BAY-DELTA WATER RIGHTS HEARING

BEFORE THE
STATE WATER RESOURCES CONTROL BOARD

EBMUD

EAST BAY MUNICIPAL UTILITY DISTRICT

EBMUDSIM MODEL DESCRIPTION, ASSUMPTIONS, VERIFICATION, AND OUTPUT

TESTIMONY OF JOHN W. SKINNER

June 1998

EBMUD EXHIBIT NO. 4
AND APPENDICES A-E

TABLE OF CONTENTS

***Note:** The EBMUDSIM model output (designated as Appendices F through L) is very voluminous. To conserve space and after consultation with SWRCB staff, those appendices have not been included in the initial EBMUD exhibit package sent to all parties. Any party wishing to receive a copy of that model output (Appendices F-L) should contact Jon Myers of EBMUD at (510) 287-1121 and those appendices will be forwarded immediately.

LIST OF FIGURES

LIST OF TABLES

I. PURPOSE OF EXHIBIT

This Exhibit describes the EBMUDSIM Mokelumne River hydrologic computer model, and presents the results of model studies prepared by the East Bay Municipal Utility District (EBMUD or District) to assess the impacts of alternatives proposed to implement the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (1995 WQCP) that was adopted by the State Water Resources Control Board (SWRCB) on May 22, 1995. The exhibit presents a general overview of EBMUDSIM and describes the key assumptions on which the model operates. Appendices describe detailed assumptions for the studies submitted, present a verification study for the EBMUDSIM model, and present the model study results.

In their September 12, 1996 report, SWRCB staff described seven alternatives for meeting the Delta outflow objectives of the 1995 WQCP that would be analyzed in a Draft EIR to implement the plan. The District prepared EBMUDSIM studies to assess impacts of these alternatives on the District and the Mokelumne River. The results of impact analyses, based on these EBMUDSIM studies, are presented in other District exhibits. This exhibit describes EBMUDSIM and presents the model output.

In March 1998, EBMUD, the U. S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG) executed a Joint Settlement Agreement (JSA)[1] that includes significantly increased release requirements for the lower Mokelumne River. The measures contained in the JSA will protect the anadromous fishery and public trust resources of the lower Mokelumne River and will result in increased inflow to the Delta during dry periods.

---

[1] In February of 1996, EBMUD, USFWS, and CDFG approved Principles of Agreement (POA) that served as the basis for the Joint Settlement Agreement. The fishery flow provisions in the JSA are identical to those contained in the 1996 POA. In some model studies the term POA is used to describe the flow provisions of the JSA.

Three of the SWRCB's proposed alternatives to implement the 1995 WQCP would adversely impact the District's ability to serve its customers over and above the impacts resulting from JSA requirements. Both versions of the Water Rights Priority alternative and the Watershed Allocation alternative would have this adverse impact. The model study results for these three cases, as well as the current release requirements under the 1961 CDFG Agreement and the JSA release requirements, are presented in this Exhibit. This Exhibit presents the following EBMUDSIM studies at current (1995) normalized demand levels:

- Mokelumne release requirements of the 1961 EBMUD/CDFG Agreement. (Model Study No. 97 222 10-6083, attached as Appendix F)

- Mokelumne release requirements of the EBMUD/USFWS/CDFG JSA. (Model Study No. 97 222 10-6075, attached as Appendix G)

- Mokelumne flows from the JSA; and Bay-Delta requirements of the Water Rights Priority Alternative w/Friant assumed in-basin (SWRCB staff Alternative 3). (Model Study No. 97 222 10-6084, attached as Appendix H)

- Mokelumne flows from the JSA; and Bay-Delta requirements of the Water Rights Priority Alternative w/Friant assumed Exporter (SWRCB staff Alternative 4). (Model Study No. 97 222 10-6085, attached as Appendix I)

- Mokelumne flows from the JSA; Bay-Delta requirements of the Watershed Allocation Alternative (SWRCB staff Alternative 5). (Model Study No. 97 222 10-6101, attached as Appendix J)

In addition this Exhibit includes two studies at future (2020) demand levels with lower Mokelumne River flow requirements of the JSA. These two studies assess conditions assuming two different EBMUD 2020 demand levels.

- Study No. 97 250 10-6076, attached as Appendix K, assumes EBMUD's 2020 demand will be 250 MGD. This demand level would be expected to occur if only conservation and reclamation efforts adopted prior to 1993 were implemented.

- Study No. 97 228 10-6074, attached as Appendix L, assumes EBMUD's 2020 demand will be 228 MGD. This demand level assumes additional conservation and reclamation efforts identified in the District's 1993 Water Supply Management Program will also be fully implemented by the year 2020.

This Exhibit also presents, in Appendix E, an analysis of the incremented inflow to the Delta resulting from operation under the JSA compared to operations under the 1961 CDF&G Agreement.

II. INTRODUCTION

A. EBMUD WATER SUPPLY SYSTEM

The EBMUD water supply system diverts surface water into Pardee and Camanche Reservoirs on the Mokelumne River. These reservoirs are located about 70 miles east of the District's service area in the foothills of the Sierra Nevada Mountains. A portion of the streamflow collected and stored in Pardee Reservoir is diverted through an 82-mile-long aqueduct system across the Delta to terminal reservoirs and water treatment plants in the San Francisco/East Bay Area. The remaining streamflow is released to Camanche Reservoir. Camanche Reservoir, located below Pardee Reservoir, is operated to release water for downstream users, maintain instream flows, provide flood control protection, provide public recreation, and generate hydropower.

B. EBMUDSIM

The East Bay Municipal Utility District's hydrologic computer simulation model (EBMUDSIM) simulates the operation of the District's reservoir system under present and future conditions. The model can analyze the effects of modified facilities and changed operating rules. Its primary purpose is to determine the system's ability to meet customer demands.

The main physical components of the EBMUDSIM model are the Mokelumne River system (Pardee and Camanche Reservoirs and the river below Camanche Reservoir), the Mokelumne Aqueducts, and the District's Terminal Reservoirs.

Mokelumne River inflow to Pardee Reservoir is the basic hydrologic input used by EBMUDSIM to perform its simulations. This inflow, derived from historic records, forms a 74-year sequence of hydrological input data for a period beginning in 1921 and ending in 1995. In the simulations presented in this exhibit, historic inflow to Pardee for water year 1978 has been altered to simulate a three-year drought sequence beginning in 1976. The three-year drought planning sequence is described in more detail in Appendix A.

EBMUDSIM incorporates all of the operational constraints governing the District's water supply system. EBMUDSIM accounts for water use by diverters upstream of Pardee Reservoir and downstream of Camanche Reservoir. The model calculates minimum release requirements for downstream diverters, channel losses, and instream flows. Remaining water is available for storage or delivery to the District's customers. The model also accounts for flood control operations. The combined effects of physical and operational constraints dictate the resulting EBMUDSIM hydrologic output for all conditions simulated.

EBMUDSIM uses a monthly time step as the basis for its simulations. The output generated by EBMUDSIM represents average monthly or end-of-month values. The model provides the user with output that shows inflow, outflow, and changes in storage for elements of the system over the study period under the conditions analyzed. By changing the input data the user can explore the effects on the system of changes in such variables as projected customer demands, facilities development alternatives, operational requirements, and water supply availability.

The validity of EBMUDSIM output has been demonstrated by a verification study described in Appendix B. This study compares actual historic operating records with EBMUDSIM simulated operations. The results of this study show that the model simulates past operations quite accurately.

C. MODEL STUDIES PREPARED FOR THE BAY-DELTA PROCEEDING

The District prepared five EBMUDSIM studies to simulate the effects on the Mokelumne system of the SWRCB's proposed alternatives to implement the 1995 WQCP. These five studies were performed assuming 1995 levels of development with EBMUD demand assumed to be 222 MGD. In addition, two EBMUDSIM studies depicting future 2020 level of development conditions are included in this exhibit. The first 2020 study assumes EBMUD demand to be 250 MGD, which includes only those conservation and reclamation measures adopted prior to 1993. The second assumes EBMUD 2020 demand to be 228 MGD, which includes additional conservation and reclamation measures adopted in 1993. These two studies demonstrate the District's need for additional water supplies, even after the increased conservation and reclamation efforts adopted in 1993 are implemented.

The conditions simulated in the eight studies presented in this Exhibit are summarized below:

- **Appendix E.** Incremental Inflow to Delta Resulting from JSA versus 1961 CDF&G Agreement.

- **Appendix F.** Study No. 97 222 10-6083. Current release requirements of the 1961 Agreement with CDFG (as amended).

- **Appendix G.** Study No. 97 222 10-6075. Release requirements of the Joint Settlement Agreement (JSA) between EBMUD, USFWS, & CDFG.

- **Appendix H.** Study No. 97 222 10-6084. Release requirements of the JSA with Delta requirements per Water Rights Priority approach with Friant treated as in-basin diverter (SWRCB Alternative 3).

- **Appendix I.** Study No. 97 222 10-6085. Release requirements of the JSA with Delta requirements per Water Rights Priority approach with Friant treated as exporter (SWRCB Alternative 4).

- **Appendix J.** Study No. 97 222 10-6101. Release requirements of the JSA with Delta requirements per Watershed Allocation approach (SWRCB Alternative 5).

- **Appendix K.** Study No. 97 250 10-6076. Releases under the JSA, 2020 Conditions with EBMUD demand of 250 MGD.

- **Appendix L.** Study No. 97 228 10-6074. Releases under the JSA, 2020 Conditions with EBMUD demand of 228 MGD.

Base Case 1961 Agreement Study Conditions

This study simulates conditions under current fishery release requirements that are set forth in a 1961 Agreement, as amended, between EBMUD and CDFG. The assumptions for this study are essentially the same as those used to perform the verification study described in Appendix B. The only differences between the verification study and the Base Case 1961 Agreement study are that (1) the verification study hydrologic simulation period begins in 1967 after Camanche Reservoir was placed into service, (2) the Base Case study includes the drought planning sequence described in Appendix A, and (3) the Base Case reflects demand conditions for Woodbridge Irrigation District (WID) and North San Joaquin Irrigation District (NSJWCD) that went into effect after 1988—when EBMUD terminated the "interim supply" provisions of its agreement with WID.

Joint Settlement Agreement Study Conditions

This study simulates conditions under the Joint Settlement Agreement (JSA) between EBMUD, USFWS, and CDFG. This study differs from the Base Case in that the 1961 CDFG Agreement fishery release requirements are replaced with the fishery release provisions of the JSA. Flow requirements under the JSA constitute a significant increase above existing 1961 CDFG Agreement requirements. Releases under the JSA result in increased inflow to the Delta from the Mokelumne River during dry periods.

JSA with Delta Requirements per Water Rights Priority Approach with Friant Assumed to be In-Basin Diverter (SWRCB Alternative 3, See Appendix C)

As described in Appendix C, under this SWRCB proposed alternative, water right holders must cease diverting water whenever the CVP/SWP releases supplemental water from storage to meet the 1995 WQCP Delta outflow objectives. When the CVP/SWP is releasing supplemental stored water in excess of their downstream requirements, the SWRCB will notify a sufficient number of water right holders, starting with the most junior water right holders, to cease diverting. A sufficient number of water right holders must cease diverting to ensure that the CVP/SWP is no longer releasing supplemental stored water.

For administrative and modeling purposes, under this alternative, SWRCB staff divided all major post-1914 water right holders in the Central Valley into eight groups in reverse order of their water right priority. SWRCB staff then estimated the amount of water that would flow into the Delta each month if diverters in each of these eight groups ceased diverting. Using the results of DWRSIM Study No. 1995C6F SWRCB 469, SWRCB staff then calculated the amount of supplemental water that the CVP/SWP released to meet 1995 WQCP Delta outflow standards each month for all 73 years modeled. By comparing the amount of supplemental water being released with the amount of water diverted in each of the eight water right groupings, the SWRCB staff was able to determine which priority group needed to cease diverting in each month to ensure that the CVP/SWP did not need to release supplemental water to meet Delta outflow objectives. The SWRCB staff provided a table showing the resulting periods when each group of diverters must cease diverting. (In the calculations SWRCB staff accounted for Vernalis flows and Delta outflows separately).

EBMUD holds two water rights on the Mokelumne River that are in the SWRCB's list of "Major Central Valley Water Rights by Priority Group". These water rights would be subject to curtailment under the proposed water rights priority approach. The more junior of the two, Application 13156 (associated with Camanche Reservoir), has a seniority date of June 16, 1949, and is contained in Priority Group 2. EBMUD's more senior right, Application 4228 (associated with Pardee Reservoir), has a seniority date of September 22, 1924, and is contained in Priority Group 5. Under Alternative 3, whenever the SWRCB determines that Group 2 or higher water is needed to meet the 1995 WQCP Delta outflow objectives, EBMUD would have to cease diverting water under Application 13156. Whenever Group 5 or higher water is needed, then EBMUD would also have to cease diverting water under Application 4228.

As described above, using the results of DWRSIM Study No. 1995C6F SWRCB 469, SWRCB staff determined when water right holders in each Priority Group must cease diversions. This information was originally reported in Alternative 3, Table D, "Water Cutoff Group Required to Meet Delta Outflow Objective" on page 133 of the SWRCB staff's March 18, 1997, Workshop Package of Handouts. EBMUD received a revised Alternative 3 Table D from the SWRCB on April 15, 1997, that it used in the EBMUDSIM modeling of Alternative 3 described in this Exhibit. When this table showed that Priority Group 2 or higher must cease diverting, releases from Camanche Reservoir were increased as necessary to ensure that water was not being diverted into Camanche Reservoir and thus releases from Camanche Reservoir equaled or exceeded its inflow. When this table showed Priority Group 5 or higher must cease diverting, releases from Camanche were increased as necessary to ensure that water was not being diverted into either Pardee or Camanche Reservoirs and thus releases from Camanche Reservoir equaled or exceeded Pardee Reservoir inflow.

EBMUDSIM has the capability to include requirements for increased releases from Camanche Reservoir to provide additional inflow to the Delta from the Mokelumne River. EBMUD staff used this capability to model this alternative. EBMUD staff reviewed the results of EBMUDSIM model Study No. 97 222 10-6075 (JSA flow conditions) to see if water was being diverted into either Pardee or Camanche Reservoirs when prohibited according to the SWRCB's revised Table D. If water was being diverted when diversions were prohibited, EBMUD staff increased Camanche Reservoir's release requirements by a sufficient amount to ensure that the prohibited diversion ceased. EBMUDSIM was then re-run with the new Camanche release requirements to simulate conditions under the Water Rights Priority approach, SWRCB Alternative 3.

JSA with Delta Requirements per Water Rights Priority Approach with Friant Assumed to be Exporter (SWRCB Alternative 4, See Appendix C)

This SWRCB proposed alternative, which is also described in Appendix C, is very similar to the SWRCB's proposed Alternative 3. The only difference between this alternative and Alternative 3 is the water rights priority assumption for Friant area water users. In Alternative 4, Friant area water users are assumed to be water exporters. This assumption increases the amount of CVP water allocated to meeting the 1995 WQCP standards for flow at Vernalis which decreases the allocations to non-CVP water users in the San Joaquin basin. This assumption also affects non-CVP allocations to Delta outflow because Friant exports and storage releases are taken into account.

As with Alternative 3, SWRCB staff determined when each Priority Group must cease diverting under this alternative. This information was originally reported in Alternative 4, Table D, on Page 142 of the SWRCB staff's March 18, 1997 Package of Handouts. EBMUD received a revised Alternative 4, Table D, on April 15, 1997 which it used to prepare the EBMUDSIM studies of Alternative 4.

JSA with Delta Requirements per Watershed Allocation Approach (SWRCB Alternative 5, See Appendix D)

In this SWRCB proposed alternative, which is described in Appendix D, SWRCB staff established monthly average Delta inflow requirements for each major Delta tributary. For Sacramento and Eastside Stream basin tributaries, including the Mokelumne, the Delta inflow requirement established by SWRCB staff represents each non-CVP/SWP project tributary's contribution to the 1995 WQCP's Delta outflow requirement—after accounting for water provided by the San Joaquin tributaries to meet the Vernalis standard. These requirements are distributed among the tributaries in proportion to their unimpaired inflow to the Delta.

SWRCB staff segregated each tributary's Delta inflow requirement by Water Year Type based on the Sacramento River Index described in the 1995 WQCP. The resulting Delta inflow requirements are described in SWRCB's January 10, 1997 memo to DWR. SWRCB staff subsequently provided EBMUD staff with revised tables for the Mokelumne River which EBMUD incorporated into its EBMUDSIM modeling of the Watershed Allocation Approach.

EBMUDSIM has the capability to include minimum Delta inflow requirements into its calculations of Camanche Reservoir release requirements. EBMUD staff used this capability to model this alternative. For this alternative, minimum Delta inflow requirements become an additional constraint on Camanche Reservoir releases. If releases provided for all other purposes are insufficient to meet the specified minimum Delta inflow, EBMUDSIM increases Camanche Reservoir releases until Delta inflow is sufficient.

JSA at 2020 Level of Development

Two studies are provided simulating future demand levels (2020 Levels of Development) under the JSA flow requirements. In these studies, the demands of senior water right holders both upstream and downstream of the District's Mokelumne Project have been increased to projected 2020 demand levels. These were obtained directly from the water agencies serving these areas. Two different demand levels were projected for EBMUD's 2020 demand. The first EBMUD demand level, 250 MGD, depicts conditions under reclamation/conservation efforts adopted prior to 1993. This study determines the District's Need for Water. The second EBMUD demand level, 228 MGD, depicts conditions under the additional reclamation/conservation efforts adopted in 1993. This study determines the District's remaining Need for Water after all accelerated reclamation/conservation efforts are included. In all other respects, these studies are the same as the 1995 level studies of conditions under the JSA.

Incremental Delta Inflow Under JSA

Appendix E presents the incremental inflow to the Delta resulting from operations under the JSA compared to operations under the 1961 CDF&G Agreement. This analysis was created by subtracting inflow to the Delta from Study No. 97 222 10-6083, depicting 1961 CDF&G Agreement operations, from Study 97 222 10-6075, which depicts JSA operations. Table E1 in Appendix E shows the resulting incremental inflow to the Delta. Table E2 in Appendix E shows the resulting incremental inflow sorted by Sacramento River Index Water Year Type.

