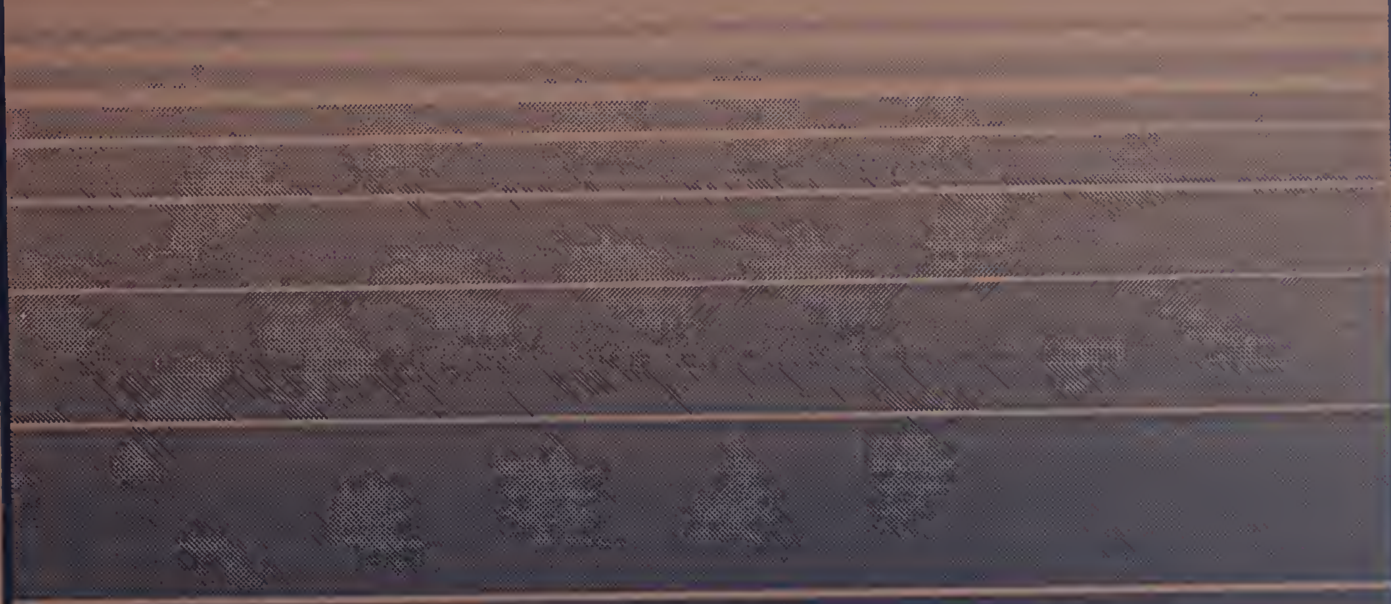
LONG-TERM

Central Valley Project OPERATIONS CRITERIA and PLAN

CVP-OCAP

October 1992



U.S. Department of the Interior
Bureau of Reclamation

LONG-TERM

CENTRAL VALLEY PROJECT

OPERATIONS CRITERIA AND PLAN

CVP-OCAP

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Sacramento, California

October 1992

MISSION STATEMENT

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

As public values related to water use and management have changed since the inception of the Central Valley Project, so have the needs which its operations must address. While continuing to carry out the legislated purposes for which the Central Valley Project was originally authorized and developed, the Bureau of Reclamation is committed to finding ways to respond to issues created by changing priorities for water.

TABLE OF CONTENTS

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

LIST OF FIGURES AND TABLES

Table of Contents (Continued)

Table of Contents (Continued)

SUMMARY

SUMMARY

SUMMARY

During the spring of 1991, the Bureau of Reclamation (Reclamation) requested formal consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) pursuant to Section 7 of the Endangered Species Act. The consultation with NMFS was requested regarding the effects of long-term Central Valley Project (CVP) operations on winter-run chinook salmon in the Sacramento River and with the FWS regarding the effects of long-term CVP operations on the bald eagle in the Shasta and Trinity Reservoirs. Specifically in question are the long-term operating criteria and procedures for the Trinity, Shasta, and Delta Divisions and the Red Bluff Diversion Dam (under the Sacramento River Division).

As a result of further discussion and a followup meeting between the two agencies on April 18, 1991, a development plan and content outline were prepared by Reclamation for a document to be entitled ***Central Valley Project - Long-Term Operations Criteria and Plan (CVP-OCAP)***. The outline and plan were formally transmitted to the NMFS on April 24, 1991.

Although it was Reclamation's intent that this consultation covering long-term CVP operation under a range of hydrologic and storage conditions be completed prior to the finalization of a plan of operations for 1992, late in 1991 NMFS and Reclamation agreed to consult separately regarding 1992 operations. In February 1992, Reclamation issued its Interim Central Valley Project Operations Criteria and Plan (CVP-OCAP) and a Biological Assessment of 1992 operations on the winter-run chinook salmon and bald eagle. NMFS issued a Biological Opinion on 1992 operations on February 14, 1992.

In June 1992, Reclamation issued a plan of study to complete the long-term CVP-OCAP and Biological Assessment of operations of the CVP under a full range of hydrologic and storage conditions. This document was prepared in accordance with that plan of study.

This document was prepared by various technical specialists within Reclamation as well as technical consultants hired by Reclamation. Representatives of other Federal and State agencies also provided review and valuable input to the process.

PURPOSE AND USE OF THIS DOCUMENT

All divisions of the CVP except the East Side and Friant Divisions are covered by this document, including the Trinity River, Shasta, Sacramento River, American River, Delta, San Felipe, and West San Joaquin Divisions. This document serves as a baseline description of the facilities and operating environment of the northern divisions of the CVP (listed above; see figure 1).

The CVP-OCAP identifies the many factors influencing the physical and institutional conditions and decisionmaking processes underlying how the project currently operates.

Regulatory and legal requirements are explained, alternative operating models and strategies described, and the operations plans based on Pre-1992 operations criteria and alternative operations criteria are also provided.

It is envisioned that CVP-OCAP will be used as a reference by technical specialists and policymakers both internally within Reclamation and outside the agency to better understand how the CVP is operated. The CVP-OCAP includes numeric and nonnumeric criteria and operating strategies. Special emphasis is given to explaining the analyses used to develop typical water year operating plans covering a range of four different initial storage conditions (low, low medium, high medium, and high), combined with five different water years covering assumed extreme critical, critical, dry, above-normal, and wet runoff conditions.

LIST OF ABBREVIATIONS/ACRONYMS

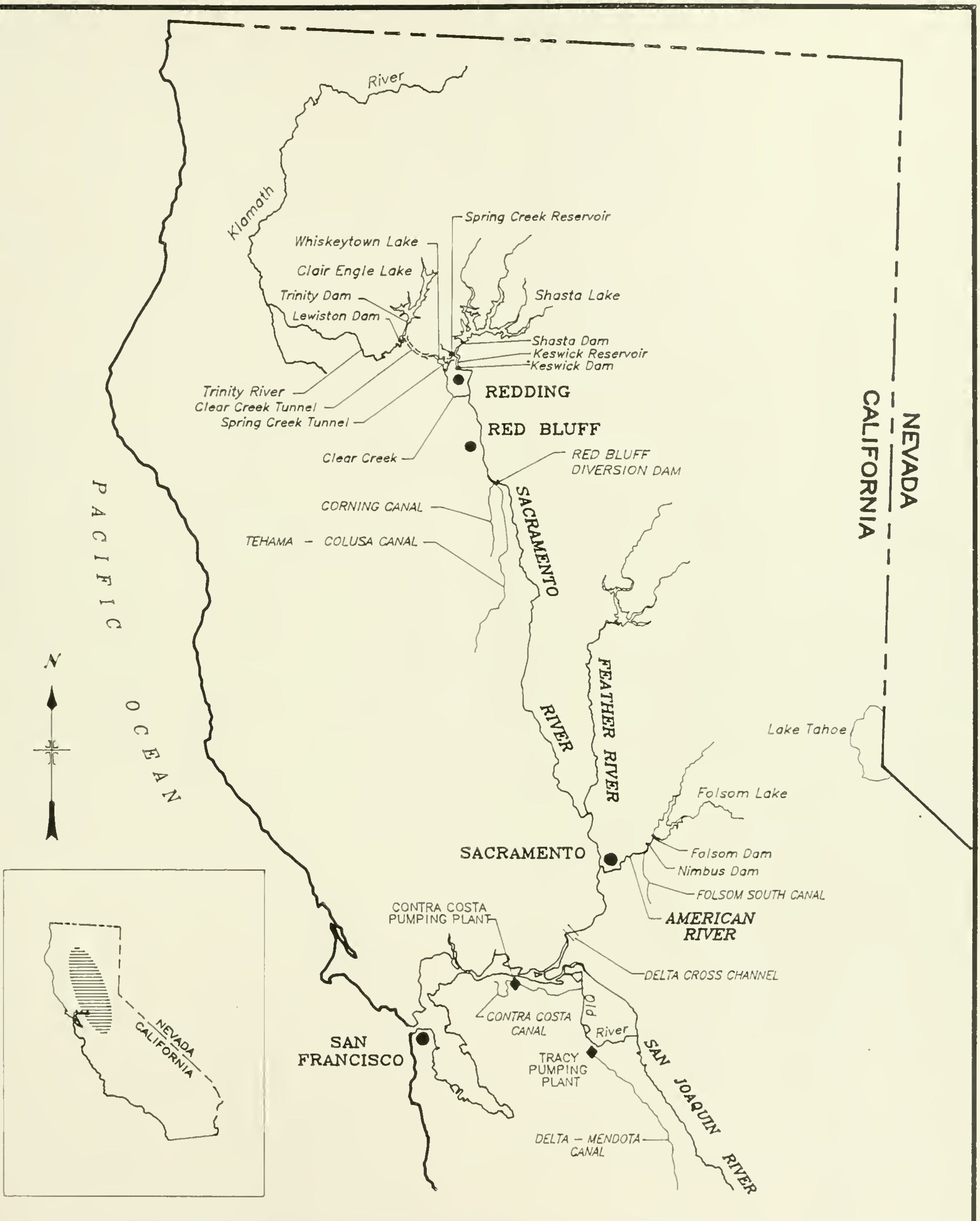
ACID	Anderson-Cottonwood Irrigation District
AEEA	Annual Energy Exchange Account
AF	Acre-feet
DCC	Delta Cross Channel
COA	Coordinated Operations Agreement
COE	U.S. Army Corps of Engineers
CVOCO	Central Valley Operations Coordinating Office
CVP	Central Valley Project
CVP-OCAP	Central Valley Project - Long-Term Operations Criteria and Plan
D-893	State Water Resources Control Board Decision 893
D-1400	State Water Resources Control Board Decision 1400
D-1485	State Water Resources Control Board Decision 1485
DCCG	Delta Cross Channel Gates
Delta	Sacramento-San Joaquin Delta
DFG	(California) Department of Fish and Game
DMC	Delta-Mendota Canal
DOI	Delta Outflow Index
DWR	Department of Water Resources
ESA	Endangered Species Act of 1973
F	Fahrenheit
ft^3/s	Cubic feet per second
FWS	U.S. Fish and Wildlife Service
MAF	Millions of acre-feet
M&I	Municipal and Industrial
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	Mean sea level
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NTE	Not to exceed
NWS	National Weather Service
O&M	Operations and Maintenance
PDC	Project Dependable Capacity
PG&E	Pacific Gas and Electric Company
RBDD	Red Bluff Diversion Dam
Reclamation	Bureau of Reclamation
RFC	River Forecast Center
RRA	Reclamation Reform Act of 1982
RWQCB	Regional Water Quality Control Board
SNL	Speed No Load
SWP	(California) State Water Project
SWRCB	California State Water Resources Control Board

SOLA	Swamp and Overflow Land Act of 1850
SMSCG	Suisun Marsh Salinity Control Gates
TAF	Thousands of acre-feet
Task Group	Sacramento River Temperature Task Group
Trinity	Trinity River Division
USFS	U.S. Forest Service
Western	Western Area Power Administration
WR	SWRCB Water Rights Order
WY	Water Year

CENTRAL VALLEY PROJECT MAP

CENTRAL VALLEY PROJECT MAP

Figure 1



FEATURES OF
THE CENTRAL VALLEY PROJECT
COVERED IN CVP - OCAP
U.S. BUREAU OF RECLAMATION

CHAPTER I
INTRODUCTION

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OVERVIEW OF THE CENTRAL VALLEY PROJECT

BACKGROUND

During the 1920's, a period of rapid growth in California, the State's political leaders recognized a need for large-scale water resources development for flood protection and water supply. The legislature authorized a statewide water resources investigation in 1921. In 1922, the legislature, governor, and the electorate approved construction of the State Central Valley Water Project. However, because of difficulty in marketing the bonds, the project could not be undertaken by the State. After repeated attempts by State officials failed to obtain Federal grants or loans to aid in financing the project, the Federal Government was requested to undertake the construction of Central Valley Project (CVP).

The first federal authorization of the CVP was by the Rivers and Harbors Act of August 30, 1935. The CVP was originally reauthorized for construction, operation and maintenance by the Secretary of the Interior pursuant to the Reclamation Act of 1902 as amended and supplemented (the Federal Reclamation laws) by the Rivers and Harbors Act of August 26, 1937. The 1937 act also provided that the dams and reservoirs of the CVP ". . . shall be used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power." Figure 2 is a list of subsequent laws, directives, and orders affecting CVP operation. In the statutes authorizing the construction, operation and maintenance of the various divisions of the CVP, Congress has consistently included language directing the Secretary to operate the CVP as a single, integrated project.

Major features of the CVP include: 20 reservoirs, with a combined storage capacity of approximately 11 million acre-feet (MAF); 8 powerplants and 2 pumping-generating plants, with a maximum capacity of about 2.0 million kilowatts; and approximately 500 miles of major canals and aqueducts.

TOPOGRAPHY AND CLIMATE

The Central Valley Basin of California extends about 500 miles in a northwest-to-southeast direction, with an average width of about 120 miles (see figure 3). The basin is surrounded by mountains except for a single outlet to the west at the Carquinez Strait. The Central Valley floor occupies about one-third of the basin and is about 400 miles in length and averages about 50 miles in width. The Cascade Range and Sierra Nevadas on the north and east rise in elevation to 14,000 feet and the Coast Ranges on the west to as high as 8,000 feet. Two major watersheds exist in the basin: the Sacramento River system in the north and the San Joaquin River system in the south. The two river systems join at the

Figure 2. Laws, Directives, and Orders Affecting Central Valley Project (CVP) Operation

Law or Directive	Year	Effect on CVP
Reclamation Act	1902	Formed legal basis for subsequent authorization of the CVP.
Rivers and Harbors Act	1935 1937 1940	First authorization of CVP for construction and provision that dams and reservoirs used first for rivers' regulation, improvement of navigation, and flood control. Second for irrigation and domestic users; third for power.
Reclamation Project Act	1939	Provided for the repayment of the construction charges and authorized the sale of CVP water to municipalities and other public corporations and agencies, plant investment, for certain irrigation water deliveries to leased lands.
Water Service Contracts	1944	Provided for the delivery of specific quantities of irrigation and municipal and industrial water to contractors.
Flood Control Act	1944	Authorized flood control operations for Shasta, Folsom, and New Melones Dams.
Water Rights Settlement Contracts	1950	Provided diverters holding riparian and senior appropriative rights on the Sacramento and American Rivers with CVP water to supplement water which historically would have been diverted from natural flows.
Grasslands Development Act	1954	Added authority for use of CVP water for fish and wildlife purposes. Also authorized development of works in cooperation with the State for furnishing water to Grasslands for waterfowl conservation.
Trinity River Act	1955	Provided that the operation of the Trinity River Division be integrated and coordinated with operation of other CVP features to allow for the preservation and propagation of fish and wildlife.
Reclamation Project Act	1956	Provided a right of renewal of long-term contracts for agricultural contractors for a term not to exceed 40 years.
Fish and Wildlife Coordination Act	1958	Provided for integration of Fish and Wildlife Conservation programs with Federal water resources developments; authorized Secretary of the Interior to include facilities to mitigate CVP-induced damages to fish and wildlife resources. Required consultation with the U.S. Fish and Wildlife Service.
San Luis Authorization Act	1960	Authorized San Luis Unit and provided for financial participation of Reclamation in development of recreation.
Reclamation Project Act	1963	Provided a right of renewal of long-term contracts for municipal and industrial contractors.
Auburn-Folsom South Unit Authorization Act	1965	Authorized Auburn-Folsom South Unit. Provided for financial participation of Reclamation in development of recreation.

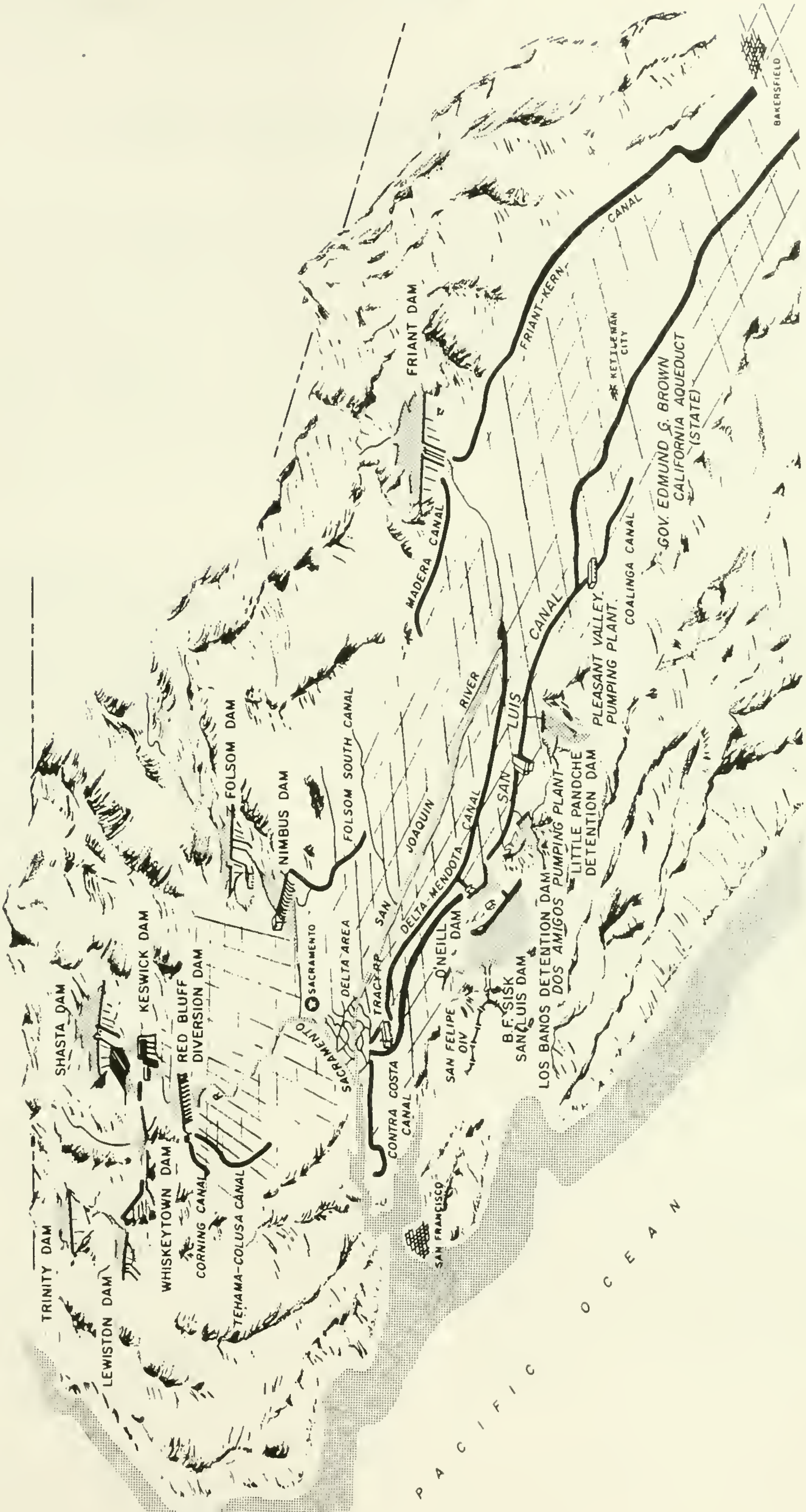
Figure 2. Laws, Directives, and Orders Affecting Central Valley Project (CVP) Operation (continued)

Law or Directive	Year	Effect on CVP
Power Contract 2948A	1967	Provided banking agreements with the Pacific Gas and Electric Company of California (PG&E), under which excess CVP energy and capacity is sold to the PG&E. The PG&E in return delivers power to CVP customers. Contract now administered by the Western Area Power Administration.
National Environmental Policy Act (NEPA)	1969	Established policy, set goals, and provided means for ensuring scientific analysis, expert agency participation and public scrutiny and input are incorporated into the decisionmaking process regarding the actions of the Federal agencies.
Council on Environmental Quality Regulations	1970	Provided directives for compliance with NEPA.
State Water Resources Control Board Decision 1379	1971	Established Delta water quality standards to be met by both the CVP and the State Water Resources Project (SWP).
Endangered Species Act	1973	Provided protection for animal and plant species that are currently in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened).
State Water Resources Control Board Decision 1485	1978	Ordered the CVP (and the SWP) to guarantee certain conditions for water quality protection for agricultural, municipal and industrial, and fish and wildlife use.
Secretarial Decision on Trinity River Release	1981	Allocated CVP yield so that releases can be maintained at 340,000 acre-feet in normal water years, 220,000 acre-feet in dry years, and 140,000 acre-feet in critically dry years.
	Amended 1991	Released a minimum of 340,000 acre-feet annually for each dry or wetter water year. During each critically dry water year, 340,000 acre-feet will be released if at all possible.
Corps of Engineers Flood Control Manuals for:		Prescribed regulations for flood control.
Shasta	1977	
Folsom	1959	
New Melones	1980	
Corps of Engineers Flood Control Diagram for:		Outlined descriptions and data on flood potential and flood ratings.
Shasta	1977	
Folsom	1986	
New Melones	1982	
Reclamation Reform Act	1982	Introduced the concept of full-cost pricing, including interest on the unpaid pumping plant investment, for certain irrigation water deliveries to leased lands.

Figure 2. Laws, Directives, and Orders Affecting Central Valley Project (CVP) Operation (continued)

Law or Directive	Year	Effect on CVP
Coordinated Operating Agreement (COA)	1986	Agreement between the U.S. government and the State of California. Determined the respective water supplies of the CVP and the SWP while allowing for a negotiated sharing of Sacramento-San Joaquin Delta excess outflows and the satisfaction of in-basin obligations between the two projects.
Public Law 99-546	1986	Ensures repayment of plant-in-servicecosts at the end of FY 1980, by end of FY 2030.
Public Law 99-546	1986	DOI and Reclamation directed to include total costs of water and distributing and servicing it in CVP contracts (both capital and O&M costs).
WR 90-5, 91-1	1990 1991	Water Rights Orders that modified Reclamation water rights to incorporate temperature control objectives in Upper Sacramento River.
National Marine Fisheries Service Biological Opinion	1992	Established operation under the Reasonable Prudent Alternative (RPA) for 1992 operations to protect winter run. Provided for "incidental taking" within the RPA.

Figure 3


TRINITY DAM
LEWISTON DAM
WHISKEYTOWN DAM
CORNING CANAL
TEHAMA-COLUSA CANAL
SHASTA DAM
KESWICK DAM
RED BLUFF DIVERSION DAM
SACRAMENTO
SACRAMENTO
FOLSOM DAM
NIMBUS DAM
FOLSOM SOUTH CANAL
DELTA AREA
TRACY PP
CONTRA COSTA CANAL
SAN FRANCISCO
SAN FELIPE DIV
O'NEILL DAM
B.F. SISK SAN LUIS DAM
LOS BANOS DETENTION DAM
DOS AMIGOS PUMPING PLANT
LITTLE PANOCHE DETENTION DAM
DELTA-MENDOTA CANAL
SAN JOAQUIN RIVER
SAN LUIS CANAL
PLEASANT VALLEY PUMPING PLANT
COALINGA CANAL
MADERA CANAL
FRIANT DAM
FRIANT-KERN CANAL
KETTLEMAN CITY
GOV. EDMUND G. BROWN CALIFORNIA AQUEDUCT (STATE)
BAKERSFIELD
PACIFIC OCEAN

Sacramento-San Joaquin Delta (Delta) where the waters are commingled before emerging through the Carquinez Strait into San Francisco Bay and thence to the Pacific Ocean.

The climate in the Central Valley is characterized as Mediterranean, with long, warm, dry summers that provide ideal growing conditions for a wide variety of quality crops under irrigation. The winters are cool and moist. Severely cold weather does not occur, but temperatures drop below freezing occasionally in virtually all parts of the valley. Rainfall on the valley floor is light, and snow almost never occurs. Average annual precipitation decreases from north to south, with precipitation levels much greater in the mountain ranges surrounding the valley. About 80 inches of precipitation, much in the form of snow, occur annually at higher elevations in the northern ranges and about 35 inches occur in the southern mountains. About 85 percent of the precipitation falls from November through April.

COMPONENTS OF CVP

Facilities of the CVP are categorized by divisions and units (see figure 4). Most of the distribution and drainage systems constructed by Reclamation have been transferred to the irrigation and water districts for operation and maintenance (O&M), including some small storage reservoirs and pumping plants. The facilities discussed in this report include the major CVP storage, conveyance, and power facilities operated by Reclamation, the joint-use facilities operated by the California Department of Water Resources (DWR), and some other facilities that routinely affect CVP operations. The nine divisions of the CVP are discussed briefly in the following section.

Trinity River Division

Trinity River water is stored in Clair Engle Lake behind Trinity Dam. Releases from this reservoir are used to generate power at Trinity, Lewiston, Spring Creek, Judge Francis Carr (Carr), and Keswick Powerplants. Lewiston Dam regulates flows in the Trinity River to meet the fishery and temperature downstream requirements of the Trinity River Basin and provides a forebay for the transbasin diversion of flows through Clear Creek Tunnel to the Sacramento Basin. Water from the Trinity River commingles with the Sacramento River's, to provide irrigation service to lands in the Sacramento Valley and other CVP areas.

Shasta Division

Shasta Dam and Shasta Lake on the Sacramento River control floodwater and store surplus winter runoff for irrigation use in the Sacramento and San Joaquin Valleys. They also provide maintenance of navigation flows and conservation of fish in the Sacramento River, protection of the Delta from intrusion of saline ocean water, water for municipal and industrial (M&I) use, and generation of hydroelectric energy.

Figure 4. Central Valley Project Facilities by Division

American River Division
- Auburn-Folsom South Unit
  - Sugar Pine Dam and Reservoir
  - Folsom South Canal
- Folsom Unit
  - Folsom Dam and Lake
  - Folsom Powerplant
  - Nimbus Dam and Powerplant and Lake Natoma
- Sly Park Unit
  - Jenkinson Lake

Delta Division
- Contra Costa Canal
- Contra Loma Reservoir
- Delta Cross Channel
- Delta-Mendota Canal
- Tracy Pumping Plant

East Side Division**
- New Melones Unit
  - New Melones Dam, Lake, and Powerplant

Friant Division**
- Friant Dam and Millerton Lake
- Friant-Kern Canal
- Madera Canal

Sacramento River Division
- Black Butte Dam and Lake
- Sacramento Canals Unit
  - Corning Canal
  - Red Bluff Diversion Dam
  - Tehama-Colusa Canal

San Felipe Division**
- Hollister Conduit
- Pacheco Tunnel and Conduit
- San Justo Dam and Reservoir
- Santa Clara Tunnel

Shasta Division
- Keswick Dam and Reservoir
- Keswick Powerplant
- Shasta Dam and Lake
- Shasta Powerplant

Trinity River Division
- Buckhorn Dam
- Clair A. Hill Whiskeytown Dam and Whiskeytown Lake
- Clear Creek South Unit
- Clear Creek Tunnel
- Cow Creek Unit
- Judge Francis Carr Powerhouse
- Lewiston Dam, Lake, and Powerhouse
- Spring Creek Debris Dam and Reservoir
- Spring Creek Power Conduit and Powerplant
- Trinity Dam and Powerplant and Clair Engle Lake

West San Joaquin Division
- San Luis Unit
  - B.F. Sisk San Luis Dam and San Luis Reservoir*
  - Coalinga Canal
  - Dos Amigos Pumping Plant*
  - Los Banos and Little Panoche Detention Dams and Reservoirs*
  - O'Neill Dam and Forebay*
  - O'Neill Pumping-Generating Plant
  - Pleasant Valley Pumping Plant
  - San Luis Canal*
  - William R. Gianelli Pumping-Generating Plant*

*Joint Federal-State Facility

**These divisions are not discussed in this document.

Sacramento River Division

The Red Bluff Diversion Dam (RBDD), the Corning Pumping Plant, and the Corning and Tehama-Colusa Canals are features of this division. The Sacramento Canals Unit was authorized to supply irrigation water to land in the Sacramento Valley.

American River Division

The American River Division includes the Folsom, Sly Park, and Auburn-Folsom South Units. Folsom Dam, Lake and Powerplant; Nimbus Dam; Lake Natoma; and Nimbus Powerplant form the Folsom Unit and are located on the American River. Folsom Dam regulates the flow of the American River for irrigation, power, flood control, M&I use, water quality, fish and wildlife, recreation, and other purposes. Jenkinson Lake, formed by Sly Park Dam on Sly Park Creek, is part of the Sly Park Unit. Folsom South Canal, which originates at Lake Natoma, is the only constructed feature of the Auburn-Folsom South Unit. The uncompleted Auburn Dam is also a part of this unit.

Delta Division

Delta Division facilities include the Contra Costa Canal (CCC), the Tracy Pumping Plant, the Delta-Mendota Canal (DMC), and the Delta Cross Channel (DCC), which is a controlled diversion channel between the Sacramento River and Snodgrass Slough. The CCC and the DMC are used to convey water pumped from the Delta to Contra Costa County and the DMC and San Luis service areas of the CVP. The channel provides a supply of water to the intakes of CCC and DMC, improves the irrigation supplies in the Delta, and helps repel ocean salinity.

West San Joaquin Division

The San Luis Unit was authorized to be built and operated jointly with the State of California. The San Luis Unit consists of San Luis Dam and Reservoir (joint Federal-State facilities), O'Neill Dam and forebay (joint Federal-State facilities), O'Neill Pumping-Generating Plant (Federal facility), San Luis Pumping-Generating Plant (joint Federal-State facilities), San Luis Canal (joint Federal-State facilities), Dos Amigos Pumping Plant (joint Federal-State facilities), Coalinga Canal (Federal facility), Pleasant Valley Pumping Plant (Federal facility), and the Los Banos and Little Panoche Detention Dams and Reservoirs (joint Federal-State facilities).

Friant Division

This division is operated separately from the rest of the CVP and thus is not covered by the Central Valley Project - Long-Term Operations Criteria and Plan (CVP-OCAP). Friant Dam and Millerton Lake are located on the San Joaquin River. The reservoir controls the San Joaquin River flows, provides downstream releases to meet requirements above Mendota Pool, and provides conservation storage and diversion into the Madera Canal and the Friant-Kern Canal.

East Side Division

The New Melones Unit of this division consists of the New Melones Dam, Lake, and Powerplant on the Stanislaus River. Functions of this unit are flood control, irrigation and M&I water supply, power generation, fishery enhancement, water quality, and recreation. Although this division is a part of the CVP, its operation is not included in the COA and it is operated as a separate feature. It is therefore not discussed in this document.

San Felipe Division

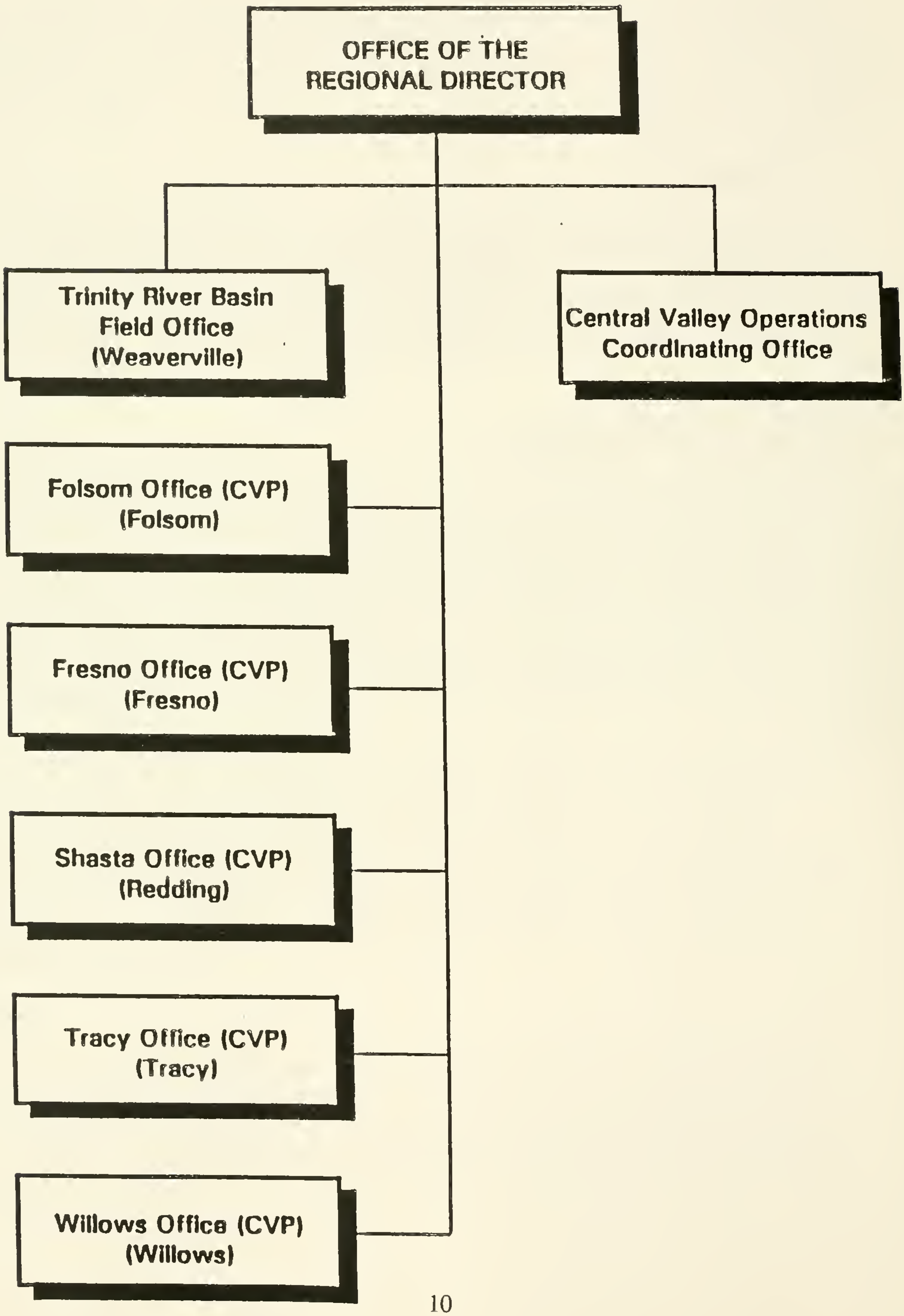
The San Felipe Division includes Pacheco Tunnel and Santa Clara Tunnel, conveyance facilities, pumping plants, power transmission facilities, a regulating reservoir, and distribution facilities in Santa Clara and San Benito Counties. Deliveries to the San Felipe Division are made through San Luis Reservoir. In CVP-OCAP analyses, the operation of the San Felipe Division is treated simply as a water demand in San Luis Reservoir.

PROJECT MANAGEMENT AND ORGANIZATION

The CVP is the Mid-Pacific Region's largest project. Facilities are operated and maintained by local field offices, with operations overseen by the Central Valley Operations Coordinating Office (CVOCO) at the regional office in Sacramento. The CVOCO is responsible for recommending CVP operating policy, developing annual operating plans, coordinating CVP operations with the State Water Project (SWP) and other entities, establishing CVP-wide standards and procedures, and making day-to-day operating decisions. Figure 5 shows the relationship between the CVOCO and the field offices in the Mid-Pacific Region.

Figure 5

Mid-Pacific Region
Bureau of Reclamation



CHAPTER II
OPERATIONS CONSTRAINTS
& OBJECTIVES

CHAPTER II
OPERATIONS CONSTRAINTS
& OBJECTIVES

CHAPTER II
OPERATIONS CONSTRAINTS AND OBJECTIVES

This chapter summarizes the general parameters--physical, contractual, environmental, and political--which affect the projectwide operation of CVP. It first addresses general projectwide constraints and then presents a discussion of project objectives by division.

PROJECTWIDE CONSTRAINTS

INTRODUCTION

The following section discusses constraints on the projectwide operation of the CVP, including: project yield, water rights, water service contracts, and hydropower requirements. This section also discusses obligations under the Coordinated Operations Agreement (COA) between Reclamation and SWP.

CVP YIELD

Yield is a measure of the availability of water to meet authorized purposes of the CVP and has traditionally been defined in terms of the ability to meet project needs within specific time periods. The estimation of firm yield of the CVP was based on the assumed operations of the CVP throughout the simulation of the critically dry 1928-34 period. Experience gained during actual drought operations and operating criteria that evolve as a result of new and previously unforeseen requirements or constraints on CVP operations may eventually affect the estimation of CVP yield. Planning operations during the current drought (which now approximates the 1928-34 period in severity) has required considering factors and requirements not previously treated in CVP yield studies. The Mid-Pacific Region has investigations currently underway to reassess the yield of the CVP.

Intermittent Water Supply

Intermittent water supply denotes a supply of water beyond the firm yield supply, which (when added to the firm yield supply) would constitute the total amount of water that could be contracted. Intermittent water supply would be used in combination with ground water through a conjunctive use program to expand the total supply of water that could be contracted by Reclamation on an annual, short-term (longer than 5 years but less than 10 years), or long-term basis (more than 10 years up to 40 years).

The amount of water that could be delivered under this type of contract would not be as dependable as firm yield since the intermittent supply would depend on the type of water year (wet, normal, or dry), the total amount of water that could be delivered to users, and the quantity of water delivered each year to firm yield contractors. The probability of delivering an intermittent supply would be calculated on the basis of past hydrology studies and the ability to meet firm yield demands based on the 1928-34 dry period (e.g., 40 years out of 100, 60 years out of 100, 80 years out of 100, etc.).

Interim Water Supply

The interim water supply is the difference between the contracted firm yield of the CVP and the total contractor demand for a firm supply at any future level of development. Interim water supplies have been made available to water contractors in the northern half of the CVP since 1935 and will be made available until demands from contractors reach the maximum amount allowed under their individual contracts. At the level expected to be achieved in 2020, contractual obligations for the CVP are expected to be at or near their maximums; interim water supply, therefore, would be practically zero.

WATER RIGHTS

Other projectwide constraints to operating the CVP are water rights, which are granted by the State Water Resources Control Board (SWRCB) and its predecessors. These rights are permits or licenses issued after applications have been made to the SWRCB. Many of the CVP water rights originated from applications filed by the State in 1927 and 1938 to advance the California Water Plan. After the Federal Government was authorized to build the CVP, those water rights were then transferred to Reclamation, who made applications for the additional water rights needed for the CVP.

In granting water rights, the SWRCB sets certain conditions within the permits to protect prior water rights, fish and wildlife needs, and other prerequisites it deems in the public interest. Conditions requiring minimum flow below CVP dams are contained within these permits. The water rights permits also specify certain periods of the year when water may be directly diverted and periods when water may be stored at CVP facilities. Table II-1 is a summary of diversion water rights and storage seasons for CVP's major storage reservoirs.

Diversion to storage is permitted year round at designated diversion points in the Sacramento River and in the Delta. Minimum flow and other permit conditions are discussed in chapter III. Conditions are imposed on the water rights of the Sacramento River and Delta facilities, including the American and Trinity River facilities, to meet water quality standards in the Delta and to coordinate operations with the SWP. These water quality standards and the releases required to meet them often have a significant influence on how the CVP and the SWP are operated.

Table II-1. Summary of diversion water rights and storage seasons (CVP's onstream storage reservoirs)

Reservoir	Diversion period	Diversion amount (ft^3/s)	Storage season (on or about)
Shasta	Sep. 1 - Jun. 30	18,000	Oct. 1 - Jun. 30
Clair Engle	Jan. 1 - Dec. 31	4,500	Jan. 1 - Dec. 31
Whiskeytown	Nov. 1 - Mar. 31	3,600	Nov. 1 - Mar. 31
Folsom	Nov. 1 - Sep. 30	8,700	Nov. 1 - Jun. 30
New Melones	Nov. 1 - Jun. 30	2,250	Nov. 1 - Jun. 30

WATER SERVICE CONTRACTS

Water service contracts for the CVP are between the U.S. and individual water users or districts and provide for an allocated supply of CVP water to be applied for beneficial use. Table II-2 lists some of the contractual entitlements to CVP water. In addition to CVP water supply, a water service contract can include a supply of water that recognizes a previous vested water right (see previous section for detailed discussion).

Table II-2. CVP contractual entitlements (in acre-feet)

		Contractual quantities (acre-feet)	
River/division	Water rights (acre-feet)	Project	Total
SACRAMENTO RIVER			
Sacramento River Division	1,829,475	942,258 [1]	2,772,163
Shasta Division	n/a		
Trinity River Division	n/a		
AMERICAN RIVER			
American River Division	344,000	385,750	729,750
DELTA			
Delta Division	887,277	1,056,218	1,943,495
West San Joaquin Division	6,000	1,116,500	1,122,500
SAN FELIPE DIVISION		196,300	196,300

[1] Water supply figure is total for all three divisions.

Water service contracts for the CVP fall into three categories: (1) Long-term contracts which have a term of more than 10 years. The Acts of July 2, 1956, and June 21, 1963, provide for renewal of such long-term contracts at the request of the contractor; (2) short-term contracts which have a term of more than 5 years but less than 10 years. Federal Reclamation law does not provide for renewing short-term contracts; and (3) temporary contracts which have a term not to exceed 5 years. As with short-term contracts, no provisions exist within Reclamation law for renewing temporary contracts.

The purposes of any water service contract are to stipulate provisions under which a water supply is provided and to produce revenues sufficient to cover an appropriate share of cost to construct the project as well as an appropriate share of the annual cost to operate and maintain the project. Typical contract provisions include:

Definition of Types of Water Delivered

Water service contracts provide for the delivery of irrigation and/or M&I water. Irrigation water is water made available from the CVP that is used primarily in producing agricultural crops, including incidental domestic use and watering livestock. M&I water is water made available from the CVP for drinking water or industrial use in addition to uses such as watering used in landscaping or providing pasture for animals.

Water Shortage Provisions

Each CVP contract stipulates that Reclamation is obligated to make available to the contractor a specified amount of project water subject to the extent that such water is available. The contract further provides that, in the operation of the CVP, Reclamation will use all reasonable means to guard against shortage in the quantity of water to be made available to the contractor. If the total water supply is not reduced because of drought or other unavoidable causes, Reclamation is contractually committed to provide the contractor with the CVP water supply as specified in the contract.

Acreage Limitation

Each contract contains appropriate language requiring the contractor's compliance with the acreage limitation found within Reclamation law, as amended and supplemented, unless the contractor has been exempted from such compliance by the Congress or the Secretary of Interior. The Reclamation Reform Act of 1982 (RRA) increased the maximum size of a landholding receiving project water to 960 acres.

Water Conservation

Pursuant to the RRA, water contracts require the contractor to formulate and institute a water conservation program.

Water and Air Pollution Control

Water contracts require that the contractor comply with all applicable water and air pollution laws and regulations of the United States and the State of California and obtain all required permits or licenses from the appropriate Federal, State, or local authorities.

Ratesetting

The objective of the irrigation ratesetting policy for the CVP is to recover Federal investment, including any O&M deficits applicable to CVP contracts within a definite 50-year repayment period terminating in the year 2030 (as required by Section 105 of the Act of October 17, 1986). Individual contractor accounting is maintained for repayment accountability, and O&M deficits are accumulated and will be repaid by contractors under the terms of each new or amended contract (as required by Section 106 of the Act of October 17, 1986).

The rate computation procedures are based on cost-of-service with capital costs amortized over a 50-year period. Water rates are based on the "pooled and averaged costs" approach according to the operationally and financially integrated project concept established by Congress and reaffirmed each time the CVP was reauthorized to include a new unit.

The cost-of-service water rates are composed of an assembly of cost components referred to as "cost pools." Each contractor pays a water service rate encompassing a proportionate share of the cost pools associated with the specific service required to provide that contractor with CVP water.

The seven potential cost components that are totaled to determine a contractor's irrigation water rate under the approved Irrigation Ratesetting Policy are: (1) Water marketing, (2) storage, (3) conveyance, (4) conveyance pumping, (5) San Luis Drain, (6) direct pumping, and (7) adjustment for historic individual contractor repayment or deficit balances.

While an approved M&I ratesetting policy is not yet in place, the interim M&I ratesetting policy uses the same cost components (except the San Luis Drain) that are used in calculating the irrigation water rates. In addition, with M&I an interest-bearing function, interest is also calculated on the unpaid capital investment.

Irrigation and M&I supplied from the CVP serve nine divisions; they are:

- Trinity River Division
- Shasta Division
- Sacramento River Division
- American River Division

- Delta Division
- West San Joaquin Division
- Friant Division
- East Side Division
- San Felipe Division

These divisions (except for the Friant, East Side, and San Felipe Divisions) are discussed in detail in the section following the discussion on Hydropower and the COA in this chapter.

HYDROPOWER

Hydropower, as provided in the Rivers and Harbors Act of 1937, is another projectwide constraint to CVP operations. Power production is an authorized CVP function under the Act. While requirements for power operations have remained subordinate to objectives for water operations, the increase in value of energy has demonstrated the benefits of the CVP's hydroelectric system to the Federal Treasury as well as to CVP customers.

Since 1977, when the Western Area Power Administration (Western) was formed under the Department of Energy, Western has had the responsibility for marketing CVP power and energy. Western dispatches power and energy and maintains a portion of the CVP transmission facilities.

The CVP powerplants have a maximum capacity of approximately 2 million kilowatts and have generated an average of 5 billion kilowatthours per year. On a daily and annual basis, CVP's water and power facilities are operated conjunctively to maximize project benefits. Daily generation is scheduled in coordination with the Pacific Gas and Electric Company of California (PG&E) to meet peakloads, while pumping is scheduled for offpeak hours as much as possible. Within other projectwide constraints, seasonal reservoir operations are planned to efficiently use CVP generating facilities and to meet contractual requirements with PG&E.

In 1967, Reclamation contracted with PG&E for the sale, interchange, and transmission of electric capacity and energy. Administered by Western, the contract created a "banking" arrangement under which excess CVP energy and capacity are sold to PG&E; in return, PG&E delivers power to CVP customers. PG&E supplies baseload energy and capacity to CVP power customers, and CVP hydropower is used during the peakload periods to help meet peakload requirements. The contract also provides for transmission of CVP power using PG&E lines and for using energy and capacity imported from the Northwest.

Power generated at CVP powerplants is applied first to meeting CVP load and second to meeting preference customer loads. Any excess power can be sold commercially, primarily to PG&E. CVP load (the energy and capacity required to run CVP facilities) amounts to about 30 percent of the energy generated in a normal year. The power sold to preference customers is classified as long-term service, short-term withdrawable power, and interruptible power. The annual preference customer firm load now exceeds 6 billion kilowatt hours, at a maximum capacity of 1,152,000 kilowatts. Over time, the sum of CVP and preference customer loads exceeds the average total power produced by the CVP. To meet preference loads, Western may purchase energy and capacity from PG&E and/or the Pacific Northwest.

By contract with PG&E, CVP is operated to meet project load and to support Project Dependable Capacity (PDC). PDC is defined as the lowest electric capacity available with energy support from CVP powerplants in any given month during the most adverse period of streamflow conditions of record after deducting the estimated capacity required for project load during PG&E's peakload period.

Provisions within CVP contracts encourage the coordination of CVP and PG&E electrical systems to meet the requirements for their combined loads. These provisions furnish: standby service during outages that result from facilities shutting down, transmission services and curtailments, scheduling facility outages, and forecasting requirements. Automatic generation control functions and computer-to-computer links are established with PG&E for data exchange, making it possible for Reclamation and Western to share load and frequency control obligations with PG&E.

Operations staff from Reclamation and Western customarily meet monthly to discuss hydropower operations issues and requirements and to review the CVP forecast of operations as it may affect capacity and energy generation during the upcoming months. The agencies also review compliance with PG&E contract requirements and decide on the next month's requirements for Pacific Northwest import energy and deliveries to or from the Annual Energy Exchange Account (AEEA).

COORDINATED OPERATIONS AGREEMENT

CVP and SWP use the Sacramento River and the Delta as common conveyance facilities. Reservoir releases and Delta exports must be coordinated to ensure that each of the projects retains its portions of the shared water and bears its share of joint obligations to protect beneficial uses.

The COA between the United States of America (Reclamation) and the State of California became effective in November 1986. The agreement defines the rights and responsibilities of the CVP and the SWP regarding Sacramento Valley and Delta water needs and provides a mechanism to measure and account for those responsibilities. The COA includes a provision for its periodic review.

Obligations for Inbasin Uses

Inbasin uses are defined in the COA as "legal uses of water in the Sacramento Basin including the water required under the Delta standards found in SWRCB Decision 1485 (D-1485). The CVP and the SWP are obligated to ensure that water is available for these specific uses, but the degree of obligation depends on several factors and changes throughout the year.

Balanced water conditions are defined in the COA as periods when the two projects agree that releases from upstream reservoirs plus unregulated flows approximately equal the water supply needed to meet Sacramento Valley inbasin uses plus exports. Excess water conditions are periods when the CVP and the SWP agree that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley inbasin uses plus exports.

During excess water conditions, sufficient water is available to meet all beneficial needs; under these conditions, the CVP and the SWP have agreed in the COA to store and export as much water as possible. However, during balanced water conditions, the two projects share in meeting inbasin uses. Balanced water conditions are further defined according to whether water from upstream storage is required to meet Sacramento Valley inbasin use or if unstored water is available for export.

When water must be withdrawn from reservoir storage to meet Sacramento Valley inbasin uses, 75 percent of the responsibility for withdrawing water is borne by the CVP and 25 percent is borne by the SWP. These percentages were derived from reservoir operations studies that simulated CVP operations with and without the interaction of the SWP while preserving the yield of the CVP. When unstored water is available for export (i.e., balanced water conditions plus circumstances when exports exceed storage withdrawals), the sum of CVP stored water, SWP stored water, and the unstored water for export is allocated 55/45 to the CVP and SWP, respectively.

Accounting and Coordination of CVP and SWP Operations

With daily close coordination, Reclamation and the DWR determine the target Delta outflow for water quality, reservoir release levels necessary to meet inbasin demands, and schedules to use each other's facilities for pumping and conveyance.

During balanced water conditions, a daily accounting is maintained according to the sharing form' las agreed to in the COA to show CVP and SWP accumulated obligations, which allows flexibility in operations by allowing either party's share to be out of balance for a given day and also avoids the need to make daily changes in reservoir releases that originate several days' travel time from the Delta. During balanced conditions, adjustments can also be made afterwards rather than by predicting the variables of reservoir inflow, storage withdrawals, and inbasin uses on a daily basis.

Although the accounting language of the COA provides the mechanism for determining the responsibilities of the two projects, real-time operations dictate actions. For example, conditions in the Delta can change rapidly. Weather conditions combined with tidal action can quickly affect Delta outflow requirements. If, in this circumstance, the SWP could respond only by increasing its Oroville release, the change would not be seen in the Delta for 3 days (3-day travel time from Oroville to the Delta). In actual operations, releases from CVP's Folsom Reservoir probably would be increased. Similarly, if conditions made it necessary to increase CVP contributions when raising the releases from Keswick Reservoir was desirable, the release from Folsom might be increased temporarily until the water from Keswick arrived (5-day travel time from Keswick to the Delta).

Releases are one means of adjusting to changing inbasin conditions. During balanced water conditions, an increase in Delta outflow can be achieved immediately by reducing project exports.

Standards contained within the D-1485 require that the CVP and the SWP each limit pumping to an average of 3,000 ft^3/s during May and June. This condition is particularly strict for operating the CVP since its annual exports are limited by the capacity of the Tracy Pumping Plant and DMC. Because this export limitation was a result of the SWP becoming operational, the SWP compensates by pumping from the Delta as much as 195,000 acre-feet of CVP water annually. If this water is pumped during balanced water conditions, the CVP is responsible for supplying the water in the Delta under the terms of the COA.

When real-time operations dictate CVP and SWP actions, an accounting procedure tracks the water obligations of the two projects. When the difference between obligations is sufficiently great, adjustments may be made in reservoir releases. These adjustments allow the project that has carried more than its obligation to recoup the water while the other project compensates for its deficient contribution in the preceding period.

During the course of any given water year, water conditions can go in and out of balance (see figure 6). Account balances continue from one balanced water condition through the excess water condition and into the next balanced water condition. If, however, the project with a positive balance (that is the party that has provided more than its accumulated share of water) enters into flood control operations, the accounting is reset to zero.

OBJECTIVES OF DIVISION OPERATIONS

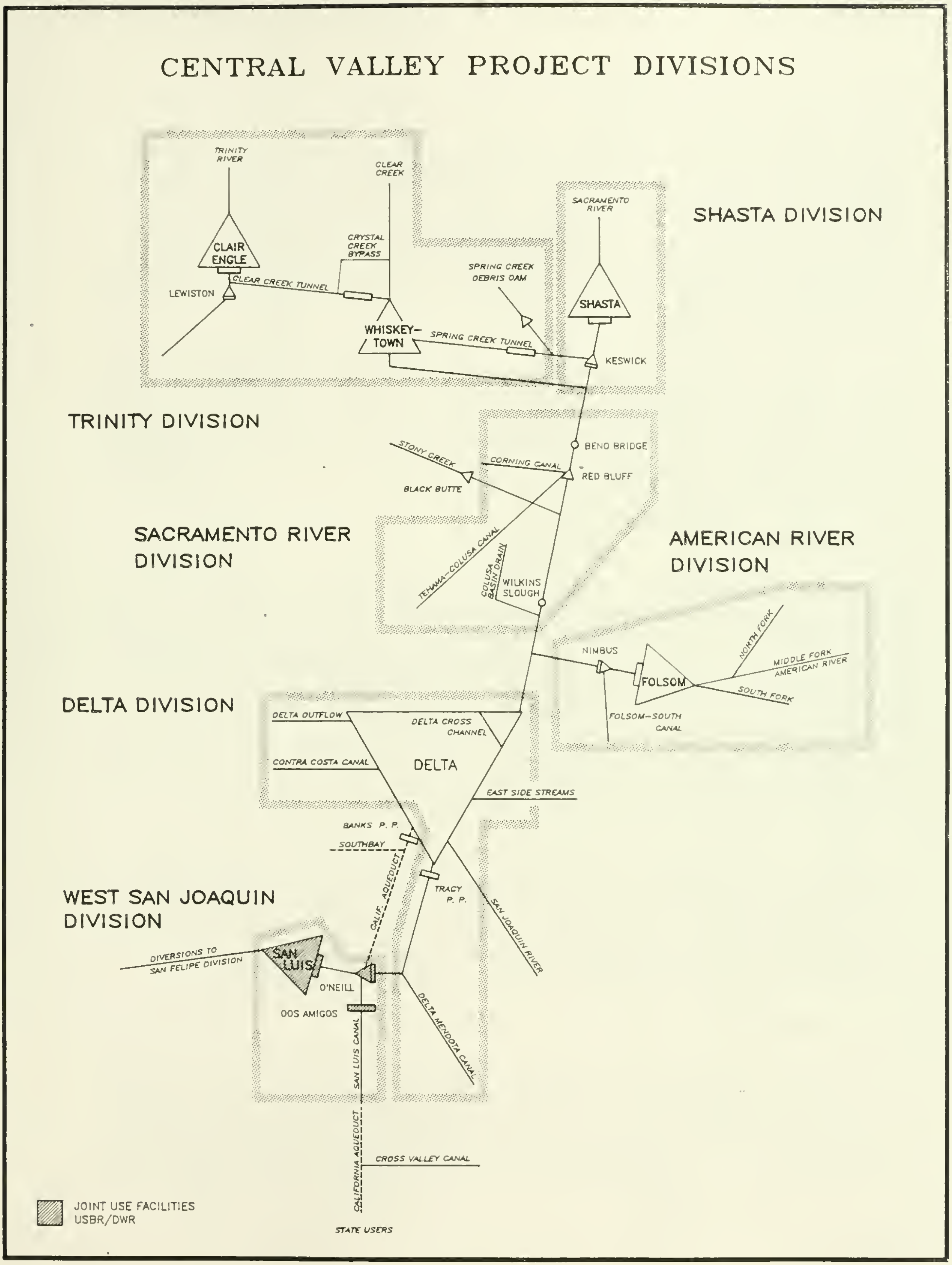
INTRODUCTION

The objectives of the CVP divisions are discussed in detail in the following section. These include operations of the Trinity River Division, the Shasta Division, the Sacramento River Division, the American River Division, the Delta Division, and the San Luis Unit of the West San Joaquin Division. (See figure 7 for a graphic representation of how these CVP divisions are interrelated.)

Figure 6. Periods of balanced conditions in the Delta

Water year	Dates in balance	Number of days in balance	Percentage of year in balance
1970	07/02/70 - 09/30/70	91	25%
1971	10/01/70 - 10/20/70	20	5%
1972	05/06/72 - 09/09/72 (levee break 06/22-07/20)	127	35%
1973	06/27/73 - 08/31/73	66	18%
1976	02/01/76 - 09/30/76	243	66%
1977	10/01/76 - 09/30/77	365	100%
1978	10/01/77 - 12/24/77	85	
	06/23/78 - 08/31/78	70	42%
1979	04/20/79 - 05/07/79	18	
	06/03/79 - 09/30/79	120	38%
1980	10/01/79 - 10/03/79	3	
	06/05/80 - 08/31/80	88	25%
1981	04/17/81 - 09/28/81	165	45%
1984	06/14/84 - 08/20/84	68	19%
1985	01/30/85 - 02/07/85	9	
	02/17/85 - 03/09/85	21	
	04/12/85 - 09/30/85	172	55%
1986	10/01/85 - 11/30/85	61	
	06/21/86 - 08/05/86	46	29%
1987	04/06/87 - 09/30/87	178	49%
1988	10/01/87 - 12/10/87	71	
	02/23/88 - 05/10/88	78	
	05/17/88 - 05/23/88	7	
	06/01/88 - 09/30/88	122	76%
1989	10/01/88 - 11/26/88	57	
	12/03/88 - 01/04/89	33	
	01/05/89 - 01/07/89	3	
	01/23/89 - 01/24/89	2	
	01/31/89 - 03/03/89	32	
	05/07/89 - 09/17/89	134	72%
1990	10/06/89 - 10/25/89	20	
	10/31/89 - 01/10/90	72	
	02/01/90 - 02/04/90	4	
	03/20/90 - 05/26/90	68	
	06/08/90 - 09/30/90	115	76%
1991	10/01/90 - 03/04/91	155	
	04/15/91 - 09/30/91	169	89%
1992	10/01/91 - 01/08/92	100	
	01/14/92 - 02/14/92	32	
	05/01/92 - 09/30/92	153	78%

Figure 7


CENTRAL VALLEY PROJECT DIVISIONS
TRINITY RIVER
CLEAR CREEK
SACRAMENTO RIVER
SHASTA DIVISION
CLAIR ENGLE
CRYSTAL CREEK BYPASS
LEWISTON
CLEAR CREEK TUNNEL
SPRING CREEK DEBRIS DAM
SHASTA
WHISKEY-TOWN
SPRING CREEK TUNNEL
KESWICK
TRINITY DIVISION
BEND BRIDGE
STONY CREEK
CORNING CANAL
RED BLUFF
BLACK BUTTE
SACRAMENTO RIVER DIVISION
TEHAMA-COLUSA CANAL
COLUSA BASIN DRAIN
WILKINS SLOUGH
AMERICAN RIVER DIVISION
NIMBUS
FOLSOM
NORTH FORK
MIDDLE FORK AMERICAN RIVER
SOUTH FORK
FOLSOM-SOUTH CANAL
DELTA DIVISION
DELTA OUTFLOW
DELTA CROSS CHANNEL
CONTRA COSTA CANAL
DELTA
EAST SIDE STREAMS
BANKS P. P.
SOUTHBAY
CALIF. AQUEDUCT
TRACY P. P.
SAN JOAQUIN RIVER
WEST SAN JOAQUIN DIVISION
DIVERSIONS TO SAN FELIPE DIVISION
SAN LUIS
O'NEILL
DOS AMIGOS
SAN LUIS CANAL
DELTA MENDOTA CANAL
CALIFORNIA AQUEDUCT
CROSS VALLEY CANAL
STATE USERS
JOINT USE FACILITIES USBR/DWR

TRINITY RIVER DIVISION OPERATIONS

The Trinity River Division (Trinity) was authorized on August 12, 1955, to increase the supply of water available for irrigation and other beneficial uses in the Central Valley. Facilities were authorized for control and storage of water from Clear Creek and Trinity River flows (see figure 8). Hydroelectric powerplants and transmission facilities were authorized to furnish energy to the CVP and to Trinity County. The enacting legislation recognized that the operation of the Trinity facilities would be integrated and coordinated with the operation of other CVP features. The legislation also provided for fish and wildlife preservation and propagation.

Under the Trinity Division, Trinity River water is stored in Clair Engle Lake behind Trinity Dam. Releases from this reservoir are used to generate power at Trinity, Lewiston, Spring Creek, Judge Francis Carr, and Keswick Powerplants. Lewiston Dam regulates flows to meet the downstream requirement of the Trinity River Basin. Water from the Trinity River commingles with the Sacramento River, to provide irrigation service to lands in Sacramento Valley and other areas of the CVP.

Water Supply

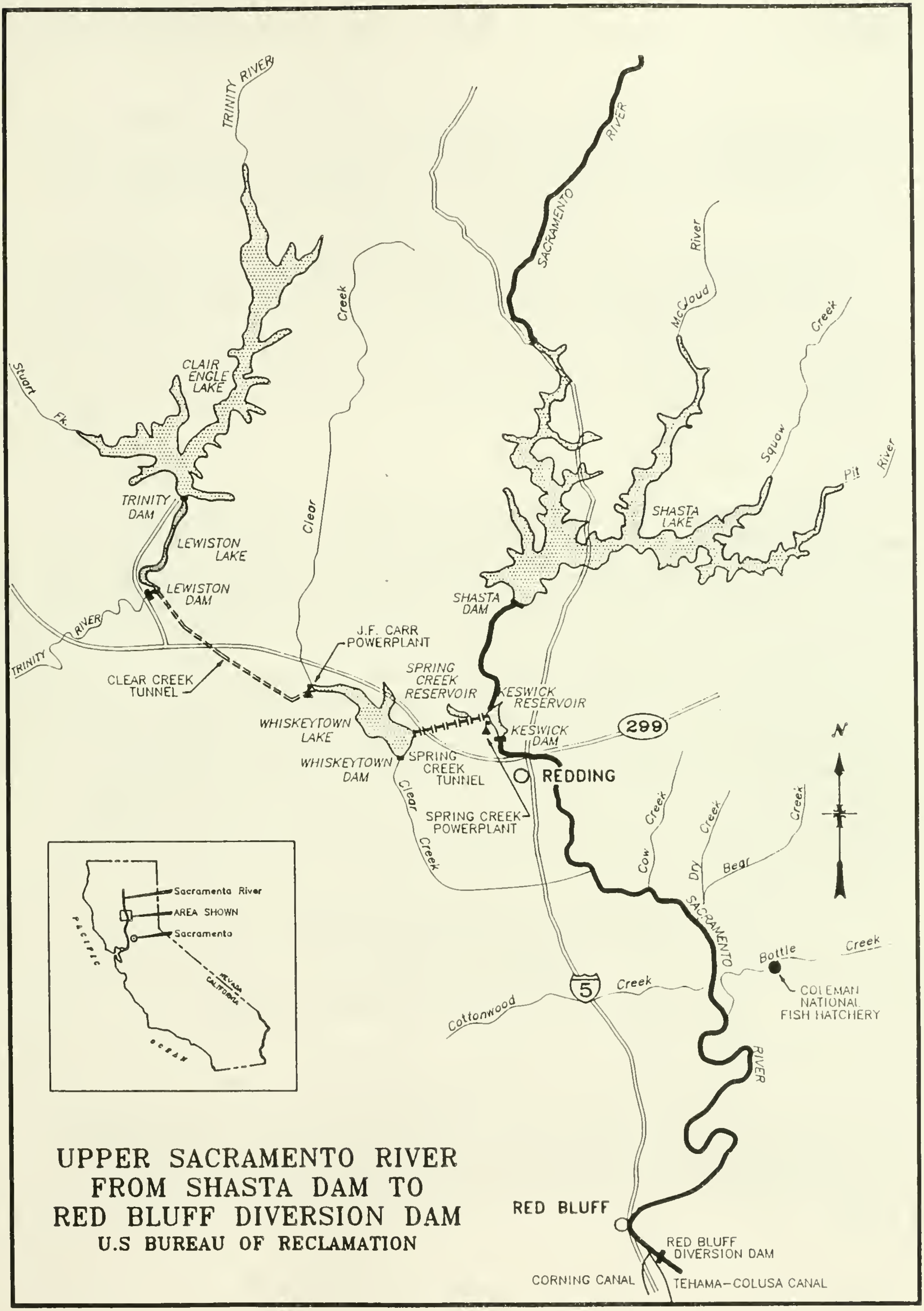
The mean annual inflow to Clair Engle Lake from the Trinity River is about 1.2 millions of acre-feet (MAF), a large percentage of which is diverted to the Central Valley. Approximately half of the average annual inflow occurs from April through September as a result of snowmelt runoff. The operation of Clair Engle Lake is influenced by the need for hydroelectric power produced in the cross-basin diversion of water. Clair Engle Lake is operated to minimize releases to the Trinity River in excess of minimum fishery requirements while attempting to fill the lake by the end of June. To avoid excess releases to the river, storage in Clair Engle Lake is reduced to about 1,850,000 acre-feet by November 1. During the winter flood season, storage is regulated within the capacity of the five powerplants (listed above) unless Reclamation Safety of Dams criteria require excess releases.

The mean annual inflow to Whiskeytown Lake from the Trinity River is approximately 270,000 acre-feet. Scheduled annual releases to Clear Creek are about 42,000 acre-feet, and average annual deliveries to the Clear Creek South Unit are 15,000 acre-feet. The remaining water supply is diverted through Spring Creek Powerplant to the Sacramento River. The storage in Whiskeytown Lake is not normally drawn down for water supply purposes. Only in years of severe drought will the storage be drawn upon to meet water demands.

Water Rights

Permits issued by the SWRCB for diverting Trinity River and Clear Creek flows provide for minimum downstream releases at Lewiston and Whiskeytown Dams, respectively. The minimum release schedule at Lewiston has been superseded by a Secretarial Decision. Reclamation has three agreements on Clear Creek that govern the releases from Whiskeytown Lake. A 1960 Memorandum of Agreement (MOA) with California

Figure 8



TRINITY RIVER
SACRAMENTO RIVER
River
McCloud
Creek
Squaw Creek
Pit River
Stuart Fk.
CLAIR ENGLE LAKE
Creek
Clear
TRINITY DAM
LEWISTON LAKE
LEWISTON DAM
SHASTA LAKE
SHASTA DAM
TRINITY RIVER
J.F. CARR POWERPLANT
CLEAR CREEK TUNNEL
SPRING CREEK RESERVOIR
KESWICK RESERVOIR
WHISKEYTOWN LAKE
KESWICK DAM
299
WHISKEYTOWN DAM
SPRING CREEK TUNNEL
REDDING
Clear Creek
SPRING CREEK POWERPLANT
Cow Creek
Dry Creek
Bear Creek
N
Sacramento River
AREA SHOWN
Sacramento
PACIFIC
OCEAN
NEVADA
CALIFORNIA
SACRAMENTO
Bottle Creek
COLEMAN NATIONAL FISH HATCHERY
5
Creek
Cottonwood
RIVER
UPPER SACRAMENTO RIVER
FROM SHASTA DAM TO
RED BLUFF DIVERSION DAM
U.S BUREAU OF RECLAMATION
RED BLUFF
RED BLUFF DIVERSION DAM
CORNING CANAL
TEHAMA–COLUSA CANAL

Department of Fish and Game (DFG) sets the following minimum flows to be releases to Clear Creek at Whiskeytown Dam (shown in table II-3).

Table II-3. Minimum flows to Clear Creek (at Whiskeytown Dam)

Time period	Minimum flow (ft^3/s)
Jan. 1 - Feb. 28, 29	50
Mar. 1 - May 31	30
Jun. 1 - Sep. 30	0
Oct. 1 - Oct. 15	10
Oct. 16 - Oct. 31	30
Nov. 1 - Dec. 31	100

The 1960 agreement specifies that releases for fish and wildlife purposes will be added to amounts necessary to satisfy existing or recognized downstream water rights. Under their 1960 water agreement, Townsend Flat claimed a Pre-1914 water right of 55 ft^3/s to the natural flows of Clear Creek, and G. E. Oakes claimed a riparian water right of 11 ft^3/s. Diversions by both users are made at Saeltzer Dam, which is about 12 miles downstream from Whiskeytown Dam (see figure 8 [shown previously]).

In 1963, Reclamation discussed a tentative release schedule with the U.S. Fish and Wildlife Service (FWS) and the National Park Service to increase the annual releases from Whiskeytown Dam to enhance the recreational and fishery values for the Whiskeytown National Recreation Area (established in 1965 by Act of Congress). The proposed release schedule shown in table II-4 provides for reduced releases in critical dry years as defined by Shasta inflow criteria. Although the release schedule was never formalized, Reclamation has operated according to the proposed schedule since May 1963.

Table II-4. Proposed release schedule (Whiskeytown Dam)

Period	Normal year (ft^3/s)	Critical year (ft^3/s)
Jan. 1 - Oct. 31	50	30
Nov. 1 - Dec. 31	100	70

At Trinity Dam, a direct diversion of 4,500 ft^3/s is permitted throughout the year under CVP water rights. No seasonal storage restriction exists at Clair Engle Lake. From November 1 through March 31, a direct diversion of 3,600 ft^3/s is permitted at Whiskeytown Dam. Storage in Whiskeytown Lake from Clear Creek flow is only allowed during that same period.

The CVP water rights on Trinity River and Clear Creek are conditioned to meet water quality standards in the Delta and to meet COA requirements. Imports of Trinity River water at Carr Powerplant are treated as CVP storage withdrawals in order to determine each party's obligations under the COA.

The operation of Whiskeytown Lake is influenced by the kokanee salmon spawning from November 15 through March 31. Before 1980, the water surface elevation was reduced to 1,197.5 feet during the flood season to minimize uncontrolled spills to Clear Creek and, thus, to maximize power production. In 1979 and 1980, DFG reported that kokanee salmon were having difficulty in passing the Whiskey Creek culvert on Whiskeytown Lake because of a small difference in elevation between the culvert and lake level. In 1980, Reclamation agreed to increase the operating level 1 foot (to 1,198.5 feet) to ensure unimpaired kokanee passage.

Fish and Wildlife

The Secretary of the Interior has authority under the Trinity River Act of 1955 to mitigate losses of fish resources and habitat. The legislation mandates that the operation of Trinity be integrated and coordinated with the operation of other CVP features to realize the fullest, most beneficial, and most economic use of the water resources with the following qualification:

> *Provided*, That the Secretary is authorized and directed to adopt appropriate measures to insure the preservation and propagation of fish and wildlife, including, but not limited to, the maintenance of the flow of the Trinity River below the diversion point at not less than one hundred and fifty cubic feet per second for the months July through November and the flow of Clear Creek below diversion point at not less than fifteen cubic feet per second . . .

When Trinity began operations in 1963, total annual releases downstream from Lewiston Dam were to be at a minimum of 120,500 acre-feet. Since 1963, salmon and steelhead runs in the Trinity River system have severely declined for a number of reasons including insufficient streamflow. The DFG then requested increases in releases to the Trinity River; in response, the minimum annual release of 120,500 acre-feet was approximately doubled in 1974 and 1975 as part of a 3-year experiment by Reclamation. The experimental increase release schedule, interrupted by the 1976-77 drought, was extended into 1980.

On January 16, 1981, a Secretarial Decision was signed which provides the following:

> Reclamation will allocate CVP yield so that releases can be maintained at 340,000 acre-feet annually in normal years. The Fish and Wildlife Service will prepare a detailed study plan to assess the results of habitat and watershed restoration. Prior to completion of the plan, releases will be 287,000 acre-feet. Releases will be incrementally increased to 340,000 acre-feet as habitat and watershed restoration

measures are implemented. In dry years, releases will be 220,000 acre-feet; 140,000 acre-feet in critically dry years.

(The referenced plan was to be submitted by FWS after 12 years of evaluation and was to recommend the final CVP allocation for releases to the Trinity River.)

In October 1984, the Trinity River Basin Fish and Wildlife Restoration Act was passed. The Act provided for a 10-year program to restore fish and wildlife resources to Pre-CVP levels. The Secretary of the Interior has the ultimate responsibility for completing this program. A Task Force, consisting of representatives from 14 Federal, State, and county entities as well as the Hoopa Valley Tribe, has been assembled to assist and advise the Secretary. A 14-member Technical Coordinating Committee has also been established to assist and advise the local Reclamation field office and the Task Force regarding the restoration program.

On May 8, 1991, the Secretary of the Interior endorsed a position statement developed by the Assistant Secretaries for Fish, Wildlife and Parks; Indian Affairs; and Water and Science. The position statement expands the commitment to release water to the Trinity River as follows:

> The Bureau of Reclamation is directed to release into the Trinity River in 1991 between 240,000 acre-feet and 340,000 acre-feet depending on the inflow to Shasta Reservoir and using the ramping formula contained in the attached position statement. The Bureau of Reclamation is also directed to release into the Trinity River, during water year 1992-96, at least 340,000 acre-feet for each dry or wetter water year and 340,000 acre-feet in each critically dry year if at all possible. The Assistant Secretaries for Fish and Wildlife and Parks, Indian Affairs, and Water and Science are directed to formulate the 1992-96 flow release agreement by December 1, 1991.

An annual water quantity from the Trinity River is established, and Reclamation notifies the FWS of the amount available for release below the Trinity Dam. Generally, the first notification is based on the conditions as of February 1. The FWS then provides Reclamation with a desired release schedule from April through March. Updates on annual quantities are then provided to the FWS monthly through May. If conditions change significantly after May 1, a further update on the annual quantity is made. For each change in quantity, the FWS provides a desired release schedule. Reclamation attempts to operate as closely as possible to the proposed FWS schedule. As the year progresses, changes in the schedule are made as needed as long as the annual quantity is not exceeded.

Another fishery concern is the time allowed for changing releases to the river at Lewiston Dam. Acceptable rates depend on a variety of conditions such as time of year, temperatures, and abundance, distribution, and species of fish in the river. The following general criteria in table II-5 has been suggested by the FWS. (Except for emergencies, Reclamation consults the FWS Sacramento Office on deviations from this schedule.)

Table II-5. General criteria for releases to Trinity River (Lewiston Dam)

	Rate of change (ft^3/s)	
If existing release is:	**When increasing**	**When decreasing**
At or above 4,000	1,000 per 2 hours	500 per 4 hours
2,000 to 4,000	500 per 2 hours	500 per 4 hours
500 to 2,000	250 per 2 hours	200 per 4 hours
300 to 500	100 per 2 hours	100 per 4 hours
150 to 300	75 per 2 hours	50 per 4 hours

DWR and DFG have worked to improve the spawning riffles in the river channel below Lewiston. Because the velocity of flows in excess of 1,200 ft^3/s will cause the gravel to be transported in the riffles, Clair Engle Lake is operated to avoid releases that exceed those at Lewiston Dam, unless higher flows are included in the FWS schedule.

The Trinity River Fish Hatchery, operated by the DFG, is used to hatch and rear both salmon and steelhead. The hatchery receives water from Lewiston Lake through an intake structure at Lewiston Dam. Because water temperature is a critical factor to hatchery production, stoplogs are installed around the intake to select warmer water from the surface of Lewiston Lake during the winter. In the summer, the stoplogs are removed as colder water is desired. Sometimes the water temperature in Lewiston may get too warm because of hot weather and low releases from Clair Engle Lake. Then the DFG, which operates the hatchery, will request "slugging" Lewiston Lake--this involves drawdown to the minimum operating level by increasing the release through Clear Creek Tunnel followed by refilling with increased releases from Clair Engle Lake. This procedure can be accomplished within 24 hours and without exceeding powerplant capacities at either Carr or Trinity Powerplants.

In October 1991, the SWRCB established the following temperature objectives for the Trinity River (see table II-6):

Table II-6. Temperature objectives for the Trinity River (SWRCB; October 1991)

Time period	Daily average temperature NTE[1]	River reach[2]
July 1 to September 14	60 °F	Lewiston Dam to Douglas City Bridge
September 15 to October 1	56 °F	Lewiston Dam to Douglas City Bridge
October 1 to December 31	56 °F	Lewiston Dam to the Confluence of North Fork Trinity River

[1] Not to exceed
[2] See figure 8

Hydropower

The cross-basin diversion of Trinity River water through the Trinity powerplants is very efficient in terms of power production. Under normal operating conditions, 1 acre-foot of water generates about 1,500 kilowatthours when released through Trinity, Carr, and Spring Creek Powerplants. This efficiency is about three to four times that of Shasta or New Melones Powerplants and almost five times that of Folsom Powerplant. Thus, the Trinity is extremely valuable for use in meeting CVP energy demands.

Energy production from Trinity is limited by powerplant capacities and, of course, water availability.. For short-term energy needs (i.e., hourly, daily, or monthly), increases may be made in Trinity imports with corresponding decreases at Shasta Powerplant without having to increase the release to the Sacramento River at Keswick Dam.

Annual operation of the Trinity power facilities is dictated to a large degree by contractual requirements with PG&E. Contract 2948A with PG&E specifies minimum monthly energy requirements for support of PDC. The project generation required for project load and support of PDC is especially high from July through October. Therefore, diversions through the Trinity powerplants are increased during that period and Clair Engle Lake is operated to achieve peak storage near July 1 annually.

Both Clair Engle and Whiskeytown Lakes are operated to minimize the need for releases over powerplant capacities. Storage in Clair Engle Lake is drawn down during the November through March flood season for this reason as well as to meet Safety of Dams criteria. A drawdown period also occurs during the flood season at Whiskeytown Lake to avoid spills. Table II-7 summarizes the target operating levels for Whiskeytown Lake.

Table II-7. Target operating levels for Whiskeytown Lake		
Period	**Elevation (feet)**	**Storage (acre-feet)**
April 1 - April 30	Fill to 1,209.0	238,000
May 1 - Labor Day	1,209.0	238,000
After Labor Day - October 14	Reduce to 1,208.0	234,700
October 15 - November 15	Reduce to 1,198.5	205,700
November 16 - March 31	1,198.5	205,700

All of the elevations shown above are subject to normal fluctuations of ± 0.5 feet. If Spring Creek Powerplant capacity is reduced due to an extended unit outage during the flood season, Whiskeytown Lake may be drawn down to an elevation of 1,193.0 feet (189,900 acre-feet of storage).

Extended outages at Trinity, Carr, and Spring Creek Powerplants can significantly influence reservoir operations. In order to avoid releases in excess of powerplant capacities, outages that last a week or more are usually scheduled in the late fall or spring when full capacities for the three powerplants are least likely to be required.

The capability of the Trinity Powerplant varies considerably according to the water surface elevation in Clair Engle Lake and plant discharge. The two generators have high head and low head runners designed to maximize powerplant capability. The power pool limitations in Clair Engle Lake are summarized in table II-8. Maximum power pool with the high head runner would be limited by high tailwater conditions caused by spills.

Table II-8. Summary of power pool limitations (Clair Engle Lake)		
Minimum	**Elevation (feet)**	**Storage (acre-feet)**
Low head runner	2,120.0	221,700
High head runner	2,189.0	524,000
Maximum	**Elevation (feet)**	**Storage (acre-feet)**
Low head runner	2,315.3	1,650,000
High head runner	2,375.0 (estimate)	2,530,000

The capacity of the Carr Powerplant is limited by head loss at the Clear Creek Tunnel. With a clean tunnel, the maximum powerplant discharge is approximately 3,600 ft^3/s. Lewiston Lake must be operated at elevations above 1,898.0 feet to avoid developing a vortex at the Clear Creek Tunnel inlet. The minimum tailwater elevation in Whiskeytown Lake for Carr Powerplant operation is about 1,190.0 feet. The powerplant efficiency varies with discharge and Whiskeytown Lake elevation within the range of 500 from 600 kilowatthours per acre-foot.

The capacity of the Spring Creek Powerplant is limited by head loss at the Spring Creek Tunnel. Maximum powerplant discharge is approximately 4,400 ft^3/s. The minimum operating elevation in Whiskeytown Lake for Spring Creek Tunnel inlet is 1,100.0 feet. The minimum tailwater elevation in Keswick Reservoir is 576.0 feet, as limited by the cooling water intake to Spring Creek Powerplant. The powerplant efficiency varies within the range of 450 to 560 kilowatthours per acre-foot.

Recreation

Recreation is not an authorized purpose of the Trinity Division; however, recreational use at Clair Engle, Lewiston, and Whiskeytown Lakes and on the Trinity River is significant. Although there are no legal or contractual requirements for water for recreational purposes, recreational use is still considered when making operational decisions that result in abnormal reservoir levels or flows in the river.

As mentioned earlier, the Whiskeytown-Shasta-Trinity National Recreation Area was established by Act of Congress in 1965. The Trinity Unit of the recreation area surrounding Clair Engle and Lewiston Lakes is within the Trinity National Forest and is administered by the U.S. Forest Service (USFS). The Whiskeytown Unit is administered by the National Park Service. Facilities provided in both units include campgrounds, boat launching ramps, and picnic areas. There are also marinas located at all three reservoirs. Private resorts are prevalent along the Trinity River below Lewiston Dam. The primary recreational use along the river is sportfishing, while other uses include camping, picnicking, rafting, canoeing, and gold dredging.

At Clair Engle and Whiskeytown Lakes, the prime recreation season begins on Memorial Day weekend and extends through Labor Day weekend. Most of the facilities at Clair Engle Lake remain in use in the normal operating range of 1,850,000 to 2,447,000 acre-feet or El. 2330.4 to 2370.0 feet. The lowest boat launching ramp is the low water ramp at Minorsville, which operates as low as El. 2,220 feet or 719,868 acre-feet. Because the normal operation of Clair Engle Lake results in favorable water surface elevations during the prime recreation season, recreation only suffers during dry or critically dry conditions.

Lewiston Lake receives fishing use throughout the year. The minimum operational elevation for the Pine Cove Marina is 1,900.0 feet. The normal operating range is 1,900.0 to 1,902.0 feet. Recreation is only affected during spill conditions at Trinity and Lewiston dams.

Whiskeytown Lake receives extensive use because of its location near Redding and its relatively stable operating range during the prime recreation season. As discussed in the next section, some drawdown of storage occurs during the flood season. At the reduced water surface elevation of 1,198.5 feet, most recreation facilities remain in use. If the water surface elevation is reduced to 1,193.0 feet because of an extended unit outage at Spring Creek Powerplant, two of the three boat launching ramps are not available. Only in years of severe drought will the storage in Whiskeytown Lake be drawn upon to meet water demands. Thus, conditions for recreation at Whiskeytown Lake may be ideal, while recreational uses at Clair Engle and Shasta Lakes suffer because of low storage levels.

Flood Control

Like recreational uses, flood control is not an authorized function of the Trinity Division; however, incidental flood control benefits are provided through operations for other purposes. As stated previously, Clair Engle and Whiskeytown Lakes are operated to minimize the need for releases in excess of powerplant capacities. Additionally, Clair Engle Lake is operated at reduced storage levels (no more than 2,100,000 acre-feet) during the flood season because of Safety of Dams criteria.

A minimum storage reservation of 348,000 acre-feet in Clair Engle Lake is maintained during November through March (see previous section on CVP yield at the beginning of this chapter). During a major flood, releases from Trinity Dam are restricted to the combined capacity of the powerplant and outlet works until a spill occurs. The release to the river at Lewiston Dam is reduced by the diversion through Clear Creek Tunnel unless flood conditions on Clear Creek or on the Sacramento River require the diversion to be suspended. The surcharge capacity (storage above the spillway crest) of Clair Engle Lake also effectively decreases the peak flows in the Trinity River.

Spills at Whiskeytown Lake are minimized by providing about 35,000 acre-feet of storage space during the flood season. The operation of Whiskeytown Lake during major floods is complicated by its interrelationship with Trinity River and Sacramento River operations. As indicated, hydrologic conditions and forecasts of conditions in both the Trinity and Sacramento basins must be considered when operating Whiskeytown Lake. Some of the guidelines that are followed during floods are listed below.

- Releases from Spring Creek Powerplant and diversions through Carr Powerplant are minimized when releases from Keswick Dam are decreased to meet flood control objectives at Bend Bridge.

- Releases from Spring Creek Powerplant are maximized to maintain the storage in Whiskeytown Lake at target levels except as limited by flood control operations at Keswick Dam.

- Diversions through Carr Powerplant are suspended when flood stages are exceeded at Bend Bridge.

- Diversions through Carr Powerplant are adjusted to avoid releases to Clear Creek from Whiskeytown Dam in excess of natural inflow.

- Diversions through Carr Powerplant are suspended when releases to Clear Creek from Whiskeytown Dam equal or exceed 3,000 ft^3/s. At that flow, damages begin to occur to structures downstream from the dam.

- Diversions through Carr Powerplant are maximized when the water would otherwise be released to the Trinity River because of Clair Engle Lake operations. Even at spill or near spill conditions in Whiskeytown Lake, the diversion may be continued to gain generation at Carr and Spring Creek Powerplants.

Safety of Dams Criteria

Studies completed by the Corps of Engineers (COE) in 1974 and Reclamation in 1975 showed that the spillway and outlet works at Trinity Dam are not sufficient to safely pass the inflow design flood. The dam was not authorized for flood control, and the uncontrolled spillway and outlets works were designed to a flood study completed in 1955. A January 1974 storm produced the highest peak inflow of record into Clair Engle Lake, 105,000 ft^3/s. The 5-day volume was approximately 340,000 acre-feet. COE and Reclamation studies were initiated and interim operating procedures were adopted for Trinity Dam to restrict storage in Clair Engle Lake to 2,100,000 acre-feet (El. 2347.6 feet) during the flood season from November 1 through March 31. Because of the limited release capacity from Trinity Dam below the spillway crest elevation, drawdown and controlled filling of Clair Engle Lake is necessary to keep the storage from exceeding the limitation of 2,100,000 acre-feet. Additionally, the regulation of storage below that limitation needs to be accomplished with releases that are within Trinity and Carr Powerplant capacities, and releases to the Trinity River beyond the requirements for fisheries also need to be avoided. The following guidelines are used to accomplish these objectives during the November 1 through March 31 flood season:

- Storage in Clair Engle Lake is regulated within powerplant capacity to the target storages shown in table II-9.

Table II-9. Target storage of Clair Engle Lake

Date	Storage (acre-feet)
November 1 - December 31	1,850,000
January 31	1,900,000
February 28, 29	2,000,000
March 31	2,100,000

- If the storage approaches 2 MAF and hydrologic conditions indicate a high probability of exceeding that limit, releases to the Trinity River should be increased to 1,200 ft^3/s. Releases through the Carr Powerplant should already be at its maximum capacity.

- If the storage is at or near 2 MAF with a certainty of exceeding that limit, releases to the Trinity River should be increased to 2,500 ft^3/s.
- If the storage is above 2 MAF, releases from Trinity Dam should be increased to the capacities of the inflow or outlet works, whichever is less.
- When considering increases to the Trinity River release, all meteorologic and hydrologic conditions need to be considered. When possible, consideration is given in scheduling release changes to minimize downstream fluctuations in flow.

SHASTA AND SACRAMENTO RIVER OPERATIONS

Introduction

As part of the Shasta Division, Shasta Dam and Shasta Lake on the Sacramento River serve to control floodwater and store surplus winter runoff for irrigation use in the Sacramento and San Joaquin Valleys. The Division provides maintenance of navigation flows and conservation of fish in the Sacramento River, protection of the Delta from intrusion of saline ocean water, water for M&I use, and generation of hydroelectric energy.

As part of the Sacramento River Division, the RBDD the Corning Pumping Plant, and the Corning and Tehama-Colusa Canal were authorized to supply irrigation water to land in the Sacramento Valley.

The following sections discuss the many needs that are met by the operation of the Shasta and Sacramento River Divisions.

Fish and Wildlife Requirements

Combined facilities built under the Shasta and the Sacramento River Divisions of the CVP harness the Sacramento River for delivery of irrigation and M&I water supply, navigation, flood control, power, and recreation. Figure 8 (shown previously) shows the major features of these divisions along the river.

The upper Sacramento River is the largest and most important salmon stream in California and provides more spawning habitat for chinook salmon than any other river in the State. The Sacramento River supports four separate chinook salmon runs--the winter-run, spring, summer, and fall. The population of each of the runs has declined by varying degrees over the past 20 years; the population of the winter-run has declined more than 99 percent since 1967 and is listed as threatened under the Federal Endangered Species Act. Fishery experts have identified water temperature in the upper Sacramento River as the critical factor in the decline of the winter-run. Elevated temperatures (anything above 56 °F) negatively affect spawning adults, egg maturation and viability, and preemergent fry.

Drought conditions from 1987-92 have resulted in lower than normal levels of storage in Shasta Reservoir and subsequently warmer temperatures in the Sacramento River. In response to this situation and the declining winter-run population, Reclamation has made releases from Shasta Dam's low level outlet to access cooler water and to alleviate high water temperature during critical periods of the spawning cycle of the winter-run. Low-level outlet releases have been made every year since 1987 to protect some life stages of chinook salmon runs. Releases through the low-level outlets at Shasta Dam bypass the powerplant, resulting in a loss of hydroelectric generation. In addition, in 1991 and 1992, to help improve winter-run survival, releases were made from upper level outlets to warm the Sacramento River during the upstream migration of the winter-run to induce the winter-run to spawn as far upstream as possible. Generally, the farther upstream the winter-run spawn, the more favorable the temperature conditions will be for their survival.

In 1990 and 1991, the SWRCB issued Water Rights Orders (WR) 90-5 and 91-01 which modify Reclamation's water rights for the Sacramento River. The orders include temperature objectives for the Sacramento River and state that Reclamation shall operate Keswick and Shasta Dams and the Spring Creek Powerplant to meet a daily average water temperature of 56 °F at RBDD in the Sacramento River during critical periods when higher temperature would be harmful to the fishery. To assure compliance with terms and conditions in the two orders, Reclamation must also monitor water quality.

Under the orders, the compliance point may be changed when the objective cannot be met at the RBDD. Reclamation must report any changes in the location of the temperature control point to the SWRCB Division of Water Rights and file an operation plan showing the strategy to meet the temperature requirement at the new location.

Temperature Operations Plans

In coordination with a multiagency task group (the Sacramento River Temperature Task Group) established to improve and stabilize the chinook population in the Sacramento River Basin, Reclamation has developed temperature operation plans for the Shasta/Trinity Divisions, which consider impacts on the winter-run and other races of chinook salmon and associated costs. The task group meets annually to discuss operational alternatives, new objectives, biological information, and a status report on water temperatures. Once the task group has recommended an operation plan for temperature control, Reclamation then submits a report on the operation plan to the SWRCB (generally on or before June 1 each year).

After implementation of the operation plan, the task group performs additional studies and holds meetings as needed to develop revisions based on updated reservoir and biological data. Reclamation submits a supplemental report showing any changes in the plan for the winter-run and a fall-run plan to the SWRCB before fall-run spawning season begins.

Tools Used for Analyzing Operational Alternatives

Several computer models, including the CVP operations forecast model and a temperature model for the Shasta/Trinity system, are used in analyzing operational alternatives. CVP operations are simulated for a 12-month period for the major reservoirs within the CVP, providing monthly estimates of releases required from each reservoir to meet water and energy demands for the CVP. Output from the operations forecast is then used as input to the temperature model.

The estimated releases, inflows, evaporation, and storage of the CVP's major reservoirs are used as the temperature model input data. The temperature model predicts monthly temperature versus depth profiles in Clair Engle, Whiskeytown and Shasta Reservoirs. The temperature model uses these profiles, along with projected releases, to estimate the mean-monthly temperature at various locations in the Sacramento and Trinity Rivers. Mean-monthly temperatures for the Trinity are computed from Lewiston to the river's confluence with the North Fork and on the Sacramento from Keswick to Red Bluff. The river temperature calculations are based on the release flows and temperatures from Lewiston and Keswick Dams, normal climatic conditions, and estimates of tributary accretions.

Temperature Control Alternatives

Scheduling of releases from the low-level outlets at Shasta and Trinity Dams and diversions of Trinity River water to Keswick Reservoir where it is discharged into the Sacramento River are part of the operational plan developed by the task group. Depending on conditions, operation plans may be implemented as early as April, with warm water releases from the upper outlets of Shasta Dam used to attract the winter-run salmon to spawn as far upstream as possible in the upper Sacramento River. In addition to drawing the winter-run upstream, this operation conserves cold water in Shasta for the temperature operations during the summer. By coordinating CVP and SWP operations, releases from Shasta can be minimized as the American and Feather River systems are used to meet downstream needs. To conserve as much water as possible in Shasta Lake, the releases to the Sacramento River may be limited to meeting CVP and SWP purposes that cannot be met by these other systems.

When the combination of cold water resources in Shasta Lake and Trinity diversions are insufficient to provide the desired temperatures, releases from Whiskeytown Reservoir may be used to provide additional cold water to protect the fishery resources in the Sacramento River. Since this resource is fairly limited, this plan is generally used as a last option.

Actual Operations for Temperature Control

Reclamation accesses hourly temperature data from the Sacramento and Trinity water quality network. The data are telemetered to the California Data Exchange Center at DWR where, in turn, CVP operators can access it. According to the operation plan developed by the task group, operations can be adjusted as needed to meet the temperature objective at designated control points.

The temperatures on the Sacramento and Trinity River systems are influenced by: the ratio of the Spring Creek Powerplant releases to Shasta releases, relative temperatures of the releases, total storage at Shasta Lake and Clair Engle Reservoir, the depth of releases from Shasta and Trinity Dams, the percent of total releases from each depth, ambient air temperatures and other climatic conditions, tributary accretions and temperatures, and residence time in Keswick and Lewiston Reservoirs and in the Sacramento and Trinity

Rivers. During times when project operations are being adjusted to meet critical temperature objectives, the most readily controlled factors are the Shasta low-level outlet release and the use of Trinity diversions; both of these factors can have a significant effect on downstream river temperatures. Reclamation operators may make changes in the ratio of releases between Shasta and Spring Creek Powerplants and also the percentage of Shasta releases that are discharged through the low level outlets.

However, releases for temperature control that bypass the powerplant at Shasta are not considered a long-term solution to the temperature problems on the Sacramento River. If all other options to control river temperatures are exhausted, management in both Reclamation and the DFG would be consulted immediately regarding the potential of using bypass releases from Shasta Dam. Until permanent temperature control measures are adopted, the interim bypass operation will continue as the best temperature control measure available.

Minimum Instream Flows Provided by 1960 MOA

On April 5, 1960, Reclamation and DFG executed an MOA for the protection and preservation of fish and wildlife resources of the Sacramento River as affected by the operation of Shasta and Keswick Dams and their related facilities (see figure 1). The agreement provided for minimum releases into the natural channel of the Sacramento River at Keswick Dam as shown in table II-10.

Table II-10. Minimum releases into the Sacramento River at Keswick Dam for normal years

Time period	Minimum releases (ft^3/s)
January 1 through February 28	2,600
March 1 through August 31	2,300
September 1 through November 30	3,900
December 1 through December 31	2,600

Since October 1981 (by agreement between Reclamation and DFG), a minimum release of 3,250 ft^3/s from Keswick for a normal year has been used from September 1 through the end of February. The SWRCB included this release schedule in Reclamation's water rights permits for Shasta in its Order WR 90-5 in 1990, which did not change release requirements for critical years. For critically dry calendar years based on Shasta inflow criteria, the minimum flows are shown in table II-11.

When minimum flows for critical years are used, releases are increased at least once daily to provide the flows specified for normal years, beginning about December 1 and extending to about May 1. If extremely critical conditions occur from December 1 through February 28, the flow may be reduced below 2,000 ft^3/s (by agreement between Reclamation and the DFG).

