD debt carryover must be spilled; and SOD and NOD asset carryover is allowed

ENDNOTES

1. Although conditions in 2003 serve as a baseline for analysis in this EIR data from 2004 and 2005 were used in some cases to extend the period of historical record. The longer the historical record the more likely it is that the historical record contains representative hydrologic conditions.