III. EBMUDSIM - METHODOLOGY & ASSUMPTIONS

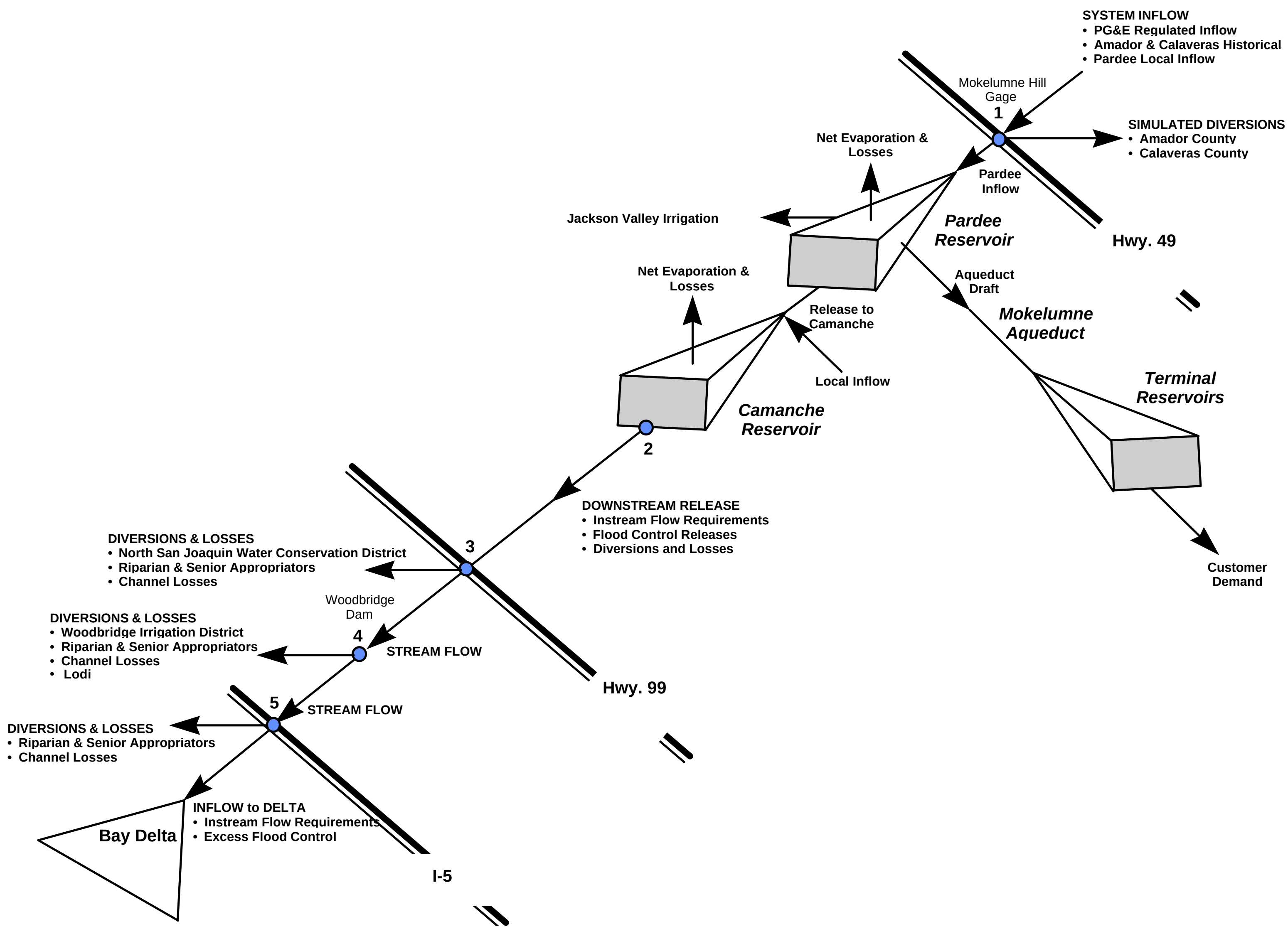
The main function of EBMUDSIM is to simulate operation of Pardee and Camanche Reservoirs and power plants, the Mokelumne Aqueducts, and the East Bay Terminal Reservoirs. Figure 1 is a schematic presentation of the physical components of the system and their relationship to the input and output water quantities balanced in the model. EBMUDSIM is driven by hydrologic data, water demand, and operational rules that define the availability of water supply to the District and to other water users of the Mokelumne River.

A. HYDROLOGIC DATA BASE

EBMUDSIM is designed to operate with any set of hydrologic data regardless of how the data set was generated. Most studies, however, are based on an historical hydrologic sequence which is maintained in the hydrologic database. The hydrologic database contains the following monthly data:

- **Net Precipitation**. Historical precipitation data minus evaporation rates (net unit precipitation), in feet.

FIGURE 1. Schematic Diagram of EBMUD Water Supply System



- **Maximum allowable storage** in Camanche Reservoir under the Flood Control Agreement with the US Army Corps of Engineers, in cfs.

- **Historical local runoff into Camanche** Reservoir from the watershed lying between Pardee and Camanche, in cfs.

- **End-of-month storage in PG&E reservoirs** upstream of Pardee, in AF.

- **True Natural Flow**, undiminished, unregulated runoff, at Mokelumne Hill gage, in AF.

- **For November through July, the actual precipitation** which occurred between October 1 and the first of the month being considered. For August, September, and October, the previous month's precipitation, in inches.

- **Undiminished, regulated Pardee Reservoir inflow** assuming no upstream diversions (historical Amador and Calaveras County diversions have been added back to historical measured Pardee inflows), in cfs.

- **The maximum allowable diversion by CPUD** from the middle and south forks, subject to the 1940 and 1970 agreements and the appropriate permits and licenses, in AF.

- **Computed local runoff from the watershed** between the Mokelumne Hill gage and Pardee Dam, in cfs.

In the EBMUDSIM studies prepared for use in this proceeding, a runoff equal to 185 TAF replaces the historic runoff for water year 1978, and affected hydrologic data base information is also modified accordingly. This enables the District to assess its water supply under drought conditions that could have occurred if the 1976-77 drought had continued for an additional year. More detail on the drought planning sequence is provided in Appendix A.

B. MOKELUMNE RIVER UPSTREAM OF EBMUD SYSTEM

EBMUDSIM takes into consideration the operation of other facilities on the Mokelumne River upstream of the EBMUD system as noted below. These facilities include PG&E's reservoirs and diversions within Amador and Calaveras Counties.

PG&E Reservoirs

EBMUDSIM does not simulate the operation of PG&E's system. Instead, the PG&E system operations are part of the input data in the hydrologic database. EBMUDSIM accounts for PG&E operation in the following ways:

- It uses flows at the Mokelumne Hill Gage, located downstream of PG&E's system, in computing System Inflow. Flow at this point already reflects regulation provided by the PG&E upstream reservoirs in accordance with the Lodi Decrees. (See EBMUD Exhibit No. 2 for a description of the Lodi Decrees).

- It uses the historic available storage space in PG&E's reservoirs to compute the portion of flood control space that can be "transferred" to PG&E's system. This "transferable" amount reduces flood control space requirements in Pardee and Camanche, thus increasing allowable storage amounts in EBMUD's system.

Upstream Diversion

For current (1995) level of development studies, EBMUDSIM incorporates existing demands of various water-using entities on the Mokelumne River upstream of EBMUD's facilities. For future (2020) level of development studies, EBMUDSIM incorporates the future anticipated demands of the water-using entities upstream of EBMUD's facilities. Upstream diversions in Amador County and Calaveras County are apportioned in the model among the various water agencies that operate within each county. These agencies are:

Amador County:

- Amador Water Agency via Amador Canal Diversion (AWA)
- Amador Water Agency via Central Amador Water Project (CAWP)
- Jackson Valley Irrigation District (JVID)

Calaveras County:

- Calaveras Public Utility District (CPUD)
- Calaveras County Water District (CCWD)

These entities' demands in the model are determined from a hierarchy of various water rights and agreements coupled with existing or future river conditions. "River condition" is a user specified input which represents the level of development in the basin. The model studies presented in this proceeding represent river conditions at either 1995 or 2020 levels of development. The upstream demands assumed in these studies are summarized in Table 1.

TABLE 1. Annual Diversion Schedule in TAF - Upstream Users

USER	Level of Development 1995		Level of Development 2020	
Amador County				
ACWA	12.5		18.0	
CAWP	1.1		2.0	
JVID	3.8			
Total Amador		17.4		20.0
Calaveras County				
CPUD	2.2		4.9	
CCWD	1.7		6.8	
Total Calaveras		4.0		11.7
Total Amador & Calaveras		**21.4**		**31.7**

C. EBMUD STORAGE RESERVOIRS

Pardee Reservoir

Pardee Reservoir is the most upstream reservoir in the EBMUD water supply system and the diversion point, via the Mokelumne Aqueducts, to the District's East-Bay service area and its Terminal Reservoirs.

Reservoir Properties

Pardee Reservoir properties are presented in Table 2 below.

TABLE 2. Pardee Reservoir Properties

Description	Elevation (feet)	Area (acres)	Storage (AF)
Spillway crest (gross pool)	567.65	2,222	197,950
Dead storage	396.52	276	12,200

Reservoir Operation

Pardee Reservoir is operated in the model as follows:

- It fills up or draws down to the target storage levels.

  Target storage levels are defined twice annually: end of June and end of December. The logic in the model is to reach target levels, gradually, by forecasting the inflow and then regulating the releases in a manner that would minimize spills.

- It provides the source of water for Mokelumne Aqueduct draft.

- It provides the source of water for diversion to JVID.

- It provides releases to Camanche Reservoir for downstream needs and to prevent Camanche's storage volume from falling below dead storage.

- It maintains cold hypolimnetic volume in Camanche Reservoir by releasing water to Camanche in the period of May through October when needed, whenever the volume in Pardee Reservoir remains above 100 TAF (to ensure Pardee stratification)

Hydropower Operation

The powerhouse at the base of Pardee Dam contains three Francis turbines with a total generating capacity of 28,650 kW. EBMUDSIM calculates hydropower generated from Pardee Reservoir releases.

Camanche Reservoir

Camanche Reservoir is the downstream reservoir in the EBMUD water supply system on the Mokelumne River. The main functions of the Camanche Reservoir simulated in the model are to provide downstream releases for fisheries purposes and for other water users on the river and to maintain flood control space requirements in accordance with EBMUD's agreement with the US Army Corps of Engineers.

<u>Reservoir Properties</u>

Camanche Reservoir properties are presented in Table 3.

TABLE 3. Camanche Reservoir Properties

Description	**Elevation (feet)**	**Area (acres)**	**Storage (AF)**
Spillway crest (gross pool)	235.5	7,470	417,120
Dead storage	119.0	468	4,290

<u>Reservoir Operation</u>

Camanche Reservoir is operated in the model as follows:

- It provides releases to meet flow requirements for the lower Mokelumne River. The studies presented in this proceeding include the existing flow requirements under the District's 1961 Agreement with the California Department of Fish and Game and under the flows contained in the 1997 Joint Settlement Agreement.

- It releases water, to the extent possible, for downstream diversion requirements of water users on the river with senior water rights. If diversions cannot be met in full because of a shortage of water in the system, EBMUDSIM will not attribute the shortage to any one of the users. Instead, it will report an overall deficit termed in the model as a negative flood control release.

- It provides releases for channel depletion (losses) in the river below Camanche Dam. Channel losses are computed in the model as a function of total annual Camanche releases.

- It provides releases to maintain specified flood control space in the reservoir. Whenever Camanche storage levels exceed the flood control levels, the reservoir is drawn down to the required level by increasing releases above the minimum needed to satisfy downstream requirements.

<u>Hydropower Operation</u>

The powerhouse at the base of Camanche Dam contains three 3,560 kW Kaplan turbines with a total generating capacity of 10,680 kW. EBMUDSIM calculates hydropower generated from Camanche Reservoir releases.

Flood Control Operation

One of the operational constraints in EBMUDSIM is the simulation of flood control requirements in Camanche and Pardee Reservoirs. Flood control rules are detailed in the US Army Corps of Engineers' Camanche Reservoir - Water Control Manual - September 1981. The main rules relevant to EBMUDSIM are briefly summarized below.

The required flood control space is a maximum of 200,000 acre-feet. A minimum of 130,000 acre-feet must be provided in Pardee and Camanche Reservoirs, during the flood control period. The remaining 70,000 acre-feet may be provided by unfilled storage in PG&E's Salt Springs and Lower Bear Reservoirs located above Pardee, in accordance with an established formula included in the Army Corps of Engineers' manual. If none of the flood control space is transferable to PG&E's reservoirs, EBMUD must provide the entire space up to a maximum of 200,000 acre-feet divided between Camanche and Pardee Reservoirs. The flood control period is between September 15 and August 1 of the following year.

Maintenance of Stratification

EBMUDSIM simulates operations to maintain stratification in both Pardee and Camanche reservoirs under the JSA requirements (this feature is not invoked for 1961 DFG Agreement studies). This feature manages release rates from Pardee Reservoir to maintain 28,000 acre-feet of hypolimnion in Camanche Reservoir and is represented in the model as follows:

- Total volume of water to be released from Pardee for the period May through October is computed by the formula:

Total Pardee Release May - Oct.	**=**	**1.38**	**X**	**Total Camanche Release May - Oct.**	**-**	**1.55**	**X**	**Camanche Storage on April 30**	**+**	**174,000**

- If the resulting Pardee release would cause Pardee storage to fall below 100,000 acre-feet before November, the total release from Pardee is reduced so that storage in Pardee at the end of October is exactly 100,000 acre-feet. This maintains stratification in Pardee Reservoir

- Total Pardee release is divided by six to allow equal amounts of water to be released from Pardee in each month of the May-through-October period.

- If Pardee storage by May 1 is less than 100,000 acre-feet , no releases for reservoir stratification are made for the period.

D. MOKELUMNE RIVER DOWNSTREAM OF EBMUD SYSTEM

Diversions

EBMUDSIM incorporates the requirements of the water users downstream of the Camanche Reservoir that divert water from the Mokelumne River. These water users include:

- Woodbridge Irrigation District (WID)
- Riparian and Senior Appropriators
- North San Joaquin Water Conservation District (NSJWCD)
- City of Lodi

Table 4 shows a summary of the diversion amounts on an annual basis.

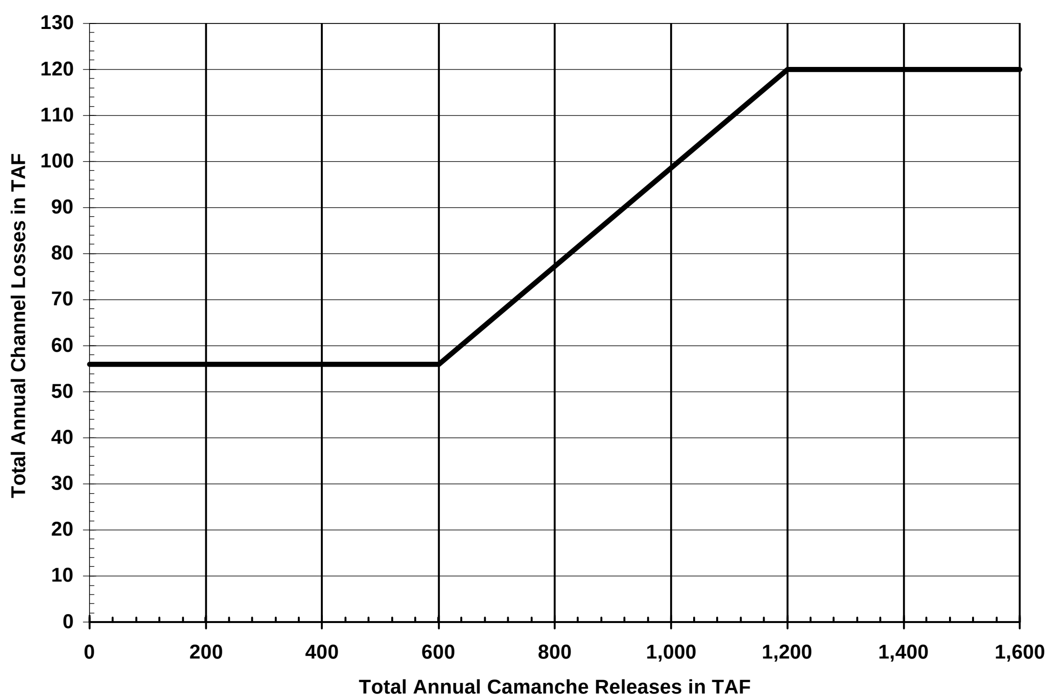
TABLE 4. Annual Diversion Schedule - Downstream Users

User	Amount (TAF)	Comments/Conditions
Riparian & Senior Appropriators	20.6	When True Natural Flow is greater than 250 TAF
	16.1	In dry years when natural flow diminishes, it is assumed that diversion amounts in July, Aug. & Sept. are reduced by 50 %
North San Joaquin Water Conservation District	10.0	In Normal years - 1995 level of development
	20.0	In Normal years - 2020 level of development
	0.0	When Camanche storage is deficient
Woodbridge Irrigation District	60.0	When Pardee inflow is greater than 375 TAF
	39.0	When Pardee Inflow is less than 375 TAF
City of Lodi	3.6	All years, 2020 level studies only.

Channel Loss

EBMUDSIM incorporates a component of loss to the system called channel loss. Channel losses occur in the segment of the lower Mokelumne River below Camanche Dam. Channel losses are an important and significant factor in the water budget of the system. EBMUD, under water rights and agreements with other water users on the river, is obligated to release sufficient water to ensure that entitlements are delivered to the user at the point of take-out or use. Channel losses deplete the amount of water in the stream, thus requiring EBMUD to increase releases from Camanche Dam to compensate for the losses. Channel loss in the model depends on total release from Camanche. The relationship is shown in Figure 2.

FIGURE 2. Relationship between Total Annual Camanche Releases and Total Annual Channel Losses between Camanche Dam and I-5.



Fish Release Requirements

Fish release requirements are the minimum flows that must be released to the lower Mokelumne River for fishery purposes. Fish release water from Camanche Dam is in addition to releases for downstream diversions and losses. Fishery flow requirements are summarized in Table 5.

Bay-Delta Releases

EBMUDSIM has the capability to impose user-specified flow requirements into the Bay-Delta estuary on the operation of EBMUD's Mokelumne River Project. Delta inflows are defined externally to EBMUDSIM usually by studies using other models such as DWRSIM. The Delta inflows are stored in a supplementary input file. The data is organized in a matrix where every year in the period of simulation is assigned with 12 monthly flow values. EBMUDSIM treats the Delta flows as part of the fish flow requirements.

E. WATER TRANSMISSION SYSTEM

Mokelumne Aqueducts

<u>Aqueduct Properties</u>

EBMUD's water supply is diverted from Pardee Reservoir through the Pardee Tunnel into three Mokelumne Aqueduct pipelines. The capacity of the pipelines varies depending upon Pardee Reservoir elevation and whether it is gravity flow or pumped flow. The total maximum capacity of the aqueducts under gravity flow is 202 MGD and under pumped flow is 325 MGD.

TABLE 5. Release Requirements for Fishery (cfs)

Description	Year Type		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Base Case[1] **1961 Agreement with CDF&G**	All	Incremental release for fishery in addition to releases for other downstream	0	50	66	40	30	30	0	0	0	0	0	0
1997 Joint Settlement Agreement (JSA)	Normal	Minimum Camanche Release	325	325	325	325	325	325	325[2]	325[2]	325[2]	100	100	100
	Below Normal		250	250	250	250	250	250	250[2]	250[2]	250[2]	100	100	100
	Dry		220	220	220	220	220	220	220	220	100	100	100	100
	Critical		115	130	130	130	130	130	130	100	100	100	100	100
	Normal	Expected Flow Below WID	100	100	100	100	100	100	150	300	300	25	25	25
	Below Normal		100	100	100	100	100	100	150	200	200	20	20	20
	Dry		80	80	80	80	80	80	150	150	20	20	20	20
	Critical		45	75	75	75	75	75	75	15	15	15	15	15

1. An additional operating constraint included in EBMUDSIM for the "Base Case" is that October, November, and December releases from Camanche Reservoir will be no less than 65% of the previous months release.
2. Additional release of up to 200 cfs may be required in these months depending on Pardee/Camanche storage conditions.

Aqueduct Draft

Aqueduct draft depends on the following factors:

- EBMUD’s water rights.

- Physical aqueduct capacity.

- Terminal Reservoirs operation. The Terminal Reservoirs operate to meet target storage defined by the Terminal Reservoir Rule Curve. The rule curve drives the model to draft water from Pardee Reservoir to the Terminal Reservoir through the Mokelumne Aqueducts.

- Pardee and Camanche operation. Aqueduct draft is reduced, as necessary, to allow Pardee Reservoir to release adequate flow to Camanche Reservoir to meet downstream releases. In addition, when Pardee Reservoir falls below elevation 396 feet (dead storage level), Aqueduct Draft cannot exceed Pardee inflow.