Table II-11. Minimum flow from Keswick Dam for critical years

Time period	Minimum releases (ft^3/s)
January 1 through February 28	2,000
March 1 through August 31	2,300
September 1 through November 30	2,800
December 1 through December 31	2,000

Seasonal Fluctuations Under the 1960 MOA

To achieve the best possible conditions for salmon reproduction by reducing fluctuations in river stage, the 1960 MOA provides that releases from Keswick Dam from September 1 through December 31 are made with a minimum of fluctuation or change if protecting the salmon is compatible with other operational requirements. Biologists from the DFG have indicated that the fall-run chinook salmon begin migrating about September 15. Usually, releases from Shasta and Keswick Dams are gradually reduced in September and early October during the operational transition that occurs--from meeting Delta export and water quality demands to operating the system for flood control from October through December. Normally, Reclamation attempts to reduce releases from Shasta and Keswick to the minimum fishery release requirement by October 15 each year.

From October 15 to December 31, Reclamation attempts to minimize changes in releases from Keswick. Releases may be increased to meet unexpected downstream needs, such as higher outflows in the Delta to meet water quality requirements or to meet flood control requirements. Decreases to Keswick releases may be made when tributary inflows increase to a level that will allow downstream needs to be met with reduced Keswick releases. A temporary decrease in the release from Keswick Dam occurs around the end of October or first of November for removing boards at the Anderson-Cottonwood Irrigation District's (ACID) Diversion Dam (see detailed discussion at the end of this section on the Shasta and Sacramento River Operations). To avoid release fluctuations, the base flow is carefully selected to achieve the desired target storages in Shasta Lake from October through December.

Changes and Ramping

Under WR 90-5, the following conditions to Reclamation's Shasta water rights permits for release decrease were added: (1) Releases shall not be decreased more than 15 percent in a 12-hour period, and (2) releases shall not be decreased more than 2.5 percent in a 1-hour period.

The WR 90-5 requirements are not in effect during flood control or other emergency operations. The percent reductions are applied to the original release before decreases begin. Whenever possible, decreases are at night to minimize impacts on fishery. Although WR 90-5 was published in early 1990, Reclamation had been following these guidelines since the 1970's. During normal nonemergency operations, no practical maximum rate of increase exists. Large increases are generally scheduled at night to minimize impacts on the public.

Reservoir Fishery Problems

No constraints related to fisheries in the reservoirs exist regarding operating Shasta and Keswick Dams. However, the Central Valley Fish and Wildlife Management Study identified reservoir fishery management problems and possible solutions related to the operation of these reservoirs. One problem common to many CVP storage reservoirs is extreme water level fluctuation that results from flood control and water supply operations. Accomplishing these higher priority purposes prevents an operational means of mitigating this problem.

Recreation Use at Shasta Lake and Sacramento River

A significant amount of recreational use occurs at Shasta Lake and on the Sacramento River. Although recreation is not an expressly authorized purpose for Shasta and Keswick Dams, whenever possible Reclamation considers recreational use when making operational decisions that significantly affect reservoir levels or flows in the river. No legal or contractual obligations exist for maintaining reservoir levels or riverflows to accommodate recreation at the expense of other CVP purposes.

As discussed previously regarding the Trinity River Division, the Whiskeytown-Shasta-Trinity National Recreation Area was established by Act of Congress in 1965. The Shasta Unit, administered by USFS, surrounds Shasta Lake. Facilities provided by the USFS include campgrounds, boat launching ramps, beaches, and picnic areas; also, many resorts and marinas operate under permit and provide a host of recreational facilities and services. Recreation at Shasta Lake provides a major source of income for the Shasta County economy; therefore, drawdown of the water surface in Shasta Lake has many direct and indirect adverse impacts on the area.

The prime recreation season for this recreation area begins on Memorial Day weekend and extends through Labor Day weekend. For recreational interests, it is desirable to have Shasta Lake full on Memorial Day weekend and at no less than El. 1,017.0 on Labor Day weekend. This elevation corresponds to a drawdown of 50 feet below the top of the conservation pool and is just below the bottom of the flood control storage envelope.

The rate at which reservoir drawdown occurs during the prime recreation season affects marina operators, who are concerned about the need to extend access and utilities, while boaters must be wary of being stranded in shallow waters. The maximum rate of drawdown usually occurs in July as irrigation demands peak.

As previously noted, no requirement exists to maintain reservoir levels for recreation. However, customary patterns of storage and release do result in acceptable water levels during the prime recreation season at Shasta Lake during most years. Storage normally peaks in May, and because of D-1485 pumping restrictions during May and June in the

Delta, significant drawdown usually does not occur until July and August. In drought periods, recreation suffers due to the drawdown required to meet CVP uses.

No release requirements exist at Keswick Dam for recreation; however, the releases to meet CVP uses normally provide satisfactory flows for recreation. During flood control operations, little recreational use occurs along the river. In the spring and fall, marinas in the Sacramento area have occasionally reported shallow water problems at low flows.

Flood Control Objectives and Criteria--Shasta Dam and Lake

This discussion of flood control objectives and regulating criteria is based on the ***Report on Reservoir Regulation for Flood Control, Shasta Dam and Lake*** (COE, April 1962, revised January 1977), and on the current Flood Control Diagram dated July 8, 1977 (COE, figure 9). The report and diagram were prepared by the COE pursuant to the provisions of the Flood Control Act of 1944.

Flood control objectives for Shasta Lake require that releases are restricted to quantities that will not cause downstream flows or stages to exceed (insofar as possible): (1) A flow of 79,000 ft^3/s at the tailwater of Keswick Dam, and (2) a stage of 39.2 feet in the Sacramento River at Bend Bridge gauging station (which approximates a flow of 100,000 ft^3/s).

Based on the Flood Control Diagram, storage space in Shasta Lake is reserved below El. 1,067.0. The maximum flood space reservation is 1,300,000 acre-feet, with variable storage space requirements based on the current flood hazard (determined from the daily accumulation of seasonal inflow to Shasta Lake). The Flood Control Diagram contains an explanation for its use, and a schedule of releases; one correction to the schedule is that the two references to releases of 39,000 ft^3/s should be changed to 36,000 ft^3/s, since flows in excess of 36,000 ft^3/s begin to cause flooding in Redding. Flood control operations at Shasta Lake require forecasts of flood runoff both upstream and downstream from Shasta as far in advance as possible.

Historically, the most critical CVP forecast for the Sacramento River is that of local runoff entering the Sacramento River between Keswick Dam and Bend Bridge. Travel time required for release changes at Keswick Dam to affect Bend Bridge flows is approximately 8 to 10 hours. Therefore, Reclamation maintains close liaison with the National Weather Service's River Forecast Center (NWSRFC) to obtain timely and accurate forecasts of hydrologic conditions. The RFC issues a forecast of upper Sacramento River conditions at least daily during flood periods. That forecast provides projected stages of the river at stations from Bend Bridge to Colusa.

During flood periods, CVOCO staff maintain close communication with the RFC hydrometeorologists to obtain updated projections for the river stage at Bend Bridge and the inflow to Shasta Lake. The CVOCO staff also monitors hourly flow data and real-time precipitation data to keep apprised of changing conditions. The hourly stages and flows for Cottonwood, Clear, Cow, and Battle Creeks are automatically reported to gauging stations

Figure 9

SHASTA LAKE FLOOD CONTROL DIAGRAM

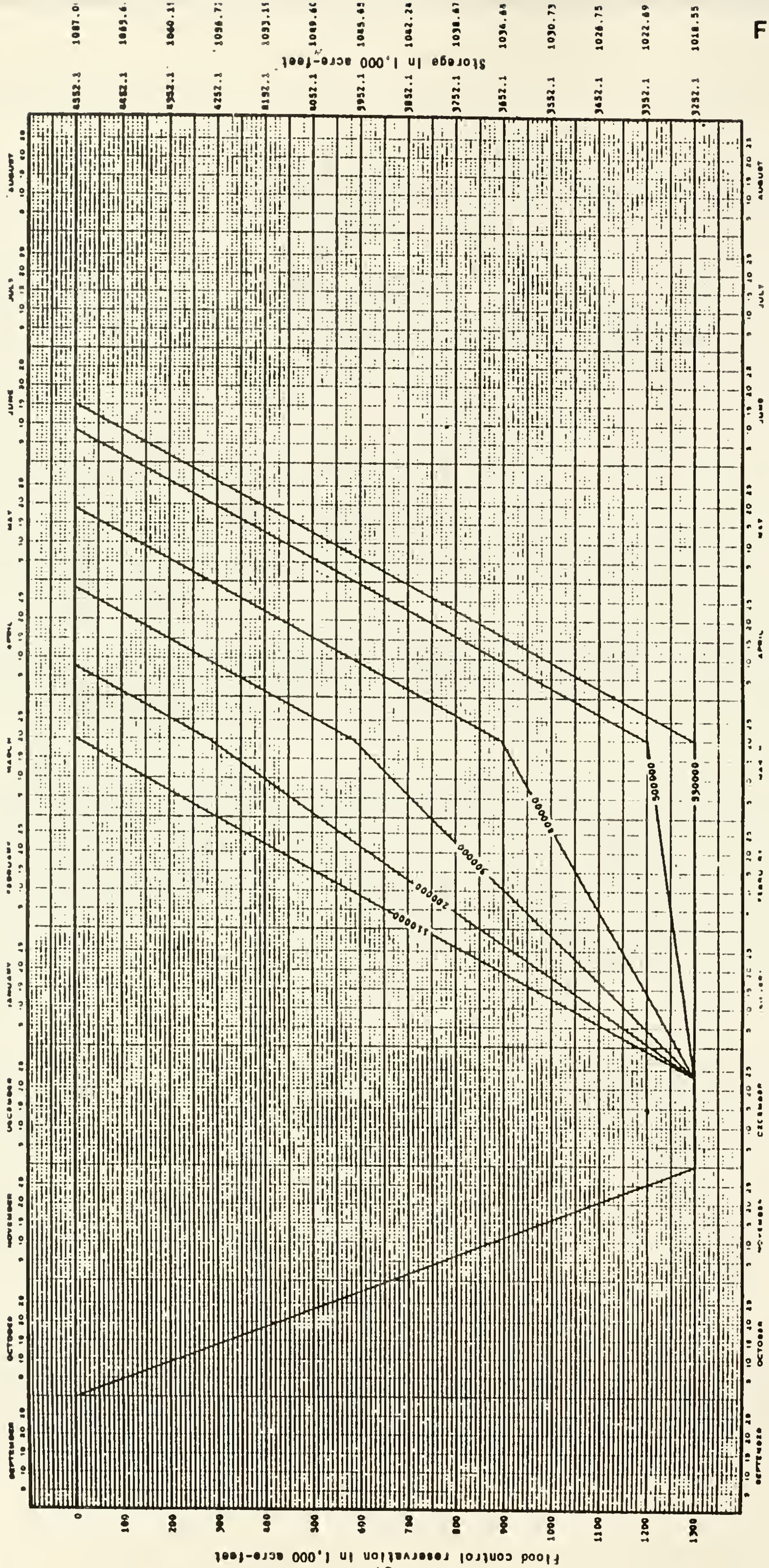


Figure 9
(continued)

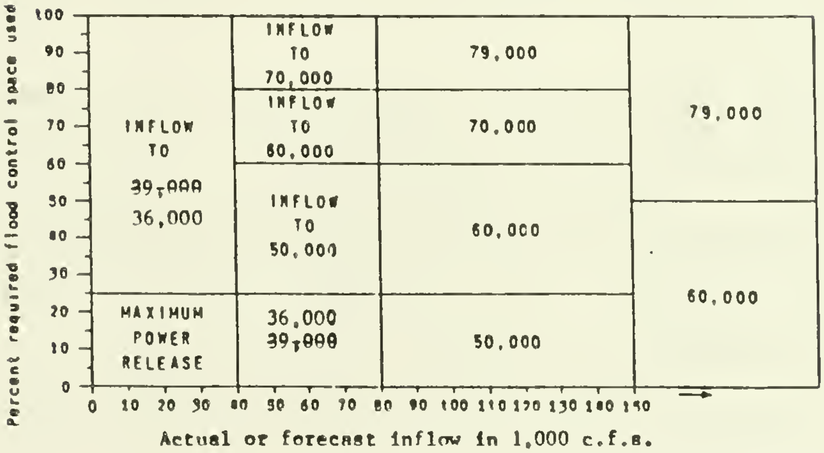
USE OF DIAGRAM

1. Rainflood parameters relate the accumulation of seasonal inflow to the required flood control space reservation on any given day. Parameter values are computed daily, from the accumulation of seasonal inflow by adding the current day's inflow in cubic feet per second (cfs) to 95% of the parameter value computed through the preceding day.*

2. Except when releases are governed by the emergency spillway release diagram currently in force (File No. SA-26-92), water stored in the flood control reservation, defined hereon, shall be released as rapidly as possible, subject to the following conditions:
   a. That releases are made according to the Release Schedule hereon.
   b. That flows in Sacramento River below Keswick Dam do not exceed 79,000 cfs.
   c. That flows in Sacramento River at Bend Bridge gage do not exceed 100,000 cfs.
   d. That releases are not increased more than 15,000 cfs or decreased more than 4,000 cfs in any 2-hour period.

*Flood Control Diagram is initialized each flood season by assuming a parameter value of 100,000 c.f.s. day on 1 October.

RELEASE SCHEDULE



SHASTA DAM AND LAKE
SACRAMENTO RIVER, CALIFORNIA

FLOOD CONTROL DIAGRAM

Prepared Pursuant to Flood Control Regulations for Shasta Dam and Lake

APPROVED: Richard M. Connell
Brigadier General, USA, Division Engineer
South Pacific Division

APPROVED: B. E. Martin
Regional Director Mid Pacific Region
U.S.B.R.

Effective Date: 8 JUL 1977 File No. SA-17-26-13 located near the confluences of these tributaries with the Sacramento River just above Bend Bridge. The precipitation is obtained from more than 20 event-reporting stations located in the watershed above Red Bluff, both upstream and downstream from Shasta Dam. Weather data, especially the quantitative precipitation forecasts issued by the National Weather Service, are monitored closely by both staffs.

When necessary, CVOCO staff monitors conditions and direct operations around the clock. During flood operations, the CVOCO staff meteorologist work as liaison at the RFC and DWR flood operations center.

If the flow at Bend Bridge is projected to exceed 100,000 ft^3/s, the release from Keswick Dam is decreased so that the 100,000-ft^3/s flow at Bend Bridge is not exceeded. As the flow at Bend Bridge is projected to recede, the Keswick Dam release is increased to evacuate water stored in the flood control space at Shasta Lake. Changes to Keswick Dam releases are scheduled to minimize rapid fluctuations in the flow at Bend Bridge. Again, accurate and timely forecasts of local runoff are necessary to achieve the desired control over flows in the upper Sacramento River.

When making release changes at Keswick Dam for flood control purposes, the following release levels are considered:

- The capacity of Keswick Powerplant is about 16,000 ft^3/s, which would be a maximum release rate when no flood control space is being used.

- The maximum capacity of Shasta Powerplant is about 18,000 ft^3/s, although it varies considerably with the head. The release schedule on the Flood Control Diagram requires maximum powerplant release when Shasta Lake storage is encroached into the flood control space by 25 percent or less, with actual or forecasted inflows of 40,000 ft^3/s or less. The Keswick Dam release must include discharge from Spring Creek Powerplant, releases from Spring Creek Debris Dam, and sideflow into Keswick Reservoir.

- Flows in excess of 36,000 ft^3/s begin to cause flooding in Redding. The Keswick Dam release needs to be restricted to this level for as long as the release schedule on the Flood Control Diagram allows.

The Flood Control Diagram specifies that releases should not be increased more than 15,000 ft^3/s or decreased more than 4,000 ft^3/s in any 2-hour period. The restriction on the rate of decrease is intended to prevent sloughing of saturated downstream channel embankments caused by rapid reductions in the river stage. In rare instances, the rate of decrease may have to be accelerated to prevent exceeding the flow of 100,000 ft^3/s at Bend Bridge. The CVOCO operational data management system maintains daily Shasta Lake flood control storage requirements. A computer program is used for projecting the flood control storage requirements, given forecasted daily inflows and schedules releases. By projecting the flood control storage requirements, a desired schedule for releases at Keswick Dam can be developed, which is useful both in anticipating future encroachment problems and in analyzing receding flood control conditions.

Navigation and Related "Depth and Head" Issues of the Sacramento River

Navigation is an expressly authorized function of Shasta and Keswick Dams. The River and Harbors Acts of August 30, 1935, and August 26, 1937, authorized funds for expenditure in accordance with plans set forth in the Rivers and Harbors Committee Document Number 35, 73rd Congress. Document Number 35 recommended providing channel depths of 6 feet between Sacramento and Colusa and 5 feet between Colusa and Chico Landing (see previous figure 2), and a minimum flow of 5,000 ft^3/s between Chico Landing and Sacramento. Section 7 of the Flood Control Act of December 22, 1944, provides that it is the duty of the Secretary of War to prescribe regulations for the use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds. The COE now has this responsibility. In 1952, it was decided not to allocate storage space in Shasta Lake to navigation and that Section 7 would not apply to navigational features. Although the COE is, therefore, without authority to regulate Shasta operations for navigation, the River and Harbors Act of 1937 and subsequent acts obligated Reclamation to operate Shasta Dam to improve navigation.

Recently, no commercial traffic occurs between Sacramento and Chico Landing, and, therefore, the COE has not dredged this reach to preserve channel depths since 1972. Because no detrimental consequences occur to navigational interests, Reclamation does not operate to provide a minimum flow of 5,000 ft^3/s at all points below Chico Landing. However, Shasta and Keswick Dams are operated to provide a minimum flow of 5,000 ft^3/s at Wilkins Slough in all but extremely dry years.

The navigation requirement of a minimum flow of 5,000 ft^3/s has been used as the basis for designing many of the pumping stations along the Sacramento River. At flows below 5,000 ft^3/s, diverters have reported increased pump cavitation as well as greater pumping head requirements. Diverters are able to operate for extended periods at flows as low as 4,000 ft^3/s at Wilkins Slough, but pumping operations become severely affected, and some pumps become inoperable at flows lower than this. On a daily operating basis, flows may drop as low as 3,500 ft^3/s for short periods while changes are made in Keswick releases to reach target levels at Wilkins Slough, but using the 3,500 ft^3/s rate as a target level for an extended period would have major impacts on diverters.

No criteria have been established that specifies when the flow criteria will be relaxed. However, the basis for Reclamation's decision to operate at less than 5,000 ft^3/s is the increased importance of conserving water in storage when water supplies are not sufficient to meet full contractual delivery and other operational requirements.

Water Quality Problems Caused by Spring Creek

Water quality problems caused by acid mine drainage from Spring Creek into Keswick reservoir and the Sacramento River are a major concern to CVP operations. In the Spring

Creek watershed, concentrated acid mine water from several inactive copper mines and leaching from exposed ore bodies and tailing piles have caused fishkills in the Sacramento River below Keswick Dam. Operating Spring Creek Debris Dam and Shasta Dam with dilution criteria has allowed some control of the toxic wastes, but in January 1980, Reclamation, DFG, and SWRCB executed a Memorandum of Understanding (MOU) to implement actions to further protect the Sacramento River system from heavy metal pollution from Spring Creek and adjacent watersheds. The MOU identifies actions and responsibilities for each agency and established release criteria based on allowable concentrations of total copper and zinc in the Sacramento River below Keswick Dam. The release criteria are summarized below:

- The Iron Mountain Mine area above Spring Creek Debris Dam is currently undergoing cleanup operations as part of the Environmental Protection Agency Superfund. Part of this cleanup includes diverting inflows to Spring Creek Debris Dam that flow through the Iron Mountain Mine drainage around the drainage directly into Keswick Reservoir. This results in the inflow into the debris dam being reduced; however, metal concentrations in the inflow may be higher than in previous years. In general, the equations developed for the MOU are only used as a basis for releases. If the threat of a hazardous waste spill is not imminent, releases are generally set at a reduced percentage of the allowable according to the MOU equations. As monitoring data become available, this percentage is adjusted up or down as needed to meet the requirements below Keswick Dam.

- When Spring Creek Reservoir storage exceeds 5,000 acre-feet, the MOU provides for "emergency" relaxation amounting to a 50-percent increase in the specified objective concentrations of copper and zinc. Recently, Reclamation and the DFG have agreed not to use the emergency criteria until a spill actually occurs.

Under the provisions of the MOU, Reclamation agrees to operate according to the above-mentioned criteria and schedules, provided that such operation will not cause flood control parameters on the Sacramento River to be exceeded or interfere unreasonably with other CVP requirements (as determined by Reclamation). The MOU also specified a minimum schedule for monitoring copper and zinc concentrations at Spring Creek Debris Dam and in the Sacramento River below Keswick Dam. Reclamation has primary responsibility for this monitoring, although DFG and the Regional Water Quality Control Board (RWQCB) also collect and analyze samples as needed. After a multilevel intake structure at the debris dam was installed, the monitoring schedule specified in the MOU was modified to sample a minimum of once weekly, regardless of the elevation in the dam.

To minimize the buildup of metal concentrations in the water in the Spring Creek arm of Keswick Reservoir, releases from the debris dam need to be coordinated with releases from Spring Creek Powerplant to keep the arm of the powerplant flushed out. This coordination is not always possible when Spring Creek Powerplant may not be scheduled to operate. During these periods, Spring Creek may be operated at "Speed No Load" (SNL) to meet electrical system needs. Running the units at SNL requires small amounts of water and provides some flushing of the Spring Creek arm. The number of hours the units at Spring Creek Powerplant may be operated according to this method depend on electrical system needs and the availability of water for release to Spring Creek Powerplant. If releases are made from the debris dam but Spring Creek Powerplant has not operated recently and power generation is scheduled, the units at the Spring Creek Powerplant generally will be run for several hours at SNL before they begin generating. This is done to minimize the slugging effect that might occur if the units at Spring Creek Powerplant were instantly brought to full load. When power generation from Spring Creek Powerplant is needed for electrical system emergencies, it may not be possible to operate the units at SNL before generating.

Operating Spring Creek Debris Dam during major flood events is complicated because releases from Keswick Dam may be reduced to meet flood control objectives at Bend Bridge just when storage and inflow at Spring Creek Reservoir are high. Because Spring Creek releases may have to be reduced when Keswick releases are reduced to maintain the required dilution of copper and zinc, spills can and have occurred from Spring Creek Reservoir. In these situations, the amount and concentrations of the spill must be considered to calculate the allowable Spring Creek Debris Dam release, and the release from the outlet works must be adjusted accordingly. When spills exceed the allowable release, the Spring Creek Powerplant discharge may be curtailed to confine the toxic water in the Spring Creek arm of Keswick Reservoir until Keswick releases can be increased.

In some cases, Reclamation has voluntarily released additional water from Shasta Lake and/or Spring Creek Powerplant to dilute spills to meet ratios of toxic metals below Keswick Dam. No criteria have been established for making these releases, and the releases therefore have been treated on a case-by-case basis. Since water released for diluting spills is likely to be in excess of any other CVP requirements, these releases risk losing the beneficial use of the water for other purposes.

Seepage and Drainage Problems in the Sacramento River

There has been a long history of concern among farmers over seepage from the Sacramento River to adjacent farmlands. Reclamation has shown in numerous studies that high stages in the river can result in seepage flow under levees. While other factors including flood-plain topography and stratigraphy influence seepage, the height and duration of the river stage above the level of adjacent land are major contributors to the extent and severity of the seepage. Because the operations of Shasta and Keswick Dams do regulate a substantial portion of riverflow, these operations can affect seepage potential. In most years, Shasta Dam operations do provide some degree of seepage control; however, Shasta was not authorized specifically for controlling seepage and the impacts of operations on seepage potential are incidental to authorized CVP purposes.

Widespread seepage damage might be expected to occur in those very wet years when inflow to Shasta Lake exceeds the 90-percentile level, particularly those years that have major flood events late in the season. Because of a large amount of storage space that would have to be reserved for seepage control in these wet years, operation for Shasta Lake for that purpose is not justifiable. However, in less extreme years, Shasta and Keswick Dams may be operated for some control of seepage while not affecting authorized CVP functions. When releases from Keswick Dam can be reduced in March and April to lessen seepage potential during those months, the threat of damage to crops is significantly reduced. (During this period, deciduous fruit and nut trees are coming out of dormancy and annual crops are being planted.)

Another seepage-related concern in the Sacramento River is the diversion of water from the Trinity River to the Sacramento River when stages in the Sacramento River are high. In these situations, the amount of diverted Trinity River water is normally a small percentage of the total flow in the Sacramento River. The impact of this diversion on river stages depends on hydraulic conditions in the river and bypass system. If a spill is already occurring at Moulton and Colusa' weirs, an increase in the release at Keswick Dam will have little impact downstream. If a spill is not occurring, the impact on increased stages will vary, depending on the width of the river channel.

Because power is an authorized purpose of CVP and Trinity in particular, diversions are made when runoff cannot be stored in Clair Engle Lake. During the flood season, the diversion is made to regulate storage in Clair Engle Lake while minimizing the spill to Trinity River. The diversion is suspended whenever the Sacramento River approaches or reaches flood stage. The diversion is normally minimized during the spring as Clair Engle Lake is filled; however, exceptional runoff conditions may require high diversions during this period.

During September and October, farmers in the Sacramento Valley drain their rice fields; and high stages in the Sacramento River can impede this drainage. Drainage from the Colusa Basin Drain, which enters the Sacramento River near Knights Landing, is especially susceptible to capacity problems. Colusa Basin Drain flows are regulated at a Knights Landing outfall structure. Some flow from the drain can also be diverted through the Knights Landing Ridge Cut to the Yolo Bypass when the Sacramento River is high. When river stages are sufficiently high at Knights Landing to restrict flows from the outfall structure, water in the drain backs up and floods land on the west side of the drain if the Ridge Cut is insufficient to release flows during this time of year. Water that is backed up enough to flow through the Ridge Cut causes agricultural damage by flooding farmlands in the Yolo Bypass.

The stage in the Sacramento River at Knights Landing that begins to impede flow from the Colusa Basin Drain varies depending on the magnitude of drainage flows. In September 1982, problems occurred at a stage of 22.8 feet at Knights Landing, which corresponds to a stage of 32.7 feet (or 9,600 ft^3/s) at Wilkins Slough. As a general guideline, drainage problems might occur when the stage at Wilkins Slough exceeds 32.0 feet ($>9,000$ ft^3/s) in September and October. At this time of year, the releases from Keswick Dam are being decreased from the level required in August for Delta demands to a base release for salmon spawning. In all but very wet years, the releases at Keswick Dam, combined with minimal accretions or depletions between Keswick and Wilkins Slough, should result in flows less than 9,000 ft^3/s. CVP generally operates with enough flexibility during this period to permit adjusting the releases to alleviate severe drainage problems.

The timing and amount of drainage flows entering the Sacramento River during rice field drainage is regulated by the RWQCB to limit the impact of pesticide and other chemical constituents in the drainwater. During the heaviest drainage periods, CVP and SWP operations in the Feather and American Rivers and in the Delta may be adjusted to adequately compensate for changes in Sacramento River flows and control outflows from the Delta.

Needs of ACID Diversion Dam

ACID diverts water from the Sacramento River in Redding. The United States and ACID signed a contract (No. 14-06-200-3346A) providing for CVP water service and an agreed-upon amount of water diversion. The ACID diverts to their main canal on the right bank of the river from a diversion dam located in Redding about 5 miles downstream from Keswick Dam. The diversion dam consists of boards supported by a pinned steel superstructure anchored to a concrete foundation across the river. The boards are manually set from a walkway supported by the steel superstructure. The number of boards set in the dam varies depending upon riverflow and the desired head in the canal.

The contract between the ACID and the United States allows the ACID to notify Reclamation (as far in advance as is reasonably possible) each time it intends to install or remove boards from its diversion dam. Reclamation similarly notifies the ACID each time it intends to change releases at Keswick Dam. In addition, during the irrigation season, the ACID notifies Reclamation of the maximum flow that they believe its diversion dam and its current board setting of boards can safely accommodate. Reclamation notifies the ACID at least 24 hours in advance of any change in releases at Keswick Dam that would exceed the maximum flow designated by the ACID.

The irrigation season for the ACID runs from April through October; therefore, around April 1 of each year, the ACID erects the diversion dam, which consists of raising the steel and installing the walkway and then setting the boards. Around November 1 of each year, the reverse process is accomplished. The dates of installation and removal vary depending upon hydrologic conditions. Removal and installation of the dam cannot be done safely at flows greater than 6,000 ft^3/s. Usually, the ACID requests Reclamation to limit the Keswick release to a maximum flow of 5,000 ft^3/s for 5 days so they can install or remove the dam. As indicated previously, sometimes during the irrigation season the setting of the boards must be changed due to changes in releases at Keswick Dam. When boards must be removed due to an increase at Keswick, the release may have to be decreased first to allow that work to be done safely. If an emergency exists, personnel from Reclamation's Shasta Office can be dispatched to assist the ACID in removing the boards.

Rates of release decreases required for the ACID operations are limited to 15 percent in a 12-hour period and 2-1/2 percent in any one hour. Therefore, advance notification is important when scheduling decreases to allow for installation or removal of the ACID dam. Flood control operations and other emergencies are not affected by the release change limitations.

Requirements for Operating the RBDD

The RBDD impounds water in Lake Red Bluff for diversion into the Tehama-Colusa and Corning Canals. Water is passed downstream through a variety of fish facilities and 11 fixed wheel gates. Sacramento River water is diverted into the canals by gravity through a gated intake structure. Since 1988, because the dam gates are raised for the winter-run chinook salmon, winter diversions have been made through 100-horsepower vertical propeller pumps, with a current total capacity of 125 ft^3/s.

Flowthrough Fish Facilities at the RBDD. Fish facilities include fish ladders and diffusers on both abutments and a bypass for returning fish diverted into the canal headworks back to the river. At full lake elevation, flows through these facilities total about 870 ft^3/s. Additionally, since 1984, gate 6 on the dam has been converted to a center fish ladder from June 1 to December 1 (this period varies according to the weather), which allows an additional 60 to 80 ft^3/s of water to pass through.

Gate Operations (December through April) at RBDD. All gates are usually open beginning December 1 for passage of chinook salmon and are closed by about April 1. These dates can change depending on weather conditions and irrigation demands; for instance, gates will be raised sooner than December 1 if runoff from storms is heavy. Also, gates will be closed later than April 1 if irrigation demands do not exceed the pumping capacity of 125 ft^3/s and the wheeling capacity available from the Orland Project (up to 70 ft^3/s through Orland Lateral 40). Closing the gates at the beginning of the irrigation season usually requires extra releases from Keswick to maintain minimum flows past the dam, while building up the elevation in Lake Red Bluff.

Gate Operations (May through November) at RBDD. Flow downstream of the dam is governed by releases from Keswick Dam; these releases maintain minimum flows downstream of Red Bluff and are determined by the CVOCO staff. Operational control at Red Bluff consists of maintaining a lake elevation of 252.6 by an automated gate, gate 11. If gate 11 cannot pass the flow necessary to maintain the target lake elevation, additional gates are opened incrementally.

Diversions from Red Bluff. Major diversions from Lake Red Bluff that use the gated intake typically start around April or May each year and end when the dam gates open about December 1. The start of the irrigation season can vary significantly based on factors such as water supply, rainfall, weather, and cropping patterns. With the RBDD presently operated solely for the passage of winter-run chinook salmon, water demand between December 1 and April 1 is handled by using alternate water supplies at Black Butte Reservoir and 5 to 100 horsepower permanent pumps (with a total capacity of 125 ft^3/s of flow) at the

RBDD. Black Butte water is delivered through Orland Lateral 40, whose maximum capacity of 70 ft^3/s is subject to reduction by the Orland Project's use of the lateral.

During the irrigation season, two peaks typically occur to the water diversion. These peaks generally occur during the startup of water used to irrigate the rice fields in May and again in July at the peak of the irrigation season. Flow ranges during these peaks are between 1,500 to 2,000 ft^3/s. Total annual diversion (again, this depends on various factors) are around 350,000 to 400,000 acre-feet. This amount is the combined amount of water deliveries to the Corning and Tehama-Colusa Canal Water Contractors, the Glenn-Colusa Irrigation District, the Tehama-Colusa Canal Fish Facility, and the Sacramento River Wildlife Refuge.

AMERICAN RIVER OPERATIONS

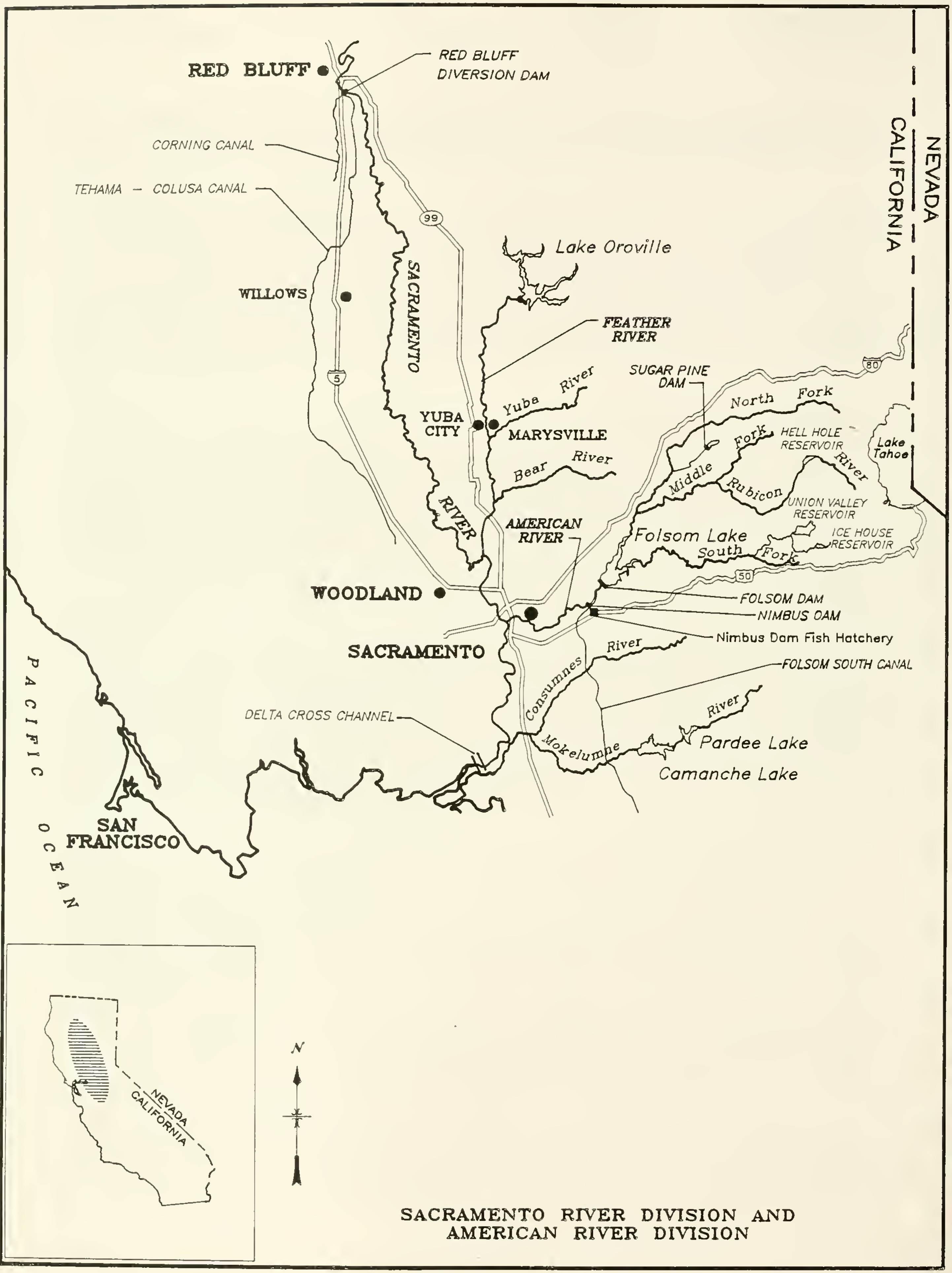
As part of the American River Division, Folsom Dam, Lake, and Powerplant; Nimbus Dam; Lake Natoma; and Nimbus Powerplant are located on the American River. Folsom Dam regulates the flow of the American River for irrigation, power, flood control, M&I use, fish and wildlife, recreation, and other purposes. Also included in the American River Division is Jenkinson Lake (formed by Sly Park Dam) and the Folsom South Canal, which originates at Lake Natoma. The uncompleted Auburn Dam is also a part of the American River Division.

Folsom Dam and Lake were authorized in 1949 as a feature of the American River Division (see figure 10) to provide water for irrigation, M&I use, hydroelectric power, recreation, water quality, and flood control. Numerous factors are considered when determining operations for this division, including the inbasin water needs of the American River along with water supply needs and power requirements of the CVP as a whole. Other contributing factors that affect operations are current and anticipated hydrologic conditions as well as operator experience and intuition. The following discussion details the analysis behind CVP operations on the American River.

Fish and Wildlife Requirements

When Folsom Dam was completed in 1956, nearly 90 percent of the riverine habitat was isolated from anadromous fish. To mitigate for the loss in habitat, a hatchery was included in the early features of the American River Division. The Nimbus Fish Hatchery, the adjacent American River Trout Hatchery, and the lower American River are now responsible for propagating one of the largest salmon and steelhead fisheries in the Sacramento River watershed. Although the hatcheries have been successful, it is important to maintain a natural anadromous fishery in the remaining habitat of the lower American River; thus, American River operations attempt to aid the needs of both the river and the hatchery fish.

The two principal factors influencing the viability of fish populations in the American River are flow and water temperature. Most resident fish in the lower American River are tolerant of fluctuations in flow and temperature, but nonresident species like salmon, steelhead, and



SACRAMENTO RIVER DIVISION AND AMERICAN RIVER DIVISION shad are more sensitive to changing water conditions. Folsom operations recognize this sensitivity. A discussion of fishery concerns in the American River by season follows.

Flows and Habitat in the American River

About mid-October, lower American River releases are established at a level that can likely be maintained at a minimum through February, which provides stable flows in the river for spawning and incubation of salmon. Typically, the release is fixed at between 1,000 ft^3/s and 1,750 ft^3/s, depending on Folsom Lake storage at the end of September and expected inflows from upstream reservoirs. If hydrologic conditions in the fall are extremely dry, the established flow may be reduced. An attempt is made to limit the rate and magnitude of release changes because any reduction in flow creates the potential to expose redds. However, short-term increases followed by reductions are sometimes necessary for salinity control in the Delta.

The fall flows described above are probable when sufficient water supplies are available. They are, however, somewhat larger than the minimums currently required of Reclamation. SWRCB Decision 893 (D-893) defines the minimum allowable riverflow as 500 ft^3/s from September 15 through December 31. If Auburn Dam and additional reaches of Folsom South Canal are ever completed, SWRCB Decision 1400 (D-1400) will become effective and a riverflow of 1,250 ft^3/s will be required from October 15 through July 14. Although it is not required, current Reclamation operations attempt to satisfy criteria similar to those found in D-1400.

Flood operations generally prescribe any release changes during the winter. Typically, this results in a series of release increases for short durations followed by a reduction to the established minimum flow or, in some circumstances, establishing a higher minimum flow. In extremely dry years, it may be necessary to reduce the established minimum release. Reclamation attempts to limit the magnitude and rate of the reduction, and the release is never reduced below the minimums required under D-893. If salmon and steelhead young are in the river, high flows can in effect flush them out into the Sacramento River. Those that remain in the lower American River can be stranded in nonconnecting side channels as the flows are reduced. To avoid stranding these fish, flow reductions are planned with gradual changes that enable the young to return to the main channel.

Steelhead trout are given less consideration than salmon because they are more adaptable to variable water conditions. Unlike salmon, steelhead have the ability to reabsorb their eggs if spawning conditions are not favorable, and steelhead also do not die after spawning. This ability to adapt to changing conditions means they are not as susceptible to American River operations, which differ from conditions that existed before the CVP was established. The various resident fish species are also more adaptable than salmon and require no special consideration from CVP operations.

Water Temperatures Downstream and at Hatchery (American River)

Along with flow, proper water temperature must also be maintained to protect the salmon fishery. Water temperature is a function of cold water storages ambient air temperatures and flow. In the winter, source and ambient air temperatures create sufficiently cold water temperatures regardless of flow. During the remainder of the year, the overriding influence on water temperature may be one, two, or all three of the above-mentioned variables. CVP operations can exercise some control over source temperature and flow, but they have no control over ambient air temperature, so Reclamation attempts to preserve cold water in Folsom for release in the fall.

The coldest water is located in the bottom of Folsom Reservoir. To conserve this resource, releases that do not require the coldest water are taken from other levels. Folsom Dam has an intake structure with louvers which allows the selective withdrawal of water. Typically, the warmest water is released until temperatures are too high for successful hatchery operations. Hatchery personnel advise Reclamation of this condition, and, if cold water exists, the louvers are set to allow its removal. Because hatchery needs may require this cold water during the summer, a conflict occurs with the need to retain cold water for release in the fall for salmon spawning in the lower American River.

Recently, temperature operations required for the winter-run chinook salmon in the Sacramento River have reduced the operational flexibility of Folsom to react to fall conditions. This flexibility loss is particularly evident in dry years when efforts to maintain a cold water pool in Shasta through the summer result in lower-than-normal summer Keswick releases and higher-than-normal summer Folsom releases. Thus, Folsom storage in the fall may be lower than normal with a smaller cold water pool and therefore with less capability to provide cold fall flows. The management of Folsom's cold water pool requires constant attention and also receives close scrutiny from the public.

Recreation Use at Folsom Lake and American River

Both the lower American River and the reservoirs behind Folsom and Nimbus provide significant recreation opportunities. The principal reservoir recreation is boating and fishing, while river recreation is primarily rafting and fishing. Folsom Lake is the most popular multiuse year-round unit in the California State Park System.

Recognizing the importance of lake recreation, the elevation of Folsom Lake is a consideration for summer/fall operations. With summer the heaviest use period, as much water as possible must be kept in storage. The summer recreation season extends through the Labor Day holiday in September. Reclamation attempts to keep enough water in storage throughout the summer to maintain access to boat launching and marina facilities; however, recreation is considered subordinate to other demands on Folsom's water. In normal water year, the marinas may be accessible year round, but in extremely dry years, the marinas may be inoperable as early as July. As a regulating reservoir, Lake Natoma fluctuates several feet daily, but does not experience extreme seasonal fluctuations. Lake Natoma is used for boating and fishing.

Rafting on the lower American River accounts for the largest number of recreation days. From spring through summer, ambient air temperature and flow levels are conducive to this type of activity, and although river recreation is not considered when allocating water, it is a safety concern to Reclamation. During the spring of wetter years, releases from Nimbus Dam may have to be sustained at high levels for prolonged periods. Fishing along the lower American River does not receive any special consideration by Reclamation other than that given to protect certain species.

Flood Control Objectives and Criteria--Folsom Dam and Lake

Flood control requirements and regulating criteria are specified by the COE and described in the ***Folsom Dam and Lake, American River, California, Water Control Manual*** (COE, December 1987). Flood control objectives for Folsom require that the dam and lake are operated to:

- Protect the city of Sacramento and other areas within the lower American River flood plain against reasonably probable rain floods.

- Control flows in the American River downstream from Folsom Dam to existing channel capacities, insofar as practicable, and to reduce flooding along the lower Sacramento River and in the Delta in conjunction with other CVP projects.

- Provide the maximum amount of water conservation storage without impairing the flood control functions of the reservoir.

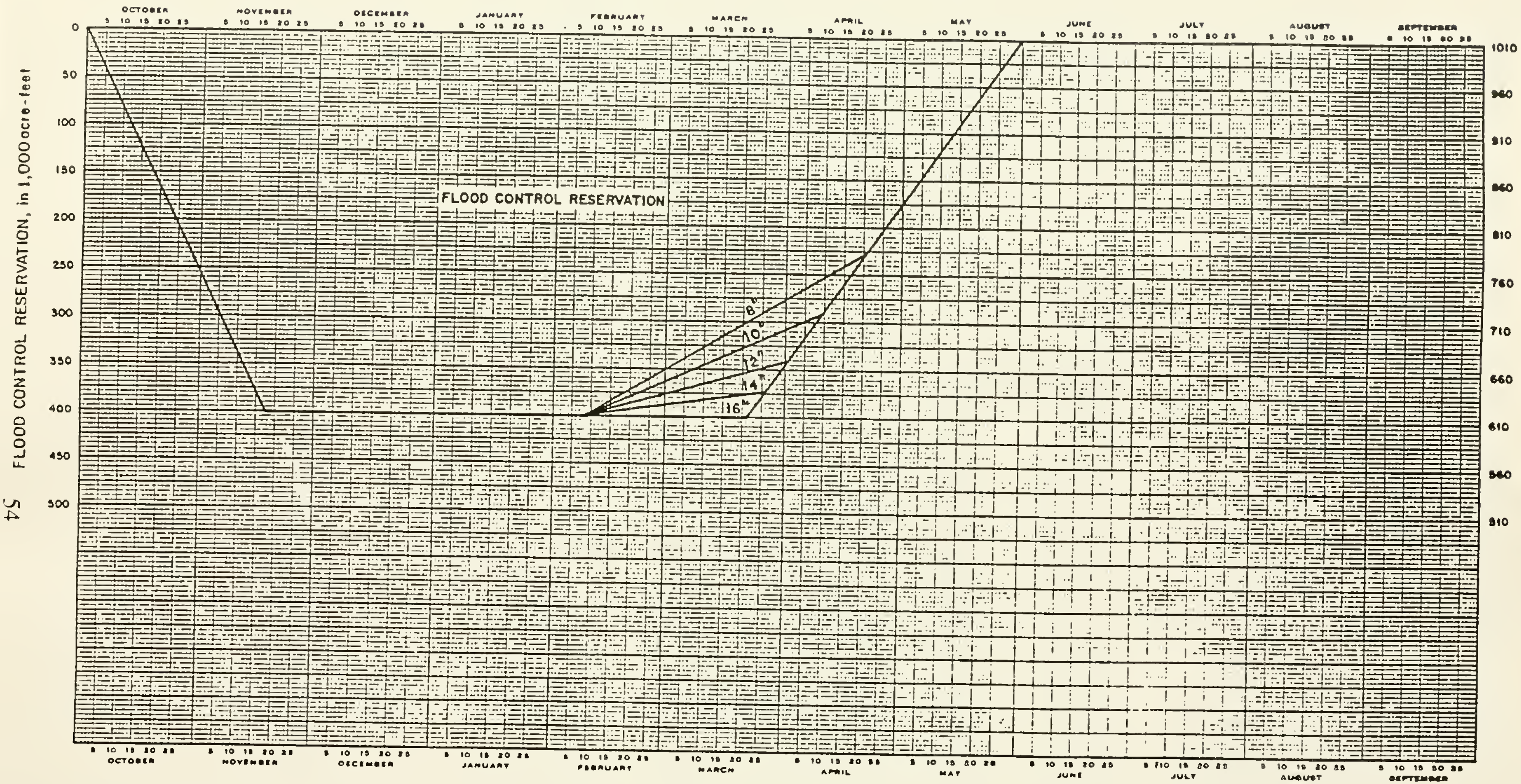
- Provide the maximum amount of power practicable and be consistent with required flood control operations and the conservation functions of the reservoir.

Allowable flood control storage, as depicted in figure 11, depends on the time of year and wetness of the particular basin. From June 1 through September 30, no flood control storage restrictions exist. From October 1 through February 7 and from April 20 through May 31, reserving storage space for flood control is a function only of the date, with full flood reservation space required from November 17 through February 7. Beginning on February 8 and continuing through April 20, flood reservation space is a function of both date and wetness of the basin. Essentially, if basin conditions are on the dry side, required flood control space is thus reduced. Conversely, if the basin has experienced a considerable amount of precipitation, the flood control space is not reduced until later on in the season.

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

Figure 11

FOLSOM LAKE FLOOD CONTROL DIAGRAM



*Folsom Lake was resurveyed in 1991 and the maximum storage capacity is now 974,000 acre-feet. The storages on this diagram are based on the previous storage capacity of 1,010,000 acre-feet.

Figure 11
(continued)

NOTES

1. The objective of the Flood Control Diagram is to provide an increased degree of protection to the Lower American River during the development of a revised flood control operational plan for the American River Basin.
2. Flood Control Reservation is the flood control space required under present authorization. When water is stored in this space, reservoir releases must be in accordance with requirements of this diagram.

USE OF DIAGRAM

1. Rain flood parameters define the flood control space reservation on any given day and are computed daily from the weighted accumulation of seasonal basin mean precipitation by adding the current day's precipitation in inches to 97% of the parameter computed the preceding day.
2. Except when larger releases are required by the accompanying Emergency Spillway Release Diagram, water stored within the Flood Control Reservation; defined hereon, shall be released as rapidly as possible subject to the following schedule:

   a. Required Flood Control Release — Maximum inflow 1/ up to 115,000 cfs but not less than 20,000 cfs when inflows are increasing

   b. Releases will not be increased more than 15,000 cfs or decreased more than 10,000 cfs during any 2 hour period.

1/ Maximum inflow is the greatest inflow since storage entered into Flood Control Reservation

FOLSOM DAM AND LAKE
American River, California

FLOOD CONTROL DIAGRAM

Prepared Pursuant to Flood Control Regulations for Folsom Dam and Lake in accordance with the Code of Federal Regulations Title 33 Part 208.11

APPROVED Patrick J. Kelly
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South Pacific Division

APPROVED Neil W. Schild
Regional Director Mid Pacific Region
U.S.B.R.

Effective Date 7 November 1986 File No. AM-1-26-584

- Maximum inflow (after the storage entered into the flood control reservation space) of as much as 115,000 ft^3/s but not less than 20,000 ft^3/s when inflows are increasing.

- Releases will not be increased more than 15,000 ft^3/s or decreased more than 10,000 ft^3/s during any 2-hour period.

- Flood control requirements override other operational considerations in the fall and winter period. Consequently, changes in river releases of short duration may occur. Reclamation attempts to plan operations to avoid minor fluctuations in flow and to maximize the amount of water that can be released for hydropower generation.

In normal years, the focus of Folsom operations is on filling Folsom Lake near the end of May when flood control restrictions are lifted. In drier years, Folsom may be permitted to fill earlier as flood control restrictions are gradually eased.

DELTA OPERATIONS

Introduction

The CVP's Delta Division includes the Delta Cross Channel, the Contra Costa Canal, the Tracy Pumping Plant, and the Delta-Mendota Canal. The Delta Cross Channel is a controlled diversion channel between the Sacramento River and Snodgrass Slough, in the Delta. The channel provides a supply of water to the intakes of the Contra Costa and the Delta-Mendota Canals, improves the irrigation supplies in the Sacramento-San Joaquin Delta, and helps repel ocean salinity. The Tracy Pumping Plant diverts water from the Delta to the head of the Delta-Mendota Canal. The Delta-Mendota Canal is discussed in the section following Delta Operations, with the operations of the San Luis Unit.

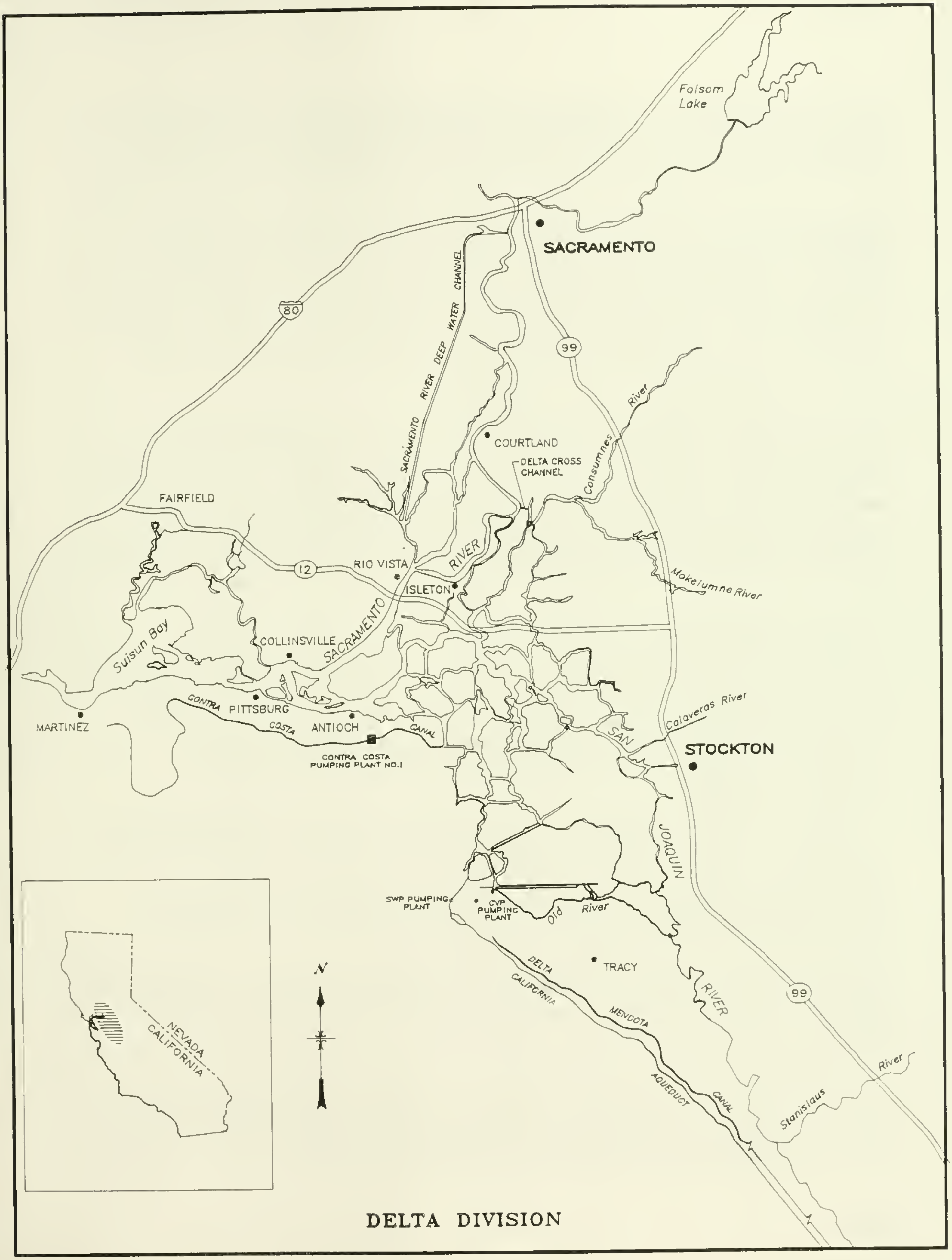
The Delta was originally a tidal marsh providing habitat for numerous species of wildlife, fish, and plants. Depending on the time of year, the Delta was either a freshwater wetland or brackish marsh. More than 80 percent of this former marsh was leveed and developed for agriculture between the mid-1800's and early 1900's. Figure 12 depicts the major features of this division of the CVP.

CVP operations for satisfying the requirements of the 735,000 acres encompassed by the Delta consider the requirements of riparian water rights holders, the conditions imposed by D-1485 to protect the environment and water quality, and the export diversions needed by the CVP and the SWP to meet their respective contractual commitments south of the Delta. Export diversion requirements are covered in the following section. Reclamation facilities within the Delta region are DCC, DMC, the Tracy Pumping Plant, and CCC. Responsibility for meeting Delta water quality requirements is currently shared by the CVP and the SWP.

Water Rights--Delta Division

In late 1850, the Swamp and Overflow Land Act (SOLA) conveyed ownership of all swamp and overflow land, including Delta marshes, from the Federal Government to the State of

Figure 12


Folsom Lake
SACRAMENTO
80
99
SACRAMENTO RIVER DEEP WATER CHANNEL
COURTLAND
DELTA CROSS CHANNEL
Consumnes River
FAIRFIELD
12
RIO VISTA
ISLETON
RIVER
SACRAMENTO
Mokelumne River
Suisun Bay
COLLINSVILLE
CONTRA COSTA CANAL
PITTSBURG
ANTIOCH
MARTINEZ
CONTRA COSTA PUMPING PLANT NO.1
Calaveras River
SAN
STOCKTON
JOAQUIN
SWP PUMPING PLANT
CVP PUMPING PLANT
Old River
TRACY
RIVER
99
DELTA MENDOTA CANAL
CALIFORNIA AQUEDUCT
Stanislaus River
N
NEVADA
CALIFORNIA
DELTA DIVISION

California. The bulk of water rights in the Delta thus stem from the SOLA. A riparian right was attached to these lands as they passed into private ownership. By 1871, most of California's swampland was in private ownership. Delta water rights have never been formally adjudicated, but typical riparian diversions total approximately 1.3 MAF annually.

Monthly diversion rates generally follow the pattern of minimal diversions during the winter and maximum diversions during the summer. The estimated diversions are assumed to remain the same regardless of the water year type and to peak in July when they total approximately 270,000 acre-feet. Releases from both CVP and SWP reservoirs are required to satisfy these diversions when uncontrolled runoff cannot satisfy the divisions. Extended wet weather minimizes both the quantity and duration of these diversions, while dry weather not only increases the quantity and duration of these diversions but also further depletes upstream storage available from the CVP and the SWP.

Riparian diversions contribute to reverse flows occurring on the San Joaquin River at Antioch; these flows typically occur in mid- to late summer. During reverse flow periods, water in the western Delta can increase in salinity and become brackish. A massive amount of water fluctuates in and out of the Delta due to natural tidal action, overwhelming the volume of freshwater outflow, which complicates the reverse flow phenomenon considerably. The CVP and the SWP are required to keep salinity levels at certain standards in compliance with D-1485 (described in the next section).

SWRCB D-1485--Delta Water Quality Standards

The current Delta water quality standards and the beneficial uses they protect are defined in D-1485, which also addresses minimum Delta flow requirements. The beneficial uses protected by D-1485 include agriculture, M&I, and fish and wildlife needs. The Delta standards apply throughout the year but become more critical whenever "balanced conditions" exist in the Delta, typically from April through November depending on hydrologic conditions.

In addition to D-1485 water quality standards, operators for the CVP and the SWP consider the current water supply and hydrologic conditions and impacts to fisheries, recreation, and power when making their operational decisions. The uncontrollable variables of tides, winds, barometric pressure, river depletions, and agricultural drainage largely define the operators' abilities to comply with the water quality standards.

Operational actions initiated to maintain Delta water quality are based on past experience and empirical studies, which are used as guides for determining initial responses to existing Delta conditions. Changes in operations are made according to varying Delta conditions and provide a reasonable level of protection against noncompliance with the standards.

Complying with the water quality portion of the Delta standards requires from 3.0 MAF to 5.5 MAF annually, as measured by the Delta outflow index (DOI), depending on the water year type (D-1485 defines the classification of the water year type).

Because of the hydraulic characteristics of the Delta, some standards are managed more efficiently through export curtailments, while others are managed more efficiently through flow increases. For example, the Contra Costa and Jersey Point standards are managed more efficiently by export curtailments. While complying with these standards, CVP and SWP operators also target a DOI and salinity levels in the western Delta. These levels are expected to provide a reasonable margin of error against noncompliance with D-1485 should adverse or unforeseen conditions arise. In typical or full delivery years, curtailments will likely have an adverse impact on CVP water supply availability south of the Delta. Therefore, during typical years, curtailments are usually made by the SWP as their ability to recover from curtailments is significantly greater than that of the CVP. In deficiency years, both projects will likely have much flexibility in their ability to curtail exports.

In contrast, the D-1485 Emmaton water quality standard is more efficiently managed by flow increases. In most instances, salinity levels at Emmaton will react proportionately to increases in flow in the Sacramento River. Closing the Delta Cross Channel Gates (DCCG) increases the flow on the Sacramento River. However, this action diverts freshwater passing through DCC to the San Joaquin River side of the Delta. Without this additional carriage water, reverse flow conditions on the San Joaquin River side of the Delta increase salinity intrusion near the Tracy Pumping Plant. For this reason, the DCCG can usually only be closed for a couple of days before deteriorating water quality on the San Joaquin River side of the Delta requires that the DCCG be reopened.

Another way to increase flows on the Sacramento River is to increase the releases from the CVP and the SWP. The approximate lag times for releases from the two projects to reach Emmaton are shown in table II-12.

Table II-12. Lag times for CVP and SWP releases to reach Emmaton

Dam	River	Lag time
Nimbus	American	1 day
Oroville	Feather	3 days
Keswick	Sacramento	5 days

In a typical water year, releases may be increased simultaneously on all three rivers, with the largest initial release increase occurring on the American River. Then, as the increases from the Feather River and Sacramento River reach the Delta, the release on the American River is decreased accordingly.

D-1485 water quality standards for the Suisun Marsh that require a specific minimum DOI for 60 consecutive days in below normal and wetter year types are straightforward in terms of their implementation. However, deciding when and if project operations should be initiated to achieve this standard objective is difficult when the preceding year-type classification is below normal or wetter but the runoff between January and April is insufficient to keep the DOI greater than the minimum level for 60 consecutive days, as required.

The above situation presents a dilemma to the operators of the two projects because dry and critical year types do not have this minimum DOI requirement; satisfying this objective during dry and critical year types is not identified by D-1485 as a beneficial use of water. If natural runoff became available in the Delta under the above scenario, operators would have to decide whether the water should be exported or used to assist in satisfying the minimum DOI requirement (in anticipation of a below normal or wetter year type).

This very situation arose in 1987--water year (WY) 1986 was a wet year type; however, the runoff between January and April in 1987 was insufficient to keep the DOI greater than 12,000 ft^3/s for 60 consecutive days (as called for in D-1485). Operators for the CVP and the SWP took a risk and projected that 1987 would be a dry or critical year type. 1987 was indeed classified as a critical year type. Had the operators not taken the risk that the 12,000 ft^3/s would not be required, not only would 330,000 acre-feet have been sent through the Delta without being tied to any beneficial use identified in D-1485, but also the water would not have been available for WY 1988 which was another critical year.

Reclamation Facilities in the Delta

The DCCG are operated for water quality, fishery, recreation, and flood control purposes. However, the original and primary purpose of the DCC was to provide passage for a fresh supply of Sacramento River "carriage water" in order to assist in repelling ocean saline waters near the Tracy Pumping Plant. In addition to operations for the D-1485 Emmaton standard previously described, the gates are operated to meet D-1485 standards in the spring to reduce adverse impacts to the striped bass. The gates are also closed in order to reduce scour on the downstream side of the gate structure when flow in the Sacramento River at Sacramento is expected to exceed 20,000 ft^3/s to 25,000 ft^3/s.

The Tracy Pumping Plant, consisting of six constant speed units is operated to meet water demands south of the Delta. Changes in pump operations are typically performed early in the day to allow adequate time for O&M personnel to adjust check gates on the DMC during daylight hours. Partly due to the time involved in changing pump operations and the additional wear on the pumping units, frequently cycling the units is normally avoided.

The Suisun Marsh Salinity Control Gates (SMSCG) are not a CVP facility, but are described here because of their significant effect on coordinated operations in the Delta by DWR and Reclamation. Phase II of the ***Plan of Protection for the Suisun Marsh*** was completed in November 1988 (Reclamation, 1988), with the SMSCG operating for the first time. The SMSCG, operated by the State of California, are located about 2 miles northwest of the confluence of the eastern end of Montezuma Slough and the Sacramento River near Collinsville (see figure 12). The primary objective of Phase II is to help meet channel water salinity standards established by D-1485 at control sites at Collinsville, the SMSCG, National Steel, and Beldons Landing.

The SMSCG is operated from October 1 through May 31 (the control season) to: (1) Divert less saline water from the Sacramento River near Collinsville into Montezuma Slough, and (2) prevent higher salinity water originating in Grizzly Bay from entering the western end of Montezuma Slough. Its operation is necessary during control seasons of below normal, dry, and critical water year types. The SMSCG can either be operated full time to divert the maximum quantity of water from the Sacramento River at Collinsville into the eastern end of Montezuma Slough or intermittently to divert the quantity needed to meet D-1485 standards.

During full operation, the SMSCG gates open and close twice each tidal day (which is approximately 25 hours long). The gates are opened during the ebbing portion of the tide when the water level is higher on the Collinsville (upstream) side and remain open about 7 hours each cycle. The gates are closed during the flood tide when water in Montezuma Slough begins to flow upstream toward Collinsville.

The quantity of flow pumped by the SMSCG according to the tides is primarily a function of the shape and sequence of ocean tides and hydrologic conditions in the Delta. When the gates are in operation, flows past the SMSCG recorded on a 15-minute basis vary from no flow when the gates are closed to several thousand cubic feet per second with the three gates open. During round-the-clock operation of the gate, the net flow through the SMSCG is about 1,800 ft^3/s when averaged over one tidal day period. When the gates are not operated from June through September and the flashboards in the gates are removed, the net flow in Montezuma Slough over one tidal day period is low and often in the upstream direction (as estimated by hydrodynamic model simulations). Water is diverted from Montezuma Slough at individual diversion points onto private ownerships along the slough and at the Roaring River Distribution System intake (one of the initial facilities of the ***Plan of Protection***). The intake to the Roaring River intake is currently screened to prevent fish eggs and larvae from being entrapped.

More than 30 private owners along Montezuma Slough divert water from the slough through more than 60 culvert pipes of varying diameters. Most of these diversions are used to convert adjacent areas to ponds for waterfowl management and hunting. Maximum diversion rates usually occur during October when the managed wetlands are flooded for the first time that year. On the average, initial flooding requires approximately 2 weeks.

Annual water management practices vary greatly in Suisun Marsh, but the Suisun Resource Conservation District is working to establish and enforce efficient management schedules for the private owners. During the control season, diversions from Montezuma Slough occur during initial flooding in October, water circulation from November through mid-January, and leach cycles from February through May. Currently, the privately owned diversions are not screened.

DELTA-MENDOTA CANAL AND SAN LUIS OPERATIONS

As part of the West San Joaquin Division, the San Luis Unit was authorized in 1960 to be built and operated jointly with the State of California. The San Luis Unit consists of San

Luis Dam and Reservoir (joint Federal-State facilities), O'Neill Dam and forebay (joint Federal-State facilities), O'Neill Pumping-Generating Plant (Federal facility), San Luis Pumping-Generating Plant (joint Federal-State facilities), San Luis Canal (joint Federal-State facilities), Dos Amigos Pumping Plant (joint Federal-State facilities), Coalinga Canal (Federal facility), Pleasant Valley Pumping Plant (Federal facility), and the Los Banos and Little Panoche Detention Dams and Reservoirs (joint Federal-State facilities).

The management of the San Luis Unit (see figure 13) depends on the operation of the northern features of the CVP while simultaneously influencing the operation of the northern CVP system. This relationship results from the need to deliver about half of the CVP's annual water supply through the DMC and San Luis Unit, while essentially all of the water must originate from the northern CVP. To accomplish the objective of providing water to CVP contractors in the San Joaquin Valley, three conditions must be considered: (1) Water demands for CVP water service contractors and exchange contractors must be determined, (2) a plan to fill and draw down San Luis Reservoir must be made, and (3) coordinating Delta pumping and utilizing San Luis Reservoir must be established. Only after these three conditions are made can the CVP operators incorporate the DMC and San Luis operations into plans for operating the northern CVP system.

Water Demands--DMC and San Luis Unit

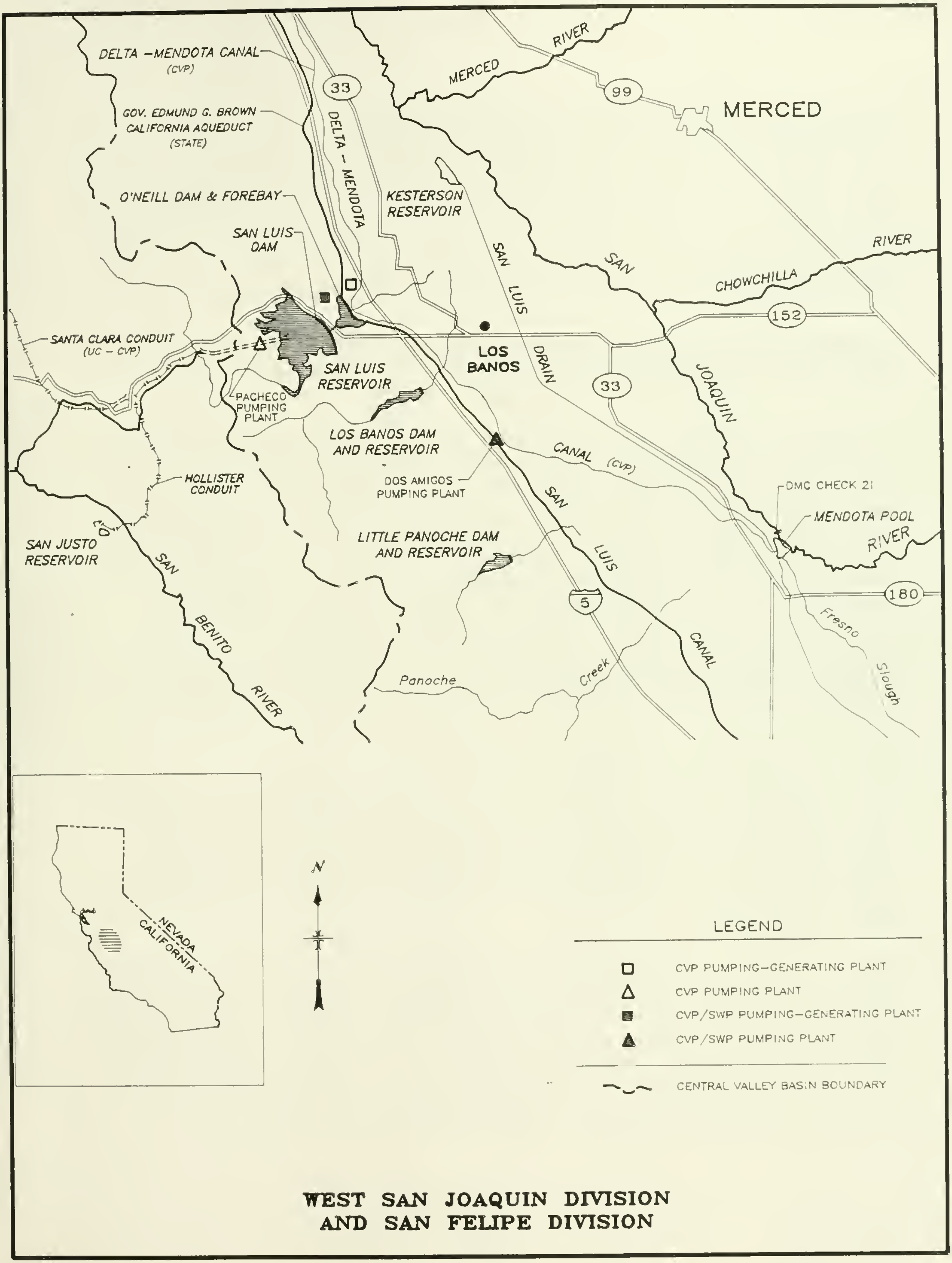
Water demands for the DMC and San Luis Unit are primarily composed of two separate types--CVP water service contractors and exchange contractors. A significantly different relationship exists between Reclamation and these two groups. Exchange contractors "exchanged" their senior rights to water in the San Joaquin River for a CVP water supply from the Delta. Reclamation thus guaranteed the exchange contractors a firm water supply of 840,000 acre-feet per annum, with a maximum reduction in water-short years of 25 percent. Conversely, water service contractors did not have water rights to "exchange." Water service contractors also receive their supply from the Delta, but their supplies are subject to reductions that can exceed 25 percent.

Combining the supply entitlements of these two types of contractors with the pattern of requests for water is necessary to achieve the best operation of the CVP. In many years, full water supplies and sufficient Delta pumping capability are available to meet all demands. In some years, water deliveries are limited because of insufficient supply or lack of conveyance capacity. The scheduling of water demands, together with the scheduling of the releases of supplies from the northern CVP to meet those demands, is a CVP operational objective intertwined with the Trinity, Sacramento, and American River operations.

San Luis Reservoir Operations

Two means of moving water from its source in the Delta are available for the DMC and the San Luis Unit. The first is Reclamation's Tracy Pumping Plant, which pumps water into the DMC. The second is the State's Banks Pumping Plant, which pumps water into the State Aqueduct (see figure 12). During the spring and summer, water demands are greater than

Figure 13



WEST SAN JOAQUIN DIVISION AND SAN FELIPE DIVISION

Reclamation's and DWR's capability to pump water at these two facilities, and water stored in San Luis Reservoir must be used to make up the difference.

However, San Luis Reservoir has very little natural inflow. Therefore, if it is to be used for a water supply, the water must be stored when the two pumping plants (mentioned above) can export more water from the Delta than is needed for contracted water needs. Because the amount of water that can be exported from the Delta is limited by available water supply, Delta constraints, and the capacities of the two pumping plants, the fill and drawdown cycle of San Luis Reservoir is an extremely important element of CVP operations.

Adequate storage in San Luis Reservoir must be maintained to ensure delivery capacity through Pacheco Pumping Plant to the San Felipe Division. Lower reservoir elevations can also result in turbidity problems for the San Felipe Division.

A typical San Luis Reservoir operation starts with the CVP's share of the reservoir storage nearly empty at the end of August. Irrigation demands decrease in September and the opportunity to begin refilling San Luis Reservoir depends on the available water supply in the Delta and the pumping capability at Tracy Pumping Plant that exceeds water demands. Tracy pumping continues at the maximum until the end of April, unless San Luis Reservoir is filled or the Delta water supply is not available. In May and June, export pumping from the Delta is limited by D-1485 standards and irrigation demands are also increasing. Consequently, San Luis Reservoir begins to lose storage. In July and August, Tracy pumping is again at the maximum, and some CVP water is exported at Banks Pumping Plant as payback for the water not pumped at Tracy during the May-June pumping restriction. Irrigation demands are still high during this period, and San Luis continues to decrease in storage capability until it bottoms out late in August and the cycle begins anew.

San Luis Unit Operation--State and Federal Coordination

The CVP operation of the San Luis Unit requires coordination with the SWP since some of its facilities are entirely owned by the State and others are joint State and Federal facilities. Similar to the CVP, the SWP also has water demands it must meet with limited water supplies and facilities. Coordinating the operations of the two projects avoids inefficient situations; for example, one entity pumping water at San Luis Reservoir at the same time the other is releasing water.

Other San Luis Unit water problems are also coordination matters. When the SWP pumps D-1485 water for the CVP, it may be of little consequence to SWP operations but extremely critical to CVP operations. The amount of water in the shares of San Luis Reservoir may make it possible to "exchange" space or water to aid either the operations of the CVP or the SWP. Additionally, close coordination is required to ensure that water pumped into O'Neill Forebay by the two projects does not exceed the CVP's capability to pump into San Luis Reservoir or into the San Luis Canal at the Dos Amigos Pumping Plant.

Although secondary to water concerns, power scheduling at the joint facilities is also a joint coordination concern. Because of time-of-use power cost differentials, both entities will likely want to schedule pumping and generation simultaneously. When facility capabilities of the two projects are limited, equitable solutions can be achieved between the operators of the SWP and the CVP.

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CHAPTER III
DECISION CRITERIA

CHAPTER III
DECISION CRITERIA

CHAPTER III
DECISION CRITERIA

The CVP is operated as an integrated unit. Many demands for both water and power may be met by releases from any one of several CVP reservoirs. Demands in the Delta and south of the Delta may be met by releases from any northern CVP reservoirs. Decisions for filling and withdrawing storage from CVP reservoirs are typically based on a number of physical and hydrological factors as well as the overall objectives of the project (see chapter II for a detailed discussion of CVP objectives by division). Many of the factors and the relative priority of operational objectives tend to change depending on existing conditions. This chapter presents a discussion of the many competing and/or interdependent factors that influence operations decisions.

RESERVOIR STORAGE CRITERIA

Inflow and releases are the principal elements influencing reservoir storage. Operators must maximize the capability of the reservoir to store inflow, while simultaneously maximizing the amount of water stored to meet multipurpose project objectives.

CVP operators must make decisions on reservoir storage not only regarding an individual reservoir but also must consider the other reservoirs included in the project. Of course, some water requirements can only be served by specific reservoirs, but other requirements can be satisfied by water from one of several reservoirs or from a combination of reservoirs. The added possibility of using multiple water sources for some requirements adds complexity to operations decisions.

Another major consideration governing CVP operations decisions is the CVP storage space south of the Delta that can only be filled with water exported from the Delta. Discussions then occur about the geographic distribution of water in storage and whether or not the water should be moved from upstream storage to downstream storage. Other considerations influencing CVP operations in their decisions are flood control, lake recreation, power production, and cold water reserves. Long-term CVP operations (annual) are guided by past strategies and policies. The following discussion is based on that long-term context.

Flood Control

Shasta and Folsom Dams were identified as facilities providing flood protection in the 1935 legislation that authorized CVP. Trinity and Whiskeytown Dams were not authorized for flood control. However, Safety of Dams criteria at Trinity Dam and regulation criteria at Whiskeytown Dam cause storage at the two reservoirs to be lowered to less than full levels during flood periods, thus providing incidental flood protection to downstream areas.

As stated earlier, the COE is responsible for determining flood control needs at CVP reservoirs. At Shasta and Folsom Lakes, a minimum amount of vacant storage space is reserved for flood control, depending on the time of year and estimates of the relative wetness of the upstream area draining into the reservoirs. Typically, some flood control limitation on reservoir storage occurs from October through May. If CVP reservoir storage exceeds what the COE prescribes, water must be released at rates of flow defined in COE's Flood Control Manuals.

Major inflow to CVP reservoirs occurs in the fall and winter as a result of rain and in the spring and early summer as a result of snowmelt. Since rainfall cannot be predicted with any certainty beyond a few days, flood control regulations require reservoir levels to be lowered in the fall of the year. With this in mind, the CVOCO staff attempts to schedule reservoir releases during the summer; thus, when fall arrives, large releases are not necessary to reach the level for flood control storage. In some cases, the storage level is reduced below that required for flood control so space is available to regulate reservoir inflows. Release changes thus do not have to be made with every inflow fluctuation.

Water Supply for the Upcoming Year

No reliable forecasts exist which are capable of predicting hydrologic conditions for the upcoming water year. Operators must assume that conditions may range from drought to flood. For this reason, reservoir's must be operated with consideration for some degree of protection for future supplies in the event of dry conditions. The volume of water or carryover storage that CVP operators attempt to retain in the reservoirs at the end of September forms the initial basis for the water supply for the upcoming year. During years when water is scarce, the objectives for carryover storage influence the amount of water available to meet water requests. Reclamation does not have a standing policy on carryover storage; rather, it has established annual carryover storage objectives as part of the process of allocating CVP water supplies. Carryover objectives consider existing water demands, forecasted water supply, cold water supplies, power system requirements and other CVP capabilities. Carryover storage objectives also consider the risks of continued droughts and possible impacts beyond the end of the current water year. In carrying out CVP operations, carryover storage is considered flexible. Early in the water year (October-November), a carryover storage objective may be used to help determine CVP capabilities. Once the rainy season is over (in May), objectives for CVP operations are generally fixed and CVP storage may vary as necessary to meet these objectives. Actual carryover storage may be affected by contingencies affecting CVP operations, unforeseen hydrologic events, and variations from forecasted inflows.

If carryover storage is expected to be anything less than the maximum allowed by flood control or Safety of Dams criteria, water distributed among CVP reservoirs is then necessary. In this situation, it is unlikely that one reservoir will be empty and another full; rather, a balance is achieved among all reservoirs. Part of determining the balance may be the potential of a given reservoir to refill, which depends on other variables affecting the operations of the coordinated systems.

Cold Water Pool

Another criteria affecting CVP reservoir storage is water temperature, which is a significant factor affecting fisheries downstream of reservoirs. Water stored in CVP reservoirs is not always at a uniform temperature because of each reservoir's unique geographical and physical location, and characteristic of its stratified water temperature profile. Thus, the availability of water at a suitable temperature and its depth in the reservoir are factors that CVP operators must consider.

As stated above, a reservoir's geographical location affects the temperature of its stored water. For example, Clair Engle Lake is situated in mountain surroundings at an elevation of about 2,200 feet above sea level, while Shasta Lake is located at about 1,000 feet above sea level and Folsom Lake is at about 425 feet above sea level in a chaparral environment. Typically, ambient air temperature cools as the elevation increases; thus, the effect on reservoir warming is less at Clair Engle Lake than at Folsom Lake. Another physical attribute that contributes to differences in water temperature is the amount of reservoir surface area compared to the volume of water; that is, with less surface area, less warming occurs.

As stated in the beginning of this section, large reservoirs tend to have stratified water temperatures. Typically, water at the deepest reach of the reservoir is cooler than water at or nearer the surface. In CVP reservoirs, this condition is generally present during the summer and fall. During the winter and spring, water at all reservoir levels mixes as a result of the dynamics of cooler weather and reservoir turbulence caused by higher inflows.

CVP reservoirs need cooler water more during the summer and fall. Consequently, CVP operators attempt to preserve a cold water pool in Clair Engle, Shasta, and Folsom Lakes for salmon and steelhead in the Trinity, Sacramento, and American Rivers. Water from both Clair Engle and Shasta Lakes can be used for cooling the Sacramento River. However, under most storage and runoff conditions, cold water supplies must be carefully managed to meet fishery management objectives together with other CVP objectives.

At Folsom Lake, however, a large cold water pool is not available for either the instream fishery or the Nimbus River Hatchery and the American River Trout Hatchery that receive water from Nimbus Dam downstream of Folsom Dam. In some years, water temperatures in the American River are too high in the fall for instream salmon spawning or hatchery production. During these years, hatchery eggs are transported to other State hatcheries for propagation.

Lake Recreation

Lake recreation is another criteria influencing CVP reservoir storage. CVP reservoirs need to be kept as full as possible to provide the best opportunities for recreation. Since CVP reservoir storage is used throughout a typical water year, the CVOCO staff attempts to achieve reservoir levels that maintain prime recreation at least through the Labor Day weekend in September. Normally, Folsom Lake is most likely to be closest to the limits needed for lake recreation because it is small. In past years, an attempt was made to maintain the lake at a storage of at least 576,000 acre-feet (at 426 feet elevation) through Labor Day to sustain a sufficient water depth in the Brown's Ravine Marina. In 1990, the reservoir was excavated near the marina so that the marina can be used until the reservoir storage is reduced to 455,000 acre-feet (411 feet elevation).

Electrical Capacity and Energy

Another criteria influencing CVP reservoir storage is electrical capacity and energy. To maximize electrical energy produced at CVP reservoirs, reservoir releases must be small enough to be discharged through the powerplants. At the same time, reservoir storage needs to be at the highest level allowable to increase hydraulic head and produce the most energy per acre-foot of water released.

At CVP reservoirs, electrical capacity partly depends on the amount of storage available in the reservoir; that is, more storage means greater available electrical capacity and less storage means reduced electrical capacity. Energy production is a function of electrical capacity and the volume of water released through the individual powerplant. To the greatest extent possible, the CVOCO attempts to make all releases pass through the powerplants. However, sometimes releases must exceed the limits of the powerplants. This condition usually occurs during CVP flood operations when reservoir storage exceeds allowable flood control limits and water must be quickly removed from storage.

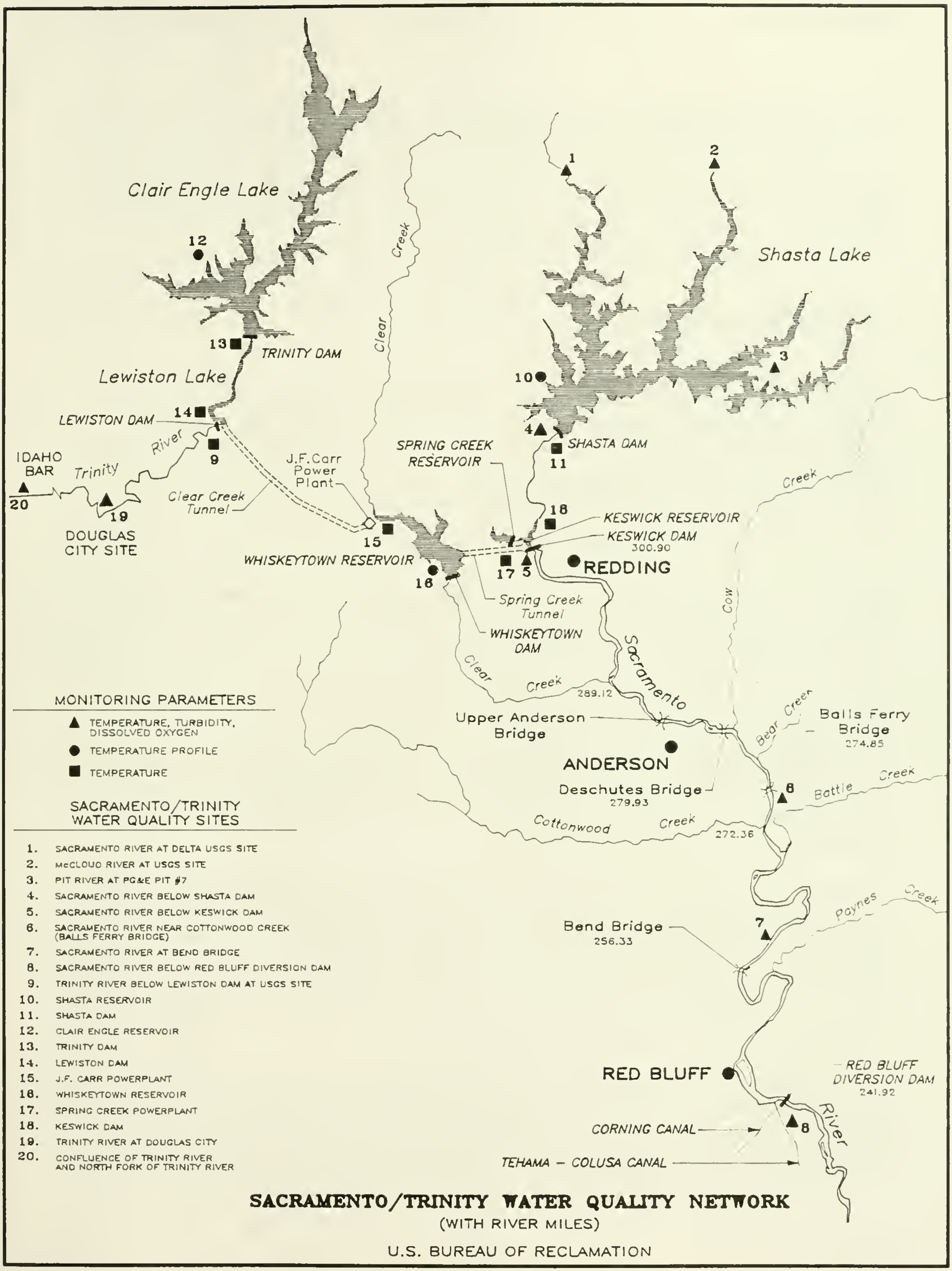
Often during CVP operations, flood releases can be avoided or diminished by keeping reservoir levels low enough that the water may be controlled. While this type of operation would minimize spills and increase energy production, it would reduce electrical capacity and would increase problems related to cold water conservation, carryover storage, recreation, and other CVP uses. Since power is subordinate to some other project uses, CVP operators can only shape operations for power when no impact occurs to water operations. This shaping is most evident in scheduling water from the Trinity River through Whiskeytown Lake and into Keswick Reservoir.

Operating characteristics related to contracts and the CVP system place a premium on power generated in the summer and fall. As a result, water remains in storage at Clair Engle Lake until the latter half of the year so that it can be used when it is most needed to generate power at the Trinity, Carr, and Spring Creek Powerplants. Since this CVP operation affects Keswick, it also affects Shasta operations, and in turn, a balance must be reached between Clair Engle and Shasta. Except for flood control operations, Folsom Lake is not governed by any special power generation considerations.

Downstream Water Quality

Yet another criteria governing CVP reservoir storage is downstream water quality. The quality of water released from CVP reservoirs is normally excellent, at the Spring Creek Debris Dam (see figure 14), however, highly polluted mine drainage is intercepted and stored. Through an agreement with the DFG and the RWQCB, January 1980 MOU, the

Figure 14



SACRAMENTO/TRINITY WATER QUALITY NETWORK
(WITH RIVER MILES)
U.S. BUREAU OF RECLAMATION

polluted water is released from the dam in small enough quantities that it is not toxic to fish downstream of Keswick Dam when diluted by water in Keswick Reservoir.

Because storage space is limited in Spring Creek Reservoir, the reservoir may spill during high runoff. Diluting spills at Spring Creek Debris Dam is not a responsibility or authorized CVP function, but in the past, Reclamation has voluntarily provided dilution water from Shasta Lake during spills when sufficient storage was available.

STREAMFLOW CRITERIA

Managing CVP reservoir releases, an important factor governing operational decisions, depends on reservoir storage, downstream needs, and instream controls. This section describes the instream controls that influence CVP operations. At least seven separate elements are considered during the operation of one water year, other conditions may also be imposed because of special fishery needs, regulatory requirements, or other related actions. The seven elements are discussed in detail in the following sections.

1: Water Fluctuations for Fishery Needs

Streams below CVP dams support both resident and anadromous fisheries. While resident fisheries are slightly affected by release fluctuations, the anadromous fisheries are the most sensitive and are present year round in CVP streams.

Maintaining water conditions favorable to spawning and later outmigration of the young anadromous fish is one of the main concerns of CVP operators. During the spawning period, care is taken to attempt to establish project releases that can be sustained until the eggs hatch. If releases are reduced and the redds are dewatered, the eggs die. Conversely, if releases are too low and large increases are required, the redds can be washed away and the eggs will die. CVP activities need to be coordinated to anticipate and avoid streamflow fluctuations during spawning wherever possible.

Once the eggs have hatched and the young are ready to begin the outmigration to the ocean, CVP operators can assist their migration with release fluctuations. By coordinating with the DFG and the FWS, operators sometimes increase releases to "push" the fish downstream. This extra push helps reduce predation and minimizes fish being entrained at river diverter pumps.

2: Water Fluctuations for Flood Control Requirements

Another element considered during yearly CVP operations is flood control. Flood control operations are prescribed by the COE; however, CVP operators do have some latitude regarding the magnitude and duration of releases, with public safety and levee stability two important issues. When releases are increased because of flood control requirements, they are usually accomplished through a series of stepped increases which are defined by such things as powerplant capability, minor flooding of adjacent lands, erosion, and channel capacity. The operators attempt to establish flood releases at the lowest step of the progression that will satisfy the requirements for removing storage that has encroached upon the flood space. Through this method, the public's safety is maximized both from the threat of flood and from the effect of flood releases.

Once the threat of flood is past and the reservoir storage approaches allowable, releases are decreased. During this procedure, levee stability becomes a concern. If the water level on the levees is reduced too quickly, material will slough off the embankment, which ultimately leads to levee failures. Thus, the COE identifies specific rates at which the flows can be reduced.

3: Seepage

Seepage is another element considered during yearly CVP operations; it can be a problem on the Sacramento River but is not likely on the Trinity or American Rivers. In very wet years on the Sacramento, prolonged midlevel releases from Keswick Dam may be required for flood control to remove floodwaters in Shasta Lake. Because a large release of short duration would compromise public safety and possibly cause property damage, midlevel releases of longer duration are specified.

With midlevel releases extended for a longer duration, downstream subsurface water radiates from the Sacramento River channel, causing high ground-water levels and, in some cases, surface-water flooding. In agricultural areas, prolonged periods of ground water in the crop root zone can diminish crop yields and in severe cases actually drown a crop.

In most years when conditions are so wet that they cause seepage, CVP operators have little or no opportunity to avoid this problem. To avoid exacerbating the condition, however, water is imported during these periods from the Trinity Basin only when public safety is threatened on the Trinity River.

4: Water Temperature

Until recently, water temperature concerns (another element considered during yearly CVP operations) in CVP streams were more frequently the result of water that was too cold. At the Lewiston Hatchery below Trinity Dam, a cold water virus was an annual problem for hatchery managers resulting in modifications to the Lewiston Dam control works to aid diverting warmer water to the hatchery. Also, special operations for the filling and drawdown of Lewiston Lake were established to mix the stratified warm and cold waters.

Since the advent of the current drought, conservation of cold water has gained more emphasis in CVP operations. On both the Trinity and Sacramento Rivers, warm water downstream of the two dams has become a concern because of temperature effects on salmon reproduction. In 1990, the SWRCB ordered the CVP to meet certain water temperature criteria in the Sacramento River between Keswick Dam and RBDD. On the Trinity River, the RWQCB has established water temperature criteria between Lewiston Dam and the confluence of the North Fork of the Trinity River.

CVP operators meet the temperature criteria on the Sacramento River by mixing waters of differing temperatures from Shasta Lake and Whiskeytown Lake and/or regulating quantities to be released. For example, in September and October of 1991, low-level outlet releases from Trinity Dam were made to cool releases to the Trinity River below Lewiston Dam and to cool exports to the Sacramento River Basin.

5: Recreation on Instream Rivers

The fifth element considered during yearly CVP operations is river recreation. This element is considered more during periods of high releases than during low releases and is a direct consequence of public safety since both the Trinity and American Rivers are heavily used by weekend recreationists--anglers on the Trinity and anglers and rafters on the American. CVP operators are concerned about riverflows that are too high for safe rafting or which are so high they prohibit access to the river for fishing. As stated previously, flood control operations or other constraints can restrict changes in CVP operations for recreationists.

6: ACID Diversion Dam and Nimbus Fishracks

Unique operations that cause streamflow fluctuations and other elements considered during yearly CVP operations are for the required insertion and removal of both the ACID Diversion Dam on the Sacramento River and the Nimbus fishracks on the American River.

Each spring ACID installs a diversion dam in the Sacramento River channel below Keswick Dam, which requires several days' work in the river to erect steel bents and place wooden stoplogs. Because the dam is fragile and cannot withstand high flows with the stoplogs in place, CVP operators coordinate release changes with the ACID so more stoplogs can be added when releases are reduced or stoplogs can be removed with increasing releases. Each fall after the irrigation season, releases are reduced to accommodate removing the dam. Although the spring and fall operations do not affect annual CVP operations, these operations can affect other instream flow needs. The CVP is obligated by contract with ACID to cooperate with their efforts.

On the American River, fishracks are installed across the river to divert salmon into the Nimbus Hatchery in early fall; they may require a reduction in Nimbus releases during the installation. During the installation, Reclamation schedules repair work on the rock sill below the fishracks; the sill is constructed of rock cobbles that can be washed downstream by high Nimbus releases. Repairs and installation of the fishracks are usually accomplished from 3 to 5 days with little or no effect on instream water uses.

7: Pump Intake Levels

The seventh element considered during yearly CVP operations are pump intake levels. In the past, many barges traversed the Sacramento River. Recognizing this important transportation corridor, CVP was required in 1935 to maintain minimum flows in the Sacramento River near Chico Landing (Wilkins Slough). Because the water was held at a year-round minimum flow for navigation, water users that diverted from the river located their pump intakes accordingly.

Recently, as barge traffic has diminished, so has the need to maintain minimum navigation flows. However, navigation flows cannot be eliminated without affecting the pumping capability of the water users so CVP operators continue to maintain the navigation flow requirements under all but the most critical water supply conditions.

CRITERIA FOR WATER DELIVERIES

Except in times of water shortage, the CVP makes available the amounts of water specified in the terms of its water service contracts and water rights settlement agreements. In the water rights agreements, shortage conditions are defined to permit reduced availability based on the "Shasta Criteria", as discussed later in this section under the "Decisionmaking Process." For all other CVP water contractors, water availability during shortages are determined by hydrologic and storage conditions. A number of different numeric shortage provisions exist within CVP water contracts; however, for planning purposes, all contracts are grouped as agricultural, M&I, or water rights settlements. Reclamation is required to allocate shortages equally among contractors from the same service area if individual contracts and CVP capabilities permit. In practice, agricultural contractors and some M&I contractors have received equal reductions in allocations during years of water shortage. Some M&I contracts prohibit imposing of shortages until agricultural contractors have their allocations reduced by at least 25 percent.

Decisionmaking Process

The decisionmaking process for allocating the water supply available to CVP contractors involves runoff and operations forecasting and reservoir carryover storage needs. That is, the decision involves comparing the forecasted conditions resulting from drawing on storage during the existing water year to satisfy the allocated water supply with the risks of potential impacts in the following water year or years. No current set rule curve or formal risk analysis has been established to make that comparison and decision. However, the current process, which has evolved through 6 years of constant drought conditions, forms a basis for the allocation decision.

Soon after the beginning of the water year, the upcoming year's operations are forecasted on the basis of a range of assumed hydrologic and operations conditions. Because of widely varying weather conditions from year to year, no reliable forecasts of seasonal runoff are available before February. Thus, earlier (in the water year) operations forecasts are based on current storage conditions and runoff quantities derived from the range of conditions that have occurred historically. The purpose of developing these early operations forecasts is to provide some initial direction for forecasting and a method of assessing current and future conditions and preliminary implications of alternative decisions. The operations forecasts yield monthly information on water allocations, reservoir storage, releases, electrical generation and capacity, Delta exports and inflows, and Delta outflow requirements. By developing an array of possible conditions, CVP operators and managers can evaluate potential problems well in advance of the first official water allocations announcement on February 15. Usually, the CVOCO staff consolidates and presents an initial array of operations forecasts to Reclamation managers in December, and updates that array in January. These early forecasts may or may not include assumed water supply shortages, depending on the reservoir storages existing at the time and the severity of the assumed hydrology of each forecast. The number of early forecasts developed may vary depending on the scope and complexity of the possible responses of the CVP to the range of operations conditions being examined.

The February 15 forecasts of runoff and CVP operations are used to determine the first water allocations announcement for the current year. Water rights contracts contain shortage provisions based on inflow to Shasta Lake, and those contracts require notice of shortages to be given to the water contractors no later than February 15. All of the agricultural contractors need to know about their water allocation as soon as possible so that they can make timely decisions and appropriate plans for using their allocated water supply. Therefore, when shortages because of drought are imminent, they have been declared in February and are based on a conservative forecast. This strategy minimizes the likelihood of imposing a greater shortage later on in the water year when substantial investments have already been made. The shortages can and have been relaxed after the February announcement when improved hydrologic conditions increase the projections for runoff and reservoir carryover storage. The shortages to water rights contractors are rescinded when the forecasted Shasta inflow exceeds the specific contractual provisions, while other water contractors may be subject to shortages based on insufficient water availability.

The February 15 water allocation decision reflects assessments of both total CVP reservoir storage upstream of the Delta and individual CVP reservoir storages. Because the integrated CVP operations focus on requirements in the Delta, the total storage available to meet these requirements is one measurement of water supply. And because the Delta requirements include CVP exports to satisfy allocated water deliveries, the forecasting process can be iterative to achieve the balance between storage and water delivery requirements. Storage levels in individual reservoirs are subject not only to Delta water requirements but also to the geographical distribution of precipitation and runoff during the year, local demands, and minimum streamflow needs below each reservoir. Monthly operations forecasts after the initial February 15 forecasts ar used to identify both total and individual reservoir storage needs and impacts.

Water Rights Settlement Agreements--Provision for Shortages in Deliveries

As mentioned at the beginning of this section (Criteria for Water Deliveries), the "Shasta Criteria" are included in water rights settlement agreements for the Sacramento River and the San Joaquin River exchange contractors. These contractors receive water in the Mendota

Pool (see figure 13) via the DMC. Both Sacramento River and San Joaquin River exchange contractors must be notified of any shortages in their water supplies by February 15 each year. (Sacramento River contractors are limited to 25 percent supply reductions, while San Joaquin River contractors are limited to a deficiency schedule that approximates 25 percent reductions.) The shortages may not be imposed later than that date but may be rescinded at any time if the conditions mentioned at the beginning of this chapter warrant. According to the "Shasta Criteria," when forecasted inflows to Shasta Lake fall below the defined threshold, a water year is defined as "critical," and water deliveries to the water rights contractors mentioned above may be reduced. The criteria are as follows:

- The forecasted full natural inflow to Shasta Lake for the current water year (the forecast made by the United States [Reclamation] on or before February 15 and reviewed as frequently thereafter as conditions and information warrant) is equal to or less than 3.2 MAF; or

- The total accumulated actual deficiencies below 4 MAF in the immediately prior water year (each of which had inflows of less than 4 MAF), together with the forecasted deficiency for the current water year, exceed 800,000 acre-feet.

Normally, a median forecast (that is, based on an exceedance probability of 50 percent) is used to determine the water allocations to water rights settlement contractors and other CVP contractors. More conservative forecasts are used simultaneously to assess the effect to CVP operations of subsequent dry conditions possibly occurring. In years of reduced storage and more flexibility for CVP operations, a very conservative forecast (based on a 90-percent exceedance probability) has been used to reduce the risk of subsequent conditions being drier than the initial February forecast. The conservative approach may result in allocating deficiencies in deliveries to contractors in February that are rescinded later; however, the risk of not imposing deficiencies in February that may be warranted in later forecasts is substantially reduced. Conservative forecasts have been used in water allocation decisionmaking from 1989 to 1992.

Past Water Delivery Decisions (1977 and 1989-92)

Water deliveries under long-term contracts were reduced in 1977 and from 1990-92. In 1977, 1991, and 1992, contract deliveries for water rights settlements were also reduced. In 1989, water delivery reductions were announced for all long-term contractors and water rights contractors but were later restored. Interim water delivery and deliveries under some temporary contracts were suspended in 1989.

The rationale for each year's water allocation decisions may vary depending on current hydrologic and storage conditions, operations objectives, economic factors, and the availability of alternative water sources. The process employed in making this decision, the factors considered, and the timing of the decisions still have similarities from year to year. The water allocation decision has been made for the last 5 years (1987-92) by a management team. The CVP operators have presented their recommendations, and management have then made the final decision based on forecasted information. Past decisions have been considered each year, including the outcome of those decisions.

Water Year 1977

WY 1977 was the driest year of record for the CVP, and water deliveries were reduced to all contractors for the first time in CVP history. Water rights holders received their minimum supplies, 75 percent; agricultural users received 25 percent, and M&I uses, 25-50 percent. Despite the delivery reductions, reservoir storages had to be drawn down during the water year from 3.6 MAF to 1.3 MAF, also the lowest in CVP history. The reservoir drawdown in WY 1977 was not so much discretionary as it was the combined result of the low runoff and numerous, inflexible CVP operational requirements. By the end of WY 1977, the major CVP reservoirs were at or near their minimum levels for multipurpose operations. Fortunately, very wet conditions in WY 1978 ended that drought and CVP water allocations to long-term contractors were not reduced again until WY 1990 (the fourth year of the current drought).

Water Year 1988

WY 1988 was the last water year when CVP contractor water deliveries were not limited. The February most probable water supply forecast that year was only slightly below normal. Based on the forecasted conditions, Reclamation committed to full water deliveries early in the year. Unfortunately, the months of February and March were extraordinarily dry. The actual runoff in WY 1988 equaled about the 95-percent exceedance level of the February forecast. Storage was reduced from 6.2 MAF at the beginning of the year to 4.6 MAF at the end of WY 1988.

Water Year 1989

In February 1989, with the water supply forecasts indicating a high probability of another "critical" runoff year, Reclamation adopted a strategy for assessing CVP's water delivery capability. The main elements of this strategy included:

- Adopting forecasted inflows with a 90-percent chance of exceedance for determining the CVP water available for delivery.

- Adopting an objective for system carryover storage for the end of WY 1989. The 3.6-MAF figure was adopted as an initial objective because it would enable the CVP to operate in WY 1990 under hydrologic conditions similar to WY 1977, with similar reductions in deliveries, i.e., the carryover storage of 3.6 MAF would provide a protection level for project capabilities for the next year even if it repeated the historical worst-case conditions.

Using this approach with forecasts based on February 1 conditions, water deliveries in 1989 were announced as 75 percent for water rights contractors, 50 percent for agricultural users, and 50 to 75 percent for M&I uses. These allocations were confirmed based on March 1 conditions. During March 1989, the entire Central Valley experienced extremely wet weather, and forecasted conditions changed accordingly. Full water deliveries were restored, except for interim and temporary water contracts. Reservoir storage increased during WY 1989 from 4.6 MAF to 5.1 MAF.

Water Year 1990

The same as in the previous year, the water supply forecast in February 1990 was for a "critical" runoff year. Using the same criteria as used in 1989 for assessing water delivery capability, Reclamation announced in February that 1990 water deliveries would be 75 percent of contractual supplies for water rights holders, 50 percent for agricultural contractors, and 50-75 percent for M&I uses.

Subsequent conditions in 1990 were so dry that even the 90-percent exceedance runoff forecasts were reduced, in updates performed in March, April, and May. Reclamation confirmed the planned water deliveries for those months, although projected carryover storage was reduced to about 2.9 MAF to support the announced water deliveries. The extraordinary and unseasonal storms of late May 1990 provided a major boost to CVP capabilities. Water deliveries for water rights contractors were restored to 100 percent, based on the Shasta inflow criteria (see previous discussion under Water Rights Settlement Agreements). Other contractors' supplies were not equally increased; however, a large amount of additional water was retained as carryover storage, and some additional deliveries were made available under hardship criteria. Carryover storage at the end of WY 1990 was 4.0 MAF, reduced from the previous year's storage of 5.1 MAF, but a major recovery from the conditions forecasted in May.

Water Year 1991

Until March 1 of 1991, WY 1991 was even drier than WY 1977. The 90-percent exceedance forecasts (based on February 1 conditions) indicated that the CVP could only support water deliveries of the type allocated in 1977 (75 percent to water rights holders, 25 percent to agriculture users, and 25-50 percent to M&I uses), and then only by drawing storage down to 0.6 MAF. By March 1, forecasted conditions were unimproved until several consecutive storms greatly improved the water supply forecast during one of the wettest March's on record. Despite the wet March, WY 1991 was the driest year of the then 5-year drought. Water deliveries were not generally increased, though a substantial amount of hardship deliveries were approved. Carryover storage at year's end was 3.3 MAF, reduced from the 4.0 MAF of storage the previous year.

Water Year 1992

Again, in WY 1992, 90 percent exceedance probability forecasts based on February 1 conditions were for a year similar to WY 1977. Reclamation's initial water allocation announcement (in February) was made in consideration of the National Marine Fisheries Service's (NMFS) Biological Opinion that called for reasonable and prudent alternative (RPA) operations to avoid jeopardizing the winter-run chinook salmon (a threatened species) in the Sacramento River. The initial allocation in February, consistent with the implementation of the RPA, was 0 percent for project agriculture, 50 percent for Sacramento River water rights, the deficiency schedule for San Joaquin River water rights, and 50 percent of the lesser of contract amount or recent years demand for M&I. During February 1992, a series of significant storms provided 200 percent or more of normal February precipitation in many northern California locations. As a result, operations plans were quickly reconfigured under the substantially improved forecast for water year runoff. On March 5, 1992, water allocations were increased to 15 percent for project agriculture, 75 percent for Sacramento River water rights, 50 percent plus demonstrated hardship for M&I, and 50 percent of needs for wildlife refuges. On March 20, on the basis of increased confidence in March 1 forecasted conditions, allocations were increased to 25 percent for project agriculture, and 75 percent of historical use for M&I. The increases in allocations were made only after discussions with NMFS and were consistent with the provisions of the RPA. Operations were demonstrated to provide improved conditions for winter run, in addition to increased water delivery. System carryover storage during WY 1992 fell from 3.3 to 3.1 MAF. However, both Shasta and Clair Engle Reservoirs increased in storage.

ENERGY REQUIREMENTS FOR THE CVP SYSTEM

Although power generation is not a priority use of CVP water, it is a project function that is watched extremely closely by operators who carefully consider power in all long-range operational plans. Short-range operational decisions normally do not have multiple options that can be chosen based on power needs. This lack of flexibility in the short term emphasizes the need for sound long-range planning since the consequences of using CVP for power needs can affect CVP's ability to repay its debt to the Federal Treasury.

CVP powerplants are operated in conjunction with the water demands on CVP storage and regulating reservoirs. Thus, power is generated according to irrigation, M&I, and other demands for project water. Recognizing that these water demands would be seasonal (with much larger releases during the summer), CVP powerplants were designed to generate peaking power whenever possible while still meeting other project objectives. Since peaking power (intended to meet the highest electrical demands during the day) alone cannot satisfy the power requirements of CVP power customers and peaking is more efficiently used when integrated with baseload power (intended to meet some minimum threshold of electrical demand), the United States entered into a support contract (Contract 2948A) with PG&E in 1967. Western now administers this contract and delivers peaking power from CVP powerplants in the PG&E system; PG&E in return delivers power as required to Western's preference power customers and CVP facilities.

Power generated from the CVP system is dedicated first to meeting the project's power requirements (called project use power), primarily for pumping facilities. The remaining capability of the project's power facilities is used to provide commercial power to the various preferred customers (irrigation districts, municipalities, military installations, and various Federal and State government installations) in northern California.

Some of the power operator's problems are illustrated by looking at energy production and energy requirements by seasons. During the fall (September through November), reservoir releases are at the lowest levels of the year; thus, proportionately less energy is being produced than at other times of the year. Water is being pumped simultaneously at Tracy, O'Neill, and San Luis Pumping Plants to prepare for the water supply for the upcoming year in the San Joaquin Valley.

To increase energy production in the fall, Reclamation may meet Sacramento River release requirements by providing some or all of the Keswick release from water exported from the Trinity Basin (the Keswick releases produce power at the Trinity, Carr, and Spring Creek Powerplants). The energy produced this way is more than 3.5 times the amount produced by an equivalent amount of water from the Shasta releases. Despite these efforts, insufficient energy is often produced to meet all contractual demands, and CVP must purchase energy from other sources, typically utilities in the Pacific Northwest and from PG&E.

During the winter (December through February), pumping demands are high until San Luis Reservoir fills (although San Luis does not fill in all years), and preference customer use remains constant. Power generation may increase beyond fall levels if flood control operations require additional releases from reservoirs. In a typical year, CVP generation is usually insufficient to satisfy contract requirements for these months and additional energy must be purchased from other sources in the winter.

During the spring (March through May), exports from the Delta may be limited as a result of filling San Luis Reservoir or D-1485 export limitations in May; thus, pumping loads may be less. Preference customers' loads remain fairly constant. Power generation is also governed by temperatures that influence releases required for irrigation demands and flood control releases necessary to control the melting snowpack. Spring is a transitional period for power demand when the purchase of additional energy is sometimes but not always required.

Water demands are at their highest during the summer (June through August). Energy is being produced by releases at the upstream reservoirs and at San Luis as water is drawn from storage. Additional energy is imported from the Pacific Northwest, but some energy may also be "banked" with PG&E.

During certain months, the CVP produces more electric capacity and energy than it needs for its own and preference customer use. When this occurs, PG&E buys the power and credits (or "banks") the capacity or energy to account for CVP's later use. If the power is needed later, CVP pays PG&E to withdraw it from the bank. For many years, CVP produced significant quantities of surplus electric capacity and energy that were placed into the bank accounts. Recently, much of the energy has been withdrawn, but several years' supply still remains for the CVP to use at the current withdrawal rate.

As discussed in chapter II, PG&E also agreed, in a 1967 contract with Reclamation, to supply an amount of electrical capacity equal to the difference between 1,152 megawatts and the PDC currently 1,010 megawatts. The CVP receives this support capacity either by withdrawing it from the bank or by purchasing it from PG&E. Power operators strive to maintain as high a PDC value as possible to avoid purchases.

Maintaining PDC is a function of energy production; that is, for every megawatt of electrical capacity, a certain amount of energy must be produced. As pointed out previously, during certain times of the year, energy production is not very high. If the energy production is too low, the PDC will then be reduced, and additional capacity purchases must be made monthly for 5 years.

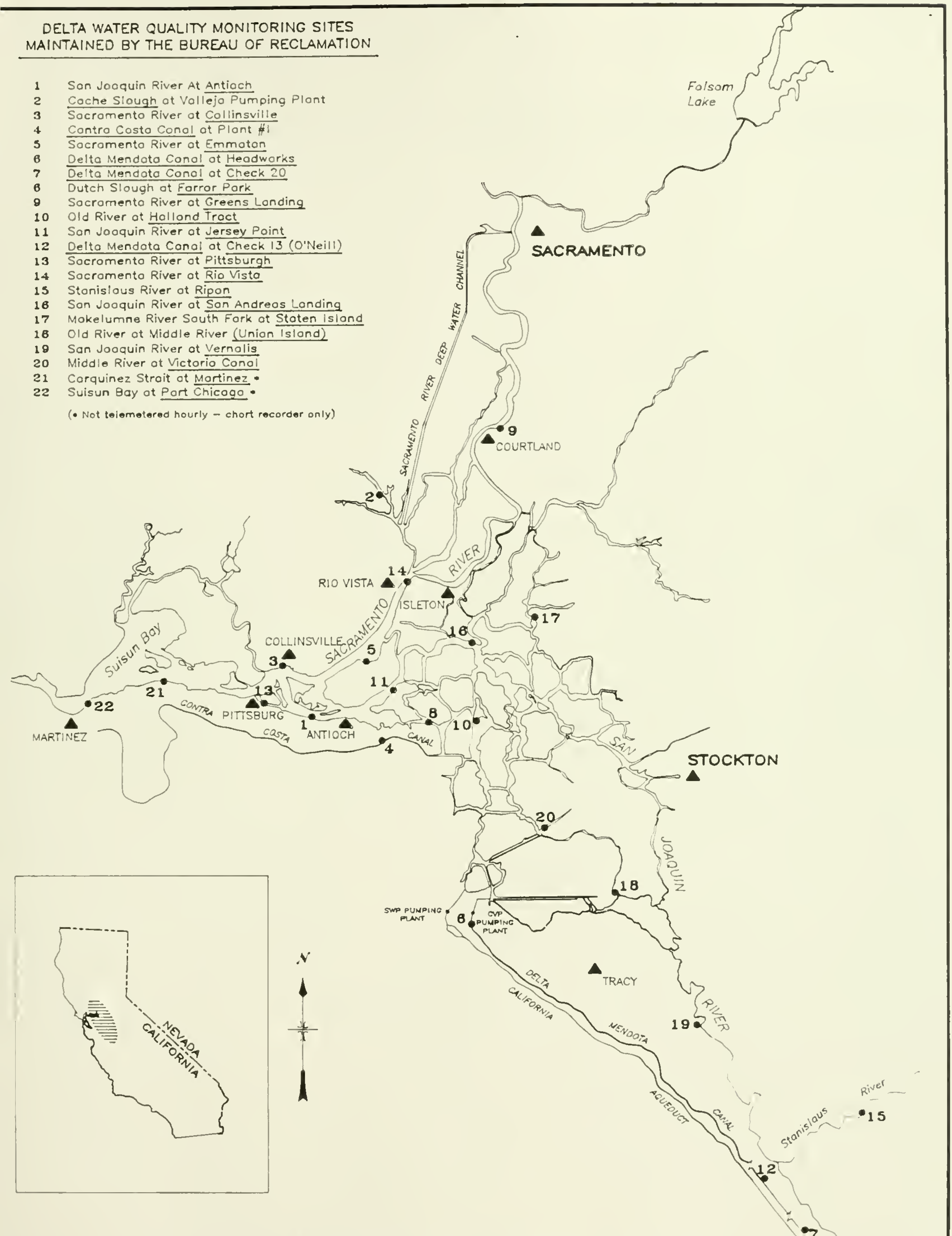
WATER QUALITY IN THE DELTA

Another important factor that influences CVP operational decisions is water quality in the Delta. Delta water quality decisions are shaped by two separate mechanisms: (1) It is a CVP obligation to its water contractors to provide water of a defined minimum quality, and (2) it is a requirement of D-1485 that water quality standards for various purposes be met at locations throughout the Delta. D-1485 standards are more stringent than CVP contractual standards (CVP contractual standards are also known as the "Tracy Standards"), and, therefore, D-1485 standards control water quality conditions in the Delta. Deciding on how to meet these requirements can be straightforward in extremely wet years, but may be risky and require balancing objectives in dry and extremely dry years. Under either scenario, the decisions on water quality standards are made jointly with the SWP, who shares responsibility with the CVP for Delta water quality.

As just stated, maintaining water quality in the Delta is a shared responsibility between the CVP and SWP, who are charged with ensuring that D-1485 water quality standards are always met, regardless of adverse hydrologic or other conditions. (A more complete discussion of D-1485 and CVP and SWP coordination is found in chapter I, under Projectwide Constraints [COA].) Typically, water quality objectives are met by increasing the amount of freshwater that flows to the ocean through the Delta. Since the D-1485 standards must always be met, the CVP strives to reserve sufficient water supplies in its system to provide the outflow necessary to meet its obligations in the Delta.

In real time, operating decisions are required to meet Delta water quality daily and a comprehensive monitoring system in the Delta provides the operators with real-time information on water conditions. This system consists of 20 water-quality monitoring stations located throughout the Delta (see figure 15). In consultation with the SWP operators, CVP staff analyze effects of the tides, meteorological conditions, existing daily Delta outflow, antecedent water conditions, pumping schedules, and existing reservoir releases to estimate upcoming water quality conditions. If operational changes are needed to reduce daily Delta outflow, a decision is made by the two agencies to either increase releases or decrease pumping. Once the decision is made, CVP and SWP staff determine who will

Figure 15



DELTA WATER QUALITY MONITORING SITES

increase releases and by what quantity and/or who will decrease pumping by what quantity (see discussion in chapter II under the COA section).

CHAPTER IV
OPERATIONS FORECASTING

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Operations forecasting is performed by the CVOCO staff to determine how the current and anticipated water and power resources available to the CVP can best be used to meet project objectives. Operations forecasting encompasses many processes, including data collection and analysis, review, and communication. It may be conducted seasonally, monthly, weekly, or daily, depending on the existing needs and on the uncertainty of the quantities being forecasted. This chapter discusses the principal steps taken in the forecasting process.

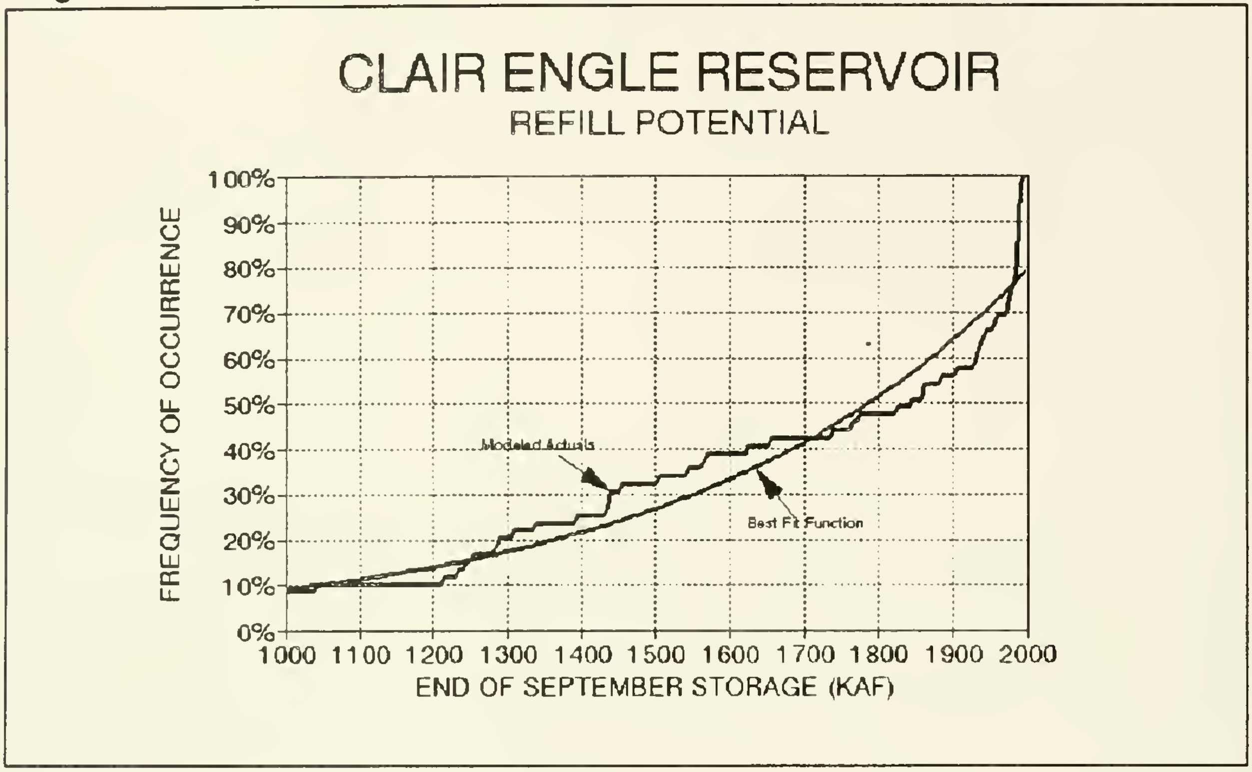
RESERVOIR REFILL POTENTIAL

Each river basin has its own distinguishing runoff characteristics. As discussed in chapter I under Topography and Climate, the Central Valley Basin of California has two major watersheds--the Sacramento River system in the north and the San Joaquin River system in the south. When CVP reservoir operations, which are defined by storage capacity and downstream demands, are superimposed on the basin characteristics, a relationship between runoff, reservoir releases, and annual reservoir carryover storage emerges. A certain amount of carryover storage (water in storage at the end of September each year) is desirable for all CVP reservoirs. The amount varies at each reservoir, but it can be loosely defined as the storage level where it will be possible to regularly meet water demands and constraints without jeopardizing the carryover storage in the upcoming year.

In the CVP system, a combination of reservoirs is used to meet downstream demands. When more than one water source is available, it is advantageous to use the reservoir with the greatest refill potential. Refill potential describes the probability that a reservoir will, over the course of a year's inflows and releases, return to its beginning state or (desirable carryover storage).

Figures 16 through 17 present the refill potential for the major storage reservoirs within the northern system of the CVP--Clair Engle, Shasta, Folsom, and New Melones. Not included are Whiskeytown Lake, which is not generally operated as a storage reservoir; San Luis Reservoir, an offstream pumped storage reservoir; and Millerton Lake, which is part of the Friant Division and is operated separately from the remainder of the CVP. The figures are based on results from a simulation of 57 years of CVP operations (1922-78). Each reservoir is considered to be at its desirable carryover storage on October 1. The reservoir inflow for the first month (October) is added to the storage, and an assumed release from the reservoir is subtracted. If the resulting storage is at or above the allowable flood control storage, the reservoir is considered to have refilled. If the reservoir has not reached or has exceeded flood control but at the end of September it is at or above the desirable carryover storage, it is also considered to have refilled. The storage level is reset to the desirable carryover storage and the process then begins for the water year.

Figure 16. Graph - Clair Engle Reservoir and Shasta Reservoir Refill Potential



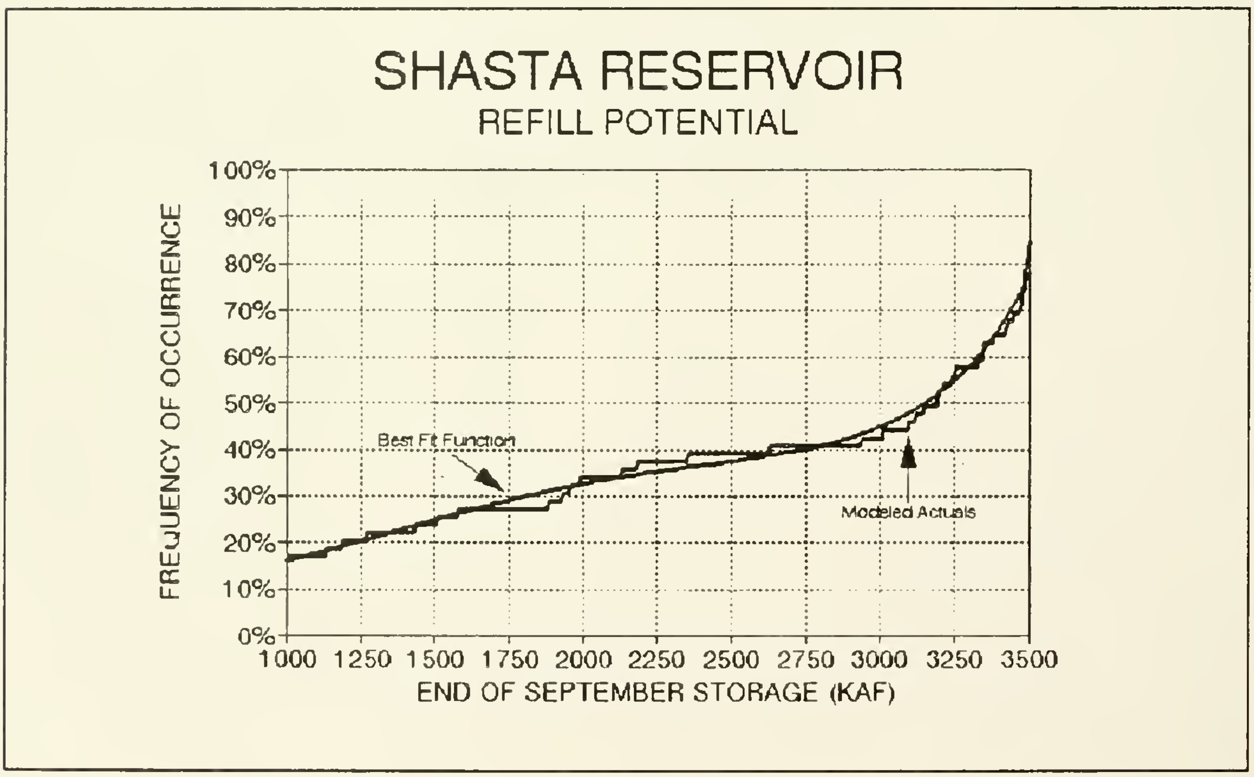
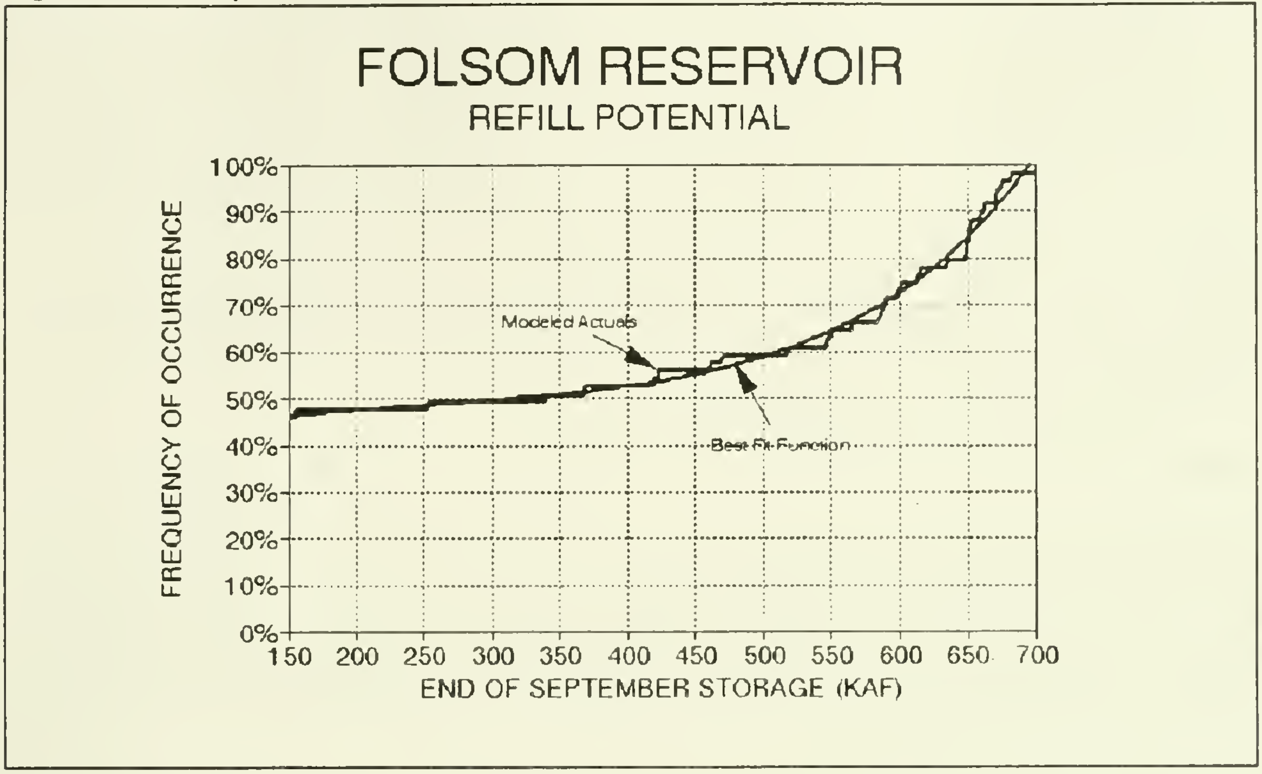
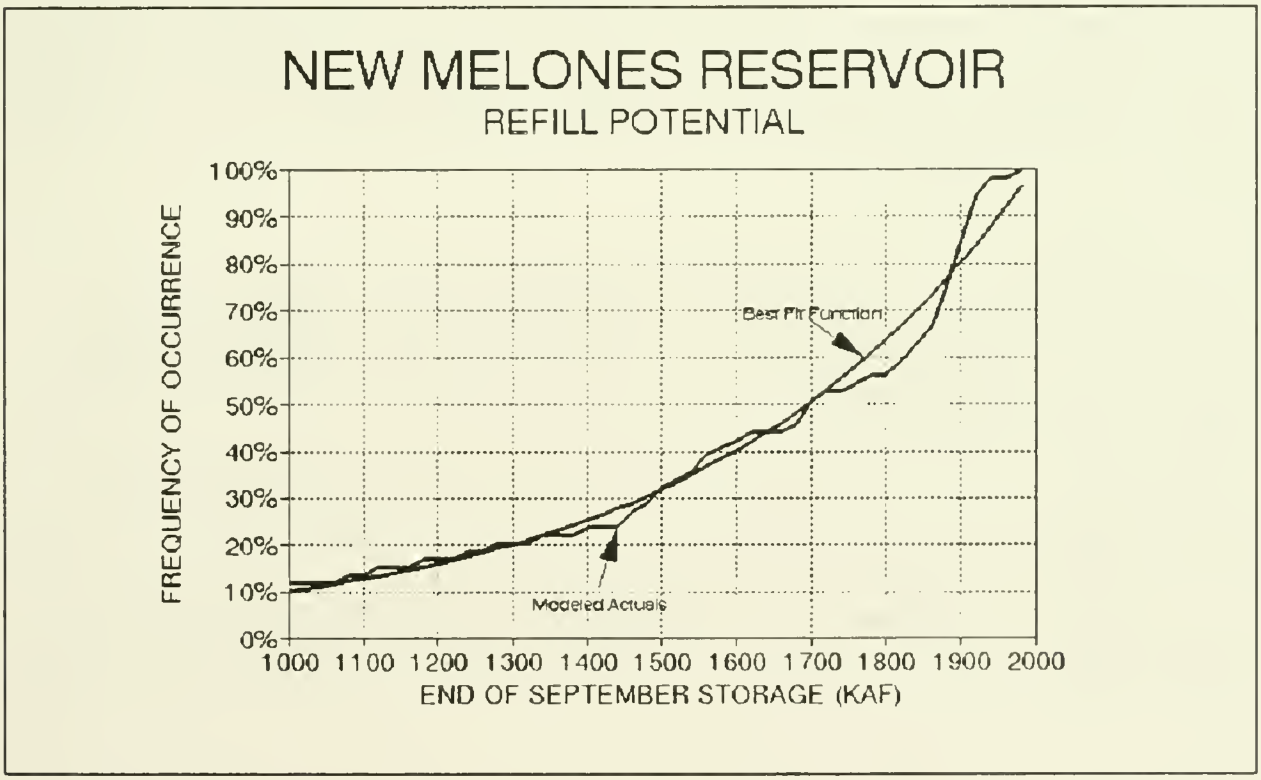


Figure 17. Graph - Folsom Reservoir and New Melones Reservoir Refill Potential





Two assumptions are required for this analysis of reservoir refill potential. (1) The first is the determination of the desirable carryover storage, which is determined through a trial-and-error procedure wherein a desirable storage is selected and the results of the analysis suggest a change. Past operations of CVP reservoirs also provide valuable input to this determination, as do physical constraints associated with the individual reservoir. (2) The second assumption required for this analysis is an estimate of the releases from the reservoir. In figures 16 and 17, the storages are derived from an operational study of the CVP that assumes current (1990) reservoir level demands and conditions, while also meeting all obligations of the CVP and the SWP. First, the median release for each month for each of the four reservoirs was determined. The 12 monthly values were then adjusted with a constant multiplier to equilibrate the sum of the monthly medians with the median of the annual release totals.

TRINITY DAM AND CLAIR ENGLE RESERVOIR

The Trinity River at Trinity Dam has an average annual runoff of about 1,250,000 acre-feet, and Clair Engle Reservoir has a storage capacity of 2,447,000 acre-feet. Flood control is not an authorized function of this reservoir. However, under Safety of Dams criteria, limitations are imposed that are similar to flood control regulations. These criteria are substituted for allowable flood control storage to determine if refill has occurred. Experience has shown that the desirable carryover storage is about 1,850,000 acre-feet (see figure 16).

Looking at the smoothed curve ("best fit function") in figure 16, it can be predicted that there is a 57-percent chance that the reservoir will refill with 1,850,000 acre-feet of carryover storage. As the carryover storage is reduced, the ability of the reservoir to refill in 1 year is diminished. When the carryover storage is reduced to one-half of storage capacity (1,225,000 acre-feet), the refill potential has fallen to 15 percent.

SHASTA DAM AND LAKE

The Sacramento River at Shasta Dam has an average annual runoff of about 5,675,000 acre-feet, and Lake Shasta has a storage capacity of 4,552,000 acre-feet. Flood control is an authorized function of this CVP reservoir, and allowable flood control storage figures are used to determine if refill has occurred. Experience has shown that the desirable carryover storage is about 3,175,000 acre-feet.

Looking at the smoothed curve ("best fit function") in figure 16, it can be predicted that there is a 52-percent chance that the reservoir will refill with 3,175,000 acre-feet of carryover storage. As the carryover storage is reduced, the ability of the reservoir to refill in 1 year is diminished. When carryover storage is reduced to one-half of the reservoir's storage capacity (2,276,000 acre-feet), the refill potential has fallen to 36 percent.

FOLSOM DAM AND RESERVOIR

The American River at Folsom Dam has an average annual runoff of about 2,800,000 acre-feet, and Folsom Reservoir has a storage capacity of 974,000 acre-feet. Flood control is an authorized function of this CVP reservoir, and allowable flood control storage figures are used to determine if refill has occurred. Experience has shown that the desirable carryover storage is about 620,000 acre-feet.

Studying the smoothed curve ("best fit function") in figure 17, it can be predicted that there is about an 80-percent chance that the reservoir will refill with 620,000 acre-feet of carryover storage. As the carryover storage is reduced, the ability of the reservoir to refill in 1 year is diminished. When carryover storage is reduced to one-half of the reservoir's storage capacity (487,000 acre-feet), the refill potential has fallen to about 60 percent.

NEW MELONES DAM AND RESERVOIR[1]

The Stanislaus River at New Melones Dam has an average annual runoff of about 1,100,000 acre-feet, and New Melones Reservoir has a storage capacity of 2,420,000 acre-feet. Flood control is an authorized function of this CVP reservoir, and allowable flood control storage figures are used to determine if refill has occurred. Experience has shown that the desirable carryover storage is about 1,800,000 acre-feet.

Studying the smoothed curve ("best fit function") in figure 17, it can be predicted that there is a 64-percent chance that the reservoir will refill with 1,800,000 acre-feet of carryover storage. As the carryover storage is reduced, the ability of the reservoir to refill in 1 year is diminished. When carryover storage is reduced to one-half of the reservoir's storage capacity (1,210,000 acre-feet), the refill potential has been reduced to 17 percent.

CONCLUSIONS

The information contained in these figures can be used to select which reservoir CVP releases should originate from. Folsom Reservoir has a high potential for refilling, as results show that even when Folsom is drawn down to 200,000 acre-feet, there is nearly a 50-percent chance that the reservoir will refill. By contrast, a decrease in carryover storage at Clair Engle or New Melones Reservoirs can severely affect their chances for refilling. It is therefore logical to assume that in the absence of other constraints, Folsom would always be the likely source when more then one water source is available because of its high refill potential.

Reservoirs are designed to use their carryover storage to meet demands in dry years. Prudent operations require that carryover storage be high enough to provide protection for dry years but low enough that water is not needlessly spilled in normal or wet years. The

[1] New Melones is discussed in this chapter because of its refill potential but is not discussed in other chapters of this document.

ability of each CVP reservoir to refill is not the only factor to consider when determining CVP releases, but it is an important factor.

RUNOFF FORECASTS

The purpose of developing seasonal runoff forecasts is to gain as accurate as possible an assessment of the potential for runoff into each major CVP reservoir. This assessment includes the probable range of the total runoff for the particular water year and the distribution of runoff over time. The accurate estimation of runoff is probably the single most important factor in planning CVP operations.

Reclamation, DWR, and NWSRFC independently prepare forecasts of seasonal runoff for various streams in the Central Valley. Reclamation forecasts runoff into the following reservoirs shown in table IV-1.

Table IV-1. Reclamation-forecasted runoff (CVP reservoirs)

Reservoir	River
Clair Engle	Trinity
Shasta	Sacramento
Folsom	American
New Melones	Stanislaus
Millerton	San Joaquin

USE OF MULTIPLE LINEAR REGRESSION MODELS

The system Reclamation uses for forecasting runoff for CVP reservoirs is sets of multiple linear regression models. Those models were developed by analyzing historical data sets, which consisted of measured monthly amounts of precipitation, measured snow water content, and calculated monthly amounts of runoff at the five reservoirs. The general form of the multiple linear regression models used to predict the runoff is an equation in which the estimate of runoff from the beginning of the current month through the remainder of the water year is a function of antecedent runoff, seasonal precipitation to date, and observed snow water content. No estimates of future precipitation or other predictive inputs are used in this process.

Under the forecasting procedures, an array of about 40 multiple linear regression models in the form of equations based on various combinations of the data inputs are developed. Each equation provides one forecast of runoff for the remainder of the water year. Each of these 40 forecasts will have approximately the same potential for error as measured by statistical parameters. A "most probable" forecast is computed by taking the mean of the 40 estimates. This forecast is assumed to have a 50-percent exceedance probability.

Forecast Confidence Limits

Confidence limits quantify the uncertainty of an estimate, such as the runoff forecast, by defining the upper and lower limit of a range of values that is expected with a given probability, to include the actual runoff. Confidence limits on the seasonal runoff forecast are estimated by analyzing the error potential of the multiple linear regression models used. This analysis develops a probabilistic distribution based on the errors obtained by hindcasting the runoff of each historical year, using the same multiple linear regression models as were used to obtain the "most probable" forecast. This distribution of historical errors is assumed to adequately represent the probable accuracy of the current year's runoff forecast. However, in extremely wet or dry years, further special analyses may be warranted to more accurately define the confidence limits.

Customarily, the 90-percent and 10 percent exceedance forecasts are computed in order to define reasonable upper and lower bounds within which the actual runoff should fall 80 percent of the time. The estimation of runoff outside these limits becomes increasingly subject to error based on the limitations of the length of record for the historical data as well as the properties of the multiple linear regression models themselves.

Because of low reservoir storage conditions, the 90-percent exceedance forecast of runoff for the CVP reservoirs has been used as a basis for decisionmaking on annual water allocation since 1989. A conservative estimate of runoff potential translates to a relatively low risk that CVP's initial water allocations would be later reduced, even if subsequent precipitation is well below normal. This approach to risk management is important to water users and other resource managers who must make a substantial commitment early in the year on the basis of estimates of the minimum water supply available. However, in conditions of high reservoir storage, a less conservative forecast would provide a more practical basis for operations decisionmaking.

Depending on prevailing hydrologic and storage conditions, one or more runoff forecasts will be developed for use as input data to Reclamation's operations forecasting model. Reclamation's current forecast procedures develop a total volumetric runoff forecast for the remainder of the water year, for each major water supply reservoir. Typically, confidence limits will be computed for each reservoir's forecast so that a water year runoff will be estimated at the 90-percent, 50-percent, and 10-percent levels of exceedance probability. These water year forecasts are then distributed into monthly amounts, generally by using a pattern wherein each month's forecasted runoff has the same historical probability of exceedance. This pattern may be altered if factors such as antecedent runoff conditions or snowmelt potential indicate a different distribution should be used.

Runoff forecasts are initially computed in February. They are based on precipitation and runoff conditions through January 31 plus February snow course measurements, which will normally be taken within a few days of the end of January. If necessary, these snow course measurements are then adjusted to represent end-of-the-month conditions of the snow water content. Forecasts are recomputed in March, April, and May, using the same process but with different multiple linear regression equations and updated data inputs. Figure 18 lists the precipitation sites and snow courses used in forecasting CVP reservoir runoff.

Forecasts may be performed earlier than February, but the potential inaccuracy of such early forecasts raises the possibility of large forecasting errors. For many water management purposes, it is less risky to use assessments of runoff potential that are derived simply from the statistical properties and the rankings of the historical runoff data. As shown in Figure 19, slightly more than 50 percent of the rainy season is past by February 1, and knowledge of runoff potential sufficiently, outweighs the risks of inaccurate forecasts.

The final forecasts are computed in May of each water year, although adjustments to these forecasts will be made in subsequent months based on observed runoff, the actual timing of the peak of snowmelt runoff, and the shape of the recession of snowmelt runoff hydrography. Furthermore, in the American, Stanislaus, and San Joaquin River Basins, the forecast of natural runoff must be converted to "operational reservoir inflow" by adjusting for the effects of regulation by upstream reservoirs, imports and exports from the basins, and consumptive use (if appropriate).

Accuracy of Runoff Forecasts

The accuracy of the runoff forecasts in any given year is highly dependent on the pattern of the precipitation in that year, a factor that cannot be well predicted. However, the patterns of precipitation and runoff in the Central Valley over many years have exhibited two important tendencies--the rainy season generally occurs between November and April and snowmelt runoff typically occurs between April and July.

Because of these generalized tendencies (see figure 20), the accuracy, or, conversely, the error potential of the water year runoff forecasts, can be depicted as a "funnel diagram." The general tendency for forecast errors over time is that they tend to get smaller as the year proceeds and more information becomes "observed" and less remains to be "estimated."

Although no forecasts of runoff are developed past the end of each current water year, the characteristics of the baseflow runoff persist into the next water year, a particularly important factor during water year that depart significantly from the average. In these cases, expected amounts of runoff for October through January may be adjusted to account for the persistence of the previous water year's characteristics.

Consultations and Coordination

Reclamation, DWR, and NWSRFC in Sacramento all prepare independent forecasts of runoff for each CVP water supply reservoirs. Before final adoption of the runoff forecast for use in operations planning, Reclamation consults with and compares forecasts with personnel from these two agencies. Based on those consultations, Reclamation may decide to adjust its

Figure 18. Runoff Forecast Data Requirements For Major CVP Water Supply Reservoirs

Data point location	Data type	Elevation (in feet)	Months used in forecast			
			Feb	Mar	Apr	May
Reservoir: Clair Engle Historical Data Set: 1946-1991						
Clair Engle Lake	Inflow	2370	X	X	X	X
Fort Jones	Precipitation	2725	X	X	X	X
Mt. Shasta City	"	3540	X	X	X	X
Weaverville	"	2050	X	X	X	X
Callahan	"	3185	X	X	X	X
Big Flat	Snow Water Content	5100	X	X	X	X
Middle Boulder 1	"	6600	X	X	X	X
Middle Boulder 2	"	6200	X	X		X
Sand Flat	"	6800	X	X		X
Deadfall Lakes	"	7200			X	
Red Rock Mountain	"	6700			X	
Shimmy Lake	"	6200			X	
Mumbo Basin	"	5700			X	
Parks Creek	"	6700			X	
Dynamite Meadows	"	5700				X
Reservoir: Shasta Historical Data Set: 1945-1991						
Shasta Lake	Runoff	1067	X	X	X	X
Alturas	Precipitation	4400	X	X	X	X
Burney	"	3140	X	X	X	X
Mt. Shasta City	"	3540	X	X	X	X
Shasta Dam	"	1075	X	X	X	X
Mt. Shasta	Snow Water Content	7900	X	X	X	X
Sand Flat	"	6800	X	X	X	X
Cedar Pass	"	7100	X	X	X	X
Adin Mountains	"	6150	X	X	X	
Lower Lassen	"	8250	X	X	X	X
Stouts Meadow	"	5250	X			X

Figure 18. Runoff Forecast Data Requirements For Major CVP Water Supply Reservoirs (continued)

Data point location	Data type	Elevation (in feet)	Months used in forecast Feb	Mar	Apr	May
New Manzanita	"	5900	X			
Thousand Lakes	"	6500	X			
Dead Horse Canyon	"	4500			X	
Reservoir: Folsom **Historical Data Set: 1930-1991**						
Folsom Lake	Runoff	466	X	X	X	X
Placerville	Precipitation	1890	X	X	X	X
Twin Lakes	"	8000	X	X	X	X
Colfax	"	2410	X	X	X	X
Soda Springs	"	6500	X	X	X	X
Lake Spaulding	"	5150	X	X	X	X
Donner Summit	Snow Water Content	6900	X	X	X	X
Upper Carson Pass	"	8500	X	X	X	X
Silver Lake	"	7100	X	X	X	
Ice House	"	5300	X			
Huysink	"	6600		X		
Bear Valley Ridge 1	"	6700		X		X
Lake Lucile	"	8200			X	
Rubicon 1	"	8100			X	
Ward Creek	"	7000			X	
Cicso	"	5900			X	
Sixmile Valley	"	5750			X	
Blue Lakes	"	8000				X
Reservoir: New Melones **Historical Data Set: 1948-1991**						
New Melones Lake	Runoff	1088	X	X	X	X
Calaveras Big Trees	Precipitation	4695	X	X	X	X
Hetch Hetchy	"	3870	X	X	X	X
Salt Springs	"	3700	X	X	X	X

Figure 18. Runoff Forecast Data Requirements For Major CVP Water Supply Reservoirs (continued)

Data point location	Data type	Elevation (in feet)	Months used in forecast Feb	Mar	Apr	May
Tiger Creek	"	2355	X	X	X	X
Yosemite	"	3966	X	X	X	X
Herring Creek	Snow Water Content	7300	X	X	X	X
Bear Valley Ridge 1	"	6700	X	X		
Soda Creek	"	7800			X	X
Eagle Meadow	"	7500			X	X
Lower Relief Valley	"	8100			X	X
Stanislaus Meadow	"	7750			X	X
Reservoir: Millerton **Historical Data Set: 1941-1991**						
Millerton Lake	Runoff	578	X	X	X	X
Yosemite	Precipitation	3966	X	X	X	X
Huntington	"	7020	X	X	X	X
Auberry	"	2140	X	X	X	X
Crane	"	2410	X	X	X	X
Kaiser Pass	Snow Water Content	9100	X	X	X	X
Chilikoot Lake	"	7450	X	X	X	X
Chilikoot Meadow	"	7150	X	X	X	X
Florence Lake	"	7200		X	X	X
Huntington Lake	"	7000	X	X	X	X
Peregoy Meadow	"	7000		X		X
Snow Flat	"	8700		X		
Piute Pass	"	11300			X	
Agnew Pass	"	9450			X	
Blackcap Basin	"	10300			X	
Mammoth Pass	"	9500			X	
Dutch Lake	"	9100			X	
Upper Burnt Corral	"	9700			X	
Ostrander Lake	"	8200				X

Figure 19

TYPICAL PATTERN OF PRECIP ACCUMULATION

CENTRAL VALLEY – CALIFORNIA

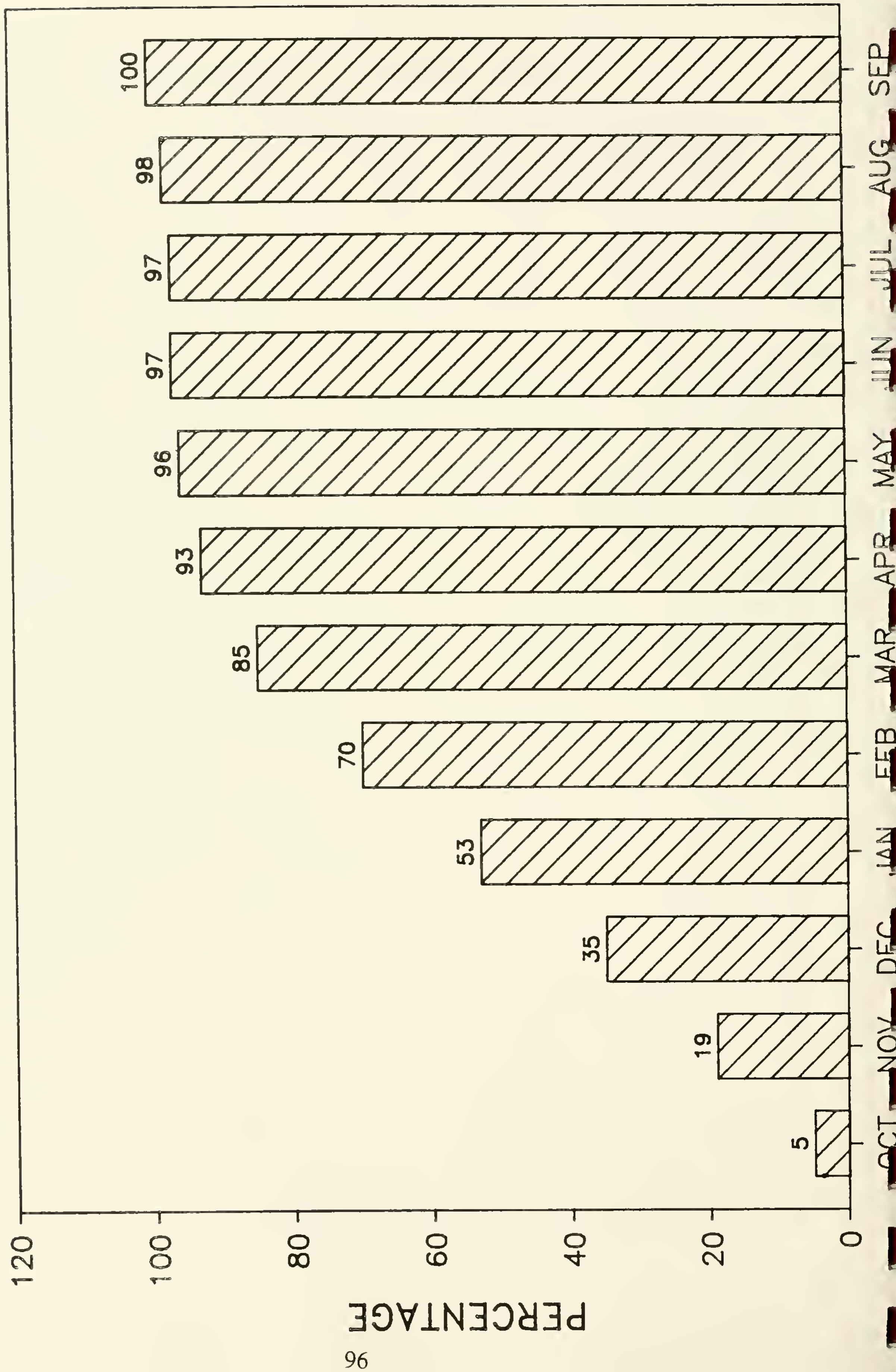
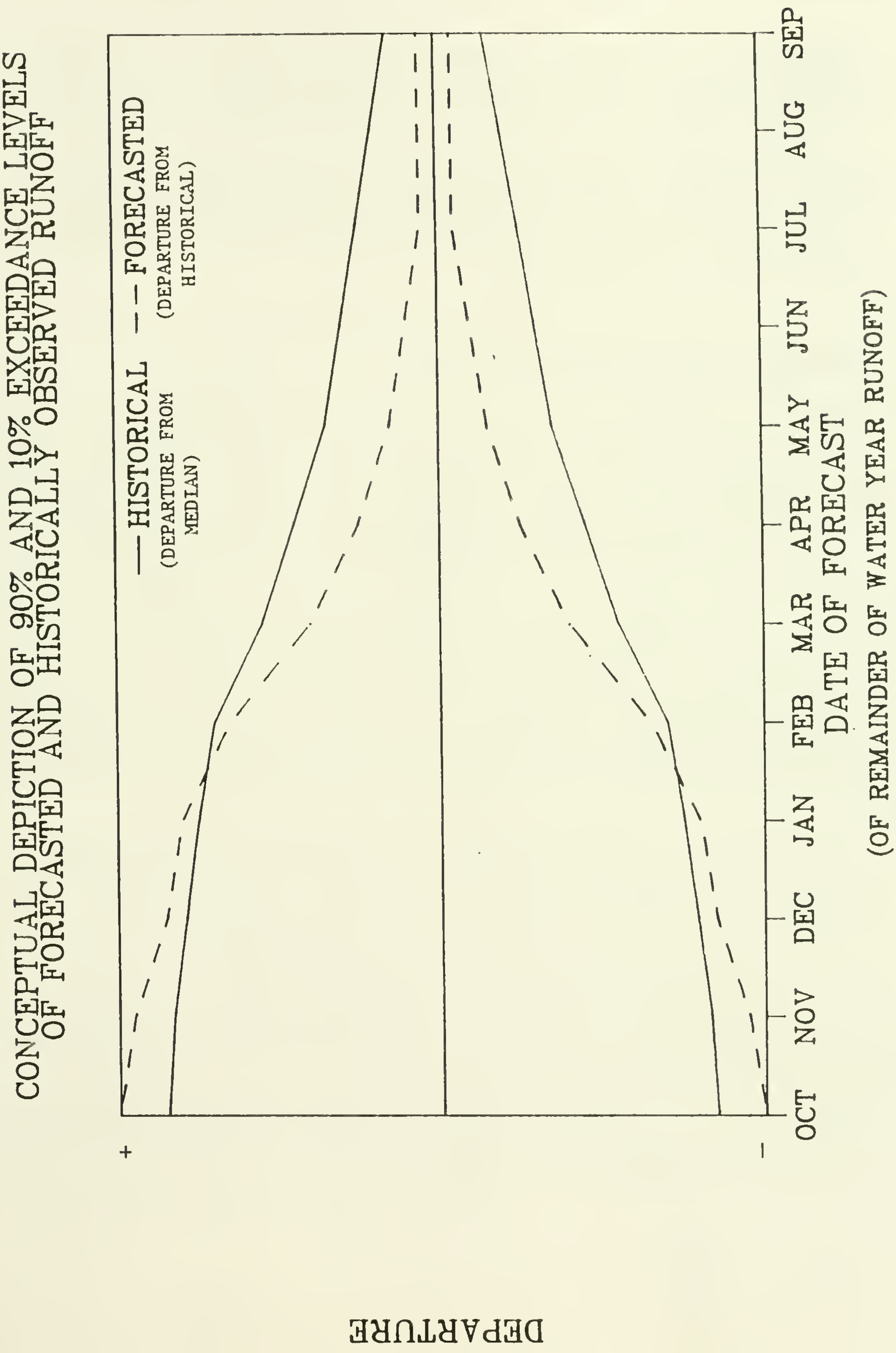


Figure 20



CONCEPTUAL DEPICTION OF 90% AND 10% EXCEEDANCE LEVELS OF FORECASTED AND HISTORICALLY OBSERVED RUNOFF
— HISTORICAL (DEPARTURE FROM MEDIAN)
- - FORECASTED (DEPARTURE FROM HISTORICAL)
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
DATE OF FORECAST
(OF REMAINDER OF WATER YEAR RUNOFF)
+
-
DEPARTURE

original forecast. An important element of the forecast consultations is the discussion of any unique conditions of the current water year and how those conditions may affect the accuracy of the runoff forecasts.

Most of the precipitation data used by Reclamation is collected or reported by either the DWR or the NWSRFC. All of the snow water content data is collected and reported by DWR's California Cooperative Snow Surveys. Reclamation has entered into annual agreements with each of these agencies, which help support data collection, processing and reporting, and runoff forecasting efforts.

ACCRETIONS AND DEPLETIONS

Another step in the forecasting process is determining Sacramento River accretions and depletions. This term refers to the difference between the amounts of water released to the Sacramento and its tributaries by the CVP and the SWP and the amount that flows past the city of Sacramento and into the Delta. Depending on the time of year and hydrologic conditions, this amount may represent a net gain (accretion) or a net loss (depletion). Accretions and depletions are forecasted for both short-term and long-term operational planning purposes.

Short-term forecasts (about 7 days or less in the future) are used to estimate inflows to the Delta at key points on the Sacramento River and to provide guidance to CVP operators on predicting release requirement from 5 to 7 days in advance (the maximum travel time from Keswick Dam to the Delta). Such short-term predictions of accretions and depletions may make use of: real-time flow data, temperature and weather forecasts, travel time, non-CVP reservoir releases, existing trends in accretions and depletions, and advice and input from some of the major irrigation districts using water on the Sacramento River.

Long-term forecasts of accretions and depletions are made to plan monthly or seasonal operations. For long-term forecasts, accretions and depletions are treated as monthly quantities and are customarily forecasted or estimated for 12 months into the future. The following discussion focuses on the long-term range forecasts of accretions and depletions.

Over a 12-month period, Sacramento River accretions and depletions are a function of countless natural phenomena, decisions made by CVP reservoir operators, and individual water user requirements. Some of these phenomena have an element of predictability, but a great deal of variability and uncertainty is associated with the long-term forecasts of accretions and depletions. When estimating beyond the end of the current irrigation season, historical patterns and the correlation between accretions and the upstream water supply provide almost the entire basis for the estimate.

One major hindrance in forecasting accretions and depletions is the relatively short historical period of records available which is representative of the present level of development and streamflow regulation in the Sacramento Valley. The construction and subsequent operation of the Tehama-Colusa Canal and New Bullards Bar Dam on the Yuba River have each had a major influence on the quantity and pattern of accretions and depletions in the Sacramento River. These facilities, which began operation during the 1970's, have left less than a 20-year period of record from which to base comparisons and to formulate estimates of future accretions and depletions.

The net annual accretions and depletions have ranged from about 1.0 MAF in 1977 to more than 20 MAF in 1983. The range of these quantities, in addition to the scope and complexity of the other hydrologic processes affecting it within the Sacramento Valley, add to the problems of accurately forecasting accretions and depletions. Fortunately, certain predictable tendencies help to characterize the accretions and depletions. Furthermore, CVP operational considerations limit the range of accretions that have any practical effect on CVP operations to periods when the Delta has "balanced" conditions. When "excess" conditions exist, the projects are storing and exporting as much water as possible. Thus, the accuracy of the estimate of accretions and depletions is significant to CVP operations only within the range that is associated with the CVP's capability to respond operationally. During winter months, this excludes the wetter one-half to three-fourths of all historical accretions, simply because these accretions are large enough to result in "excess" conditions.

The characteristics used in estimating accretions and depletions include:

- The predictability of the rainy season (accretion) and the growing season (depletion),

- The quantifiable nature of reservoir regulation effects (including New Bullards Bar, South Yuba system, Black Butte and Bear River),

- Physical limits to rates of depletion that are tied to the aggregate diversion capability and the irrigated acreage in the Sacramento Valley,

- Contractual or water rights limitations to the overall water use of the Sacramento River during the course of a growing season, and

- Predictability of the timing and quantities of water associated with flooding and draining of rice fields.

In the Sacramento Valley, irrigation is generally limited to the months April through October. This complements the rainy season, November through March, although there may be significant overlap in many years. The irrigation season is dominated by depletions and usually results in a net depletion to the Sacramento River as a whole, although the influence of accretions from tributary inflow may still be significant.

The months November through March are almost totally dominated by accretions in the Sacramento River. In estimating accretions and depletions, it is helpful to treat the irrigation season or the irrigation component of the accretions and depletions separate from the other hydrologic inputs. Early in the water year, the basis for estimating accretions and depletions is to select (using historical data) amounts and patterns that are consistent with the assumed water supply upstream of the reservoirs. History shows a high correlation between headwaters runoff and accretions. Early in the water year, historical patterns and amounts may adequately represent net depletion as well unless water use limitations or deficiencies are anticipated. In the Sacramento Valley during a normal year, about 4 MAF are used for irrigation. Later in the water year, as the overall characteristics of the water year become better known, estimates may be refined by the knowledge of tributary runoff forecasts, current inflow conditions, basin saturation, and reservoir releases on the Yuba and possibly other streams.

Once the irrigation season begins, the estimating of accretions and depletions for the remainder of the season becomes a process of verification and adjustment of the expected quantities. In the absence of rainfall runoff, actual accretions and depletions become more predictable but remain a source of some uncertainty even during the summer when monthly estimates may frequently be in error by 20 percent or more.

FORECASTS OF DELTA REQUIREMENTS

Forecasts of Delta requirements are perhaps the most difficult to make within the forecasting process for CVP operations. So many factors can influence conditions in the Delta that it is unlikely that any forecast will succeed in correctly identifying them all. For example, four major water diversion points are located in the Delta, with literally hundreds of minor water diverters. There are forecasted tide tables, but no long-term forecasts of barometric pressure that can affect the magnitude of the tides. Also, no long-term forecasts of daily meteorological events are made. Despite these limitations, forecasts of Delta requirements are necessary. Without the forecasts, planning for upstream reservoir operations and water deliveries south of the Delta would be impossible and the reliability of the projects would be compromised.

Every month throughout the year has Delta water quality standards that must be met. Investigations by the CVP and SWP operators have provided estimates of the required daily Delta outflow necessary to meet these standards. Estimates of daily consumptive use by unmonitored diversions, evaporation, and consumptive use by riparian vegetation have also been established. This information, along with forecasted Delta inflows from sources other than the Sacramento and San Joaquin Rivers and informed guesses about tidal influences, provide the operators of the two projects with a baseline condition of Delta water needs.

With the baseline needs established, CVP Delta exports are then added to the total. Depending on the amount of CVP Delta exports and water quality conditions in the Delta, some amount of water in excess of exports, known as carriage water, may be required. Carriage water is that quantity necessary to counteract a degradation in Delta water quality caused by operating the export pumps. Thus, the Delta water requirements are equal to the baseline needs plus exports plus carriage water.

Once the Delta water requirements are established, the operators of the two projects then estimate how much water must be released from CVP and SWP reservoirs to meet both the Delta requirements and the intervening depletions along the Sacramento and San Joaquin Rivers as they flow into the Delta.

12-MONTH FORECAST OF CVP WATER AND POWER OPERATIONS

Another important step in the CVP forecasting process is forecasting monthly water and power operations. A computer model of the CVP is used which simulates the operation of key CVP water and power facilities, as well as some SWP facilities operated in coordination with the CVP. The model is also used each month to provide to Western a forecast of operations, capacity, and energy available to PG&E for the next 12 months. Additionally, the model can be used at any time to simulate operations under any set of assumed conditions from 1 to 12 months or more.

The program provides interactive control of CVP and SWP exports in the Delta and releases from Goodwin, Nimbus, Keswick, and Shasta Dams, the Oroville Complex, and Trinity River diversions. Other data, such as initial storage conditions, monthly inflows, and water and power demands, are entered into an input file before running the model. The program also provides for interactive changes to AEEA at the end of the calendar year and at the end of the chosen forecast period.

The model has built-in logic; with the input data, it forms the basis for an initial CVP operation plan. This plan may then be modified interactively by overriding certain inputs or computed values. Storages at Shasta, Folsom, New Melones, and Oroville Reservoirs are limited by flood control reservations. The program computes allowable CVP and SWP exports from the Delta according to accounting provisions of the COA. During balanced conditions in the Delta, CVP and SWP reservoir releases are automatically adjusted by the model to meet those COA requirements. The program also automatically checks minimum energy requirements and for generation in excess of CVP and preference loads (the program provides messages during the interactive phase when more or less generation is needed). Then, the operator can change the releases or pumping to affect the energy or can wait to use AEEA to balance energy needs.

Forecasting water and power operations not only is useful in planning operations to meet CVP operational objectives, it also serves to identify potential problems that may arise under assumed conditions and chosen operations.

CHAPTER V
WATER YEAR 1992
OPERATIONS PLAN

CHAPTER V
WATER YEAR 1992
OPERATIONS PLAN

Chapter V
WATER YEAR OPERATIONS PLANS

OBJECTIVE AND SCOPE

The objective of these operations plans within the framework of CVP-OCAP, is to assist in identifying and quantifying the extent of operations capabilities encompassing a range of hydrologic and storage conditions, to expose operational concerns or problems, and to serve as a basis for developing and evaluating alternative operations, especially for the protection of winter run.

The scope of these 12-month operations plans includes the major CVP and SWP reservoir operations, coordinated CVP/SWP operations to meet Delta requirements, releases to the American, Feather, Sacramento, and Trinity Rivers; and flows in the Sacramento River.

CVP-OCAP operations plans and analyses portray operations of the CVP under five distinct levels of water year runoff covering a wide range of possible hydrologic conditions coupled with four initial reservoir carryover conditions. The plans are given titles associated with the State of California's Sacramento River water year classification system, starting storage, and nominal percent of allocated CVP agricultural water delivery. The plans are in ascending order of assumed water supply: Extreme Critical, Critical, Dry, Above Normal, and Wet; ascending order of starting storage, low (LO), low middle (LM), high middle (HM), and high (HI); level of agriculture delivery, 0 percent, 25 percent, 50 percent, 75 percent, 100 percent. Characteristics associated with each of the operating plans are displayed in the summary tables for the water year operations plans (see figures 21 and 22). Starting storage level HI represents multipurpose maximum end-of-water-year storage targets for each reservoir. Starting storage LO represents approximate storage levels anticipated for end of WY 1992. Storage levels LM and HM are intermediate storage levels selected to provide adequate representation of a full range of storage conditions for CVP-OCAP. Tables V-1 and V-2 summarize, respectively, the overall water supply and the annual reservoir inflow associated with the five water year types that form the hydrology of the operations plans.

CVP-OCAP water year operations plans presented here include numerical, graphical, and descriptive summaries of the forecasted operations data, including forecasted Sacramento River temperature conditions, and estimates of temperature-related winter-run survival deriving from each of the different year types. Also included in this chapter are brief discussions of the special assumptions, strategic approach, significant operations highlights, and conclusions drawn from the 18 plans comprising each of the Pre-1992 and NMFS B alternatives and the five plans investigated under the Upper Sacramento temperature control (TEM) alternative.

Table V-1. Characteristics of the five levels of water year runoff used by CVP-OCAP

Designation	SRI[1]	Estimated probability of nonexceedence for SRI[2]
Wet (W)	23.8	75%
Above Normal (A)	15.8	50%
Dry (D)	12.5	30%
Critical (C)	8.8	10%
Extreme Critical (E)	5.7	2%

[1] Annual unimpaired flow (in MAF) of Sacramento, Feather, Yuba, and American Rivers
[2] Based on natural flow records for 1906-90

Table V-2. Water year inflow to reservoirs for the five CVP-OCAP water year types (Units: MAF)

Water year designation	Trinity	Shasta	Folsom	Oroville
Wet (W)	1.6	7.0	3.7	5.4
Above Normal (A)	1.05	5.1	2.6	3.3
Dry (D)	.86	4.1	1.7	2.8
Critical (C)	.60	3.5	1.2	1.8
Extreme Critical (E)	.26	2.5	.60	1.3

CVP-OCAP operations studies were performed using a spreadsheet model of CVP and SWP reservoir operations, Delta, and San Luis operations. The spreadsheet incorporated minimum releases, maximum storages, project and nonproject demands, COA and Delta requirements while accounting for water coming into and out of project facilities and the Delta. Otherwise, selection of releases, exports, and satisfaction of operations objectives is left up to user discretion, thus allowing the maximum flexibility in exploring alternative operations and criteria.

PRE-1992 AND ALTERNATIVE OPERATIONS CRITERIA

For CVP-OCAP, operations plans were prepared representing three different sets of criteria. These are designated: Pre-1992, referring to criteria for CVP operations absent the special measures and protection provided under ESA; TEM referring to special operations criteria intended to provide improved Sacramento River temperature control; and B referring to the NMFS alternative B for protection of winter-run juveniles in the Delta. As portrayed in CVP-OCAP, the B alternative operations also include modified upstream operations intended to equal or improve on temperature and survival achieved in the Pre-1992 and TEM alternative operations.

All of the CVP-OCAP operations alternatives are assumed to take place in an operations environment that includes only project features, demands, and capabilities that could be expected to be in place in 1993. Each of alternative operations rely primarily on the criteria described in chapters I through IV of this document, although special assumptions are listed separately for each alternative in this section.

Pre-1992 Operations

The Pre-1992 operations analyses were performed first. These were intended to represent a point of reference for comparison with subsequent operations alternatives. The Pre-1992 alternative relies almost exclusively on the operations criteria described in chapters I-IV. Initially, 20 operations cases were identified for analysis under this alternative (five water year types W, A, D, C, E; combined with four different starting storages HI, HM, LM, LO). Two of the 20 Pre-1992 operations cases were deleted from further analysis: cases E-LM-000 and E-LO-000. In these two cases, based on the Extreme Critical hydrology, CVP ran out of water, and would need to operate for health, safety, hardship, and survival. These cases are not irrelevant by any means, but were deemed unmeaningful within the scope of CVP-OCAP. The remaining 18 cases comprise the Pre-1992 operations alternative presented here. The operations results for these 18 cases went on to receive temperature and survival analysis. Although Shasta powerplant bypass is assumed to be a part of the Pre-1992 alternative operations, results are presented for Pre-1992 operations both with Bypass and No Bypass. This is done to portray the significance to temperature control of that aspect of operations and to provide a basis for comparison of the relative significance of the changes to temperature and survival attributable to other, alternative operations. Both the TEM and B alternatives assume operations incorporate Shasta powerplant bypass.

TEM Alternative Operations

The second set of operations criteria analyzed were the TEM alternative. The TEM alternative was devised as a followup to the Pre-1992 operations for cases in which it appeared that upper Sacramento River temperatures and winter run survival might benefit from a more restrictive water allocation strategy, or other modified operation criteria. After the temperature and survival analyses were performed on the 18 Pre-1992 operations cases, any case where overall survival was estimated to be significantly below 100 percent, were candidates for TEM alternative operations analysis. Six of the 18 cases were selected for the additional analysis. One of the six, E-HM-000, was deleted from the TEM alternative because it required the arbitrary reallocation of CVP water, deemed to be outside the scope of CVP-OCAP. For the remaining five cases, a TEM alternative operation strategy was developed and analyzed. A significant aspect of the TEM alternative operation was the assumption that the RBDD gates would be raised from November 1 through April 30. The distribution of spawning of winter run resulting from the gates being up during April has a significant effect on overall winter-run survival. In some cases this effect is more significant than the other major aspect of the TEM alternative which was the reduction of water allocation.

NMFS B Alternative Operations

For the B alternative, all 18 of the cases comprising the Pre-1992 alternative were modified to incorporate the criteria of NMFS alternative B (see table V-3) as submitted to the SWRCB in the Interim Delta Hearings in July 1992. Among the eight alternatives A through H presented in that table, CVP-OCAP presents only alternative B for detailed analysis of operations, temperatures and winter run survival. By preliminary screening, alternatives A and C were determined to be more restrictive of operations than alternative B. Since none of these alternatives was implied to provide more or less protection, alternative B was selected for detailed analysis because of its less restrictive criteria. Alternatives D through H assume a barrier in Georgiana Slough. This was also deemed outside the scope of CVP-OCAP. DWR is investigating alternative operations for 1993 that include the temporary rock barrier for Georgiana Slough. The criteria specified by NMFS for alternative B require the DCC to be closed from February through April. They further require a positive flow at Jersey Point (or Antioch) during that same period. The B alternative operations presented in CVP-OCAP meet the Antioch flow criterion on an average monthly basis. Additionally, for CVP-OCAP alternative B, CVP water allocations and reservoir operations were configured with the objective to equal or better temperature and survival conditions achieved in the Pre-1992 and TEM cases representing the same hydrologic and starting storage conditions.

In alternative B, during February, March, and April, CVP and SWP pumping was curtailed, if necessary, to provide positive Antioch flow. If Delta balanced conditions existed, COA sharing formulas determined the respective amounts of CVP and SWP Delta export pumping. If Delta excess conditions existed, the total amount of combined Tracy and Banks pumping allowed within the Antioch flow constraint, was calculated and split equally between Tracy and Banks. If Tracy allowable pumping exceeded Tracy capability, then SWP pumped the excess. If either party's share of San Luis Reservoir was full, any excess in the allowable pumping by that party was shifted to the other party's export pumping.

Table V-3. NMFS ALTERNATIVES A THROUGH H

Juvenile winter-run chinook salmon protective alternatives for the Sacramento-SanJoaquin Delta for all water year types

Alternative	Close Delta Cross Channel	Close Georgiana Slough	Maximum total daily CVP/SWP exports
A	2/1 thru 4/30	Open	2/1 thru 3/31 Vernalis Q 4/1 thru 4/30 75% Vernalis Q Plus 10% DOF when DOF $\geq$ 50,000 ft^3/s
B	2/1 thru 4/30	Open	SJR Jersey Pt. Q 0 to +1,000 ft^3/s 2/1 thru 4/30
C	2/1 thru 4/30	Open	3,000 ft^3/s 2/1 thru 4/30
D	2/1 thru 4/30	2/1 thru 4/30	2/1 thru 3/31 Vernalis Q 4/1 thru 4/30 75% Vernalis Q Plus 10% DOF when DOF $\geq$ 50,000 ft^3/s
E	2/1 thru 4/30	2/1 thru 4/30	D-1485 Salinity
F	11/1 thru 4/30	2/1 thru 4/30	D-1485 Salinity
G	1/1 thru 4/30	3/1 thru 4/30	3,000 ft^3/s 2/1 thru 2/29
H	2/1 thru 4/30	2/1 thru 4/30	SJR Jersey Pt. Q 0 to -2,000 ft^3/s 2/1 thru 4/30

CVP WATER ALLOCATION

Beneficial uses of CVP water are many and varied. In most years, the combination of carryover storage and runoff into the reservoirs is sufficient to provide both the quantity of water necessary for these uses and the operational flexibility to deliver the water. In this context, operational flexibility refers to: the availability of supply at the time it is needed; physical storage and conveyance capacity; and, sufficient supplies and ability to control cold/warm water releases. It is the combination of these factors which define the limits of water allocation, and it is the operator's perception of the diverse water needs and their interrelationship that identify the specific water allocation.

Meeting the water needs for beneficial uses requires a strategy that gives recognition to two competing requirements: (1) CVP needs to retain sufficient carryover storage to ensure temperature control capability and reduce risks of shortages in future years, and (2) CVP may need to draw from available storage in a given year in order to support sufficient water deliveries to avert adverse health, safety, and economic hardship conditions.

Usually, it is possible to satisfy competing needs in years when water supplies are above normal or wetter. Even in drier years, if normal carryover storage is available at the beginning of the year, the probability is good that 100 percent water allocations will be available. However, all beneficial uses of CVP water are adversely affected during prolonged periods of insufficient water supply. Both environmental and economic systems are stressed by the cumulative impacts of dry conditions to a point where tolerance of continued drought is significantly weakened. When storage in CVP reservoirs at the beginning of the water year is diminished, there is limited capability in the system to mitigate the impact of continuing drought. It is significant that these studies display deficiencies on water deliveries at least as severe as those that have occurred historically and in some cases, CVP agricultural allocations are reduced to zero.

The operations alternatives portrayed in this plan combine water deliveries with five separate water year runoff levels and four initial reservoir carryover conditions. Certain assumptions regarding the water allocations apply in all cases, others are specific to the objectives and criteria of a particular alternative operation. Table V-4 portray annual CVP and SWP annual demands assumed for CVP-OCAP operations studies. Table V-5 displays a breakdown of CVP demands by category of use.

Table V-4. Annual water demand in CVP-OCAP

SWP	Delta	3.8	MAF
	Feather River Service Area	1.0	MAF
CVP	Delta	3.4	MAF
	Sacramento Basin	2.9	MAF

Table V-5. CVP-OCAP annual CVP deliveries by category of use (Units: MAF)

	Water rights	Project agriculture	M&I	Refuge
Delta	.9	2.1	.3	.1
Sacramento Basin	2.2	.4	.2	.1
Total	3.1	2.5	.5	.2

NOTE: Water rights and M&I subject to maximum 25% reduction in CVP-OCAP

Water Allocation Criteria Common to All Operations Alternatives

- CVP Water allocations are described only for 25 percent increments (0 percent, 25 percent, 50 percent, 75 percent, 100 percent). Intermediate levels of allocation are not considered.

- CVP water allocations are determined for two time periods in each year, October through February, and March through September. Allocations are fixed and not modified during those periods. For the October through February period, water allocations are based on antecedent water year conditions implied by storage available at the start of the water year. There is no attempt to simulate the uncertainty in the water year runoff that exists when allocations are fixed, except insofar as a conservative approach was adopted in the selection of amounts of end of water year storage retained in conjunction with the water allocation in each case.

- Water rights allocations are determined by the Shasta Criteria. An assumption is made regarding the previous years Shasta inflow, on the basis of the starting storage condition. This results in accumulated deficiency in inflow triggering reduction in allocations to water rights in some cases.

- M&I allocations are 100 percent if project agricultural allocations are 75 percent or more.

- SWP water allocation is based on water supply available for Delta export, consistent with end of water year objective for Oroville storage.

- Feather River Service Area deliveries are not reduced in any of the operations plans.

Pre-1992 Operations

The water allocation strategy in the Pre-1992 operations alternative attempts to balance storage and water delivery objectives with consideration for other operations objectives, including river temperatures and CVP power and energy production.

- CVP deliveries are supported at least at the levels allocated in WY 1992, i.e., 25 percent to agricultural contractors. M&I allocations are a minimum of 75 percent of WY 1987 to WY 1989 use. If necessary, carryover storage may be used to continue deliveries at these levels of allocation.

- Under extremely adverse runoff conditions, even the above minimum levels of allocation may not be supportable. In this case, water deliveries may be further reduced as needed to preserve carryover storage sufficient to provide continued capability to deliver water for health and safety and to maintain minimal instream flows and Delta water quality.

- In dry and critical years, CVP agricultural water allocations are increased above the nominal 25 percent, if possible while providing for end of water year reservoir storage above the defined LO storage level.

- In the above normal and wet year type (50th percentile and greater), it appears that the only limits on water deliveries would be physical capability of the CVP facilities to export, convey, and regulate water for delivery south of the Delta.

TEM Alternative Operations

After temperature and winter-run survival analysis were completed for the 18 Pre-1992 cases, if overall survival results fell below 98 percent, a TEM alternative was devised with the objective of decreasing temperature related mortality. Five of the 18 Pre-1992 cases were given this additional analysis. Water allocations were reduced by 25 percent in the March-September period to test the effect of this change on estimated temperatures and survival. Reductions in the minimum objective flow at Wilkins Slough were made in order to permit further flexibility with timing of Keswick release. In one case, C-LO-25.TEM, a reduction in Sacramento River water rights allocation to 50 percent, was tested. In this same case, COA borrowing from Oroville was used to retain more water in Shasta through August 31, with repayment of COA borrowing in September.

NMFS B Alternative

Water allocations for the NMFS B alternative operations were initially selected for each case to be the same as they were for Pre-1992 operations. They were then reduced as necessary to meet two objectives: (1) Eliminate reverse flow at Antioch in February, March, and April; (2) equal or exceed temperature control and survival in upper Sacramento that was achieved in the Pre-1992 or TEM alternative operations.

ASSUMPTIONS

Assumptions Common to All CVP-OCAP Water Year Operations Plans

- All cases portray one 12-month period, October-September.

- COA provisions are met regarding sharing of CVP/SWP responsibilities during balanced conditions (exception C-LO-25.TEM).

- D-1485 Standards for Delta are met, as appropriate to "year type."

- CVP annual Delta Export is 3.4 MAF (for 100 percent supply). Tracy pumping maximum 4,600 ft^3/s, but limited by conveyance in DMC during nonirrigation season. D-1485 limit of 3,000 ft^3/s in May and June. D-1485 replacement pumping at Banks up to 195,000 acre-feet in July and August if needed. Cross Valley pumping at Banks up to 128,000 acre-feet per year.

Table V-6. Comparison of annual water allocations Pre-1992 and NMFS B alternatives					
Water Year Designation	Starting Storage	CVP (Project AG) Pre-1992	CVP (Project AG) "B"	SWP Pre-1992	SWP "B"
Wet (W)	HI	100%	100%	100%	100%
	HM	100%	100%	100%	95%
	LM	100%	100%	100%	95%
	LO	100%	100%	80%	85%
Above Normal (A)	HI	100%	100%	100%	90%
	HM	100%	100%	95%	80%
	LM	100%	100%	90%	75%
	LO	100%	100%	80%	70%
Dry (D)	HI	100%	75%	95%	80%
	HM	100%	75%	90%	75%
	LM	75%	75%	80%	65%
	LO	50%	50%	65%	60%
Critical (C)	HI	100%	75%	80%	70%
	HM	75%	50%	65%	60%
	LM	50%	25%	50%	50%
	LO	25%	0%	35%	35%
Extreme Critical (E)	HI	50%	25%	45%	40%
	HM	0%	0%	25%	25%

- SWP annual Delta Export is 3.8 MAF (100 percent requests) maximum pumping per Corps permit is 6,680 ft^3/s, except December 15 to March 15, when it is 6,680 ft^3/s, plus one-third of the Vernalis flow if greater than 1,000 ft^3/s, but may not exceed 7,300 ft^3/s. D-1485 limit of 3,000 ft^3/s in May and June, and 4,600 ft^3/s in July. DFG limit of 2,000 ft^3/s or 3,000 ft^3/s in May and June.

- No waterbank or other transfers affect CVP and SWP operations.

- Delta Cross Channel closed in accordance with D-1485, or if Freeport flow is greater than 25,000 ft^3/s.

- Sacramento River accretions/depletions are modified in accordance with CVP water allocations.

- Trinity River flow allocations for all years are 340,000 acre-feet.

Upper Sacramento River Temperature and Survival Analysis

The temperature analysis of upper Sacramento River operations was performed with the Reclamation's temperature model. The model simulates monthly temperature conditions in CVP reservoirs and at locations downstream from their discharge points. Model inputs include initial storage and temperature conditions, inflow, outflow, evaporation, solar radiation, and average air temperature. Release temperatures from Whiskeytown, Shasta, and Clair Engle are computed for each outlet level. Mean monthly river temperatures are computed on the Sacramento from Keswick to Red Bluff. River temperatures are based on the quantity and temperature of the Keswick release, normal climactic conditions, and tributary accretions similar to dry year (1976) conditions.

Survival analysis, or conversely, temperature-related mortality analysis was performed using the model provided to Reclamation by CH2M Hill and described in the Biological Assessment (October 1992). The Sacramento River reaches are: Reach 1 - Keswick to Balls Ferry, Reach 2 - Balls Ferry to RBDD, and Reach 3 - below RBDD. In the survival model analysis, estimated survival in each reach is computed using average monthly temperatures from April through September. Average temperature in Reach 1 is represented by temperature below Clear Creek, Reach 2 average temperature is represented by Bend, and Reach 3 average temperature is represented by Red Bluff.

For the Pre-1992 operations criteria, temperature and mortality results were computed for both the Bypass and No-Bypass versions of the operation. In the No-Bypass version, all Shasta releases were assumed to be made through the powerplant penstock intakes at El. 815 feet. Also, in the No-Bypass version, selection of releases from Shasta, Whiskeytown, and Clair Engle were made primarily on the basis of storage targets, refill probability, and seasonal energy requirements; not necessarily for temperature control. For the Bypass version of the Pre-1992 operations, Keswick releases were the same as in the No-Bypass case. However, the Bypass case used Shasta cold water bypass (742-foot level outlets), and warm water Bypass (942-foot level outlets) to meet the temperature objectives in the Sacramento River that were established as 56 °F at either Red Bluff, Bend, or Balls Ferry. In some cases, the bypass operation modified the proportions of Shasta and Spring Creek Powerplants release to better accomplish temperature objectives.

The presentation of the Bypass and No-Bypass versions of the Pre-1992 operations is done to portray the significance to temperature control of the use of bypass and selective reservoir withdrawals. It is assumed that bypass operations are part of Pre-1992 operations criteria, as well as all the cases investigated under the TEM and NMFS B alternative operations.

Assumptions Common to All Temperature Analyses of Long-Term Operations Plans

- January 1 forecasted storage conditions were used to initiate temperature analyses of each of the Long-Term Operations Plans.

- Cold water bypass at Shasta was used to meet temperature objectives. Warm water bypass was used when possible to conserve the cold water in Shasta for later use. Both cold and warm water are released in some months because of difference in reservoir temperature profile between beginning and end of month.

- Monthly operational temperature objectives and a control point were selected for each case to either meet the biological criteria for winter run, or to maximize survival in cases where relaxed temperature criteria permitted best use of temperature control capabilities.

- No cold water bypass at Trinity was assumed.

Assumptions Regarding Spawning Distribution for Survival Analysis

Pre-1992 Operations:

- RBDD gates up December through March

- Spawning Distribution:

	Water Year Type	
	Wet/Above Norm	Dry/Critical
Reach 1	50%	60%
Reach 2	40%	35%
Reach 3	10%	5%

TEM and NMFS B Alternative Operations:

- RBDD gates up November through April

- Spawning Distribution:

Water Year Type		
	Wet/Above Norm	Dry/Critical
Reach 1	60%	90%
Reach 2	35%	7%
Reach 3	5%	3%

SUMMARY OF RESULTS

Because of the large amount of information generated by the CVP-OCAP water year operations plans, several summary graphics have been prepared to allow both a numeric and visual comparison of results. Figures 21 through 33, at the end of Chapter V, are provided to summarize the CVP-OCAP water year operations plans and to highlight some of the most significant results and conclusions.

Supplemental appendices of graphs and tables, Appendices A through C of this report, provide further information on the results of the CVP-OCAP water year operations studies, and also the results of all the temperature analyses completed for each of the Pre-1992, TEM, and NMFS B operations alternatives.

The following is a description of the CVP-OCAP water year operations plans and results as portrayed in figures 21-33.

Figure 21

Summary table in water year operations plan, Pre-1992 and TEM alternatives. This table summarizes the assumed hydrologic conditions and year types, operations study nomenclature, storage conditions at beginning and end of water year, and the CVP and SWP water allocations assumed to occur in the Pre-1992 and TEM water year operations plans.

Figure 22

Summary table for water year operations plans, B operations alternative. This table provides the same information as figure 17, but for the B alternative operations plans.

Figure 23 (2 pages)

Temperature and survival results for long-term CVP-OCAP. Pre-1992 alternative and TEM alternative operations. This figure summarizes the Sacramento River temperature and temperature-related survival estimated to result from each of the Pre-1992 and TEM operations plans. Target and achieved temperatures listed are for the assumed temperature control point: either RBDD (Red Bluff Diversion Dam), BB (Bend Bridge), or BSF (Balls Ferry). Estimated survival is given by river "reach" and overall based on the spawning distributions given in the "Assumptions" section of Chapter V.

Figure 24 (2 pages)

Temperature and survival results for long-term CVP-OCAP, B alternative operations. This figure provides the same information as figure 20, but for the B alternative operations.

Figure 25

Sacramento River winter-run salmon temperature-related survival (Pre-1992 alternative). This figure is a plot of estimated overall survival for each water year plan in the Pre-1992 alternative as a function of Shasta storage illustrating the difference in survival achieved when Shasta Powerplant bypasses (both cold and warm water), and selective storage withdrawal) for temperature control are used to improve on the basic "no-bypass" operation.

Figure 26

Sacramento River winter-run salmon temperature-related survival (B alternative). This figure is a plot of estimated overall survival versus Shasta storage for the B alternative water year operations plans.

Figure 27

Sacramento River winter-run salmon temperature-related survival (comparison of the Pre-1992 and B alternatives. This plot compares the estimated survival for each of the 18 water year plans analyzed in the Pre-1992 and B alternatives. The differences in overall estimated survival may be attributable to spawning distributions assumed, or to other factors. Comparison of individual reach survivals between alternative eliminates the effect of assumed spawning distribution.

Figure 28 (5 pages)

Total Delta export. Figure 25 compares monthly total Delta export (Tracy plus Banks) for each of the 18 water year plans in the Pre-1992 and B alternative operations. From these plots, the significance to Delta exports of the February through April constraint on reverse flow is demonstrated, for the various hydrologic and storage conditions. This figure also illustrates when and to what extent it was possible to increase Delta pumping in alternative B, to compensate for the February through April constraint.

Figure 29

Long-term CVP-OCAP alternative comparison: Change in Shasta storage. This figures presents a comparison of the water year change in Shasta storage for each of the 18 Pre-1992 and B alternative water year operations plans.

Figure 30

Long-term CVP-OCAP alternative comparison: Change in system storage. This figures presents a comparison of water year change in CVP system storage for each of the 18 Pre-1992 and B alternative water year operations plans. CVP system storage is the sum of Shasta, Clair Engle, and Folsom.

Figure 31

Long-term CVP-OCAP Antioch flow condition: Pre-1992 and B alternatives. This figure portrays computed monthly average Antioch flow for each water year operation plan of the Pre-1992 and B alternative. The Antioch flow is displayed as one of four categories, with darkest shading indicative of the most reverse flow. The relative frequency of the flow categories is evident in these plots.

Figure 32

Long-term CVP-OCAP Cross Channel gate position: Pre-1992 and B alternatives. This figure portrays the status of the Delta Cross Channel Gates for each month of each of the water year operations plans in the Pre-1992 and B alternatives. The "gates open or closed" status refers to the D-1485 provision for CDFG requested closures during April 15 to May 31 when Delta outflow exceeds 12,000 ft^3/s. During those months Antioch flows were computed assuming the Delta Cross Channel gates were open.

Figure 33

Long-term CVP-OCAP: COA Delta status (periods of balanced and excess conditions). This figure portrays on a monthly basis the Pre-1992 and B alternative water year operations plans whether "balanced" or "excess" conditions exist in the Delta as defined in the COA.

CONCLUSIONS

- Pre-1992 operations criteria provide at least 99 percent temperature-related survival in all wet and above normal years, and some dry and critical years if starting storage is high enough.

- Pre-1992 water allocation policy is generally protective of winter-run temperature conditions in Sacramento River, with a few significant exceptions.

- Spawning distribution assumed for Dry and Critical years, combined with the assumed RBDD gate operation in the TEM and B alternatives confines 90 percent of spawning to Reach 1, making the effectiveness of temperature control capability significantly greater.

- Reduced water allocations and other operations measures taken in TEM alternatives are less significant in their effect on overall survival than: (1) Cold and warm water bypass, and (2) operation of RBDD gates.

- Increasing carryover storage by decreasing release may adversely affect temperature-related survival when effect of downstream warming exceeds the effect of cooler release temperatures.

- It is not possible in any of the CVP-OCAP operations cases to meet the 56 °F criterion at RBDD.

- At Bend Bridge, with the exception of September, all Above Normal and Wet year cases effectively provide 56 °F in both the Pre-1992 and B alternative operations. In Dry, Critical, and Extreme Critical years, the 56° objective seems unachievable at Bend, to varying degrees.
- At the Below Clear Creek site, all operations cases in all alternatives meet the 56° objective, with some minor exceptions. There are some September exceedances in the driest cases.

- When comparing the survival results of the B or TEM alternative with those of the Pre-1992, individual reach survivals must be compared in order to isolate the effects of the assumed spawning distribution from the other differences in the operations criteria. (The assumed spawning distribution is tied to the operation assumption for the RBDD gates; and is different for the Pre-1992 versus the TEM and B alternatives.) When comparing Reach 1 survivals for the Pre-1992, TEM, and B alternatives, there are no significant differences. For Reach 2 survival, differences among alternative versions of the operations are no more than a few percent with the exceptions of the cases D-LO, C-HM, C-LM, C-LO, and E-H1.

- Measures such as use of Folsom withdrawals in lieu of Shasta and reduction of the flow objective at Wilkins Slough, have less effect on upper Sacramento River temperature operations than Shasta bypass, and Shasta/Trinity/Whiskeytown reoperation. However, those measures may be more effective and significant in years where distribution of runoff is not geographically uniform.

- Alternative B Antioch flow criteria cause significant reduction in both CVP and SWP water delivery capability (see table V-6). The relative effects on the CVP and SWP depend on the methodology assumed for sharing available exports. Operations portrayed here under alternative B result in CVP agricultural water allocations that are reduced 25 percent (about 650,000 acre-feet) in 7 of the 18 water years, when compared with the Pre-1992 operations cases. SWP deliveries are reduced 5 percent to 15 percent (about 200,000 to 600,000 acre-feet) in 13 of the 18 water years, when compared with the Pre-1992 operations.