Terminal Reservoirs

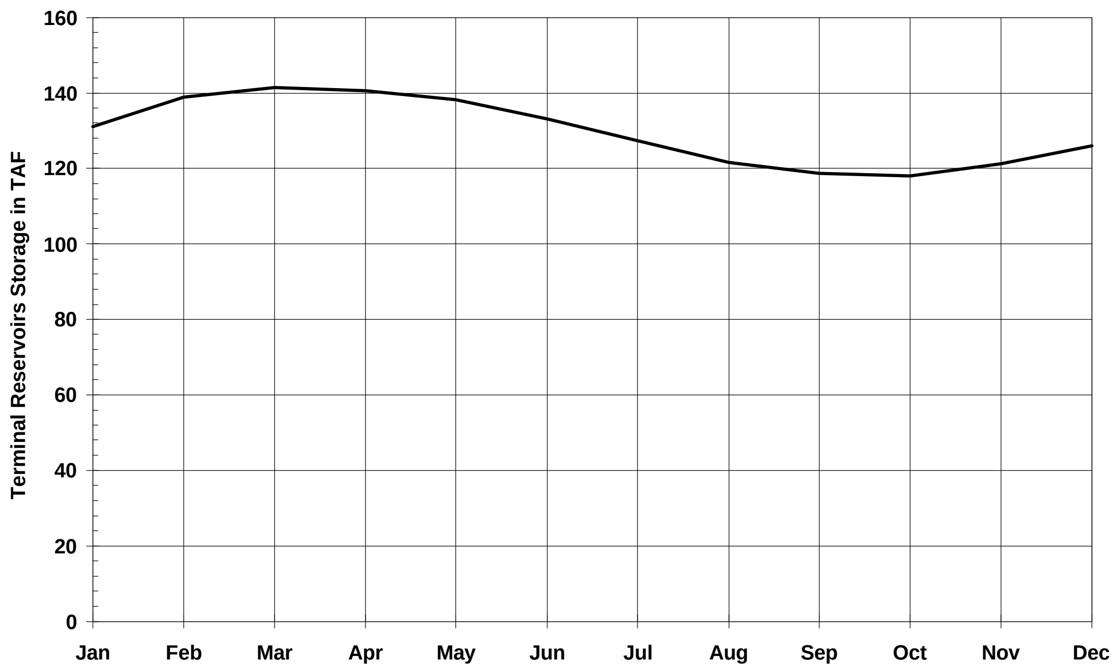
EBMUDSIM represents all five Terminal Reservoirs as a single reservoir with a combined gross storage of 155 TAF. Terminal reservoir dead storage equals 19.2 TAF.

In order to ensure a reliable supply of water to the District, the Terminal Reservoirs are kept as full as possible within operational guidelines. These guidelines are in the form of a rule curve.

Rule Curves

The Terminal Reservoir rule curve defines an end-of-month (EOM) target storage level for each month of the year. The rule curve is based on the average end-of-month amounts in storage during the period 1980 through 1989. Figure 3 shows a graphical presentation of the rule curve.

FIGURE 3. Terminal Reservoirs Rule Curve



Reservoirs Operation

All five Terminal Reservoirs operate in the model as a single reservoir. Water balance computations are performed using inflow, outflow, and the rule curves. It is assumed that terminal reservoir evaporation, losses and releases are equal to local runoff.

Inflow to the Terminal Reservoirs consists of aqueduct draft from Pardee Reservoir and supplemental supply to the Mokelumne Aqueducts from other sources.

Outflow from the Terminal Reservoirs is the District's customer demand.

Rule Curves define end of month target storage in the terminal reservoirs.
The Terminal Reservoirs operate as follows:

- The EOM storage is the balance between inflow and outflow plus the previous month's EOM storage. If the new storage falls below the rule curve target storage level, inflow is increased by calling more water from Pardee via Mokelumne aqueduct draft, as it is available.

- If storage in the Terminal Reservoirs declines to the dead storage amount, customer demand is reduced.

F. EAST BAY CUSTOMER DEMAND

The nominal customer demand represents average annual daily consumption of EBMUD customers. It plays the central role in the process as the computer model simulates the operations of the physical system with the objective of providing requested demand throughout the study period.

Customer demand varies seasonally through the year, and is expected to increase over time. The current normalized 1995 demand level and forecasted 2020 demand levels are presented in Table 6.

Given hydrologic conditions and other system operation constraints, it is conceivable that customer demand may not be satisfied throughout the simulation period. This usually occurs in severe dry years. EBMUDSIM handles shortages of the water supply by imposing customer demand cutbacks (or deficiencies) in dry years to simulate the District's rationing policy.

TABLE 6. Summary of EBMUD's Demand Projections (MGD)

EBMUD's Demand and Supply Projections	1995	2020
Customer demand per 1984/85 level (adjusted for accounts)	230	277
Reduction due to conservation and reclamation measures adopted prior to 1993	(8)	(27)
Subtotal		**250**
Reduction due to conservation and reclamation measures adopted after 1993		(22)
Planning level of demand	**222**	**228**

Early Deficiency Rules

The model reduces annual customer demand whenever projected total system storage at the end of September falls below 500 TAF. Total system storage is defined as the combined storage in Pardee, Camanche and the Terminal Reservoirs. The amount of reduction in customer demand is based on the "Early Deficiency Rules". The early deficiency rules define a relationship between demand, end-of-Sept. storage, and percent of demand reduction. The early deficiency rules result in a sliding scale of reductions in customer demand, depending on projected end of September total system storage levels.

Table 7 shows the Early Deficiency Rule used in the model. It reflects current Board policy and current basis for planning. It provides for reasonable application of hardship to customers that is achievable for a relatively short period of time.

Once the percent demand deficiency is calculated, it is distributed back to each month of the year.

TABLE 7. EBMUD Early Deficiency Rules Used for Drought Planning

Stage of Drought	If the April Projection of Storage on September 30 is:	Manage Demand to Impose the Following Deficiencies for the Year
No Drought	500 TAF or more	None
Moderate	500 - 450 TAF	0 to 15%
Severe	450 - 300 TAF	15 to 25%
Critical	Less than 300 TAF	25%

Notes: 1. One half of the deficiency values above are expected to be achieved during the first year that deficiencies are applied.
2. TAF = thousand acre-feet
3. Source: UWMP, 1996, Figure VIII-1

If the year in which deficiencies are applied is the first year of the drought, the model reduces the computed cutback by 50%. In subsequent drought years, the model applies the full percentage cutback as computed. The logic of this rule is that, in the first year of a drought, it can take up to six months to achieve customer demand reductions. This occurs because reliable forecasts of runoff are not available until after the April 1st snow survey and because additional time is needed to hold drought rationing hearings, begin drought management measures and for customers to respond to those measures. Therefore, demand reduction is only achievable during the last six months of the first year of drought. In the model, this real life situation is simplified by applying 50% of the cutback for the entire year. In subsequent years of drought, customer behavior usually reflects rationing measures, and the full cutback can be expected to occur for the entire year.

APPENDIX A

Drought Planning Sequence

Appendix A - Drought Planning Sequence

Mokelumne River storage is the primary reason that, despite high variability between normal and dry-year runoff in the Mokelumne River watershed, sufficient water remains available to meet all needs in most years. During some historical dry periods, Mokelumne basin runoff was insufficient to supply all needs. During these periods, most of the District's demand was supplied by water previously diverted to storage. The worst drought event in EBMUD's history was the 1976-77 drought, when runoff was only 25% or average and total reservoir storage decreased to 39% of normal.

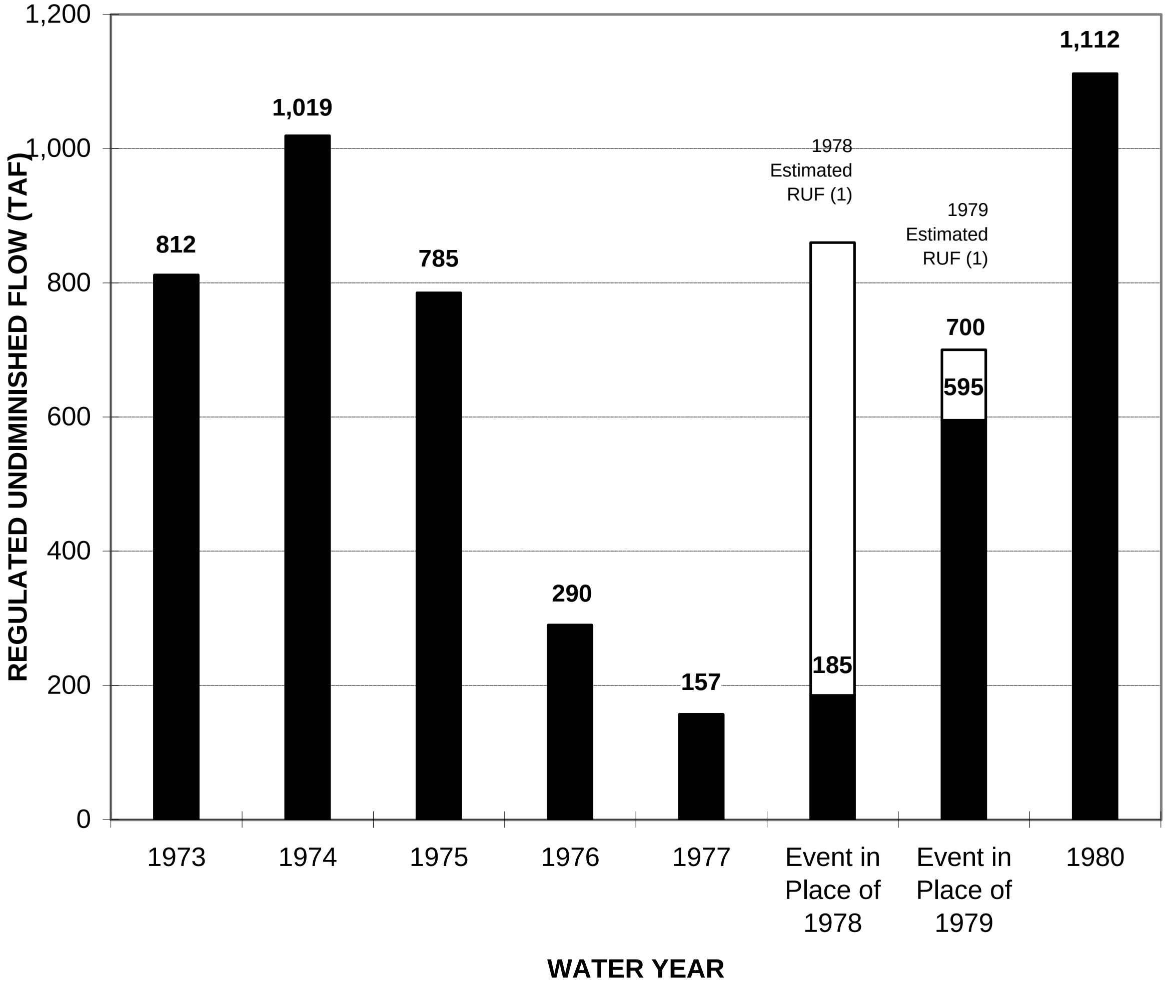
To operate its system, EBMUD assesses its water supply situation in April of each year, taking into account the amount of water stored in its reservoirs and the amount of water stored in the Mokelumne River basin's snowpack. This practice is similar to the approach taken by other water project operators throughout California. Customer demand is then managed as necessary, to allow at least enough water to remain in storage at the end of October (carry-over storage) to meet basic needs for one more year, should the following year turn out to be as dry as 1977 (the driest year on record). Providing this carry-over storage is necessary because rainfall and resulting runoff the following year is not known and because water project operators must safeguard against the severe impacts which would result from complete loss of the water supply should drought conditions continue. The California Department of Water Resources describes this approach on Page 17 of their March 1991 Urban Drought Guidebook as follows: "At a minimum, the carry-over amount should be enough to meet essential health, safety, and fire fighting needs if the subsequent winter is as dry as the driest year on record."

During the 1976-77 drought, the critically-dry year of 1977 was followed by a very wet year (1978), allowing the system to recover rapidly. However, at the end of the 1977 water year, in September 1977, it was not known what kind of water year 1978 would be; just as it is not known how much precipitation and runoff will occur next year. Thus, EBMUD could not allow its storage to become fully depleted at the end of 1977 in anticipation of plentiful water the following year. Had it done so, and if 1978 had turned out to be third dry year, the District would not have had sufficient water to meet its needs or its downstream obligations. Completely depleting storage during 1977 based on the expectation that high precipitation would occur during the year following a severe two-year drought would have irresponsibly placed customers and downstream beneficial uses at serious risk. To guard against the possibility of a complete loss of water supply, EBMUD implemented several emergency measures during 1977 to provide adequate, but greatly reduced, carry-over storage to preserve water supplies if the drought continued. Similar actions were taken by other water suppliers throughout California.

The drought planning sequence used by EBMUD to assess the adequacy of its water supply system reflects the District's experiences during the 1976-77 drought. In the District's drought planning sequence, runoff during water year 1978 has been replaced with a dry year amount of 185 TAF (the average annual runoff that occurred in 1976 and 1977). The resulting drought planning sequence is shown in Figure A1. This reflects the fact, described above, that in actual operations, water operators do not know and cannot predict future precipitation. The resulting drought planning sequence is less conservative than one that assumes that driest year of record conditions would occur during the year following a two-year drought, but the 1976, 1977, 185 TAF sequence does provide a safeguard against the possibility of dry conditions continuing for a third year. In its water supply evaluations, the District assumes that carry-over storage would become fully depleted by the end of the third drought year, with none held back as carry-over for a fourth dry year.

This approach is only slightly different from the approach of using historic hydrology with an associated minimum carry-over storage (either surface or groundwater) as a safeguard against an event more extreme than has occurred historically. However,

Figure A1
Drought Planning Sequence Hydrology



Notes:
(1) 1973 Through 1979 RUF Hydrology Except 1978 Replaced With 185 TAF:TAF / year

Source: Mokelumne River Hydrologic Database 1928-1988, and EBMUD using the drought planning sequence approach allows the District to explicitly consider the effects of supplemental sources of supply that could be available during the third year of drought. The drought planning sequence clearly shows the basis for the carry-over storage provided at the end of the second year of drought. To allow comparison of the two approaches, the District prepared EBMUDSIM studies using the historic 1976-77 hydrology with sufficient carry-over storage at the end of the second year. Table A1 below shows that the two approaches result in equivalent Needs for Water.

TABLE A1. Comparison of Drought Planning Sequences (Three-Year Without Carry-Over Storage and Two-Year With Carry-Over Storage)

Drought Sequence	Need for Water	Minimum Storage
1976-1977-185 TAF	185 TAF	35 TAF (Dead Storage)
1976-1977	185 TAF	231 TAF

Use of a single drought planning sequence to assess water supply impacts is based on the premise that if the water supply system is adequate during the worst-case drought, it will be adequate during less severe droughts and that measures taken to ensure an adequate supply during the worst-case drought will be effective during less severe droughts. To ensure this premise is correct, the District investigates water supply impacts from less severe droughts when performing its water supply evaluations. Thus an EBMUDSIM hydrologic model study is performed and results are printed for the entire 1922 through 1994 hydrologic sequence.

Prior to selecting its drought planning sequence, the District investigated several different approaches to system analysis, including the use of tree-ring studies and stochastic hydrologic methods. The District concluded that, at the present time, these techniques could not be relied upon to significantly improve the conclusions regarding system impacts that result from using historical hydrology and the drought planning sequence. The primary problem with other techniques is the reliability of the data set. Others have reached similar conclusions. The Army Corps of Engineers summarized the current problems with determining drought frequencies on Page 32 of their September 1991 report “”The National Study of Water Management During Drought” (IWR Report 91-NDS-2) as follows: “ One difficulty with computing frequency of drought, however, is the small record sample available. Unlike floods where a peak value is selected for each year, droughts of duration longer than a single year have fewer potential occurrences. This, together with the problem of distinguishing independent events, makes computation of drought frequency from gaged records difficult at best and statistically questionable at worst”.

The District’s own investigation of the feasibility of accurately calculating the probabilities of extreme drought confirms that the lack of data makes the reliability of these calculations very questionable. EBMUD analyzed the effects that the addition of 12 years of data to a 69-year hydrologic database has on calculations of drought probabilities using stochastic techniques. The analysis showed that adding the 12 years of data (1976 through 1987) to the 1907 through 1975 hydrologic database dramatically increased the calculated probability of occurrence of extreme drought events. For droughts of two to three years duration, the 1000-year return interval drought calculated using the 1907 through 1975 data set became a drought with about a 200-year return interval using the 1907 through 1987 data set. Stated another way, what could have been calculated to be a very improbable two-year drought in 1975, would have been calculated to be much more probable 12 years later in 1987. This increase in probability would have been even more dramatic if the additional drought years of 1988 through 1992 were included in the data set.

The District reached similar conclusions regarding the usefulness of tree-ring studies for system analysis. A reconstruction of Mokelumne Basin runoff using correlations with tree-ring widths does not exist. However, reconstructions of Sacramento basin precipitation and runoff have been attempted. These studies have not yet conclusively demonstrated a close correlation between tree-ring width and streamflow, particularly during extreme events. For this reason, synthetic hydrologic sequences generated by correlations with tree-ring data have not been incorporated into the EBMUDSIM hydrologic database.

Within the past 20 years, the District has experienced the most extreme two-year drought and the most extreme six-year drought since records of precipitation and runoff have been kept for the Mokelumne basin. In planning for the future, it would not be responsible for the District to ignore the possibility of more extreme events than have occurred historically. Given the lack of data, the degree of uncertainty in calculations of drought probabilities, the lack of redundancy in the District's water supply system, and the inability to predict the end of droughts during real-time events, its is reasonable and prudent for the District to base its drought planning sequence on a 1976-1977-185 TAF event.

APPENDIX B

Verification Study Results

August 7, 1997

Memo To: File

From: Daniel Haller, Junior Civil Engineer

Subject: Verification of EBMUDSIM

Introduction

This memo presents the results of a verification study that compares EBMUDSIM output for Camanche Reservoir releases and Total System Storage with actual historical values. This study was completed in July, 1997 using the latest version of EBMUDSIM.

Summary

The attached graphics provide a comparison of historic values with EBMUDSIM output for the study period (1967-1993) for the following items:

- EBMUD Total System Storage - Historic vs. Model; (Fig. B1)
- Releases from Camanche Reservoir - Historic vs. Model; (Fig B2)
- Regression Analysis of Camanche Releases including the correlation coefficient for the data for annual totals; (Fig B3)

- Regression Analysis of Total System Storage including the correlation coefficient for the data by month (Fig B4, 12 pages);

- Regression Analysis of Camanche Releases including the correlation coefficient for the data by month (Fig. B5, 12 pages).

Discussion

EBMUDSIM simulates operation of the District's water supply system. A simple water balance is performed using the historical hydrology in the Mokelumne basin. Regulated river flow resulting from water released from PG&E's reservoirs above Pardee is the basic hydrologic unit used in EBMUDSIM. Water provided to Amador and Calaveras counties is then subtracted from the regulated flow to determine Pardee inflow. Subsequent calculations determine aqueduct drafts to the East Bay reservoir system, Pardee releases to Camanche Reservoir, and Camanche Reservoir releases to the Lower Mokelumne River.

To determine how accurately EBMUDSIM simulates actual operations, a verification study was conducted. EBMUDSIM uses fixed values for such parameters as diversions by other agencies, EBMUD service area demand, and system losses. For the verification study, these values are the same as those used in the Base Case for the State Water Resources Control Board Bay-Delta Proceeding except for the following:

- Study period used is 1967-1993 to correspond to the time period that the existing supply system has been in service. The Total System

Storage comparison does not begin until 1970 because Camanche Reservoir was still filling until then;

- Diversions to Woodbridge Irrigation District (WID) are 65,855 AF in years in which TNF falls below 300 TAF and 75,855 AF in years during which TNF is greater than 300 TAF. The WID diversion amounts correspond to averages for the study period;

- North San Joaquin Water Conservation District is served until EBMUD total storage on the Mokelumne is 100 TAF below full storage;

- The original Elevation-Area-Capacity (EAC) data for Pardee and Camanche Reservoirs are used in order to correlate with historic operations. (Camanche EAC revised in July 1993 and Pardee EAC revised in July 1996 based on new bathymetric surveys.)

- Customer demand of 220 MGD at 1990 Level of Development.