Figure 21

SUMMARY TABLE FOR WATER YEAR OPERATIONS PLANS

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

"PRE-1992" OPERATIONS ALTERNATIVE (WITH BYPASS OPERATION)

Hydrologic Conditions						Study Storages (MAF): BEGINNING OF YEAR / END OF YEAR											CVP-Water Allocation Percent of Ag Supply		SWP Allocation
	SRI Criteria		Shasta Criteria				Clair Engle		Shasta		Folsom		CVP Total		Oroville				Percent
SRI	Study Year	Prior Year	Study Year	Prior Year	Designation	Category	Beg	End	Beg	End	Beg	End	Beg	End	Beg	End	Oct-Feb	Mar-Sep	Delivery
23.8	Wet	Wet	Normal	Normal	W-HI-100.PRE	High	1.9	2.0	3.2	3.1	0.6	0.6	5.7	5.7	2.7	2.4	100%	100%	100%
23.8	Wet	Below Normal	Normal	Normal	W-HM-100.PRE	High Middle	1.5	2.0	2.5	3.1	0.4	0.6	4.4	5.7	2.2	2.4	100%	100%	100%
23.8	Wet	Critical	Normal	Normal	W-LM-100.PRE	Low Middle	1.1	1.9	2.0	3.1	0.2	0.6	3.3	5.6	1.7	2.4	75%	100%	100%
23.8	Wet	Critical	Normal	Critical	W-LO-100 PRE	Low	0.7	1.7	1.7	3.0	0.2	0.6	2.6	5.3	1.2	2.4	50%	100%	80%
15.8	Above Normal	Wet	Normal	Normal	A-HI-100.PRE	High	1.9	1.9	3.2	2.9	0.6	0.6	5.7	5.5	2.7	1.9	100%	100%	100%
15.8	Above Normal	Below Normal	Normal	Normal	A-HM-100.PRE	High Middle	1.5	1.8	2.5	2.8	0.4	0.5	4.4	5.1	2.2	1.9	100%	100%	95%
15.8	Above Normal	Critical	Normal	Normal	A-LM-100.PRE	Low Middle	1.1	1.5	2.0	2.5	0.2	0.5	3.3	4.5	1.7	1.8	75%	100%	90%
15.8	Above Normal	Critical	Normal	Critical	A-LO-100.PRE	Low	0.7	1.1	1.7	2.5	0.2	0.5	2.6	4.2	1.2	1.5	50%	100%	80%
12.5	Dry	Wet	Normal	Normal	D-HI-100.PRE	High	1.9	1.7	3.2	2.5	0.6	0.5	5.7	4.7	2.7	2.0	100%	100%	95%
12.5	Dry	Below Normal	Normal	Normal	D-HM-100.PRE	High Middle	1.5	1.2	2.5	2.3	0.4	0.5	4.4	4.0	2.2	1.6	100%	100%	90%
12.5	Dry	Critical	Normal	Normal	D-LM-075.PRE	Low Middle	1.1	1.0	2.0	2.1	0.2	0.4	3.3	3.5	1.7	1.5	75%	75%	80%
12.5	Dry	Critical	Normal	Critical	D-LO-050.PRE	Low	0.7	0.7	1.7	2.0	0.2	0.4	2.6	3.2	1.2	1.5	50%	50%	65%
8.8	Critical	Wet	Normal	Normal	C-HI-100 PRE	High	1.9	1.4	3.2	2.0	0.6	0.3	5.7	3.7	2.7	1.6	100%	100%	80%
8.8	Critical	Below Normal	Normal	Normal	C-HM-075.PRE	High Middle	1.5	1.0	2.5	1.6	0.4	0.2	4.4	2.8	2.2	1.5	100%	75%	65%
8.8	Critical	Critical	Critical	Normal	C-LM-050.PRE	Low Middle	1.1	0.8	2.0	1.6	0.2	0.2	3.3	2.6	1.7	1.5	75%	50%	50%
8.8	Critical	Critical	Critical	Critical	C-LO-025.PRE	Low	0.7	0.6	1.7	1.5	0.2	0.2	2.6	2.3	1.2	1.2	50%	25%	35%
5.7	Extreme Critical	Wet	Critical	Normal	E-HI-050.PRE	High	1.9	0.7	3.2	1.3	0.6	0.2	5.7	2.2	2.7	1.2	100%	50%	45%
5.7	Extreme Critical	Below Normal	Critical	Normal	E-HM-000.PRE	High Middle	1.5	0.6	2.5	1.0	0.4	0.2	4.4	1.7	2.2	1.2	100%	0%	25%
5.7	Extreme Critical	Critical	Critical	Critical	E-LM-000 PRE	Low Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5.7	Extreme Critical	Critical	Critical	Critical	E-LO-000.PRE	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

"TEM" OPERATIONS ALTERNATIVE (INVESTIGATED TO IMPROVE SACRAMENTO RIVER TEMPERATURE CONTROL)

12.5	Dry	Critical	Normal	Critical	D-LO-025.TEM	Low	0.7	0.7	1.7	2.5	0.2	0.3	2.6	3.6	1.2	1.5	50%	25%	65%
8.8	Critical	Below Normal	Normal	Normal	C-HM-050.TEM	High Middle	1.5	0.9	2.5	2.1	0.4	0.2	4.4	3.2	2.2	1.5	100%	50%	65%
8.8	Critical	Critical	Critical	Normal	C-LM-025.TEM	Low Middle	1.1	0.8	2.0	2.0	0.2	0.2	3.3	2.9	1.7	1.5	75%	25%	50%
8.8	Critical	Critical	Critical	Critical	C-LO-025.TEM	Low	0.7	0.6	1.7	1.8	0.2	0.2	2.6	2.6	1.2	1.2	50%	25%	35%
5.7	Extreme Critical	Wet	Critical	Normal	E-HI-025.TEM	High	1.9	0.7	3.2	1.8	0.6	0.2	5.7	2.6	2.7	1.2	100%	25%	45%

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Figure 22

SUMMARY TABLE FOR WATER YEAR OPERATIONS PLANS

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

"B" OPERATIONS ALTERNATIVE

(BASED ON NMFS DELTA ALTERNATIVE "B", AND TO PROVIDE SACRAMENTO RIVER TEMPERATURE CONTROL)

Hydrologic Conditions						Study Storages (MAF): BEGINNING OF YEAR / END OF YEAR											CVP-Water Allocation Percent of Ag Supply		SWP Allocation
	SRI Criteria		Shasta Criteria				Clair Engle		Shasta		Folsom		CVP Total		Oroville				Percent
SRI	Study Year	Prior Year	Study Year	Prior Year	Designation	Category	Beg	End	Beg	End	Beg	End	Beg	End	Beg	End	Oct-Feb	Mar-Sep	Delivery
23.8	Wet	Wet	Normal	Normal	W-HI-100.B	High	1.9	2.0	3.2	3.2	0.6	0.6	5.7	5.8	2.7	2.3	100%	100%	100%
23.8	Wet	Below Normal	Normal	Normal	W-HM-100.B	High Middle	1.5	2.0	2.5	3.2	0.4	0.6	4.4	5.8	2.2	2.4	100%	100%	95%
23.8	Wet	Critical	Normal	Normal	W-LM-100.B	Low Middle	1.1	2.0	2.0	3.0	0.2	0.6	3.3	5.6	1.7	2.4	75%	100%	95%
23.8	Wet	Critical	Normal	Critical	W-LO-100.B	Low	0.7	1.7	1.7	3.1	0.2	0.6	2.6	5.3	1.2	2.3	50%	100%	85%
15.8	Above Normal	Wet	Normal	Normal	A-HI-100.B	High	1.9	1.8	3.2	3.1	0.6	0.6	5.7	5.5	2.7	1.9	100%	100%	90%
15.8	Above Normal	Below Normal	Normal	Normal	A-HM-100.B	High Middle	1.5	1.8	2.5	2.8	0.4	0.6	4.4	5.1	2.2	1.9	100%	100%	80%
15.8	Above Normal	Critical	Normal	Normal	A-LM-100.B	Low Middle	1.1	1.5	2.0	2.7	0.2	0.6	3.3	4.7	1.7	1.9	75%	100%	75%
15.8	Above Normal	Critical	Normal	Critical	A-LO-100.B	Low	0.7	1.0	1.7	2.4	0.2	0.5	2.6	4.0	1.2	1.6	50%	100%	70%
12.5	Dry	Wet	Normal	Normal	D-HI-075.B	High	1.9	1.7	3.2	2.8	0.6	0.5	5.7	4.9	2.7	2.2	100%	75%	80%
12.5	Dry	Below Normal	Normal	Normal	D-HM-075.B	High Middle	1.5	1.4	2.5	2.4	0.4	0.4	4.4	4.1	2.2	1.8	100%	75%	75%
12.5	Dry	Critical	Normal	Normal	D-LM-075.B	Low Middle	1.1	1.0	2.0	1.9	0.2	0.4	3.3	3.3	1.7	1.6	75%	75%	65%
12.5	Dry	Critical	Normal	Critical	D-LO-050.B	Low	0.7	0.8	1.7	1.9	0.2	0.4	2.6	3.1	1.2	1.4	50%	50%	60%
8.8	Critical	Wet	Normal	Normal	C-HI-075.B	High	1.9	1.4	3.2	2.1	0.6	0.2	5.7	3.8	2.7	1.6	100%	75%	70%
8.8	Critical	Below Normal	Normal	Normal	C-HM-050.B	High Middle	1.5	1.1	2.5	1.8	0.4	0.3	4.4	3.2	2.2	1.3	100%	50%	60%
8.8	Critical	Critical	Critical	Normal	C-LM-025 B	Low Middle	1.1	0.9	2.0	1.7	0.2	0.2	3.3	2.8	1.7	1.1	75%	25%	50%
8.8	Critical	Critical	Critical	Critical	C-LO-000.B	Low	0.7	0.6	1.7	1.7	0.2	0.2	2.6	2.5	1.2	1.2	50%	0%	35%
5.7	Extreme Critical	Wet	Critical	Normal	E-HI-025 B	High	1.9	0.7	3.2	1.6	0.6	0.2	5.7	2.5	2.7	1.2	100%	25%	40%
5.7	Extreme Critical	Below Normal	Critical	Normal	E-HM-000 B	High Middle	1.5	0.5	2.5	1.1	0.4	0.2	4.4	1.7	2.2	1.2	100%	0%	25%
5.7	Extreme Critical	Critical	Critical	Critical	E-LM-000.B	Low Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5.7	Extreme Critical	Critical	Critical	Critical	E-LO-000 B	Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Figure 23

UNITED STATES BUREAU OF RECLAMATION
TEMPERATURE AND SURVIVAL RESULTS FOR LONG-TERM CVP-OCAP

"PRE-1992" ALTERNATIVE

WATER YEAR OPERATIONS PLAN	CONTROL POINT		Temperature (F)				Survival (%)				Total Shasta Release (TAF)									
			Jun	Jul	Aug	Sep	Reach 1 (BCL)	Reach 2 (BB)	Reach 3 (RB)	Overall	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W-HI-100.PRE	RB	No Bypass- N01	55.6	56.7	58.5	59.6	100.0	98.4	88.2	98.2	700	750	580	517	652	558	742	609	414	5,522
		Target	58.0	56.0	56.0	57.0														
		Bypass- B01	58.0	56.2	56.2	57.3	100.0	99.9	99.9	100.0	700	750	580	517	652	558	742	609	536	5,644
W-HM-100.PRE	RB	No Bypass- N02	54.8	57.8	58.2	60.9	100.0	93.1	87.3	96.0	700	750	580	517	652	710	624	668	323	5,524
		Target	58.0	56.0	57.0	58.0														
		Bypass- B02	58.0	56.3	56.7	57.9	100.0	99.9	99.4	99.9	700	750	580	517	652	710	624	668	430	5,631
W-LM-100.PRE	BB	No Bypass- N03	55.0	55.8	56.8	61.2	99.9	94.5	88.9	96.6	169	750	580	517	652	558	755	768	313	5,062
		Target	56.0	56.0	56.0	56.0														
		Bypass- B03	56.0	58.0	56.0	58.5	100.0	99.9	99.9	100.0	169	750	580	517	652	558	755	768	358	5,107
W-LO-100.PRE	BB	No Bypass- N04	55.1	55.3	57.1	61.1	99.9	94.5	88.9	96.6	140	575	580	517	652	558	830	771	327	4,950
		Target	56.0	56.0	56.0	56.0														
		Bypass- B04	56.0	58.0	56.0	56.4	100.0	100.0	90.3	99.0	140	575	580	517	652	558	830	771	358	4,981
A-HI-100.PRE	BB	No Bypass- N05	54.5	55.5	55.8	60.9	99.9	94.7	89.0	96.7	340	430	410	217	535	536	718	759	265	4,210
		Target	56.0	56.0	56.0	57.0														
		Bypass- B05	56.0	56.2	56.1	56.6	100.0	99.9	90.3	99.0	340	430	410	217	535	536	718	759	355	4,300
A-HM-100.PRE	BB	No Bypass- N06	54.4	54.5	56.6	60.8	99.9	94.5	92.3	97.0	155	213	410	217	560	574	823	721	327	4,000
		Target	56.0	56.0	56.0	56.0														
		Bypass- B06	56.0	56.0	56.1	56.5	100.0	99.9	90.3	99.0	155	213	410	217	560	574	823	721	357	4,030
A-LM-100.PRE	BB	No Bypass- N07	54.2	54.8	57.9	61.8	99.9	92.3	86.2	95.5	168	136	140	193	560	616	868	710	328	3,719
		Target	56.0	56.0	56.0	57.0														
		Bypass- B07	56.0	56.0	56.1	56.7	100.0	99.9	90.3	99.0	168	136	140	193	560	616	868	710	328	3,719
A-LO-100.PRE	BB	No Bypass- N08	54.2	54.8	58.0	61.8	99.9	92.3	85.5	95.4	168	138	149	193	559	619	868	700	331	3,725
		Target	56.0	56.0	56.0	57.0														
		Bypass- B08	56.0	56.0	56.0	56.9	100.0	99.9	90.3	99.0	168	138	149	193	559	619	868	700	331	3,725
D-HI-100.PRE	BB	No Bypass- N09	54.6	55.6	56.7	62.7	99.9	90.2	86.9	95.9	200	171	210	413	493	569	726	700	193	3,675
		Target	56.0	56.0	56.0	59.0														
		Bypass- B09	56.0	56.0	56.0	58.9	100.0	98.8	87.8	99.0	200	171	210	413	493	569	726	700	268	3,750
D-HM-100.PRE	BB	No Bypass- N10	54.3	56.2	58.0	62.8	97.9	90.2	83.2	94.5	183	153	160	403	493	599	703	699	288	3,681
		Target	56.0	56.0	57.0	58.0														
		Bypass- B10	56.1	56.3	57.3	58.2	100.0	99.4	85.2	99.1	183	153	160	403	493	599	703	699	288	3,681
D-LM-075.PRE	BB	No Bypass- N11	54.9	56.6	59.6	63.6	94.8	77.8	68.2	87.5	180	151	155	343	421	537	696	576	324	3,383
		Target	56.0	56.0	58.0	59.0														
		Bypass- B11	56.0	56.0	57.8	58.9	100.0	97.9	81.1	98.3	180	151	155	343	421	537	696	576	354	3,413
D-LO-050.PRE	BB	No Bypass- N12	55.4	57.6	60.9	63.6	92.3	68.2	47.2	81.6	180	151	155	283	405	498	614	488	331	3,105
		Target	56.0	56.0	58.0	61.0														
		Bypass- B12	56.0	56.0	58.1	60.9	99.9	94.3	78.0	96.8	180	151	155	283	405	498	614	488	358	3,132
C-HI-100.PRE	BB	No Bypass- N13	54.9	55.9	57.8	62.9	94.8	90.2	83.2	92.6	200	181	185	386	529	532	699	752	389	3,853
		Target	56.0	56.0	57.0	58.0														
		Bypass- B13	55.9	55.6	57.1	57.9	100.0	99.4	88.8	99.2	200	181	185	386	529	532	699	752	389	3,853
C-HM-075.PRE	BB	No Bypass- N14	55.1	57.1	60.1	64.7	89.0	77.8	68.2	84.0	200	181	185	338	496	497	673	649	314	3,533
		Target	56.0	56.0	58.0	60.0														
		Bypass- B14	56.0	56.1	58.0	60.5	99.9	94.3	79.6	96.9	200	181	185	338	496	497	673	649	314	3,533
C-LM-050.PRE	BB	No Bypass- N15	55.6	59.0	61.8	65.7	90.0	50.3	32.4	73.2	200	181	185	339	447	500	520	509	358	3,239
		Target	56.0	57.0	58.0	62.0														
		Bypass- B15	56.1	57.0	58.1	62.2	97.7	88.9	73.5	93.4	200	181	185	339	447	500	520	509	358	3,239
C-LO-025.PRE	BB	No Bypass- N16	56.6	59.6	63.4	66.5	73.6	32.4	16.5	56.3	200	181	185	258	393	463	551	475	328	3,034
		Target	58.0	59.0	59.0	61.0														
		Bypass- B16	57.7	58.6	59.1	60.9	99.7	60.1	31.2	82.4	200	181	185	258	393	463	551	475	328	3,034
E-HI-050.PRE	BB	No Bypass- N17	54.7	56.8	62.8	67.9	70.8	50.7	49.5	62.7	170	167	193	275	510	549	710	693	358	3,625
		Target	58.0	57.0	58.0	62.0														
		Bypass- B17	56.1	57.0	58.1	62.1	98.1	88.9	75.4	93.7	170	167	193	275	510	549	710	693	328	3,595
E-HM-000.PRE	BSF	No Bypass- N18	53.2	57.4	66.9	68.0	37.2	29.4	17.4	33.5	170	195	251	281	471	524	633	606	318	3,449
		Target	56.0	56.0	58.0	62.0														
		Bypass- B18	56.0	56.1	58.0	61.5	96.0	55.3	29.5	78.4	170	195	251	281	471	524	633	606	288	3,419

TEM ALTERNATIVE *

D-LO-025.TEM	BB	Target	56.0	57.0	57.0	60.0														
		Achieved- BT12	56.3	57.3	57.2	59.6	100.0	91.2	58.5	98.1	180	151	155	193	296	416	528	527	358	2,804
C-HM-050.TEM	BB	Target	56.0	56.0	57.0	59.0														
		Achieved- BT14	56.1	58.0	57.2	59.0	100.0	98.3	85.6	99.4	200	181	185	299	438	488	620	771	388	3,570
C-LM-025.TEM	BB	Target	56.0	56.0	58.0	61.0														
		Achieved- BT15	56.1	56.1	58.0	61.4	100.0	94.3	73.6	98.8	200	181	185	253	358	438	656	629	178	3,078
C-LO-025.TEM	BB	Target	57.0	58.0	59.0	60.0														
		Achieved- BT16	57.0	57.5	59.0	61.8	99.6	77.4	49.9	96.6	200	181	185	223	344	388	510	464	328	2,823
E-HI-025.TEM	BB	Target	56.0	56.0	57.0	60.0														
		Achieved- BT17	56.0	56.0	56.6	60.1	99.8	96.7	85.5	99.2	170	121	130	234	489	537	645	633	328	3,287

* Results based on assumption of "dry" water year spawning distributions
and Red Bluff Diversion Dam gates raised until May 1

UNITED STATES BUREAU OF RECLAMATION
TEMPERATURE AND SURVIVAL RESULTS FOR LONG TERM CVP-OCAP

"PRE-1992" ALTERNATIVE

WATER YEAR OPERATIONS PLAN	CONTROL POINT		Shasta Bypass (TAF)														September 30 Shasta Storage (MAF)	
			Warm								Cold					Total	No Bypass	Bypass
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	May	Jun	Jul	Aug	Sep			
W-HI-100.PRE	RB	No Bypass- N01	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B01	700	750	580	517	652	226	137	0			0	301	536	4,399	3.2	3.1
W-HM-100.PRE	RB	No Bypass- N02	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B02	700	750	580	517	652	476	0	41			371	90	430	4,607	3.2	3.1
W-LM-100.PRE	BB	No Bypass- N03	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B03	169	750	580	517	652	343	268	153			0	0	358	3,790	3.1	3.1
W-LO-100.PRE	BB	No Bypass- N04	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B04	140	575	580	517	652	337	367	148			0	0	358	3,674	3.0	3.0
A-HI-100.PRE	BB	No Bypass- N05	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B05	340	430	410	217	535	536	265	181			0	0	355	3,269	3.0	2.9
A-HM-100.PRE	BB	No Bypass- N06	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B06	155	213	410	217	560	574	399	130			0	0	357	3,015	2.8	2.8
A-LM-100.PRE	BB	No Bypass- N07	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B07	168	136	140	193	560	494	320	78			0	11	328	2,428	2.5	2.5
A-LO-100.PRE	BB	No Bypass- N08	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B08	168	138	149	193	559	491	314	69			0	45	331	2,457	2.5	2.5
D-HI-100.PRE	BB	No Bypass- N09	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B09	200	171	210	413	493	441	144	71			0	16	268	2,427	2.6	2.5
D-HM-100.PRE	BB	No Bypass- N10	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B10	183	153	160	403	493	396	117	102			0	37	288	2,332	2.3	2.3
D-LM-075.PRE	BB	No Bypass- N11	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B11	180	151	155	343	277	190	54	12			36	108	354	1,860	2.1	2.1
D-LO-050.PRE	BB	No Bypass- N12	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B12	180	151	155	283	138	98	2	0			295	488	358	2,148	2.1	2.0
C-HI-100.PRE	BB	No Bypass- N13	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B13	200	181	185	386	529	226	43	66			0	59	389	2,264	2.0	2.0
C-HM-075.PRE	BB	No Bypass- N14	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B14	200	181	185	338	431	115	38	28			14	140	314	1,984	1.7	1.6
C-LM-050.PRE	BB	No Bypass- N15	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B15	200	181	185	339	192	71	0	0			271	397	358	2,194	1.6	1.6
C-LO-025.PRE	BB	No Bypass- N16	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B16	200	181	185	208	176	101	41	3			22	196	328	1,641	1.5	1.5
E-HI-050.PRE	BB	No Bypass- N17	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B17	170	167	193	275	510	157	85	25			0	218	328	2,128	1.3	1.3
E-HM-000.PRE	BSF	No Bypass- N18	0	0	0	0	0	0	0	0			0	0	0	0		
		Bypass- B18	170	195	251	281	389	137	71	0			0	200	288	1,982	.9	1.0

TEM ALTERNATIVE

D-LO-025.TEM	BB	Achieved- BT12	180	151	155	193	0	16	0	0	296	0	528	527	358	2,404	N/A	2.3
C-HM-050.TEM	BB	Achieved- BT14	200	181	185	299	363	166	13	52	0	0	66	97	388	2,010	N/A	1.9
C-LM-025.TEM	BB	Achieved- BT15	200	181	185	253	11	15	2	0	0	0	283	434	178	1,742	N/A	1.9
C-LO-025.TEM	BB	Achieved- BT16	200	181	185	223	0	0	0	0	344	388	510	464	328	2,823	N/A	2.2
E-HI-025.TEM	BB	Achieved- BT17	170	121	130	234	489	212	23	11	0	0	2	183	328	1,903	N/A	2.2

Figure 24

UNITED STATES BUREAU OF RECLAMATION
TEMPERATURE AND SURVIVAL RESULTS FOR LONG TERM CVP-OCAP

"B" ALTERNATIVE

WATER YEAR OPERATIONS PLAN	CONTROL POINT		Temperature (F) Jun	Jul	Aug	Sep	Survival (%) Reach 1 (BCL)	Reach 2 (BB)	Reach 3 (RB)	Overall	Total Shasta Release (TAF) Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
W-HI-100.B	RB	Target	56.0	56.0	56.0	58.0														
	.	Achieved- B19	56.0	55.9	56.1	57.8	100.0	100.0	99.9	100.0	700	750	580	517	652	558	742	609	536	5,644
W-HM-100.B	RB	Target	56.0	56.0	56.0	58.0														
		Achieved- B20	56.0	56.0	56.4	58.2	100.0	100.0	99.9	100.0	700	750	580	517	652	558	742	609	521	5,629
W-LM-100.B	RB	Target	56.0	56.0	58.0	60.0														
		Achieved- B21	56.1	56.2	56.1	60.2	100.0	98.4	97.1	99.3	210	750	580	517	652	558	847	738	331	5,183
W-LO-100.B	RB	Target	56.0	56.0	56.0	59.0														
		Achieved- B22	56.2	56.1	56.1	59.4	100.0	99.9	98.8	99.9	140	519	580	517	652	558	827	738	327	4,858
A-HI-100.B	RB	Target	58.0	58.0	56.0	59.0														
		Achieved- B23	56.4	56.1	56.4	59.3	100.0	99.9	98.8	99.9	340	430	410	217	534	452	687	659	325	4,054
A-HM-100.B	RB	Target	56.0	58.0	58.0	59.0														
		Achieved- B24	56.1	56.1	56.0	59.0	100.0	99.9	98.8	99.9	155	213	410	253	471	581	774	814	323	3,994
A-LM-100.B	RB	Target	56.0	56.0	56.0	59.0														
		Achieved- B25	56.2	56.0	56.0	59.1	100.0	99.9	98.8	99.9	168	136	155	193	563	619	819	814	328	3,795
A-LO-100.B	RB	Target	56.0	56.0	57.0	59.0														
		Achieved- B26	56.2	56.0	57.1	59.3	100.0	99.9	98.4	99.9	168	138	165	193	572	619	819	783	232	3,689
D-HI-075.B	RB	Target	56.0	56.0	57.0	59.0														
		Achieved- B27	56.4	56.2	57.1	59.0	100.0	99.9	98.4	99.9	180	170	230	269	481	509	721	676	352	3,588
D-HM-075.B	RB	Target	56.0	56.0	58.0	59.0														
		Achieved- B28	56.3	56.3	58.3	59.4	100.0	99.4	97.9	99.9	183	153	190	293	490	511	784	625	352	3,581
D-LM-075.B	BB	Target	56.0	56.0	58.0	60.0														
		Achieved- B29	56.1	56.3	58.0	60.4	99.8	96.4	76.9	98.9	180	151	170	500	489	471	709	570	329	3,569
D-LO-050.B	BB	Target	56.0	57.0	58.0	61.0														
		Achieved- B30	56.2	57.0	58.3	61.7	99.8	88.9	55.7	97.7	180	151	170	443	486	419	522	479	331	3,181
C-HI-075.B	BB	Target	56.0	56.0	58.0	58.0														
		Achieved- B31	56.2	56.2	57.9	57.9	100.0	98.8	84.0	99.4	200	181	200	409	513	452	670	730	327	3,682
C-HM-050.B	BB	Target	56.0	56.0	58.0	60.0														
		Achieved- B32	56.2	56.2	58.0	60.2	99.8	96.4	76.9	98.9	200	181	200	382	509	508	706	451	295	3,432
C-LM-025.B	BB	Target	56.0	57.0	58.0	61.0														
		Achieved- B33	56.1	57.4	58.3	61.7	99.8	88.9	58.8	97.8	200	181	200	283	418	468	626	520	259	3,155
C-LO-000.B	BB	Target	57.0	58.0	58.0	60.0														
		Achieved- B34	57.0	58.1	58.4	61.8	99.6	80.5	30.9	96.2	200	181	200	223	340	386	543	461	338	2,872
E-HI-025.B	BB	Target	56.0	56.0	57.0	60.0														
		Achieved- B35	56.1	56.2	57.3	60.4	99.6	96.7	83.6	98.9	214	166	192	203	430	486	646	604	357	3,298
E-HM-000.B	BSF	Target	56.0	56.0	58.0	59.0														
		Achieved- B36	56.2	56.3	58.3	59.2	99.2	54.0	29.5	93.9	170	195	251	251	431	534	703	476	295	3,306

Figure 24 (continued)

UNITED STATES BUREAU OF RECLAMATION
TEMPERATURE AND SURVIVAL RESULTS FOR LONG TERM CVP-OCAP

"B" ALTERNATIVE

WATER YEAR OPERATIONS PLAN	CONTROL POINT		Shasta Bypass (TAF)														September 30 Shasta Storage (MAF)
			Warm								Cold					Total	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	May	Jun	Jul	Aug	Sep		
W-HI-100.B	RB	Achieved- B19	700	750	580	517	652	226	84	0	0	0	0	505	536	4,550	3.1
W-HM-100.B	RB	Achieved- B20	700	750	580	517	652	92	71	0	0	0	17	609	521	4,509	3.1
W-LM-100.B	RB	Achieved- B21	210	750	580	517	652	108	197	19	0	0	0	256	331	3,620	3.0
W-LO-100.B	RB	Achieved- B22	140	519	580	517	652	124	181	14	0	0	0	192	327	3,246	3.1
A-HI-100.B	RB	Achieved- B23	340	430	410	217	534	0	8	6	0	0	162	298	325	2,730	3.2
A-HM-100.B	RB	Achieved- B24	155	213	410	253	471	282	123	50	0	0	0	96	323	2,376	2.9
A-LM-100.B	RB	Achieved- B25	168	136	155	193	563	304	134	49	0	0	0	157	328	2,187	2.7
A-LO-100.B	RB	Achieved- B26	168	138	165	193	572	225	94	27	0	0	0	145	323	2,050	2.4
D-HI-075.B	RB	Achieved- B27	180	170	230	269	481	0	0	44	0	509	721	78	352	3,034	2.8
D-HM-075.B	RB	Achieved- B28	183	153	190	293	490	0	59	22	0	511	68	71	352	2,392	2.4
D-LM-075.B	BB	Achieved- B29	180	151	170	500	376	85	66	4	0	0	37	173	329	2,071	1.9
D-LO-050.B	BB	Achieved- B30	180	151	170	443	272	10	2	0	0	0	239	479	331	2,277	1.9
C-HI-075.B	BB	Achieved- B31	200	181	200	409	513	85	74	114	0	0	0	34	327	2,137	2.2
C-HM-050.B	BB	Achieved- B32	200	181	200	382	442	127	32	0	0	0	40	220	295	2,119	1.8
C-LM-025.B	BB	Achieved- B33	200	181	200	283	129	43	28	0	0	0	91	520	259	1,934	1.7
C-LO-000.B	BB	Achieved- B34	200	181	200	223	0	0	18	0	246	386	59	410	338	2,261	1.7
E-HI-025.B	BB	Achieved- B35	214	166	192	203	116	34	11	0	0	0	2	206	357	1,501	1.6
E-HM-000.B	BSF	Achieved- B36	170	195	251	251	357	162	99	0	0	0	0	136	295	1,916	1.1

Figure 25

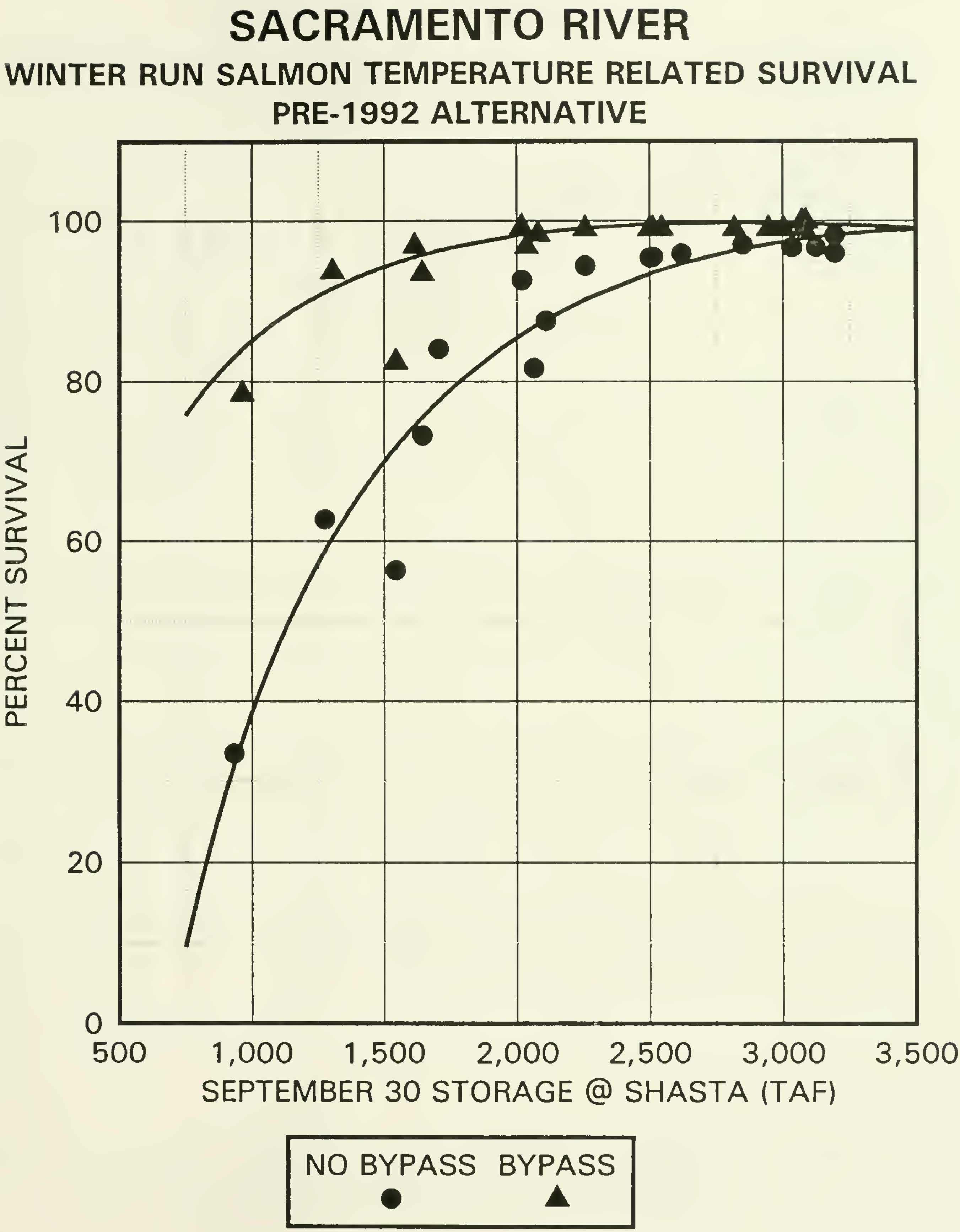

SACRAMENTO RIVER
WINTER RUN SALMON TEMPERATURE RELATED SURVIVAL
PRE-1992 ALTERNATIVE
PERCENT SURVIVAL
0
20
40
60
80
100
500
1,000
1,500
2,000
2,500
3,000
3,500
SEPTEMBER 30 STORAGE @ SHASTA (TAF)
NO BYPASS
BYPASS

Figure 26

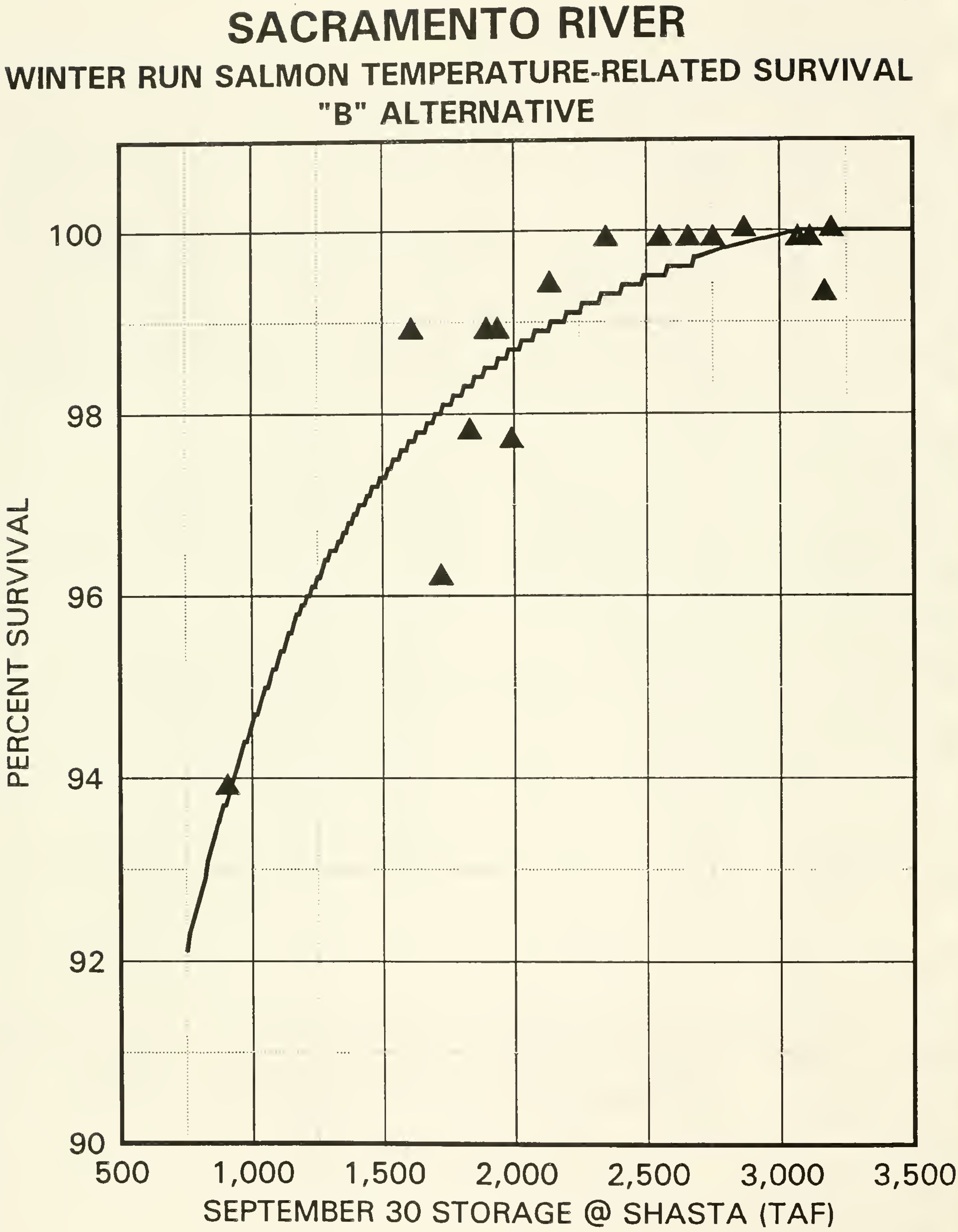

SACRAMENTO RIVER
WINTER RUN SALMON TEMPERATURE-RELATED SURVIVAL
"B" ALTERNATIVE
PERCENT SURVIVAL
100
98
96
94
92
90
500
1,000
1,500
2,000
2,500
3,000
3,500
SEPTEMBER 30 STORAGE @ SHASTA (TAF)

Figure 27

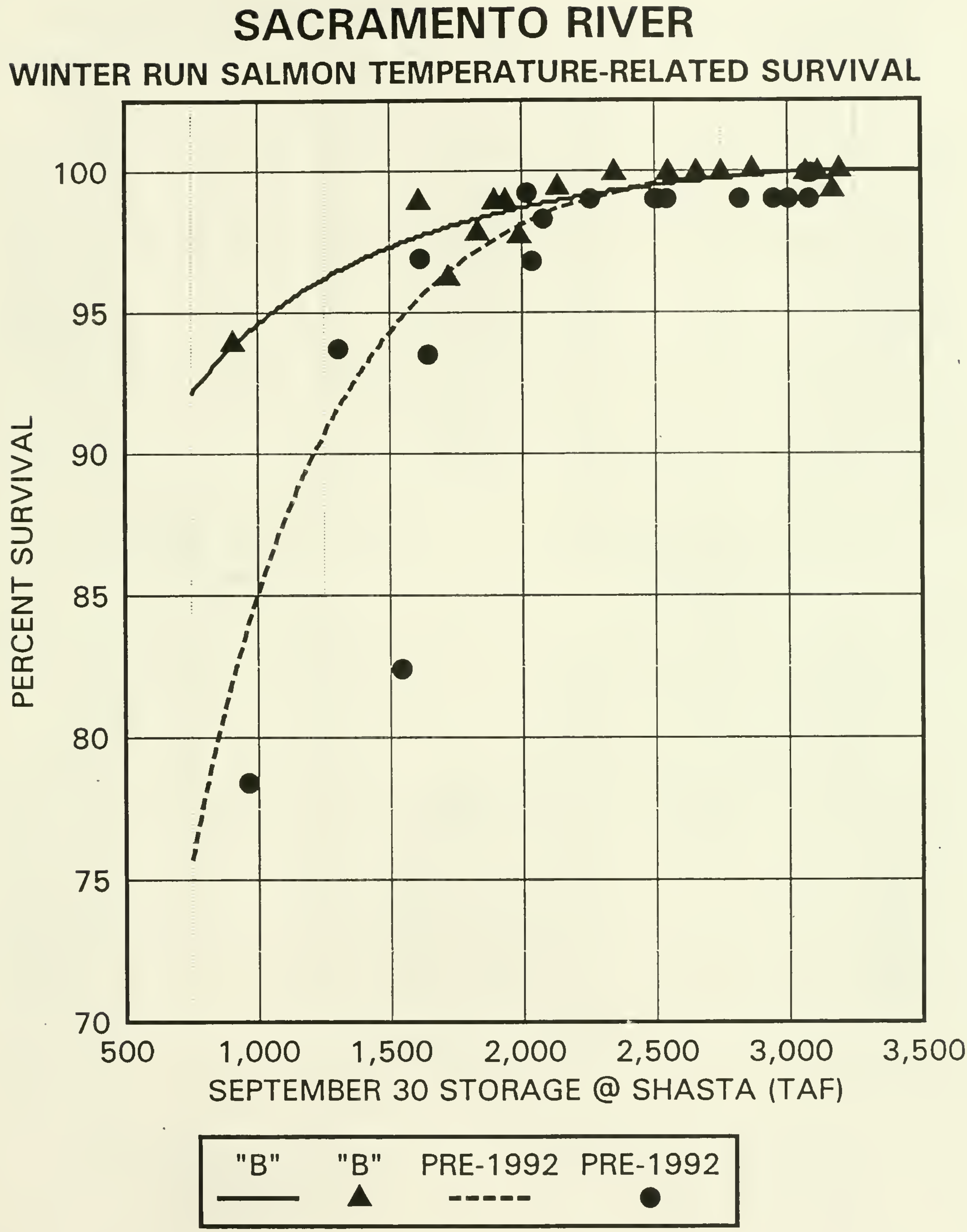

SACRAMENTO RIVER
WINTER RUN SALMON TEMPERATURE-RELATED SURVIVAL
PERCENT SURVIVAL
100
95
90
85
80
75
70
500
1,000
1,500
2,000
2,500
3,000
3,500
SEPTEMBER 30 STORAGE @ SHASTA (TAF)
"B"
"B"
PRE-1992
PRE-1992

Figure 28

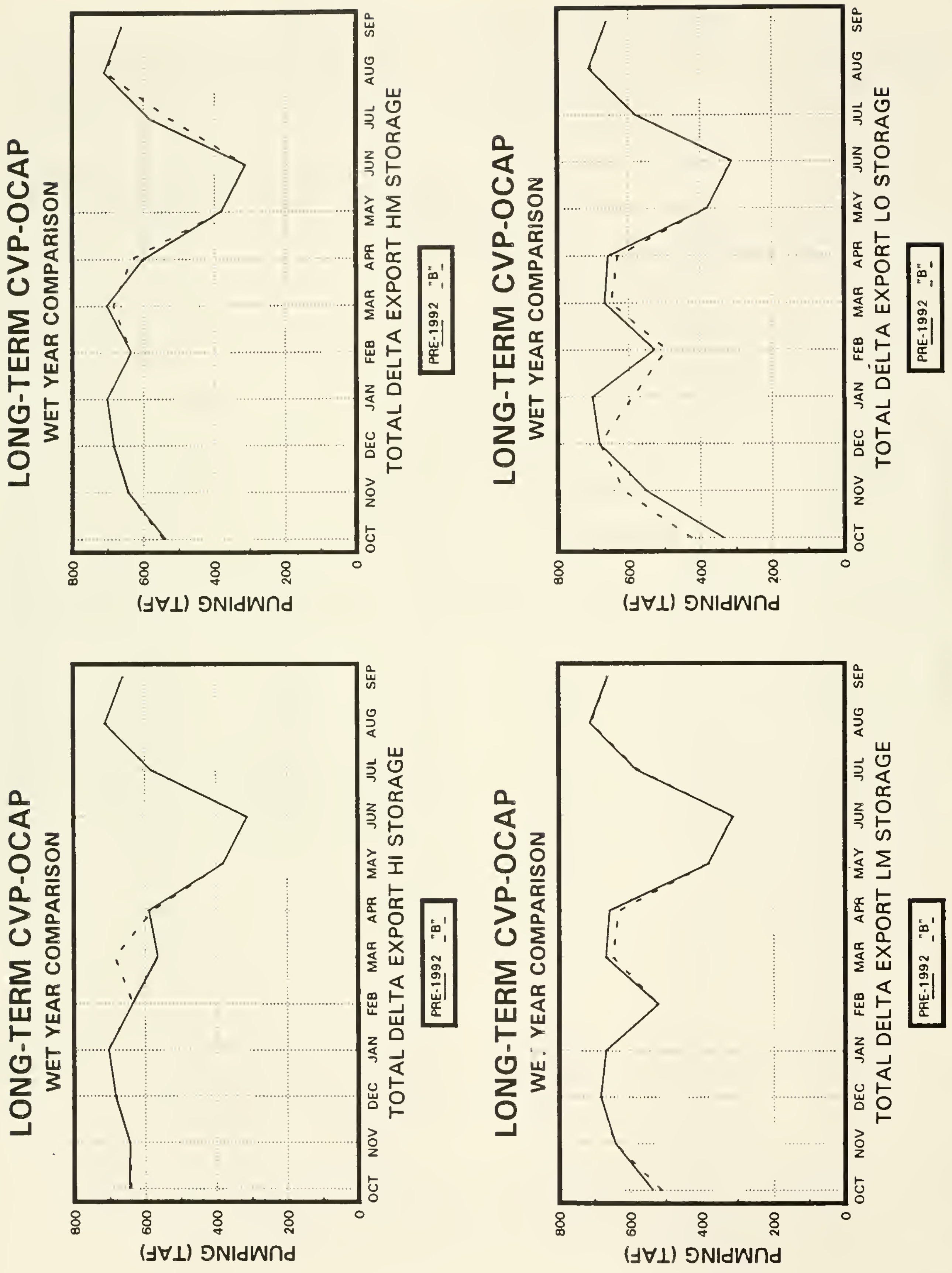

LONG-TERM CVP-OCAP
WET YEAR COMPARISON
PUMPING (TAF)
800
600
400
200
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
TOTAL DELTA EXPORT HI STORAGE
PRE-1992 "B"
LONG-TERM CVP-OCAP
WET YEAR COMPARISON
TOTAL DELTA EXPORT HM STORAGE
PRE-1992 "B"
LONG-TERM CVP-OCAP
WET YEAR COMPARISON
TOTAL DELTA EXPORT LM STORAGE
PRE-1992 "B"
LONG-TERM CVP-OCAP
WET YEAR COMPARISON
TOTAL DELTA EXPORT LO STORAGE
PRE-1992 "B"

Figure 28 (continued)

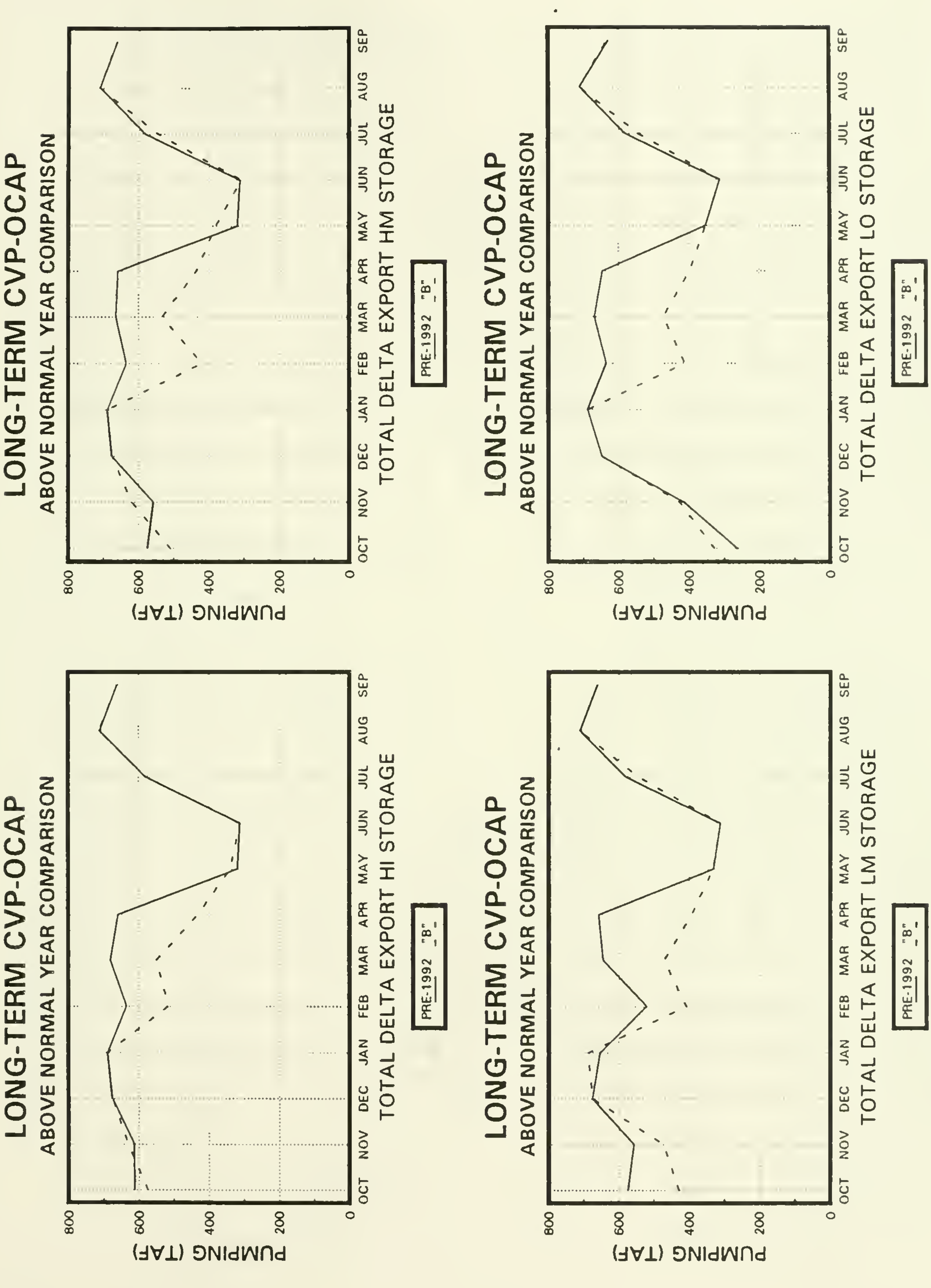
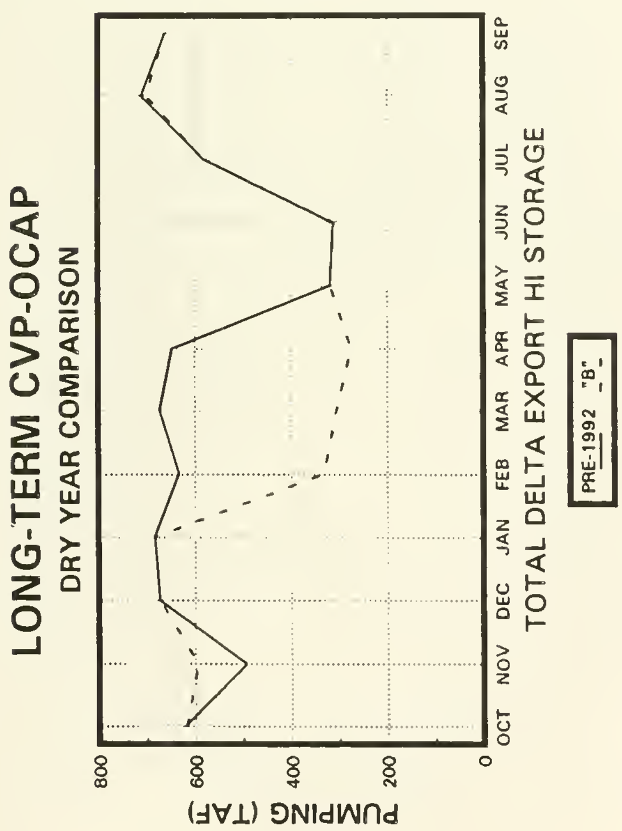
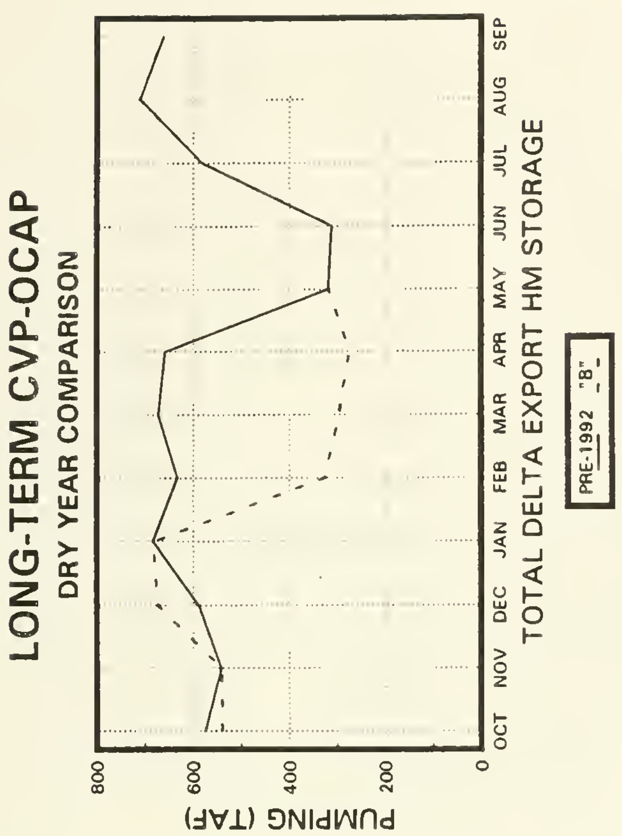
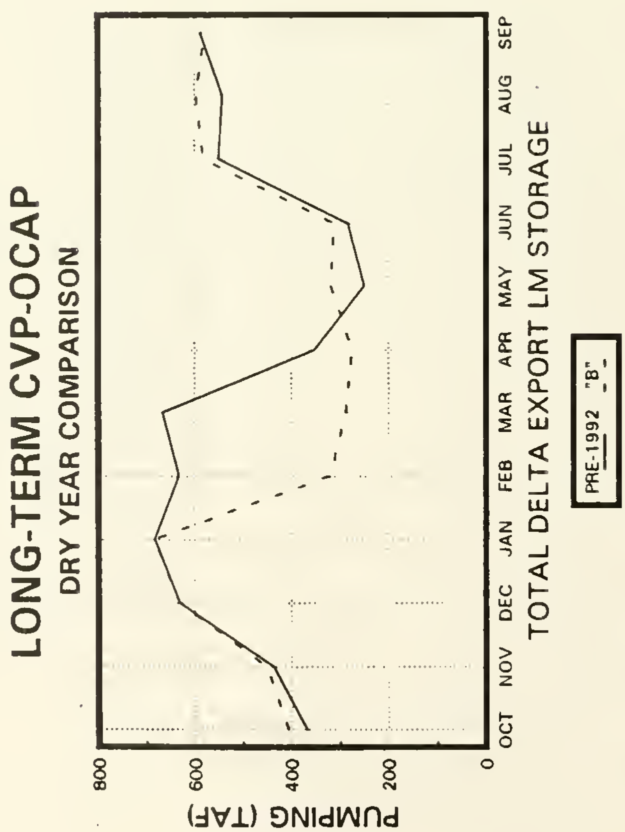


Figure 28 (continued)







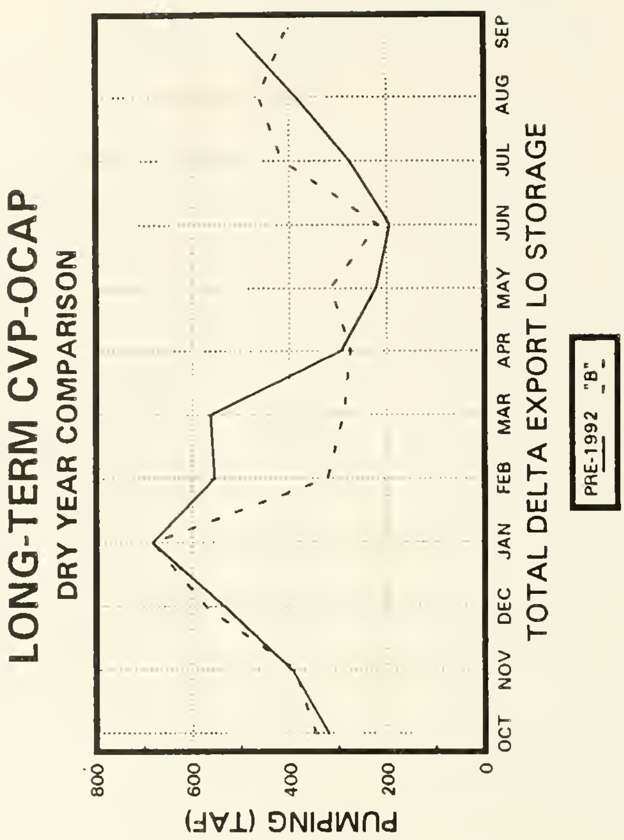
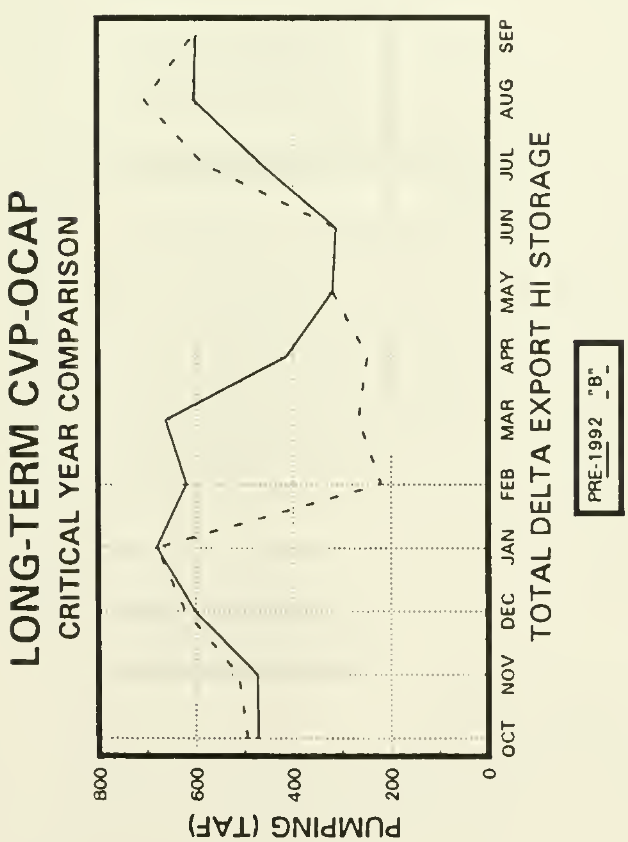
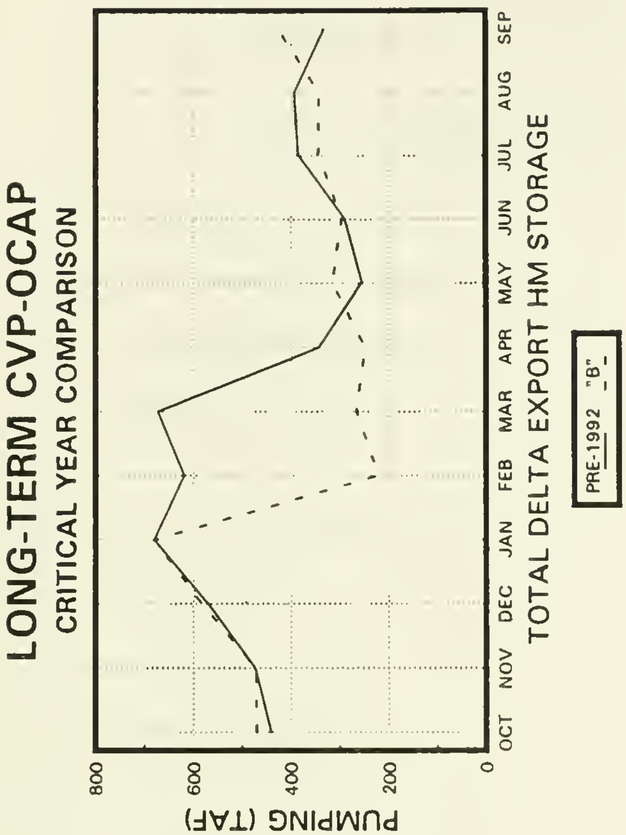
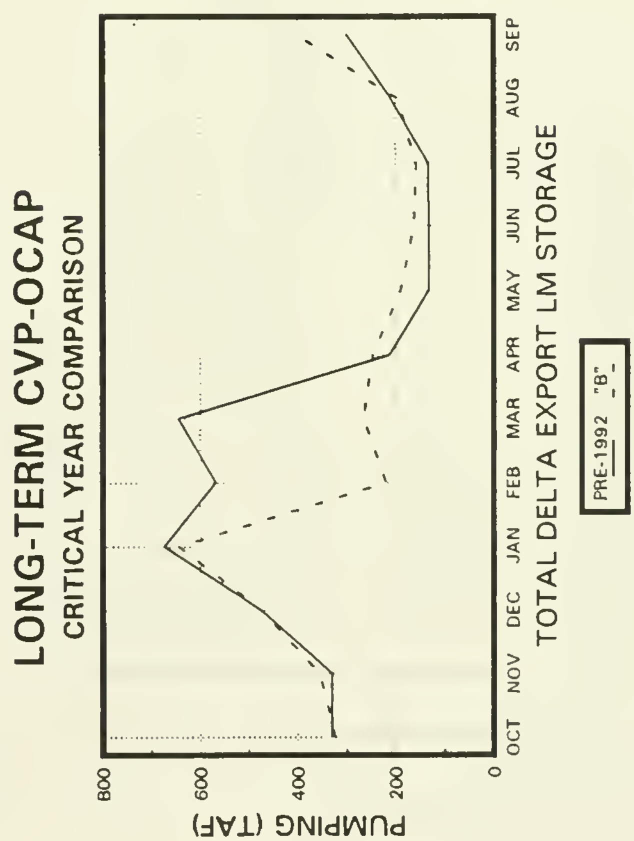


Figure 28 (continued)







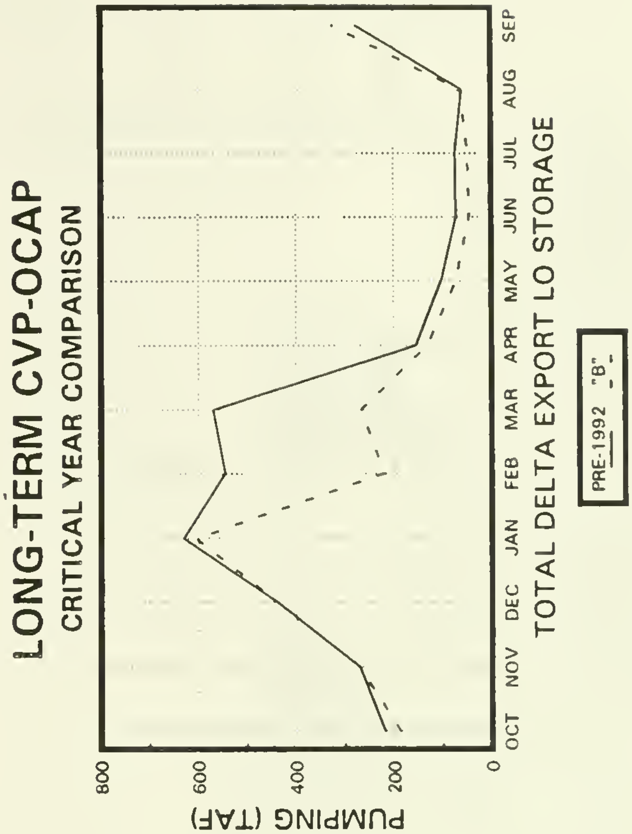
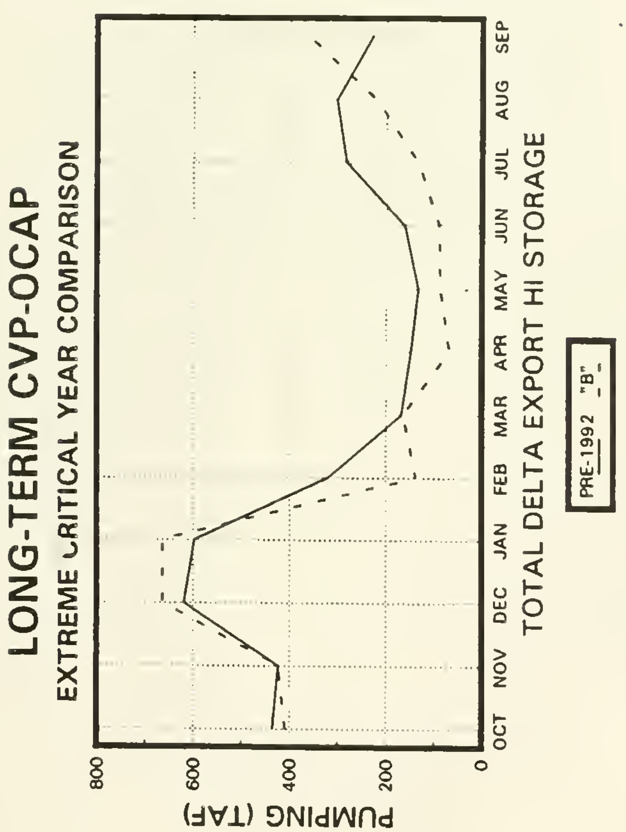


Figure 28 (continued)



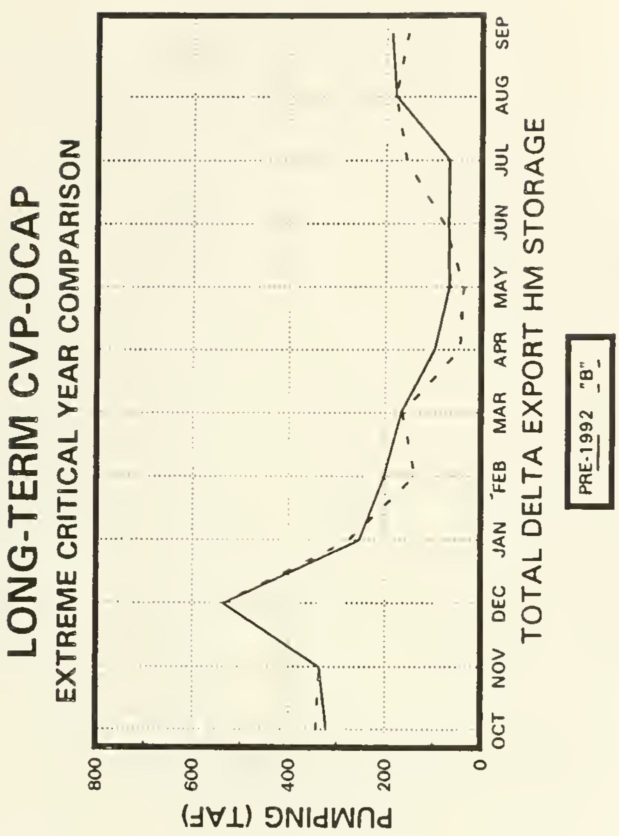


Figure 29

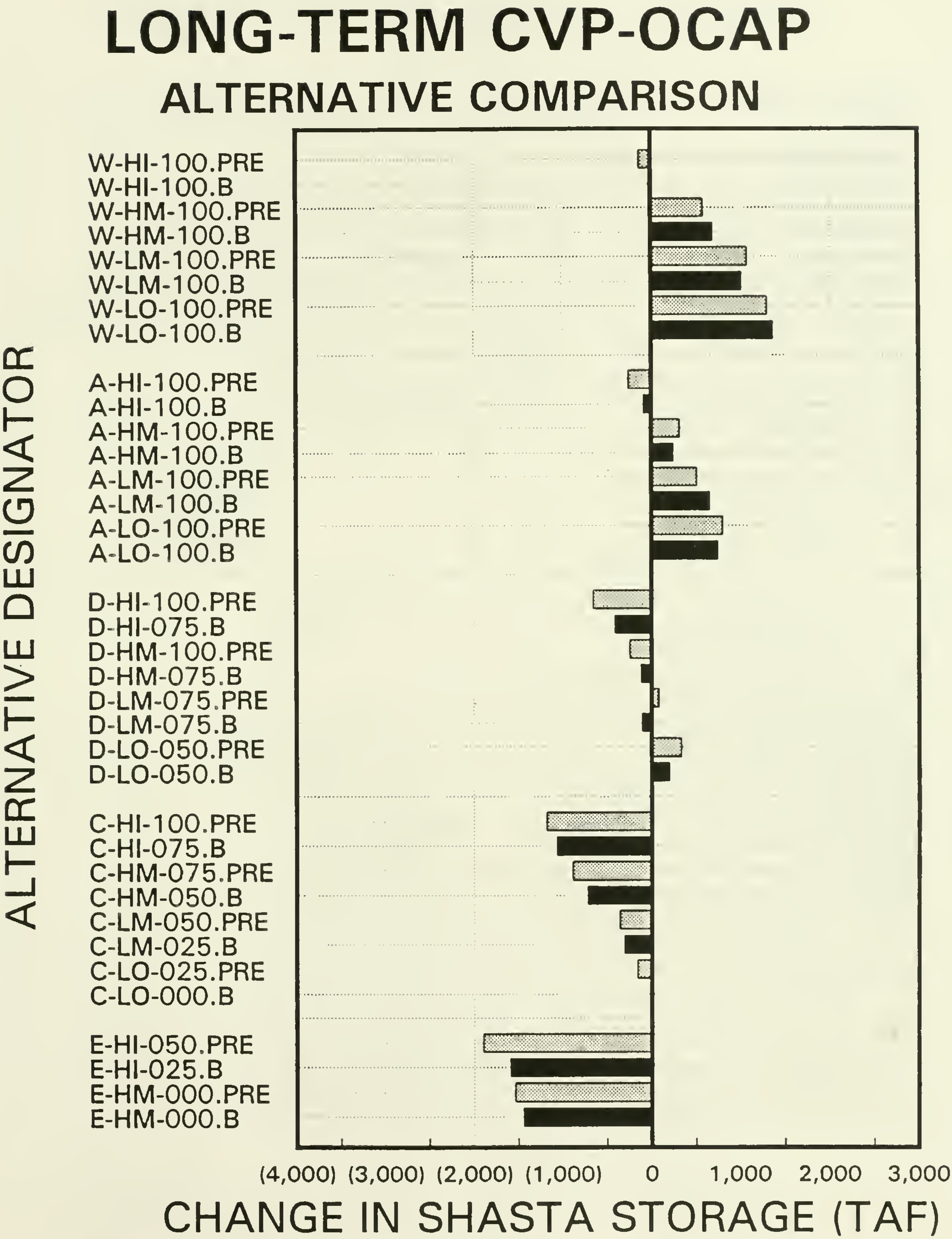
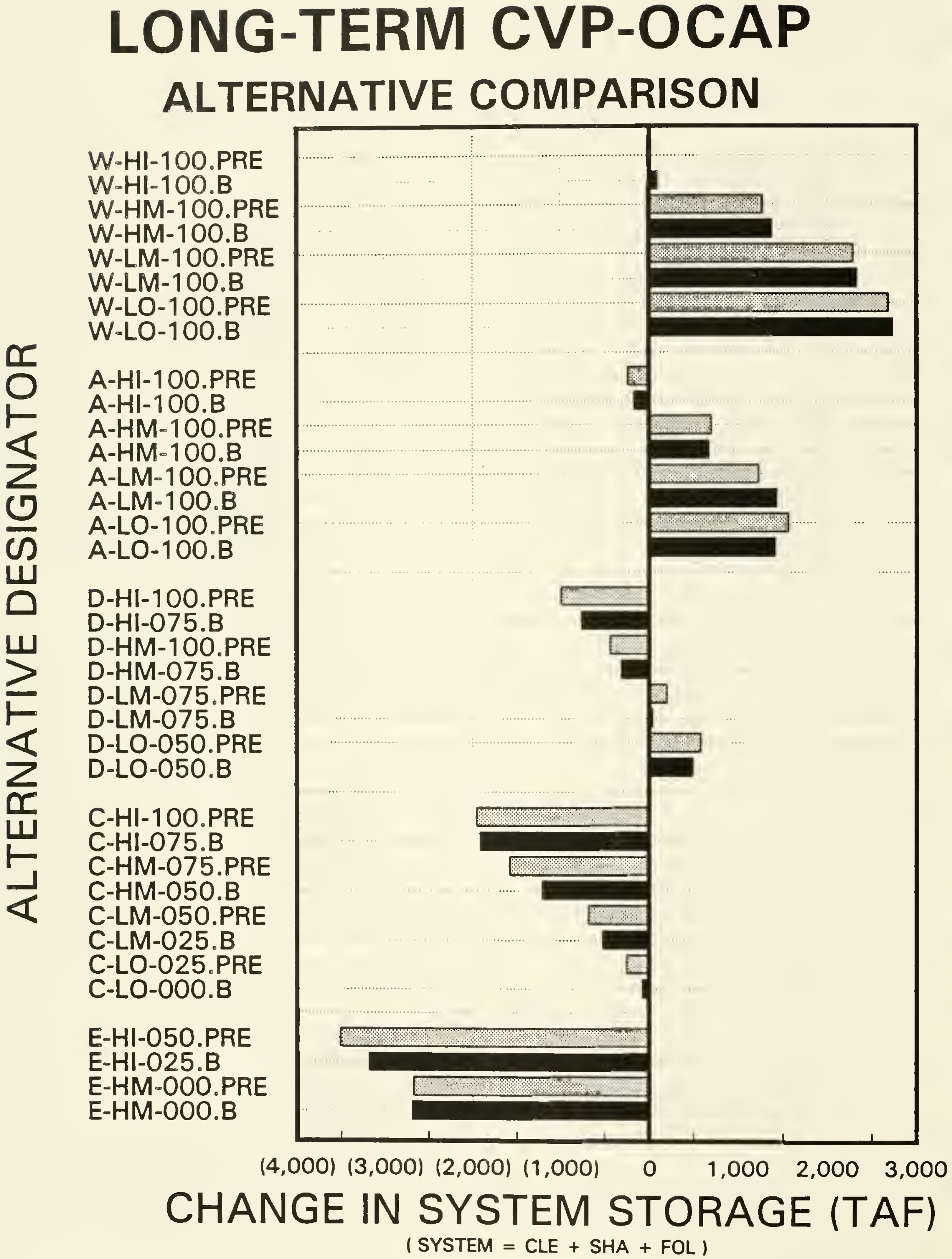

LONG-TERM CVP-OCAP
ALTERNATIVE COMPARISON
ALTERNATIVE DESIGNATOR
W-HI-100.PRE
W-HI-100.B
W-HM-100.PRE
W-HM-100.B
W-LM-100.PRE
W-LM-100.B
W-LO-100.PRE
W-LO-100.B
A-HI-100.PRE
A-HI-100.B
A-HM-100.PRE
A-HM-100.B
A-LM-100.PRE
A-LM-100.B
A-LO-100.PRE
A-LO-100.B
D-HI-100.PRE
D-HI-075.B
D-HM-100.PRE
D-HM-075.B
D-LM-075.PRE
D-LM-075.B
D-LO-050.PRE
D-LO-050.B
C-HI-100.PRE
C-HI-075.B
C-HM-075.PRE
C-HM-050.B
C-LM-050.PRE
C-LM-025.B
C-LO-025.PRE
C-LO-000.B
E-HI-050.PRE
E-HI-025.B
E-HM-000.PRE
E-HM-000.B
(4,000)
(3,000)
(2,000)
(1,000)
0
1,000
2,000
3,000
CHANGE IN SHASTA STORAGE (TAF)

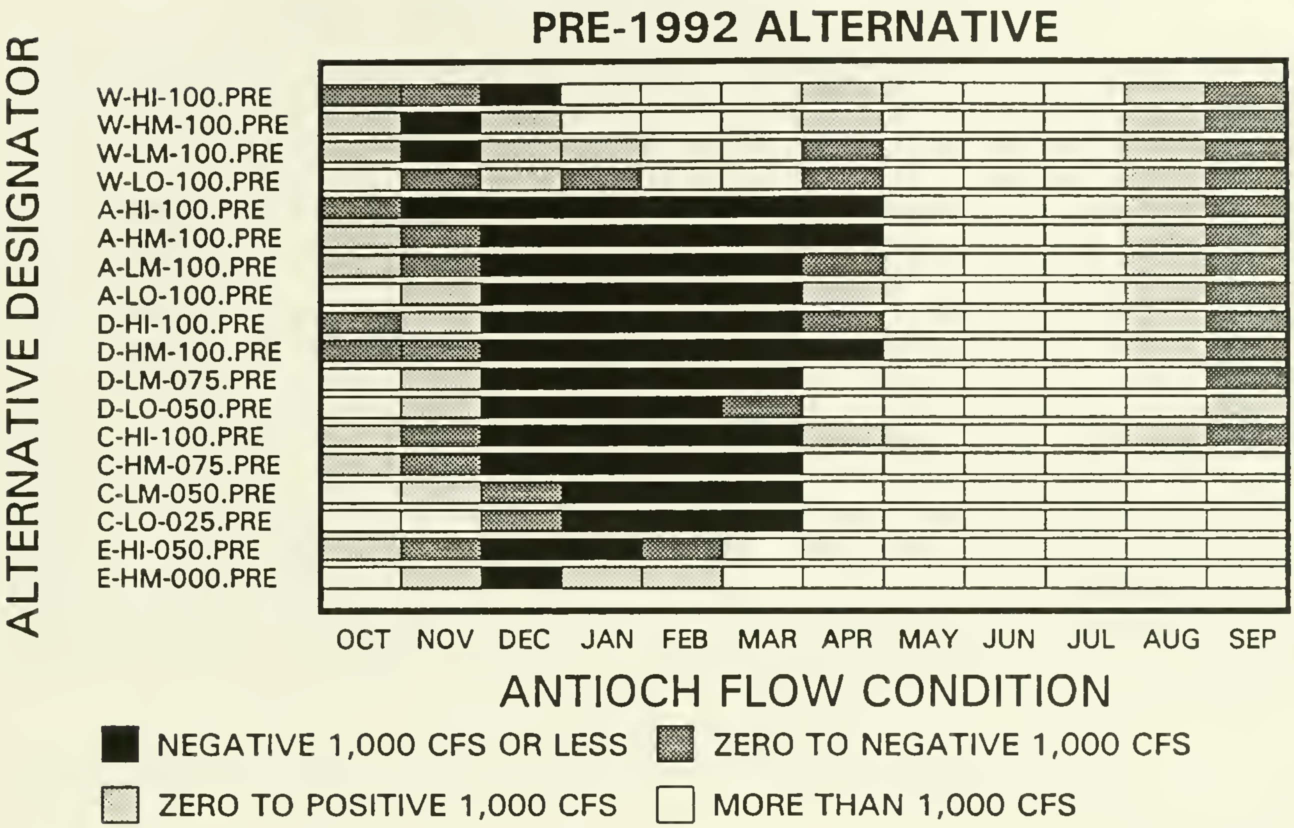
Figure 30



LONG-TERM CVP-OCAP
ALTERNATIVE COMPARISON
ALTERNATIVE DESIGNATOR
W-HI-100.PRE
W-HI-100.B
W-HM-100.PRE
W-HM-100.B
W-LM-100.PRE
W-LM-100.B
W-LO-100.PRE
W-LO-100.B
A-HI-100.PRE
A-HI-100.B
A-HM-100.PRE
A-HM-100.B
A-LM-100.PRE
A-LM-100.B
A-LO-100.PRE
A-LO-100.B
D-HI-100.PRE
D-HI-075.B
D-HM-100.PRE
D-HM-075.B
D-LM-075.PRE
D-LM-075.B
D-LO-050.PRE
D-LO-050.B
C-HI-100.PRE
C-HI-075.B
C-HM-075.PRE
C-HM-050.B
C-LM-050.PRE
C-LM-025.B
C-LO-025.PRE
C-LO-000.B
E-HI-050.PRE
E-HI-025.B
E-HM-000.PRE
E-HM-000.B
(4,000) (3,000) (2,000) (1,000) 0 1,000 2,000 3,000
CHANGE IN SYSTEM STORAGE (TAF)
(SYSTEM = CLE + SHA + FOL)

Figure 31

LONG-TERM CVP-OCAP



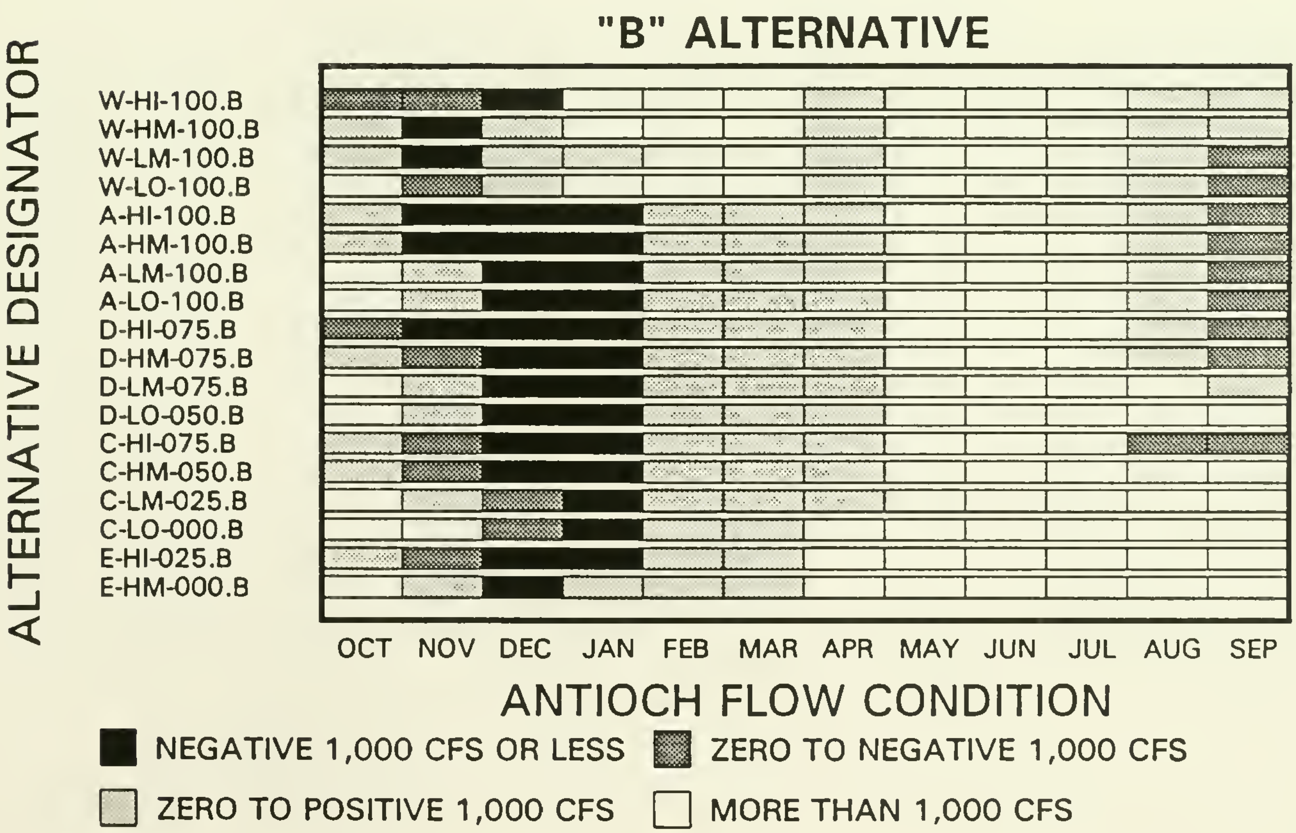
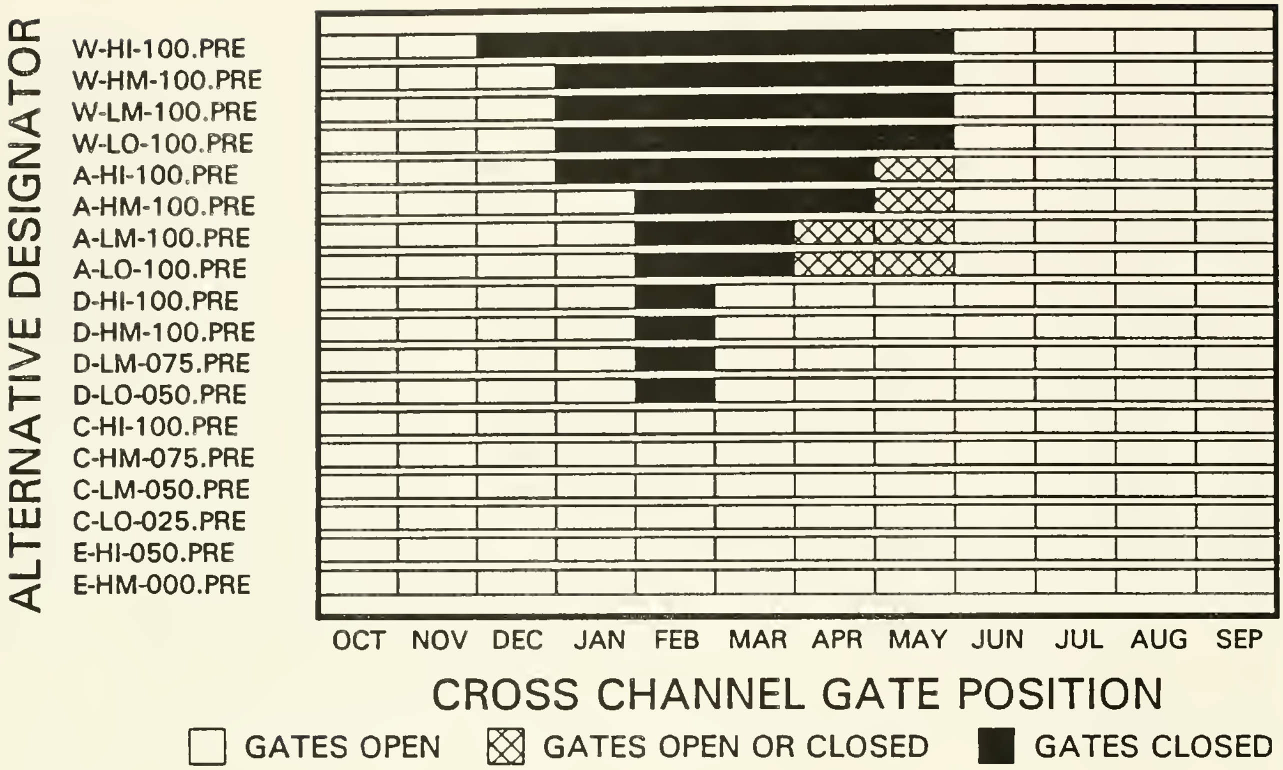


Figure 32

LONG-TERM CVP-OCAP

PRE-1992 ALTERNATIVE



"B" ALTERNATIVE

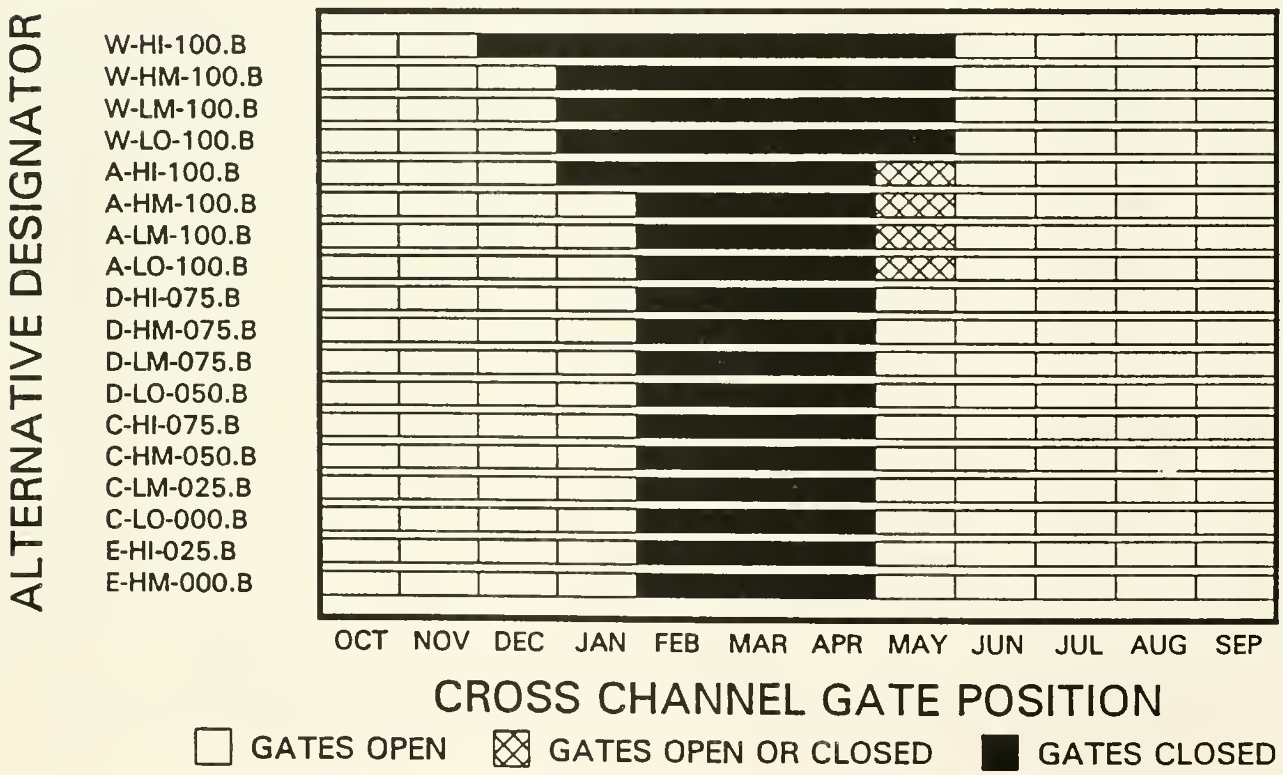
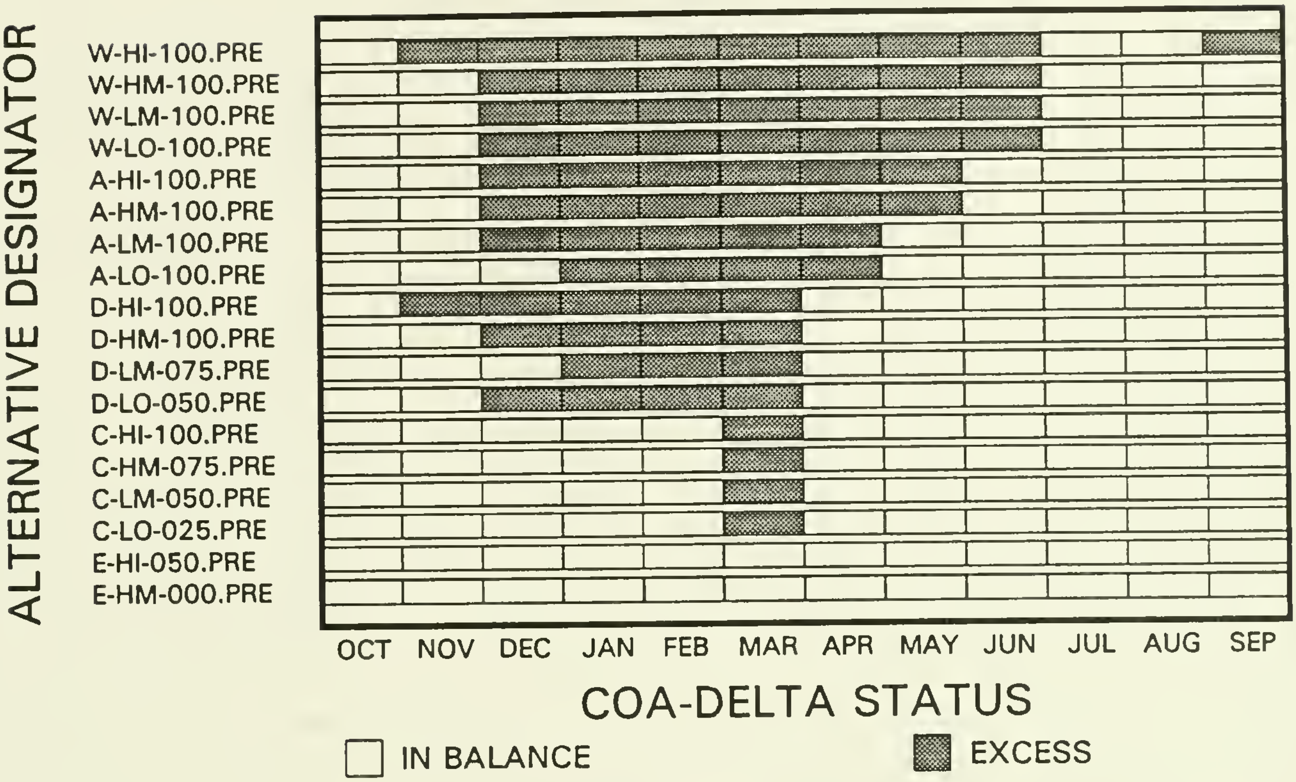