In actual operations, diversions by the entities with rights to use the Mokelumne River, including EBMUD's diversions to its service area, vary from year to year. In contrast, EBMUDSIM uses fixed amounts for each of these diversions. EBMUDSIM also assumes no local runoff or evaporation in the terminal reservoir system. The only water available for delivery to customers comes from aqueduct drafts from Pardee Reservoir. In actual operations terminal reservoir local runoff and evaporation could increase or decrease the actual amount of water available for delivery to East Bay customers. Other differences in diversions and losses that affect EBMUDSIM's ability to match actual historical values for Camanche Releases and Total System Storage are:

- EBMUDSIM assumes an annual demand of 220 MGD for the verification study. Actual demand through the study period ranged from a low of 138.1 MGD in FY 1977-78 to a high of 219.9 MGD in FY 1969-70.

- Woodbridge diversions in EBMUDSIM are either 75.8 TAF or 65.8 TAF depending on the TNF for the year. Actual diversions to Woodbridge Irrigation District range from a low of 38.3 TAF in 1991 to a high of 122.6 TAF in 1971.

- EBMUDSIM channel losses to seepage and evapotranspiration range from 56 TAF in most years to 120 TAF based on a function of Camanche Releases. Actual channel losses vary from a low of 37 TAF in 1976 to a high of 139 TAF in 1983.

In addition to the effect of differences between actual and assumed diversions and losses, there is an operational difference in the treatment of flood control releases. EBMUDSIM does not allow <u>any</u> encroachment into flood control space. Therefore, if storage is projected to be above the storage limit for a particular month, sufficient water will be released to prevent encroachment. In actual operations the release might be spread over a longer period of time to prevent excessive river flows. There are several times in the study period when flood control releases from Camanche Dam were considerably less, historically, than as simulated by EBMUDSIM. These occur in Spring, 1969; Winter, 1970; Winter,1980; Spring, 1983; Winter 1986; all years with runoff well above average.

Despite these differences, the verification study indicates remarkable correlation between actual historic operations and operations simulated by EBMUDSIM. The values obtained from EBMUDSIM output compare closely to the historical records for Total System Storage and Camanche Reservoir releases. This indicates that EBMUDSIM simulates actual operations accurately. The regression analysis for Total Annual Camanche Releases resulted in a high correlation coefficient of 0.975. The regression analyses of monthly Total System Storage also indicates very good correlation. The regression analyses of Camanche Releases for each month do not indicate a correlation as high, but are acceptable. Short-term differences between historical and simulated operations and diversions are more noticeable in comparing monthly values than when comparing annual totals.

Verify97.doc

APPENDIX C

Assumptions Related to Water Right Priority System Alternative

(SWRCB Staff Alternatives 3 and 4)

APPENDIX C - EBMUDSUM Modeling Assumptions relating to the Water Rights Priority Approach (SWRCB Alternatives 3 and 4)

JSA with Delta Requirements per Water Rights Priority Approach with Friant Assumed to be in-basin diverter (SWRCB Alternative 3)

Under this SWRCB proposed alternative, water right holders must cease diverting water whenever the CVP/SWP releases supplemental water from storage to meet the 1995 WQCP Delta outflow objectives. When the CVP/SWP is releasing supplemental stored water in excess of their downstream requirements, the SWRB will notify a sufficient number of water right holders, starting with the most junior water right holders, to cease diverting. A sufficient number of water right holders must cease diverting to ensure that the CVP/SWP is no longer releasing supplemental stored water.

On March 18, 1997, EBMUD staff attended a workshop wherein SWRCB staff explained how they developed the technical information needed to analyze their proposed alternatives for implementing the 1995 WQCP. For administrative and modeling purposes, under Alternative 3, SWRCB staff divided all major post-1914 water right holders in the Central Valley into eight groups in reverse order of their water right priority. SWRCB staff then estimated the amount of water that would flow into the Delta each month if diverters in each of these eight groups ceased diverting. Using the results of DWRSIM Study No. 1995C6F SWRCB 469, SWRCB staff then calculated the amount of supplemental water that the CVP/SWP released to meet 1995 WQCP Delta outflow standards each month for all 73 years modeled. By comparing the amount of supplemental water being released with the amount of water diverted in each of the eight water right groupings, SWRCB staff determined which priority group needed to cease diverting in each month to ensure that the CVP/SWP did not need to release supplemental water to meet delta outflow objectives. The SWRCB staff provided a table (see Table C1) showing the resulting periods when each Priority Group of diverters must cease diverting. (In

Appendix C

Table C1 - Alternative 3 Priority Cutoff Groups for Delta Outflow (Information Supplied by SWRCB Staff)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	0	0	0	0	7	5	0
1923	0	0	0	0	0	0	0	0	4	7	7	0
1924	0	0	0	0	0	0	4	7	8	8	6	0
1925	0	0	0	0	0	0	0	0	3	7	6	0
1926	0	0	0	0	0	0	0	0	8	8	8	0
1927	0	0	0	0	0	0	0	0	0	7	7	0
1928	0	0	0	0	0	0	0	0	8	9	8	0
1929	0	0	0	0	0	0	0	0	3	8	7	0
1930	0	0	0	0	0	0	0	0	7	8	7	0
1931	0	0	0	0	0	0	3	4	8	8	7	0
1932	0	0	0	0	0	0	0	0	0	7	6	0
1933	0	0	0	0	0	0	0	0	0	7	7	0
1934	0	0	0	0	0	0	0	3	8	8	7	0
1935	0	0	0	0	0	0	0	0	0	7	6	0
1936	0	0	0	0	0	0	0	0	0	8	7	0
1937	0	0	0	0	0	0	0	0	0	8	7	0
1938	0	0	0	0	0	0	0	0	0	0	2	0
1939	0	0	0	0	0	0	0	1	9	8	7	0
1940	0	0	0	0	0	0	0	0	4	8	7	0
1941	0	0	0	0	0	0	0	0	0	5	4	0
1942	0	0	0	0	0	0	0	0	0	5	3	0
1943	0	0	0	0	0	0	0	0	0	7	7	0
1944	0	0	0	0	0	0	0	0	7	8	7	0
1945	0	0	0	0	0	0	0	0	0	8	7	0
1946	0	0	0	0	0	0	0	0	7	8	7	0
1947	0	0	0	0	0	0	0	0	7	8	7	0
1948	0	0	0	0	0	0	0	0	0	7	7	0
1949	0	0	0	0	0	0	0	0	7	8	7	0
1950	0	0	0	0	0	0	0	0	1	7	4	0
1951	0	0	0	0	0	0	0	0	7	8	5	0
1952	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	5	2	0
1954	0	0	0	0	0	0	0	0	5	8	4	0
1955	0	0	0	0	0	0	0	0	7	8	7	0
1956	0	0	0	0	0	0	0	0	0	3	0	0
1957	0	0	0	0	0	0	0	0	0	8	4	0
1958	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	8	8	7	0
1960	0	0	0	0	0	0	0	0	8	8	7	0
1961	0	0	0	0	0	0	0	0	8	9	8	0
1962	0	0	0	0	0	0	0	0	0	8	7	0
1963	0	0	0	0	0	0	0	0	0	7	2	0
1964	0	0	0	0	0	0	0	0	7	8	7	0
1965	0	0	0	0	0	0	0	0	0	7	0	0
1966	0	0	0	0	0	0	0	0	8	8	7	0
1967	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	8	8	0	0
1969	0	0	0	0	0	0	0	0	0	1	0	0
1970	0	0	0	0	0	0	0	0	5	7	3	0
1971	0	0	0	0	0	0	0	0	0	3	1	0
1972	0	0	0	0	0	0	0	0	8	8	5	0
1973	0	0	0	0	0	0	0	0	4	8	4	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	2	0	0
1976	0	0	0	0	0	0	0	1	9	8	2	0
1977	0	0	0	0	9	0	9	3	8	7	4	0
1978	3	0	0	0	0	0	0	0	0	7	5	0
1979	0	0	0	0	0	0	0	0	7	7	2	0
1980	0	0	0	0	0	0	0	0	0	5	2	0
1981	0	0	0	0	0	0	0	0	8	8	5	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	3	7	0	0
1985	0	0	0	0	0	0	0	4	9	8	7	0
1986	0	0	0	0	0	0	0	0	0	7	4	0
1987	0	0	0	0	0	0	0	5	9	8	7	0
1988	0	0	0	0	0	0	0	0	8	8	7	0
1989	0	0	0	0	0	0	0	0	7	8	5	0
1990	0	0	0	0	0	0	0	0	7	8	7	0
1991	0	0	0	0	9	0	0	0	1	7	4	0
1992	0	0	0	0	0	0	0	3	8	8	7	0
1993	0	0	0	0	0	0	0	0	0	7	0	0
1994	0	0	0	0	0	0	0	0	8	8	5	0

Indicates Priority 2 to 4 (Camanche diversion ceased)

Indicates Priority 5 and greater (Pardee and Camanche diversion ceased) their calculations, SWRCB staff accounted for Vernalis flows and Delta outflows separately).

EBMUD holds two water rights on the Mokelumne River that are listed in the SWRCB's "Major Central Valley Water Rights by Priority Group" (See Table C2) that would be subject to curtailment under the proposed water rights priority approach. The more junior of the two, Application 13156, has a seniority date of June 16, 1949, and is contained in Priority Group 2. EBMUD's more senior right, Application 4228, has a seniority date of September 22, 1924, and is contained in Priority Group 5. Under alternative 3, whenever the SWRCB determines that Group 2 or higher water is needed to meet the 1995 WQCP Delta outflow objectives, EBMUD would have to cease diverting water under Application 13156. Whenever, Group 5 or higher water is needed, then EBMUD would have to cease diverting under both Application 13156 and Application 4228.

As described above, using the results of DWRSIM Study No. 1995C6F SWRCB 469, SWRCB staff determined when water right holders in each Priority Group must cease diversions. This information was originally reported in Alternative 3 Table D "Water Cutoff Group Required to Meet Delta Outflow Objective" on page 133 of the SWRCB staff's March 18, 1997 Workshop Package of Handouts. EBMUD received a revised Alternative 3 Table D from the SWRCB on April 15, 1997, that it used in the EBMUDSIM modeling of Alternative 3; (see Table C1). When Table C1 showed that Priority Group 2 must cease diverting, but Priority Groups 5 and higher could continue diverting, releases from Camanche Reservoir were increased as necessary to ensure that water was not being diverted into Camanche Reservoir and thus release from Camanche Reservoir equaled or exceeded its inflow. When Table C1 showed Priority Group 5 or higher must cease diverting, releases from Camanche were increased as necessary to ensure that water was not being diverted into either Pardee or Camanche reservoirs and thus release from Camanche Reservoir equaled or exceeded Pardee Reservoir inflow.

Table C2 - Major Central Valley Water Rights by Priority Group (Information Supplied by SWRCB Staff) (Page 77 of March 18, 1997 Handout)

Major Central Valley Water Rights by Priority Group

Priority Group	Applied	File Date	Status	DSA	Last Name (Company)	Max Dir Div	Total Storage	Primary DD Season	Secondary DD Season	Storage Season
1	A015574	10/09/53	P	67	YUBA COUNTY WATER AGENCY	0	514.,00			10/1-6/30
1	A015572	10/08/53	L	70	NATOMAS CENTRAL MUTUAL WATER CO	131 C	0	4/1-6/30		
1	A015468	08/19/53	L	69	MCGOWAN BROTHERS	25 C	0	4/1-6/15	9/1-10/31	
1	A015467	08/19/53	L	69	MCGOWAN RICE RANCH	25 C	0	4/1-6/15	9/1-10/31	
1	A015414	07/16/53	L	62	PACIFIC GAS & ELECTRIC COMPANY	0.039 C	0	1/1-12/13		
1	A015406	07/08/53	L	69	CA DEPT OF FISH & GAME	22.2 C	0	4/1-11/1		
1	A015392	06/29/53	L	65	TUTTLE	21.2 C	0	4/1-9/30		
1	A015250	03/23/53	L	55	A STEFFAN RANCH	22.2 C	0	3/1-11/30	12/1-3/1	
1	A015204	03/20/53	P	67	YUBA COUNTY WATER AGENCY	0	246,000			10/1-6/30
1	A015179	01/29/53	L	69	SUTTER EXTENSION WATER DISTRICT	31 C	0	4/1-6/30	9/1-10/1	
1	A015178	01/29/53	L	69	SUTTER EXTENSION WATER DISTRICT	15 C	0	4/1-6/30	9/1-10/1	
1	A015177	01/29/53	L	69	SUTTER EXTENSION WATER DISTRICT	20 C	0	4/1-6/30	9/1-10/1	
1	A015095	11/25/52	L	69	AKIN RANCH A PARTNERSHIP	11.6 C	0	4/15-10/1		
1	A015017	09/15/52	L	69	CA DEPT OF FISH & GAME	6 C	0	4/15-9/15		
1	A014907	07/11/52	L	55	RECLAMATION DISTRICT #548	82 C	0	1/1-12/31		
1	A014867	06/19/52	L	69	ETCHEVERRY-IRIGOYEN	15 C	0	4/1-10/1		
1	A014858A	06/16/52	P	39	U S BUREAU OF RECLAMATION (New Melones Lk)	0	980,000			11/1-6/30
1	A014804	05/12/52	L	70	SOUTH SUTTER WATER DISTRICT	330 C	58,370	5/1-9/1		10/1-6/30
1	A014803	05/12/52	P	69	FEATHER WATER DISTRICT	130 C	0	1/1-12/31		
1	A014686	02/21/52	L	69	DAVIS, HELEN	3 C	0	5/1-10/1		
1	A014665	01/31/52	L	69	SUTTER EXTENSION WATER DISTRICT	25 C	0	4/15-11/1		
1	A014649	01/21/52	L	12	CAVE	20.1 C	0	4/1-10/1		
1	A014619	01/14/52	L	12	ZUMWALT MUTUAL WATER CO	0.5 C	0	4/1-10/15		
1	A014588	11/26/51	L	69	SUTTER EXTENSION WATER DISTRICT	29 C	0	5/1-9/15		
1	A014582	11/19/51	L	49	CA DEPT OF FISH & GAME (Los Banos Wildlife Area)	47 C	0	1/1-12/31		
1	A014546	11/02/51	L	69	MCPHERRIN LAND CO	15 C	0	4/1-11/1		
1	A014544	11/01/51	L	55	ZANETTI	13 C	0	4/1-12/31		
1	A014443	08/24/51	P	69	CA DEPT OF WATER RESOURCES (Oroville)	7,545 C	3,542,100	1/1-12/31		9/1-7/31
1	A014430	08/15/51	L	70	SOUTH SUTTER WATER DISTRICT	2 C	0	4/1-11/1		
1	A014415	08/03/51	L	69	GARDEN HIGHWAY MUTUAL WATER CO	23 C	0	5/1-11/1		
1	A014378	06/28/51	L	12	MAXWELL IRRIGATION DIST	3 C	0	3/1-11/30		
1	A014354	06/20/51	L	69	MCGOWAN RICE RANCH	7.4 C	0	4/1-10/1		
1	A014316	05/21/51	L	69	U S FISH & WILDLIFE SERVICE (Butte Sink NWR)	2.4 C	0	5/1-9/1		
1	A014127	01/16/51	L	40	TURLOCK I D & MODESTO ID	0	1,046,800			11/1-7/31
1	A014113	12/28/50	P	17	OROVILLE-WYANDOTTE IRRIGATION DIST	700 C	117,300	1/1-12/31		11/1-7/1
1	A014023	10/28/50	L	55	AUGUSTA BIXLER FARMS	18.5 C	0	1/1-12/31		
1	A014022	10/26/50	L	55	AUGUSTA BIXLER FARMS	9.5 C	0	1/1-12/31		
1	A013976	10/03/50	L	58	IGO ONO COMMUNITY SERVICE DIST	0.8 C	0	4/1-11/1		
1	A013957	09/20/50	P	67	OROVILLE-WYANDOTTE IRRIGATION DIST	300 C	35,000	5/1-11/1		1/1-7/1
1	A013919	0825/50	L	12	MAXWELL IRRIGATION DIST	11.6 C	0	5/1-12/1		
1	A013873	07/31/50	P	67	BROWNS VALLEY IRRIGATION DISTRICT	0	40,000			10/1-6/1
1	A013846	07/15/50	L	17	PACIFIC GAS & ELECTRIC COMPANY	0	60			10/1-5/1
1	A013769	06/01/50	L	17	PACIFIC GAS & ELECTRIC COMPANY	0.078 C	0	1/1-12/31		
1	A013765	05/31/50	L	17	PACIFIC GAS & ELECTRIC COMPANY	0.056 C	0	1/1-12/31		
1	A013735	05/15/50	L	12	MAXWELL IRRIGATION DIST	7 C	0	4/15-10/1		
1	A013715	05/02/50	L	55	SAN JOAQUIN RIVER WATER USERS CO, INC	22.1 C	0	1/1-12/31		
1	A013710	04/28/50	L	69	CREPS	4.7 C	0	4/15-12/15		
1	A013628	03/10/50	L	49	BROCCHINI	0.75 C	0	3/1-11/1		
1	A013590	02/20/50	L	15	OJI BROTHERS, A CO-PARTNERSHIP	2.87 C	0	4/1-10/1		
1	A013541	01/13/50	L	49	WEAVER	45 C	0	11/1-7/1		
1	A013454	11/09/49	L	55	ANDREOTTI	13.5 C	0	4/1-10/1		
1	A013452	11/09/49	L	12	PROVIDENT IRRIGATION DIST	3.25 C	0	4/1-10/1		
1	A013371	10/01/49	P	22	U S BUREAU OF RECLAMATION (Folsom)	700 C	300,000	11/1-8/1		11/1-7/1
1	A013370	10/0149	P	22	U S BUREAU OF RECLAMATION (Folsom)	8,000 C	1,000,000	11/1-8/1		11/1-7/1
1	A013349	09/12/49	L	69	SUTTER EXTENSION WATER DISTRICT	2.66 C	0	4/15-10/15		
1	A013323	08/31/49	L	69	MCGOWAN RICE RANCH	7 C	0	4/1-10/1		
2	A013175	06/27/49	L	49	CHOWCHILLA WATER DISTRICT	90 C	50,000	3/1-7/31		11/1-5/1
2	A013156	06/16/49	P	29	EAST BAY MUNICIPAL UTILITY DIST	194 C	353,000	12/1-7/1		12/1-7/1
2	A013148	06/10/49	L	55	PETERSEN ESTATE COMPANY	18 C	0	4/15-10/15		
2	A013130	06/02/49	P	67	BROWNS VALLEY IRRIGATION DISTRICT	0	20,000			10/1-5/1
2	A013093A	05/13/49	P	39	CALAVERAS COUNTY WATER DIST	0	5,000			11/1-7/1
2	A013091	05/13/49	P	39	CALAVERAS COUNTY WATER DIST	0	63,000			11/1-7/1
2	A013031	04/18/49	L	65	KNAGGS	3 C	0	4/15-10/1		
2	A013008	03/30/49	L	69	MCGOWAN BROTHERS	14.2 C	0	4/1-10/1		
2	A013002	03/25/49	L	12	OLIVE PERCY DAVIS TRUST	1 C	0	4/1-10/1		
2	A013001	03/25/49	L	12	OLIVE PERCY DAVIS TRUST	0.27 C	0	4/1-10/1		
2	A013000	03/25/49	L	12	OLIVE PERCY DAVIS TRUST	5 C	0	4/1-10/1		

Table C2 - Major Central Valley Water Rights by Priority Group (Con.) (Information Supplied by SWRCB Staff) (Page 81 of March 18, 1997 Handout)

Major Central Valley Water Rights by Priority Group

Priority Group	Applied	File Date	Status	DSA	Last Name (Company)	Max Dir Div	Total Storage	Primary DD Season	Secondary DD Season	Storage Season
5	A00851	11/30/25	L	22	PACIFIC GAS & ELECTRIC COMPANY	0	300			12/1-6/30
5	A004743	08/22/25	L	70	CARMICHAEL WATER DISTRICT	10 C	0	5/1-11/1		
5	A004699	07/15/25	L	15	PREMIERE FARMLAND PARTNERS III LTD PART	2 C	0	4/15-9/30		
5	A004665	06/30/25	L	69	GORRILL LAND COMPANY	15 C	0	4/1-9/30		
5	A004664	06/30/25	L	69	GORRILL LAND COMPANY	21.7 C	0	4/1-9/15		
5	A004663	06/30/25	L	69	RANCHO ESQUON PARTNERS	13.8 C	0	4/1-9/15		
5	A004637	06/15/25	L	55	MORAN	12.44 C	0	3/15-12/1		
5	A004613	06/02/25	L	15	PREMIERE FARMLAND PARTNERS III LTD PART	0.5 C	0	4/1-10/31		
5	A004524	03/31/25	L	62	PACIFIC GAS & ELECTRIC COMPANY	1 C	0	1/1-12/31		
5	A004513	03/20/25	L	55	R & M RANCH, A PARTNERSHIP	12.72 C	0	4/1-12/31		
5	A004512	03/20/25	L	55	R & M RANCH, A PARTNERSHIP	5.79 C	0	4/1-12/31		
5	A004470	02/20/25	L	55	PARADISE MUTUAL WATER COMPANY	14.14 C	0	4/1-11/1		
5	A004460	02/14/25	L	49	RIVER JUNCTION RECL DIST NO 2064	72.29 C	0	3/1-10/1		
5	A004452	02/10/25	L	55	YAMADA BROTHERS	31.69 C	0	4/1-11/15		
5	A004432	01/27/25	L	55	DAL PORTO	16.13 C	0	3/1-11/1		
5	A004364	12/13/24	L	15	WALLACE CONSTRUCTION INC	7.25 C	0	3/1-11/1		
5	A004351	12/04/24	L	65	CHURCH OF JESUS CHRIST OF L D S (Deseret Farms)	0.37 C	0	5/1-10/1		
5	A004276	10/24/24	L	55	GRUNAUER JR	29.87 C	0	3/1-12/1		
5	A004275	10/24/24	L	55	OHLENDORF	17.5 C	0	3/1-12/1		
5	A004237	09/26/24	L	49	TWIN OAKS IRRIGATION COMPANY	21.91 C	0	2/15-10/15		
5	A004228	09/22/24	L	29	EAST BAY MUNICIPAL UTILITY DIST	310 C	209,950	1/1-12/31		10/1-7/15
5	A004124	07/31/24	L	65	SWEETWATER COMPANY	7.12 C	0	1/1-12/31		
5	A004123	07/31/24	L	65	SWEETWATER COMPANY	11.64 C	0	11/1-3/31		
5	A004101	07/18/24	L	55	RECLAMATION DISTRICT #999	12.8 C	0	5/1-10/1		
5	A004100	07/18/24	L	55	RECLAMATION DISTRICT #999	111.88 C	0	5/1-10/1		
5	A004099	07/18/24	L	55	RECLAMATION DISTRICT #999	4.82 C	0	5/1-10/1		
5	A004000	05/23/24	L	69	PACIFIC GAS & ELECTRIC COMPANY	2.5 C	0	9/1-6/1		
5	A003990	05/15/24	L	59	MCGURK	12 C	0	4/1-11/15		
5	A003914	03/21/24	L	55	MCCORMACK WILLIAMSON COMPANY	18.75 C	0	3/1-11/1		
5	A003843	02/11/24	L	70	CAMP FAR WEST IRRIGATION DIST	11.76 C	0	5/1-10/1		
5	A003795	01/10/24	L	17	PACIFIC GAS & ELECTRIC COMPANY	0.0009 C	0	1/1-12/31		
5	A003794	01/10/24	L	17	PACIFIC GAS & ELECTRIC COMPANY	0.5 C	0	1/1-12/31		
5	A003769	12/22/23	L	55	HASTINGS RECLAMATION DISTRICT 2060	45 C	0	3/1-11/1		
5	A003768	12/22/23	L	55	JERSEY ISLAND RECLAMATION DIST 830	40.22 C	0	3/1-11/1		
5	A003648	09/24/23	L	49	TURLOCK I D & MODESTO I D	100 C	0	3/1-10/31		
5	A003613	08/25/23	L	55	BRACK RECLAMATION DISTRICT #2033	49.38 C	0	3/1-11/1		
5	A003550	07/26/23	L	67	PACIFIC GAS & ELECTRIC COMPANY	0	26,662			11/1-6/30
5	A003423	05/17/23	L	65	CHURCH OF JESUS CHRIST OF L D S (Deseret Farms)	7.25 C	0	4/1-10/1		
5	A003353	04/12/23	L	61	HOT SPRINGS VALLEY IRRIGATION DIST	0	48,400			12/1-4/1
5	A003290A	03/12/23	L	15	OJI BROTHERS, A CO-PARTNERSHIP	9.39 C	0	4/1-10/31		
5	A003206	12/27/22	L	15	TAYLOR—SUTTER BYPASS PROPERTIES INC	20.3 C	0	4/1-10/15		
5	A003195	12/27/22	L	15	SUTTER MUTUAL WATER COMPANY	1.38 C	0	4/1-10/31		
5	A003091	10/19/22	L	49	OAKDALE IRRIGATION DISTRICT	0	10,754			10/1-7/1
5	A003069	10/07/22	L	24	MAGOON ESTATE LIMITED	5.35 C	1,100	4/1-6/15		9/15-5/1
5	A002979	08/12/22	P	17	OROVILLE-WYANDOTTE IRRIGATION DIST	185 C	0	1/1-12/31		
5	A002978	08/12/22	L	67	YUBA COUNTY WATER DISTRICT	21.4 C	0	4/1-10/15		
5	A002960	07/28/22	L	55	SPANOS	4.27 C	0	3/1-11/1		
5	A002959	07/28/22	L	55	DELTA FARMS R D #2044	39.18 C	0	3/1-11/1		
5	A002958	07/28/22	L	55	DELTA FARMS R D #2042	25.28 C	0	3/1-11/1		
5	A002957	07/28/22	L	55	DELTA FARMS R D #2041	13.62 C	0	3/1-11/1		
5	A002956	07/28/22	L	55	DELTA FARMS R D #2030	76.36 C	0	3/1-11/1		
5	A002955	07/28/22	L	55	DELTA FARMS R D #2029	42.83 C	0	3/1-11/1		
5	A002954	07/28/22	L	55	DELTA FARMS R D #2028	60.16 C	0	3/1-11/1		
5	A002953	07/28/22	L	55	DELTA FARMS R D #2027	61.66 C	0	3/1-11/1		
5	A002952	07/28/22	L	55	DELTA FARMS R D #2026	63.94 C	0	3/1-11/1		
5	A002951	07/28/22	L	55	DELTA FARMS R D #2025	49.25 C	0	3/1-11/1		
5	A002950	07/28/22	L	55	DELTA FARMS R D #2024	27 C	0	3/1-11/1		
5	A002949	07/28/22	L	55	FALLMAN	11.75 C	0	3/1-11/1		
6	A002948	07/28/22	L	55	RECLAMATION DISTRICT #756	71.56 C	0	3/1-11/1		
6	A002909	06/27/22	L	69	REANCHO ESQUON PARTNERS	20 C	0	4/1-6/15		
6	A002881	06/13/22	L	70	CAMP FAR WEST IRRIGATION DIST	0	5,000			3/1-5/1
6	A002805	03/24/22	L	69	RANCHO ESQUON PARTNERS	14 C	0	5/1-9/1		
6	A002778	03/06/22	P	17	OROVILLE-WYANDOTTE IRRIGATION DIST	50 C	25,000	4/1-6/1		10/1-6/1
6	A002777	03/06/22	L	69	GORRILL LAND COMPANY	15 C	0	4/1-9/15		
6	A002681A	12/08/21	L	55	MCCORMACK	0.82 C	0	5/1-9/15		
6	A002652B	11/22/21	P	68	NEVADA IRRIGATION DIST	0	65,000			11/30-6/1
6	A002652A	11/22/21	L	68	NEVADA IRRIGATION DIST	0	12,500			11/30-6/1

EBMUDSIM has the capability to include requirements for increased releases from Camanche Reservoir to provide additional inflow to the Delta from the Mokelumne River. EBMUD staff used this capability to model this alternative. EBMUD staff reviewed the results of EBMUDSIM model Study No. 97 222 10-6075 (JSA flow conditions) to see if water was being diverted in either Pardee or Camanche Reservoirs when prohibited, according to the SWRCB's revised Table D. If water was being diverted when diversions were prohibited, EBMUD staff increased Camanche Reservoir's release requirements by a sufficient amount to ensure that the prohibited diversion ceased. EBMUDSIM was then re-run with the new Camanche release requirements included, to simulate conditions under the Water Rights Priority approach, Alternative 3.

To verify that EBMUDSIM correctly modeled the Alternative 3 Water Rights Priority approach, EBMUD staff prepared several comparison tables. Table C3 compares Camanche inflow to Camanche release when Priority Group 2 must cease diverting, but Priority Groups 5 and higher can continue diverting. This Table verifies that no water is being diverted into Camanche Reservoir when diversions are not allowed. Table C4 compares Pardee inflow with Camanche Release when Priority Group 5 or higher must cease diverting. This Table verifies that no water is being diverted into Pardee Reservoir, Camanche Reservoir, or into the Mokelumne Aqueducts when Priority Group 5 or higher diversions are not allowed. Table C5 shows the amounts that Camanche Releases were increased over the POA study case to ensure EBMUD's diversions were curtailed when required under this alternative. These tables verify that EBMUDSIM is correctly modeling the impacts of this alternative on the Mokelumne River system.

JSA with Delta Requirements per Water Rights Priority Approach with Friant Assumed to be Exporter (SWRCB Alternative 4)

The SWRCB's proposed Alternative 4 is very similar to the SWRCB's Alternative 3. The only difference between this alternative and Alternative 3 is the water rights priority assumption for Friant area water users. In Alternative 4, Friant area water users are assumed to be water exporters. Thus in this alternative, Friant exports have the same priority as other CVP/SWP exports. However, in this alternative, releases from Millerton Reservoir are assumed to part of CVP/SWP supplemental water released into the Delta. These assumptions increase the amount of CVP water allocated to meeting the 1995 WQCP standards for flow at Vernalis which decreases the allocations to non-CVP water users in the San Joaquin basin. These assumptions also affect non-CVP allocations to Delta outflow because Friant exports and storage releases are taken into account.

As with Alternative 3, SWRCB staff determined when each Priority Group must cease diverting under this alternative. This information was originally reported in Alternative 4 Table D on Page 142 of the SWRCB staff's March 18, 1997 Package of Handouts EBMUD received a revised Alternative 4 Table D on April 15, 1997 which it used to prepare the EBMUDSIM studies of Alternative 4, (see Table C6).

To verify that EBMUDSIM correctly modeled the alternative 4 Water Rights Priority approach, EBMUD staff prepared several comparison tables. Table C7 compares Camanche inflow to Camanche release when Priority Group 2 must cease diverting, but Priority Groups 5 and higher can continue diverting. This Table verifies that no water is being diverted into Camanche Reservoir when diversions are not allowed. Table C8 compares Pardee inflow with Camanche Release when Priority Group 5 or higher must cease diverting. This Table verifies that no water is being diverted into Pardee Reservoir, Camanche Reservoir, or into the Mokelumne Aqueducts when Priority Group 5 or higher diversions are not allowed. Table C9 shows the amounts that Camanche Releases were increased over the POA study case to ensure EBMUD's diversions were curtailed when required under this alternative. These tables verify that EBMUDSIM is correctly modeling the impacts of this alternative on the Mokelumne River system.

TABLE C3. Comparison of Camanche Inflow to Camanche Release When Camanche Must Cease Diversions but Pardee Diversions are Allowed (Priority Groups 2 - 4) for Alternative 3

Water Year	Oct				Apr				May				Jun				Jul				Aug			
	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1922																								
1923													4	1417	1417	0								
1924					4	0	221	221																
1925													3	1728	1728	0								
1926																								
1927																								
1928																								
1929													3	283	298	15								
1930																								
1931					3	0	221	221	4	104	236	132												
1932																								
1933																								
1934									3	272	362	90												
1935																								
1936																								
1937																								
1938																					2	259	1132	873
1939																								
1940													4	1101	1229	128								
1941																					4	250	991	741
1942																					3	294	1091	797
1943																								
1944																								
1945																								
1946																								
1947																								
1948																								
1949																								
1950																					4	229	888	659
1951																								
1952																								
1953																					2	264	651	387
1954																					4	226	343	117
1955																								
1956																	3	531	1189	658				

TABLE C3. Comparison of Camanche Inflow to Camanche Release When Camanche Must Cease Diversions but Pardee Diversions are Allowed (Priority Groups 2 - 4) for Alternative 3

Water Year	Oct				Apr				May				Jun				Jul				Aug			
	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1957																					4	232	539	307
1958																								
1959																								
1960																								
1961																								
1962																								
1963																					2	253	983	730
1964																								
1965																								
1966																								
1967																								
1968																								
1969																								
1970																					3	262	365	103
1971																	3	616	815	199				
1972																								
1973													4	1321	1320	-1					4	266	689	423
1974																								
1975																	2	701	1212	511				
1976																					2	30	232	202
1977									3	0	236	236									4	0	232	232
1978	3	84	125	41																				
1979																					2	571	566	-5
1980																					2	204	1008	804
1981																								
1982																								
1983																								
1984													3	1430	1429	-1								
1985									4	304	393	89												
1986																					4	237	970	733
1987																								
1988																								
1989																								
1990																								
1991																					4	235	260	25
1992									3	340	336	-4												
1993																								
1994																								

TABLE C4. Comparison of Pardee Inflow to Camanche Release When Both Camanche and Pardee Must Cease Diversions (Priority Groups 5 and above) for Alternative 3

WY	Feb				Apr				May				Jun				Jul				Aug			
	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1922																	7	759	1078	319	5	529	994	465
1923																	7	672	781	109	7	515	647	132
1924									7	326	325	-1	8	247	298	51	8	262	271	9	6	256	255	-1
1925																	7	549	645	96	6	495	495	0
1926													8	533	533	0	8	505	505	0	8	499	499	0
1927																	7	649	999	350	7	523	932	409
1928													8	671	681	10	9	540	540	0	8	505	505	0
1929																	8	545	546	1	7	520	520	0
1930													7	1285	1285	0	8	526	526	0	7	525	525	0
1931													8	262	298	36	8	347	347	0	7	240	239	-1
1932																	7	754	754	0	6	544	543	-1
1933																	7	612	612	0	7	560	560	0
1934													8	531	531	0	8	440	441	1	7	252	257	5
1935																	7	566	566	0	6	507	507	0
1936																	8	644	1006	362	7	555	922	367
1937																	8	607	869	262	7	553	803	250
1938																								
1939													9	578	578	0	8	525	525	0	7	510	510	0
1940																	8	570	822	252	7	549	739	190
1941																	5	717	1060	343				
1942																	5	973	1176	203				
1943																	7	667	957	290	7	586	872	286
1944													7	821	821	0	8	564	564	0	7	536	536	0
1945																	8	612	918	306	7	550	852	302
1946													7	1332	1332	0	8	578	731	153	7	524	616	92
1947													7	571	571	0	8	523	523	0	7	502	502	0
1948																	7	575	575	0	7	560	560	0
1949													7	1207	1206	-1	8	600	600	0	7	531	531	0
1950																	7	610	957	347				
1951													7	935	935	0	8	614	630	16	5	557	556	-1
1952																								
1953																	5	860	859	-1				
1954													5	675	674	-1	8	496	496	0				
1955													7	858	858	0	8	517	518	1	7	527	527	0
1956																								

TABLE C4. Comparison of Pardee Inflow to Camanche Release When Both Camanche and Pardee Must Cease Diversions (Priority Groups 5 and above) for Alternative 3

WY	Oct				Apr				May				Jun				Jul				Aug			
	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1957																	8	520	605	85				
1958																								
1959													8	489	489	0	8	502	502	0	7	500	500	0
1960													8	869	869	0	8	479	480	1	7	483	483	0
1961													8	478	478	0	9	471	471	0	8	450	450	0
1962																	8	609	609	0	7	560	560	0
1963																	7	646	1059	413				
1964													7	538	538	0	8	563	563	0	7	541	541	0
1965																	7	893	1228	335				
1966													8	429	429	0	8	511	511	0	7	511	511	0
1967																								
1968													8	608	608	0	8	474	474	0				
1969																								
1970													5	1983	1983	0	7	704	743	39				
1971																								
1972													8	1164	1163	-1	8	592	592	0	5	523	523	0
1973																	8	722	787	65				
1974																								
1975																								
1976													9	254	298	44	8	246	271	25				
1977					9	209	221	12					8	241	298	57	7	242	271	29				
1978																	7	280	280	0	5	172	232	60
1979													7	1562	1562	0	7	774	774	0				
1980																	5	1269	1269	0				
1981													8	430	429	-1	8	223	309	86	5	130	257	127
1982																								
1983																								
1984																	7	956	954	-2				
1985													9	496	497	1	8	482	482	0	7	537	537	0
1986																	7	730	1058	328				
1987									5	257	257	0	9	334	334	0	8	486	487	1	7	476	476	0
1988													8	410	410	0	8	469	469	0	7	392	391	-1
1989													7	1100	1101	1	8	541	541	0	5	494	494	0
1990													7	567	567	0	8	519	520	1	7	455	455	0
1991																	7	531	532	1				
1992													8	282	298	16	8	477	477	0	7	468	469	1
1993																	7	615	622	7				
1994													8	467	467	0	8	368	369	1	5	421	421	0

TABLE C5. Increases in Camanche Reservoir Releases Over JSA Conditions Necessary to Comply with Alternative 3 Requirements (cfs)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	577	0	0	0
1924	0	0	0	0	0	0	0	89	0	0	23	0
1925	0	0	0	0	0	0	0	0	1204	0	152	0
1926	0	0	0	0	0	0	0	0	175	112	156	0
1927	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	85	116	0
1929	0	0	0	0	0	0	0	0	0	237	263	0
1930	0	0	0	0	0	0	0	0	927	43	182	0
1931	0	0	0	0	0	0	0	0	0	76	7	0
1932	0	0	0	0	0	0	0	0	0	361	197	0
1933	0	0	0	0	0	0	0	0	0	219	217	0
1934	0	0	0	0	0	0	0	0	233	132	0	0
1935	0	0	0	0	0	0	0	0	0	173	164	0
1936	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	220	132	167	0
1940	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	463	168	193	0
1945	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	373	0	0	0
1947	0	0	0	0	0	0	0	0	213	130	159	0
1948	0	0	0	0	0	0	0	0	0	182	217	0
1949	0	0	0	0	0	0	0	0	682	159	188	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	38	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	145	0	0
1954	0	0	0	0	0	0	0	0	150	103	0	0
1955	0	0	0	0	0	0	0	0	500	115	184	0
1956	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	131	109	157	0
1960	0	0	0	0	0	0	0	0	511	77	140	0
1961	0	0	0	0	0	0	0	0	180	162	193	0
1962	0	0	0	0	0	0	0	0	0	216	217	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	180	170	198	0
1965	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	71	118	168	0
1967	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	250	81	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	1347	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	639	151	180	0
1973	0	0	0	0	0	0	0	0	339	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	9	0	0
1979	0	0	0	0	0	0	0	0	1204	291	220	0
1980	0	0	0	0	0	0	0	0	0	200	0	0
1981	0	0	0	0	0	0	0	0	131	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	467	199	0	0
1985	0	0	0	0	0	0	0	0	139	89	194	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	21	36	178	219	0
1988	0	0	0	0	0	0	0	0	112	198	159	0
1989	0	0	0	0	0	0	0	0	743	100	151	0
1990	0	0	0	0	0	0	0	0	269	211	198	0
1991	0	0	0	0	26	0	0	0	0	223	0	0
1992	0	0	0	0	0	0	0	100	0	168	212	0
1993	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	169	60	164	0