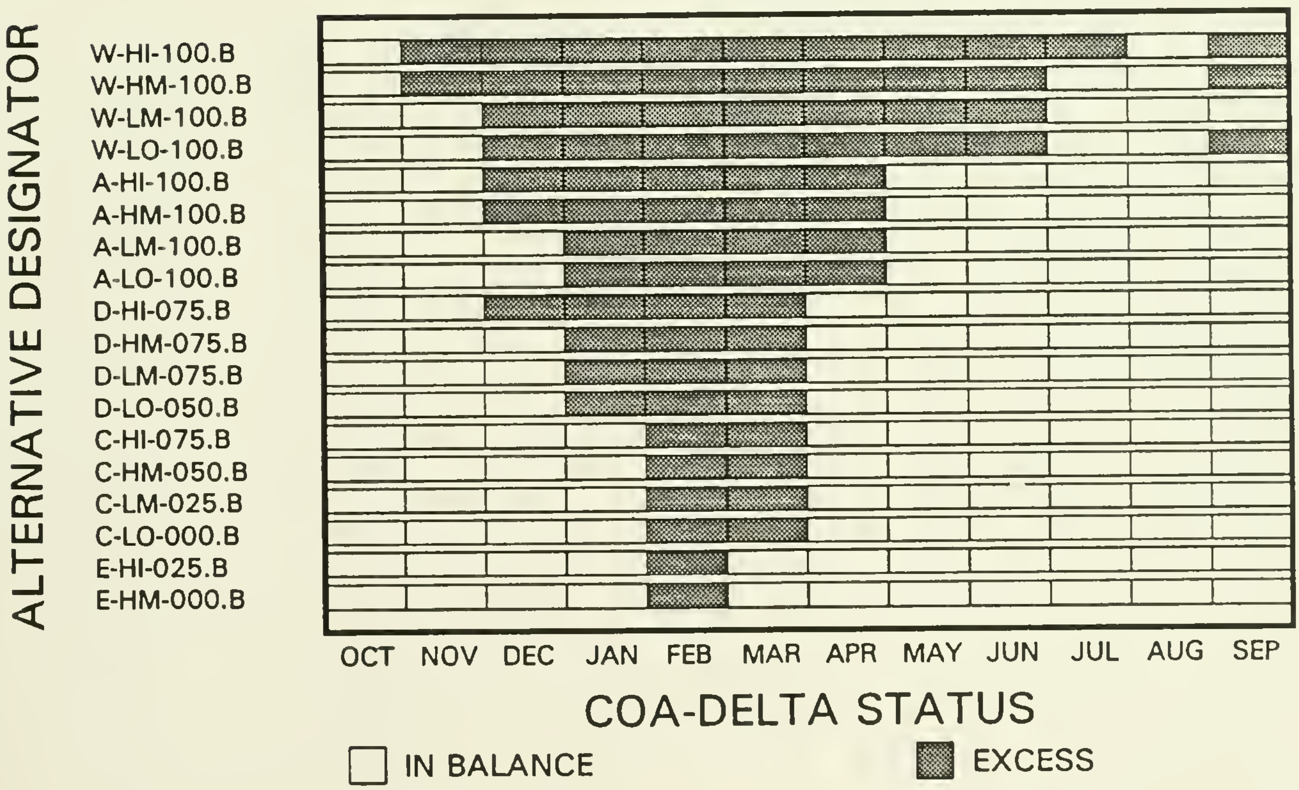
Figure 33

LONG-TERM CVP-OCAP

PRE-1992 ALTERNATIVE



"B" ALTERNATIVE



APPENDICES

APPENDIX

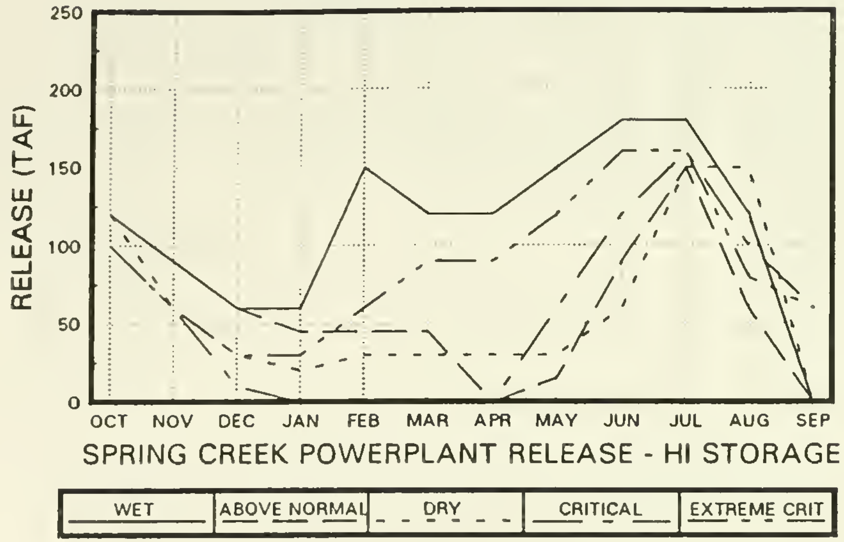
Appendix A

Graphical Results of CVP-OCAP Water Year Operations Studies

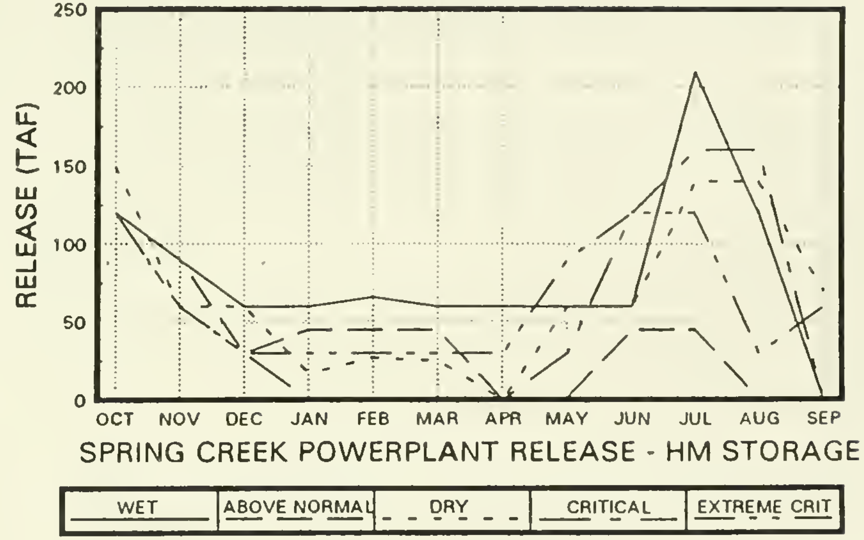
Appendix A

Table of Contents

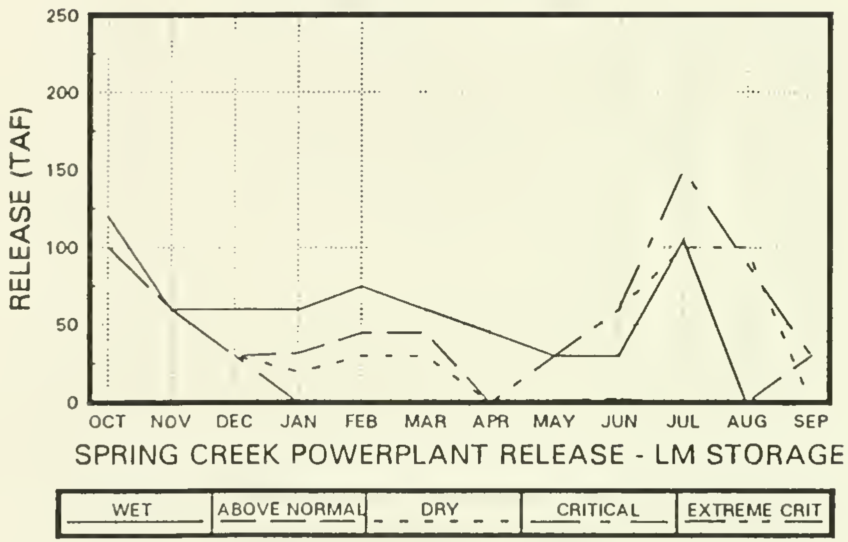
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



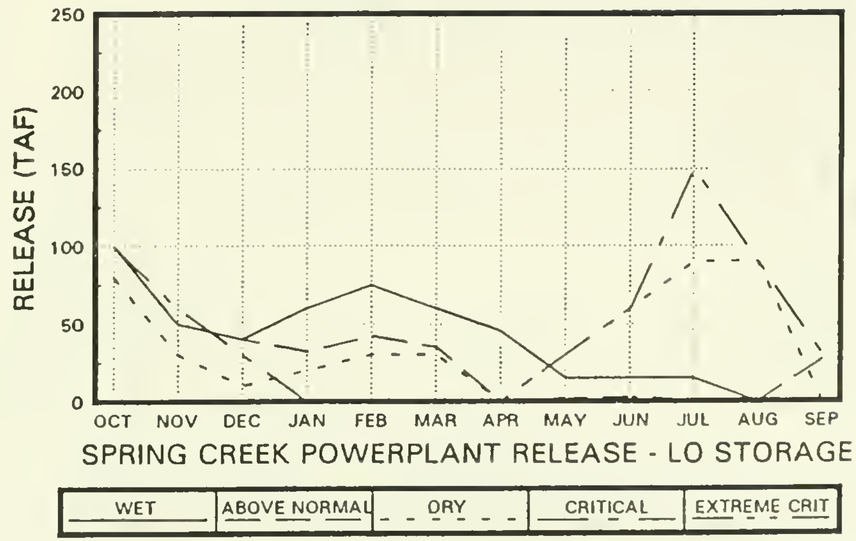
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



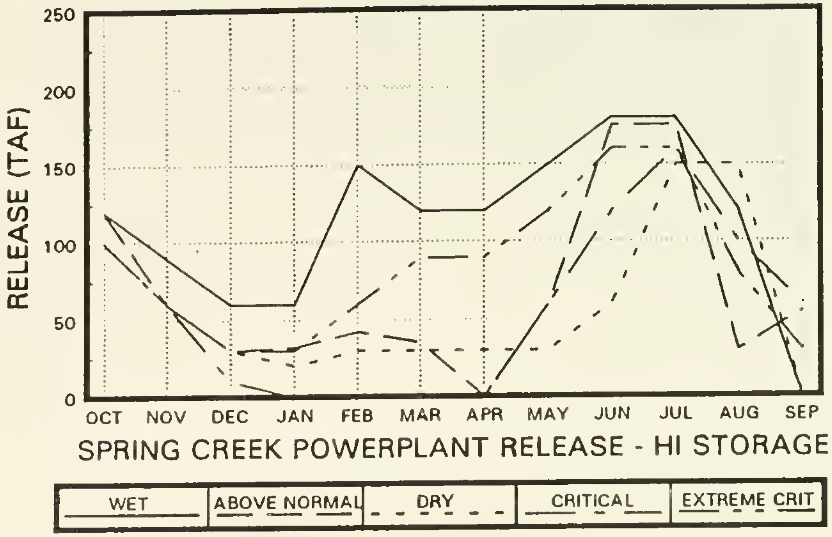
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



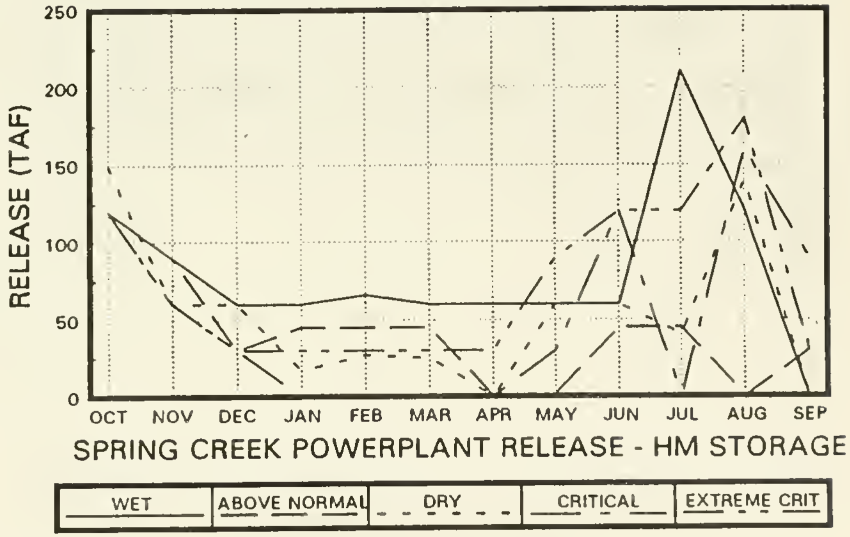
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



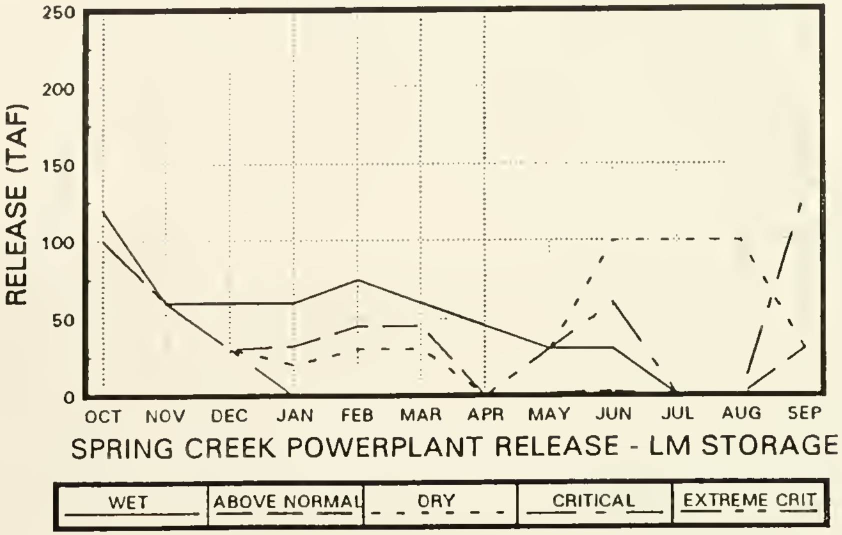
LONG-TERM OCAP
"B" ALTERNATIVE



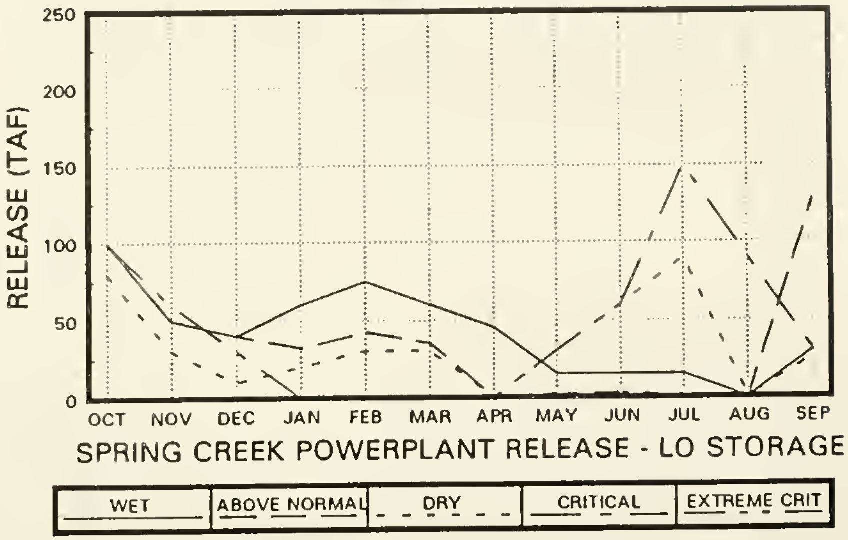
LONG-TERM OCAP
"B" ALTERNATIVE

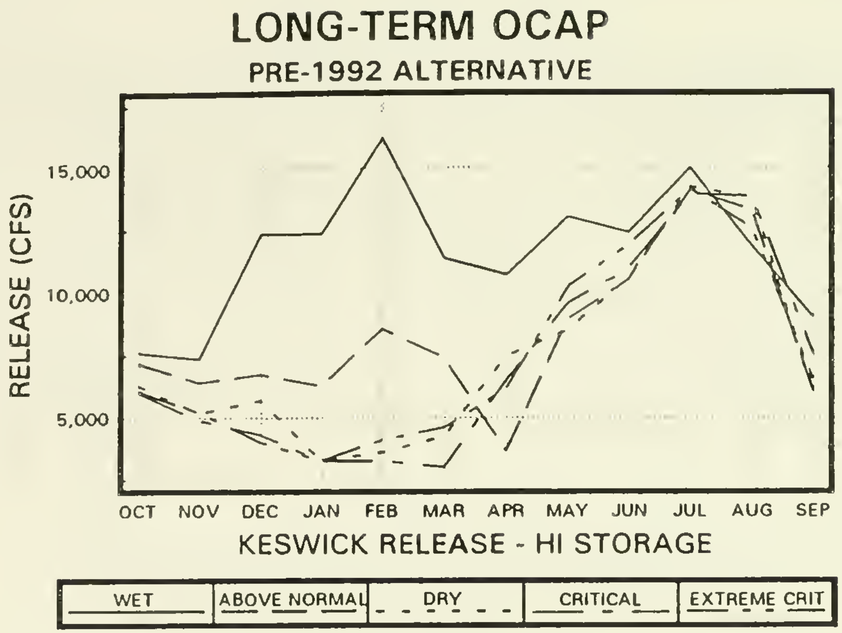


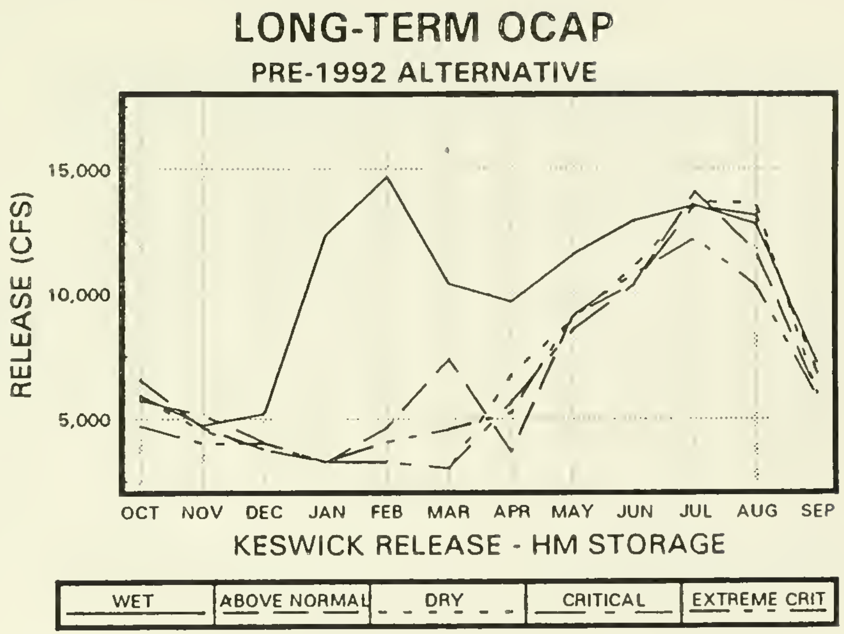
LONG-TERM OCAP
"B" ALTERNATIVE

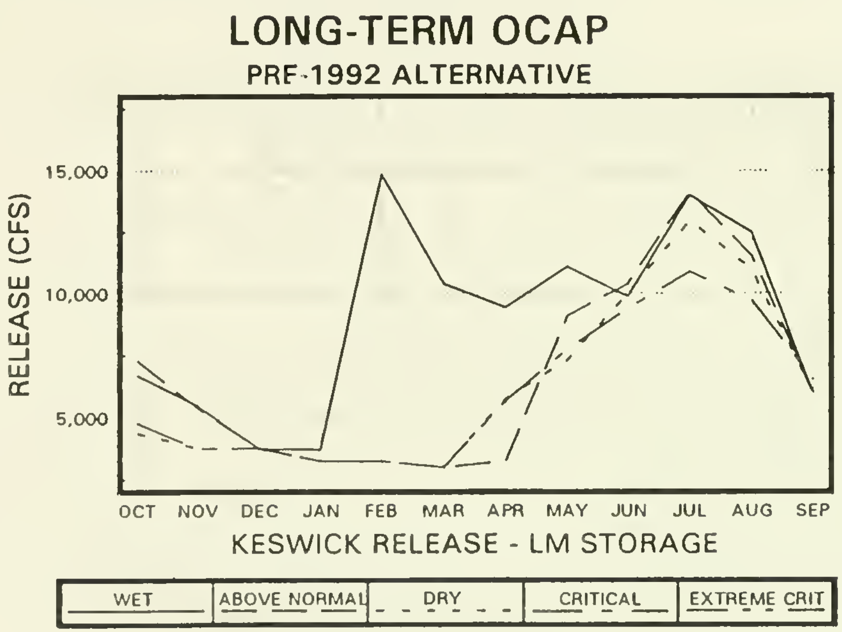


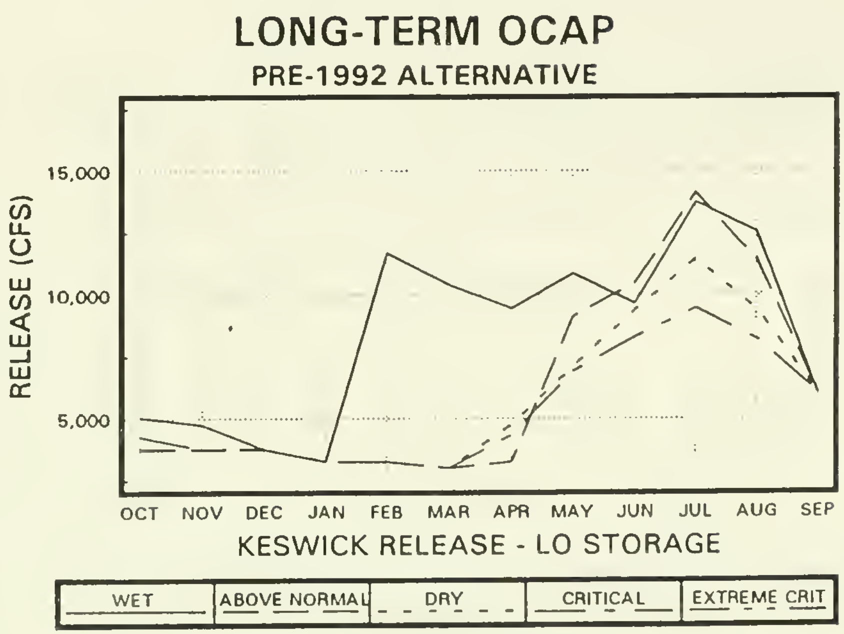
LONG-TERM OCAP
"B" ALTERNATIVE



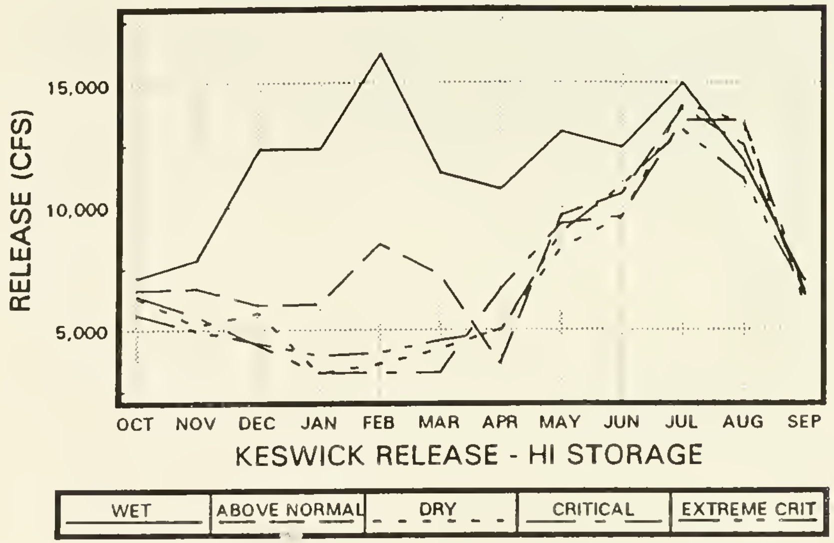

LONG-TERM OCAP
PRE-1992 ALTERNATIVE
RELEASE (CFS)
15,000
10,000
5,000
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
KESWICK RELEASE - HI STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT


LONG-TERM OCAP
PRE-1992 ALTERNATIVE
RELEASE (CFS)
15,000
10,000
5,000
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
KESWICK RELEASE - HM STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT

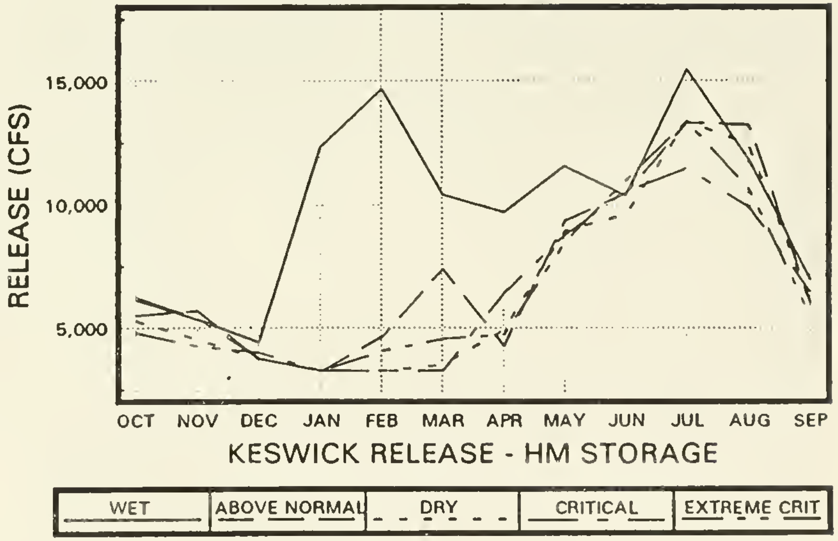

LONG-TERM OCAP
PRE-1992 ALTERNATIVE
RELEASE (CFS)
15,000
10,000
5,000
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
KESWICK RELEASE - LM STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT


LONG-TERM OCAP
PRE-1992 ALTERNATIVE
RELEASE (CFS)
15,000
10,000
5,000
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
KESWICK RELEASE - LO STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT

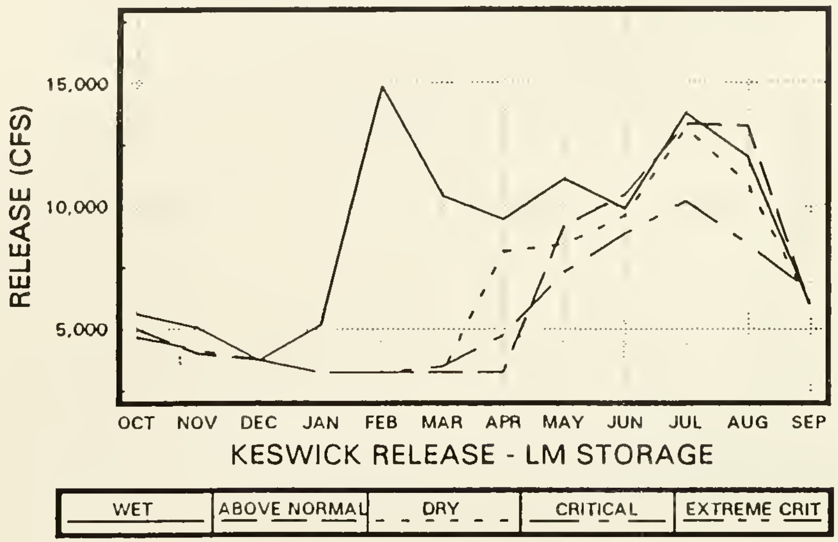
LONG-TERM OCAP
"B" ALTERNATIVE



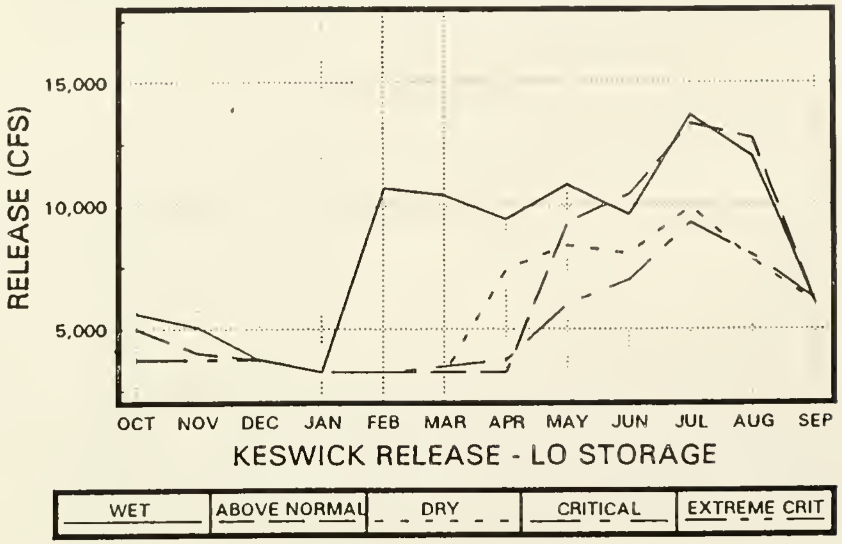
LONG-TERM OCAP
"B" ALTERNATIVE



LONG-TERM OCAP
"B" ALTERNATIVE

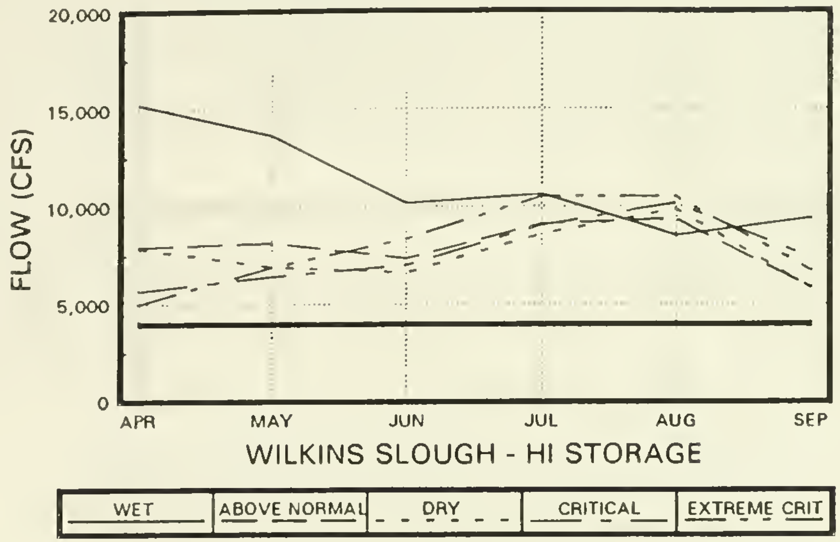


LONG-TERM OCAP
"B" ALTERNATIVE



LONG-TERM OCAP

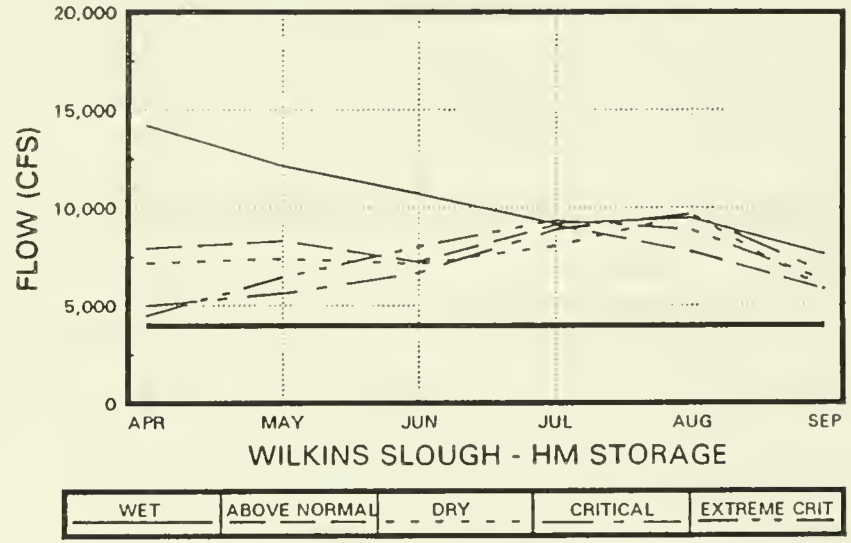
PRE-1992 ALTERNATIVE



WILKINS SLOUGH - HI STORAGE

LONG-TERM OCAP

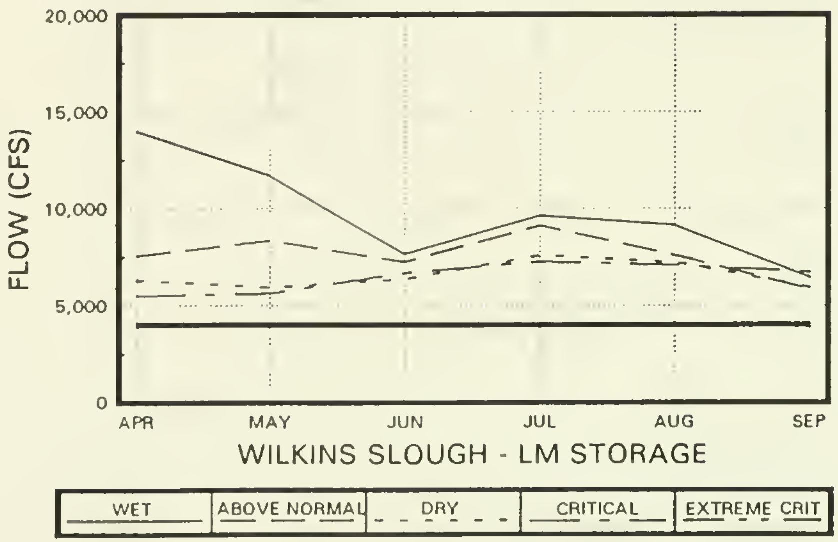
PRE-1992 ALTERNATIVE



WILKINS SLOUGH - HM STORAGE

LONG-TERM OCAP

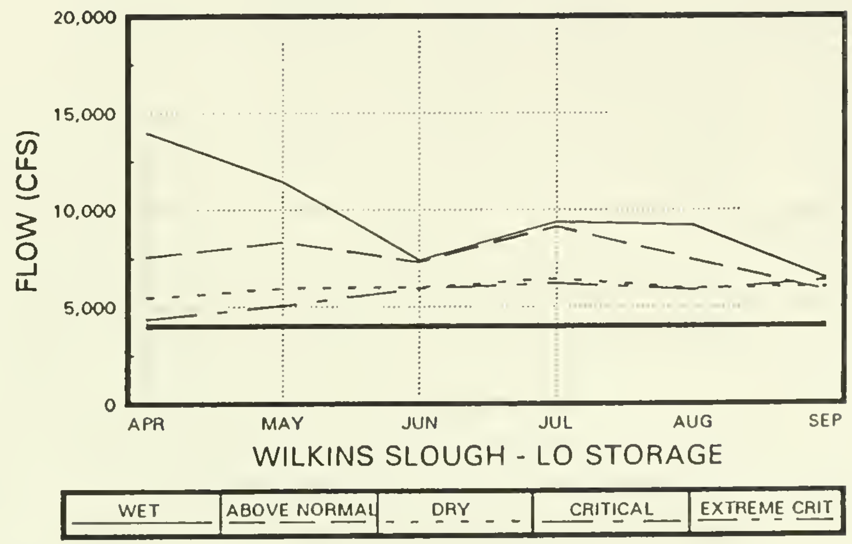
PRE-1992 ALTERNATIVE



WILKINS SLOUGH - LM STORAGE

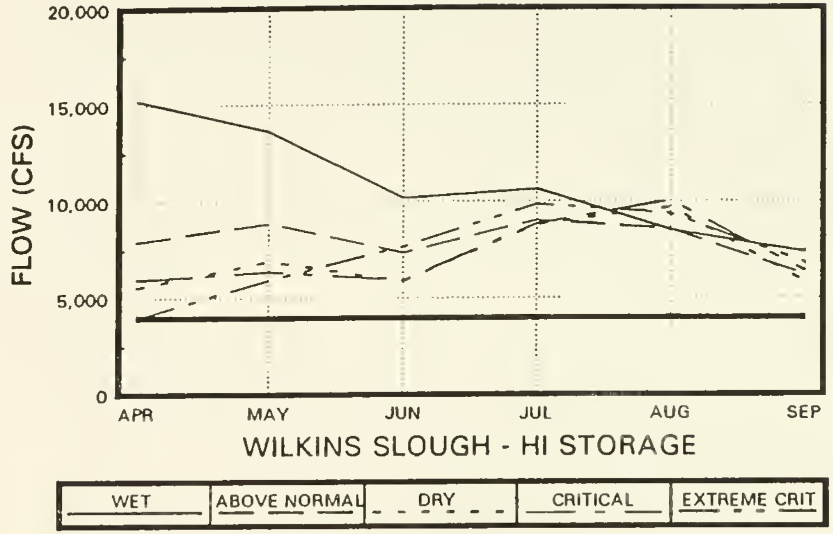
LONG-TERM OCAP

PRE-1992 ALTERNATIVE

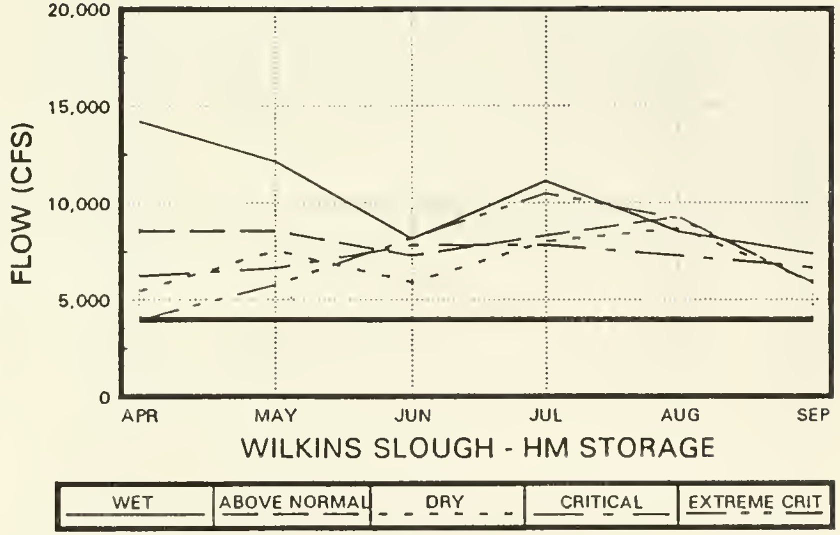


WILKINS SLOUGH - LO STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE



LONG-TERM OCAP
"B" ALTERNATIVE



LONG-TERM OCAP
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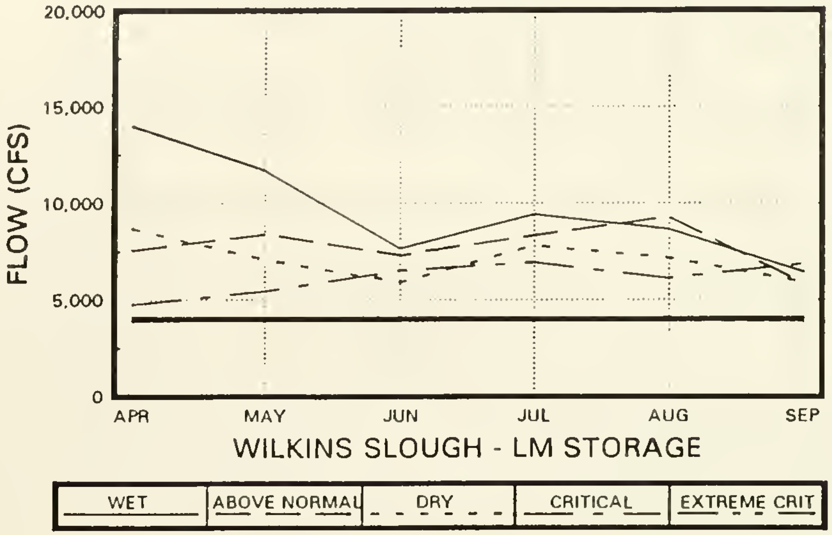

LONG-TERM OCAP
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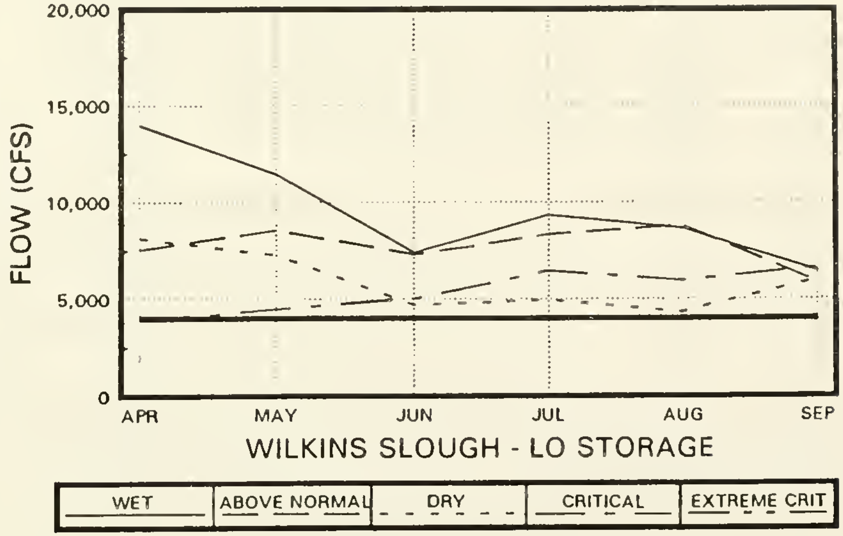

LONG-TERM OCAP
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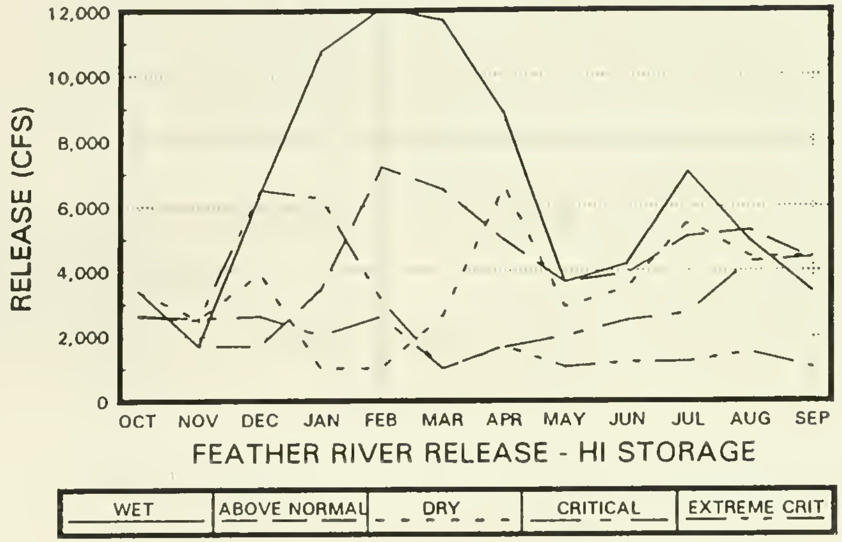

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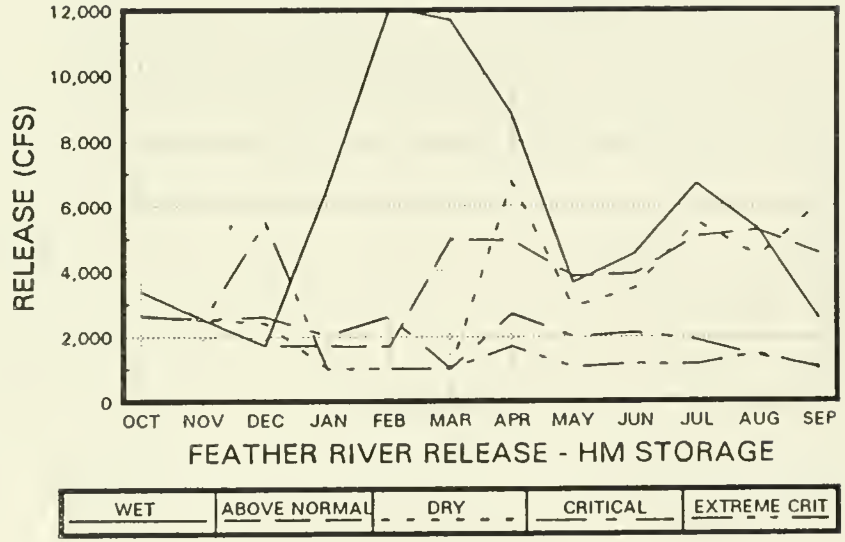

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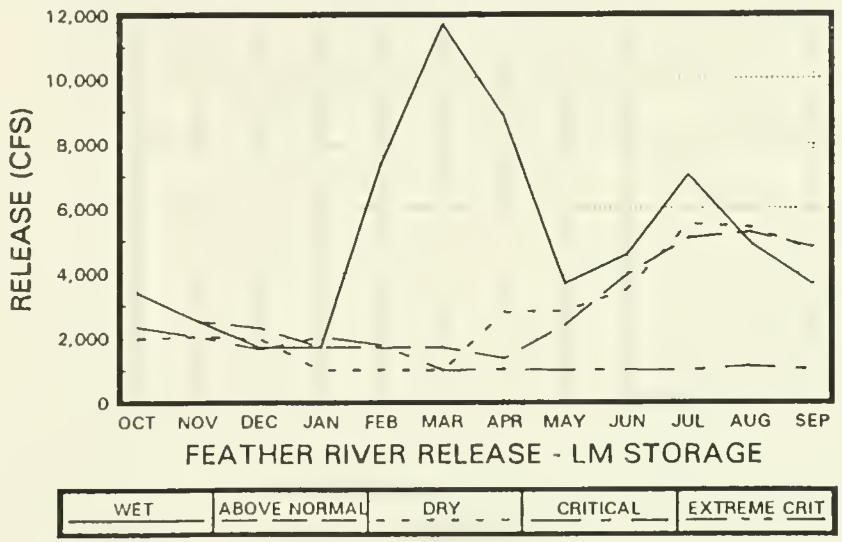

LONG-TERM OCAP
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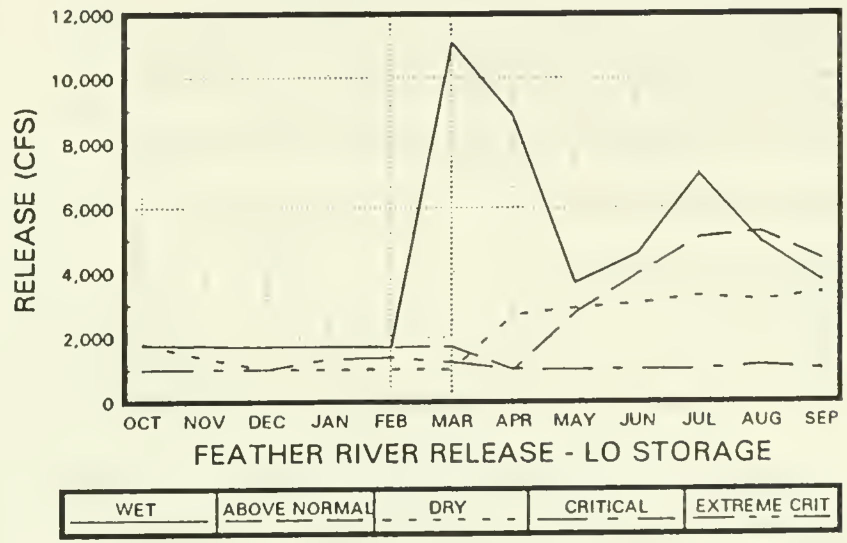

LONG-TERM OCAP
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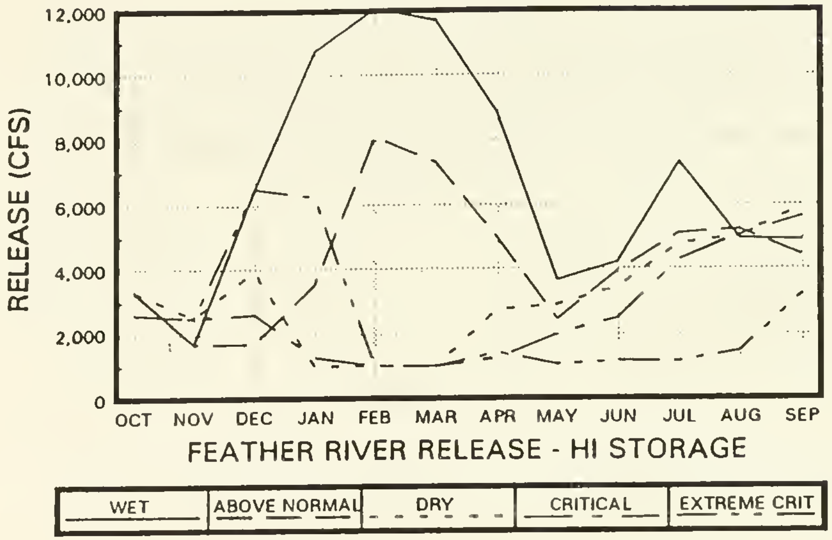

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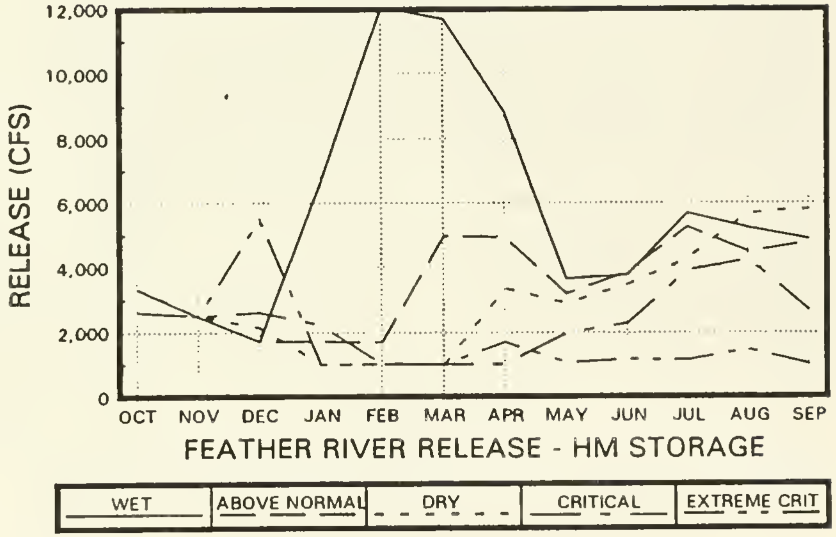

LONG-TERM OCAP
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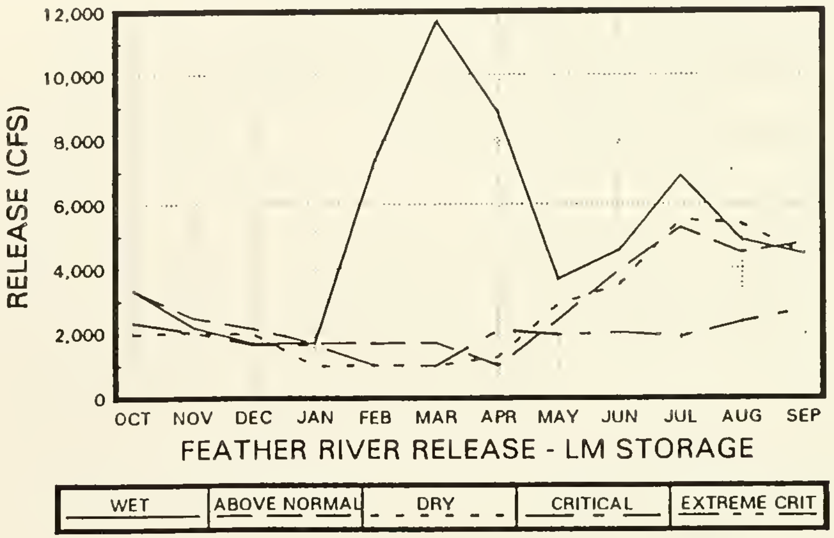

LONG-TERM OCAP
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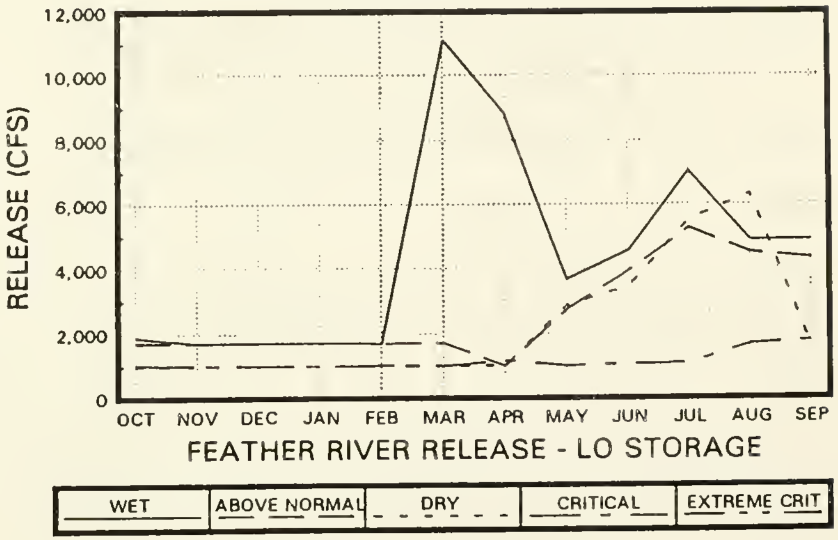

LONG-TERM OCAP
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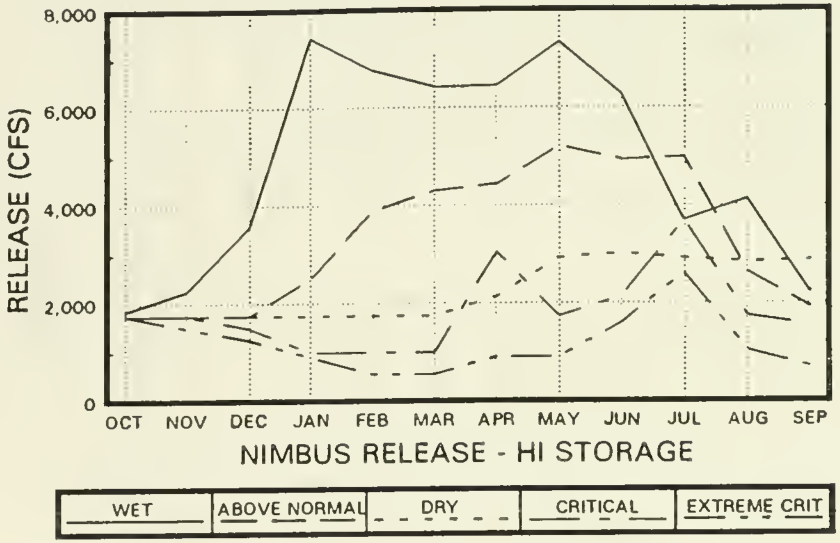

LONG-TERM OCAP
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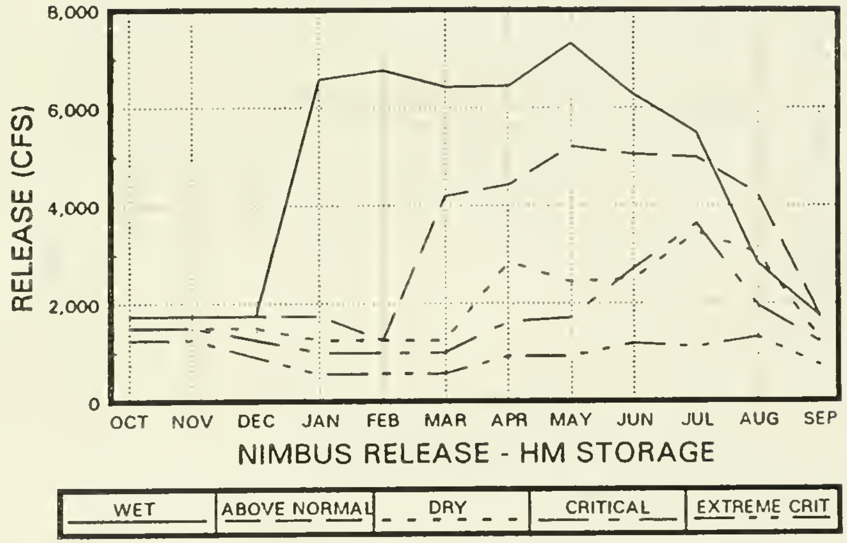

LONG-TERM OCAP
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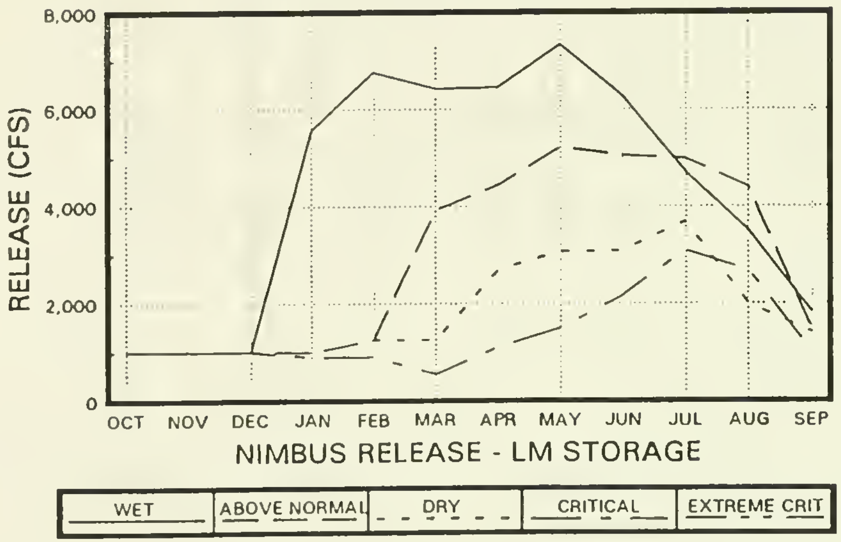

LONG-TERM OCAP
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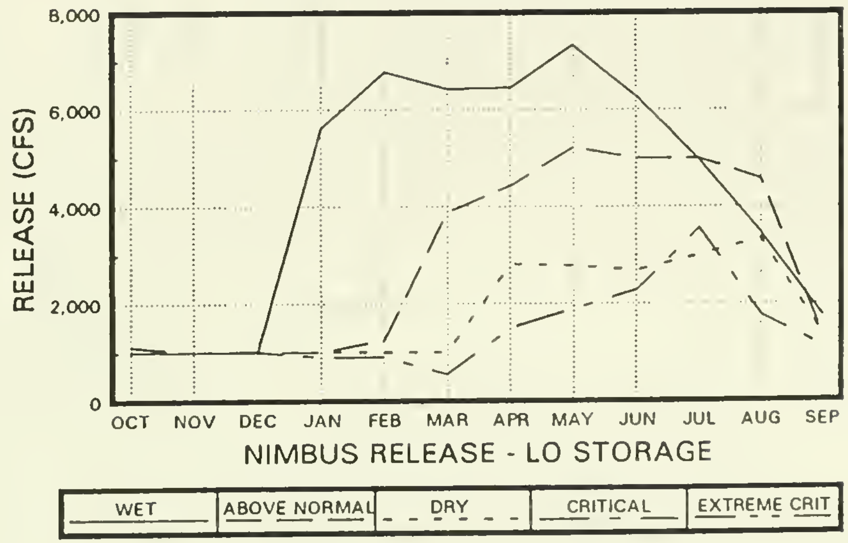
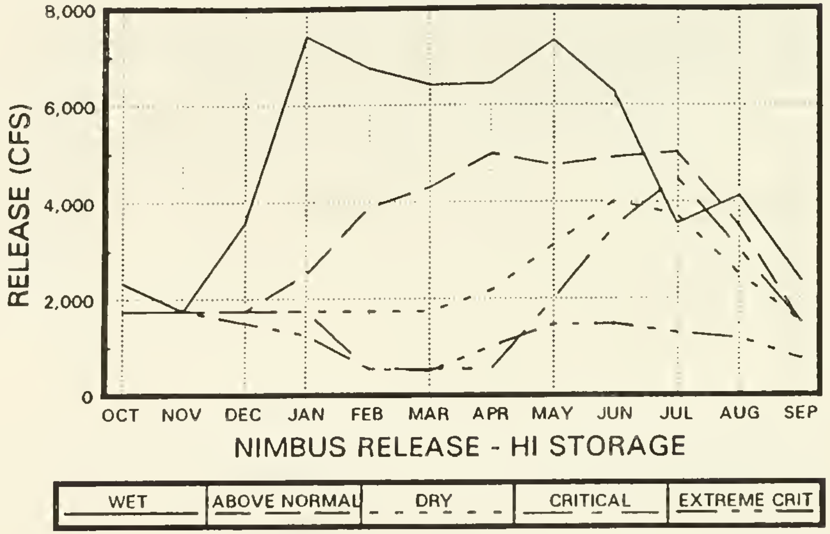


LONG-TERM OCAP
"B" ALTERNATIVE



LONG-TERM OCAP
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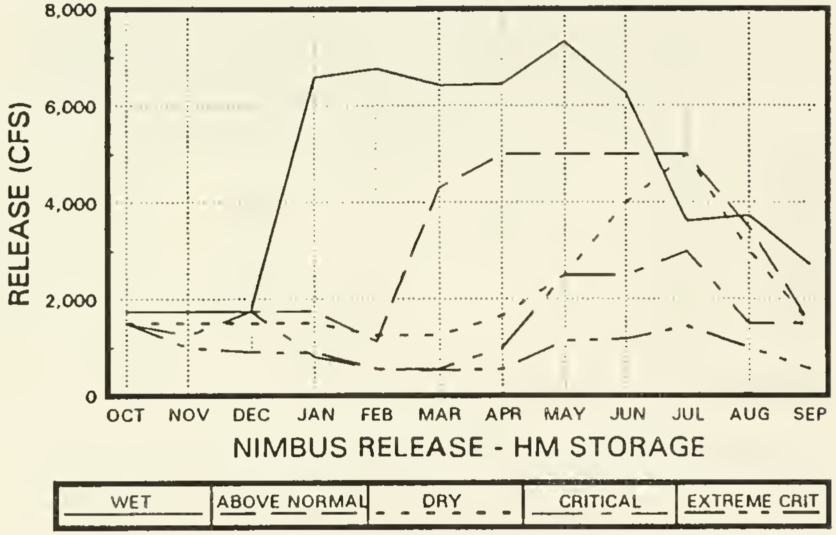
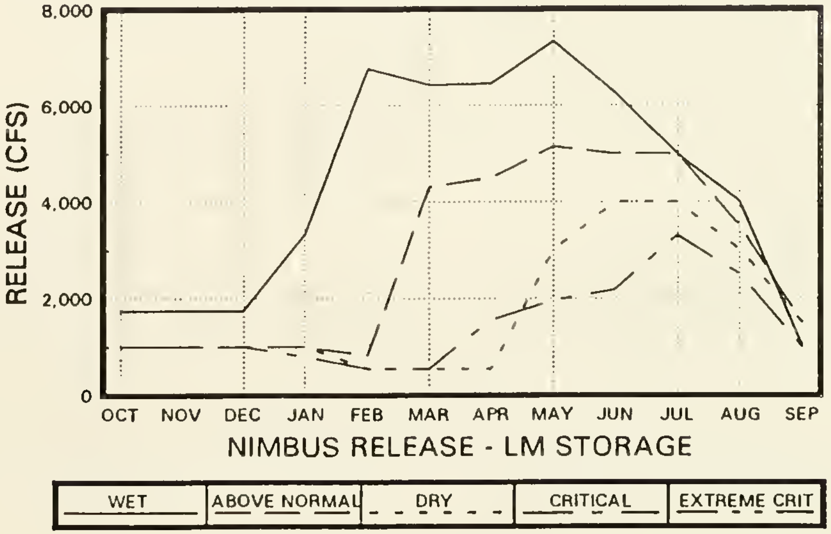
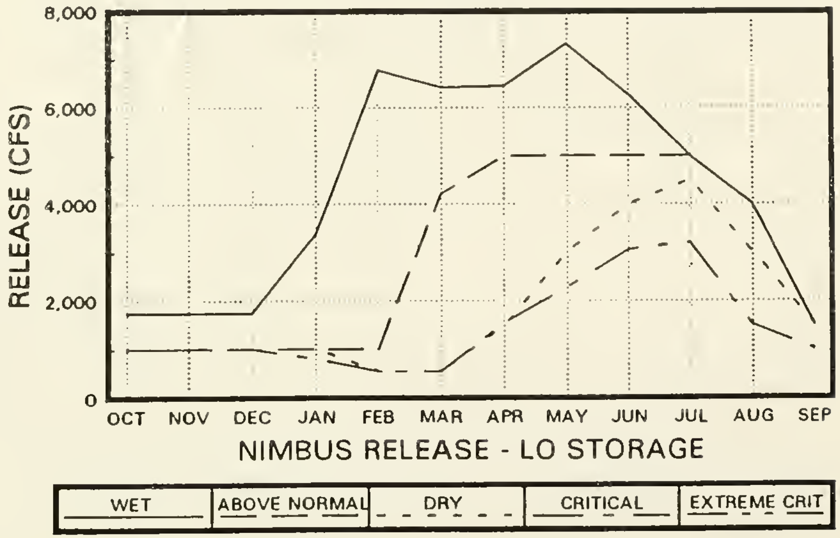


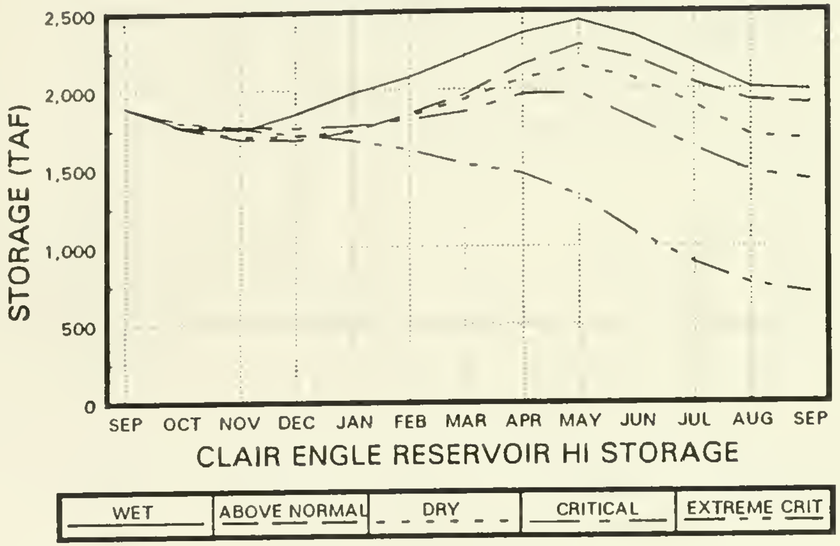
LONG-TERM OCAP
"B" ALTERNATIVE



LONG-TERM OCAP
"B" ALTERNATIVE

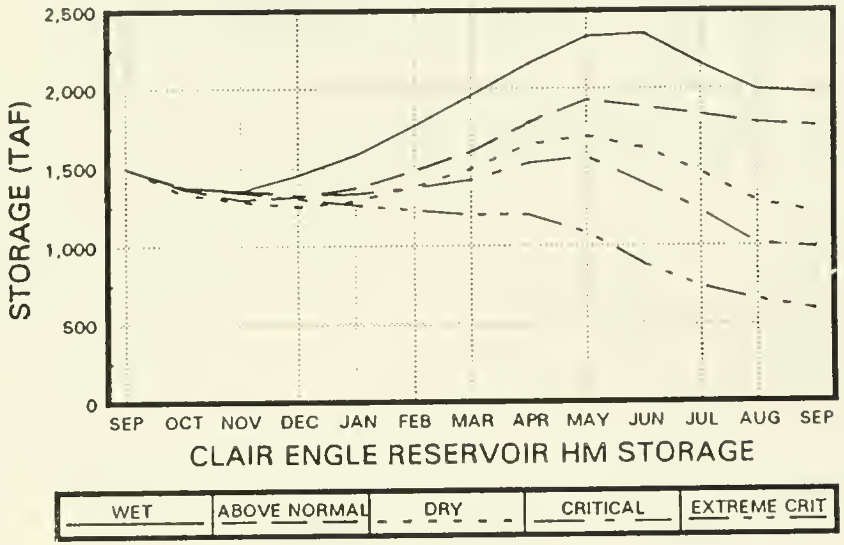


LONG-TERM OCAP
PRE-1992 ALTERNATIVE



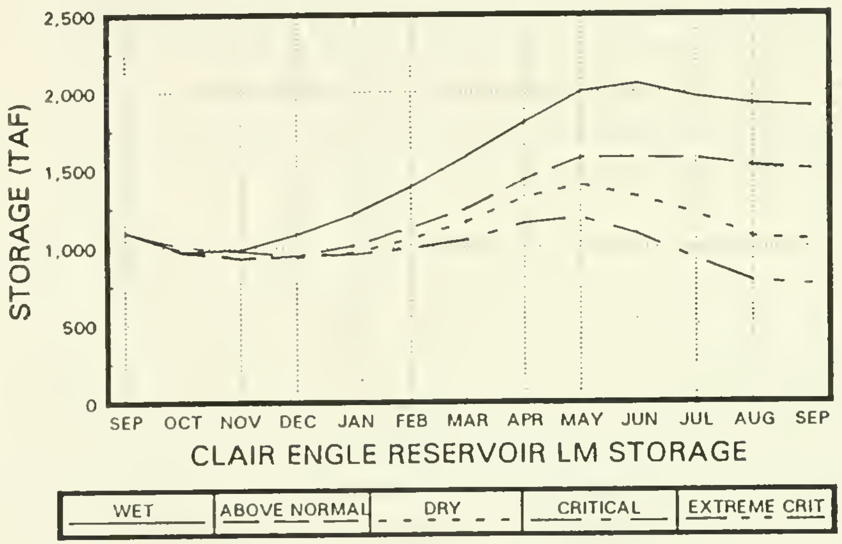
CLAIR ENGLE RESERVOIR HI STORAGE

LONG-TERM OCAP
PRE-1992 ALTERNATIVE



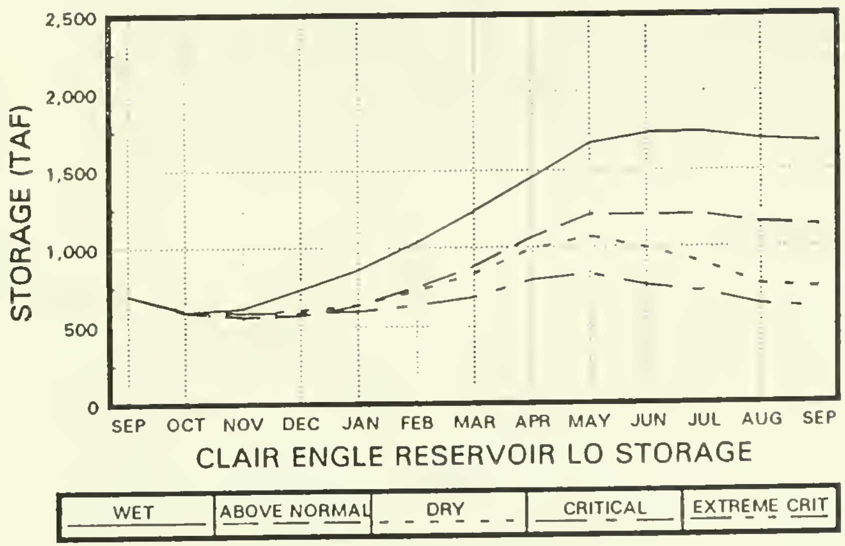
CLAIR ENGLE RESERVOIR HM STORAGE

LONG-TERM OCAP
PRE-1992 ALTERNATIVE



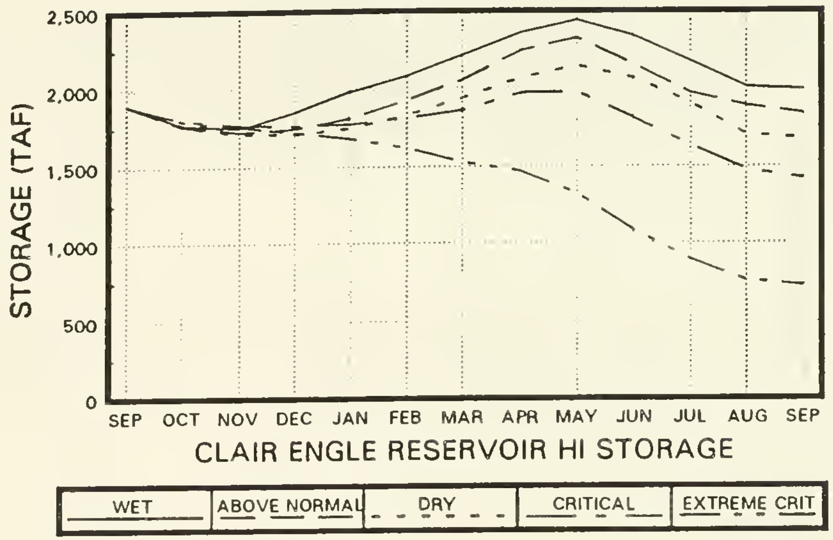
CLAIR ENGLE RESERVOIR LM STORAGE

LONG-TERM OCAP
PRE-1992 ALTERNATIVE



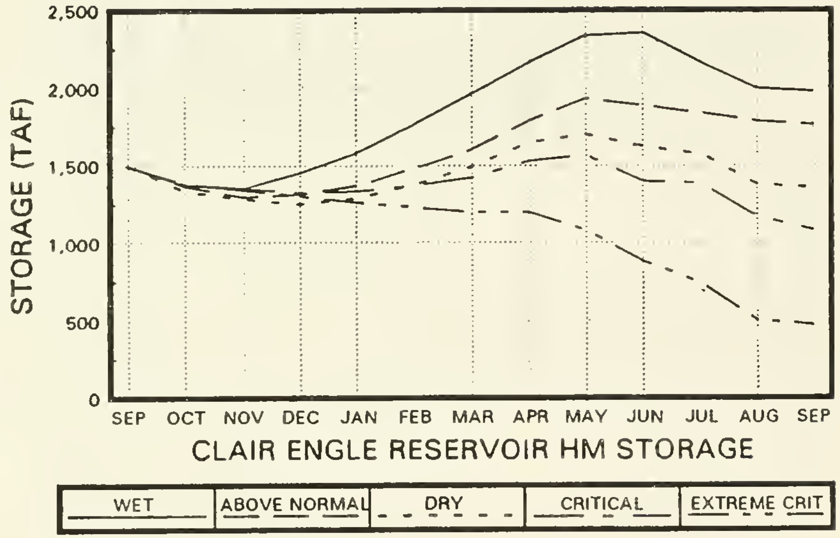
CLAIR ENGLE RESERVOIR LO STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE



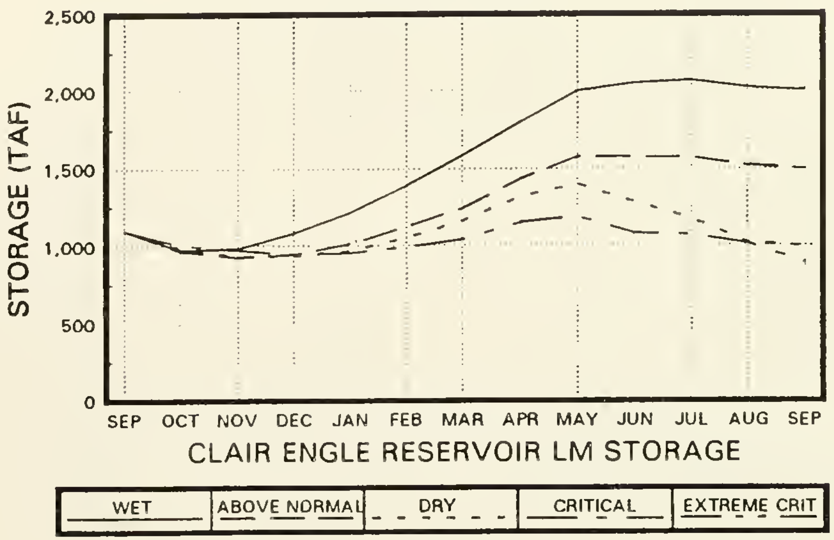
CLAIR ENGLE RESERVOIR HI STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE



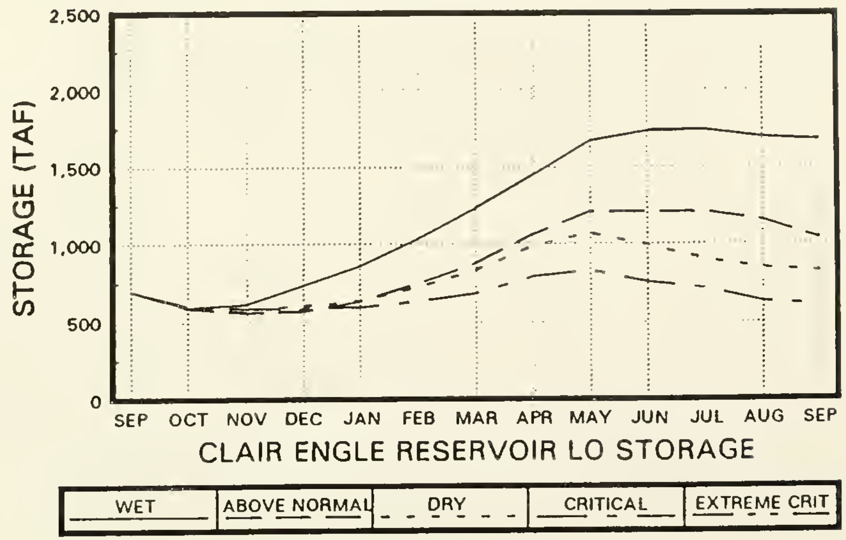
CLAIR ENGLE RESERVOIR HM STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE



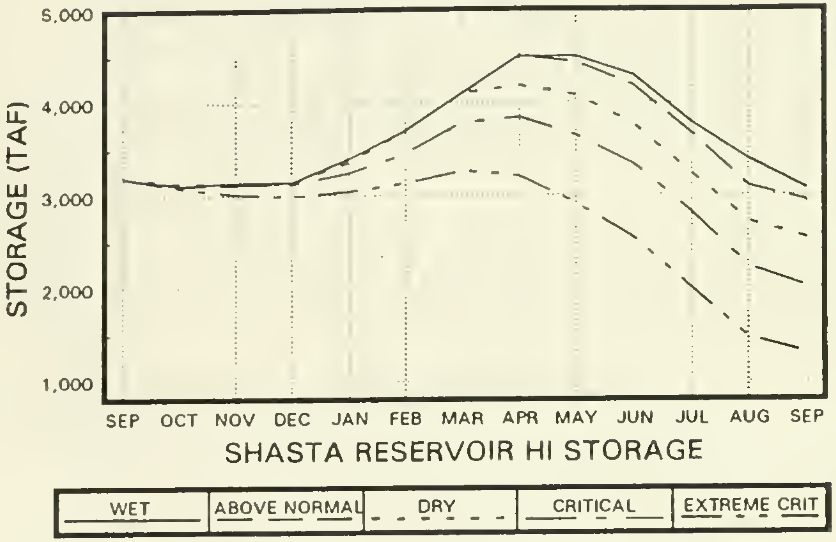
CLAIR ENGLE RESERVOIR LM STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE

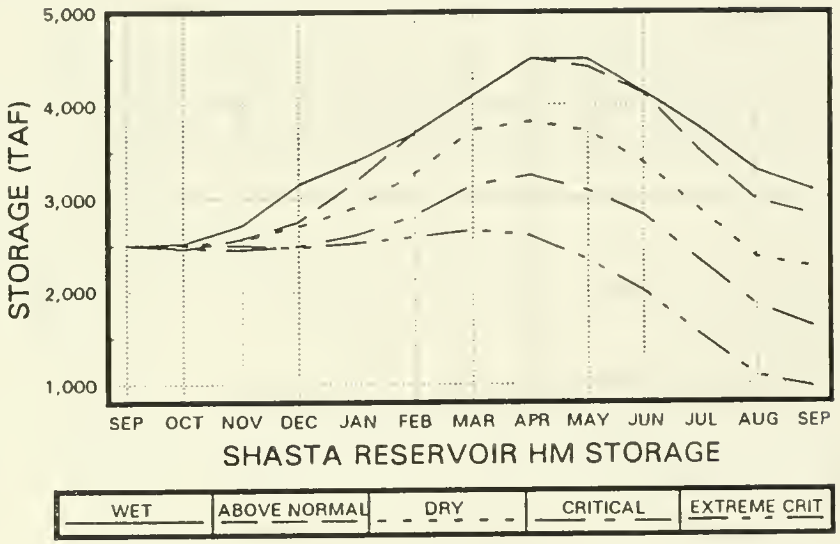


CLAIR ENGLE RESERVOIR LO STORAGE

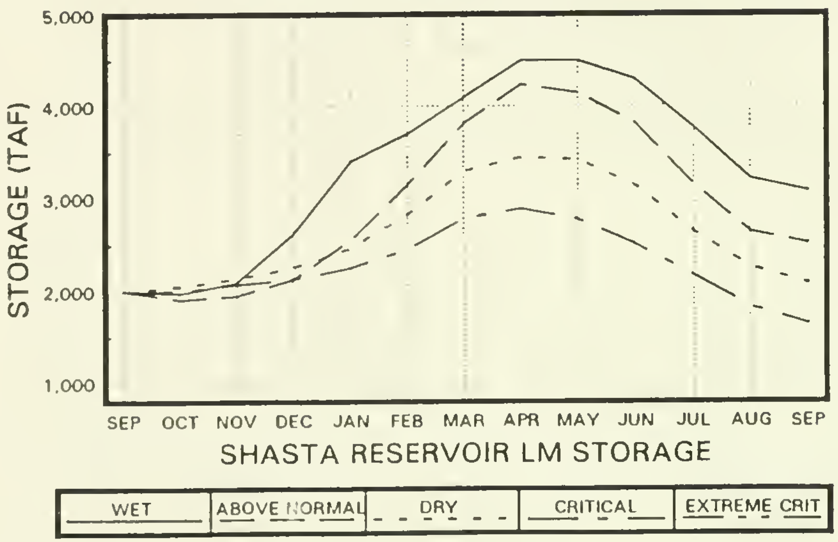
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



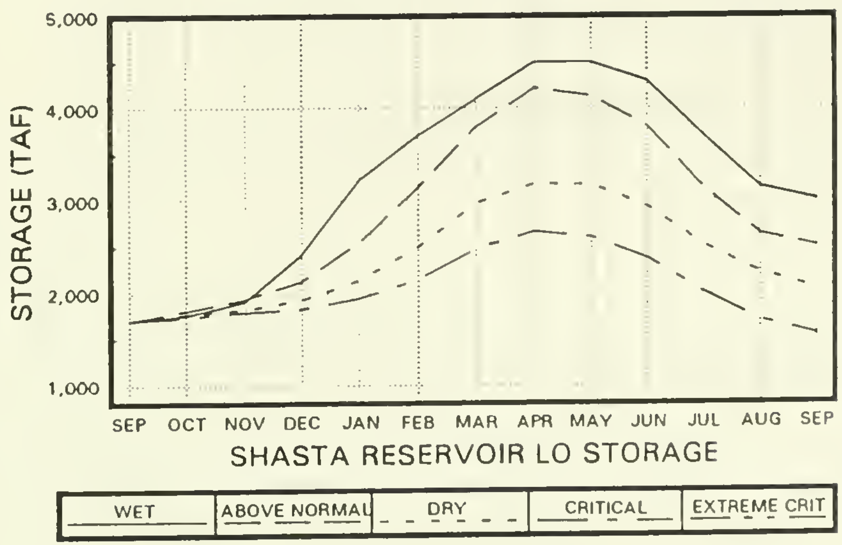
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



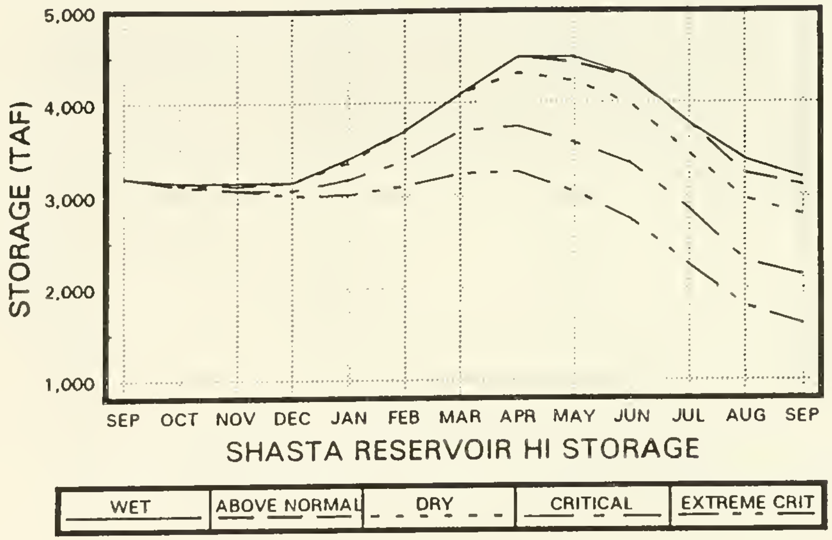
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



LONG-TERM OCAP
PRE-1992 ALTERNATIVE

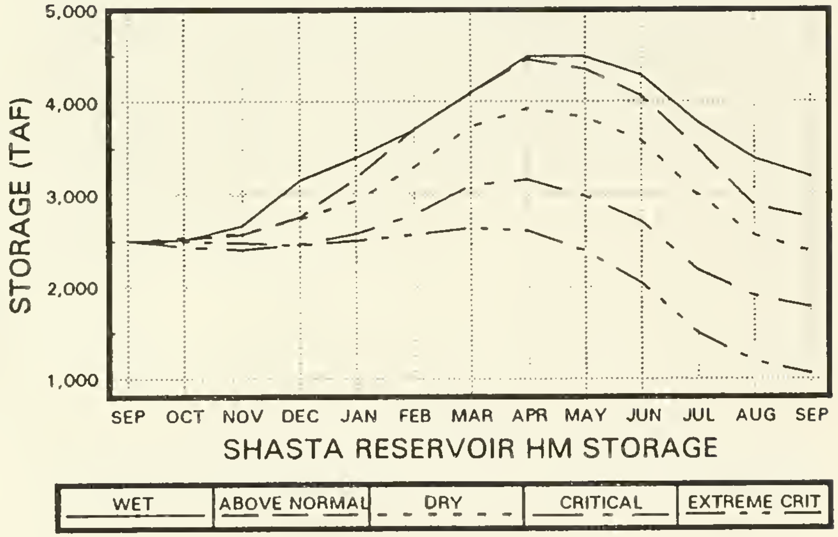


LONG-TERM OCAP
"B" ALTERNATIVE



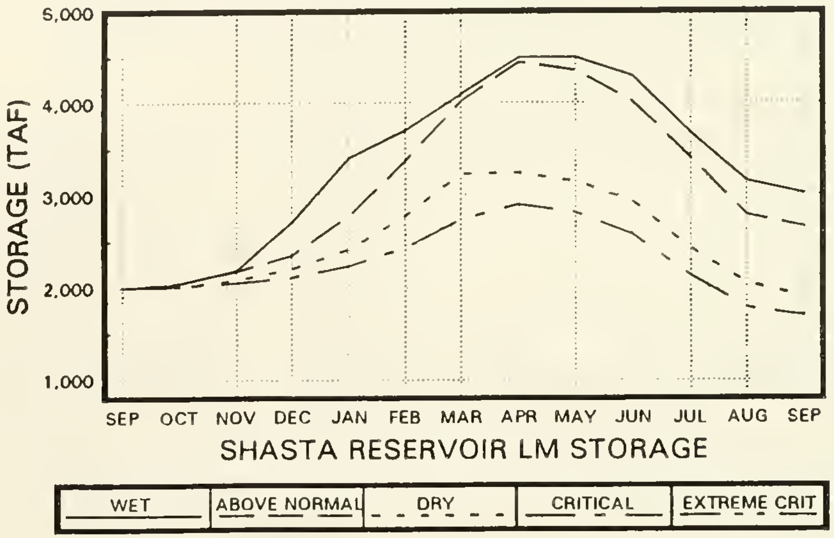
SHASTA RESERVOIR HI STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE



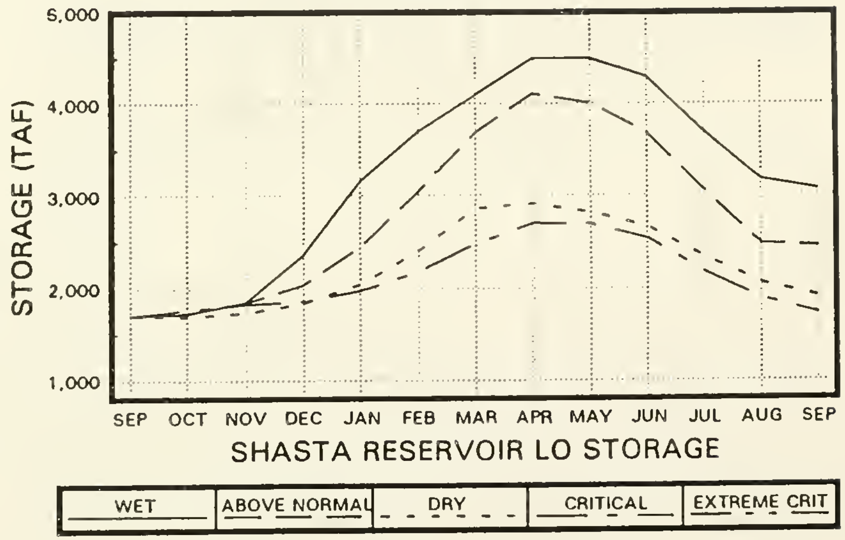
SHASTA RESERVOIR HM STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE

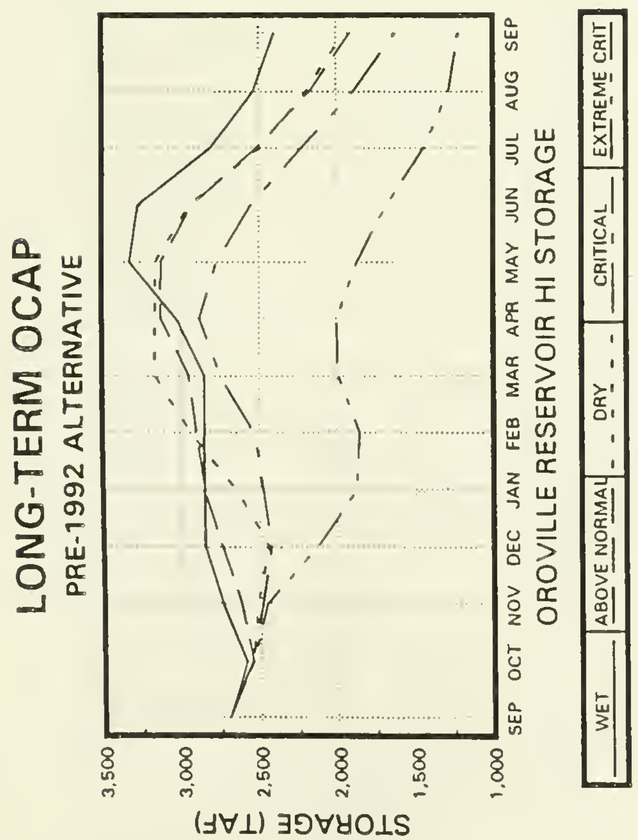


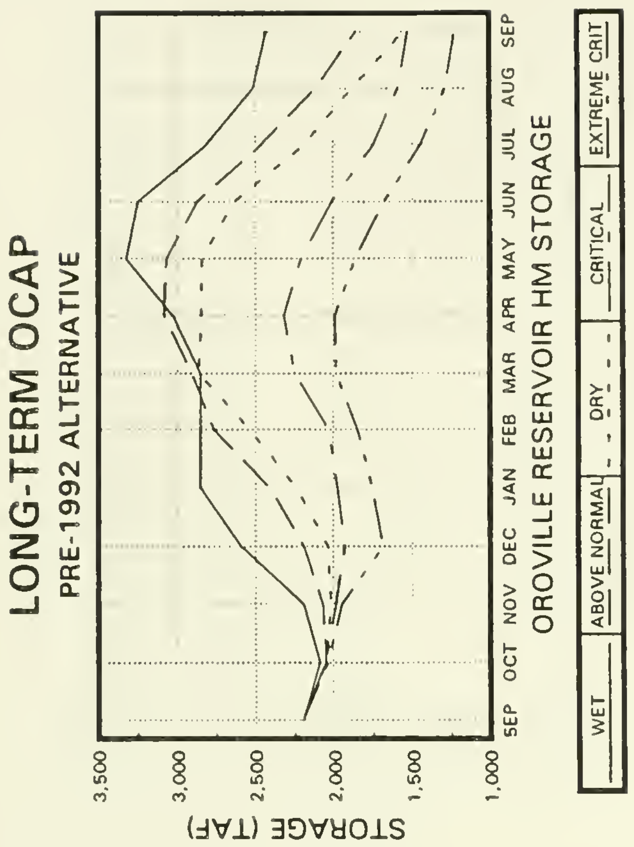
SHASTA RESERVOIR LM STORAGE

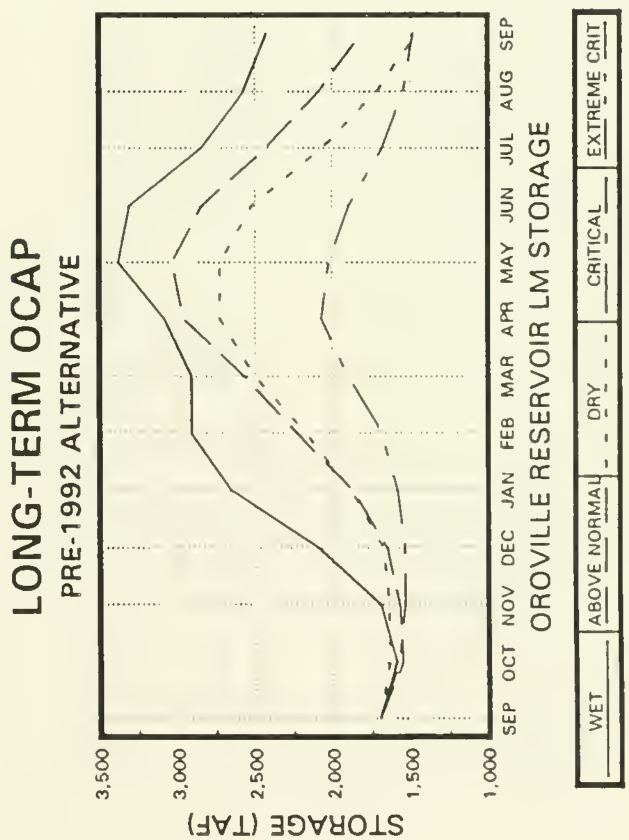
LONG-TERM OCAP
"B" ALTERNATIVE

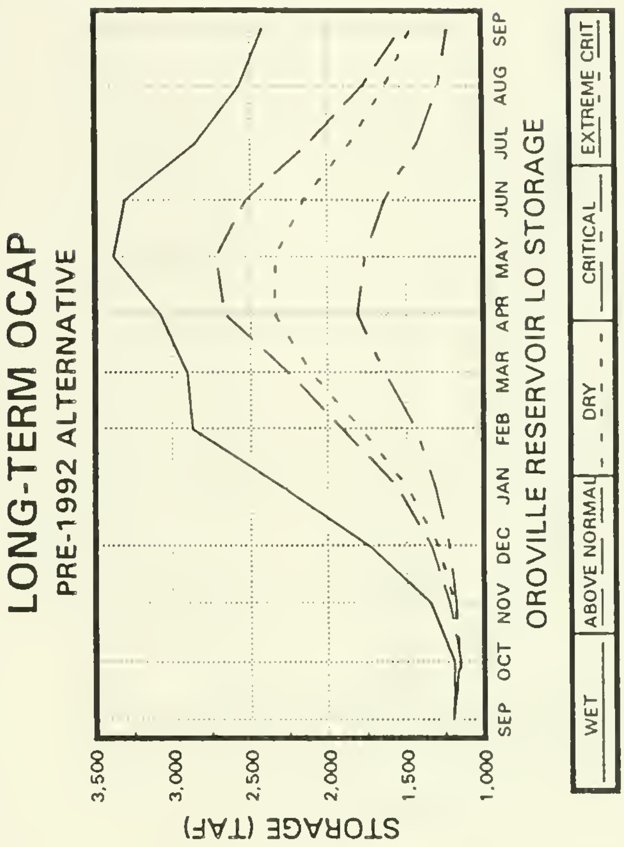


SHASTA RESERVOIR LO STORAGE

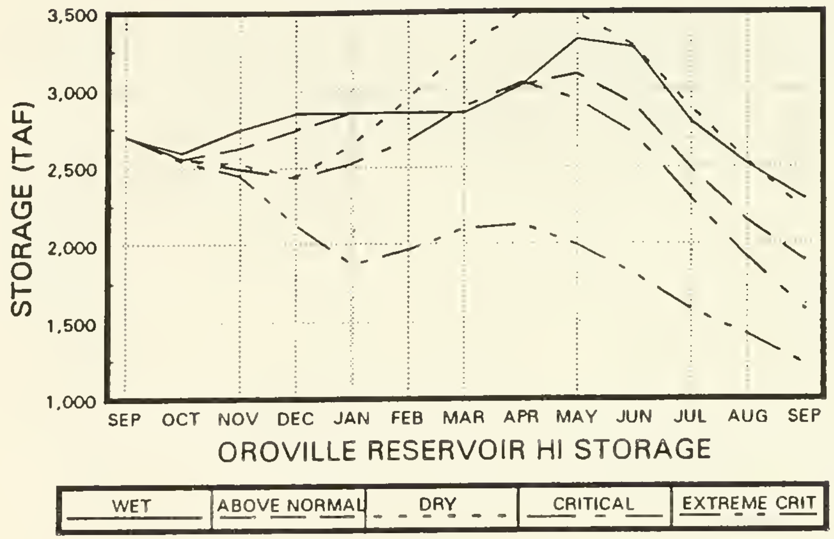

LONG-TERM OCAP
PRE-1992 ALTERNATIVE
STORAGE (TAF)
3,500
3,000
2,500
2,000
1,500
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
OROVILLE RESERVOIR HI STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT


LONG-TERM OCAP
PRE-1992 ALTERNATIVE
STORAGE (TAF)
3,500
3,000
2,500
2,000
1,500
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
OROVILLE RESERVOIR HM STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT

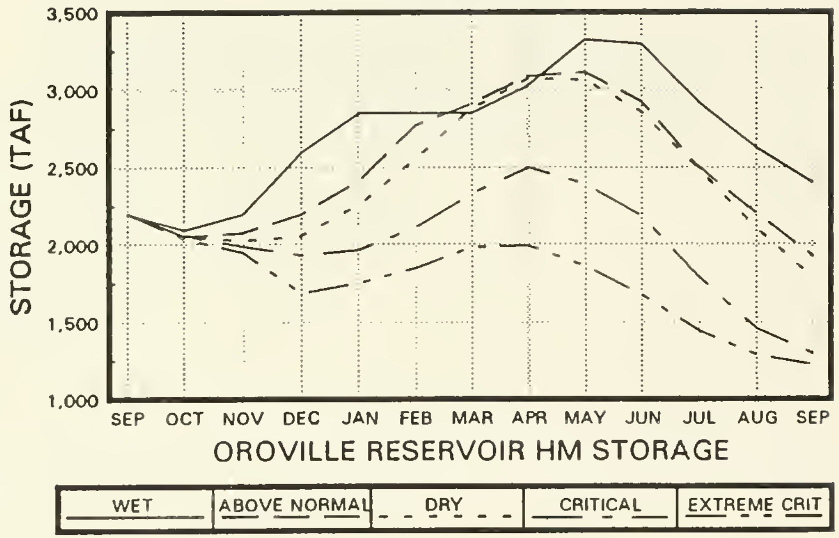

LONG-TERM OCAP
PRE-1992 ALTERNATIVE
STORAGE (TAF)
3,500
3,000
2,500
2,000
1,500
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
OROVILLE RESERVOIR LM STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT


LONG-TERM OCAP
PRE-1992 ALTERNATIVE
STORAGE (TAF)
3,500
3,000
2,500
2,000
1,500
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
OROVILLE RESERVOIR LO STORAGE
WET
ABOVE NORMAL
DRY
CRITICAL
EXTREME CRIT

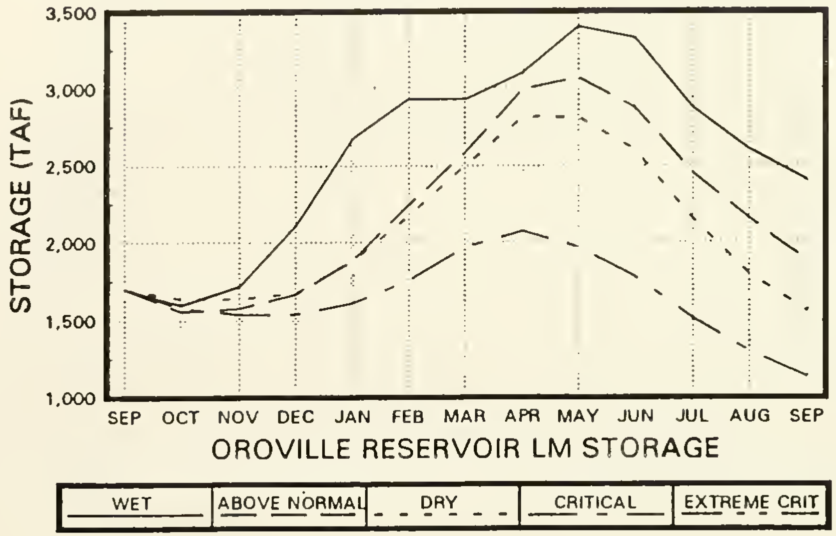
LONG-TERM OCAP
"B" ALTERNATIVE



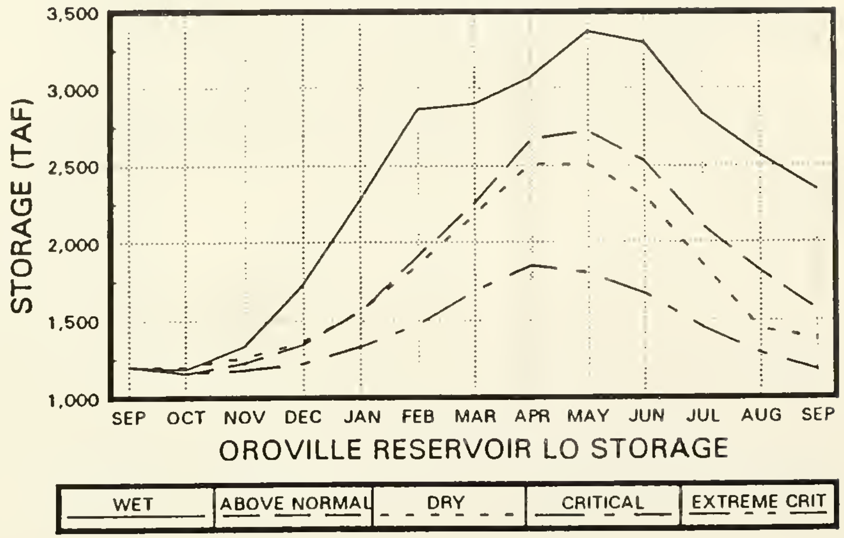
LONG-TERM OCAP
"B" ALTERNATIVE



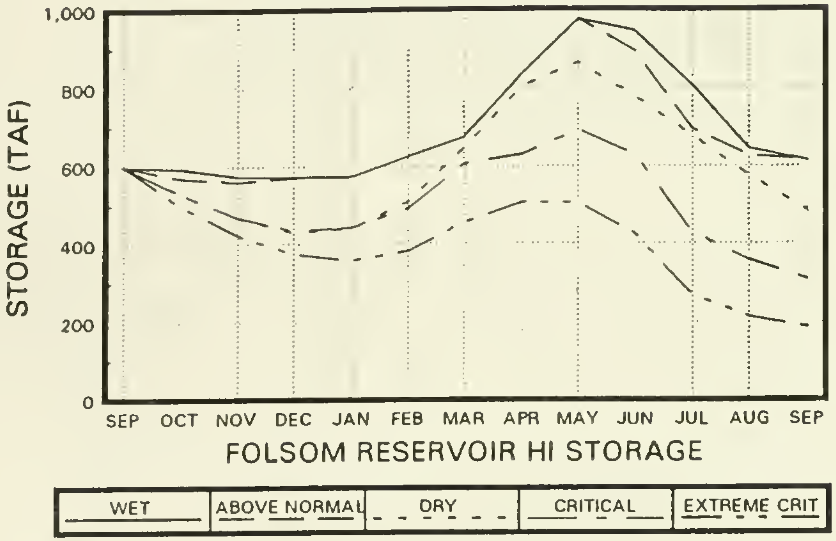
LONG-TERM OCAP
"B" ALTERNATIVE



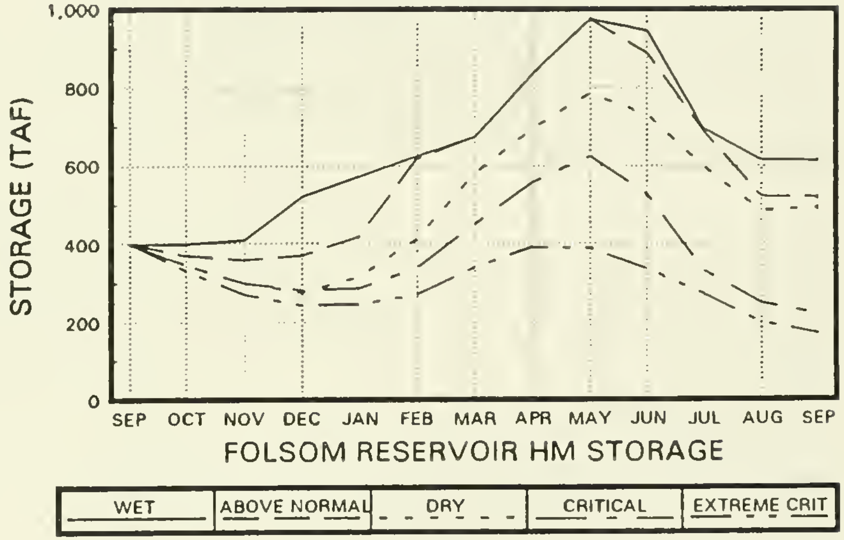
LONG-TERM OCAP
"B" ALTERNATIVE



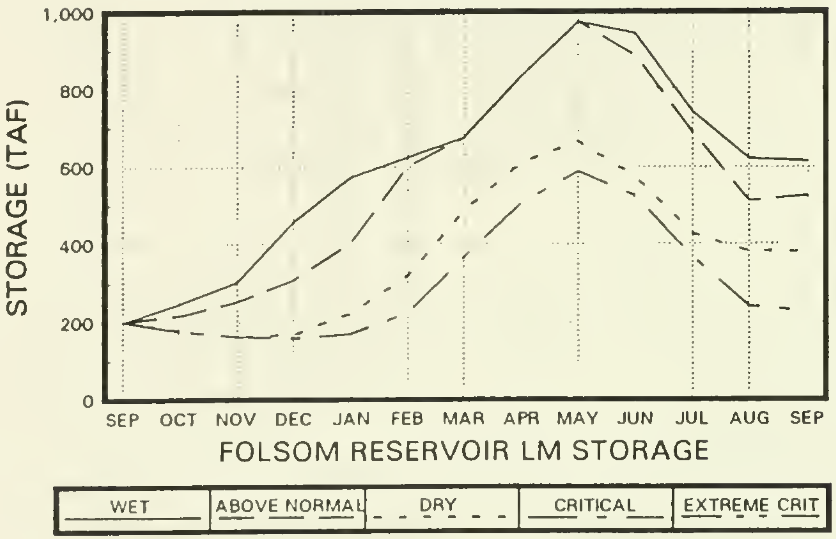
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



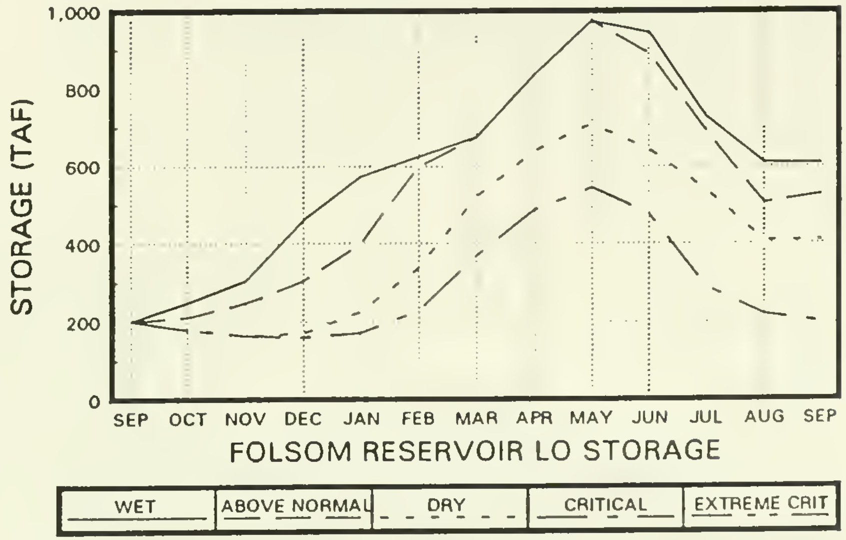
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



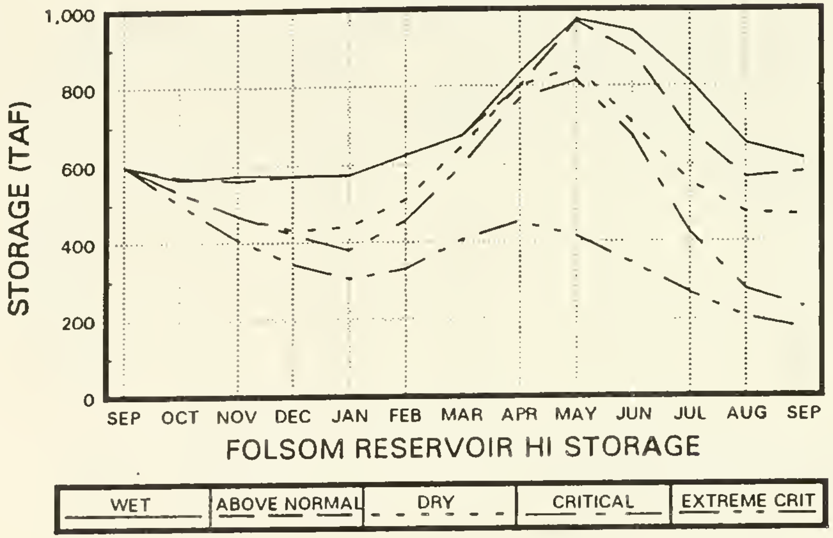
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



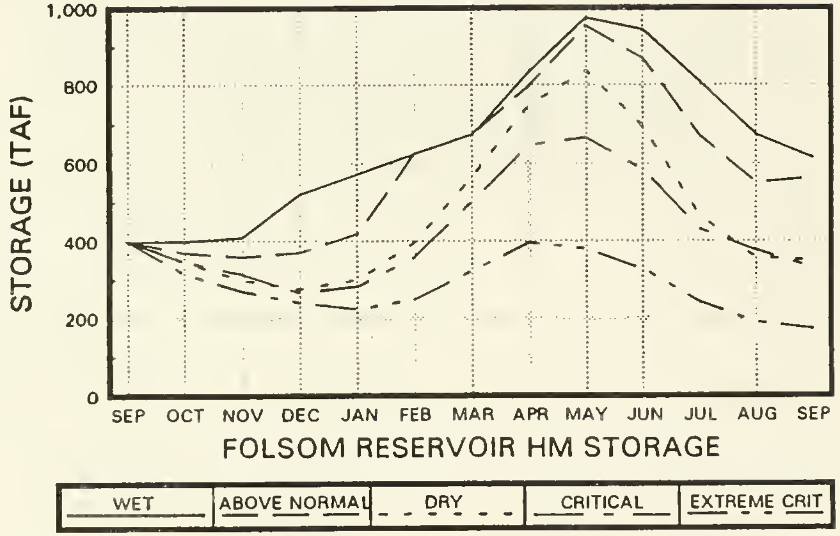
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



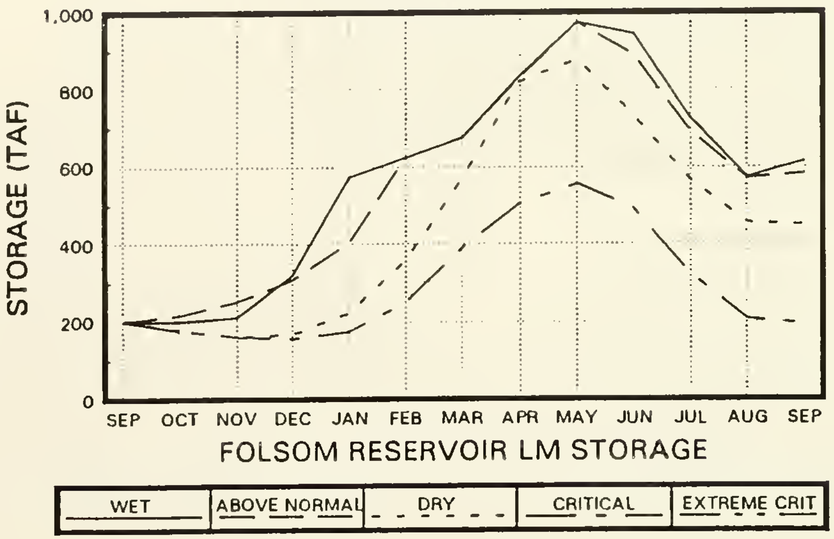
LONG-TERM OCAP
"B" ALTERNATIVE



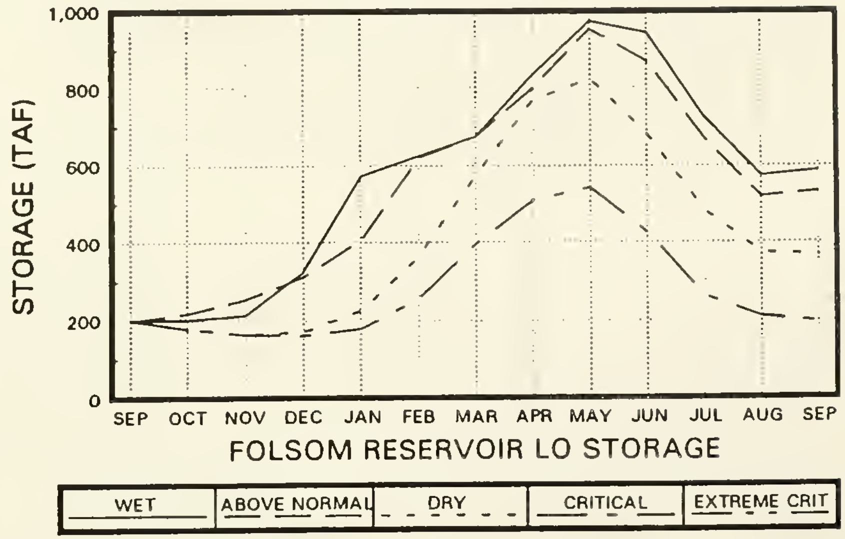
LONG-TERM OCAP
"B" ALTERNATIVE



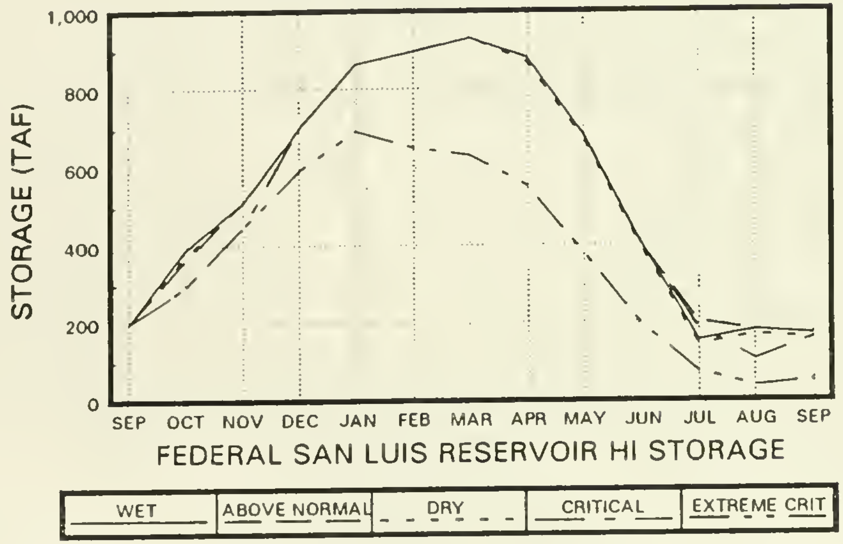
LONG-TERM OCAP
"B" ALTERNATIVE



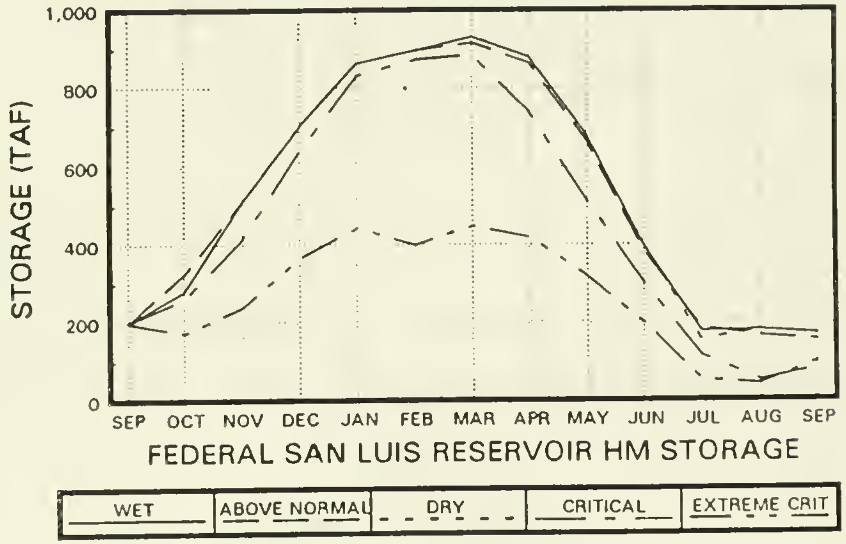
LONG-TERM OCAP
"B" ALTERNATIVE



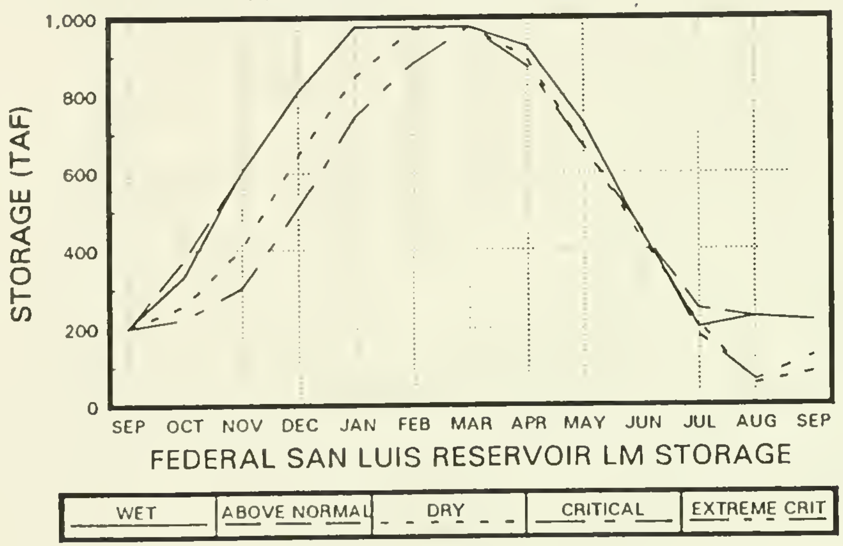
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



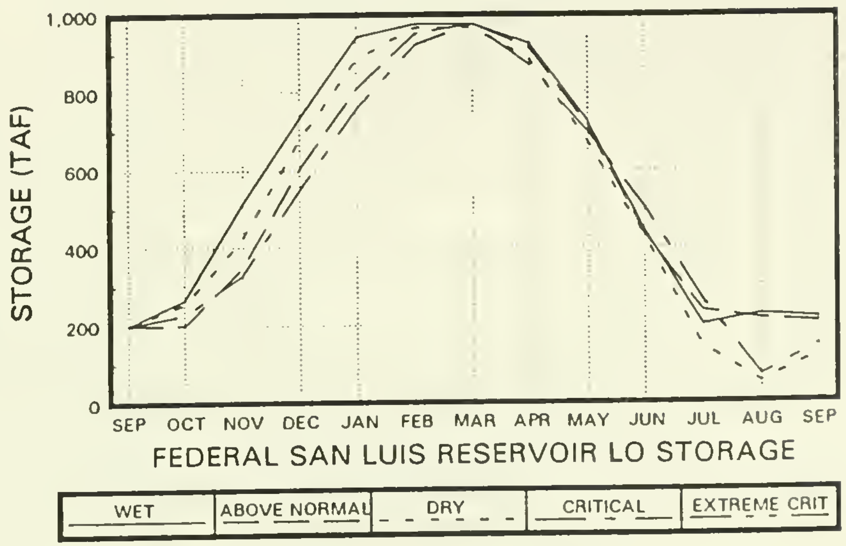
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



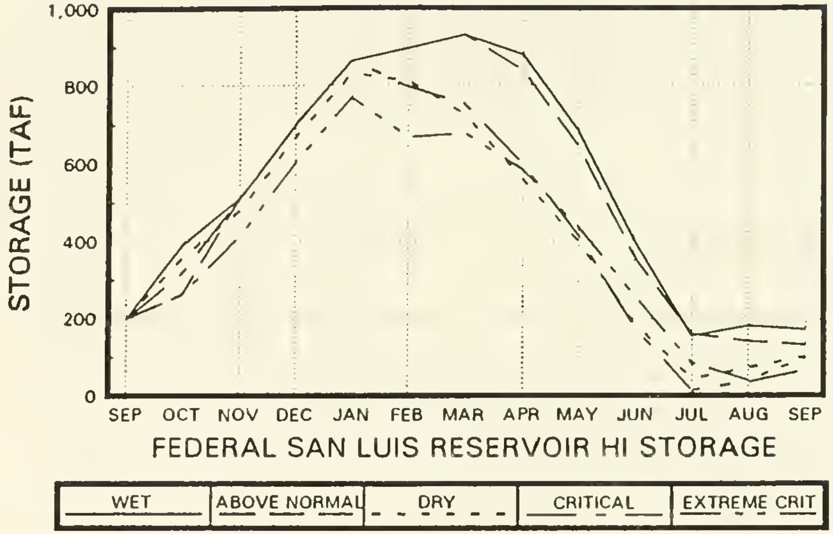
LONG-TERM OCAP
PRE-1992 ALTERNATIVE



LONG-TERM OCAP
PRE-1992 ALTERNATIVE

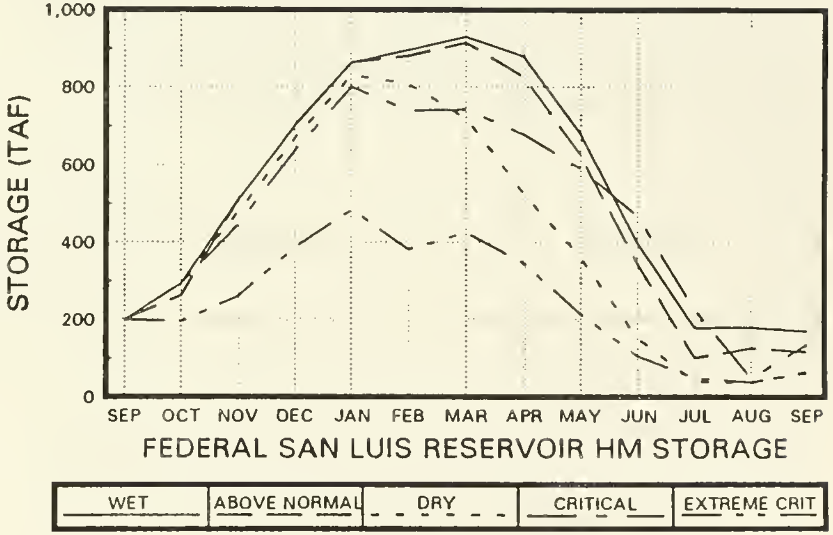


LONG-TERM OCAP
"B" ALTERNATIVE



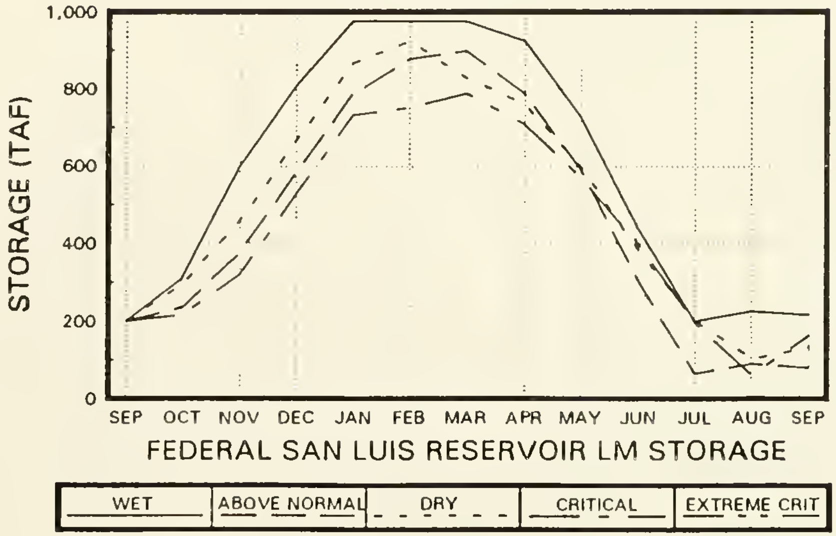
FEDERAL SAN LUIS RESERVOIR HI STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE



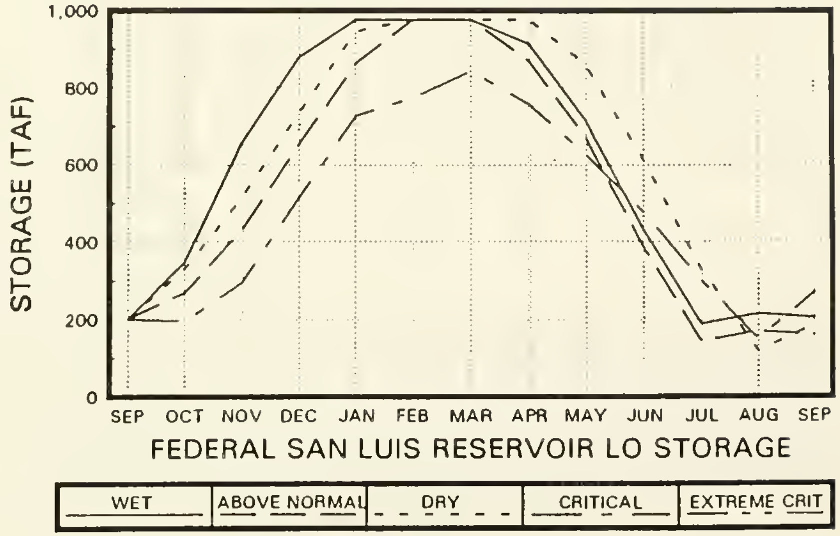
FEDERAL SAN LUIS RESERVOIR HM STORAGE

LONG-TERM OCAP
"B" ALTERNATIVE

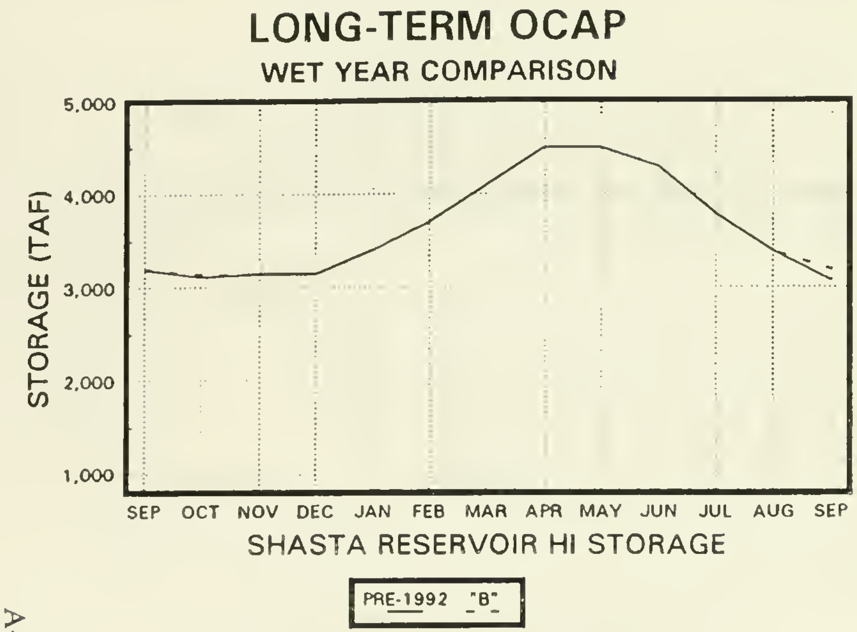


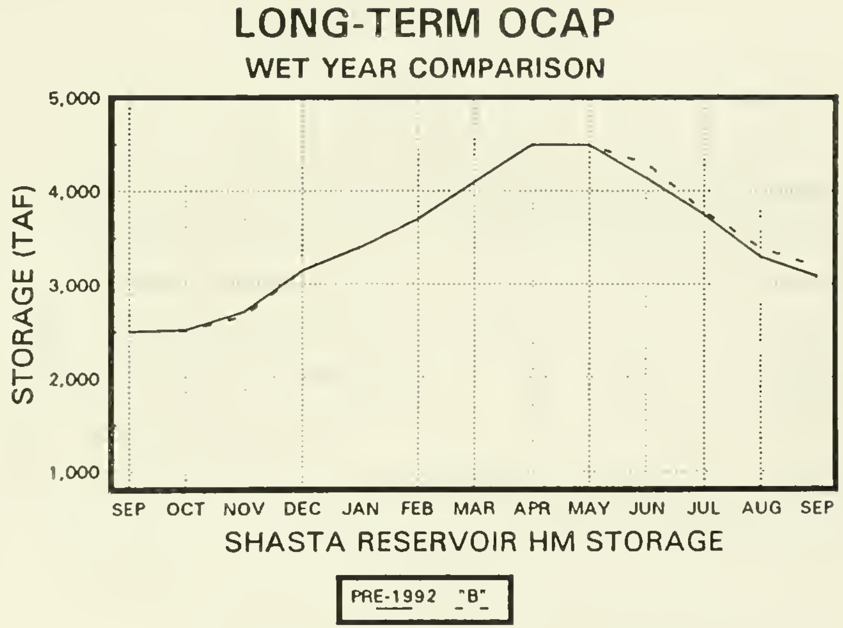
FEDERAL SAN LUIS RESERVOIR LM STORAGE

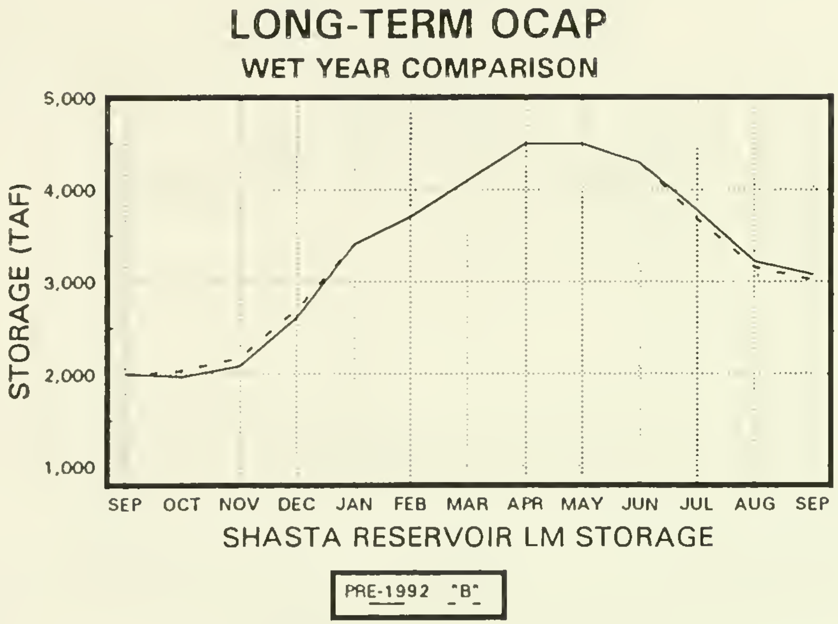
LONG-TERM OCAP
"B" ALTERNATIVE

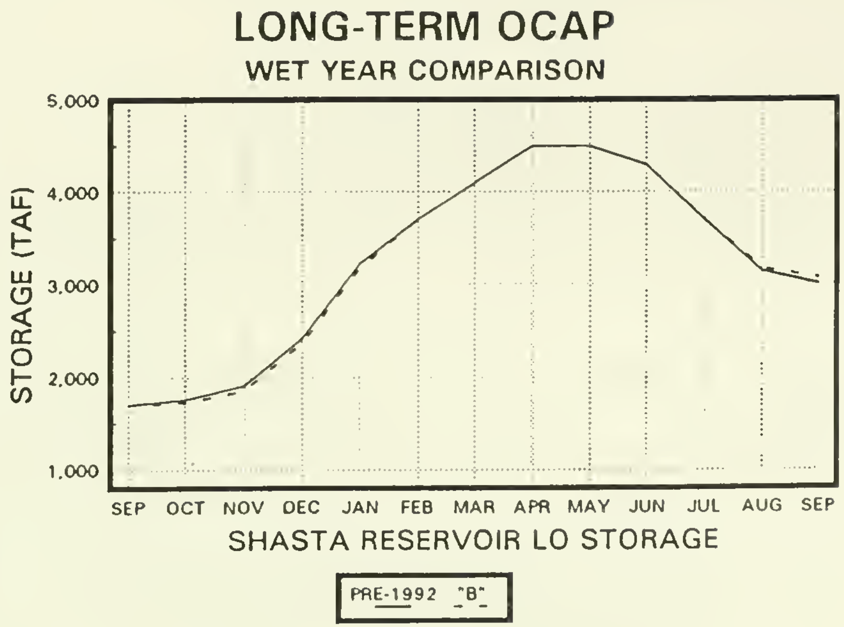


FEDERAL SAN LUIS RESERVOIR LO STORAGE


LONG-TERM OCAP
WET YEAR COMPARISON
STORAGE (TAF)
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
SHASTA RESERVOIR HI STORAGE
PRE-1992 "B"

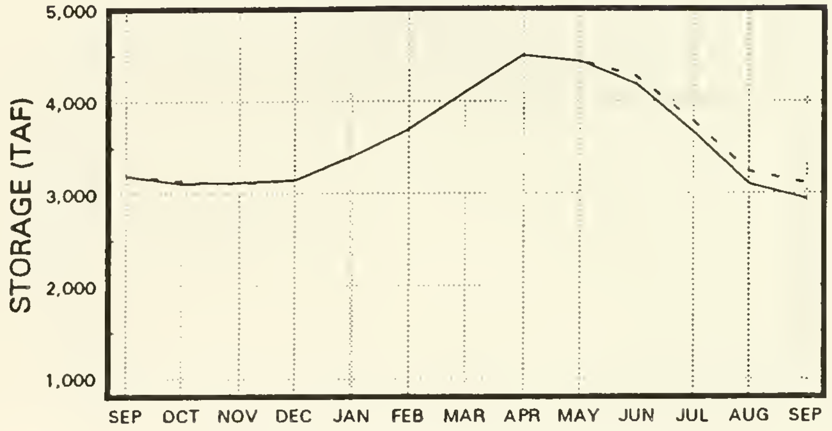

LONG-TERM OCAP
WET YEAR COMPARISON
STORAGE (TAF)
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
SHASTA RESERVOIR HM STORAGE
PRE-1992 "B"


LONG-TERM OCAP
WET YEAR COMPARISON
STORAGE (TAF)
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
SHASTA RESERVOIR LM STORAGE
PRE-1992 "B"


LONG-TERM OCAP
WET YEAR COMPARISON
STORAGE (TAF)
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
SHASTA RESERVOIR LO STORAGE
PRE-1992 "B"

LONG-TERM OCAP

ABOVE NORMAL YEAR COMPARISON

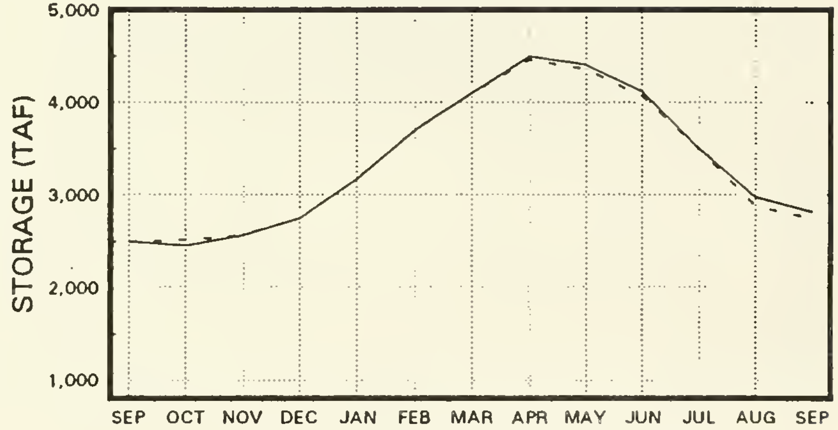


SHASTA RESERVOIR HI STORAGE

PRE-1992 "B"

LONG-TERM OCAP

ABOVE NORMAL YEAR COMPARISON

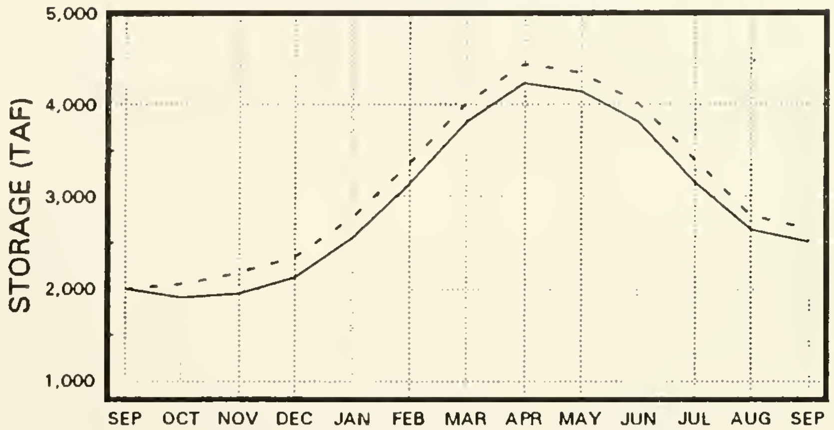


SHASTA RESERVOIR HM STORAGE

PRE-1992 "B"

LONG-TERM OCAP

ABOVE NORMAL YEAR COMPARISON

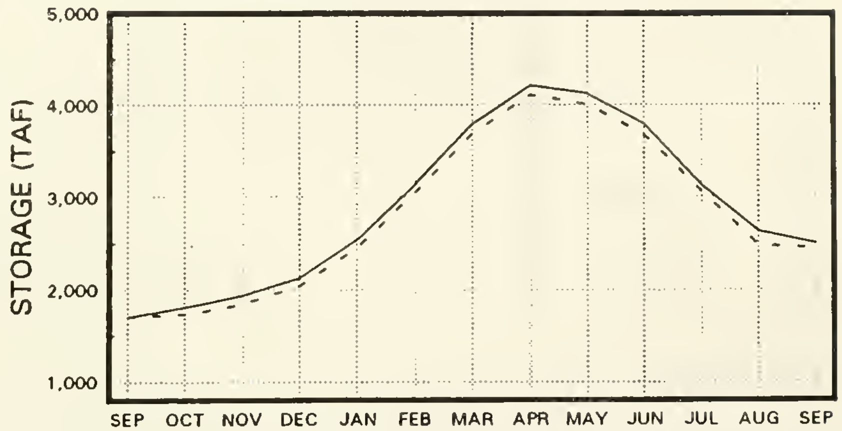


SHASTA RESERVOIR LM STORAGE

PRE-1992 "B"

LONG-TERM OCAP

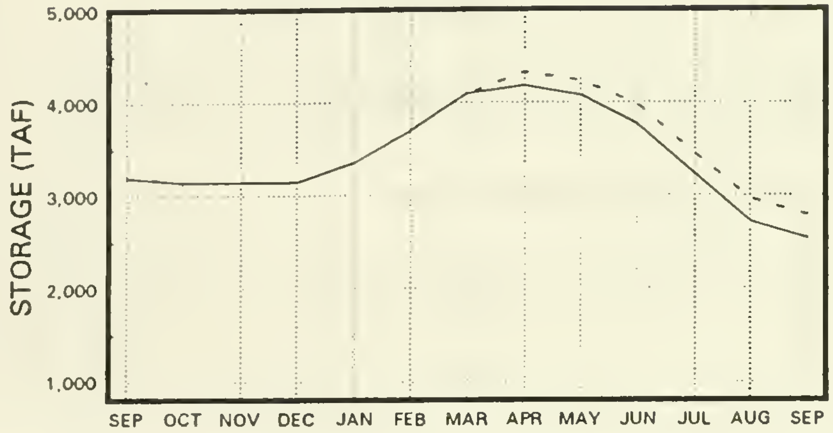
ABOVE NORMAL YEAR COMPARISON



SHASTA RESERVOIR LO STORAGE

PRE-1992 "B"

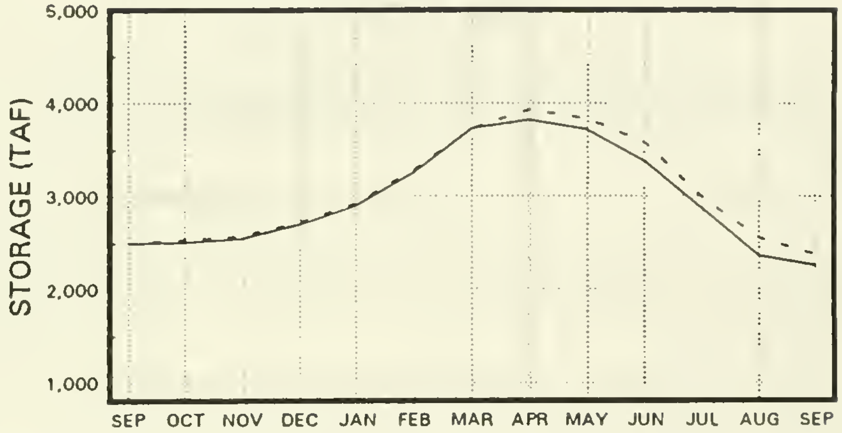
LONG-TERM OCAP
DRY YEAR COMPARISON



SHASTA RESERVOIR HI STORAGE

PRE-1992 "B"

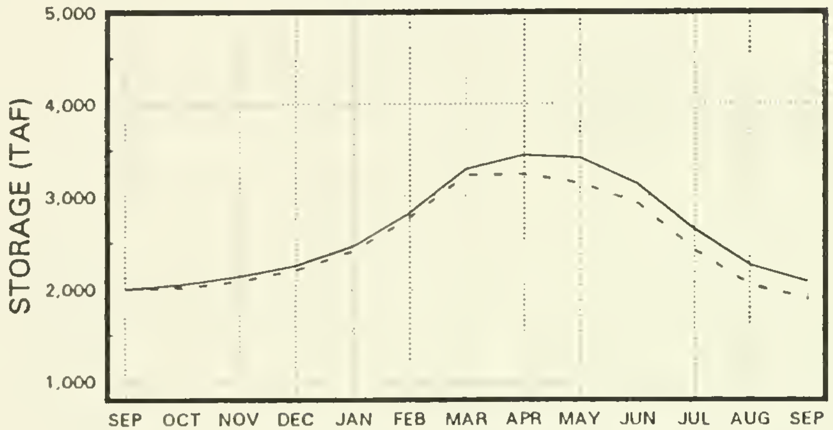
LONG-TERM OCAP
DRY YEAR COMPARISON



SHASTA RESERVOIR HM STORAGE

PRE-1992 "B"

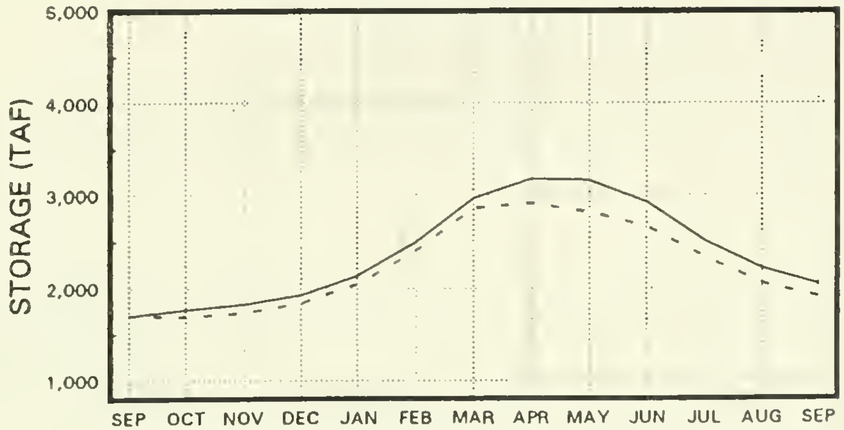
LONG-TERM OCAP
DRY YEAR COMPARISON



SHASTA RESERVOIR LM STORAGE

PRE-1992 "B"

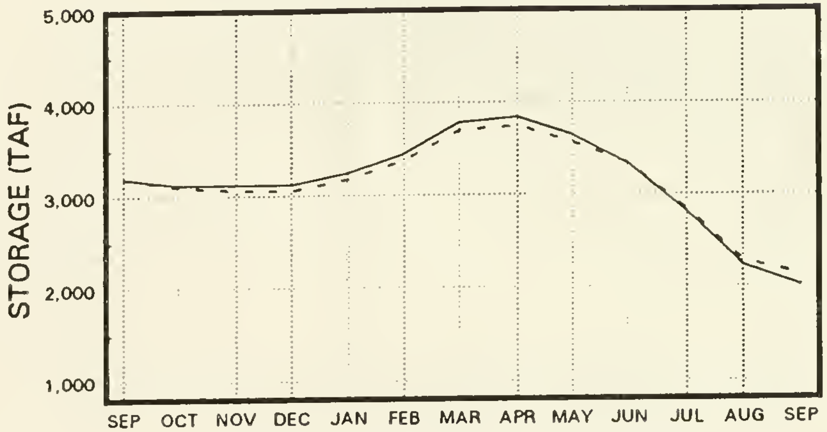
LONG-TERM OCAP
DRY YEAR COMPARISON



SHASTA RESERVOIR LO STORAGE

PRE-1992 "B"

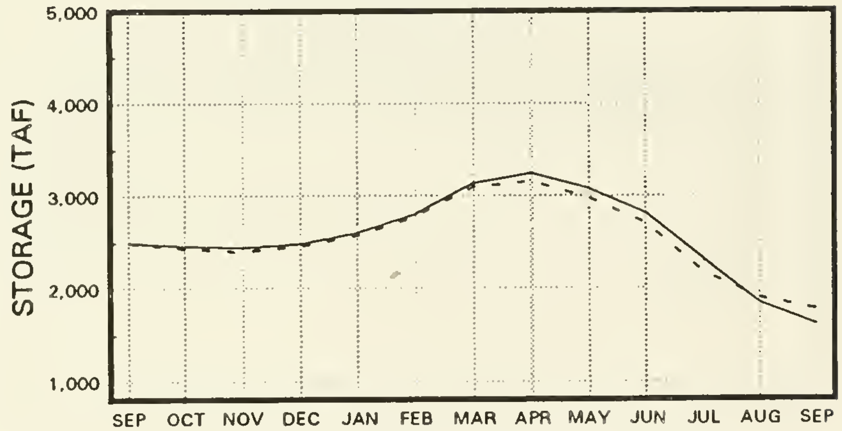
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



SHASTA RESERVOIR HI STORAGE

PRE-1992 "B"

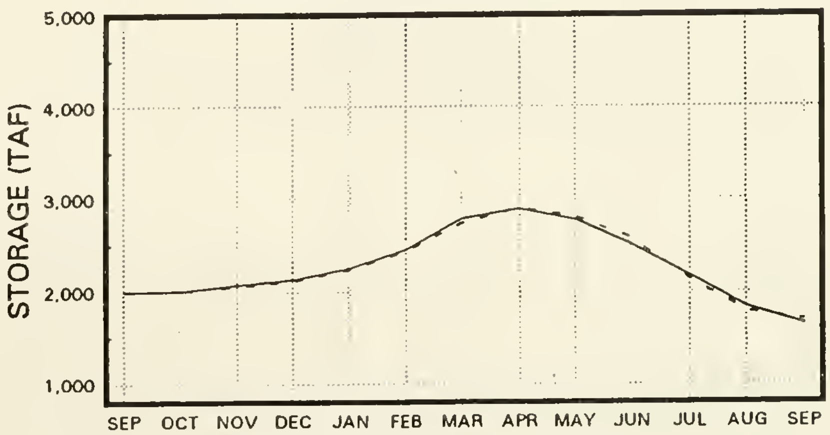
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



SHASTA RESERVOIR HM STORAGE

PRE-1992 "B"

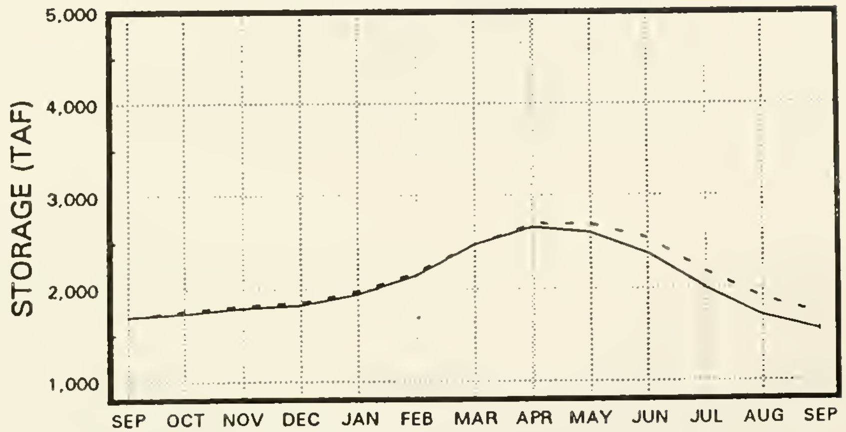
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



SHASTA RESERVOIR LM STORAGE

PRE-1992 "B"

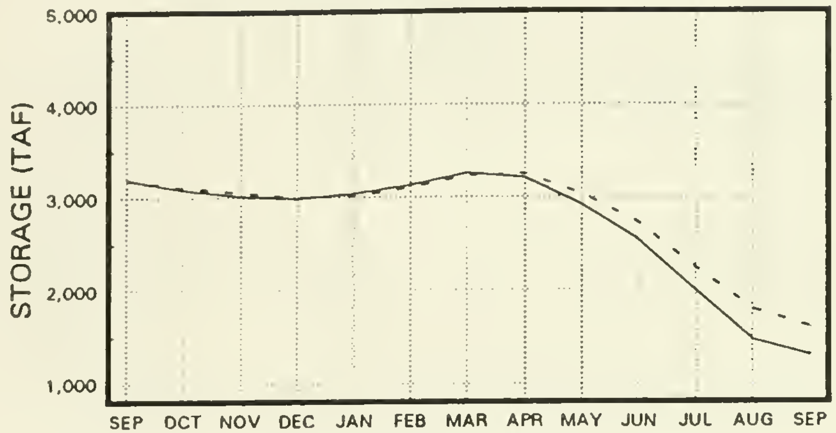
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



SHASTA RESERVOIR LO STORAGE

PRE-1992 "B"

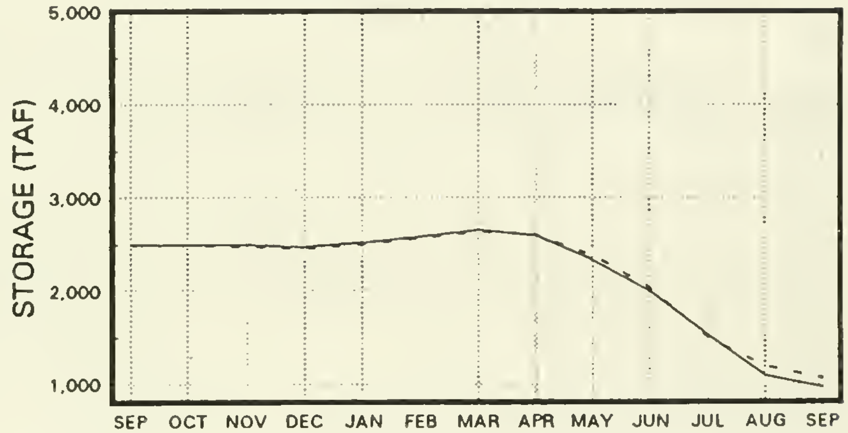
LONG-TERM OCAP
EXTREME CRITICAL YEAR COMPARISON



SHASTA RESERVOIR HI STORAGE

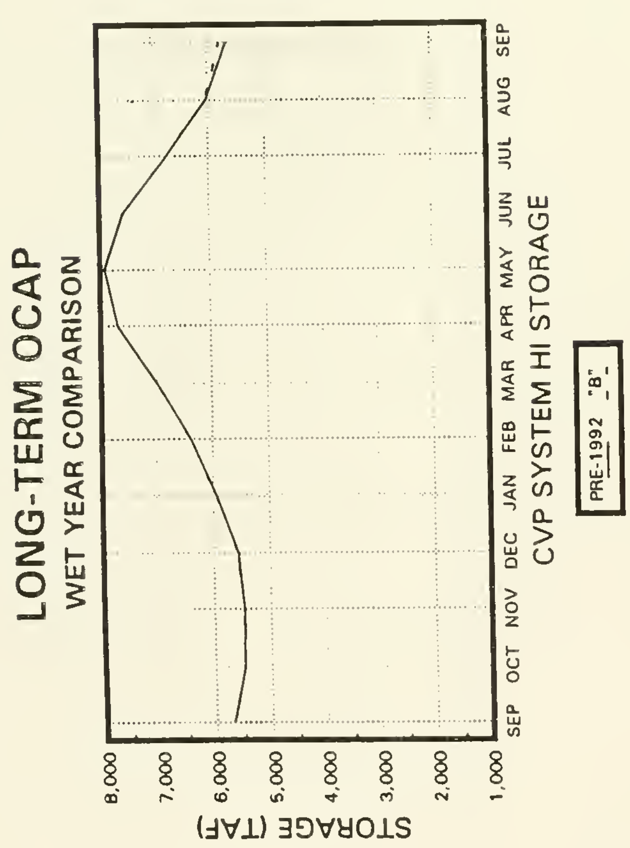
PRE-1992 "B"

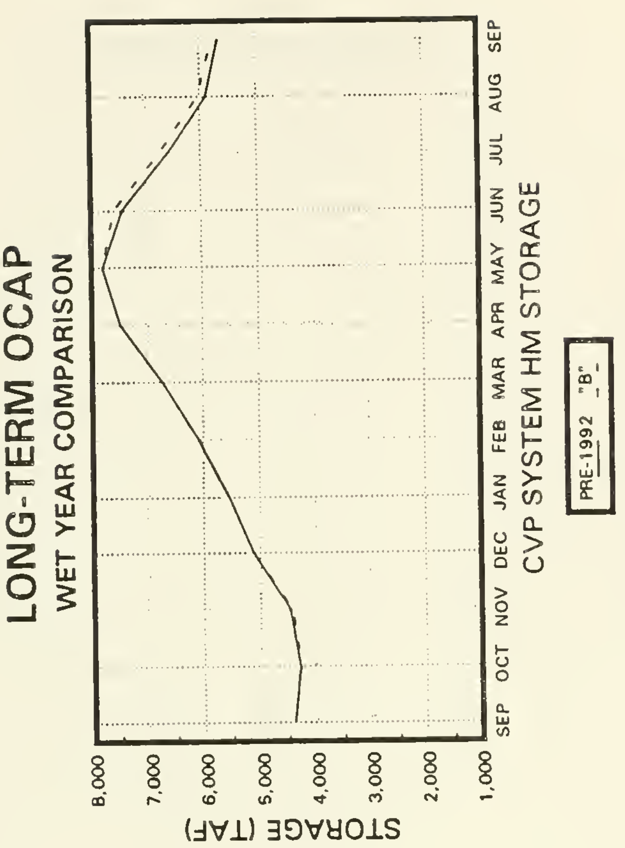
LONG-TERM OCAP
EXTREME CRITICAL YEAR COMPARISON

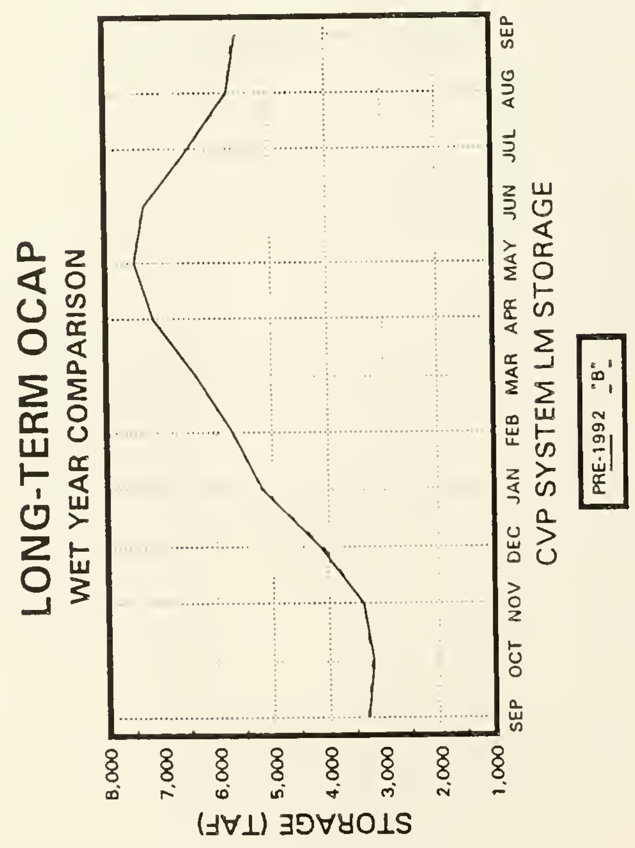


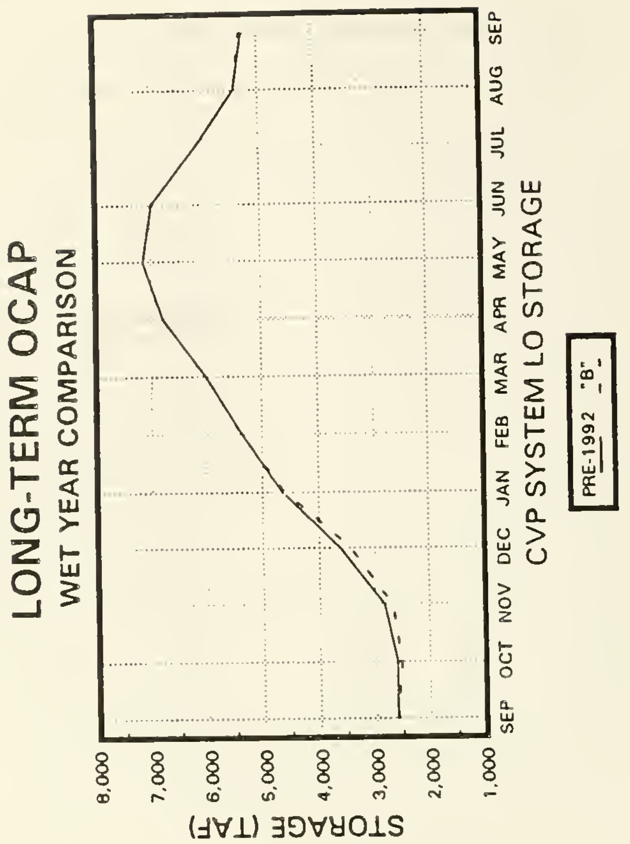
SHASTA RESERVOIR HM STORAGE

PRE-1992 "B"

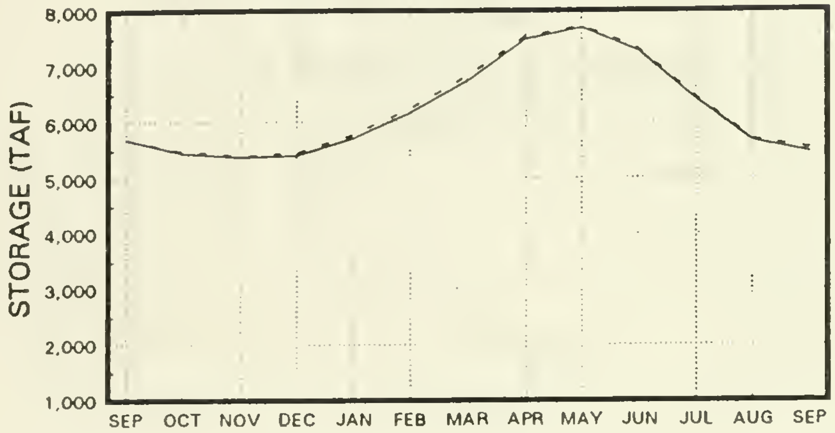

LONG-TERM OCAP
WET YEAR COMPARISON
CVP SYSTEM HI STORAGE
PRE-1992 "B"
STORAGE (TAF)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP


LONG-TERM OCAP
WET YEAR COMPARISON
CVP SYSTEM HM STORAGE
PRE-1992 "B"
STORAGE (TAF)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP


LONG-TERM OCAP
WET YEAR COMPARISON
CVP SYSTEM LM STORAGE
PRE-1992 "B"
STORAGE (TAF)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP


LONG-TERM OCAP
WET YEAR COMPARISON
CVP SYSTEM LO STORAGE
PRE-1992 "B"
STORAGE (TAF)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP

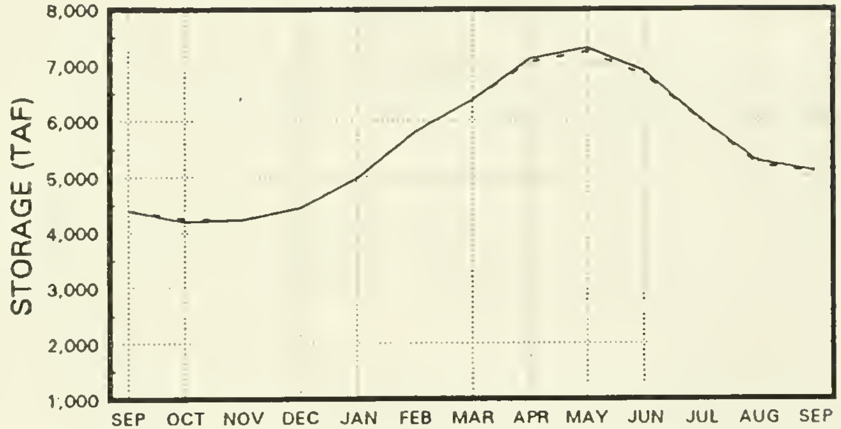
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



CVP SYSTEM HI STORAGE

PRE-1992 "B"

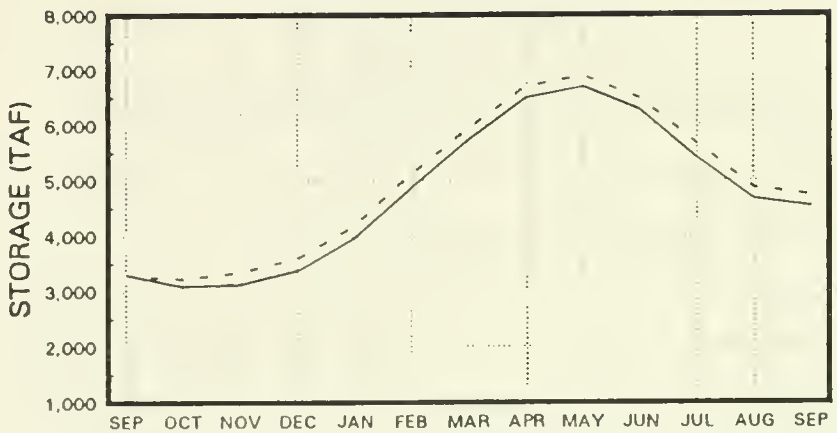
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



CVP SYSTEM HM STORAGE

PRE-1992 "B"

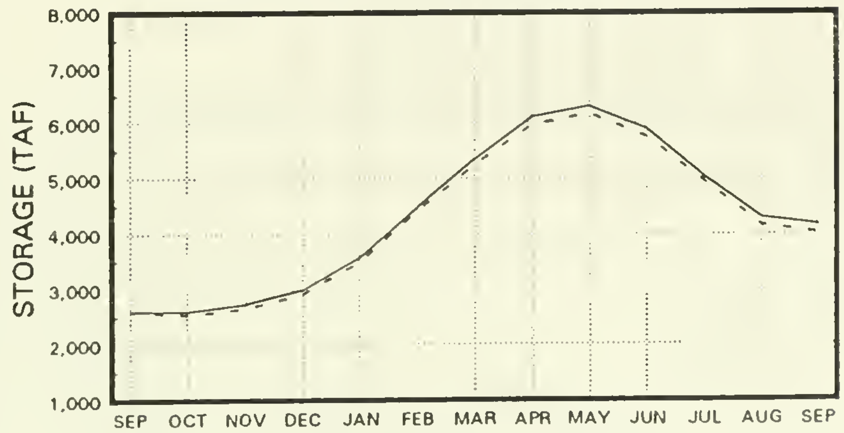
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



CVP SYSTEM LM STORAGE

PRE-1992 "B"

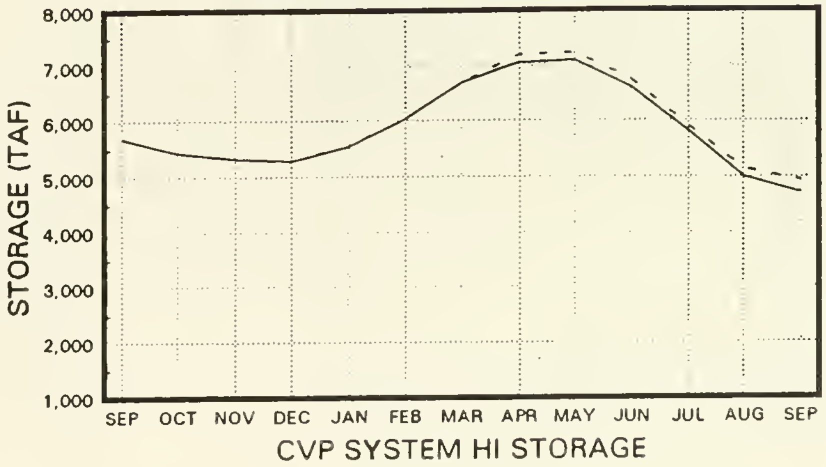
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



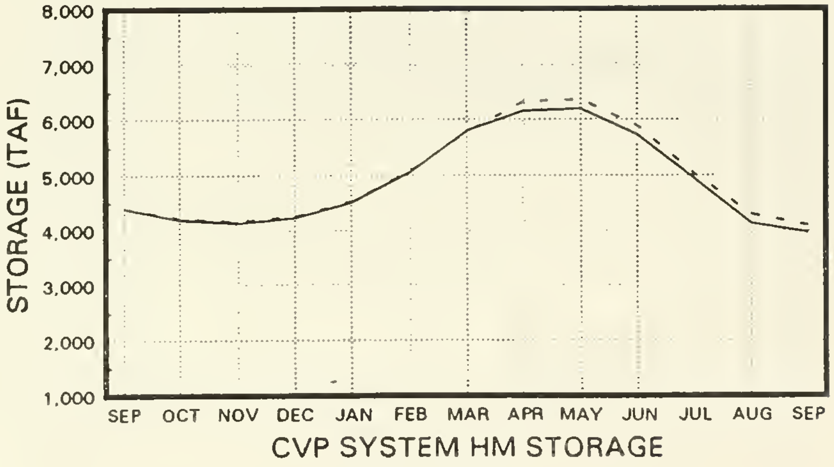
CVP SYSTEM LO STORAGE

PRE-1992 "B"

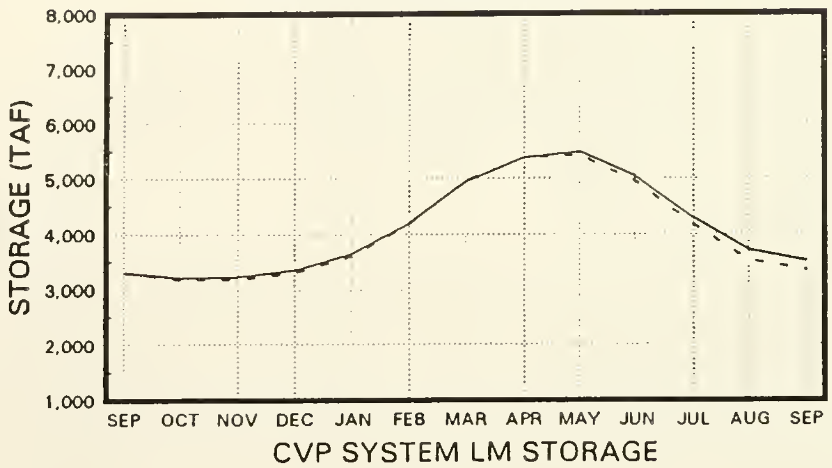
LONG-TERM OCAP
DRY YEAR COMPARISON



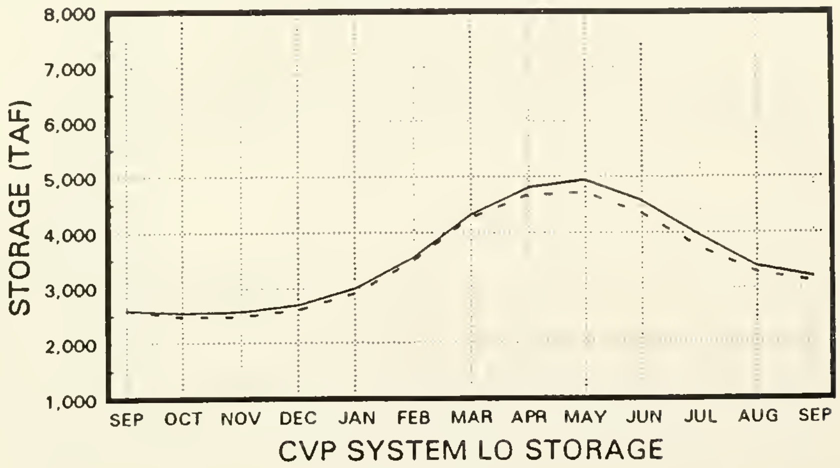
LONG-TERM OCAP
DRY YEAR COMPARISON



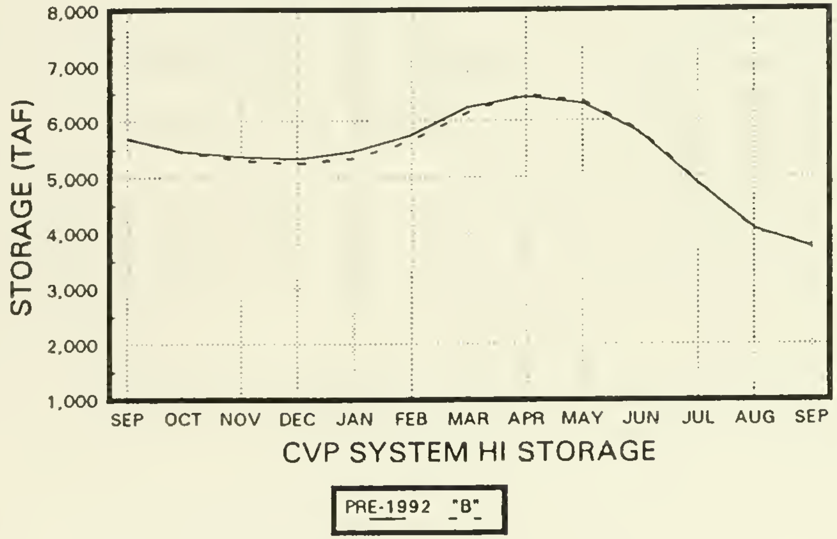
LONG-TERM OCAP
DRY YEAR COMPARISON



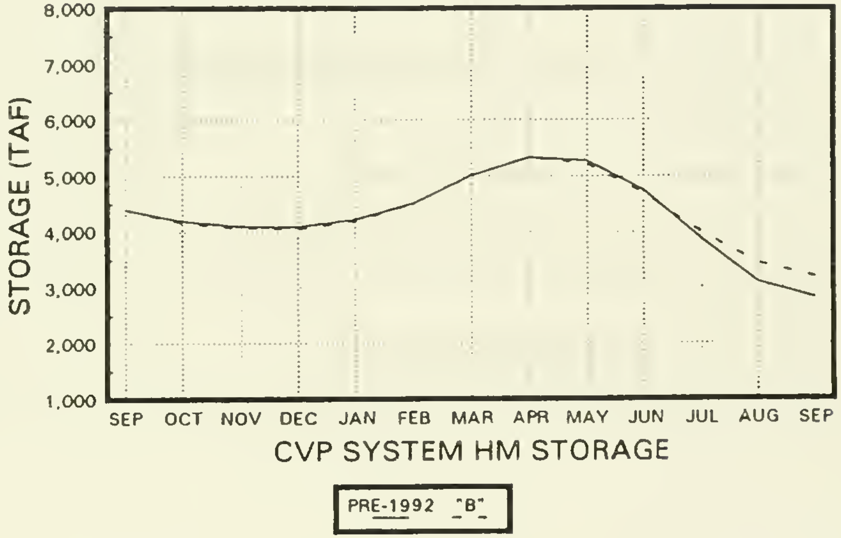
LONG-TERM OCAP
DRY YEAR COMPARISON



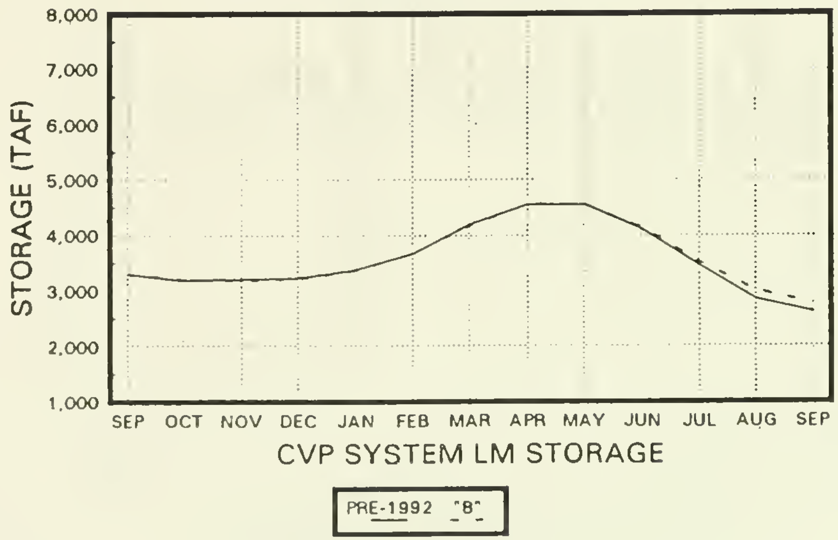
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



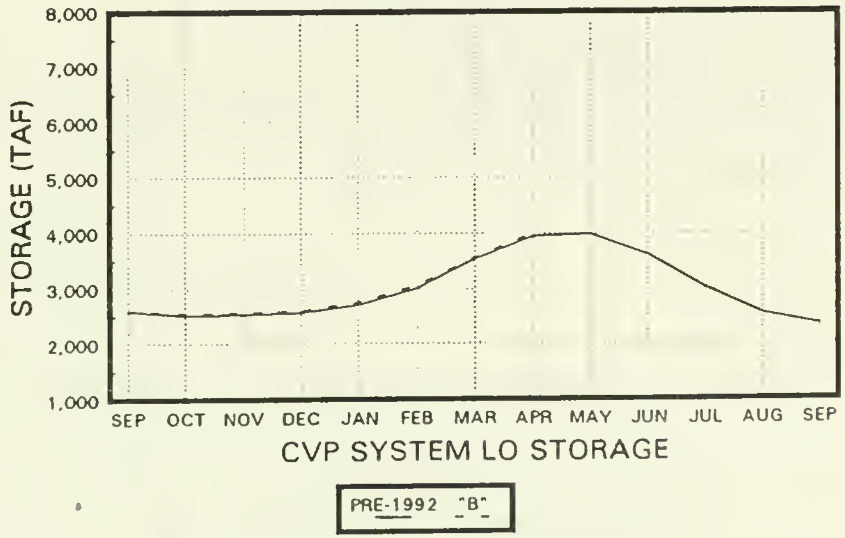
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



LONG-TERM OCAP
CRITICAL YEAR COMPARISON

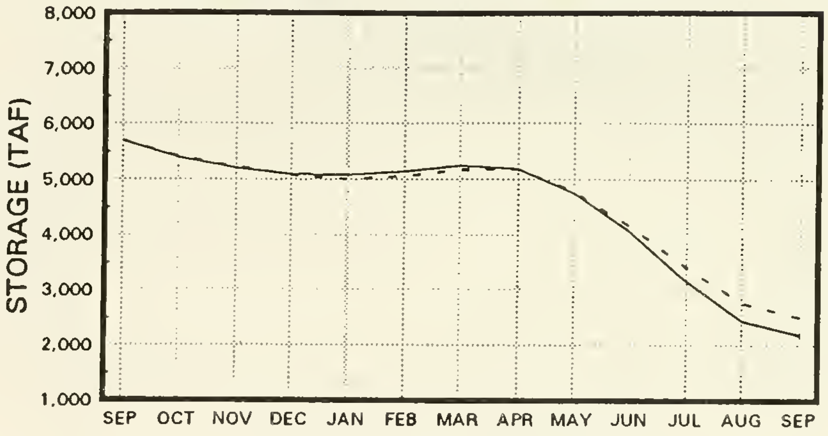


LONG-TERM OCAP
CRITICAL YEAR COMPARISON



LONG-TERM OCAP

EXTREME CRITICAL YEAR COMPARISON

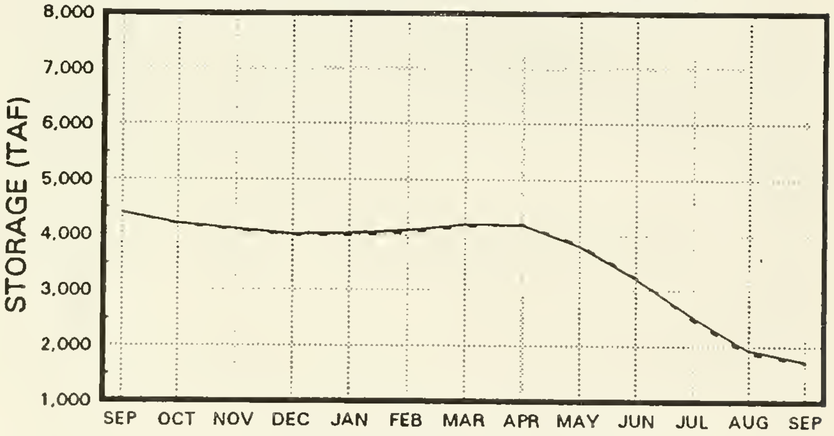


CVP SYSTEM HI STORAGE

PRE-1992 "B"

LONG-TERM OCAP

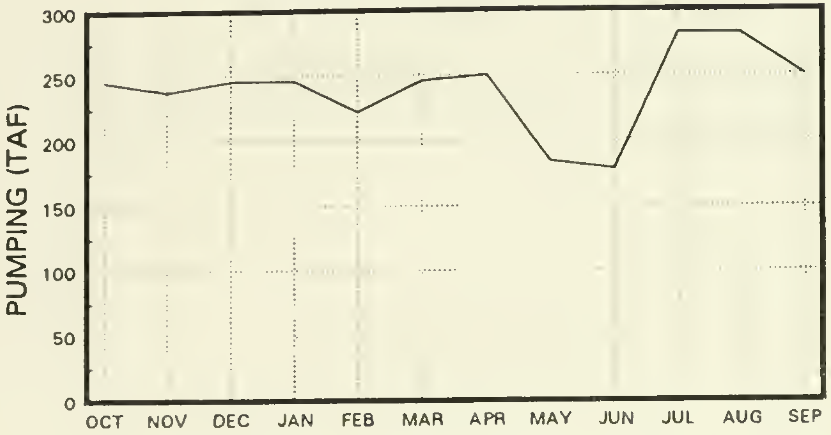
EXTREME CRITICAL YEAR COMPARISON



CVP SYSTEM HM STORAGE

PRE-1992 "B"

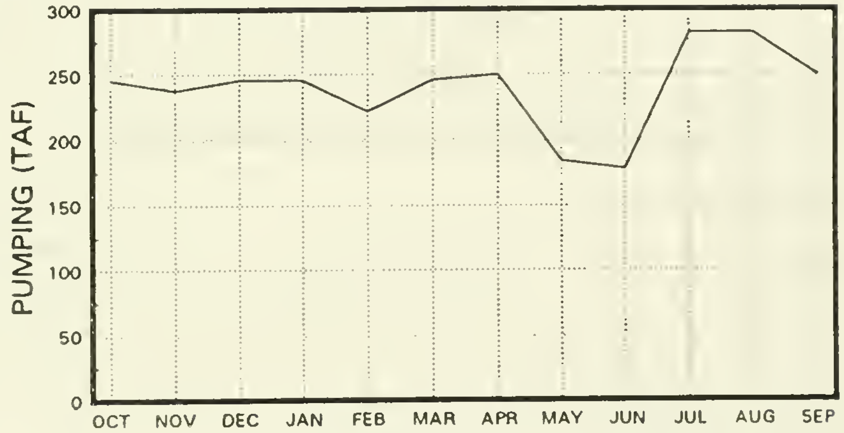
LONG-TERM OCAP
WET YEAR COMPARISON



TRACY PUMPING HI STORAGE

PRE-1992 "B"

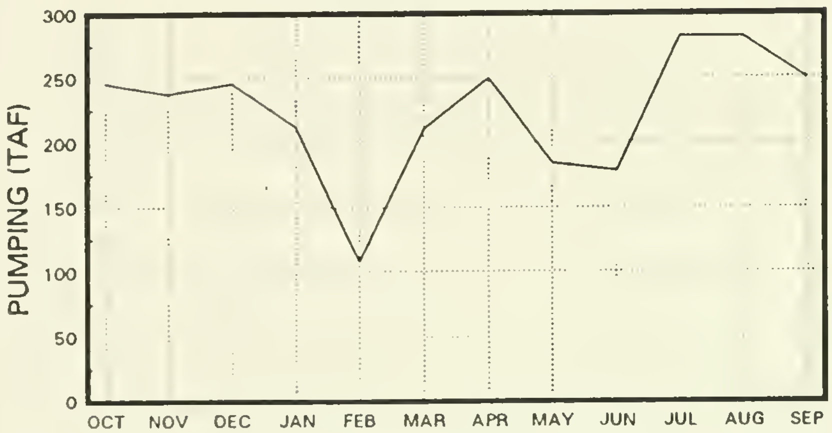
LONG-TERM OCAP
WET YEAR COMPARISON



TRACY PUMPING HM STORAGE

PRE-1992 "B"

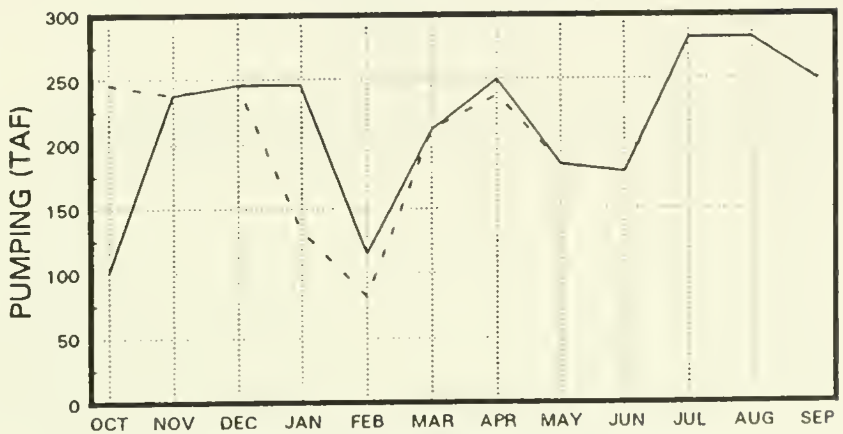
LONG-TERM OCAP
WET YEAR COMPARISON



TRACY PUMPING LM STORAGE

PRE-1992 "B"

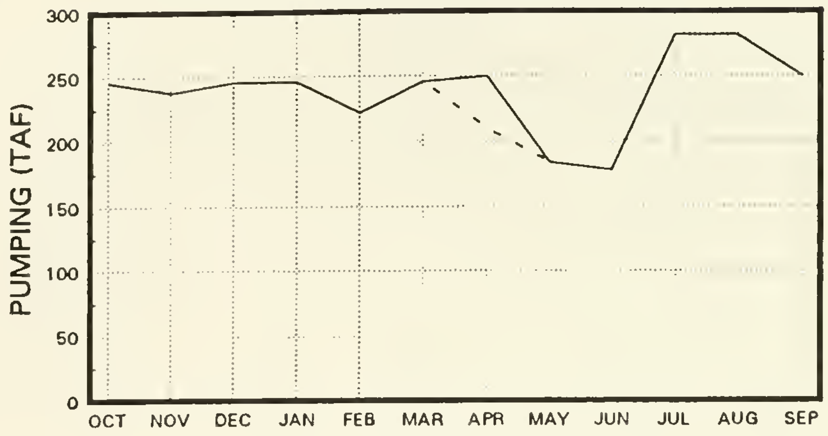
LONG-TERM OCAP
WET YEAR COMPARISON



TRACY PUMPING LO STORAGE

PRE-1992 "B"

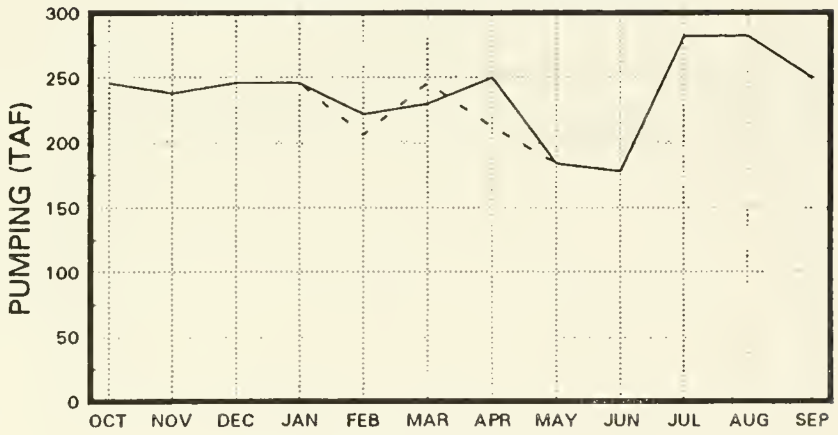
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



TRACY PUMPING HI STORAGE

PRE-1992 "B"

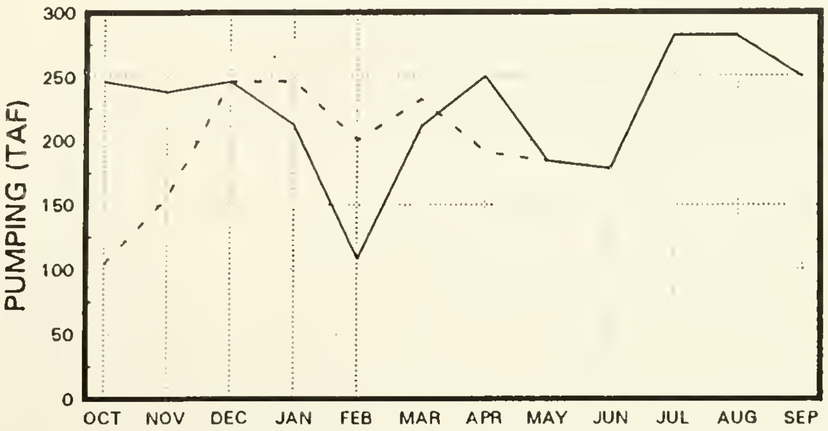
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



TRACY PUMPING HM STORAGE

PRE-1992 "B"

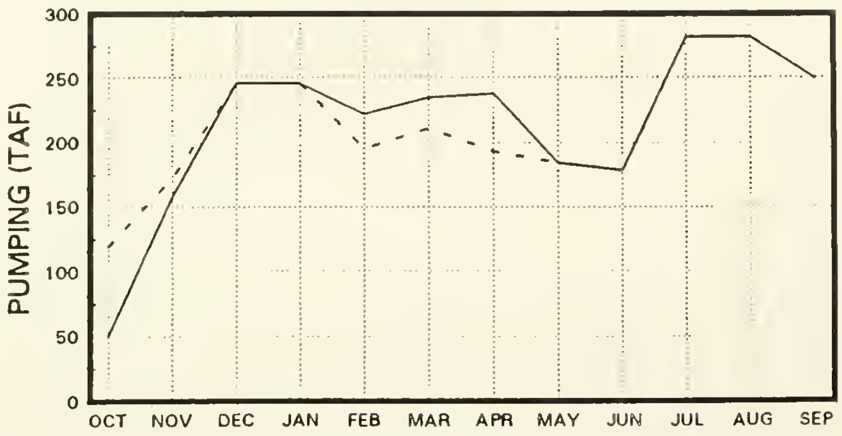
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON



TRACY PUMPING LM STORAGE

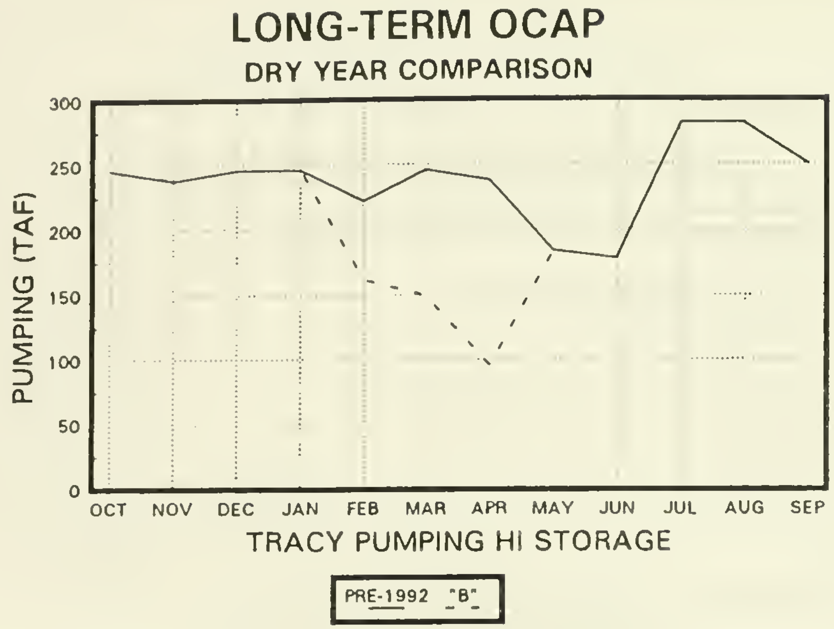
PRE-1992 "B"

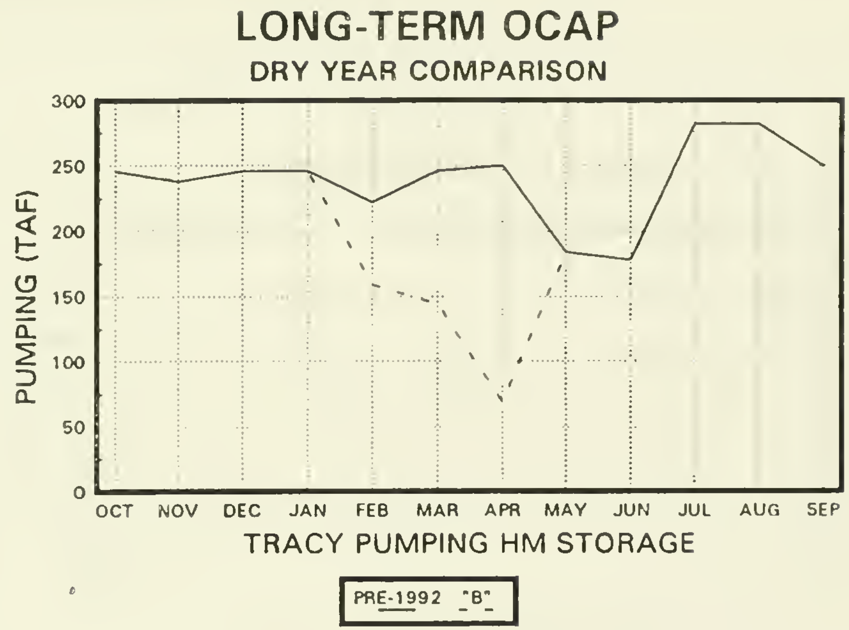
LONG-TERM OCAP
ABOVE NORMAL YEAR COMPARISON