Table C6. Alternative 4 Priority Cutoff Groups for Delta Outflow (Information Supplied by SWRCB Staff)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	0	0	0	0	7	7	0
1923	0	0	0	0	0	0	0	0	4	8	7	0
1924	0	0	0	0	0	0	4	8	8	8	7	0
1925	0	0	0	0	0	0	0	0	3	8	7	0
1926	0	0	0	0	0	0	0	0	8	8	8	0
1927	0	0	0	0	0	0	0	0	0	8	7	0
1928	0	0	0	0	0	0	0	0	8	9	8	0
1929	0	0	0	0	0	0	0	0	4	8	7	0
1930	0	0	0	0	0	0	0	0	8	8	7	0
1931	0	0	0	0	0	0	3	4	8	8	8	0
1932	0	0	0	0	0	0	0	0	0	8	7	0
1933	0	0	0	0	0	0	0	0	0	8	8	0
1934	0	0	0	0	0	0	0	3	8	8	7	0
1935	0	0	0	0	0	0	0	0	0	8	7	0
1936	0	0	0	0	0	0	0	0	0	8	8	0
1937	0	0	0	0	0	0	0	0	0	8	8	0
1938	0	0	0	0	0	0	0	0	0	0	4	0
1939	0	0	0	0	0	0	0	0	9	8	8	0
1940	0	0	0	0	0	0	0	0	4	8	8	0
1941	0	0	0	0	0	0	0	0	0	4	5	0
1942	0	0	0	0	0	0	0	0	0	4	5	0
1943	0	0	0	0	0	0	0	0	0	8	7	0
1944	0	0	0	0	0	0	0	0	7	8	8	0
1945	0	0	0	0	0	0	0	0	0	8	7	0
1946	0	0	0	0	0	0	0	0	7	8	7	0
1947	0	0	0	0	0	0	0	0	8	8	8	0
1948	0	0	0	0	0	0	0	0	0	8	7	0
1949	0	0	0	0	0	0	0	0	8	8	7	0
1950	0	0	0	0	0	0	0	0	1	8	6	0
1951	0	0	0	0	0	0	0	0	8	8	5	0
1952	0	0	0	0	0	0	0	0	0	0	2	0
1953	0	0	0	0	0	0	0	0	0	5	2	0
1954	0	0	0	0	0	0	0	0	7	8	5	0
1955	0	0	0	0	0	0	0	0	7	8	8	0
1956	0	0	0	0	0	0	0	0	0	2	2	0
1957	0	0	0	0	0	0	0	0	0	8	7	0
1958	0	0	0	0	0	0	0	0	0	0	2	0
1959	0	0	0	0	0	0	0	0	8	9	7	0
1960	0	0	0	0	0	0	0	0	8	8	8	0
1961	0	0	0	0	0	0	0	0	8	9	8	0
1962	0	0	0	0	0	0	0	0	0	8	7	0
1963	0	0	0	0	0	0	0	0	0	7	4	0
1964	0	0	0	0	0	0	0	0	7	8	8	0
1965	0	0	0	0	0	0	0	0	0	7	2	0
1966	0	0	0	0	0	0	0	0	8	8	7	0
1967	0	0	0	0	0	0	0	0	0	0	2	0
1968	0	0	0	0	0	0	0	0	8	8	2	0
1969	0	0	0	0	0	0	0	0	0	0	2	0
1970	0	0	0	0	0	0	0	0	6	8	5	0
1971	0	0	0	0	0	0	0	0	0	4	2	0
1972	0	0	0	0	0	0	0	0	8	8	7	0
1973	0	0	0	0	0	0	0	0	3	8	5	0
1974	0	0	0	0	0	0	0	0	0	2	2	0
1975	0	0	0	0	0	0	0	0	0	4	2	0
1976	0	0	0	0	0	0	0	3	9	8	2	0
1977	0	0	0	0	9	7	9	3	8	8	5	0
1978	3	0	0	0	0	0	0	0	0	5	6	0
1979	0	0	0	0	0	0	0	0	8	8	4	0
1980	0	0	0	0	0	0	0	0	0	4	4	0
1981	0	0	0	0	0	0	0	0	8	8	7	0
1982	0	0	0	0	0	0	0	0	0	0	1	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	3	8	2	0
1985	0	0	0	0	0	0	0	3	8	8	7	0
1986	0	0	0	0	0	0	0	0	0	8	7	0
1987	0	0	0	0	0	0	0	4	9	8	8	0
1988	0	0	0	0	0	0	0	0	8	8	8	0
1989	0	0	0	0	0	0	0	0	8	8	7	0
1990	0	0	0	0	0	0	0	0	8	8	8	0
1991	0	0	0	0	9	0	0	0	0	7	5	0
1992	0	0	0	0	0	0	0	3	8	8	8	0
1993	0	0	0	0	0	0	0	0	0	8	2	0
1994	0	0	0	0	0	0	0	0	8	8	7	0

Indicates Priority 2 to 4 (Camanche diversion ceased)

Indicates Priority 5 and greater (Pardee and Camanche diversion ceased)

TABLE C7. Comparison of Camanche Inflow to Camanche Release When Camanche Must Cease Diversions But Pardee Diversions are Allowed (Priority Groups 2 - 4) for Alternative 4

Water Year	Oct				Apr				May				Jun				Jul				Aug			
	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1922																								
1923													4	1417	1417	0								
1924					4	0	221	221																
1925													3	1728	1728	0								
1926																								
1927																								
1928																								
1929													4	283	298	15								
1930																								
1931					3	0	221	221	4	104	236	132												
1932																								
1933																								
1934									3	272	362	90												
1935																								
1936																								
1937																								
1938																					4	259	1132	873
1939																								
1940													4	1101	1229	128								
1941																	4	493	1060	567				
1942																	4	601	1176	575				
1943																								
1944																								
1945																								
1946																								
1947																								
1948																								
1949																								
1950																								
1951																								
1952																					2	328	1379	1051
1953																					2	264	651	387
1954																								
1955																								
1956																	2	531	1189	658	2	266	1103	837

TABLE C7. Comparison of Camanche Inflow to Camanche Release When Camanche Must Cease Diversions But Pardee Diversions are Allowed (Priority Groups 2 - 4) for Alternative 4

Water Year	Oct				Apr				May				Jun				Jul				Aug			
	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Cam. Inflow (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1957																								
1958																					2	324	1207	883
1959																								
1960																								
1961																								
1962																								
1963																					4	253	983	730
1964																								
1965																					2	362	1153	791
1966																								
1967																					2	282	1389	1107
1968																					2	223	343	120
1969																					2	407	1305	898
1970																								
1971																	4	616	815	199	2	424	749	325
1972																								
1973													3	1321	1321	0								
1974																	2	601	1120	519	2	510	1046	536
1975																	4	701	1212	511	2	489	1146	657
1976									3	0	236	236									2	30	232	202
1977									3	0	236	236												
1978	3	86	125	39																				
1979																					4	576	571	-5
1980																	4	898	1119	221	4	204	1045	841
1981																								
1982																								
1983																								
1984													3	1430	1428	-2					2	417	679	262
1985									3	304	393	89												
1986																								
1987									4	56	236	180												
1988																								
1989																								
1990																								
1991																								
1992									3	343	339	-4												
1993																					2	325	436	111
1994																								

TABLE C8. Comparison of Pardee Inflow to Camanche Release When Both Camanche and Pardee Must Cease Diversions (Priority Groups 5 and above) for Alternative 4

WY	Feb				Mar				Apr				May				Jun				Jul				Aug			
	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1922																					7	759	1078	319	7	529	994	465
1923																					8	672	781	109	7	515	647	132
1924													8	326	325	-1	8	247	298	51	8	262	271	9	7	256	255	-1
1925																					8	549	645	96	7	495	495	0
1926																	8	533	533	0	8	505	505	0	8	499	499	0
1927																					8	649	999	350	7	523	932	409
1928																	8	671	681	10	9	540	540	0	8	505	504	-1
1929																					8	545	546	1	7	520	520	0
1930																	8	1285	1285	0	8	526	526	0	7	525	525	0
1931																	8	262	298	36	8	347	347	0	8	240	239	-1
1932																					8	754	754	0	7	544	543	-1
1933																					8	612	612	0	8	560	560	0
1934																	8	531	531	0	8	440	441	1	7	252	257	5
1935																					8	566	566	0	7	507	507	0
1936																					8	644	1006	362	8	555	922	367
1937																					8	607	869	262	8	553	803	250
1938																												
1939																	9	578	578	0	8	525	525	0	8	510	510	0
1940																					8	570	822	252	8	549	739	190
1941																									5	556	991	435
1942																									5	579	1091	512
1943																					8	667	957	290	7	586	872	286
1944																	7	821	821	0	8	564	564	0	8	536	536	0
1945																					8	612	918	306	7	550	852	302
1946																	7	1332	1332	0	8	578	731	153	7	524	616	92
1947																	8	571	571	0	8	523	523	0	8	502	502	0
1948																					8	575	575	0	7	560	560	0
1949																	8	1207	1206	-1	8	600	600	0	7	531	531	0
1950																					8	610	957	347	6	549	888	339
1951																	8	935	935	0	8	614	630	16	5	557	556	-1
1952																												
1953																					5	860	859	-1				
1954																	7	675	674	-1	8	496	496	0	5	534	534	0
1955																	7	858	858	0	8	517	518	1	8	527	527	0
1956																												

TABLE C8. Comparison of Pardee Inflow to Camanche Release When Both Camanche and Pardee Must Cease Diversions (Priority Groups 5 and above) for Alternative 4

WY	Feb				Mar				Apr				May				Jun				Jul				Aug			
	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)	PG	Par. Inflow + Cam. R/O (cfs)	Cam. Release (cfs)	Difference (Rel. - Inf.) (cfs)
1957																					8	520	605	85	7	480	539	59
1958																												
1959																	8	489	489	0	9	502	502	0	7	500	500	0
1960																	8	869	869	0	8	479	480	1	8	483	483	0
1961																	8	478	478	0	9	471	472	1	8	450	450	0
1962																					8	609	609	0	7	560	560	0
1963																					7	646	1059	413				
1964																	7	538	538	0	8	563	563	0	8	541	541	0
1965																					7	893	1228	335				
1966																	8	429	429	0	8	511	511	0	7	511	511	0
1967																												
1968																	8	608	608	0	8	474	474	0				
1969																												
1970																	6	1983	1983	0	8	704	743	39	5	545	545	0
1971																												
1972																	8	1164	1163	-1	8	592	592	0	7	523	523	0
1973																					8	722	787	65	5	530	688	158
1974																												
1975																												
1976																	9	254	298	44	8	246	271	25				
1977	9	91	130	39	7	105	130	25	9	209	221	12					8	241	298	57	8	242	271	29	5	234	234	0
1978																					5	280	280	0	6	172	232	60
1979																	8	1562	1562	0	8	774	774	0				
1980																												
1981																	8	430	429	-1	8	223	309	86	7	130	257	127
1982																												
1983																												
1984																					8	956	954	-2				
1985																	8	496	497	1	8	482	482	0	7	537	537	0
1986																					8	730	1058	328	7	598	970	372
1987																	9	334	334	0	8	487	487	0	8	477	476	-1
1988																	8	410	410	0	8	469	469	0	8	392	391	-1
1989																	8	1101	1101	0	8	541	541	0	7	494	494	0
1990																	8	567	567	0	8	519	520	1	8	455	455	0
1991	9	154	156	2																	7	531	532	1	5	463	464	1
1992																	8	282	298	16	8	477	477	0	8	468	469	1
1993																					8	615	610	-5				
1994																	8	468	467	-1	8	368	369	1	7	421	421	0

TABLE C9. Increases in Camanche Reservoir Releases Over JSA Conditions Necessary to Comply with Alternative 4 Requirements (cfs)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	577	0	0	0
1924	0	0	0	0	0	0	0	89	0	0	23	0
1925	0	0	0	0	0	0	0	0	1204	0	152	0
1926	0	0	0	0	0	0	0	0	175	112	156	0
1927	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	85	115	0
1929	0	0	0	0	0	0	0	0	0	237	263	0
1930	0	0	0	0	0	0	0	0	927	43	182	0
1931	0	0	0	0	0	0	0	0	0	76	7	0
1932	0	0	0	0	0	0	0	0	0	361	197	0
1933	0	0	0	0	0	0	0	0	0	219	217	0
1934	0	0	0	0	0	0	0	0	233	132	0	0
1935	0	0	0	0	0	0	0	0	0	173	164	0
1936	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	220	132	167	0
1940	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	463	168	193	0
1945	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	373	0	0	0
1947	0	0	0	0	0	0	0	0	213	130	159	0
1948	0	0	0	0	0	0	0	0	0	182	217	0
1949	0	0	0	0	0	0	0	0	682	159	188	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	38	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	145	0	0
1954	0	0	0	0	0	0	0	0	150	103	191	0
1955	0	0	0	0	0	0	0	0	500	115	184	0
1956	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	131	109	157	0
1960	0	0	0	0	0	0	0	0	511	77	140	0
1961	0	0	0	0	0	0	0	0	180	163	193	0
1962	0	0	0	0	0	0	0	0	0	216	217	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	180	170	198	0
1965	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	71	118	168	0
1967	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	250	81	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	1347	0	186	0
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	639	151	180	0
1973	0	0	0	0	0	0	0	0	340	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	2	0
1978	0	0	0	0	0	0	0	0	0	9	0	0
1979	0	0	0	0	0	0	0	0	1204	291	225	0
1980	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	131	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	462	182	0	0
1985	0	0	0	0	0	0	0	0	139	89	194	0
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	36	178	219	0
1988	0	0	0	0	0	0	0	0	112	198	159	0
1989	0	0	0	0	0	0	0	0	743	100	151	0
1990	0	0	0	0	0	0	0	0	269	211	198	0
1991	0	0	0	0	26	0	0	0	0	223	207	0
1992	0	0	0	0	0	0	0	103	0	168	212	0
1993	0	0	0	0	0	0	0	0	0	110	0	0
1994	0	0	0	0	0	0	0	0	169	60	164	0

APPENDIX D

Assumptions Related to Watershed Allocation Alternative

(SWRCB Staff Alternative 5)

APPENDIX D - EBMUDSIM modeling Assumptions Relating to the Watershed Allocation Approach (SWRCB Alternative 5)

POA with Delta Requirements per Watershed Allocation Approach (SWRCB Alternative 5)

In this alternative SWRCB staff established monthly average Delta inflow requirements for each major Delta tributary. For Sacramento and Eastside basin tributaries, including the Mokelumne River, the Delta inflow requirement established by SWRCB staff represents each non-CVP/SWP project tributary's contribution to the 1995 WQCP's Delta outflow requirement—after accounting for water provided by the San Joaquin tributaries to meet the Vernalis standard. These requirements are distributed among the tributaries in proportion to their unimpaired inflow to the Delta.

SWRCB staff segregated each tributary's Delta inflow requirement by Water Year Type based on the Sacramento River Index described in the 1995 WQCP. The resulting Delta inflow requirements are described in SWRCB staff's January 10, 1997 memo to DWR. (EBMUD received revised tables for the Mokelumne River which it incorporated into its EBMUDSIM modeling of the Watershed Allocation Approach (See Table D1)).

In the 1995 WQCP, according to Footnote No. 2 on page 23, the water year classification for the previous year remains in effect until the initial forecast of unimpaired runoff becomes available. This occurs in February, when the first preliminary unimpaired runoff forecast becomes available, and the water year classification is updated. A final determination is made in May of each year. For the EBMUDSIM modeling of the watershed allocation approach, the water year classification and associated Delta inflow requirements, remain the same from February through the following January. Table D2 shows the water year

TABLE D1. Minimum Mokelumne River Delta Inflow Requirements by Water Year Type
Watershed Allocation Approach (SWRCB Alternative 5)
(Information supplied by SWRCB Staff)

Sacto. River Index	DWRSIM Study 1995-C06F-469 (all values are in cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	36	96	88	104	314	390	412	860	1081	359	68	30
AN	39	94	88	111	303	424	605	842	946	359	72	30
BN	39	97	94	93	216	402	392	740	867	324	65	30
D	39	97	93	93	146	210	350	542	776	286	62	30
C	42	99	96	83	182	213	341	490	815	263	59	30

TABLE D2. Resulting Minimum Mokelumne River Delta Inflow Requirements
1922 through 1994
(cfs)

WY	WY Type	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
1922	AN	303	424	605	842	946	359	72	30	39	97	94	111
1923	BN	216	402	392	740	867	324	65	30	42	99	96	93
1924	C	182	213	341	490	815	263	59	30	39	97	93	83
1925	D	146	210	350	542	776	286	62	30	39	97	93	93
1926	D	146	210	350	542	776	286	62	30	36	96	88	93
1927	W	314	390	412	860	1081	359	68	30	39	94	88	104
1928	AN	303	424	605	842	946	359	72	30	42	99	96	111
1929	C	182	213	341	490	815	263	59	30	39	97	93	83
1930	D	146	210	350	542	776	286	62	30	42	99	96	93
1931	C	182	213	341	490	815	263	59	30	39	97	93	83
1932	D	146	210	350	542	776	286	62	30	42	99	96	93
1933	C	182	213	341	490	815	263	59	30	42	99	96	83
1934	C	182	213	341	490	815	263	59	30	39	97	94	83
1935	BN	216	402	392	740	867	324	65	30	39	97	94	93
1936	BN	216	402	392	740	867	324	65	30	39	97	94	93
1937	BN	216	402	392	740	867	324	65	30	36	96	88	93
1938	W	314	390	412	860	1081	359	68	30	39	97	93	104
1939	D	146	210	350	542	776	286	62	30	39	94	88	93
1940	AN	303	424	605	842	946	359	72	30	36	96	88	111
1941	W	314	390	412	860	1081	359	68	30	36	96	88	104
1942	W	314	390	412	860	1081	359	68	30	36	96	88	104
1943	W	314	390	412	860	1081	359	68	30	39	97	93	104
1944	D	146	210	350	542	776	286	62	30	39	97	94	93
1945	BN	216	402	392	740	867	324	65	30	39	97	94	93
1946	BN	216	402	392	740	867	324	65	30	39	97	93	93
1947	D	146	210	350	542	776	286	62	30	39	97	94	93
1948	BN	216	402	392	740	867	324	65	30	39	97	93	93
1949	D	146	210	350	542	776	286	62	30	39	97	94	93
1950	BN	216	402	392	740	867	324	65	30	39	94	88	93
1951	AN	303	424	605	842	946	359	72	30	36	96	88	111
1952	W	314	390	412	860	1081	359	68	30	36	96	88	104
1953	W	314	390	412	860	1081	359	68	30	39	94	88	104
1954	AN	303	424	605	842	946	359	72	30	39	97	93	111
1955	D	146	210	350	542	776	286	62	30	36	96	88	93
1956	W	314	390	412	860	1081	359	68	30	39	94	88	104
1957	AN	303	424	605	842	946	359	72	30	36	96	88	111
1958	W	314	390	412	860	1081	359	68	30	39	97	94	104
1959	BN	216	402	392	740	867	324	65	30	39	97	93	93
1960	D	146	210	350	542	776	286	62	30	39	97	93	93
1961	D	146	210	350	542	776	286	62	30	39	97	94	93
1962	BN	216	402	392	740	867	324	65	30	36	96	88	93
1963	W	314	390	412	860	1081	359	68	30	39	97	93	104
1964	D	146	210	350	542	776	286	62	30	36	96	88	93
1965	W	314	390	412	860	1081	359	68	30	39	97	94	104
1966	BN	216	402	392	740	867	324	65	30	36	96	88	93
1967	W	314	390	412	860	1081	359	68	30	39	97	94	104
1968	BN	216	402	392	740	867	324	65	30	36	96	88	93
1969	W	314	390	412	860	1081	359	68	30	36	96	88	104
1970	W	314	390	412	860	1081	359	68	30	36	96	88	104
1971	W	314	390	412	860	1081	359	68	30	39	97	94	104
1972	BN	216	402	392	740	867	324	65	30	39	94	88	93
1973	AN	303	424	605	842	946	359	72	30	36	96	88	111
1974	W	314	390	412	860	1081	359	68	30	36	96	88	104
1975	W	314	390	412	860	1081	359	68	30	42	99	96	104
1976	C	182	213	341	490	815	263	59	30	42	99	96	83
1977	C	182	213	341	490	815	263	59	30	42	99	96	83
1978	C	182	213	341	490	815	263	59	30	39	97	94	83
1979	BN	216	402	392	740	867	324	65	30	39	94	88	93
1980	AN	303	424	605	842	946	359	72	30	39	97	93	111
1981	D	146	210	350	542	776	286	62	30	36	96	88	93
1982	W	314	390	412	860	1081	359	68	30	36	96	88	104
1983	W	314	390	412	860	1081	359	68	30	36	96	88	104
1984	W	314	390	412	860	1081	359	68	30	39	97	93	104
1985	D	146	210	350	542	776	286	62	30	36	96	88	93
1986	W	314	390	412	860	1081	359	68	30	39	97	93	104
1987	D	146	210	350	542	776	286	62	30	42	99	96	93
1988	C	182	213	341	490	815	263	59	30	39	97	93	83
1989	D	146	210	350	542	776	286	62	30	42	99	96	93
1990	C	182	213	341	490	815	263	59	30	42	99	96	83
1991	C	182	213	341	490	815	263	59	30	42	99	96	83
1992	C	182	213	341	490	815	263	59	30	39	94	88	83
1993	AN	303	424	605	842	946	359	72	30	42	99	96	111
1994	C	182	213	341	490	815	263	59	30	36	96	88	83

classification and resulting Delta inflow requirements from the Mokelumne River for each year of the 73 years modeled.

EBMUDSIM has the capability to include minimum Delta inflow requirements into its calculations of Camanche Reservoir release requirements. EBMUD staff used this capability to model this alternative. For this alternative, minimum Delta inflow requirements become an additional constraint on Camanche Reservoir. If releases provided for all other purposes are insufficient to meet the specified minimum Delta inflow, EBMUDSIM increases Camanche Reservoir releases until Delta inflow is sufficient.

To verify that EBMUDSIM correctly modeled the Watershed Allocation Approach, EBMUD staff prepared Table D3 that compares modeled inflow to the Delta from the Mokelumne River with required minimum inflow according to Table D2. Table D3 shows that inflow to the Delta from the Mokelumne River always equals or exceeds the minimum requirements for the EBMUDSIM model studies of the Watershed Allocation Approach indicating that the model correctly simulates conditions under this alternative.

TABLE D3. Comparison of Modeled Delta Inflow with Minimum Delta Inflow Requirements for lower Mokelumne River 1922 through 1994

		Feb			Mar			Apr			May		
WY	WY Type	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)
1922	AN	303	303	0	424	424	0	605	605	0	842	1674	832
1923	BN	216	416	200	402	402	0	392	392	0	740	742	2
1924	C	182	259	77	213	233	20	341	341	0	490	490	0
1925	D	146	146	0	210	210	0	350	350	0	542	542	0
1926	D	146	154	8	210	210	0	350	350	0	542	542	0
1927	W	314	314	0	390	390	0	412	412	0	860	860	0
1928	AN	303	303	0	424	424	0	605	605	0	842	842	0
1929	C	182	182	0	213	213	0	341	341	0	490	490	0
1930	D	146	146	0	210	210	0	350	350	0	542	542	0
1931	C	182	182	0	213	213	0	341	341	0	490	490	0
1932	D	146	146	0	210	210	0	350	350	0	542	542	0
1933	C	182	182	0	213	213	0	341	341	0	490	490	0
1934	C	182	182	0	213	213	0	341	341	0	490	490	0
1935	BN	216	216	0	402	402	0	392	392	0	740	740	0
1936	BN	216	216	0	402	402	0	392	392	0	740	740	0
1937	BN	216	216	0	402	402	0	392	392	0	740	740	0
1938	W	314	1209	895	390	1656	1266	412	2258	1846	860	2700	1840
1939	D	146	259	113	210	233	23	350	350	0	542	542	0
1940	AN	303	303	0	424	424	0	605	605	0	842	842	0
1941	W	314	511	197	390	603	213	412	412	0	860	1182	322
1942	W	314	1011	697	390	390	0	412	412	0	860	1510	650
1943	W	314	984	670	390	1785	1395	412	616	204	860	1455	595
1944	D	146	259	113	210	233	23	350	350	0	542	542	0
1945	BN	216	216	0	402	402	0	392	392	0	740	740	0
1946	BN	216	216	0	402	402	0	392	392	0	740	740	0
1947	D	146	259	113	210	233	23	350	350	0	542	542	0
1948	BN	216	216	0	402	402	0	392	392	0	740	740	0
1949	D	146	154	8	210	210	0	350	350	0	542	542	0
1950	BN	216	216	0	402	402	0	392	392	0	740	740	0
1951	AN	303	1086	783	424	424	0	605	605	0	842	842	0
1952	W	314	1222	908	390	1000	610	412	2910	2498	860	2875	2015
1953	W	314	1092	778	390	390	0	412	412	0	860	860	0
1954	AN	303	303	0	424	424	0	605	605	0	842	842	0
1955	D	146	154	8	210	210	0	350	350	0	542	542	0
1956	W	314	964	650	390	390	0	412	412	0	860	1625	765
1957	AN	303	303	0	424	424	0	605	605	0	842	842	0
1958	W	314	314	0	390	473	83	412	1778	1366	860	2384	1524
1959	BN	216	259	43	402	402	0	392	392	0	740	740	0
1960	D	146	146	0	210	210	0	350	350	0	542	542	0
1961	D	146	146	0	210	210	0	350	350	0	542	542	0
1962	BN	216	216	0	402	402	0	392	392	0	740	740	0
1963	W	314	314	0	390	390	0	412	412	0	860	860	0
1964	D	146	154	8	210	210	0	350	350	0	542	542	0
1965	W	314	845	531	390	390	0	412	412	0	860	1255	395
1966	BN	216	259	43	402	402	0	392	392	0	740	740	0
1967	W	314	314	0	390	390	0	412	412	0	860	2704	1844
1968	BN	216	259	43	402	402	0	392	392	0	740	740	0
1969	W	314	911	597	390	735	345	412	2236	1824	860	3203	2343
1970	W	314	1058	744	390	462	72	412	412	0	860	860	0
1971	W	314	612	298	390	490	100	412	412	0	860	860	0
1972	BN	216	259	43	402	402	0	392	392	0	740	740	0
1973	AN	303	303	0	424	424	0	605	605	0	842	842	0
1974	W	314	314	0	390	804	414	412	593	181	860	1235	375
1975	W	314	314	0	390	390	0	412	412	0	860	1160	300
1976	C	182	259	77	213	233	20	341	341	0	490	490	0
1977	C	182	182	0	213	213	0	341	341	0	490	490	0
1978	C	182	91	-91	213	175	-38	341	82	-259	490	59	-431
1979	BN	216	216	0	402	402	0	392	392	0	740	740	0
1980	AN	303	303	0	424	424	0	605	605	0	842	863	21
1981	D	146	259	113	210	233	23	350	350	0	542	542	0
1982	W	314	2267	1953	390	1673	1283	412	3486	3074	860	2727	1867
1983	W	314	2250	1936	390	3351	2961	412	1688	1276	860	4157	3297
1984	W	314	978	664	390	390	0	412	412	0	860	914	54
1985	D	146	259	113	210	233	23	350	350	0	542	542	0
1986	W	314	3627	3313	390	2643	2253	412	412	0	860	1461	601
1987	D	146	259	113	210	233	23	350	350	0	542	542	0
1988	C	182	182	0	213	213	0	341	341	0	490	490	0
1989	D	146	146	0	210	210	0	350	350	0	542	542	0
1990	C	182	182	0	213	213	0	341	341	0	490	490	0
1991	C	182	88	-94	213	213	0	341	341	0	490	383	-107
1992	C	182	182	0	213	213	0	341	341	0	490	490	0
1993	AN	303	303	0	424	424	0	605	605	0	842	842	0
1994	C	182	182	0	213	213	0	341	341	0	490	490	0

TABLE D3. Comparison of Modeled Delta Inflow with Minimum Delta Inflow Requirements for lower Mokelumne River 1922 through 1994

		Jun			Jul			Aug			Sep		
WY	WY Type	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)
1922	AN	946	2189	1243	359	857	498	72	546	474	30	495	465
1923	BN	867	869	2	324	358	34	65	77	12	30	32	2
1924	C	815	815	0	263	296	33	59	62	3	30	30	0
1925	D	776	776	0	286	306	20	62	65	3	30	30	0
1926	D	776	776	0	286	306	20	62	65	3	30	30	0
1927	W	1081	1081	0	359	408	49	68	78	10	30	30	0
1928	AN	946	946	0	359	392	33	72	81	9	30	30	0
1929	C	815	815	0	263	296	33	59	62	3	30	30	0
1930	D	776	776	0	286	306	20	62	65	3	30	30	0
1931	C	815	815	0	263	296	33	59	62	3	30	30	0
1932	D	776	776	0	286	306	20	62	65	3	30	30	0
1933	C	815	815	0	263	296	33	59	62	3	30	30	0
1934	C	815	815	0	263	296	33	59	62	3	30	30	0
1935	BN	867	867	0	324	356	32	65	75	10	30	30	0
1936	BN	867	867	0	324	356	32	65	75	10	30	30	0
1937	BN	867	867	0	324	356	32	65	75	10	30	30	0
1938	W	1081	1873	792	359	961	602	68	641	573	30	583	553
1939	D	776	776	0	286	306	20	62	65	3	30	30	0
1940	AN	946	946	0	359	392	33	72	81	9	30	30	0
1941	W	1081	1403	322	359	730	371	68	410	342	30	352	322
1942	W	1081	1695	614	359	955	596	68	635	567	30	577	547
1943	W	1081	1293	212	359	620	261	68	300	232	30	242	212
1944	D	776	776	0	286	306	20	62	65	3	30	30	0
1945	BN	867	867	0	324	356	32	65	75	10	30	30	0
1946	BN	867	867	0	324	356	32	65	75	10	30	30	0
1947	D	776	776	0	286	306	20	62	65	3	30	30	0
1948	BN	867	867	0	324	356	32	65	75	10	30	30	0
1949	D	776	776	0	286	306	20	62	65	3	30	30	0
1950	BN	867	867	0	324	356	32	65	75	10	30	30	0
1951	AN	946	946	0	359	392	33	72	81	9	30	30	0
1952	W	1081	1776	695	359	1103	744	68	783	715	30	725	695
1953	W	1081	1081	0	359	408	49	68	78	10	30	30	0
1954	AN	946	946	0	359	392	33	72	81	9	30	30	0
1955	D	776	776	0	286	306	20	62	65	3	30	30	0
1956	W	1081	1609	528	359	936	577	68	616	548	30	558	528
1957	AN	946	946	0	359	392	33	72	81	9	30	30	0
1958	W	1081	1703	622	359	1030	671	68	710	642	30	652	622
1959	BN	867	867	0	324	356	32	65	75	10	30	30	0
1960	D	776	776	0	286	306	20	62	65	3	30	30	0
1961	D	776	776	0	286	306	20	62	65	3	30	30	0
1962	BN	867	867	0	324	356	32	65	75	10	30	30	0
1963	W	1081	1081	0	359	408	49	68	78	10	30	30	0
1964	D	776	776	0	286	306	20	62	65	3	30	30	0
1965	W	1081	1475	394	359	802	443	68	482	414	30	425	395
1966	BN	867	867	0	324	356	32	65	75	10	30	30	0
1967	W	1081	1813	732	359	1141	782	68	820	752	30	763	733
1968	BN	867	867	0	324	356	32	65	75	10	30	30	0
1969	W	1081	1730	649	359	1057	698	68	737	669	30	679	649
1970	W	1081	1081	0	359	408	49	68	78	10	30	30	0
1971	W	1081	1081	0	359	408	49	68	78	10	30	30	0
1972	BN	867	867	0	324	356	32	65	75	10	30	30	0
1973	AN	946	946	0	359	392	33	72	81	9	30	30	0
1974	W	1081	1455	374	359	783	424	68	462	394	30	405	375
1975	W	1081	1380	299	359	707	348	68	387	319	30	330	300
1976	C	815	815	0	263	296	33	59	62	3	30	30	0
1977	C	815	332	-483	263	-37	-300	59	-7	-66	30	30	0
1978	C	815	-7	-822	263	1	-262	59	-68	-127	30	30	0
1979	BN	867	867	0	324	356	32	65	75	10	30	30	0
1980	AN	946	967	21	359	412	53	72	102	30	30	51	21
1981	D	776	776	0	286	306	20	62	65	3	30	30	0
1982	W	1081	1737	656	359	1065	706	68	744	676	30	687	657
1983	W	1081	3178	2097	359	1833	1474	68	1513	1445	30	1456	1426
1984	W	1081	1134	53	359	461	102	68	141	73	30	84	54
1985	D	776	776	0	286	306	20	62	65	3	30	30	0
1986	W	1081	1370	289	359	697	338	68	377	309	30	320	290
1987	D	776	776	0	286	306	20	62	65	3	30	30	0
1988	C	815	815	0	263	296	33	59	62	3	30	30	0
1989	D	776	776	0	286	306	20	62	65	3	30	30	0
1990	C	815	427	-388	263	203	-60	59	59	0	30	30	0
1991	C	815	405	-410	263	215	-48	59	62	3	30	30	0
1992	C	815	173	-642	263	160	-103	59	59	0	30	30	0
1993	AN	946	946	0	359	392	33	72	81	9	30	30	0
1994	C	815	815	0	263	296	33	59	62	3	30	30	0

TABLE D3. Comparison of Modeled Delta Inflow with Minimum Delta Inflow Requirements for lower Mokelumne River 1922 through 1994

		Oct			Nov			Dec			Jan		
WY	WY Type	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)	Req'd Delta Inflow (cfs)	Modeled Delta Inflow (cfs)	Difference (Req. - Modeled) (cfs)
1922	AN	39	184	145	97	255	158	94	282	188	111	460	349
1923	BN	42	188	146	99	260	161	96	244	148	93	251	158
1924	C	39	39	0	97	97	0	93	93	0	83	83	0
1925	D	39	92	53	97	155	58	93	139	46	93	146	53
1926	D	36	36	0	96	96	0	88	88	0	93	93	0
1927	W	39	122	83	94	185	91	88	169	81	104	176	72
1928	AN	42	92	50	99	155	56	96	139	43	111	146	35
1929	C	39	39	0	97	97	0	93	93	0	83	83	0
1930	D	42	42	0	99	99	0	96	96	0	93	93	0
1931	C	39	39	0	97	97	0	93	93	0	83	83	0
1932	D	42	42	0	99	99	0	96	96	0	93	93	0
1933	C	42	42	0	99	99	0	96	96	0	83	83	0
1934	C	39	39	0	97	97	0	94	94	0	83	83	0
1935	BN	39	39	0	97	97	0	94	94	0	93	93	0
1936	BN	39	92	53	97	155	58	94	139	45	93	146	53
1937	BN	36	122	86	96	185	89	88	979	891	93	129	36
1938	W	39	152	113	97	221	124	93	198	105	104	251	147
1939	D	39	39	0	94	94	0	88	88	0	93	93	0
1940	AN	36	122	86	96	185	89	88	169	81	111	176	65
1941	W	36	188	152	96	260	164	88	370	282	104	1329	1225
1942	W	36	174	138	96	405	309	88	389	301	104	1491	1387
1943	W	39	174	135	97	245	148	93	226	133	104	251	147
1944	D	39	92	53	97	155	58	94	139	45	93	146	53
1945	BN	39	122	83	97	198	101	94	1054	960	93	592	499
1946	BN	39	188	149	97	260	163	93	244	151	93	251	158
1947	D	39	92	53	97	155	58	94	139	45	93	146	53
1948	BN	39	92	53	97	155	58	93	139	46	93	146	53
1949	D	39	92	53	97	155	58	94	139	45	93	128	35
1950	BN	39	79	40	94	2203	2109	88	4093	4005	93	1291	1198
1951	AN	36	122	86	96	185	89	88	208	120	111	1319	1208
1952	W	36	140	104	96	208	112	88	182	94	104	251	147
1953	W	39	122	83	94	185	91	88	169	81	104	176	72
1954	AN	39	92	53	97	155	58	93	139	46	111	146	35
1955	D	36	36	0	96	96	0	88	88	0	93	2134	2041
1956	W	39	171	132	94	241	147	88	222	134	104	251	147
1957	AN	36	92	56	96	155	59	88	139	51	111	124	13
1958	W	39	171	132	97	242	145	94	223	129	104	251	147
1959	BN	39	39	0	97	97	0	93	93	0	93	93	0
1960	D	39	39	0	97	97	0	93	93	0	93	93	0
1961	D	39	39	0	97	97	0	94	94	0	93	93	0
1962	BN	36	36	0	96	96	0	88	88	0	93	93	0
1963	W	39	92	53	97	155	58	93	139	46	104	146	42
1964	D	36	36	0	96	96	0	88	88	0	93	2058	1965
1965	W	39	177	138	97	457	360	94	245	151	104	292	188
1966	BN	36	92	56	96	155	59	88	139	51	93	130	37
1967	W	39	176	137	97	247	150	94	229	135	104	251	147
1968	BN	36	36	0	96	96	0	88	88	0	93	93	0
1969	W	36	156	120	96	225	129	88	221	133	104	3408	3304
1970	W	36	116	80	96	177	81	88	522	434	104	671	567
1971	W	39	188	149	97	260	163	94	325	231	104	251	147
1972	BN	39	92	53	94	155	61	88	139	51	93	146	53
1973	AN	36	188	152	96	1295	1199	88	852	764	111	1339	1228
1974	W	36	183	147	96	255	159	88	239	151	104	251	147
1975	W	42	188	146	99	260	161	96	244	148	104	251	147
1976	C	42	42	0	99	99	0	96	96	0	83	83	0
1977	C	42	42	0	99	99	0	96	68	-28	83	67	-16
1978	C	39	39	0	97	87	-10	94	51	-43	83	83	0
1979	BN	39	39	0	94	94	0	88	88	0	93	93	0
1980	AN	39	188	149	97	260	163	93	244	151	111	251	140
1981	D	36	36	0	96	96	0	88	88	0	93	93	0
1982	W	36	294	258	96	1285	1189	88	1608	1520	104	1303	1199
1983	W	36	208	172	96	2224	2128	88	2594	2506	104	1493	1389
1984	W	39	205	166	97	514	417	93	244	151	104	251	147
1985	D	36	92	56	96	155	59	88	139	51	93	109	16
1986	W	39	160	121	97	229	132	93	208	115	104	251	147
1987	D	42	42	0	99	99	0	96	96	0	93	93	0
1988	C	39	39	0	97	97	0	93	93	0	83	83	0
1989	D	42	42	0	99	99	0	96	96	0	93	93	0
1990	C	42	42	0	99	99	0	96	96	0	83	2	-81
1991	C	42	42	0	99	99	0	96	96	0	83	83	0
1992	C	39	39	0	94	94	0	88	88	0	83	83	0
1993	AN	42	92	50	99	155	56	96	139	43	111	146	35
1994	C	36	36	0	96	96	0	88	88	0	83	83	0

APPENDIX E

Incremental Delta Inflow Resulting from

Joint Settlement Agreement Release Requirements

versus

1961 CDF&G Agreement Release Requirements

TABLE E1. Incremental Inflow to Delta Resulting from JSA versus 1961 DFG Agreement (Acre-Feet)