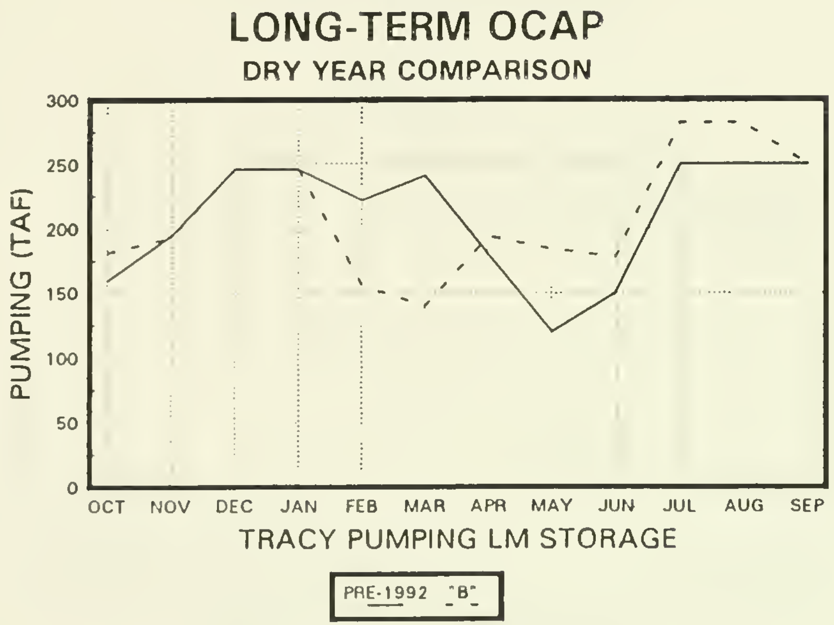


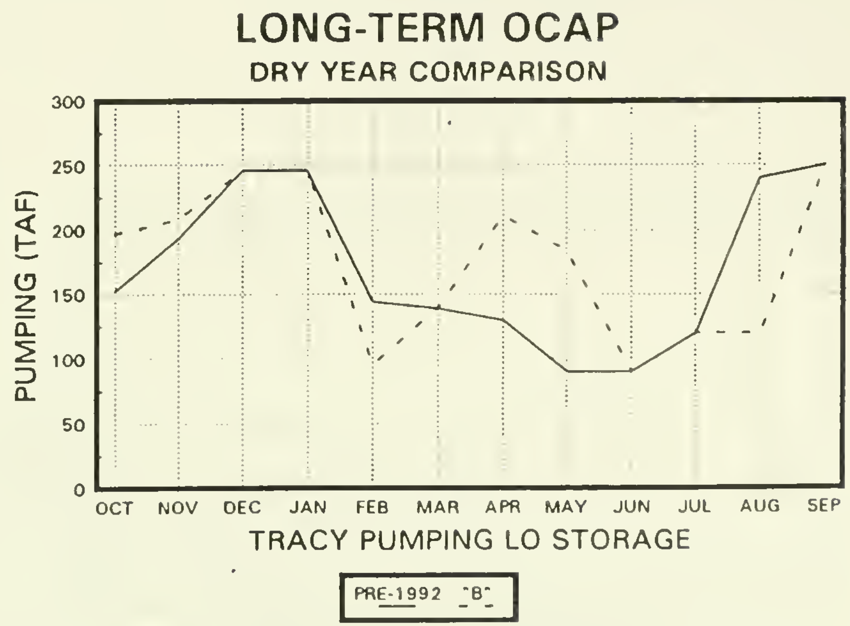
TRACY PUMPING LO STORAGE

PRE-1992 "B"

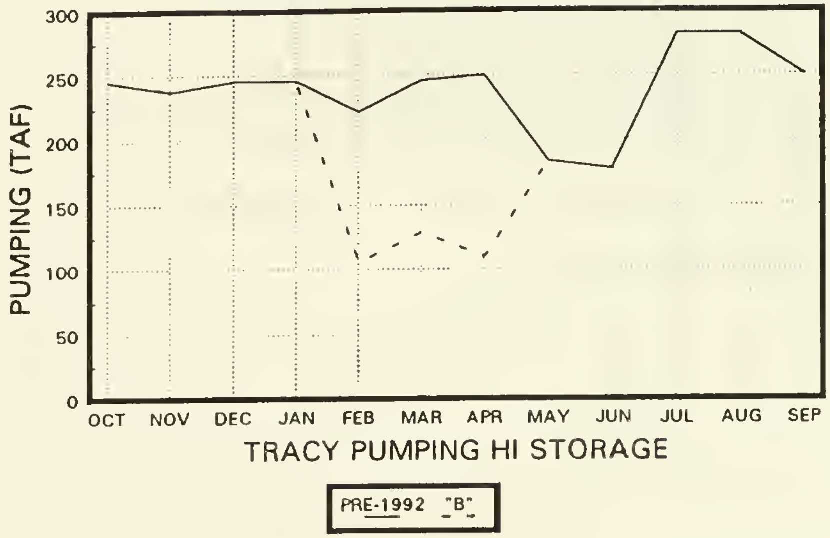

LONG-TERM OCAP
DRY YEAR COMPARISON
PUMPING (TAF)
300
250
200
150
100
50
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
TRACY PUMPING HI STORAGE
PRE-1992 "B"


LONG-TERM OCAP
DRY YEAR COMPARISON
PUMPING (TAF)
300
250
200
150
100
50
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
TRACY PUMPING HM STORAGE
PRE-1992 "B"

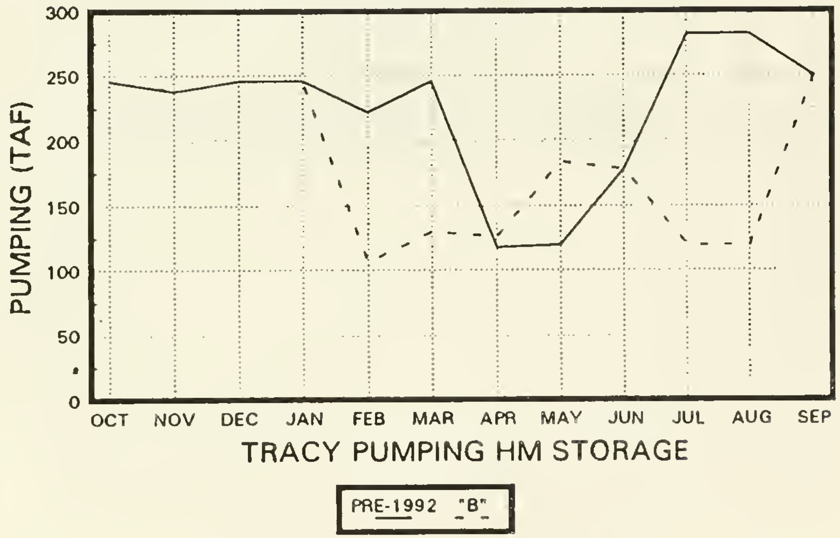

LONG-TERM OCAP
DRY YEAR COMPARISON
PUMPING (TAF)
300
250
200
150
100
50
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
TRACY PUMPING LM STORAGE
PRE-1992 "B"


LONG-TERM OCAP
DRY YEAR COMPARISON
PUMPING (TAF)
300
250
200
150
100
50
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
TRACY PUMPING LO STORAGE
PRE-1992 "B"

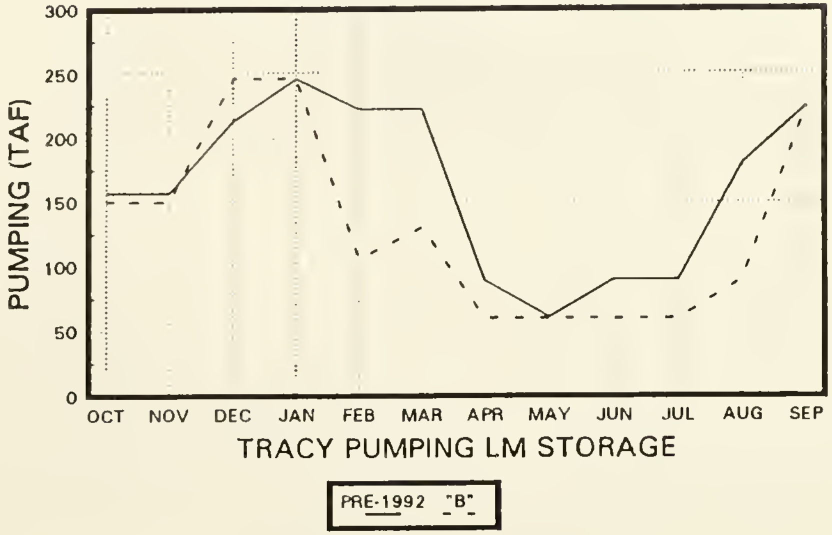
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



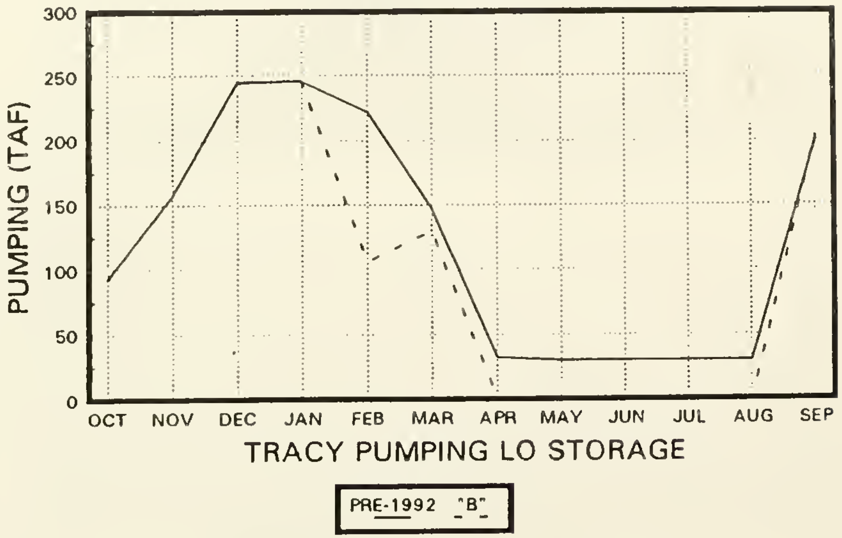
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



LONG-TERM OCAP
CRITICAL YEAR COMPARISON

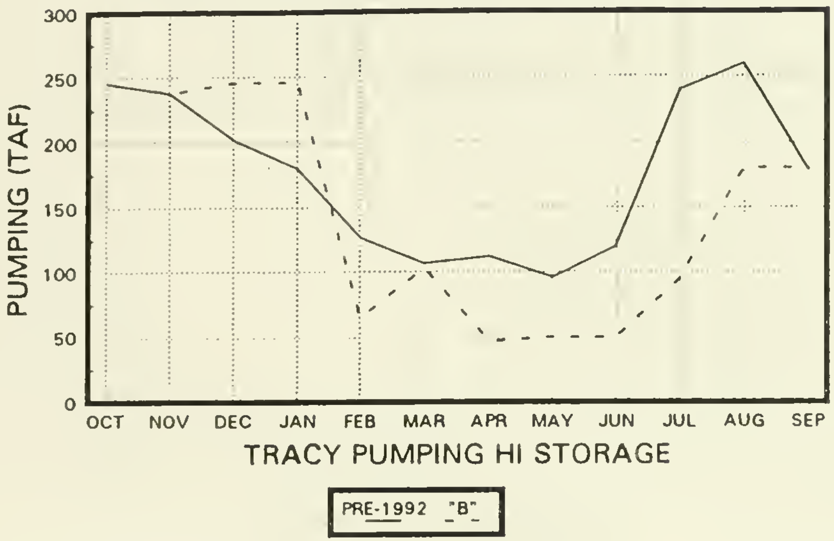


LONG-TERM OCAP
CRITICAL YEAR COMPARISON



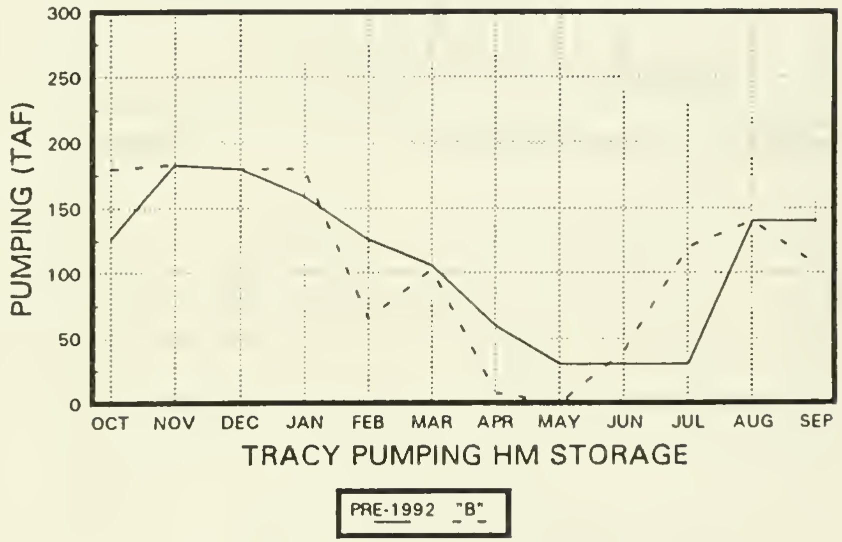
LONG-TERM OCAP

EXTREME CRITICAL YEAR COMPARISON



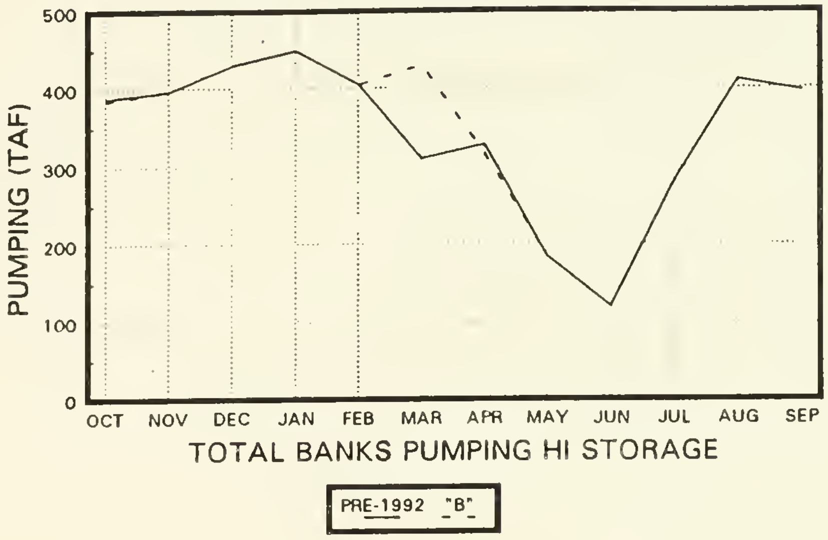
LONG-TERM OCAP

EXTREME CRITICAL YEAR COMPARISON



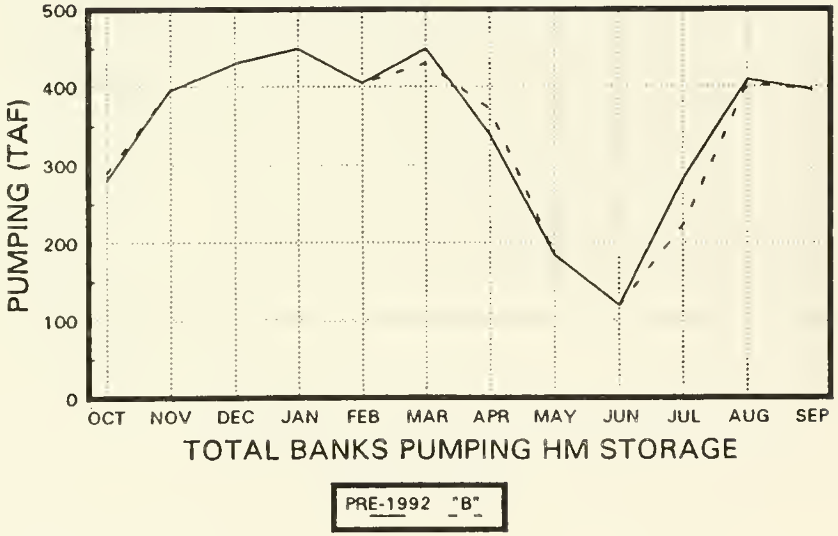
LONG-TERM OCAP

WET YEAR COMPARISON



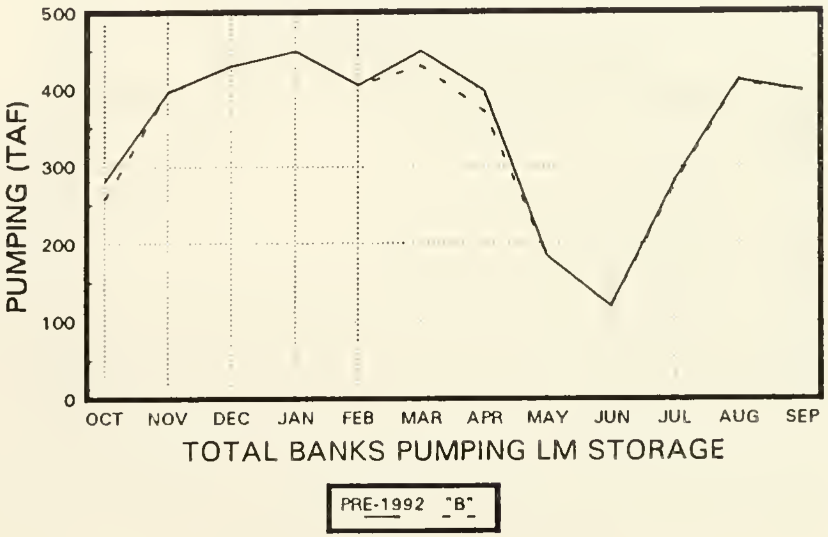
LONG-TERM OCAP

WET YEAR COMPARISON



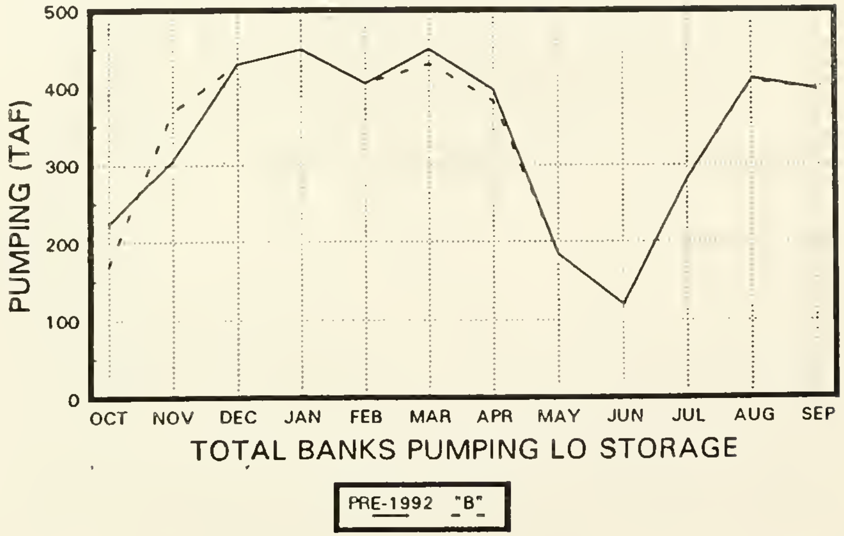
LONG-TERM OCAP

WET YEAR COMPARISON



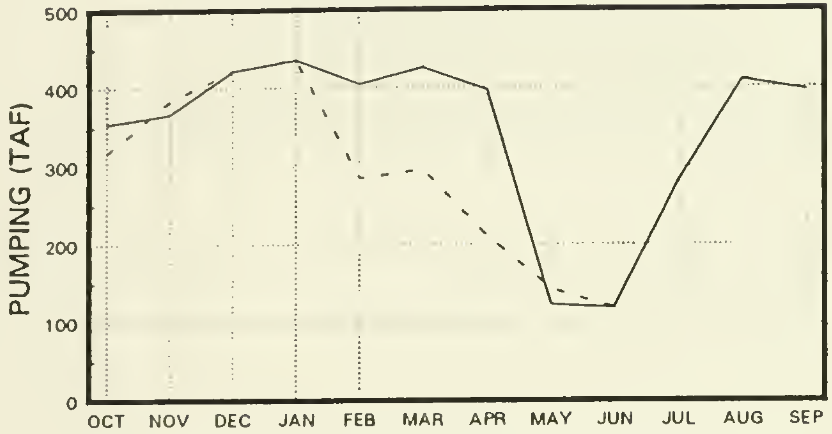
LONG-TERM OCAP

WET YEAR COMPARISON



LONG-TERM OCAP

ABOVE NORMAL YEAR COMPARISON

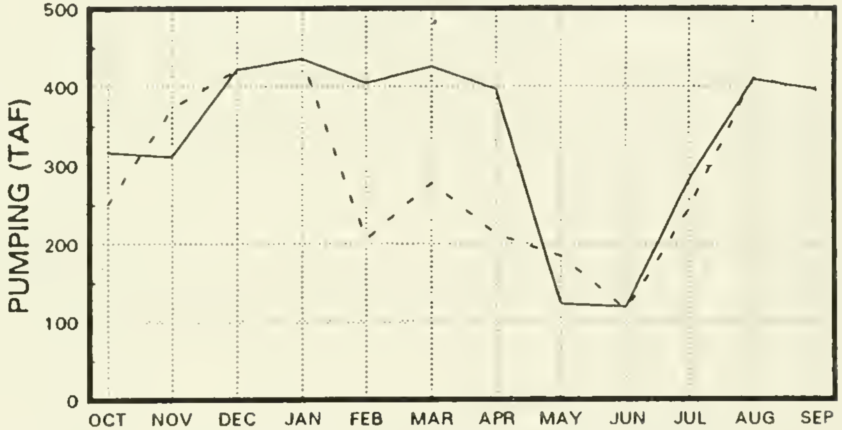


TOTAL BANKS PUMPING HI STORAGE

PRE-1992 "B"

LONG-TERM OCAP

ABOVE NORMAL YEAR COMPARISON

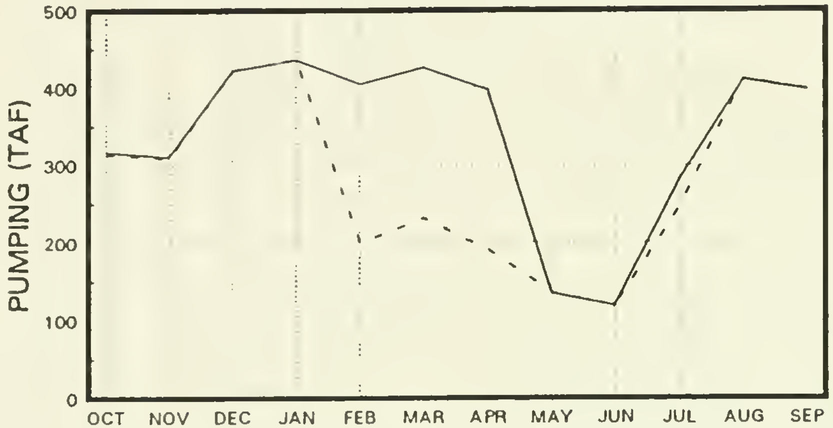


TOTAL BANKS PUMPING HM STORAGE

PRE-1992 "B"

LONG-TERM OCAP

ABOVE NORMAL YEAR COMPARISON

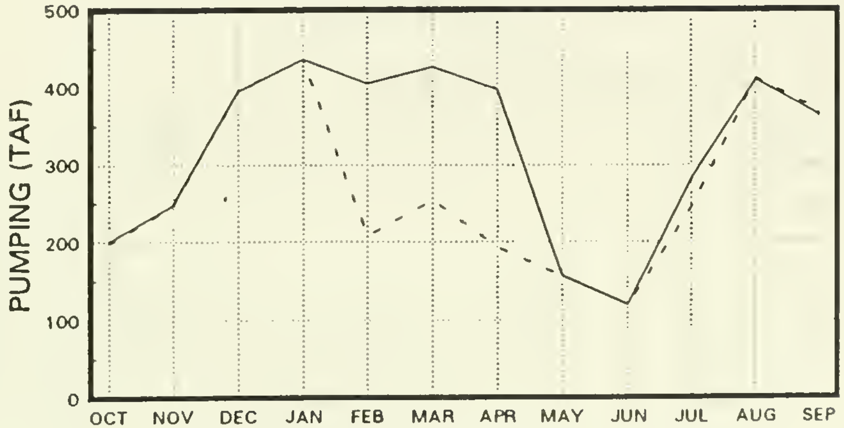


TOTAL BANKS PUMPING LM STORAGE

PRE-1992 "B"

LONG-TERM OCAP

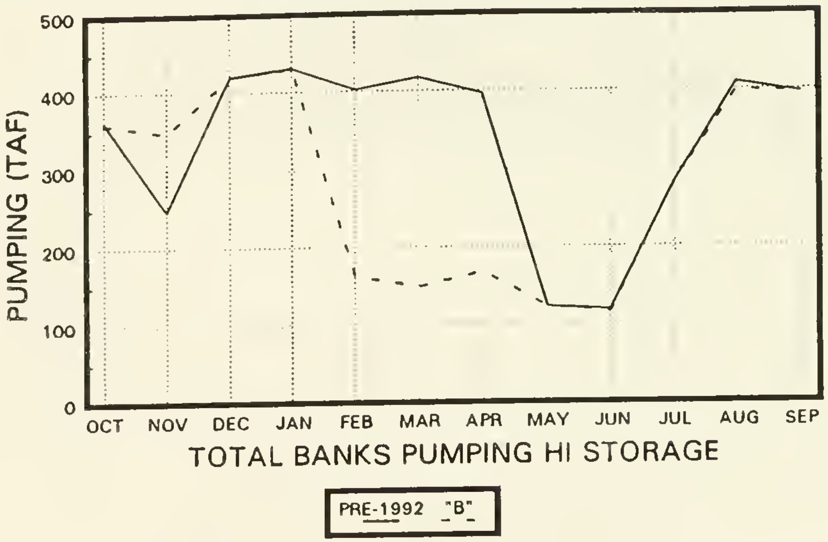
ABOVE NORMAL YEAR COMPARISON



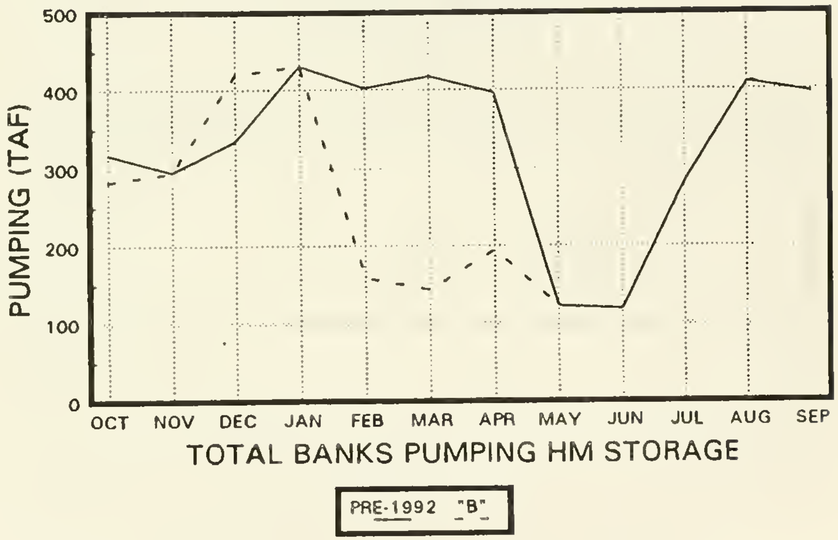
TOTAL BANKS PUMPING LO STORAGE

PRE-1992 "B"

LONG-TERM OCAP
DRY YEAR COMPARISON



LONG-TERM OCAP
DRY YEAR COMPARISON



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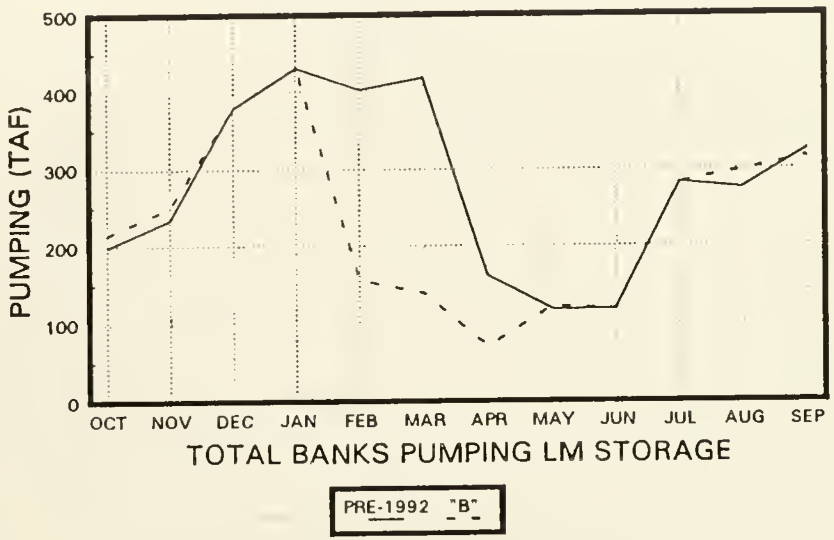
DRY YEAR COMPARISON



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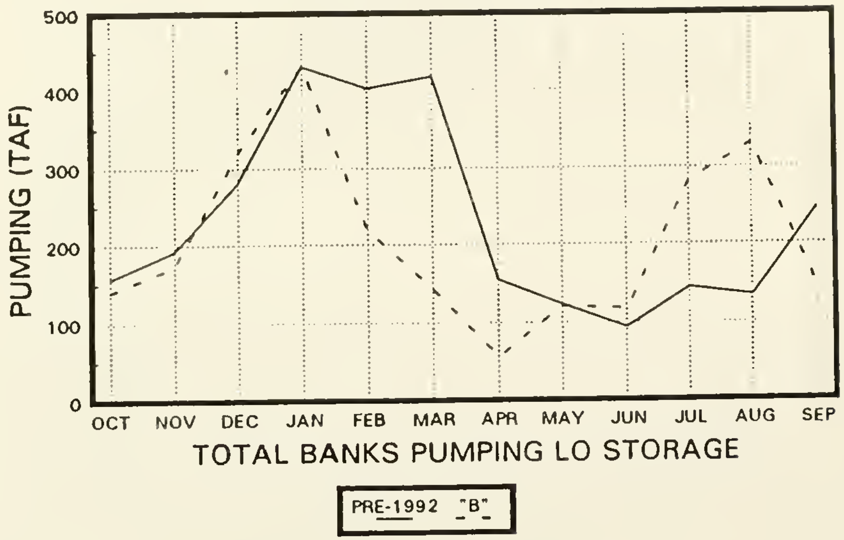
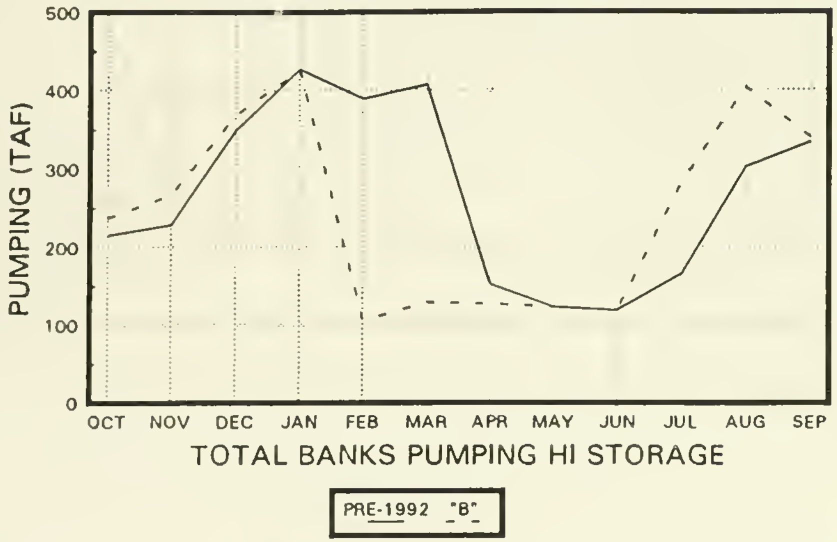
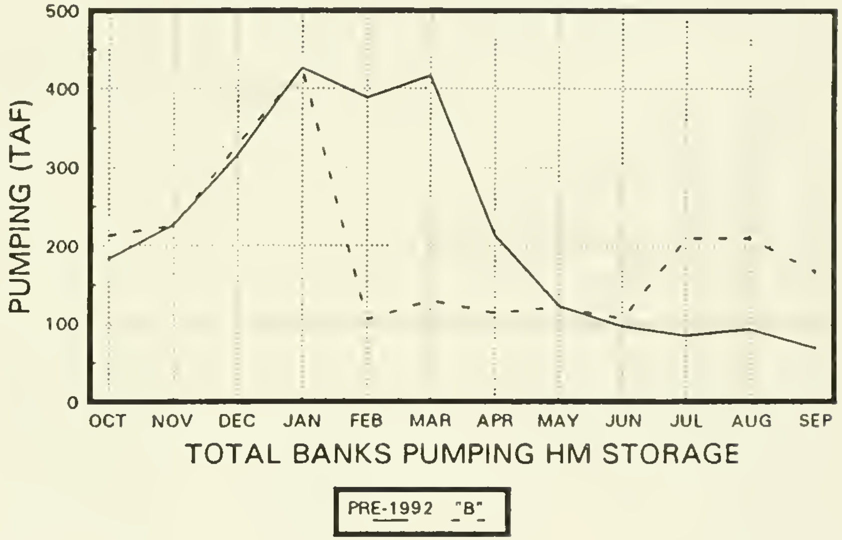
DRY YEAR COMPARISON



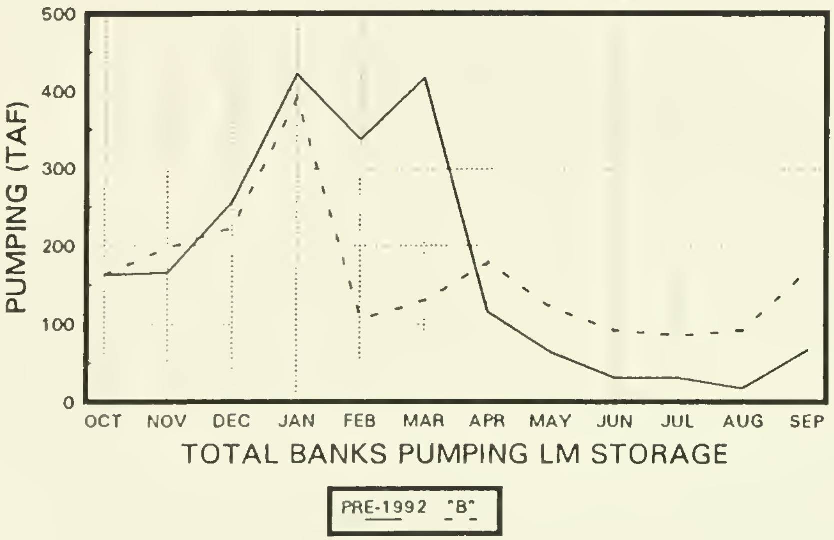
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



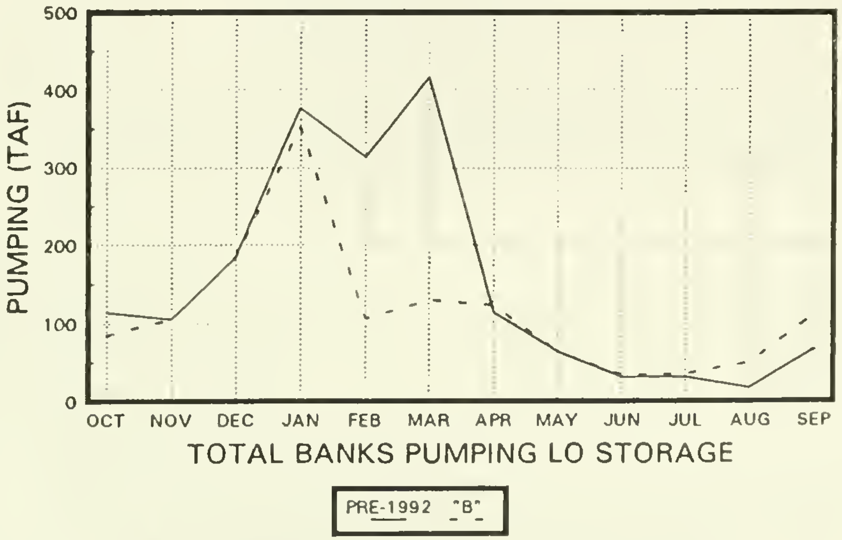
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



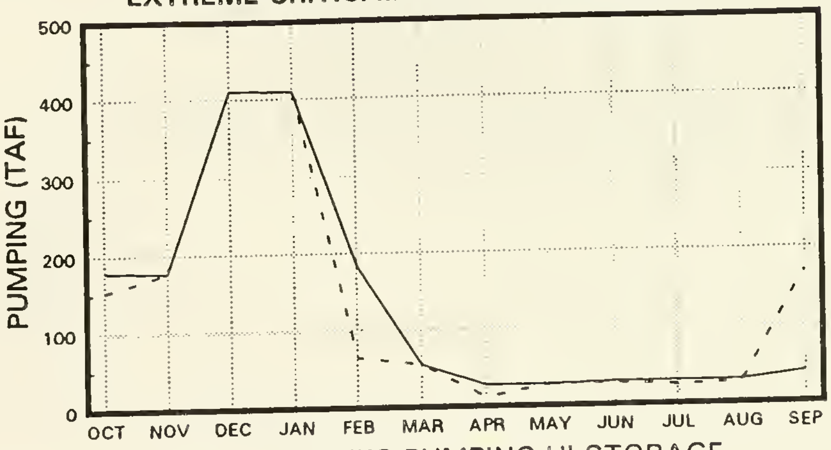
LONG-TERM OCAP
CRITICAL YEAR COMPARISON



LONG-TERM OCAP
CRITICAL YEAR COMPARISON



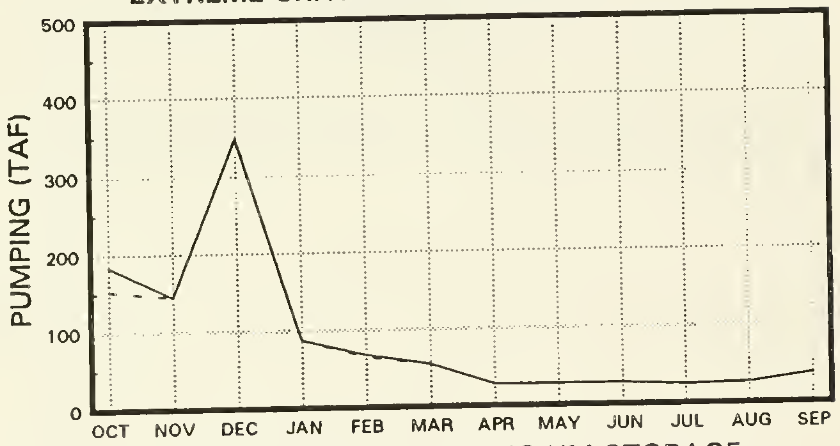
LONG-TERM OCAP
EXTREME CRITICAL YEAR COMPARISON



TOTAL BANKS PUMPING HI STORAGE

PRE-1992 "B"

LONG-TERM OCAP
EXTREME CRITICAL YEAR COMPARISON



TOTAL BANKS PUMPING HM STORAGE

PRE-1992 "B"

Appendix B

Tabular Results of CVP-OCAP Water Year Operations Studies

Appendix B

Table of Contents

LONG-TERM OPERATIONS CRITERIA AND PLAN

OPERATIONS STUDIES

PRE-1992 ALTERNATIVE

UNITED STATES BUREAU OF RECLAMATION

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

DATE: 10/13
TIME: 14:06
BYPASS

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,773	1,753	1,854	1,982	2,082	2,218	2,358	2,441	2,339	2,178	2,011	1,992	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	240	
SHASTA EOM STORAGE	3,200	3,118	3,150	3,150	3,400	3,700	4,100	4,496	4,494	4,291	3,787	3,390	3,072	
OROVILLE EOM STORAGE	2,700	2,590	2,740	2,850	2,850	2,851	2,850	3,025	3,322	3,268	2,812	2,535	2,401	
FOLSOM EOM STORAGE	600	594	574	573	573	624	674	834	974	944	805	644	614	
WHISKEYTOWN STORAGE WITHDRAWAL		116	78	21	3	84	65	64	128	170	176	119	0	1,024
SHASTA STORAGE WITHDRAWAL		78	(32)	0	(250)	(300)	(400)	(403)	(8)	188	482	379	306	40
OROVILLE STORAGE WITHDRAWAL		107	(149)	(106)	2	0	0	(177)	(302)	44	445	269	127	260
FOLSOM STORAGE WITHDRAWAL		3	20	4	1	(50)	(50)	(162)	(145)	23	130	154	26	(46)
SPRING CREEK POWERPLANT		120	90	60	60	150	120	120	150	180	180	120	0	1,350
KESWICK RELEASE		468	438	760	760	900	700	637	802	738	922	729	536	8,390
OROVILLE RELEASE		209	101	394	662	670	719	525	225	251	433	304	200	4,693
NIMBUS RELEASE		113	134	220	457	376	395	384	451	373	228	254	132	3,516
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		7,785	8,931	18,056	26,550	33,220	20,736	15,238	13,619	10,182	10,638	8,529	9,421	
FREEPORT FLOW (CFS)		15,122	16,101	35,849	65,610	76,716	53,652	36,566	27,365	22,301	22,436	19,151	18,025	
ACTUAL DELTA OUTFLOW		277	405	1,735	3,689	4,013	3,085	1,779	1,391	1,004	615	305	333	18,630
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		(617)	(651)	(1,519)	1,931	4,337	3,398	701	2,503	6,980	2,938	397	(28)	20,371
CROSS CHANNEL GATES		OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		260	397	430	449	405	310	328	184	119	282	216	397	3,777
CVP BANKS PUMPING		128	0	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	0	0	(0)	(0)	0	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		250	217	269	234	266	295	306	298	396	477	401	251	3,660
CVP SAN LUIS EOM STORAGE	200	390	510	702	864	896	931	880	681	398	155	181	171	
SWP SAN LUIS EOM STORAGE	300	296	466	620	824	952	953	954	817	515	295	86	216	
TRINITY EOM ELEVATION (FT)	2,333	2,323	2,322	2,329	2,339	2,346	2,356	2,366	2,372	2,365	2,353	2,341	2,340	
TRINITY SURFACE AREA (ACRES)	13,991	13,322	13,217	13,748	14,423	14,943	15,653	16,377	16,803	16,276	15,444	14,572	14,472	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,253	
SHASTA EOM ELEVATION (FT)	1,015	1,011	1,012	1,012	1,024	1,036	1,053	1,069	1,068	1,060	1,040	1,023	1,009	
SHASTA SURFACE AREA (ACRES)	23,529	23,108	23,272	23,272	24,548	26,063	28,060	30,019	30,009	29,007	26,501	24,499	22,872	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

DATE: 10/13
TIME: 14:12
BYPASS

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,374	1,354	1,454	1,583	1,766	1,963	2,163	2,335	2,354	2,163	1,996	1,977	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	240	
SHASTA EOM STORAGE	2,500	2,521	2,710	3,150	3,400	3,700	4,100	4,496	4,494	4,139	3,754	3,298	3,087	
OROVILLE EOM STORAGE	2,200	2,091	2,192	2,591	2,850	2,851	2,850	3,025	3,322	3,248	2,814	2,515	2,431	
FOLSOM EOM STORAGE	400	400	410	521	573	624	674	834	974	944	695	615	614	
WHISKEYTOWN STORAGE WITHDRAWAL		116	78	21	3	0	5	4	38	50	206	119	0	640
SHASTA STORAGE WITHDRAWAL		(24)	(189)	(440)	(250)	(300)	(400)	(403)	(8)	340	364	438	200	(673)
OROVILLE STORAGE WITHDRAWAL		107	(100)	(395)	(257)	0	0	(177)	(302)	64	423	290	78	(271)
FOLSOM STORAGE WITHDRAWAL		(3)	(10)	(108)	(51)	(50)	(50)	(162)	(145)	23	240	74	(3)	(245)
SPRING CREEK POWERPLANT		120	90	60	60	66	60	60	60	60	210	120	0	966
KESWICK RELEASE		366	281	320	760	816	640	577	712	770	834	788	430	7,294
OROVILLE RELEASE		209	150	105	403	670	719	525	225	271	411	325	151	4,162
NIMBUS RELEASE		108	104	108	405	376	395	384	451	373	338	174	103	3,317
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,120	6,299	10,893	26,550	31,712	19,760	14,230	12,155	10,722	9,204	9,481	7,637	
FREEPORT FLOW (CFS)		13,365	13,782	22,154	60,544	75,206	52,676	35,558	25,901	23,178	22,436	19,134	14,932	
ACTUAL DELTA OUTFLOW		277	268	892	3,377	3,929	2,886	1,708	1,301	1,056	615	305	149	16,764
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		367	(1,194)	937	1,404	4,180	1,488	448	2,351	7,191	2,938	406	(771)	19,745
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		260	288	430	449	405	449	339	184	119	260	237	397	3,817
CVP BANKS PUMPING		20	108	0	0	0	0	0	0	0	22	173	0	323
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	0	0	(0)	(0)	145	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		250	217	269	234	266	295	306	298	396	477	401	251	3,660
CVP SAN LUIS EOM STORAGE	200	282	510	702	864	896	931	880	681	398	177	181	171	
SWP SAN LUIS EOM STORAGE	200	196	257	411	615	743	883	895	758	456	214	26	156	
TRINITY EOM ELEVATION (FT)	2,301	2,290	2,288	2,297	2,308	2,323	2,338	2,352	2,364	2,366	2,352	2,340	2,339	
TRINITY SURFACE AREA (ACRES)	11,857	11,165	11,056	11,608	12,304	13,283	14,319	15,363	16,259	16,353	15,366	14,493	14,393	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,253	
SHASTA EOM ELEVATION (FT)	982	983	992	1,012	1,024	1,036	1,053	1,069	1,068	1,054	1,039	1,019	1,010	
SHASTA SURFACE AREA (ACRES)	19,868	19,980	20,982	23,272	24,548	26,063	28,060	30,019	30,009	28,253	26,333	24,032	22,947	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 14:27
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	974	984	1,085	1,213	1,388	1,584	1,800	2,003	2,052	1,968	1,921	1,902	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	240	
SHASTA EOM STORAGE	2,000	1,975	2,089	2,619	3,400	3,700	4,100	4,496	4,494	4,291	3,775	3,219	3,079	
OROVILLE EOM STORAGE	1,700	1,591	1,692	2,090	2,647	2,907	2,906	3,081	3,378	3,304	2,848	2,570	2,420	
FOLSOM EOM STORAGE	200	247	302	458	573	624	674	834	974	944	743	621	614	
WHISKEYTOWN STORAGE WITHDRAWAL		116	48	21	3	9	5	0	8	20	101	0	0	331
SHASTA STORAGE WITHDRAWAL		22	(114)	(529)	(781)	(300)	(400)	(403)	(8)	188	495	538	128	(1,165)
OROVILLE STORAGE WITHDRAWAL		107	(100)	(395)	(555)	(259)	0	(177)	(302)	64	445	269	144	(760)
FOLSOM STORAGE WITHDRAWAL		(49)	(55)	(155)	(114)	(50)	(50)	(162)	(145)	23	192	115	3	(445)
SPRING CREEK POWERPLANT		120	60	60	60	75	60	45	30	30	105	0	0	645
KESWICK RELEASE		412	326	231	229	825	640	562	682	588	860	768	358	6,480
OROVILLE RELEASE		209	150	105	105	411	719	525	225	271	433	304	217	3,673
NIMBUS RELEASE		61	60	61	342	375	395	384	451	373	290	216	109	3,117
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,911	7,068	9,451	17,910	31,870	19,760	13,978	11,667	7,661	9,627	9,155	6,430	
FREEPORT FLOW (CFS)		13,365	13,782	19,956	46,042	70,699	52,676	35,306	25,413	20,116	22,436	19,151	14,932	
ACTUAL DELTA OUTFLOW		277	268	757	2,519	3,792	2,921	1,635	1,271	874	615	305	149	15,385
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		367	(1,194)	409	339	5,353	1,944	(358)	2,300	6,456	2,938	397	(771)	18,180
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		260	288	430	449	405	449	397	184	119	282	216	397	3,876
CVP BANKS PUMPING		20	108	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	212	108	211	250	184	178	282	282	250	2,687
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	0	0	(0)	(0)	79	
CVP DOS AMIGOS		43	21	11	21	43	70	140	154	197	225	169	112	1,206
SWP DOS AMIGOS		250	230	264	234	264	295	295	295	391	474	418	251	3,661
CVP SAN LUIS EOM STORAGE	200	332	600	810	976	976	976	925	726	443	200	226	216	
SWP SAN LUIS EOM STORAGE	100	96	144	303	507	637	777	858	724	428	212	(13)	117	
TRINITY EOM ELEVATION (FT)	2,264	2,251	2,252	2,263	2,275	2,291	2,308	2,325	2,341	2,344	2,338	2,334	2,333	
TRINITY SURFACE AREA (ACRES)	9,620	8,879	8,940	9,531	10,268	11,242	12,312	13,461	14,530	14,786	14,345	14,100	14,001	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,253	
SHASTA EOM ELEVATION (FT)	955	954	960	988	1,024	1,036	1,053	1,069	1,068	1,060	1,039	1,016	1,009	
SHASTA SURFACE AREA (ACRES)	17,119	16,979	17,621	20,501	24,548	26,063	28,060	30,019	30,009	29,007	26,437	23,626	22,909	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 14:31
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	594	615	735	863	1,038	1,235	1,450	1,669	1,734	1,741	1,695	1,677	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	240	
SHASTA EOM STORAGE	1,700	1,757	1,905	2,414	3,224	3,700	4,100	4,496	4,494	4,291	3,700	3,141	3,002	
OROVILLE EOM STORAGE	1,200	1,192	1,341	1,738	2,295	2,872	2,907	3,081	3,379	3,304	2,848	2,570	2,415	
FOLSOM EOM STORAGE	200	248	304	461	573	624	674	834	974	944	728	609	607	
WHISKEYTOWN STORAGE WITHDRAWAL		96	38	1	3	9	5	0	0	5	11	0	0	168
SHASTA STORAGE WITHDRAWAL		(60)	(148)	(509)	(810)	(476)	(400)	(403)	(8)	188	570	541	128	(1,387)
OROVILLE STORAGE WITHDRAWAL		6	(148)	(395)	(555)	(576)	(36)	(177)	(302)	64	445	269	149	(1,257)
FOLSOM STORAGE WITHDRAWAL		(50)	(55)	(155)	(111)	(50)	(50)	(162)	(145)	23	207	112	(2)	(438)
SPRING CREEK POWERPLANT		100	50	40	60	75	60	45	15	15	15	0	0	475
KESWICK RELEASE		310	282	231	200	649	640	562	667	573	845	771	358	6,088
OROVILLE RELEASE		108	102	105	105	94	683	525	225	271	433	304	222	3,177
NIMBUS RELEASE		61	60	61	346	376	395	384	451	373	305	213	104	3,129
VERNALIS FLOW		110	145	215	300	350	340	255	210'	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,421	6,409	9,473	17,440	28,706	19,760	13,978	11,423	7,409	9,383	9,204	6,430	
FREEPORT FLOW (CFS)		10,080	12,253	19,956	45,629	61,843	52,090	35,306	25,169	19,864	22,436	19,151	14,932	
ACTUAL DELTA OUTFLOW		277	268	757	2,460	3,294	2,885	1,635	1,256	859	615	305	149	14,760
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		2,206	(338)	409	(147)	4,332	1,883	(358)	2,275	6,396	2,938	397	(771)	19,222
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		160	241	430	449	405	449	397	184	119	282	216	397	3,729
CVP BANKS PUMPING		64	64	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		100	238	246	246	115	211	250	184	178	282	282	250	2,582
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		(0)	0	0	0	0	0	0	0	0	(0)	(0)	75	
CVP DOS AMIGOS		29	14	7	14	29	70	140	154	197	225	169	112	1,160
SWP DOS AMIGOS		208	216	243	210	229	253	257	251	334	408	337	211	3,157
CVP SAN LUIS EOM STORAGE	200	267	512	732	943	976	976	925	726	443	200	226	216	
SWP SAN LUIS EOM STORAGE	100	40	57	238	467	633	816	938	851	614	466	324	497	
TRINITY EOM ELEVATION (FT)	2,218	2,203	2,206	2,223	2,239	2,258	2,277	2,297	2,315	2,320	2,321	2,317	2,315	
TRINITY SURFACE AREA (ACRES)	7,162	6,444	6,585	7,392	8,207	9,259	10,389	11,587	12,769	13,114	13,150	12,905	12,807	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,253	
SHASTA EOM ELEVATION (FT)	937	941	950	977	1,016	1,036	1,053	1,069	1,068	1,060	1,036	1,012	1,006	
SHASTA SURFACE AREA (ACRES)	15,384	15,720	16,576	19,406	23,653	26,063	28,060	30,019	30,009	29,007	26,061	23,227	22,508	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 14:44
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,765	1,696	1,686	1,739	1,850	1,971	2,157	2,286	2,197	2,043	1,929	1,907	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	237	
SHASTA EOM STORAGE	3,200	3,115	3,124	3,150	3,400	3,700	4,100	4,496	4,431	4,180	3,671	3,105	2,946	
OROVILLE EOM STORAGE	2,700	2,550	2,620	2,740	2,850	2,901	2,949	3,124	3,121	2,925	2,521	2,174	1,921	
FOLSOM EOM STORAGE	600	570	560	571	573	624	674	834	974	893	695	626	614	
WHISKEYTOWN STORAGE WITHDRAWAL		120	89	50	13	3	10	0	2	85	150	61	1	584
SHASTA STORAGE WITHDRAWAL		81	(9)	(26)	(250)	(300)	(400)	(403)	55	237	488	548	148	169
OROVILLE STORAGE WITHDRAWAL		146	(69)	(115)	(108)	(50)	(49)	(177)	(2)	187	394	338	247	742
FOLSOM STORAGE WITHDRAWAL		27	10	(8)	(1)	(50)	(50)	(162)	(145)	74	189	63	8	(45)
SPRING CREEK POWERPLANT		120	90	60	45	45	45	0	15	90	150	60	0	720
KESWICK RELEASE		441	381	414	385	475	455	217	550	627	868	818	358	5,989
OROVILLE RELEASE		208	101	105	212	400	400	295	225	234	312	323	260	3,075
NIMBUS RELEASE		108	104	108	155	216	265	264	321	294	307	163	114	2,417
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		7,343	7,694	9,556	10,958	18,006	16,751	7,947	8,163	7,361	9,123	9,367	5,832	
FREEPORT FLOW (CFS)		14,585	13,634	16,696	22,062	40,525	42,365	23,206	19,277	17,626	20,143	18,695	14,915	
ACTUAL DELTA OUTFLOW		277	268	479	859	1,838	2,085	805	875	636	474	278	148	9,023
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		(316)	(1,111)	(1,380)	(4,569)	(1,804)	(1,753)	(3,095)	4,904	4,648	2,388	301	(775)	(2,562)
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		253	341	422	436	405	426	397	123	119	234	263	397	3,816
CVP BANKS PUMPING		102	26	0	0	0	0	0	0	0	48	147	0	323
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	144	0	0	0	0	0	0	(0)	(0)	(0)	34	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		250	230	262	234	264	295	294	296	391	475	438	231	3,660
CVP SAN LUIS EOM STORAGE	200	364	510	702	864	896	931	880	681	398	203	181	171	
SWP SAN LUIS EOM STORAGE	300	289	390	544	734	864	981	1,062	866	569	304	105	255	
TRINITY EOM ELEVATION (FT)	2,333	2,322	2,317	2,316	2,320	2,329	2,338	2,352	2,361	2,355	2,343	2,335	2,333	
TRINITY SURFACE AREA (ACRES)	13,991	13,280	12,914	12,857	13,142	13,727	14,365	15,336	16,004	15,539	14,738	14,141	14,026	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,228	
SHASTA EOM ELEVATION (FT)	1,015	1,011	1,011	1,012	1,024	1,036	1,053	1,069	1,066	1,056	1,035	1,010	1,003	
SHASTA SURFACE AREA (ACRES)	23,529	23,093	23,139	23,272	24,548	26,063	28,060	30,019	29,700	28,457	25,917	23,042	22,217	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Weter Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 14:50
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,366	1,297	1,316	1,370	1,480	1,602	1,788	1,931	1,887	1,839	1,786	1,764	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	237	
SHASTA EOM STORAGE	2,500	2,454	2,568	2,748	3,183	3,700	4,100	4,496	4,408	4,119	3,505	2,978	2,819	
OROVILLE EOM STORAGE	2,200	2,051	2,071	2,190	2,407	2,764	2,906	3,080	3,066	2,869	2,465	2,119	1,856	
FOLSOM EOM STORAGE	400	370	360	371	420	617	674	834	974	886	688	522	520	
WHISKEYTOWN STORAGE WITHDRAWAL		120	89	20	13	3	10	0	0	40	45	1	1	342
SHASTA STORAGE WITHDRAWAL		43	(115)	(179)	(435)	(517)	(400)	(403)	78	275	593	510	148	(403)
OROVILLE STORAGE WITHDRAWAL		146	(19)	(115)	(215)	(356)	(143)	(177)	10	187	394	338	257	307
FOLSOM STORAGE WITHDRAWAL		27	10	(8)	(48)	(196)	(57)	(162)	(145)	81	189	161	(2)	(151)
SPRING CREEK POWERPLANT		120	90	30	45	45	45	0	2	45	45	0	0	467
KESWICK RELEASE		403	275	231	200	258	455	217	560	620	868	720	358	5,164
OROVILLE RELEASE		208	151	105	105	94	306	295	237	234	312	323	270	2,640
NIMBUS RELEASE		108	104	108	108	69	258	264	321	301	307	261	104	2,311
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,725	5,917	6,573	7,946	14,097	16,751	7,947	8,326	7,243	9,123	7,773	5,832	
FREEPORT FLOW (CFS)		13,967	12,690	13,713	16,547	28,474	40,723	23,206	19,635	17,626	20,143	18,695	14,915	
ACTUAL DELTA OUTFLOW		277	268	296	520	1,168	2,000	805	897	636	474	278	148	7,768
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		30	(583)	(2,096)	(2,025)	(3,057)	(1,716)	(3,095)	4,989	4,648	2,388	301	(775)	(990)
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		253	247	422	436	405	426	397	123	119	234	263	397	3,722
CVP BANKS PUMPING		64	64	0	0	0	0	0	0	0	48	147	0	323
TRACY PUMPING		246	238	246	246	222	230	250	184	178	282	282	250	2,854
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	0	(0)	0	(0)	24	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		243	200	256	225	255	282	286	283	375	454	380	238	3,477
CVP SAN LUIS EOM STORAGE	200	326	510	702	864	896	915	864	665	382	187	165	155	
SWP SAN LUIS EOM STORAGE	200	196	234	393	593	732	862	952	770	490	246	107	251	
TRINITY EOM ELEVATION (FT)	2,301	2,289	2,283	2,285	2,290	2,299	2,309	2,324	2,335	2,332	2,328	2,324	2,322	
TRINITY SURFACE AREA (ACRES)	11,857	11,121	10,739	10,847	11,143	11,750	12,407	13,401	14,152	13,921	13,670	13,388	13,273	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,228	
SHASTA EOM ELEVATION (FT)	982	979	985	994	1,014	1,036	1,053	1,069	1,065	1,054	1,028	1,005	997	
SHASTA SURFACE AREA (ACRES)	19,868	19,620	20,233	21,183	23,441	26,063	28,060	30,019	29,586	28,154	25,081	22,385	21,555	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 14:56
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	966	927	947	1,013	1,124	1,245	1,432	1,575	1,574	1,572	1,520	1,496	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,000	1,908	1,948	2,127	2,550	3,144	3,815	4,235	4,146	3,816	3,158	2,642	2,513	
OROVILLE EOM STORAGE	1,700	1,551	1,572	1,652	1,869	2,226	2,569	2,958	3,033	2,836	2,432	2,086	1,808	
FOLSOM EOM STORAGE	200	217	252	308	404	600	674	834	974	887	689	512	525	
WHISKEYTOWN STORAGE WITHDRAWAL		120	59	20	0	3	10	0	0	0	0	1	31	244
SHASTA STORAGE WITHDRAWAL		89	(40)	(179)	(422)	(595)	(671)	(427)	79	316	638	500	118	(592)
OROVILLE STORAGE WITHDRAWAL		146	(19)	(78)	(215)	(356)	(344)	(391)	(80)	187	394	338	272	(145)
FOLSOM STORAGE WITHDRAWAL		(19)	(35)	(55)	(95)	(196)	(74)	(162)	(145)	81	189	171	(17)	(356)
SPRING CREEK POWERPLANT		120	60	30	32	45	45	0	2	3	0	0	30	367
KESWICK RELEASE		449	320	231	200	180	184	193	561	620	868	710	358	4,875
OROVILLE RELEASE		208	151	142	105	94	105	81	147	234	312	323	285	2,188
NIMBUS RELEASE		61	60	61	61	69	241	264	321	300	307	271	89	2,106
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		7,516	6,686	6,580	7,946	12,703	12,351	7,550	8,348	7,243	9,123	7,610	5,832	
FREEPORT FLOW (CFS)		13,967	12,690	13,565	15,797	27,079	32,781	19,211	18,201	17,626	20,143	18,695	14,915	
ACTUAL DELTA OUTFLOW		277	268	287	508	1,205	1,531	567	797	636	474	278	148	6,976
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		30	(583)	(2,132)	(1,765)	(1,561)	(2,290)	(31)	4,489	4,648	2,388	301	(775)	2,720
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	O/C	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		253	247	422	436	405	426	397	135	119	234	263	397	3,734
CVP BANKS PUMPING		64	64	0	0	0	0	0	0	0	48	147	0	323
TRACY PUMPING		246	238	246	212	108	211	250	184	178	282	282	250	2,687
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	(0)	(0)	(0)	(0)	9	
CVP DOS AMIGOS		43	21	11	21	43	70	140	154	197	225	169	112	1,206
SWP DOS AMIGOS		231	189	244	214	242	267	271	267	355	431	359	224	3,294
CVP SAN LUIS EOM STORAGE	200	376	600	810	976	976	976	925	726	443	248	226	216	
SWP SAN LUIS EOM STORAGE	100	109	158	330	541	694	840	946	793	534	314	197	356	
TRINITY EOM ELEVATION (FT)	2,264	2,250	2,246	2,248	2,255	2,267	2,278	2,295	2,307	2,307	2,307	2,303	2,301	
TRINITY SURFACE AREA (ACRES)	9,620	8,831	8,597	8,715	9,112	9,757	10,449	11,487	12,264	12,256	12,247	11,963	11,836	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	955	950	952	962	984	1,012	1,041	1,058	1,055	1,041	1,013	989	982	
SHASTA SURFACE AREA (ACRES)	17,119	16,596	16,824	17,834	20,133	23,242	26,637	28,727	28,288	26,643	23,313	20,623	19,939	

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:10
BYPASS

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	586	558	567	634	747	878	1,066	1,210	1,209	1,209	1,158	1,138	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,807	1,934	2,123	2,545	3,137	3,797	4,217	4,129	3,796	3,138	2,632	2,501	
OROVILLE EOM STORAGE	1,200	1,152	1,220	1,337	1,554	1,910	2,254	2,664	2,718	2,523	2,119	1,774	1,520	
FOLSOM EOM STORAGE	200	211	247	304	400	597	674	834	974	889	691	505	527	
WHISKEYTOWN STORAGE WITHDRAWAL		100	49	30	0	0	0	0	0	0	0	1	28	209
SHASTA STORAGE WITHDRAWAL		(109)	(127)	(189)	(422)	(592)	(660)	(427)	79	319	638	490	121	(880)
OROVILLE STORAGE WITHDRAWAL		46	(67)	(115)	(215)	(356)	(344)	(412)	(59)	187	394	338	249	(354)
FOLSOM STORAGE WITHDRAWAL		(13)	(35)	(55)	(95)	(197)	(77)	(162)	(145)	78	189	181	(26)	(358)
SPRING CREEK POWERPLANT		100	50	40	32	42	35	0	2	3	0	0	27	332
KESWICK RELEASE		231	223	231	200	180	184	193	561	623	868	700	358	4,552
OROVILLE RELEASE		108	103	105	105	94	105	60	168	234	312	323	262	1,979
NIMBUS RELEASE		68	60	61	61	69	239	264	321	297	307	281	80	2,109
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,124	5,132	6,607	7,946	12,703	12,351	7,550	8,342	7,294	9,123	7,448	5,833	
FREEPORT FLOW (CFS)		8,893	10,265	12,963	15,797	27,079	32,740	18,852	18,542	17,626	20,143	18,695	14,360	
ACTUAL DELTA OUTFLOW		277	268	277	474	1,091	1,504	558	797	636	474	278	148	6,782
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		2,871	775	(1,924)	(2,205)	(3,202)	(2,615)	44	4,298	4,648	2,388	301	(464)	4,917
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	O/C	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		153	200	363	436	405	426	397	156	119	234	263	364	3,516
CVP BANKS PUMPING		48	48	32	0	0	0	0	0	0	48	147	0	323
TRACY PUMPING		50	157	246	246	222	235	238	184	178	282	282	250	2,570
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		(0)	0	38	0	0	0	0	(0)	(0)	(0)	(0)	(0)	
CVP DOS AMIGOS		29	14	7	14	29	70	140	154	197	225	169	112	1,160
SWP DOS AMIGOS		201	192	232	204	217	238	242	235	313	385	316	198	2,973
CVP SAN LUIS EOM STORAGE	200	201	349	601	812	951	976	913	714	431	236	214	204	
SWP SAN LUIS EOM STORAGE	100	41	42	168	390	568	743	881	782	567	395	323	476	
TRINITY EOM ELEVATION (FT)	2,218	2,202	2,197	2,199	2,209	2,224	2,240	2,261	2,275	2,275	2,275	2,270	2,268	
TRINITY SURFACE AREA (ACRES)	7,162	6,388	6,183	6,250	6,715	7,469	8,299	9,422	10,249	10,246	10,245	9,953	9,839	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	944	951	962	984	1,012	1,040	1,058	1,054	1,040	1,012	988	982	
SHASTA SURFACE AREA (ACRES)	15,384	16,011	16,742	17,810	20,110	23,205	26,551	28,642	28,204	26,544	23,211	20,572	19,873	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:16
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,763	1,713	1,713	1,746	1,832	1,941	2,066	2,147	2,067	1,909	1,703	1,680	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	236	
SHASTA EOM STORAGE	3,200	3,148	3,150	3,150	3,360	3,700	4,100	4,180	4,077	3,764	3,239	2,723	2,545	
OROVILLE EOM STORAGE	2,700	2,550	2,521	2,443	2,643	2,938	3,163	3,160	3,153	2,944	2,502	2,195	1,958	
FOLSOM EOM STORAGE	600	530	470	431	440	509	646	803	863	777	677	575	486	
WHISKEYTOWN STORAGE WITHDRAWAL		120	60	23	3	3	5	9	20	56	150	151	2	602
SHASTA STORAGE WITHDRAWAL		48	(2)	0	(210)	(340)	(400)	(87)	93	299	506	499	168	575
OROVILLE STORAGE WITHDRAWAL		146	30	83	(199)	(294)	(226)	1	2	200	431	299	231	705
FOLSOM STORAGE WITHDRAWAL		67	60	42	(8)	(68)	(138)	(158)	(65)	80	92	95	85	84
SPRING CREEK POWERPLANT		120	60	30	20	30	30	30	30	60	150	150	0	710
KESWICK RELEASE		388	308	350	200	200	260	443	523	629	876	849	358	5,385
OROVILLE RELEASE		208	150	243	61	56	163	393	179	207	339	274	264	2,538
NIMBUS RELEASE		108	104	108	108	97	108	128	180	180	180	175	171	1,646
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,483	6,064	7,693	7,502	10,712	9,804	7,869	6,927	6,638	8,602	9,871	5,832	
FREEPORT FLOW (CFS)		13,727	12,641	16,598	14,928	20,893	19,753	18,163	13,533	13,257	17,134	17,736	14,932	
ACTUAL DELTA OUTFLOW		215	309	461	411	715	657	452	467	366	289	219	149	4,710
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		(642)	(0)	(1,566)	(2,543)	(4,313)	(1,039)	(995)	2,810	3,465	1,666	71	(771)	(3,858)
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		254	229	420	431	403	418	397	123	119	282	215	397	3,687
CVP BANKS PUMPING		110	18	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	246	222	246	238	184	178	282	282	250	2,858
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	(0)	0	(0)	(0)	(0)	87	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		243	200	256	225	255	282	286	283	375	454	380	238	3,477
CVP SAN LUIS EOM STORAGE	200	373	510	702	864	896	931	868	669	386	143	169	159	
SWP SAN LUIS EOM STORAGE	300	297	317	474	669	805	927	1,018	836	556	360	173	316	
TRINITY EOM ELEVATION (FT)	2,333	2,322	2,318	2,318	2,321	2,328	2,336	2,345	2,351	2,345	2,334	2,318	2,316	
TRINITY SURFACE AREA (ACRES)	13,991	13,269	13,004	13,001	13,179	13,632	14,208	14,862	15,284	14,865	14,036	12,949	12,824	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,220	
SHASTA EOM ELEVATION (FT)	1,015	1,012	1,012	1,012	1,022	1,036	1,053	1,056	1,052	1,039	1,016	993	984	
SHASTA SURFACE AREA (ACRES)	23,529	23,262	23,272	23,272	24,346	26,063	28,060	28,455	27,946	26,384	23,727	21,054	20,107	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:22
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,334	1,284	1,253	1,290	1,378	1,493	1,648	1,700	1,621	1,474	1,280	1,214	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,500	2,510	2,550	2,699	2,906	3,263	3,734	3,824	3,722	3,380	2,878	2,365	2,258	
OROVILLE EOM STORAGE	2,200	2,051	2,022	2,037	2,237	2,532	2,859	2,846	2,840	2,631	2,190	1,884	1,551	
FOLSOM EOM STORAGE	400	346	300	276	316	413	581	695	785	729	597	485	493	
WHISKEYTOWN STORAGE WITHDRAWAL		150	60	53	0	0	0	0	50	56	140	141	72	722
SHASTA STORAGE WITHDRAWAL		(13)	(40)	(149)	(207)	(357)	(470)	(97)	93	329	483	498	98	168
OROVILLE STORAGE WITHDRAWAL		146	30	(12)	(199)	(294)	(328)	10	2	200	431	299	328	614
FOLSOM STORAGE WITHDRAWAL		52	45	26	(39)	(96)	(168)	(115)	(95)	50	125	106	(12)	(121)
SPRING CREEK POWERPLANT		150	60	60	17	27	25	0	60	60	140	140	70	809
KESWICK RELEASE		357	270	231	200	180	184	403	553	659	843	838	358	5,077
OROVILLE RELEASE		208	150	148	61	56	61	402	179	207	339	274	361	2,447
NIMBUS RELEASE		92	89	92	77	69	77	170	150	150	213	186	74	1,441
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,981	5,417	5,750	7,502	10,358	8,576	7,197	7,415	7,143	8,066	9,692	5,832	
FREEPORT FLOW (CFS)		12,975	11,745	12,861	14,428	20,039	16,374	18,365	13,533	13,257	17,134	17,736	14,932	
ACTUAL DELTA OUTFLOW		215	208	316	380	667	450	452	467	366	289	219	149	4,178
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		(221)	(860)	(1,359)	(2,663)	(4,402)	(1,850)	(1,108)	2,810	3,465	1,666	71	(771)	(5,223)
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		254	231	335	431	403	418	397	123	119	282	215	397	3,604
CVP BANKS PUMPING		64	64	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	(0)	(0)	(0)	(0)	(10)	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		231	189	244	214	242	267	271	267	355	431	359	224	3,294
CVP SAN LUIS EOM STORAGE	200	326	510	702	864	896	931	880	681	398	155	181	171	
SWP SAN LUIS EOM STORAGE	200	210	242	328	533	684	822	929	764	505	333	167	326	
TRINITY EOM ELEVATION (FT)	2,301	2,286	2,282	2,279	2,282	2,290	2,300	2,313	2,317	2,311	2,299	2,281	2,275	
TRINITY SURFACE AREA (ACRES)	11,857	10,944	10,666	10,495	10,699	11,190	11,817	12,656	12,932	12,508	11,714	10,643	10,272	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	.
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	982	982	984	991	1,001	1,017	1,038	1,042	1,037	1,023	1,000	975	969	
SHASTA SURFACE AREA (ACRES)	19,868	19,919	20,135	20,928	22,013	23,852	26,231	26,683	26,172	24,444	21,868	19,141	18,554	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	75
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:27
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	984	934	934	967	1,053	1,162	1,318	1,400	1,322	1,216	1,063	1,041	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	236	
SHASTA EOM STORAGE	2,000	2,048	2,135	2,254	2,464	2,824	3,299	3,450	3,421	3,141	2,647	2,258	2,080	
OROVILLE EOM STORAGE	1,700	1,639	1,637	1,678	1,879	2,173	2,500	2,724	2,723	2,514	2,073	1,709	1,458	
FOLSOM EOM STORAGE	200	177	162	168	223	319	487	611	665	575	429	382	381	
WHISKEYTOWN STORAGE WITHDRAWAL		100	60	23	3	3	5	0	20	56	100	101	2	473
SHASTA STORAGE WITHDRAWAL		(51)	(87)	(119)	(210)	(360)	(476)	(157)	21	267	476	376	168	(150)
OROVILLE STORAGE WITHDRAWAL		59	2	(38)	(199)	(294)	(328)	(226)	(3)	200	431	358	246	208
FOLSOM STORAGE WITHDRAWAL		21	15	(5)	(55)	(96)	(168)	(125)	(57)	84	139	42	(3)	(207)
SPRING CREEK POWERPLANT		100	60	30	20	30	30	0	30	60	100	100	0	560
KESWICK RELEASE		269	223	231	200	180	184	343	451	597	796	676	358	4,510
OROVILLE RELEASE		121	122	122	61	56	61	166	174	207	339	333	279	2,041
NIMBUS RELEASE		61	60	61	61	69	77	160	188	184	227	122	84	1,355
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,587	4,659	5,758	7,508	10,364	8,583	6,307	5,952	6,353	7,578	7,253	5,916	
FREEPORT FLOW (CFS)		9,618	9,997	11,938	14,178	20,039	16,374	13,222	12,411	12,786	16,614	15,004	13,705	
ACTUAL DELTA OUTFLOW		215	208	215	365	667	455	452	467	366	289	219	149	4,067
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		1,659	119	(2,157)	(2,723)	(4,402)	(1,778)	1,772	3,438	3,729	1,957	1,601	(84)	3,130
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		167	203	347	431	403	418	161	118	119	282	274	324	3,246
CVP BANKS PUMPING		32	32	32	0	0	0	0	0	0	0	0	0	96
TRACY PUMPING		159	194	246	246	222	241	180	120	150	250	250	250	2,508
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	38	0	0	0	0	(0)	(0)	(0)	(0)	(0)	
CVP DOS AMIGOS		43	21	11	21	43	106	117	138	148	180	148	85	1,061
SWP DOS AMIGOS		206	166	219	191	217	238	242	235	313	385	316	198	2,926
CVP SAN LUIS EOM STORAGE	200	257	405	647	847	969	976	893	667	427	209	53	83	
SWP SAN LUIS EOM STORAGE	100	49	79	203	432	608	776	677	540	326	202	140	254	
TRINITY EOM ELEVATION (FT)	2,264	2,252	2,247	2,247	2,250	2,259	2,270	2,285	2,292	2,285	2,276	2,260	2,258	
TRINITY SURFACE AREA (ACRES)	9,620	8,939	8,640	8,636	8,838	9,344	9,978	10,858	11,312	10,878	10,285	9,404	9,277	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,220	
SHASTA EOM ELEVATION (FT)	955	958	963	969	980	997	1,019	1,026	1,024	1,012	989	969	960	
SHASTA SURFACE AREA (ACRES)	17,119	17,391	17,875	18,535	19,677	21,583	24,037	24,802	24,653	23,225	20,652	18,554	17,570	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	50
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:34
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	604	585	604	637	723	833	989	1,072	994	900	758	737	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	236	
SHASTA EOM STORAGE	1,700	1,767	1,824	1,923	2,133	2,493	2,968	3,179	3,166	2,927	2,516	2,214	2,037	
OROVILLE EOM STORAGE	1,200	1,149	1,190	1,291	1,491	1,785	2,112	2,342	2,336	2,155	1,853	1,629	1,456	
FOLSOM EOM STORAGE	200	178	164	170	226	337	521	638	708	642	538	408	410	
WHISKEYTOWN STORAGE WITHDRAWAL		80	30	3	3	3	5	0	20	56	90	91	2	383
SHASTA STORAGE WITHDRAWAL		(69)	(57)	(99)	(210)	(360)	(476)	(217)	5	228	394	288	168	(404)
OROVILLE STORAGE WITHDRAWAL		49	(40)	(99)	(199)	(294)	(328)	(232)	2	174	293	218	168	(287)
FOLSOM STORAGE WITHDRAWAL		20	15	(5)	(55)	(111)	(184)	(118)	(75)	60	97	125	(5)	(236)
SPRING CREEK POWERPLANT		80	30	10	20	30	30	0	30	60	90	90	0	470
KESWICK RELEASE		231	223	231	200	180	184	283	435	558	704	578	358	4,166
OROVILLE RELEASE		111	80	61	61	56	61	160	179	181	201	193	201	1,546
NIMBUS RELEASE		62	60	61	61	56	61	167	171	160	185	205	81	1,330
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,124	4,732	5,787	7,516	10,371	8,593	5,457	5,952	6,017	6,439	5,952	6,014	
FREEPORT FLOW (CFS)		8,833	9,287	10,954	14,178	19,789	16,124	12,236	11,955	11,279	12,184	12,493	12,337	
ACTUAL DELTA OUTFLOW		215	208	254	365	731	543	452	467	366	289	219	149	4,258
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		2,098	517	(1,101)	(2,723)	(3,305)	(491)	2,325	3,693	4,573	4,438	3,007	682	13,712
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		157	161	248	431	403	418	155	123	93	144	134	246	2,713
CVP BANKS PUMPING		0	32	32	0	0	0	0	0	0	0	0	0	64
TRACY PUMPING		152	193	246	246	144	139	130	90	90	120	240	250	2,041
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		(0)	0	0	0	0	0	0	(0)	(0)	(0)	(0)	(0)	
CVP DOS AMIGOS		29	14	7	14	29	50	79	100	107	129	100	57	716
SWP DOS AMIGOS		216	132	181	157	178	194	199	187	251	317	252	158	2,422
CVP SAN LUIS EOM STORAGE	200	255	424	676	886	966	965	884	673	425	143	51	121	
SWP SAN LUIS EOM STORAGE	100	33	56	119	384	599	813	753	672	496	305	171	248	
TRINITY EOM ELEVATION (FT)	2,218	2,205	2,202	2,205	2,209	2,221	2,235	2,253	2,261	2,253	2,243	2,226	2,223	
TRINITY SURFACE AREA (ACRES)	7,162	6,514	6,375	6,511	6,742	7,314	8,014	8,969	9,457	8,999	8,431	7,540	7,406	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,220	
SHASTA EOM ELEVATION (FT)	937	941	945	951	962	981	1,004	1,014	1,013	1,002	982	967	957	
SHASTA SURFACE AREA (ACRES)	15,384	15,777	16,109	16,682	17,867	19,829	22,335	23,423	23,355	22,119	19,953	18,315	17,329	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:50
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,805	1,773	1,765	1,774	1,812	1,862	1,970	1,976	1,808	1,634	1,476	1,419	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	3,200	3,127	3,125	3,130	3,250	3,450	3,785	3,843	3,646	3,340	2,824	2,237	2,019	
OROVILLE EOM STORAGE	2,700	2,556	2,485	2,428	2,476	2,531	2,748	2,879	2,768	2,548	2,231	1,894	1,629	
FOLSOM EOM STORAGE	600	530	470	436	442	492	606	628	692	628	431	359	310	
WHISKEYTOWN STORAGE WITHDRAWAL		101	64	12	0	0	0	0	55	119	161	102	62	676
SHASTA STORAGE WITHDRAWAL		69	2	(5)	(120)	(200)	(336)	(64)	189	292	499	572	209	1,106
OROVILLE STORAGE WITHDRAWAL		141	71	61	(45)	(55)	(218)	(133)	106	211	308	329	260	1,037
FOLSOM STORAGE WITHDRAWAL		67	60	36	(5)	(50)	(114)	(23)	(69)	58	190	67	46	265
SPRING CREEK POWERPLANT		100	60	10	0	0	0	0	60	120	160	100	60	670
KESWICK RELEASE		369	292	265	200	180	184	386	589	652	859	852	449	5,276
OROVILLE RELEASE		163	151	161	125	145	61	99	123	148	166	264	263	1,870
NIMBUS RELEASE		108	104	92	62	56	61	182	107	128	228	108	93	1,327
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,175	5,378	5,777	6,468	6,208	7,740	5,681	6,439	7,025	9,042	10,180	7,361	
FREEPORT FLOW (CFS)		11,950	11,043	11,852	12,863	13,006	13,994	11,155	10,183	11,509	15,166	16,240	14,461	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	309	268	246	232	240	195	149	2,804
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		352	(467)	(2,108)	(3,126)	(2,882)	(2,341)	456	1,810	2,643	2,130	596	(507)	(3,444)
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		183	196	285	427	389	407	152	123	119	135	212	269	2,897
CVP BANKS PUMPING		32	32	64	0	0	0	0	0	0	30	90	65	313
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	90	28	0	0	(0)	(0)	(0)	(0)	(0)	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		205	166	219	191	217	238	242	235	313	385	316	198	2,925
CVP SAN LUIS EOM STORAGE	200	294	446	702	864	896	931	880	681	398	185	106	161	
SWP SAN LUIS EOM STORAGE	300	267	290	351	577	740	896	789	657	442	171	48	106	
TRINITY EOM ELEVATION (FT)	2,333	2,326	2,323	2,322	2,323	2,326	2,330	2,338	2,339	2,326	2,312	2,299	2,294	
TRINITY SURFACE AREA (ACRES)	13,991	13,492	13,323	13,277	13,328	13,526	13,793	14,356	14,388	13,504	12,581	11,729	11,415	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	1,015	1,011	1,011	1,012	1,017	1,026	1,040	1,042	1,034	1,021	997	968	956	
SHASTA SURFACE AREA (ACRES)	23,529	23,154	23,145	23,170	23,786	24,801	26,491	26,779	25,789	24,246	21,581	18,443	17,227	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-)	C
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	75
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	PRE

DATE: 10/13
TIME: 15:56
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,386	1,354	1,325	1,335	1,372	1,423	1,530	1,567	1,400	1,228	1,012	989	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	236	
SHASTA EOM STORAGE	2,500	2,464	2,448	2,489	2,609	2,809	3,144	3,250	3,086	2,817	2,329	1,847	1,615	
OROVILLE EOM STORAGE	2,200	2,056	1,987	1,930	1,977	2,032	2,249	2,319	2,210	2,013	1,747	1,590	1,526	
FOLSOM EOM STORAGE	400	346	300	282	287	337	451	558	624	526	333	249	220	
WHISKEYTOWN STORAGE WITHDRAWAL		121	64	32	0	0	0	0	25	119	161	162	2	686
SHASTA STORAGE WITHDRAWAL		32	17	(42)	(120)	(200)	(336)	(112)	156	257	473	469	224	820
OROVILLE STORAGE WITHDRAWAL		141	70	60	(45)	(55)	(218)	(72)	106	189	258	150	60	645
FOLSOM STORAGE WITHDRAWAL		52	45	21	(5)	(50)	(114)	(108)	(70)	93	186	80	26	157
SPRING CREEK POWERPLANT		120	60	30	0	0	0	0	30	120	160	160	0	680
KESWICK RELEASE		352	307	248	200	180	184	338	526	617	833	809	404	5,000
OROVILLE RELEASE		163	150	160	125	145	61	160	123	126	116	85	63	1,478
NIMBUS RELEASE		92	89	77	62	56	61	97	106	162	224	120	72	1,219
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,905	5,628	5,507	6,475	6,216	7,748	5,008	5,626	6,689	8,879	9,692	6,689	
FREEPORT FLOW (CFS)		11,430	11,026	11,315	12,863	13,006	13,994	9,962	9,142	11,139	13,865	12,841	10,008	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	299	268	246	232	240	195	149	2,794
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		644	(458)	(1,808)	(3,126)	(2,882)	(2,476)	1,124	2,393	2,850	2,859	2,500	1,987	3,606
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		183	195	284	395	389	417	213	123	97	85	33	69	2,484
CVP BANKS PUMPING		0	32	32	32	0	0	0	0	0	0	60	0	156
TRACY PUMPING		246	238	246	246	222	246	118	120	178	282	282	250	2,674
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	58	28	0	(0)	(0)	(0)	(0)	(0)	(0)	
CVP DOS AMIGOS		85	57	28	57	113	106	117	138	148	180	148	85	1,262
SWP DOS AMIGOS		168	132	181	157	178	194	199	187	251	317	252	158	2,374
CVP SAN LUIS EOM STORAGE	200	262	414	638	832	872	884	739	513	302	115	52	82	
SWP SAN LUIS EOM STORAGE	200	207	264	363	592	795	1,007	1,005	924	752	503	267	168	
TRINITY EOM ELEVATION (FT)	2,301	2,291	2,288	2,286	2,286	2,290	2,294	2,303	2,307	2,292	2,277	2,255	2,253	
TRINITY SURFACE AREA (ACRES)	11,857	11,231	11,056	10,897	10,950	11,158	11,435	12,022	12,221	11,312	10,354	9,105	8,972	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	3,220	
SHASTA EOM ELEVATION (FT)	982	980	979	981	987	997	1,012	1,017	1,010	997	973	946	932	
SHASTA SURFACE AREA (ACRES)	19,868	19,676	19,587	19,810	20,451	21,504	23,243	23,785	22,944	21,548	18,942	16,244	14,873	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	50
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	PRE

DATE: 10/13
TIME: 16:03
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	1,006	974	946	955	993	1,043	1,151	1,189	1,083	922	777	752	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,000	2,003	2,070	2,129	2,249	2,449	2,784	2,890	2,775	2,505	2,169	1,828	1,643	
OROVILLE EOM STORAGE	1,700	1,577	1,536	1,538	1,584	1,686	1,903	2,072	2,024	1,894	1,683	1,543	1,481	
FOLSOM EOM STORAGE	200	177	162	158	169	224	367	507	588	525	368	241	227	
WHISKEYTOWN STORAGE WITHDRAWAL		101	64	32	0	0	0	0	25	59	151	92	32	556
SHASTA STORAGE WITHDRAWAL		(6)	(67)	(59)	(120)	(200)	(336)	(111)	107	260	320	329	178	296
OROVILLE STORAGE WITHDRAWAL		121	41	1	(45)	(101)	(218)	(171)	44	123	203	134	57	191
FOLSOM STORAGE WITHDRAWAL		21	15	5	(11)	(55)	(142)	(141)	(85)	58	150	122	12	(49)
SPRING CREEK POWERPLANT		100	60	30	0	0	0	0	30	60	150	90	30	550
KESWICK RELEASE		294	223	231	200	180	184	339	477	560	670	599	388	4,346
OROVILLE RELEASE		143	121	101	125	99	61	61	61	60	61	69	60	1,024
NIMBUS RELEASE		61	60	61	55	50	34	65	92	129	190	165	60	1,023
VERNALIS FLOW		70	80	.90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,998	4,249	5,223	6,500	6,247	7,780	5,512	5,634	6,689	7,253	7,090	6,724	
FREEPORT FLOW (CFS)		9,657	8,640	9,808	12,771	12,073	13,544	7,774	7,141	8,494	9,788	9,879	9,476	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	297	268	246	232	240	195	149	2,793
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		1,637	879	(963)	(3,074)	(2,360)	(2,243)	2,349	3,514	4,331	5,142	4,158	2,284	15,654
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		163	166	225	390	337	417	115	63	31	31	17	67	2,021
CVP BANKS PUMPING		0	0	32	32	0	0	0	0	0	0	0	0	64
TRACY PUMPING		157	157	213	246	222	222	89	61	90	90	180	224	1,950
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	0	52	23	0	0	(0)	0	(0)	(0)	(0)	
CVP DOS AMIGOS		43	21	11	21	43	50	79	100	107	129	100	57	762
SWP DOS AMIGOS		130	98	143	123	139	150	155	139	188	248	189	117	1,819
CVP SAN LUIS EOM STORAGE	200	223	302	511	745	881	976	873	664	451	180	63	125	
SWP SAN LUIS EOM STORAGE	100	128	192	272	530	721	979	926	836	664	432	247	189	
TRINITY EOM ELEVATION (FT)	2,264	2,254	2,251	2,248	2,249	2,253	2,258	2,269	2,273	2,262	2,245	2,228	2,225	
TRINITY SURFACE AREA (ACRES)	9,620	9,070	8,880	8,708	8,766	8,990	9,289	9,916	10,130	9,521	8,566	7,663	7,500	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	955	955	959	962	969	979	996	1,000	995	982	964	945	934	
SHASTA SURFACE AREA (ACRES)	17,119	17,135	17,511	17,843	18,507	19,592	21,375	21,926	21,326	19,892	18,067	16,136	15,041	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75 [illegible]-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	PRE

DATE: 10/13
TIME: 16:10
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	606	585	586	595	633	684	792	830	756	716	632	607	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,735	1,792	1,821	1,941	2,141	2,478	2,663	2,603	2,369	2,004	1,697	1,542	
OROVILLE EOM STORAGE	1,200	1,159	1,179	1,220	1,310	1,435	1,638	1,809	1,761	1,632	1,421	1,282	1,221	
FOLSOM EOM STORAGE	200	178	163	159	171	228	370	486	544	475	289	219	198	
WHISKEYTOWN STORAGE WITHDRAWAL		101	54	2	0	0	0	0	25	29	31	32	32	306
SHASTA STORAGE WITHDRAWAL		(37)	(57)	(29)	(120)	(200)	(336)	(192)	53	223	351	295	148	100
OROVILLE STORAGE WITHDRAWAL		39	(20)	(39)	(89)	(124)	(204)	(172)	44	123	203	134	57	(46)
FOLSOM STORAGE WITHDRAWAL		20	15	5	(11)	(56)	(142)	(117)	(61)	64	179	66	18	(19)
SPRING CREEK POWERPLANT		100	50	0	0	0	0	0	30	30	30	30	30	300
KESWICK RELEASE		263	223	231	200	180	184	258	423	493	581	505	358	3,900
OROVILLE RELEASE		61	60	61	81	76	75	60	61	60	61	69	60	787
NIMBUS RELEASE		61	60	62	55	50	34	89	116	136	219	109	66	1,057
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,647	4,324	5,253	6,509	6,259	7,792	4,344	5,057	5,933	6,196	5,870	6,340	
FREEPORT FLOW (CFS)		7,818	7,616	9,175	12,054	11,659	13,763	6,800	6,646	7,486	8,812	7,439	9,073	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	386	268	246	232	240	195	149	2,881
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		2,667	1,452	(610)	(2,672)	(2,128)	(1,217)	2,895	3,791	4,896	5,688	5,524	2,510	22,797
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		82	105	185	377	314	417	114	63	31	31	17	67	1,804
CVP BANKS PUMPING		32	0	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		93	157	245	246	222	147	32	30	30	30	30	200	1,462
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	0	84	23	0	0	0	0	(0)	(0)	(0)	
CVP DOS AMIGOS		29	14	7	14	29	26	41	52	56	67	52	30	417
SWP DOS AMIGOS		141	64	105	90	101	106	111	91	126	180	125	77	1,317
CVP SAN LUIS EOM STORAGE	200	228	328	547	760	922	976	868	698	502	264	69	147	
SWP SAN LUIS EOM STORAGE	100	38	77	156	437	644	948	940	900	794	633	514	500	
TRINITY EOM ELEVATION (FT)	2,218	2,205	2,202	2,202	2,203	2,209	2,216	2,230	2,235	2,225	2,220	2,209	2,205	
TRINITY SURFACE AREA (ACRES)	7,162	6,528	6,375	6,385	6,452	6,712	7,053	7,761	8,001	7,525	7,270	6,705	6,533	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	939	943	945	952	963	980	990	987	975	955	937	927	
SHASTA SURFACE AREA (ACRES)	15,384	15,589	15,922	16,093	16,784	17,908	19,740	20,735	20,415	19,164	17,139	15,367	14,432	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	E
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	50
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	PRE

DATE: 10/13
TIME: 16:21
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,800	1,761	1,722	1,681	1,620	1,528	1,468	1,323	1,083	900	760	699	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	3,200	3,093	3,023	2,997	3,047	3,140	3,267	3,216	2,919	2,549	2,004	1,469	1,304	
OROVILLE EOM STORAGE	2,700	2,546	2,458	2,132	1,880	1,859	1,995	2,004	1,873	1,682	1,448	1,285	1,222	
FOLSOM EOM STORAGE	600	500	424	376	358	383	455	507	505	426	269	214	187	
WHISKEYTOWN STORAGE WITHDRAWAL		102	64	33	27	55	77	80	117	160	162	83	62	1,022
SHASTA STORAGE WITHDRAWAL		103	70	26	(50)	(93)	(127)	45	290	359	530	523	158	1,833
OROVILLE STORAGE WITHDRAWAL		151	89	330	254	22	(138)	(11)	128	184	227	158	59	1,453
FOLSOM STORAGE WITHDRAWAL		97	75	51	19	(25)	(72)	(53)	(2)	74	151	52	24	392
SPRING CREEK POWERPLANT		100	60	30	30	60	90	90	120	160	160	80	60	1,040
KESWICK RELEASE		373	310	246	200	227	283	365	630	709	870	773	388	5,373
OROVILLE RELEASE		161	149	400	384	172	61	101	65	71	75	93	62	1,794
NIMBUS RELEASE		108	89	77	55	31	34	54	55	95	161	64	42	865
VERNALIS FLOW		40	50	50	60	60	60	50	40	20	20	20	30	500
FEATHER RIVER DEMANDS		50	0	0	0	0	1	58	193	193	232	145	87	959
YUBA RIVER ACCRETIONS		32	28	23	14	12	12	10	10	9	5	5	5	165
SACRAMENTO RIVER ACCRETIONS		87	88	63	119	42	(3)	(90)	(290)	(311)	(335)	(200)	30	(800)
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,235	5,451	4,005	4,032	4,000	4,000	5,008	6,927	8,369	10,505	10,505	6,724	
FREEPORT FLOW (CFS)		11,845	10,695	12,787	12,330	8,490	6,102	7,215	7,480	9,481	12,542	11,875	8,756	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		411	(272)	(2,632)	(2,827)	(353)	1,658	2,663	3,324	3,779	3,600	3,041	2,687	15,078
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		147	145	411	410	184	55	28	28	30	30	30	40	1,538
CVP BANKS PUMPING		32	32	0	0	0	0	0	0	0	0	0	0	64
TRACY PUMPING		246	238	202	180	127	107	112	96	120	240	260	178	2,105
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	0	(0)	0	(0)	(0)	(0)	0	(0)	(0)	(0)	
CVP DOS AMIGOS		85	57	28	57	113	50	79	100	107	129	100	57	962
SWP DOS AMIGOS		118	87	130	112	126	136	140	123	168	226	167	104	1,637
CVP SAN LUIS EOM STORAGE	200	294	446	594	693	651	631	552	377	194	74	37	52	
SWP SAN LUIS EOM STORAGE	300	324	378	657	949	999	909	786	678	526	317	167	97	
TRINITY EOM ELEVATION (FT)	2,333	2,325	2,322	2,319	2,316	2,311	2,303	2,298	2,285	2,262	2,243	2,226	2,218	
TRINITY SURFACE AREA (ACRES)	13,991	13,465	13,259	13,049	12,833	12,504	12,011	11,683	10,884	9,519	8,431	7,553	7,159	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	1,015	1,010	1,007	1,005	1,008	1,012	1,018	1,015	1,002	984	955	922	911	
SHASTA SURFACE AREA (ACRES)	23,529	22,981	22,619	22,482	22,742	23,221	23,872	23,613	22,078	20,130	17,140	13,985	12,942	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	E
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	0
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	PRE