Year	S I	February	March	April	May	June	July	August	September	October	November	December	January	Total
1922	AN	-16,691	6,685	17,134	-29,037	101	5,825	4,748	5,062	-11,573	-485	-2,951	0	-21,182
1923	BN	0	12,487	14,032	4,049	441	-9,799	-9,799	-9,204	-11,817	-665	6,548	12,950	9,224
1924	C	12,816	12,487	3,619	0	0	0	0	232	960	877	-1,026	960	30,923
1925	D	1,889	558	8,082	-2,687	-3,102	-13,460	-13,460	-12,747	-6,937	2,405	8,610	12,950	-17,900
1926	D	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	63,025
1927	W	-37,876	-706	-16,719	-8,536	-9,788	2,591	2,109	2,508	-10,766	3,627	6,123	12,950	-54,483
1928	AN	12,816	-31,974	19,983	-1,915	6,668	-9,315	-9,514	-8,927	1,701	1,730	4,482	12,950	-1,314
1929	C	12,816	12,487	8,082	7,699	0	0	0	279	6,320	6,232	4,508	6,494	64,916
1930	D	6,933	6,092	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	50,747
1931	C	6,933	6,030	3,619	0	0	0	0	232	960	877	-1,026	960	18,583
1932	D	1,889	558	8,082	614	93	-10,159	-10,159	-9,552	-401	4,577	6,352	8,338	232
1933	C	8,614	7,875	8,082	7,699	0	0	0	279	4,430	6,232	4,508	-6,515	41,202
1934	C	5,603	6,030	8,082	7,699	0	0	0	279	6,320	6,232	4,508	6,494	51,246
1935	BN	6,933	6,092	8,082	-10,817	-10,969	-21,590	-21,590	-20,614	-7,831	-97	5,315	-3,946	-71,032
1936	BN	-17,609	160	166	181	185	3,362	2,285	2,679	-10,299	339	7,288	12,950	1,688
1937	BN	-6,881	-10,870	12,678	9,262	-11,301	-2,680	-2,680	-2,314	-8,813	1,225	4,906	10,104	-7,362
1938	W	-10,137	11	11	13	13	6,060	4,983	5,290	-16,664	-3,710	4,507	12,950	3,325
1939	D	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	63,025
1940	AN	6,933	-67,546	15,968	-18,282	11,676	-1,741	-2,818	-2,260	-6,331	2,786	-1,125	0	-62,740
1941	W	0	0	11,009	-2,478	-8,466	2,324	2,126	2,336	-13,192	-1,530	7,999	-1	125
1942	W	-1	11,278	6,934	-18,189	-2	5,082	4,004	4,343	-15,834	2,551	-1	-2	162
1943	W	-2	-2	-3	-3	14,258	-1,977	-3,054	-2,487	-11,675	-576	6,607	12,950	14,038
1944	D	12,816	12,487	8,082	7,699	0	0	0	279	6,274	-161	5,245	-3,203	49,519
1945	BN	-61,635	6,944	17,008	-528	-17,377	-611	-611	-312	-10,926	6,694	0	0	-61,354
1946	BN	4,387	12,487	14,032	-18,392	-2,153	-2,774	-2,972	-2,597	-5,010	3,617	3,469	4,099	8,192
1947	D	5,835	12,487	8,082	7,699	0	0	0	279	6,274	8,017	6,352	8,338	63,363
1948	BN	8,614	7,875	8,082	-8,983	-9,195	-19,756	-19,756	-18,840	-6,639	653	5,819	8,338	-43,787
1949	D	8,614	7,875	8,082	266	-244	-10,507	-10,507	-9,889	247	4,434	6,352	-8,604	-3,880
1950	BN	58	78	8,227	6,901	-10,580	639	441	706	-12,358	6,857	72	0	1,042
1951	AN	0	0	8,903	16,375	7,670	-11,354	-11,439	-10,603	-4,625	3,654	1,947	160	686
1952	W	129	174	180	196	200	6,776	5,699	5,983	-25,943	-9,498	688	12,950	-2,466
1953	W	4,529	12,487	8,082	2,431	1,850	-8,342	-8,342	-7,795	-7,456	2,078	8,390	12,950	20,862
1954	AN	12,816	12,487	1,212	2,738	-828	-11,110	-11,110	-10,473	-1,020	4,188	3,891	-4,033	-1,241
1955	D	8,614	7,875	8,082	7,699	0	0	0	279	6,274	8,017	-49,439	32	-2,566
1956	W	26	35	6,588	-6,499	40	4,933	3,855	4,199	-16,341	-3,500	4,659	12,950	10,948
1957	AN	12,816	12,487	8,082	-2,422	-2,846	-13,196	-13,196	-12,490	-5,092	3,565	9,389	230	-2,674
1958	W	-6,930	147	151	165	168	5,872	4,795	5,108	-19,882	-5,694	3,231	12,950	81
1959	BN	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	63,025
1960	D	6,933	6,030	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	50,685
1961	D	6,933	6,030	3,619	0	0	0	0	0	456	877	-1,026	960	17,847
1962	BN	1,889	558	8,082	9,688	8,874	-1,085	-1,085	-771	258	4,366	4,508	1,642	36,922
1963	W	-89,187	6,030	11,057	-16,164	331	3,281	2,686	2,878	-12,487	5,084	-3,512	12,950	-77,053
1964	D	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	-56,522	37	-4,461
1965	W	30	4,994	-4,677	11,598	6,050	-2,703	-3,185	-2,615	-23,021	7,602	2,770	3,943	787
1966	BN	12,816	12,487	8,082	7,699	0	0	0	279	6,274	8,017	-22,532	-31,253	1,869
1967	W	383	515	533	581	10,859	3,825	2,747	3,127	-28,468	-10,984	-168	12,950	-4,099
1968	BN	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	-45,065	11,466
1969	W	377	507	525	572	583	7,229	6,151	6,420	-22,711	-7,366	6,557	6,740	5,581
1970	W	-51	-68	21,223	5,758	5,070	-10,967	-11,052	-10,228	-6,237	6,468	-62	0	-146
1971	W	0	0	19,983	7,745	1,042	-9,178	-9,178	-8,603	-10,876	1,752	7,848	5,207	5,740
1972	BN	11,632	10,813	11,057	6,395	5,687	-4,378	-4,378	-3,958	2,024	-3,726	-3,331	-21,506	6,334
1973	AN	236	318	19,983	5,436	-7,628	-4,464	-4,464	-4,040	-8,115	6,258	292	99	3,911
1974	W	1,042	-855	112	6,462	5,985	-1,401	-1,884	-1,355	-17,940	-4,484	4,028	12,950	2,662
1975	W	12,816	932	14,032	3,351	-11,840	-4,154	-4,154	-3,740	-23,456	-5,290	1,631	12,950	-6,921
1976	C	12,816	12,487	3,619	0	0	0	0	232	960	877	-1,026	960	30,923
1977	C	1,889	558	3,619	0	0	0	0	232	960	877	-1,026	966	8,073
1978	C	1,889	558	3,619	0	0	0	0	232	960	877	-1,026	960	8,068
1979	BN	1,889	558	3,619	0	0	0	0	0	853	877	-1,026	960	7,729
1980	AN	-7,741	0	12,549	-2,179	1,965	-1,373	-1,855	-1,328	-17,923	-4,506	3,968	12,950	-5,470
1981	D	12,816	12,487	8,082	7,699	0	0	0	279	6,320	6,232	-16,959	-28,125	8,831
1982	W	0	0	0	0	10,257	2,717	1,640	2,054	-16,430	0	0	0	238
1983	W	0	0	0	0	0	11,865	10,788	10,907	-41,000	8,650	0	0	1,211
1984	W	0	0	21,814	8,803	5,042	-10,996	-11,081	-10,255	-10,251	7,590	1,090	12,950	14,706
1985	D	10,374	12,487	8,082	7,699	0	0	0	279	6,274	8,017	417	-18,081	35,548
1986	W	-47,062	629	4,086	-2,717	8,431	1,606	529	979	-12,002	-1,230	6,431	12,950	-27,370
1987	D	12,816	12,487	3,619	0	0	0	0	0	6,320	6,232	4,508	6,494	52,474
1988	C	6,933	6,092	3,619	0	0	0	0	232	960	877	-1,026	960	18,645
1989	D	1,889	558	8,082	10,773	9,924	0	0	279	853	877	-1,026	960	33,168
1990	C	1,889	496	8,082	7,699	0	0	0	279	456	877	-1,026	960	19,712
1991	C	1,889	558	3,619	0	0	0	0	0	456	877	-1,026	960	7,332
1992	C	1,889	558	3,619	0	0	0	0	0	456	877	-1,026	960	7,332
1993	AN	1,889	558	9,913	-18,488	-23,952	-9,155	-9,240	-8,475	-15,236	-2,815	5,104	12,950	-56,946
1994	C	12,816	12,487	3,619	0	0	0	0	0	6,320	6,232	4,508	2,302	48,283

TABLE E2. Incremental Inflow to Delta Resulting from JSA versus 1961 DFG Agreement Sorted by Sacramento Index Water Year Type (Acre-Feet)

Year	S I	February	March	April	May	June	July	August	September	October	November	December	January	Total
1927	W	-37,876	-706	-16,719	-8,536	-9,788	2,591	2,109	2,508	-10,766	3,627	6,123	12,950	-54,483
1938	W	-10,137	11	11	13	13	6,060	4,983	5,290	-16,664	-3,710	4,507	12,950	3,325
1941	W	0	0	11,009	-2,478	-8,466	2,324	2,126	2,336	-13,192	-1,530	7,999	-1	125
1942	W	-1	11,278	6,934	-18,189	-2	5,082	4,004	4,343	-15,834	2,551	-1	-2	162
1943	W	-2	-2	-3	-3	14,258	-1,977	-3,054	-2,487	-11,675	-576	6,607	12,950	14,038
1952	W	129	174	180	196	200	6,776	5,699	5,983	-25,943	-9,498	688	12,950	-2,466
1953	W	4,529	12,487	8,082	2,431	1,850	-8,342	-8,342	-7,795	-7,456	2,078	8,390	12,950	20,862
1956	W	26	35	6,588	-6,499	40	4,933	3,855	4,199	-16,341	-3,500	4,659	12,950	10,948
1958	W	-6,930	147	151	165	168	5,872	4,795	5,108	-19,882	-5,694	3,231	12,950	81
1963	W	-89,187	6,030	11,057	-16,164	331	3,281	2,686	2,878	-12,487	5,084	-3,512	12,950	-77,053
1965	W	30	4,994	-4,677	11,598	6,050	-2,703	-3,185	-2,615	-23,021	7,602	2,770	3,943	787
1967	W	383	515	533	581	10,859	3,825	2,747	3,127	-28,468	-10,984	-168	12,950	-4,099
1969	W	377	507	525	572	583	7,229	6,151	6,420	-22,711	-7,366	6,557	6,740	5,581
1970	W	-51	-68	21,223	5,758	5,070	-10,967	-11,052	-10,228	-6,237	6,468	-62	0	-146
1971	W	0	0	19,983	7,745	1,042	-9,178	-9,178	-8,603	-10,876	1,752	7,848	5,207	5,740
1974	W	1,042	-855	112	6,462	5,985	-1,401	-1,884	-1,355	-17,940	-4,484	4,028	12,950	2,662
1975	W	12,816	932	14,032	3,351	-11,840	-4,154	-4,154	-3,740	-23,456	-5,290	1,631	12,950	-6,921
1982	W	0	0	0	0	10,257	2,717	1,640	2,054	-16,430	0	0	0	238
1983	W	0	0	0	0	0	11,865	10,788	10,907	-41,000	8,650	0	0	1,211
1984	W	0	0	21,814	8,803	5,042	-10,996	-11,081	-10,255	-10,251	7,590	1,090	12,950	14,706
1986	W	-47,062	629	4,086	-2,717	8,431	1,606	529	979	-12,002	-1,230	6,431	12,950	-27,370
Average		-8,186	1,719	4,996	-329	1,909	688	9	431	-17,268	-403	3,277	8,773	-4,384
1922	AN	-16,691	6,685	17,134	-29,037	101	5,825	4,748	5,062	-11,573	-485	-2,951	0	-21,182
1928	AN	12,816	-31,974	19,983	-1,915	6,668	-9,315	-9,514	-8,927	1,701	1,730	4,482	12,950	-1,314
1940	AN	6,933	-67,546	15,968	-18,282	11,676	-1,741	-2,818	-2,260	-6,331	2,786	-1,125	0	-62,740
1951	AN	0	0	8,903	16,375	7,670	-11,354	-11,439	-10,603	-4,625	3,654	1,947	160	686
1954	AN	12,816	12,487	1,212	2,738	-828	-11,110	-11,110	-10,473	-1,020	4,188	3,891	-4,033	-1,241
1957	AN	12,816	12,487	8,082	-2,422	-2,846	-13,196	-13,196	-12,490	-5,092	3,565	9,389	230	-2,674
1973	AN	236	318	19,983	5,436	-7,628	-4,464	-4,464	-4,040	-8,115	6,258	292	99	3,911
1980	AN	-7,741	0	12,549	-2,179	1,965	-1,373	-1,855	-1,328	-17,923	-4,506	3,968	12,950	-5,470
1993	AN	1,889	558	9,913	-18,488	-23,952	-9,155	-9,240	-8,475	-15,236	-2,815	5,104	12,950	-56,946
Average		2,564	-7,443	12,636	-5,308	-797	-6,209	-6,543	-5,948	-7,579	1,597	2,777	3,923	-16,330
1923	BN	0	12,487	14,032	4,049	441	-9,799	-9,799	-9,204	-11,817	-665	6,548	12,950	9,224
1935	BN	6,933	6,092	8,082	-10,817	-10,969	-21,590	-21,590	-20,614	-7,831	-97	5,315	-3,946	-71,032
1936	BN	-17,609	160	166	181	185	3,362	2,285	2,679	-10,299	339	7,288	12,950	1,688
1937	BN	-6,881	-10,870	12,678	9,262	-11,301	-2,680	-2,680	-2,314	-8,813	1,225	4,906	10,104	-7,362
1945	BN	-61,635	6,944	17,008	-528	-17,377	-611	-611	-312	-10,926	6,694	0	0	-61,354
1946	BN	4,387	12,487	14,032	-18,392	-2,153	-2,774	-2,972	-2,597	-5,010	3,617	3,469	4,099	8,192
1948	BN	8,614	7,875	8,082	-8,983	-9,195	-19,756	-19,756	-18,840	-6,639	653	5,819	8,338	-43,787
1950	BN	58	78	8,227	6,901	-10,580	639	441	706	-12,358	6,857	72	0	1,042
1959	BN	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	63,025
1962	BN	1,889	558	8,082	9,688	8,874	-1,085	-1,085	-771	258	4,366	4,508	1,642	36,922
1966	BN	12,816	12,487	8,082	7,699	0	0	0	279	6,274	8,017	-22,532	-31,253	1,869
1968	BN	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	-45,065	11,466
1972	BN	11,632	10,813	11,057	6,395	5,687	-4,378	-4,378	-3,958	2,024	-3,726	-3,331	-21,506	6,334
1979	BN	1,889	558	3,619	0	0	0	0	0	853	877	-1,026	960	7,729
Average		-877	6,046	9,237	1,490	-3,313	-4,191	-4,296	-3,885	-3,959	2,902	1,432	-3,160	-2,575
1925	D	1,889	558	8,082	-2,687	-3,102	-13,460	-13,460	-12,747	-6,937	2,405	8,610	12,950	-17,900
1926	D	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	63,025
1930	D	6,933	6,092	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	50,747
1932	D	1,889	558	8,082	614	93	-10,159	-10,159	-9,552	-401	4,577	6,352	8,338	232
1939	D	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	63,025
1944	D	12,816	12,487	8,082	7,699	0	0	0	279	6,274	-161	5,245	-3,203	49,519
1947	D	5,835	12,487	8,082	7,699	0	0	0	279	6,274	8,017	6,352	8,338	63,363
1949	D	8,614	7,875	8,082	266	-244	-10,507	-10,507	-9,889	247	4,434	6,352	-8,604	-3,880
1955	D	8,614	7,875	8,082	7,699	0	0	0	279	6,274	8,017	-49,439	32	-2,566
1960	D	6,933	6,030	8,082	7,699	0	0	0	279	4,430	6,232	4,508	6,494	50,685
1961	D	6,933	6,030	3,619	0	0	0	0	0	456	877	-1,026	960	17,847
1964	D	12,816	12,487	8,082	7,699	0	0	0	279	4,430	6,232	-56,522	37	-4,461
1981	D	12,816	12,487	8,082	7,699	0	0	0	279	6,320	6,232	-16,959	-28,125	8,831
1985	D	10,374	12,487	8,082	7,699	0	0	0	279	6,274	8,017	417	-18,081	35,548
1987	D	12,816	12,487	3,619	0	0	0	0	0	6,320	6,232	4,508	6,494	52,474
1989	D	1,889	558	8,082	10,773	9,924	0	0	279	853	877	-1,026	960	33,168
Average		8,550	8,467	7,524	5,372	417	-2,133	-2,133	-1,820	3,382	5,043	-4,319	380	28,729
1924	C	12,816	12,487	3,619	0	0	0	0	232	960	877	-1,026	960	30,923
1929	C	12,816	12,487	8,082	7,699	0	0	0	279	6,320	6,232	4,508	6,494	64,916
1931	C	6,933	6,030	3,619	0	0	0	0	232	960	877	-1,026	960	18,583
1933	C	8,614	7,875	8,082	7,699	0	0	0	279	4,430	6,232	4,508	-6,515	41,202
1934	C	5,603	6,030	8,082	7,699	0	0	0	279	6,320	6,232	4,508	6,494	51,246
1976	C	12,816	12,487	3,619	0	0	0	0	232	960	877	-1,026	960	30,923
1977	C	1,889	558	3,619	0	0	0	0	232	960	877	-1,026	966	8,073
1978	C	1,889	558	3,619	0	0	0	0	232	960	877	-1,026	960	8,068
1988	C	6,933	6,092	3,619	0	0	0	0	232	960	877	-1,026	960	18,645
1990	C	1,889	496	8,082	7,699	0	0	0	279	456	877	-1,026	960	19,712
1991	C	1,889	558	3,619	0	0	0	0	0	456	877	-1,026	960	7,332
1992	C	1,889	558	3,619	0	0	0	0	0	456	877	-1,026	960	7,332
1994	C	12,816	12,487	3,619	0	0	0	0	0	6,320	6,232	4,508	2,302	48,283
Average		6,830	6,054	4,992	2,369	0	0	0	193	2,348	2,525	677	1,340	27,326

APPENDIX F

Model Output for

1961 Agreement Release Requirements

Study No. 97 222 10-6083

APPENDIX G

Model Output for

Joint Settlement Agreement Release Requirements

Study No. 97 222 10-6075

APPENDIX H

Model Output for

Joint Settlement Agreement Release Requirements

with

Bay-Delta Water Rights Priority System Approach

Friant Assumed in-Basin

Study No. 97 222 10-6084

(SWRCB staff Alternative 3)

APPENDIX I

Model Output for
Joint Settlement Agreement Release Requirements
with
Bay-Delta Water Rights Priority System Approach
Friant Assumed to be Exporter

Study No. 97 222 10-6085
(SWRCB staff Alternative 4)

APPENDIX J

Model Output for

Joint Settlement Agreement Release Requirements

with

Watershed Allocation Approach

Study No. 97 222 10-6101

(SWRCB staff Alternative 5)

APPENDIX K

Model Output for

Joint Settlement Agreement Release Requirements

Study No. 97 250 10-6076

(2020 Conditions/EBMUD demand of 250 MGD)

APPENDIX L

Model Output for

Joint Settlement Agreement Release Requirements

Study No. 97 228 10-6074

(2020 Conditions/EBMUD demand of 228 MGD)

Note Regarding Appendices F through L (EBMUDSIM Model Output)

The EBMUDSIM model output (designated as Appendices F through L) is very voluminous. To conserve space and after consultation with SWRCB staff, those appendices have not been included in the initial EBMUD exhibit package sent to all parties. Any party wishing to receive a copy of that model output (Appendices F-L) should contact Jon Myers of EBMUD at (510) 287-1121 and those appendices will be forwarded immediately.