DATE: 10/13
TIME: 16:25
BYPASS

ALL VALUES IN KAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,381	1,342	1,302	1,262	1,230	1,199	1,199	1,084	884	743	653	593	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,500	2,497	2,499	2,473	2,523	2,588	2,657	2,600	2,341	1,998	1,532	1,087	963	
OROVILLE EOM STORAGE	2,200	2,038	1,950	1,685	1,755	1,849	1,986	1,995	1,864	1,675	1,446	1,286	1,225	
FOLSOM EOM STORAGE	400	331	271	243	246	270	341	392	389	336	272	199	171	
WHISKEYTOWN STORAGE WITHDRAWAL		122	64	33	27	25	17	20	87	120	122	33	62	732
SHASTA STORAGE WITHDRAWAL		(1)	(2)	26	(50)	(65)	(69)	51	252	334	453	436	118	1,483
OROVILLE STORAGE WITHDRAWAL		159	89	269	(69)	(94)	(138)	(11)	128	182	222	155	57	950
FOLSOM STORAGE WITHDRAWAL		67	60	29	(2)	(24)	(71)	(52)	(0)	49	59	69	26	211
SPRING CREEK POWERPLANT		120	60	30	30	30	30	30	90	120	120	30	60	750
KESWICK RELEASE		289	238	246	200	225	281	311	562	644	753	636	348	4,733
OROVILLE RELEASE		161	149	339	61	56	61	101	65	69	70	90	60	1,283
NIMBUS RELEASE		77	74	55	34	31	35	55	57	70	69	81	44	683
VERNALIS FLOW		40	50	50	60	60	60	50	40	20	20	20	30	500
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		32	28	23	14	12	12	10	10	9	5	5	5	165
SACRAMENTO RIVER ACCRETIONS		87	88	63	119	42	(3)	(90)	(290)	(311)	(335)	(200)	30	(800)
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,881	4,239	4,000	4,054	4,000	4,000	4,505	6,466	8,033	9,367	8,879	6,292	
FREEPORT FLOW (CFS)		9,991	9,233	11,440	6,739	6,390	6,086	6,345	6,410	7,935	9,048	9,871	8,093	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		1,450	547	(1,878)	304	822	1,667	3,150	3,923	4,644	5,556	4,163	3,059	27,407
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		153	145	349	88	68	55	28	28	28	25	27	38	1,033
CVP BANKS PUMPING		32	0	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		126	183	180	159	126	106	60	30	30	30	140	140	1,310
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	(0)	(0)	0	(0)	(0)	0	0	(0)	(0)	(0)	
CVP DOS AMIGOS		85	57	28	57	113	2	3	4	4	5	4	2	364
SWP DOS AMIGOS		68	41	80	67	75	77	82	59	85	134	82	50	900
CVP SAN LUIS EOM STORAGE	200	174	239	365	443	400	447	419	319	199	53	42	100	
SWP SAN LUIS EOM STORAGE	200	282	385	654	669	656	627	565	524	457	338	275	260	
TRINITY EOM ELEVATION (FT)	2,301	2,291	2,287	2,284	2,280	2,277	2,274	2,274	2,263	2,241	2,224	2,212	2,203	
TRINITY SURFACE AREA (ACRES)	11,857	11,204	10,989	10,769	10,542	10,365	10,187	10,187	9,528	8,336	7,442	6,849	6,436	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	982	981	982	980	983	986	989	987	974	955	927	894	883	
SHASTA SURFACE AREA (ACRES)	19,868	19,853	19,863	19,723	19,992	20,337	20,705	20,404	19,011	17,107	14,373	11,489	10,616	

LONG-TERM OPERATIONS CRITERIA AND PLAN

OPERATIONS STUDIES

TEM ALTERNATIVE

UNITED STATES BUREAU OF RECLAMATION

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

DATE: 10/15
TIME: 09:25

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	TEM

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	604	585	604	637	723	833	989	1,072	994	900	758	737	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,735	1,792	1,891	2,102	2,461	2,937	3,238	3,333	3,175	2,938	2,687	2,535	
OROVILLE EOM STORAGE	1,200	1,146	1,189	1,290	1,490	1,784	2,111	2,343	2,339	2,159	1,860	1,637	1,468	
FOLSOM EOM STORAGE	200	178	163	170	226	337	521	627	629	522	314	282	286	
WHISKEYTOWN STORAGE WITHDRAWAL		80	30	3	3	3	5	0	20	56	90	91	28	410
SHASTA STORAGE WITHDRAWAL		(38)	(57)	(99)	(210)	(360)	(476)	(307)	(104)	146	219	236	141	(907)
OROVILLE STORAGE WITHDRAWAL		52	(42)	(99)	(199)	(294)	(328)	(234)	0	172	291	216	165	(299)
FOLSOM STORAGE WITHDRAWAL		20	15	(5)	(55)	(111)	(184)	(108)	(6)	102	202	27	(6)	(109)
SPRING CREEK POWERPLANT		80	30	10	20	30	30		30	60	90	90	26	496
KESWICK RELEASE		262	223	231	200	180	184	193	326	476	529	526	358	3,690
OROVILLE RELEASE		114	78	61	61	56	61	158	177	179	199	191	198	1,534
NIMBUS RELEASE		61	60	61	61	56	61	178	240	201	290	108	80	1,457
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,640	4,732	5,787	7,525	10,380	8,605	4,125	4,472	5,025	4,000	5,415	6,135	
FREEPORT FLOW (CFS)		9,397	9,261	10,954	14,178	19,789	16,124	10,858	11,272	10,573	11,013	10,021	12,287	
ACTUAL DELTA OUTFLOW		215	208	286	365	731	566	452	467	366	289	219	149	4,314
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		1,782	531	(684)	(2,717)	(3,305)	(190)	3,096	4,076	4,968	5,093	4,391	710	17,753
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		160	159	248	430	403	418	153	121	91	142	132	243	2,700
CVP BANKS PUMPING		32	0	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		152	226	246	246	144	116	50	50	50	50	90	250	1,670
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		(0)	(0)	0	0	0	0	0	(0)	(0)	0	(0)	(0)	
CVP DOS AMIGOS		29	14	7	14	29	26	41	52	56	67	52	30	417
SWP DOS AMIGOS		216	132	181	157	178	194	199	187	251	317	252	158	2,422
CVP SAN LUIS EOM STORAGE	200	287	456	676	887	966	976	867	686	475	214	45	155	
SWP SAN LUIS EOM STORAGE	100	36	57	120	384	600	813	751	668	490	298	161	236	
TRINITY EOM ELEVATION (FT)	2,218	2,205	2,202	2,205	2,209	2,221	2,235	2,253	2,261	2,253	2,243	2,226	2,223	
TRINITY SURFACE AREA (ACRES)	7,162	6,514	6,375	6,511	6,742	7,314	8,014	8,969	9,457	8,999	8,431	7,540	7,406	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	940	943	949	961	980	1,003	1,016	1,021	1,014	1,003	991	983	
SHASTA SURFACE AREA (ACRES)	15,384	15,591	15,924	16,500	17,690	19,659	22,170	23,721	24,209	23,400	22,177	20,865	20,058	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	50
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	TEM

DATE: 10/15
TIME: 09:32

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,386	1,354	1,325	1,335	1,372	1,423	1,530	1,567	1,400	1,228	1,012	926	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,500	2,586	2,653	2,712	2,833	3,032	3,368	3,513	3,406	3,146	2,708	2,263	2,136	
OROVILLE EOM STORAGE	2,200	2,058	1,990	1,933	1,943	1,961	2,178	2,308	2,200	2,007	1,746	1,592	1,531	
FOLSOM EOM STORAGE	400	346	300	281	287	337	451	548	591	515	316	202	186	
WHISKEYTOWN STORAGE WITHDRAWAL		121	64	32	0	0	0	0	25	119	161	162	92	776
SHASTA STORAGE WITHDRAWAL		(89)	(67)	(59)	(120)	(200)	(336)	(152)	99	248	420	431	118	293
OROVILLE STORAGE WITHDRAWAL		139	69	61	(9)	(17)	(218)	(132)	104	186	253	147	57	640
FOLSOM STORAGE WITHDRAWAL		52	45	21	(5)	(50)	(114)	(99)	(47)	71	192	110	14	192
SPRING CREEK POWERPLANT		120	60	30					30	120	160	160	90	770
KESWICK RELEASE		231	223	231	200	180	184	298	469	608	780	771	388	4,563
OROVILLE RELEASE		161	149	161	161	183	61	100	121	123	111	82	60	1,473
NIMBUS RELEASE		92	89	77	61	56	61	107	129	141	230	150	60	1,254
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		3,923	4,227	5,215	6,483	6,226	7,759	4,504	4,976	6,857	8,375	9,351	6,518	
FREEPORT FLOW (CFS)		9,413	9,603	11,039	13,455	13,685	13,994	8,438	8,573	10,556	13,029	12,655	9,480	
ACTUAL DELTA OUTFLOW		215	208	215	326	288	301	268	246	232	240	195	149	2,883
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		1,773	344	(1,653)	(2,825)	(2,719)	(2,450)	1,978	2,712	3,176	3,327	2,604	2,282	8,548
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		181	193	285	415	389	417	153	121	94	80	30	66	2,425
CVP BANKS PUMPING		0	32	32	0	0	0	0	0	0	0	98	0	162
TRACY PUMPING		124	155	228	246	222	246	90	90	150	240	240	225	2,256
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	(0)	0	0	0	0	(0)	(0)	0	0	0	(0)	
CVP DOS AMIGOS		85	57	28	57	113	50	79	100	107	129	100	57	962
SWP DOS AMIGOS		168	132	181	157	178	194	199	187	251	317	252	158	2,374
CVP SAN LUIS EOM STORAGE	200	140	209	415	577	626	733	611	401	212	51	56	101	
SWP SAN LUIS EOM STORAGE	200	205	260	360	609	811	1,024	962	879	704	449	211	109	
TRINITY EOM ELEVATION (FT)	2,301	2,291	2,288	2,286	2,286	2,290	2,294	2,303	2,307	2,292	2,277	2,255	2,246	
TRINITY SURFACE AREA (ACRES)	11,857	11,231	11,056	10,897	10,950	11,158	11,435	12,022	12,221	11,312	10,354	9,105	8,589	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	982	986	989	992	998	1,007	1,022	1,028	1,024	1,012	992	969	963	
SHASTA SURFACE AREA (ACRES)	19,868	20,328	20,683	20,997	21,628	22,665	24,384	25,121	24,577	23,250	20,974	18,585	17,883	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

DATE: 10/15
TIME: 09:39

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	TEM

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	1,006	974	946	955	993	1,043	1,151	1,189	1,083	922	777	752	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,000	2,067	2,133	2,193	2,313	2,512	2,848	3,039	3,013	2,804	2,482	2,110	1,954	
OROVILLE EOM STORAGE	1,700	1,577	1,536	1,538	1,585	1,687	1,889	2,058	2,010	1,877	1,661	1,518	1,455	
FOLSOM EOM STORAGE	200	177	161	157	168	224	345	457	480	406	275	212	197	
WHISKEYTOWN STORAGE WITHDRAWAL		101	64	32	0	0	0	0	25	59	151	92	32	556
SHASTA STORAGE WITHDRAWAL		(69)	(67)	(59)	(120)	(200)	(336)	(197)	18	198	305	359	148	(19)
OROVILLE STORAGE WITHDRAWAL		121	41	1	(45)	(101)	(203)	(171)	44	126	208	137	59	217
FOLSOM STORAGE WITHDRAWAL		21	16	6	(11)	(55)	(121)	(114)	(26)	69	125	60	12	(17)
SPRING CREEK POWERPLANT		100	60	30					30	60	150	90	30	550
KESWICK RELEASE		231	223	231	200	180	184	253	388	498	655	629	358	4,031
OROVILLE RELEASE		143	121	101	125	99	76	61	61	63	66	72	62	1,050
NIMBUS RELEASE		61	60	62	55	50	55	93	151	140	165	102	60	1,055
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		3,964	4,246	5,223	6,509	6,259	7,792	4,260	4,488	6,017	7,399	7,887	6,340	
FREEPORT FLOW (CFS)		8,621	8,640	9,812	12,769	12,073	14,130	6,791	6,653	7,699	9,208	9,403	8,996	
ACTUAL DELTA OUTFLOW		215	208	215	319	250	309	268	246	232	240	195	151	2,850
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		2,220	879	(966)	(2,522)	(2,354)	(2,417)	2,900	3,787	4,776	5,467	4,425	2,582	18,777
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		163	166	225	379	337	417	115	63	34	35	20	69	2,023
CVP BANKS PUMPING		0	32	0	0	0	0	0	0	0	0	98	0	130
TRACY PUMPING		93	125	245	246	222	246	30	30	40	50	50	191	1,568
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	(0)	0	23	0	0	0	(0)	(0)	(0)	0	
CVP DOS AMIGOS		43	21	11	21	43	26	41	52	56	67	52	30	463
SWP DOS AMIGOS		130	98	143	123	139	150	155	139	188	248	189	117	1,819
CVP SAN LUIS EOM STORAGE	200	159	238	447	649	785	938	828	658	472	254	177	246	
SWP SAN LUIS EOM STORAGE	100	128	192	272	520	710	968	916	826	657	429	246	191	
TRINITY EOM ELEVATION (FT)	2,264	2,254	2,251	2,248	2,249	2,253	2,258	2,269	2,273	2,262	2,245	2,228	2,225	
TRINITY SURFACE AREA (ACRES)	9,620	9,070	8,880	8,708	8,766	8,990	9,289	9,916	10,130	9,521	8,566	7,663	7,500	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	955	959	962	966	972	982	999	1,007	1,006	996	981	961	952	
SHASTA SURFACE AREA (ACRES)	17,119	17,494	17,867	18,197	18,856	19,935	21,709	22,701	22,568	21,479	19,774	17,739	16,856	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

DATE: 10/15
TIME: 09:45

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	50
Alternative Extension	TEM

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	606	585	586	595	633	684	792	830	756	716	632	607	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,767	1,824	1,853	1,973	2,173	2,508	2,730	2,719	2,560	2,235	1,939	1,783	
OROVILLE EOM STORAGE	1,200	1,159	1,179	1,220	1,266	1,368	1,571	1,742	1,694	1,565	1,355	1,215	1,155	
FOLSOM EOM STORAGE	200	178	163	160	172	228	371	545	604	480	275	205	193	
WHISKEYTOWN STORAGE WITHDRAWAL		101	54	2	0	0	0	0	25	29	31	32	32	306
SHASTA STORAGE WITHDRAWAL		(69)	(57)	(29)	(120)	(200)	(336)	(227)	4	148	310	284	148	(144)
OROVILLE STORAGE WITHDRAWAL		39	(20)	(39)	(45)	(101)	(204)	(172)	44	123	203	134	57	21
FOLSOM STORAGE WITHDRAWAL		20	15	5	(11)	(56)	(143)	(175)	(63)	119	199	66	10	(14)
SPRING CREEK POWERPLANT		100	50						30	30	30	30	30	300
KESWICK RELEASE		231	223	231	200	180	184	223	374	418	540	494	358	3,656
OROVILLE RELEASE		61	60	61	125	99	75	60	61	60	61	69	60	854
NIMBUS RELEASE		62	60	62	55	50	34	33	115	192	241	110	60	1,073
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,124	4,324	5,253	6,532	6,287	7,821	4,191	4,960	5,512	6,407	6,407	6,620	
FREEPORT FLOW (CFS)		7,299	7,614	9,168	12,769	12,073	13,763	5,262	5,840	7,161	8,492	7,289	8,962	
ACTUAL DELTA OUTFLOW		215	208	215	341	293	380	268	246	232	240	195	149	2,983
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		2,957	1,453	(606)	(2,235)	(1,735)	(1,295)	3,756	4,242	5,077	5,868	5,609	2,574	25,666
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		82	105	185	357	294	417	24	13	12	11	8	230	1,738
CVP BANKS PUMPING		0	32	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		93	125	245	246	222	153	30	30	30	30	30	30	1,264
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	(0)	(0)	0	0	0	(90)	(50)	(20)	(20)	(10)	163	
CVP DOS AMIGOS		29	14	7	14	29	26	41	52	56	67	52	30	417
SWP DOS AMIGOS		141	64	105	90	101	106	111	91	126	180	125	77	1,317
CVP SAN LUIS EOM STORAGE	200	196	296	515	730	895	966	872	726	558	353	187	109	
SWP SAN LUIS EOM STORAGE	100	38	77	156	416	603	906	809	720	594	413	286	434	
TRINITY EOM ELEVATION (FT)	2,218	2,205	2,202	2,202	2,203	2,209	2,216	2,230	2,235	2,225	2,220	2,209	2,205	
TRINITY SURFACE AREA (ACRES)	7,162	6,528	6,375	6,385	6,452	6,712	7,053	7,761	8,001	7,525	7,270	6,705	6,533	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	941	945	947	954	965	982	993	992	985	968	952	942	
SHASTA SURFACE AREA (ACRES)	15,384	15,777	16,109	16,279	16,967	18,086	19,912	21,089	21,030	20,191	18,431	16,773	15,871	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

DATE: 10/15
TIME: 10:00

Study Year Hydrologic Type (W-A-D-C-E)	E
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	TEM

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,750	1,711	1,672	1,631	1,570	1,478	1,418	1,273	1,033	850	711	680	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	3,200	3,148	3,150	3,139	3,189	3,329	3,519	3,509	3,231	2,874	2,392	1,916	1,750	
OROVILLE EOM STORAGE	2,700	2,546	2,458	2,132	1,880	1,859	1,995	2,004	1,873	1,684	1,455	1,295	1,234	
FOLSOM EOM STORAGE	600	515	440	376	358	363	420	471	455	383	251	196	179	
WHISKEYTOWN STORAGE WITHDRAWAL		152	64	33	27	55	77	80	117	160	162	83	32	1,042
SHASTA STORAGE WITHDRAWAL		48	(2)	11	(50)	(140)	(190)	4	269	345	465	463	158	1,382
OROVILLE STORAGE WITHDRAWAL		151	89	330	254	22	(138)	(11)	128	182	222	155	57	1,441
FOLSOM STORAGE WITHDRAWAL		82	75	66	19	(5)	(57)	(52)	13	68	126	52	15	402
SPRING CREEK POWERPLANT		150	60	30	30	60	90	90	120	160	160	80	30	1,060
KESWICK RELEASE		368	238	231	200	180	220	324	609	695	805	713	358	4,942
OROVILLE RELEASE		161	149	400	384	172	61	101	65	69	70	90	60	1,782
NIMBUS RELEASE		92	89	92	55	50	50	54	70	89	136	64	33	874
VERNALIS FLOW		40	50	50	60	60	60	50	40	20	20	20	30	500
FEATHER RIVER DEMANDS		50	0	0	0	0	1	58	193	193	232	145	87	959
YUBA RIVER ACCRETIONS		32	28	23	14	12	12	10	10	9	5	5	5	165
SACRAMENTO RIVER ACCRETIONS		87	88	63	119	42	(3)	(90)	(290)	(311)	(335)	(200)	30	(800)
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,158	4,239	3,755	4,043	3,168	2,995	4,520	6,911	8,521	9,838	9,838	6,340	
FREEPORT FLOW (CFS)		11,518	9,485	12,787	12,330	7,996	5,336	6,539	7,385	9,111	10,997	10,850	8,075	
ACTUAL DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,773
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		595	405	(2,626)	(2,827)	(77)	2,087	3,041	3,377	3,986	4,465	3,614	3,074	19,115
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		152	145	410	410	183	55	30	28	28	25	27	38	1,532
CVP BANKS PUMPING		32	0	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		220	198	202	180	100	60	70	90	100	150	200	139	1,709
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		6	(0)	(0)	(0)	(1)	(0)	2	(0)	(0)	(0)	0	(0)	
CVP DOS AMIGOS		85	57	28	57	113	26	41	52	56	67	52	30	663
SWP DOS AMIGOS		118	87	130	112	126	136	140	123	168	226	167	104	1,637
CVP SAN LUIS EOM STORAGE	200	268	348	496	595	526	493	424	314	187	69	45	62	
SWP SAN LUIS EOM STORAGE	300	330	384	663	954	1,004	914	792	684	530	316	163	91	
TRINITY EOM ELEVATION (FT)	2,333	2,321	2,318	2,315	2,312	2,307	2,299	2,294	2,281	2,257	2,237	2,220	2,215	
TRINITY SURFACE AREA (ACRES)	13,991	13,200	12,994	12,782	12,566	12,235	11,739	11,410	10,606	9,228	8,126	7,232	7,032	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	1,015	1,012	1,012	1,012	1,014	1,020	1,029	1,028	1,016	1,000	976	950	940	
SHASTA SURFACE AREA (ACRES)	23,529	23,262	23,272	23,216	23,473	24,188	25,152	25,100	23,689	21,846	19,288	16,642	15,678	

LONG-TERM OPERATIONS CRITERIA AND PLAN

OPERATIONS STUDIES

"B" ALTERNATIVE

UNITED STATES BUREAU OF RECLAMATION

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 11:09
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,773	1,753	1,854	1,982	2,082	2,218	2,358	2,441	2,339	2,178	2,011	1,992	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	240	
SHASTA EOM STORAGE	3,200	3,148	3,150	3,150	3,400	3,700	4,100	4,496	4,494	4,291	3,787	3,390	3,194	
OROVILLE EOM STORAGE	2,700	2,594	2,744	2,850	2,850	2,851	2,850	3,025	3,322	3,268	2,796	2,518	2,294	
FOLSOM EOM STORAGE	600	564	574	573	573	624	674	834	974	944	814	653	614	
WHISKEYTOWN STORAGE WITHDRAWAL		116	78	21	3	84	65	64	128	170	176	119	0	1,024
SHASTA STORAGE WITHDRAWAL		48	(2)	0	(250)	(300)	(400)	(403)	(8)	188	482	379	184	(81)
OROVILLE STORAGE WITHDRAWAL		103	(149)	(102)	2	0	0	(177)	(302)	44	461	269	218	367
FOLSOM STORAGE WITHDRAWAL		33	(10)	4	1	(50)	(50)	(162)	(145)	23	121	154	35	(46)
SPRING CREEK POWERPLANT		120	90	60	60	150	120	120	150	180	180	120	0	1,350
KESWICK RELEASE		438	468	760	760	900	700	637	802	738	922	729	414	8,269
OROVILLE RELEASE		205	101	398	662	670	719	525	225	251	449	304	291	4,800
NIMBUS RELEASE		143	104	220	457	376	395	384	451	373	219	254	141	3,516
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		7,296	9,436	18,056	26,550	33,220	20,736	15,238	13,619	10,182	10,638	8,529	7,381	
FREEPORT FLOW (CFS)		15,065	16,103	35,905	65,610	76,716	53,652	36,566	27,365	22,301	22,554	19,151	17,668	
ACTUAL DELTA OUTFLOW		277	405	1,738	3,689	4,013	2,965	1,791	1,391	1,004	622	305	312	18,512
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		(585)	(651)	(1,513)	1,931	4,337	1,837	864	2,503	6,980	2,966	397	(114)	18,953
CROSS CHANNEL GATES		OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		257	397	430	449	405	430	316	184	119	282	216	397	3,881
CVP BANKS PUMPING		128	0	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	0	0	0	(0)	0	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		250	230	264	233	264	295	294	295	393	476	415	253	3,662
CVP SAN LUIS EOM STORAGE	200	390	510	702	864	896	931	880	681	398	155	181	171	
SWP SAN LUIS EOM STORAGE	300	292	449	608	814	944	1,064	1,065	931	632	413	191	318	
TRINITY EOM ELEVATION (FT)	2,333	2,323	2,322	2,329	2,339	2,346	2,356	2,366	2,372	2,365	2,353	2,341	2,340	
TRINITY SURFACE AREA (ACRES)	13,991	13,322	13,217	13,748	14,423	14,943	15,653	16,377	16,803	16,276	15,444	14,572	14,472	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,253	
SHASTA EOM ELEVATION (FT)	1,015	1,012	1,012	1,012	1,024	1,036	1,053	1,069	1,068	1,060	1,040	1,023	1,014	
SHASTA SURFACE AREA (ACRES)	23,529	23,262	23,272	23,272	24,548	26,063	28,060	30,019	30,009	29,007	26,501	24,499	23,496	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 11:13
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,374	1,354	1,454	1,583	1,766	1,963	2,163	2,335	2,354	2,163	1,996	1,977	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	240	
SHASTA EOM STORAGE	2,500	2,509	2,661	3,150	3,400	3,700	4,100	4,496	4,494	4,291	3,787	3,390	3,194	
OROVILLE EOM STORAGE	2,200	2,094	2,197	2,596	2,850	2,851	2,850	3,025	3,322	3,294	2,921	2,625	2,400	
FOLSOM EOM STORAGE	400	400	410	521	573	624	674	834	974	944	810	674	614	
WHISKEYTOWN STORAGE WITHDRAWAL		116	78	21	3	0	5	4	38	50	206	119	0	640
SHASTA STORAGE WITHDRAWAL		(12)	(152)	(489)	(250)	(300)	(400)	(403)	(8)	188	482	379	184	(780)
OROVILLE STORAGE WITHDRAWAL		103	(102)	(395)	(252)	0	0	(177)	(302)	18	362	287	218	(240)
FOLSOM STORAGE WITHDRAWAL		(2)	(10)	(108)	(51)	(50)	(50)	(162)	(145)	23	125	129	55	(246)
SPRING CREEK POWERPLANT		120	90	60	60	66	60	60	60	60	210	120	0	966
KESWICK RELEASE		378	318	271	760	816	640	577	712	618	952	729	414	7,186
OROVILLE RELEASE		205	148	105	408	670	719	525	225	225	350	322	291	4,193
NIMBUS RELEASE		108	104	108	405	376	395	384	451	373	223	229	162	3,316
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,314	6,917	10,102	26,550	31,712	19,760	14,230	12,155	8,165	11,126	8,529	7,381	
FREEPORT FLOW (CFS)		13,503	14,373	21,362	60,625	75,206	52,676	35,558	25,901	19,847	21,496	19,042	18,016	
ACTUAL DELTA OUTFLOW		277	302	844	3,382	3,929	2,905	1,675	1,301	858	615	305	333	16,726
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		289	(1,066)	747	1,413	4,180	1,735	5	2,351	6,391	3,464	458	(31)	19,937
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		257	301	430	449	405	430	372	184	119	199	234	397	3,777
CVP BANKS PUMPING		32	96	0	0	0	0	0	0	0	25	170	0	323
TRACY PUMPING		246	238	246	246	222	246	250	184	178	282	282	250	2,870
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	0	0	(0)	(0)	0	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		238	206	256	222	253	280	293	283	376	453	381	238	3,479
CVP SAN LUIS EOM STORAGE	200	294	510	702	864	896	931	880	681	398	180	181	171	
SWP SAN LUIS EOM STORAGE	200	205	290	457	674	815	951	1,010	889	608	331	161	305	
TRINITY EOM ELEVATION (FT)	2,301	2,290	2,288	2,297	2,308	2,323	2,338	2,352	2,364	2,366	2,352	2,340	2,339	
TRINITY SURFACE AREA (ACRES)	11,857	11,165	11,056	11,608	12,304	13,283	14,319	15,363	16,259	16,353	15,366	14,493	14,393	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,253	
SHASTA EOM ELEVATION (FT)	982	982	990	1,012	1,024	1,036	1,053	1,069	1,068	1,060	1,040	1,023	1,014	
SHASTA SURFACE AREA (ACRES)	19,868	19,916	20,725	23,272	24,548	26,063	28,060	30,019	30,009	29,007	26,501	24,499	23,496	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 12:05
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	974	984	1,085	1,213	1,388	1,584	1,800	2,003	2,052	2,071	2,025	2,006	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	242	240	241	
SHASTA EOM STORAGE	2,000	2,041	2,180	2,709	3,400	3,700	4,100	4,496	4,494	4,291	3,682	3,157	3,018	
OROVILLE EOM STORAGE	1,700	1,595	1,715	2,113	2,670	2,930	2,929	3,103	3,401	3,326	2,880	2,605	2,407	
FOLSOM EOM STORAGE	200	201	211	321	573	624	674	834	974	944	725	573	614	
WHISKEYTOWN STORAGE WITHDRAWAL		116	48	21	3	9	5	0	8	20	0	0	0	230
SHASTA STORAGE WITHDRAWAL		(44)	(139)	(529)	(691)	(300)	(400)	(403)	(8)	188	587	508	128	(1,103)
OROVILLE STORAGE WITHDRAWAL		103	(119)	(395)	(555)	(259)	0	(177)	(302)	64	435	266	192	(748)
FOLSOM STORAGE WITHDRAWAL		(3)	(10)	(108)	(251)	(50)	(50)	(162)	(145)	23	210	146	(45)	(445)
SPRING CREEK POWERPLANT		120	60	60	60	75	60	45	30	30	0	0	0	540
KESWICK RELEASE		346	301	231	319	825	640	562	682	588	847	738	358	6,437
OROVILLE RELEASE		205	131	105	105	411	719	525	225	271	423	301	265	3,685
NIMBUS RELEASE		108	104	108	205	375	395	384	451	373	307	246	61	3,117
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,836	6,653	9,451	19,385	31,870	19,760	13,978	11,667	7,661	9,418	8,664	6,430	
FREEPORT FLOW (CFS)		12,983	13,799	20,706	45,285	70,695	52,676	35,306	25,413	20,116	22,359	19,104	14,932	
ACTUAL DELTA OUTFLOW		277	268	803	2,473	3,792	2,940	1,662	1,271	875	615	305	149	15,431
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		581	(1,204)	589	257	5,351	2,195	5	2,300	6,469	2,982	424	(771)	19,179
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		257	269	430	449	405	430	370	184	118	277	213	397	3,799
CVP BANKS PUMPING		0	128	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	212	108	211	250	184	178	282	282	250	2,687
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	(0)	0	0	0	0	0	0	0	6	0	32	
CVP DOS AMIGOS		43	21	11	21	43	70	140	154	197	225	169	112	1,206
SWP DOS AMIGOS		238	219	256	224	255	282	285	283	376	415	419	238	3,490
CVP SAN LUIS EOM STORAGE	200	312	600	810	976	976	976	925	726	443	200	226	216	
SWP SAN LUIS EOM STORAGE	100	105	145	312	527	666	800	865	744	462	301	72	216	
TRINITY EOM ELEVATION (FT)	2,264	2,251	2,252	2,263	2,275	2,291	2,308	2,325	2,341	2,344	2,346	2,342	2,341	
TRINITY SURFACE AREA (ACRES)	9,620	8,879	8,940	9,531	10,268	11,242	12,312	13,461	14,530	14,786	14,886	14,647	14,547	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,210	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,262	3,252	3,255	
SHASTA EOM ELEVATION (FT)	955	957	965	992	1,024	1,036	1,053	1,069	1,068	1,060	1,036	1,013	1,006	
SHASTA SURFACE AREA (ACRES)	17,119	17,353	18,126	20,982	24,548	26,063	28,060	30,019	30,009	29,007	25,974	23,310	22,592	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	W
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/13
TIME: 19:26
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	594	615	735	863	1,038	1,235	1,450	1,669	1,734	1,741	1,695	1,677	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,721	1,849	2,359	3,169	3,700	4,100	4,496	4,494	4,291	3,702	3,177	3,068	
OROVILLE EOM STORAGE	1,200	1,184	1,334	1,731	2,288	2,865	2,900	3,075	3,372	3,298	2,842	2,567	2,342	
FOLSOM EOM STORAGE	200	202	213	324	573	624	674	834	974	944	725	573	586	
WHISKEYTOWN STORAGE WITHDRAWAL		96	38	1	3	9	5	0	0	5	11	0	28	197
SHASTA STORAGE WITHDRAWAL		(24)	(128)	(509)	(810)	(531)	(400)	(403)	(8)	188	567	508	97	(1,453)
OROVILLE STORAGE WITHDRAWAL		14	(149)	(395)	(555)	(576)	(36)	(177)	(302)	64	445	266	218	(1,183)
FOLSOM STORAGE WITHDRAWAL		(4)	(11)	(109)	(248)	(50)	(50)	(162)	(145)	23	210	146	(17)	(417)
SPRING CREEK POWERPLANT		100	50	40	60	75	60	45	15	15	15	0	30	505
KESWICK RELEASE		346	302	231	200	594	640	562	667	573	842	738	358	6,052
OROVILLE RELEASE		116	101	105	105	94	683	525	225	271	433	301	291	3,250
NIMBUS RELEASE		108	104	108	209	376	395	384	451	373	307	246	89	3,149
VERNALIS FLOW		110	145	215	300	350	340	255	210	180	85	90	95	2,375
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	110	210	410	425	335	165	115	100	97	115	130	2,297
SACRAMENTO RIVER ACCRETIONS		140	285	830	2,155	2,315	1,485	630	205	(35)	(203)	(110)	205	7,902
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,005	6,734	9,473	17,440	27,711	19,760	13,978	11,423	7,409	9,339	8,664	6,430	
FREEPORT FLOW (CFS)		11,544	13,308	20,706	43,397	60,844	52,090	35,306	25,169	19,864	22,436	19,104	15,848	
ACTUAL DELTA OUTFLOW		277	268	803	2,435	3,271	2,904	1,662	1,256	859	615	305	204	14,860
REQUIRED DELTA OUTFLOW		277	268	277	277	555	615	595	821	783	615	305	149	5,537
ANTIOCH FLOW		1,387	(929)	589	1,089	4,702	2,134	5	2,275	6,396	2,938	424	(551)	20,457
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		168	240	430	449	405	430	382	184	119	282	213	397	3,699
CVP BANKS PUMPING		0	128	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	133	82	211	238	184	178	282	282	250	2,570
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		(0)	(0)	0	0	0	0	0	0	0	(0)	0	0	
CVP DOS AMIGOS		29	14	7	14	29	70	140	154	197	225	169	112	1,160
SWP DOS AMIGOS		216	222	236	203	229	253	257	251	334	408	337	211	3,157
CVP SAN LUIS EOM STORAGE	200	349	658	878	976	976	976	913	714	431	188	214	204	
SWP SAN LUIS EOM STORAGE	100	40	49	238	474	640	804	910	823	586	439	294	467	
TRINITY EOM ELEVATION (FT)	2,218	2,203	2,206	2,223	2,239	2,258	2,277	2,297	2,315	2,320	2,321	2,317	2,315	
TRINITY SURFACE AREA (ACRES)	7,162	6,444	6,585	7,392	8,207	9,259	10,389	11,587	12,769	13,114	13,150	12,905	12,807	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	939	946	974	1,013	1,036	1,053	1,069	1,068	1,060	1,036	1,014	1,009	
SHASTA SURFACE AREA (ACRES)	15,384	15,509	16,258	19,106	23,370	26,063	28,060	30,019	30,009	29,007	26,074	23,412	22,851	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/13
TIME: 19:51
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,765	1,726	1,746	1,812	1,926	2,057	2,243	2,327	2,152	1,974	1,890	1,840	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	3,200	3,148	3,110	3,150	3,400	3,700	4,100	4,496	4,432	4,266	3,787	3,240	3,113	
OROVILLE EOM STORAGE	2,700	2,556	2,626	2,745	2,850	2,851	2,850	3,025	3,097	2,900	2,494	2,150	1,894	
FOLSOM EOM STORAGE	600	570	560	571	573	624	674	800	968	888	687	566	579	
WHISKEYTOWN STORAGE WITHDRAWAL		120	59	20	0	0	0	0	47	170	175	31	56	678
SHASTA STORAGE WITHDRAWAL		48	38	(40)	(250)	(300)	(400)	(403)	54	152	457	529	115	0
OROVILLE STORAGE WITHDRAWAL		141	(69)	(115)	(103)	0	0	(177)	(77)	187	396	336	250	769
FOLSOM STORAGE WITHDRAWAL		27	10	(8)	(1)	(50)	(50)	(128)	(173)	74	191	115	(17)	(10)
SPRING CREEK POWERPLANT		120	60	30	32	42	35	0	60	175	175	30	55	814
KESWICK RELEASE		408	398	370	372	472	445	217	594	627	862	769	380	5,914
OROVILLE RELEASE		203	101	105	217	450	449	295	151	234	314	321	263	3,102
NIMBUS RELEASE		108	104	108	155	216	265	298	293	293	309	215	89	2,452
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,808	7,976	8,842	10,746	17,952	16,588	7,947	8,879	7,361	9,029	8,568	6,208	
FREEPORT FLOW (CFS)		13,964	13,916	15,982	21,938	41,371	42,999	23,772	18,331	17,626	20,127	18,712	14,915	
ACTUAL DELTA OUTFLOW		277	268	436	852	2,005	2,254	1,066	797	636	474	278	148	9,489
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		32	(1,270)	(1,552)	(4,582)	13	0	16	4,416	4,648	2,397	292	(775)	3,636
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		317	256	422	436	285	296	210	143	119	236	261	397	3,378
CVP BANKS PUMPING		0	128	0	0	0	0	0	0	0	45	150	0	323
TRACY PUMPING		246	238	246	246	222	246	210	184	178	282	282	250	2,830
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		69	59	0	0	0	0	0	0	(0)	(0)	0	32	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		225	195	244	212	240	266	277	267	355	431	359	224	3,295
CVP SAN LUIS EOM STORAGE	200	262	510	702	864	896	931	840	641	358	160	141	131	
SWP SAN LUIS EOM STORAGE	300	378	430	603	816	851	868	781	636	377	160	40	199	
TRINITY EOM ELEVATION (FT)	2,333	2,322	2,319	2,321	2,326	2,335	2,345	2,358	2,364	2,351	2,338	2,332	2,328	
TRINITY SURFACE AREA (ACRES)	13,991	13,280	13,073	13,176	13,529	14,126	14,814	15,782	16,216	15,309	14,376	13,937	13,676	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,966	2,965	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	1,015	1,012	1,011	1,012	1,024	1,036	1,053	1,069	1,066	1,059	1,040	1,016	1,011	
SHASTA SURFACE AREA (ACRES)	23,529	23,262	23,067	23,272	24,548	26,063	28,060	30,019	29,705	28,883	26,502	23,736	23,083	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/13
TIME: 20:06
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,366	1,297	1,316	1,370	1,480	1,602	1,788	1,931	1,887	1,839	1,786	1,762	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,500	2,518	2,568	2,748	3,183	3,700	4,100	4,460	4,357	4,065	3,500	2,879	2,750	
OROVILLE EOM STORAGE	2,200	2,054	2,077	2,196	2,413	2,770	2,911	3,086	3,112	2,919	2,503	2,204	1,926	
FOLSOM EOM STORAGE	400	370	360	371	420	624	674	800	954	869	671	550	563	
WHISKEYTOWN STORAGE WITHDRAWAL		120	89	20	13	3	10	0	0	40	45	1	31	372
SHASTA STORAGE WITHDRAWAL		(21)	(51)	(179)	(435)	(517)	(400)	(367)	92	278	544	604	118	(333)
OROVILLE STORAGE WITHDRAWAL		143	(22)	(115)	(215)	(356)	(143)	(177)	(31)	183	406	291	272	237
FOLSOM STORAGE WITHDRAWAL		27	10	(8)	(48)	(203)	(50)	(128)	(158)	78	190	115	(17)	(193)
SPRING CREEK POWERPLANT		120	90	30	45	45	45	0	2	45	45	0	30	497
KESWICK RELEASE		339	339	231	200	258	455	253	574	623	819	814	358	5,264
OROVILLE RELEASE		205	148	105	105	94	306	295	197	230	324	276	285	2,570
NIMBUS RELEASE		108	104	108	108	63	265	298	307	298	307	215	89	2,269
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,685	6,993	6,573	7,946	14,096	16,751	8,559	8,562	7,297	8,333	9,297	5,837	
FREEPORT FLOW (CFS)		12,872	13,723	13,713	16,547	28,349	40,834	24,383	18,998	17,566	19,557	18,712	14,915	
ACTUAL DELTA OUTFLOW		277	268	296	520	1,376	2,139	1,098	797	636	474	278	148	8,308
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		643	(1,161)	(2,096)	(2,025)	27	9	25	4,043	4,682	2,715	292	(775)	6,380
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		250	245	422	436	206	278	212	184	115	246	216	397	3,207
CVP BANKS PUMPING		0	128	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		246	238	246	246	206	246	212	184	178	282	282	250	2,816
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	0	0	0	0	0	(0)	0	(0)	0	10	
CVP DOS AMIGOS		85	57	28	57	113	70	140	154	197	225	169	112	1,406
SWP DOS AMIGOS		206	176	209	191	217	238	242	235	322	367	326	198	2,927
CVP SAN LUIS EOM STORAGE	200	262	510	702	864	880	915	826	627	344	101	127	117	
SWP SAN LUIS EOM STORAGE	200	232	294	503	737	716	744	697	626	398	256	127	313	
TRINITY EOM ELEVATION (FT)	2,301	2,289	2,283	2,285	2,290	2,299	2,309	2,324	2,335	2,332	2,328	2,324	2,322	
TRINITY SURFACE AREA (ACRES)	11,857	11,121	10,739	10,847	11,143	11,750	12,407	13,401	14,152	13,921	13,670	13,388	13,260	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	982	983	985	994	1,014	1,036	1,053	1,067	1,063	1,051	1,028	1,000	994	
SHASTA SURFACE AREA (ACRES)	19,868	19,963	20,233	21,183	23,441	26,063	28,060	29,839	29,335	27,887	25,055	21,871	21,194	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	8

DATE: 10/13
TIME: 20:19
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	966	927	947	1,013	1,124	1,245	1,432	1,575	1,574	1,572	1,520	1,496	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,000	2,050	2,172	2,351	2,773	3,368	4,023	4,443	4,350	4,016	3,406	2,786	2,657	
OROVILLE EOM STORAGE	1,700	1,555	1,577	1,668	1,885	2,242	2,585	2,995	3,069	2,872	2,456	2,157	1,879	
FOLSOM EOM STORAGE	200	217	252	308	404	624	674	830	974	889	691	570	582	
WHISKEYTOWN STORAGE WITHDRAWAL		120	59	20	0	3	10	0	0	0	0	1	31	244
SHASTA STORAGE WITHDRAWAL		(53)	(122)	(179)	(422)	(595)	(655)	(427)	83	319	589	604	118	(739)
OROVILLE STORAGE WITHDRAWAL		143	(22)	(88)	(215)	(356)	(344)	(412)	(79)	187	406	291	272	(217)
FOLSOM STORAGE WITHDRAWAL		(19)	(35)	(55)	(95)	(219)	(50)	(158)	(149)	78	190	115	(17)	(413)
SPRING CREEK POWERPLANT		120	60	30	32	45	45	0	2	3	0	0	30	367
KESWICK RELEASE		307	238	231	200	180	200	193	565	622	819	814	358	4,728
OROVILLE RELEASE		205	148	132	105	94	105	60	149	234	324	276	285	2,116
NIMBUS RELEASE		62	60	61	61	46	265	268	317	298	307	215	89	2,049
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,213	5,308	6,580	7,946	12,703	12,601	7,550	8,411	7,290	8,333	9,297	5,832	
FREEPORT FLOW (CFS)		11,610	11,269	13,404	15,797	26,653	33,415	18,917	18,217	17,626	19,557	18,712	14,915	
ACTUAL DELTA OUTFLOW		277	268	277	474	1,294	1,743	815	797	636	474	278	148	7,481
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		1,349	214	(2,170)	(2,205)	24	19	22	4,480	4,649	2,715	292	(775)	8,613
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		250	245	422	436	200	232	191	136	119	246	216	397	3,089
CVP BANKS PUMPING		64	64	0	0	0	0	0	0	0	0	195	0	323
TRACY PUMPING		104	156	246	246	200	232	191	184	178	282	282	250	2,551
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	71	0	0	0	0	(0)	0	(0)	0	9	
CVP DOS AMIGOS		43	21	11	21	43	70	140	154	197	225	169	112	1,206
SWP DOS AMIGOS		201	195	206	180	204	223	228	219	292	363	295	184	2,790
CVP SAN LUIS EOM STORAGE	200	235	376	587	786	878	899	789	590	307	64	90	80	
SWP SAN LUIS EOM STORAGE	100	138	181	393	638	625	622	569	467	274	137	40	240	
TRINITY EOM ELEVATION (FT)	2,264	2,250	2,246	2,248	2,255	2,267	2,278	2,295	2,307	2,307	2,307	2,303	2,301	
TRINITY SURFACE AREA (ACRES)	9,620	8,831	8,597	8,715	9,112	9,757	10,449	11,487	12,264	12,256	12,247	11,963	11,836	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	955	958	965	974	995	1,022	1,050	1,066	1,063	1,049	1,024	996	989	
SHASTA SURFACE AREA (ACRES)	17,119	17,399	18,080	19,064	21,317	24,384	27,676	29,755	29.297	27,644	24,580	21,382	20,704	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	A
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	100
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 12:12
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	586	558	567	634	747	878	1,066	1,210	1,209	1,209	1,158	1,038	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,731	1,843	2,032	2,454	3,046	3,691	4,111	4,009	3,677	3,068	2,479	2,448	
OROVILLE EOM STORAGE	1,200	1,155	1,225	1,342	1,559	1,915	2,258	2,669	2,723	2,527	2,112	1,814	1,565	
FOLSOM EOM STORAGE	200	218	254	311	407	618	674	800	954	869	671	519	532	
WHISKEYTOWN STORAGE WITHDRAWAL		100	49	30	0	0	0	0	0	0	0	1	128	309
SHASTA STORAGE WITHDRAWAL		(33)	(112)	(189)	(422)	(592)	(645)	(427)	92	319	589	573	22	(825)
OROVILLE STORAGE WITHDRAWAL		43	(69)	(115)	(215)	(356)	(344)	(412)	(59)	187	406	291	244	(399)
FOLSOM STORAGE WITHDRAWAL		(20)	(35)	(55)	(95)	(211)	(56)	(128)	(158)	78	190	146	(17)	(362)
SPRING CREEK POWERPLANT		100	50	40	32	42	35	0	2	3	0	0	127	432
KESWICK RELEASE		307	238	231	200	180	200	193	574	622	819	783	359	4,707
OROVILLE RELEASE		105	101	105	105	94	105	60	169	234	324	276	257	1,934
NIMBUS RELEASE		61	60	61	61	56	260	298	307	298	307	246	89	2,104
VERNALIS FLOW		110	125	130	135	185	150	145	130	90	85	90	95	1,470
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	105	110	335	165	115	100	97	115	130	1,532
SACRAMENTO RIVER ACCRETIONS		140	225	400	605	1,160	1,485	605	90	(105)	(248)	(155)	155	4,357
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,361	5,383	6,607	7,946	12,703	12,601	7,550	8,562	7,290	8,333	8,796	5,848	
FREEPORT FLOW (CFS)		9,971	10,480	12,963	15,797	26,829	33,330	19,417	18,543	17,626	19,557	18,712	14,456	
ACTUAL DELTA OUTFLOW		277	268	277	474	1,301	1,737	841	797	636	474	278	148	7,508
REQUIRED DELTA OUTFLOW		277	268	277	277	250	277	453	797	636	474	278	148	4,412
ANTIOCH FLOW		2,267	655	(1,924)	(2,205)	4	0	20	4,298	4,649	2,715	292	(518)	10,255
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	O/C	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		150	198	395	436	208	254	193	156	119	246	216	370	2,941
CVP BANKS PUMPING		48	48	0	0	0	0	0	0	0	0	195	0	291
TRACY PUMPING		119	172	246	246	195	211	193	184	178	282	282	250	2,557
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		(0)	0	70	0	0	0	0	(0)	0	(0)	(0)	10	
CVP DOS AMIGOS		29	14	7	14	29	70	140	154	197	225	169	112	1,160
SWP DOS AMIGOS		181	143	193	169	191	209	213	203	272	340	274	171	2,559
CVP SAN LUIS EOM STORAGE	200	270	433	653	864	976	976	868	669	386	143	169	159	
SWP SAN LUIS EOM STORAGE	100	60	109	307	565	573	607	570	505	334	221	145	333	
TRINITY EOM ELEVATION (FT)	2,218	2,202	2,197	2,199	2,209	2,224	2,240	2,261	2,275	2,275	2,275	2,270	2,258	
TRINITY SURFACE AREA (ACRES)	7,162	6,388	6,183	6,250	6,715	7,469	8,299	9,422	10,249	10,246	10,245	9,953	9,258	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	939	946	957	979	1,008	1,036	1,053	1,049	1,035	1,009	981	979	
SHASTA SURFACE AREA (ACRES)	15,384	15,566	16,219	17,300	19,622	22,736	26,018	28,115	27,610	25,946	22,850	19,757	19,587	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	75
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 12:16
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,763	1,713	1,713	1,746	1,832	1,941	2,066	2,147	2,067	1,909	1,703	1,680	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	236	
SHASTA EOM STORAGE	3,200	3,148	3,150	3,150	3,360	3,700	4,100	4,324	4,233	3,979	3,457	2,965	2,792	
OROVILLE EOM STORAGE	2,700	2,554	2,525	2,446	2,646	2,942	3,268	3,493	3,486	3,278	2,881	2,537	2,212	
FOLSOM EOM STORAGE	600	530	470	431	440	509	646	801	850	704	554	475	468	
WHISKEYTOWN STORAGE WITHDRAWAL		120	60	23	3	3	5	9	20	56	150	151	2	602
SHASTA STORAGE WITHDRAWAL		48	(2)	0	(210)	(340)	(400)	(231)	81	239	501	476	162	325
OROVILLE STORAGE WITHDRAWAL		143	30	83	(199)	(294)	(328)	(228)	2	198	386	334	319	447
FOLSOM STORAGE WITHDRAWAL		67	60	42	(8)	(68)	(138)	(156)	(54)	140	141	74	3	103
SPRING CREEK POWERPLANT		120	60	30	20	30	30	30	30	60	150	150	0	710
KESWICK RELEASE		388	308	350	200	200	260	299	511	569	871	826	352	5,135
OROVILLE RELEASE		205	150	243	61	56	61	164	179	205	294	309	352	2,280
NIMBUS RELEASE		108	104	108	108	97	108	129	192	240	229	154	89	1,665
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,483	6,064	7,693	7,508	10,718	9,812	5,567	6,927	5,882	8,798	9,692	5,815	
FREEPORT FLOW (CFS)		13,671	12,641	16,598	14,928	20,893	18,102	11,928	13,533	13,223	17,134	17,573	14,932	
ACTUAL DELTA OUTFLOW		215	208	461	411	1,015	922	452	467	366	289	219	149	5,174
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		(611)	(1,362)	(1,566)	(2,537)	15	0	7	2,810	3,484	1,666	162	(771)	1,297
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		265	348	420	430	162	149	168	123	117	237	250	397	3,066
CVP BANKS PUMPING		96	0	0	0	0	0	0	0	0	45	150	0	291
TRACY PUMPING		246	238	246	246	162	149	96	184	178	282	282	250	2,559
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		14	117	0	0	0	0	(0)	(0)	(0)	0	(0)	(0)	
CVP DOS AMIGOS		85	57	28	57	113	106	117	138	148	180	148	85	1,262
SWP DOS AMIGOS		206	176	209	191	217	238	242	235	322	367	326	198	2,927
CVP SAN LUIS EOM STORAGE	200	358	478	670	832	812	727	560	398	187	45	72	102	
SWP SAN LUIS EOM STORAGE	300	347	513	719	948	883	782	690	558	332	182	86	273	
TRINITY EOM ELEVATION (FT)	2,333	2,322	2,318	2,318	2,321	2,328	2,336	2,345	2,351	2,345	2,334	2,318	2,316	
TRINITY SURFACE AREA (ACRES)	13,991	13,269	13,004	13,001	13,179	13,632	14,208	14,862	15,284	14,865	14,036	12,949	12,824	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,220	
SHASTA EOM ELEVATION (FT)	1,015	1,012	1,012	1,012	1,022	1,036	1,053	1,062	1,058	1,048	1,026	1,004	996	
SHASTA SURFACE AREA (ACRES)	23,529	23,262	23,272	23,272	24,346	26,063	28,060	29,168	28,718	27,459	24,840	22,319	21,414	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	75
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 12:19
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,334	1,284	1,253	1,290	1,378	1,493	1,648	1,700	1,621	1,574	1,379	1,357	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	236	
SHASTA EOM STORAGE	2,500	2,541	2,582	2,731	2,938	3,295	3,734	3,935	3,836	3,581	2,999	2,559	2,381	
OROVILLE EOM STORAGE	2,200	2,054	2,026	2,058	2,258	2,553	2,880	3,069	3,063	2,854	2,487	2,104	1,786	
FOLSOM EOM STORAGE	400	346	300	276	301	397	566	750	838	693	466	357	350	
WHISKEYTOWN STORAGE WITHDRAWAL		150	60	53	0	0	0	0	50	56	40	141	2	552
SHASTA STORAGE WITHDRAWAL		(45)	(40)	(149)	(207)	(357)	(440)	(207)	90	241	564	425	168	43
OROVILLE STORAGE WITHDRAWAL		143	29	(28)	(199)	(294)	(328)	(192)	2	200	356	375	313	377
FOLSOM STORAGE WITHDRAWAL		52	45	26	(24)	(96)	(168)	(186)	(92)	139	219	105	3	22
SPRING CREEK POWERPLANT		150	60	60	17	27	25	0	60	60	40	140	0	639
KESWICK RELEASE		325	270	231	200	180	215	293	550	571	824	765	358	4,782
OROVILLE RELEASE		205	149	132	61	56	61	200	179	207	264	350	346	2,210
NIMBUS RELEASE		92	89	92	92	69	77	99	154	238	307	185	89	1,584
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,461	5,421	5,750	7,508	10,364	9,085	5,466	7,555	5,909	8,022	8,702	5,916	
FREEPORT FLOW (CFS)		12,399	11,732	12,598	14,678	20,039	16,876	11,923	13,533	13,257	17,134	17,752	14,932	
ACTUAL DELTA OUTFLOW		215	208	215	395	974	857	452	467	366	289	219	149	4,806
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		101	(853)	(2,526)	(2,603)	13	3	11	2,810	3,465	1,666	62	(771)	1,376
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		251	230	420	431	159	144	195	123	119	207	291	397	2,966
CVP BANKS PUMPING		32	64	0	0	0	0	0	0	0	75	120	0	291
TRACY PUMPING		246	238	246	246	159	144	69	184	178	282	282	250	2,524
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	101	0	0	0	(0)	0	(0)	(0)	(0)	6	
CVP DOS AMIGOS		85	57	28	57	113	106	117	138	148	180	148	85	1,262
SWP DOS AMIGOS		193	165	196	179	203	223	227	220	302	344	306	186	2,744
CVP SAN LUIS EOM STORAGE	200	294	478	670	832	809	719	525	363	152	40	37	67	
SWP SAN LUIS EOM STORAGE	200	247	305	524	767	714	624	575	459	256	100	66	266	
TRINITY EOM ELEVATION (FT)	2,301	2,286	2,282	2,279	2,282	2,290	2,300	2,313	2,317	2,311	2,307	2,290	2,288	
TRINITY SURFACE AREA (ACRES)	11,857	10,944	10,666	10,495	10,699	11,190	11,817	12,656	12,932	12,508	12,256	11,196	11,072	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,209	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	3,220	
SHASTA EOM ELEVATION (FT)	982	984	986	993	1,003	1,019	1,038	1,046	1,042	1,031	1,006	985	976	
SHASTA SURFACE AREA (ACRES)	19,868	20,090	20,304	21,095	22,178	24,014	26,236	27,236	26,743	25,466	22,492	20,183	19,224	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	75
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/14
TIME: 08:49
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	984	934	934	967	1,053	1,162	1,318	1,400	1,282	1,176	1,023	998	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,000	2,011	2,082	2,202	2,412	2,771	3,232	3,241	3,144	2,931	2,425	2,042	1,895	
OROVILLE EOM STORAGE	1,700	1,639	1,637	1,678	1,879	2,173	2,500	2,815	2,809	2,600	2,159	1,795	1,559	
FOLSOM EOM STORAGE	200	177	162	168	223	358	569	821	877	732	566	456	449	
WHISKEYTOWN STORAGE WITHDRAWAL		100	60	23	3	3	5	0	20	96	100	101	32	543
SHASTA STORAGE WITHDRAWAL		(13)	(72)	(119)	(210)	(360)	(460)	(15)	89	201	489	370	138	38
OROVILLE STORAGE WITHDRAWAL		59	2	(38)	(199)	(294)	(328)	(317)	2	200	431	356	231	106
FOLSOM STORAGE WITHDRAWAL		21	15	(5)	(55)	(135)	(211)	(253)	(61)	139	158	104	3	(279)
SPRING CREEK POWERPLANT		100	60	30	20	30	30	0	30	100	100	100	30	630
KESWICK RELEASE		307	238	231	200	180	200	485	519	571	809	670	358	4,768
OROVILLE RELEASE		121	122	122	61	56	61	75	179	207	339	331	264	1,939
NIMBUS RELEASE		62	60	61	61	31	34	33	184	238	246	185	89	1,283
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,200	4,908	5,758	7,508	10,364	8,833	8,683	7,056	5,909	7,789	7,170	5,909	
FREEPORT FLOW (CFS)		10,231	10,245	11,938	14,178	19,339	15,924	11,928	13,533	13,257	17,134	15,905	13,553	
ACTUAL DELTA OUTFLOW		215	208	215	365	941	806	452	467	366	289	219	149	4,692
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		1,315	(20)	(2,157)	(2,723)	26	8	7	2,810	3,465	1,666	1,096	1	5,495
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		167	203	379	431	156	140	70	123	119	282	272	315	2,657
CVP BANKS PUMPING		48	48	0	0	0	0	0	0	0	0	25	0	121
TRACY PUMPING		181	193	246	246	156	140	194	184	178	282	282	250	2,531
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	0	70	0	0	0	(0)	0	(0)	(0)	0	5	
CVP DOS AMIGOS		43	21	11	21	43	106	117	138	148	180	148	85	1,061
SWP DOS AMIGOS		216	132	181	157	178	194	199	187	251	317	252	158	2,422
CVP SAN LUIS EOM STORAGE	200	295	458	668	867	924	830	761	599	387	201	102	132	
SWP SAN LUIS EOM STORAGE	100	43	108	303	567	536	471	327	246	95	42	46	193	
TRINITY EOM ELEVATION (FT)	2,264	2,252	2,247	2,247	2,250	2,259	2,270	2,285	2,292	2,282	2,272	2,256	2,254	
TRINITY SURFACE AREA (ACRES)	9,620	8,939	8,640	8,636	8,838	9,344	9,978	10,858	11,312	10,655	10,059	9,171	9,022	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	955	956	960	966	977	995	1,016	1,017	1,012	1,002	978	957	949	
SHASTA SURFACE AREA (ACRES)	17,119	17,178	17,583	18,246	19,394	21,308	23,691	23,738	23,241	22,142	19,466	17,355	16,522	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	D
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	50
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/16
TIME: 12:24
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	604	585	604	637	723	833	989	1,072	994	900	848	827	
WHISKEYTOWN EOM STORAGE	206	206	206	206	206	206	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,690	1,732	1,832	2,042	2,401	2,862	2,913	2,820	2,660	2,342	2,050	1,900	
OROVILLE EOM STORAGE	1,200	1,199	1,259	1,360	1,560	1,855	2,182	2,512	2,508	2,301	1,862	1,441	1,377	
FOLSOM EOM STORAGE	200	178	164	170	226	362	574	768	825	680	484	374	368	
WHISKEYTOWN STORAGE WITHDRAWAL		80	30	3	3	3	5	0	20	56	90	1	28	320
SHASTA STORAGE WITHDRAWAL		7	(42)	(99)	(210)	(360)	(460)	(57)	86	149	302	279	141	(264)
OROVILLE STORAGE WITHDRAWAL		(1)	(60)	(99)	(199)	(294)	(328)	(332)	0	198	431	414	60	(208)
FOLSOM STORAGE WITHDRAWAL		20	15	(5)	(55)	(136)	(211)	(196)	(61)	139	189	104	4	(195)
SPRING CREEK POWERPLANT		80	30	10	20	30	30	0	30	60	90	0	26	406
KESWICK RELEASE		307	238	231	200	180	200	443	516	479	612	479	358	4,243
OROVILLE RELEASE		61	60	61	61	56	61	60	177	205	339	389	93	1,625
NIMBUS RELEASE		62	60	61	61	31	34	89	184	238	277	184	90	1,371
VERNALIS FLOW		110	105	115	120	150	105	80	75	80	85	90	95	1,210
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		85	75	100	99	92	79	42	40	33	49	62	70	826
SACRAMENTO RIVER ACCRETIONS		140	190	320	549	807	684	117	(50)	(227)	(341)	(208)	95	2,076
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,367	4,984	5,787	7,516	10,371	8,843	8,135	7,264	4,701	4,943	4,333	6,014	
FREEPORT FLOW (CFS)		9,270	9,203	10,954	14,178	19,339	15,924	11,915	13,458	11,684	14,428	13,729	10,680	
ACTUAL DELTA OUTFLOW		215	208	215	365	939	805	452	467	366	289	219	149	4,689
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	452	467	366	289	219	149	3,384
ANTIOCH FLOW		1,853	564	(1,606)	(2,723)	0	0	17	2,852	4,346	3,181	2,315	1,610	12,409
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		108	141	319	431	219	143	55	121	117	282	330	147	2,413
CVP BANKS PUMPING		32	32	0	0	0	0	0	0	0	0	0	0	64
TRACY PUMPING		197	208	246	246	95	140	211	184	90	120	120	250	2,107
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	70	0	0	0	(0)	0	(0)	0	(0)	9	
CVP DOS AMIGOS		29	14	7	14	29	50	79	100	107	129	100	57	716
SWP DOS AMIGOS		157	138	185	158	165	180	184	178	239	278	231	144	2,237
CVP SAN LUIS EOM STORAGE	200	332	515	735	946	976	976	976	859	611	329	117	187	
SWP SAN LUIS EOM STORAGE	100	43	41	173	437	483	436	292	220	81	68	152	146	
TRINITY EOM ELEVATION (FT)	2,218	2,205	2,202	2,205	2,209	2,221	2,235	2,253	2,261	2,253	2,243	2,237	2,234	
TRINITY SURFACE AREA (ACRES)	7,162	6,514	6,375	6,511	6,742	7,314	8,014	8,969	9,457	8,999	8,431	8,110	7,978	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,199	1,199	1,199	1,199	1,199	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,964	2,964	2,964	2,964	2,964	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	937	939	945	957	977	999	1,002	997	990	974	958	949	
SHASTA SURFACE AREA (ACRES)	15,384	15,327	15,574	16,155	17,355	19,337	21,779	22,049	21,561	20,719	19,014	17,403	16,550	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	75
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	100
Alternative Extension	B

DATE: 10/14
TIME: 12:05
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,805	1,773	1,765	1,774	1,812	1,862	1,970	1,976	1,808	1,634	1,476	1,419	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	3,200	3,103	3,061	3,061	3,181	3,381	3,701	3,749	3,568	3,344	2,856	2,292	2,135	
OROVILLE EOM STORAGE	2,700	2,558	2,490	2,433	2,526	2,671	2,888	3,044	2,933	2,713	2,298	1,914	1,578	
FOLSOM EOM STORAGE	600	530	470	421	380	455	597	768	816	671	425	276	230	
WHISKEYTOWN STORAGE WITHDRAWAL		101	64	12	0	0	0	0	55	119	161	102	62	676
SHASTA STORAGE WITHDRAWAL		93	42	0	(120)	(200)	(320)	(55)	173	211	470	550	147	991
OROVILLE STORAGE WITHDRAWAL		139	69	61	(92)	(144)	(218)	(158)	106	211	405	376	331	1,087
FOLSOM STORAGE WITHDRAWAL		67	60	52	42	(75)	(141)	(173)	(53)	139	239	144	43	344
SPRING CREEK POWERPLANT		100	60	10	0	0	0	0	60	120	160	100	60	670
KESWICK RELEASE		393	332	270	200	180	200	395	573	571	830	830	387	5,161
OROVILLE RELEASE		161	149	161	79	56	61	74	123	148	263	311	334	1,920
NIMBUS RELEASE		108	104	108	108	31	34	33	123	208	277	184	89	1,406
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,566	6,050	5,858	6,475	6,216	7,998	5,962	6,384	5,919	8,832	10,034	6,403	
FREEPORT FLOW (CFS)		12,306	11,676	12,176	12,863	10,948	13,794	8,382	10,183	11,509	17,070	17,895	14,563	
ACTUAL DELTA OUTFLOW		215	208	215	277	535	692	268	246	232	240	195	149	3,472
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		153	(822)	(2,289)	(3,126)	18	7	2	1,810	2,643	1,065	(331)	(565)	(1,435)
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		181	194	369	427	106	129	127	123	119	232	259	340	2,606
CVP BANKS PUMPING		56	72	0	0	0	0	0	0	0	50	145	0	323
TRACY PUMPING		246	238	246	246	106	129	110	184	178	282	282	250	2,497
CONTRA COSTA PUMPING		11	8	7	7	8	8	11	12	15	18	18	14	135
CVP COA BALANCE		0	(0)	84	136	0	0	(0)	(0)	0	(0)	(0)	(0)	
CVP DOS AMIGOS		85	57	28	57	113	74	117	148	159	191	148	85	1,262
SWP DOS AMIGOS		181	143	193	169	191	209	213	203	272	340	274	171	2,559
CVP SAN LUIS EOM STORAGE	200	318	510	702	864	797	753	600	413	.176	15	36	66	
SWP SAN LUIS EOM STORAGE	300	291	335	507	757	663	572	469	371	199	73	40	198	
TRINITY EOM ELEVATION (FT)	2,333	2,326	2,323	2,322	2,323	2,326	2,330	2,338	2,339	2,326	2,312	2,299	2,294	
TRINITY SURFACE AREA (ACRES)	13,991	13,492	13,323	13,277	13,328	13,526	13,793	14,356	14,388	13,504	12,581	11,729	11,415	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	1,015	1,010	1,008	1,008	1,014	1,023	1,036	1,038	1,031	1,021	999	971	963	
SHASTA SURFACE AREA (ACRES)	23,529	23,030	22,816	22,815	23,433	24,451	26,068	26,311	25,399	24,263	21,751	18,740	17,875	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	50
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	B

DATE: 10/16
TIME: 12:28
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,386	1,354	1,325	1,335	1,372	1,423	1,530	1,567	1,400	1,388	1,171	1,085	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,500	2,432	2,401	2,460	2,580	2,780	3,100	3,162	2,985	2,706	2,184	1,901	1,778	
OROVILLE EOM STORAGE	2,200	2,058	1,990	1,933	1,967	2,112	2,329	2,499	2,391	2,184	1,793	1,459	1,298	
FOLSOM EOM STORAGE	400	346	315	266	283	359	501	647	666	583	431	376	331	
WHISKEYTOWN STORAGE WITHDRAWAL		121	64	32	0	0	0	0	25	119	1	162	92	616
SHASTA STORAGE WITHDRAWAL		64	31	(59)	(120)	(200)	(320)	(68)	169	268	506	271	115	658
OROVILLE STORAGE WITHDRAWAL		139	69	61	(33)	(144)	(218)	(172)	104	199	383	327	157	872
FOLSOM STORAGE WITHDRAWAL		52	30	52	(17)	(75)	(142)	(147)	(23)	78	145	50	42	43
SPRING CREEK POWERPLANT		120	60	30	0	0	0	0	30	120	0	160	90	610
KESWICK RELEASE		384	321	231	200	180	200	382	539	628	706	611	385	4,768
OROVILLE RELEASE		161	149	161	137	56	61	60	121	136	241	262	160	1,705
NIMBUS RELEASE		92	74	108	49	31	34	60	154	149	184	92	89	1,116
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		6,426	5,878	5,215	6,500	6,247	8,030	6,237	6,643	7,832	7,835	7,292	6,672	
FREEPORT FLOW (CFS)		11,916	11,004	11,533	12,863	10,948	13,794	8,381	10,118	11,250	13,192	12,037	11,594	
ACTUAL DELTA OUTFLOW		215	208	215	277	535	692	268	246	232	240	195	149	3,472
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		372	(445)	(1,930)	(3,126)	18	8	3	1,847	2,788	3,236	2,950	1,098	6,817
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		181	194	329	427	106	130	114	122	107	210	210	167	2,297
CVP BANKS PUMPING		32	32	0	0	0	0	0	0	0	0	0	0	64
TRACY PUMPING		246	238	246	246	106	130	126	184	178	120	120	250	2,190
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	(0)	45	78	0	0	0	0	0	0	0	0	
CVP DOS AMIGOS		85	57	28	57	113	50	79	100	107	129	100	57	962
SWP DOS AMIGOS		155	121	168	146	165	180	184	171	230	294	231	144	2,189
CVP SAN LUIS EOM STORAGE	200	294	446	638	802	740	743	678	592	467	227	49	137	
SWP SAN LUIS EOM STORAGE	200	219	286	445	718	651	591	506	441	302	201	165	178	
TRINITY EOM ELEVATION (FT)	2,301	2,291	2,288	2,286	2,286	2,290	2,294	2,303	2,307	2,292	2,291	2,271	2,263	
TRINITY SURFACE AREA (ACRES)	11,857	11,231	11,056	10,897	10,950	11,158	11,435	12,022	12,221	11,312	11,246	10,031	9,533	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	982	978	977	980	986	995	1,010	1,013	1,005	992	965	949	942	
SHASTA SURFACE AREA (ACRES)	19,868	19,503	19,333	19,654	20,297	21,352	23,015	23,334	22,420	20,962	18,148	16,553	15,840	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	LM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	75
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	B

DATE: 10/16
TIME: 12:31
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,100	1,006	974	946	955	993	1,043	1,151	1,189	1,083	1,072	1,016	890	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,000	2,010	2,051	2,111	2,231	2,430	2,736	2,897	2,811	2,573	2,131	1,779	1,693	
OROVILLE EOM STORAGE	1,700	1,577	1,536	1,538	1,609	1,754	1,970	2,076	1,969	1,778	1,513	1,298	1,135	
FOLSOM EOM STORAGE	200	177	161	156	174	249	391	504	556	492	322	207	193	
WHISKEYTOWN STORAGE WITHDRAWAL		101	64	32	0	0	0	0	25	59	1	2	132	416
SHASTA STORAGE WITHDRAWAL		(12)	(42)	(59)	(120)	(200)	(305)	(167)	78	228	426	340	79	246
OROVILLE STORAGE WITHDRAWAL		121	41	1	(69)	(144)	(218)	(107)	103	184	258	209	159	538
FOLSOM STORAGE WITHDRAWAL		21	16	6	(17)	(75)	(142)	(114)	(56)	59	164	111	12	(15)
SPRING CREEK POWERPLANT		100	60	30	0	0	0	0	30	60	0	0	130	410
KESWICK RELEASE		288	248	231	200	180	215	283	448	528	626	520	389	4,156
OROVILLE RELEASE		143	121	101	101	56	61	125	120	121	116	144	162	1,371
NIMBUS RELEASE		61	60	62	49	31	34	93	121	130	204	153	60	1,058
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,891	4,667	5,223	6,509	6,259	8,286	4,764	5,464	6,521	6,927	6,114	6,858	
FREEPORT FLOW (CFS)		9,548	9,060	9,819	12,279	10,948	14,037	8,371	8,085	9,010	10,183	9,630	11,194	
ACTUAL DELTA OUTFLOW		215	208	215	277	535	707	268	246	232	240	195	149	3,488
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		1,701	644	(970)	(2,795)	18	33	10	2,986	4,042	4,920	4,298	1,322	16,208
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		163	166	224	391	106	130	179	121	92	85	92	169	1,918
CVP BANKS PUMPING		0	32	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		150	150	246	246	106	130	60	60	60	60	90	224	1,582
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		0	0	(1)	78	0	0	0	(0)	(0)	(0)	(0)	0	
CVP DOS AMIGOS		43	21	11	21	43	26	41	52	56	67	52	30	463
SWP DOS AMIGOS		130	98	143	123	139	150	155	139	188	248	189	117	1,819
CVP SAN LUIS EOM STORAGE	200	216	320	530	732	752	789	709	569	403	195	60	162	
SWP SAN LUIS EOM STORAGE	100	128	192	271	531	490	461	473	441	330	152	41	86	
TRINITY EOM ELEVATION (FT)	2,264	2,254	2,251	2,248	2,249	2,253	2,258	2,269	2,273	2,262	2,261	2,256	2,242	
TRINITY SURFACE AREA (ACRES)	9,620	9,070	8,880	8,708	8,766	8,990	9,289	9,916	10,130	9,521	9,458	9,131	8,372	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	955	956	958	961	968	978	993	1,001	997	985	962	942	937	
SHASTA SURFACE AREA (ACRES)	17,119	17,173	17,409	17,741	18,407	19,494	21,119	21,964	21,517	20,256	17,854	15,849	15,339	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	C
Starting Storage Level (HI-HM-LM-LO)	LO
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	50
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	0
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	75
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	B

DATE: 10/14
TIME: 13:18
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	700	606	585	586	595	633	684	792	830	756	716	632	607	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	1,700	1,767	1,824	1,853	1,973	2,173	2,478	2,700	2,693	2,536	2,178	1,885	1,720	
OROVILLE EOM STORAGE	1,200	1,157	1,177	1,218	1,328	1,473	1,689	1,851	1,803	1,670	1,455	1,283	1,177	
FOLSOM EOM STORAGE	200	178	163	160	178	254	396	509	542	426	263	209	195	
WHISKEYTOWN STORAGE WITHDRAWAL		101	54	2	0	0	0	0	25	29	31	32	32	306
SHASTA STORAGE WITHDRAWAL		(69)	(57)	(29)	(120)	(200)	(305)	(227)	(0)	146	343	281	157	(80)
OROVILLE STORAGE WITHDRAWAL		42	(20)	(39)	(109)	(144)	(218)	(163)	44	126	208	167	102	(2)
FOLSOM STORAGE WITHDRAWAL		20	15	5	(17)	(76)	(142)	(114)	(37)	111	157	50	12	(16)
SPRING CREEK POWERPLANT		100	50	0	0	0	0	0	30	30	30	30	30	300
KESWICK RELEASE		231	223	231	200	180	215	223	370	416	573	491	367	3,720
OROVILLE RELEASE		64	60	61	61	56	61	69	61	63	66	102	105	831
NIMBUS RELEASE		61	60	62	49	31	34	93	140	182	197	92	60	1,061
VERNALIS FLOW		70	80	90	110	110	100	80	60	50	40	50	60	900
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		40	30	40	65	56	48	22	18	17	20	25	31	412
SACRAMENTO RIVER ACCRETIONS		95	110	210	405	341	553	(3)	(192)	(243)	(320)	(225)	56	787
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,124	4,324	5,253	6,519	6,271	8,298	3,943	4,488	5,008	6,439	5,952	6,622	
FREEPORT FLOW (CFS)		7,329	7,616	9,168	11,640	10,948	14,037	6,421	6,166	7,027	8,394	7,484	9,880	
ACTUAL DELTA OUTFLOW		216	208	215	277	535	707	268	246	232	240	195	149	3,488
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	246	232	240	195	149	2,772
ANTIOCH FLOW		2,951	1,452	(606)	(2,441)	18	33	1,367	4,060	5,153	5,922	5,500	2,058	25,467
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		84	105	185	352	106	130	123	63	34	35	50	112	1,379
CVP BANKS PUMPING		0	0	0	0	0	0	0	0	0	0	0	0	0
TRACY PUMPING		92	157	245	246	106	130	0	0	0	0	0	203	1,179
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		1	(0)	(0)	78	0	0	0	0	(0)	(0)	(0)	0	
CVP DOS AMIGOS		29	14	7	14	29	2	3	4	4	5	4	2	118
SWP DOS AMIGOS		141	64	105	90	101	106	111	91	126	180	125	77	1,317
CVP SAN LUIS EOM STORAGE	200	195	295	514	727	773	843	756	626	476	300	149	270	
SWP SAN LUIS EOM STORAGE	100	40	79	158	413	412	428	430	391	287	130	45	75	
TRINITY EOM ELEVATION (FT)	2,218	2,205	2,202	2,202	2,203	2,209	2,216	2,230	2,235	2,225	2,220	2,209	2,205	
TRINITY SURFACE AREA (ACRES)	7,162	6,528	6,375	6,385	6,452	6,712	7,053	7,761	8,001	7,525	7,270	6,705	6,533	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	937	941	945	947	954	965	981	991	991	983	965	948	939	
SHASTA SURFACE AREA (ACRES)	15,384	15,777	16,109	16,279	16,967	18,086	19,749	20,929	20,894	20,062	18,116	16,465	15,499	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	E
Starting Storage Level (HI-HM-LM-LO)	HI
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	25
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	B

DATE: 10/14
TIME: 13:22
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,900	1,800	1,761	1,722	1,681	1,620	1,528	1,468	1,323	1,083	900	760	729	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	3,200	3,119	3,064	3,009	3,015	3,109	3,237	3,258	3,040	2,733	2,250	1,803	1,609	
OROVILLE EOM STORAGE	2,700	2,538	2,450	2,124	1,872	1,967	2,103	2,128	1,997	1,808	1,578	1,417	1,224	
FOLSOM EOM STORAGE	600	500	409	345	306	331	406	451	414	343	268	204	175	
WHISKEYTOWN STORAGE WITHDRAWAL		102	64	33	27	55	77	80	117	160	162	83	32	992
SHASTA STORAGE WITHDRAWAL		77	55	55	(6)	(94)	(128)	(27)	210	296	466	434	187	1,526
OROVILLE STORAGE WITHDRAWAL		159	89	330	254	(94)	(138)	(27)	128	182	222	155	189	1,449
FOLSOM STORAGE WITHDRAWAL		98	90	66	41	(25)	(75)	(46)	33	67	70	60	27	406
SPRING CREEK POWERPLANT		100	60	30	30	60	90	90	120	160	160	80	30	1,010
KESWICK RELEASE		347	295	275	244	226	282	293	550	646	806	684	387	5,036
OROVILLE RELEASE		161	149	400	384	56	61	85	65	69	70	90	192	1,782
NIMBUS RELEASE		108	104	92	77	31	31	60	91	88	80	73	45	879
VERNALIS FLOW		40	50	50	60	60	60	50	40	20	20	20	30	500
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		32	28	23	14	12	12	10	10	9	5	5	5	165
SACRAMENTO RIVER ACCRETIONS		87	88	63	119	42	(3)	(90)	(290)	(311)	(335)	(200)	30	(800)
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		5,810	5,199	4,470	4,762	4,000	4,000	4,000	5,952	7,697	9,855	9,367	6,829	
FREEPORT FLOW (CFS)		11,422	10,695	13,503	13,399	6,388	6,035	5,857	6,759	8,271	10,105	10,522	10,983	
ACTUAL DELTA OUTFLOW		215	208	215	277	314	277	268	248	232	240	195	149	2,838
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	248	232	240	195	149	2,774
ANTIOCH FLOW		648	(272)	(3,033)	(3,426)	5	8	1,760	3,754	4,456	4,964	3,798	1,440	14,103
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		153	145	411	410	65	55	12	28	28	25	27	170	1,529
CVP BANKS PUMPING		0	32	0	0	0	0	0	0	0	0	0	0	32
TRACY PUMPING		246	238	246	246	65	103	47	50	50	95	180	180	1,746
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		(0)	(0)	(0)	0	0	(0)	(0)	(0)	(0)	0	0	(0)	
CVP DOS AMIGOS		85	57	28	57	113	26	41	52	56	67	52	30	663
SWP DOS AMIGOS		105	75	118	101	114	121	126	107	147	203	145	91	1,453
CVP SAN LUIS EOM STORAGE	200	262	414	606	770	667	677	584	434	258	85	40	98	
SWP SAN LUIS EOM STORAGE	300	343	410	701	1,004	948	873	748	657	525	334	205	279	
TRINITY EOM ELEVATION (FT)	2,333	2,325	2,322	2,319	2,316	2,311	2,303	2,298	2,285	2,262	2,243	2,226	2,222	
TRINITY SURFACE AREA (ACRES)	13,991	13,465	13,259	13,049	12,833	12,504	12,011	11,683	10,884	9,519	8,431	7,553	7,356	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	1,015	1,011	1,009	1,006	1,006	1,011	1,016	1,017	1,007	993	969	944	932	
SHASTA SURFACE AREA (ACRES)	23,529	23,115	22,831	22,547	22,578	23,062	23,720	23,827	22,707	21,104	18,513	15,991	14,837	

UNITED STATES BUREAU OF RECLAMATION
LONG-TERM OPERATIONS CRITERIA AND PLAN

Study Year Hydrologic Type (W-A-D-C-E)	E
Starting Storage Level (HI-HM-LM-LO)	HM
Oct-Feb (%) Project Deliveries (100-75-50-25-0)	100
Mar-Sep (%) Project Deliveries (100-75-50-25-0)	0
Oct-Dec (%) Water Rights Deliveries (100-75-50-25-0)	100
Jan-Sep (%) Water Rights Deliveries (100-75-50-25-0)	75
Alternative Extension	B

DATE: 10/16
TIME: 12:36
BYPASS

ALL VALUES IN TAF	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
TRINITY EOM STORAGE	1,500	1,381	1,342	1,302	1,262	1,230	1,199	1,199	1,084	884	743	503	474	
WHISKEYTOWN EOM STORAGE	206	180	150	150	160	170	206	230	240	240	240	240	210	
SHASTA EOM STORAGE	2,500	2,491	2,478	2,452	2,502	2,567	2,636	2,609	2,392	2,038	1,502	1,187	1,056	
OROVILLE EOM STORAGE	2,200	2,038	1,950	1,685	1,755	1,849	1,986	1,995	1,864	1,675	1,446	1,286	1,225	
FOLSOM EOM STORAGE	400	315	270	242	224	249	323	396	380	327	243	191	174	
WHISKEYTOWN STORAGE WITHDRAWAL		122	64	33	27	25	17	20	87	120	122	183	32	852
SHASTA STORAGE WITHDRAWAL		6	13	26	(50)	(65)	(69)	21	211	344	523	306	125	1,390
OROVILLE STORAGE WITHDRAWAL		159	89	269	(69)	(94)	(138)	(11)	128	182	222	155	57	950
FOLSOM STORAGE WITHDRAWAL		83	45	29	19	(25)	(74)	(74)	13	49	79	49	15	209
SPRING CREEK POWERPLANT		120	60	30	30	30	30	30	90	120	120	180	30	870
KESWICK RELEASE		296	253	246	200	225	281	281	521	654	823	656	325	4,760
OROVILLE RELEASE		161	149	339	61	56	61	101	65	69	70	90	60	1,283
NIMBUS RELEASE		93	60	55	55	31	32	33	70	70	89	61	33	681
VERNALIS FLOW		40	50	50	60	60	60	50	40	20	20	20	30	500
FEATHER RIVER DEMANDS		58	0	0	0	0	1	58	193	193	232	145	87	967
YUBA RIVER ACCRETIONS		32	28	23	14	12	12	10	10	9	5	5	5	165
SACRAMENTO RIVER ACCRETIONS		87	88	63	119	42	(3)	(90)	(290)	(311)	(335)	(200)	30	(800)
WILKINS SLOUGH TARGET (CFS)		4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	
WILKINS SLOUGH ACTUAL (CFS)		4,980	4,493	4,000	4,054	4,000	4,000	4,000	5,789	8,201	10,505	9,204	5,906	
FREEPORT FLOW (CFS)		10,348	9,237	11,440	7,080	6,374	6,035	5,470	5,946	8,102	10,512	9,871	7,521	
ACTUAL DELTA OUTFLOW		215	208	215	277	313	277	268	248	232	240	195	149	2,837
REQUIRED DELTA OUTFLOW		215	208	215	277	250	277	268	248	232	240	195	149	2,774
ANTIOCH FLOW		1,250	548	(1,876)	112	3	8	2,029	4,209	4,550	4,736	4,163	3,379	23,111
CROSS CHANNEL GATES		OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	OPEN	OPEN	OPEN	
SWP BANKS PUMPING		153	145	350	88	65	55	28	28	28	25	27	38	1,029
CVP BANKS PUMPING		0	0	0	0	0	0	0	0	0	0	0	0	0
TRACY PUMPING		180	183	180	180	65	103	8	0	40	120	140	106	1,305
CONTRA COSTA PUMPING		11	8	7	7	8	6	8	9	11	13	13	10	111
CVP COA BALANCE		(0)	0	0	(0)	0	(0)	(0)	(0)	(0)	0	0	(0)	
CVP DOS AMIGOS		85	57	28	57	113	2	3	4	4	5	4	2	364
SWP DOS AMIGOS		68	41	80	67	75	77	82	59	85	134	82	50	900
CVP SAN LUIS EOM STORAGE	200	196	261	387	485	382	425	346	216	106	50	39	63	
SWP SAN LUIS EOM STORAGE	200	282	385	654	669	653	624	562	520	453	335	271	256	
TRINITY EOM ELEVATION (FT)	2,301	2,291	2,287	2,284	2,280	2,277	2,274	2,274	2,263	2,241	2,224	2,189	2,183	
TRINITY SURFACE AREA (ACRES)	11,857	11,204	10,989	10,769	10,542	10,365	10,187	10,187	9,528	8,336	7,442	5,786	5,564	
WHISKEYTOWN EOM ELEVATION (FT)	1,199	1,189	1,178	1,178	1,182	1,185	1,199	1,207	1,210	1,210	1,210	1,210	1,200	
WHISKEYTOWN SURFACE AREA (ACRES)	2,964	2,736	2,459	2,459	2,553	2,646	2,964	3,167	3,250	3,250	3,250	3,250	2,998	
SHASTA EOM ELEVATION (FT)	982	981	981	979	982	985	988	987	976	957	925	902	891	
SHASTA SURFACE AREA (ACRES)	19,868	19,820	19,749	19,609	19,879	20,224	20,592	20,451	19,285	17,335	14,190	12,171	11,277	

Appendix C

CVP-OCAP Temperature Study Results

Appendix C

Table of Contents

N01 JOM

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OPERATIONAL TEMPERATURE CONTROL STUDY
N01: W-HI-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO--TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	21.	100.	84.	107.	212.	270.	197.	174.	116.	142.	90.	40.
PO--F	44.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8	44.0	44.4	45.1	45.6
R--TAF	21.	100.	84.	107.	212.	270.	197.	174.	116.	142.	90.	40.
R F	44.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8	44.0	44.4	45.1	45.6
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW--F	40.1	43.8	46.1	47.6	47.5	48.0	49.5	49.5	49.1	46.4	44.5	41.9
OC-F	40.5	43.6	45.9	48.5	49.4	49.4	57.4	52.7	52.7	48.5	45.5	41.3
IF F	41.2	43.7	46.0	49.4	52.9	52.5	65.2	57.8	58.3	51.9	47.0	40.1
SC-TAF	60.	150.	120.	120.	150.	180.	180.	120.	122.	120.	90.	60.
SC-F	43.6	44.5	45.7	47.4	50.1	51.7	53.4	54.8	55.0	52.2	49.4	46.7
S742--TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	0.0	44.7	44.7	44.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S815--TAF	700.	750.	580.	517.	652.	558.	742.	609.	414.	348.	348.	700.
S815--F	46.4	45.6	45.7	45.8	45.9	46.4	47.8	50.1	52.7	55.6	54.9	48.4
S942--TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	700.	750.	580.	517.	652.	558.	742.	609.	414.	348.	348.	700.
SH-F	46.4	45.6	45.7	45.8	45.9	46.4	47.8	50.1	52.7	55.6	54.9	48.4
KASC--F	46.3	45.8	46.3	47.0	47.5	48.5	49.6	51.9	54.2	56.3	54.6	48.3
KES-F	46.1	45.6	46.2	47.1	48.0	49.3	50.3	52.4	54.4	55.2	53.5	48.2
ACL-F	46.0	45.7	46.6	47.9	49.1	50.6	51.6	53.7	55.4	55.7	53.4	48.1
BCL-F	46.0	45.7	46.6	47.9	49.2	50.7	51.7	53.7	55.4	55.7	53.4	48.1
CC-F	46.0	45.9	47.1	48.9	50.5	52.2	53.2	55.2	56.6	56.2	53.2	47.9
BB-F	45.8	46.1	47.9	50.0	52.6	54.6	55.6	57.4	58.9	56.9	53.2	47.5
RB-F	45.7	46.3	48.2	50.7	53.5	55.6	56.7	58.5	59.6	57.2	53.1	47.4

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OPERATIONAL TEMPERATURE CONTROL STUDY
N02: W-HM-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	21.	17.	23.	47.	122.	150.	227.	174.	101.	142.	90.	40.
PO-F	44.3	0.0	43.6	43.6	43.6	43.6	43.6	43.6	43.7	43.9	44.5	45.0
R-TAF	21.	17.	23.	47.	122.	150.	227.	174.	101.	142.	90.	40.
R-F	44.3	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.7	43.9	44.5	45.0
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	40.1	43.9	48.9	50.9	49.7	50.8	48.7	49.3	49.5	46.0	44.1	41.6
C-F	40.5	43.7	47.4	50.3	51.2	51.9	56.8	52.5	53.1	48.2	45.2	41.1
F-F	41.2	43.8	46.5	50.0	54.0	54.6	64.9	57.6	58.5	51.6	46.8	40.0
C-TAF	60.	66.	60.	60.	60.	60.	210.	120.	107.	120.	90.	60.
C-F	43.6	43.9	45.3	46.9	48.9	52.0	53.9	54.9	55.4	52.2	49.2	46.6
5742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	44.7	44.7	44.7	0.0	44.7	0.0	44.7	0.0	0.0	0.0
815-TAF	700.	750.	580.	517.	652.	710.	624.	668.	323.	246.	191.	260.
815-F	46.4	45.6	45.7	45.8	45.9	46.5	48.0	50.3	52.9	55.0	54.6	48.3
5942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	700.	750.	580.	517.	652.	710.	624.	668.	323.	246.	191.	260.
SH-F	46.4	45.6	45.7	45.8	45.9	46.5	48.0	50.3	52.9	55.0	54.6	48.3
ASC-F	46.3	45.8	46.3	47.0	47.5	48.2	50.2	52.0	54.9	55.9	54.2	48.0
FS-F	46.1	45.6	46.2	47.0	47.6	48.5	51.1	52.4	55.0	54.7	52.6	47.7
ACL-F	46.0	45.8	46.7	47.9	48.9	49.8	52.5	53.6	56.2	55.3	52.5	47.6
BCL-F	46.0	45.8	46.7	47.9	49.0	49.9	52.6	53.7	56.3	55.3	52.4	47.5
CC-F	46.0	46.0	47.2	49.0	50.4	51.4	54.2	55.1	57.6	55.9	52.3	47.3
3B-F	45.8	46.2	48.0	50.2	52.8	53.8	56.7	57.2	60.1	56.8	52.5	46.8
38-F	45.7	46.4	48.4	50.9	53.7	54.8	57.8	58.2	60.9	57.2	52.4	46.7

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OPERATIONAL TEMPERATURE CONTROL STUDY
N03: W-LM-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	21.	25.	23.	32.	92.	120.	122.	54.	39.	142.	60.	40.
PO-F	44.1	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.4	43.7	44.0
TR-TAF	21.	25.	23.	32.	92.	120.	122.	54.	39.	142.	60.	40.
TR--F	44.1	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.4	43.7	44.0
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
.EW-F	40.0	43.7	48.9	52.8	51.1	52.0	52.2	58.3	55.5	45.6	43.4	41.0
OC-F	40.4	43.6	47.4	51.3	52.4	53.0	59.4	60.4	58.1	47.8	44.6	40.6
NF-F	41.1	43.7	46.5	50.4	54.8	55.4	66.3	63.8	62.3	51.4	46.5	39.6
SC--TAF	60.	75.	60.	45.	30.	30.	105.	0.	45.	120.	60.	60.
SC- F	43.6	43.9	45.5	46.7	47.5	49.2	54.4	0.0	58.0	53.1	50.3	46.7
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	0.0	44.5	44.5	44.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S815-TAF	169.	750.	580.	517.	652.	558.	755.	768.	313.	292.	266.	171.
S815-F	46.1	45.3	45.6	45.7	45.8	46.3	47.8	50.5	53.3	55.8	54.7	48.2
S942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942 F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	169.	750.	580.	517.	652.	558.	755.	768.	313.	292.	266.	171.
SH F	46.1	45.3	45.6	45.7	45.8	46.3	47.8	50.5	53.3	55.8	54.7	48.2
KASC-F	45.9	45.5	46.1	46.8	47.4	48.4	49.6	51.9	55.3	56.5	54.4	47.7
KES--F	45.3	45.4	46.0	46.8	47.4	48.4	50.2	51.9	55.6	55.5	53.6	47.4
ACL-F	45.2	45.5	46.5	47.7	48.7	50.1	51.6	53.1	57.0	56.0	53.5	47.2
BCL-F	45.2	45.5	46.5	47.8	48.8	50.2	51.6	53.2	57.0	56.0	53.4	47.2
CC--F	45.1	45.7	47.0	48.8	50.3	52.1	53.2	54.7	58.5	56.5	53.3	46.9
BB-F	44.8	46.0	47.9	50.1	52.8	55.0	55.8	56.8	61.2	57.3	53.2	46.6
RB--F	44.8	46.1	48.2	50.8	53.7	56.2	56.9	57.9	62.0	57.6	53.1	46.5

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OPERATIONAL TEMPERATURE CONTROL STUDY
N04: W-LO-100.PRE - CVP-OCAP 7/30/92

ATION	J	F	M	A	M	J	J	A	S	O	N	D
O-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
U--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
'O-TAF	21.	25.	23.	32.	77.	105.	32.	54.	24.	122.	50.	20.
'O-F	43.7	42.8	42.8	42.8	42.8	42.8	42.8	42.9	0.0	43.3	43.9	44.2
?-TAF	21.	25.	23.	32.	77.	105.	32.	54.	24.	122.	50.	20.
?-F	43.7	42.8	42.8	42.8	42.8	42.8	42.8	42.9	43.0	43.3	43.9	44.2
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	39.9	43.6	48.8	52.7	52.0	52.7	65.7	58.1	58.9	45.8	43.5	39.4
C-F	40.3	43.5	47.3	51.2	53.1	53.6	69.1	60.3	61.0	48.0	44.7	39.2
-F	41.1	43.7	46.4	50.4	55.2	55.9	71.7	63.7	64.4	51.5	46.5	38.7
C-TAF	60.	75.	60.	45.	15.	15.	15.	0.	30.	100.	50.	40.
C-F	43.6	43.9	45.5	46.7	47.4	47.9	49.0	0.0	51.2	52.8	50.3	47.3
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	44.4	44.4	44.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
815-TAF	140.	575.	580.	517.	652.	558.	830.	771.	327.	210.	232.	191.
815-F	46.0	45.2	45.5	45.6	45.7	46.2	47.9	50.9	53.9	56.1	54.7	48.2
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	140.	575.	580.	517.	652.	558.	830.	771.	327.	210.	232.	191.
H-F	46.0	45.2	45.5	45.6	45.7	46.2	47.9	50.9	53.9	56.1	54.7	48.2
ASC-F	45.7	45.4	46.1	46.8	47.3	48.4	49.5	52.3	55.8	57.0	54.3	47.8
ES-F	45.1	45.2	46.0	46.8	47.3	48.4	49.5	52.3	55.4	55.6	53.6	47.7
CL-F	45.0	45.4	46.5	47.7	48.7	50.1	50.9	53.5	56.8	56.2	53.4	47.5
CL-F	45.0	45.4	46.5	47.8	48.7	50.2	51.0	53.6	56.8	56.2	53.3	47.4
C-F	44.9	45.7	47.0	48.8	50.3	52.2	52.7	55.0	58.3	56.9	53.1	47.2
B-F	44.7	46.0	47.9	50.1	52.8	55.1	55.3	57.1	61.1	57.8	53.1	46.7
B-F	44.6	46.2	48.2	50.8	53.8	56.3	56.5	58.2	61.9	58.2	53.0	46.6

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OPERATIONAL TEMPERATURE CONTROL STUDY
N05: A-HI-100.PRE - CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO--TAF	31.	19.	28.	21.	86.	185.	171.	116.	87.	146.	101.	69.
TPO-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.1	44.4
TR--TAF	31.	19.	28.	21.	86.	185.	171.	116.	87.	146.	101.	69.
IR--F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.1	44.4
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LFW F	41.0	44.0	48.6	55.1	51.9	49.8	50.4	52.0	50.5	46.0	43.8	42.4
DC--F	41.1	43.8	47.2	52.6	53.0	51.0	58.1	54.9	53.9	48.2	44.9	41.7
NF--F	41.4	43.8	46.4	50.8	55.2	53.8	65.6	59.5	59.2	51.6	46.7	40.4
SC--TAF	45.	45.	45.	0.	15.	90.	150.	60.	90.	120.	90.	60.
SC--F	43.7	43.8	44.4	0.0	45.8	48.2	54.9	55.4	56.7	52.6	49.1	46.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	45.3	0.0	0.0	45.4	0.0	45.5	0.0
S815--TAF	340.	430.	410.	217.	535.	536.	718.	759.	265.	321.	266.	380.
S815-F	47.1	45.8	45.9	46.0	46.0	46.1	46.8	49.1	52.0	54.8	54.7	49.4
S942--TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942 F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	340.	430.	410.	217.	535.	536.	718.	759.	265.	321.	266.	380.
SH-F	47.1	45.8	45.9	46.0	46.0	46.1	46.8	49.1	52.0	54.8	54.7	49.4
KASC-F	46.9	46.1	46.7	48.7	48.0	48.3	48.8	50.6	54.5	55.5	54.4	49.1
KES-F	46.5	45.9	46.5	48.7	47.9	48.3	49.9	51.0	55.1	54.7	53.1	48.7
ACL-F	46.4	46.1	47.1	50.6	49.5	49.9	51.2	52.2	56.5	55.2	52.9	48.5
BCL-F	46.4	46.1	47.1	50.7	49.6	50.0	51.3	52.2	56.5	55.2	52.9	48.5
CC--F	46.3	46.4	47.8	52.6	51.4	51.8	52.9	53.7	58.1	55.8	52.8	48.3
BB--F	45.8	46.7	48.8	54.5	54.1	54.5	55.5	55.8	60.9	56.6	52.8	47.4
RB--F	45.8	46.9	49.2	55.6	55.1	55.8	56.6	56.8	61.7	56.9	52.7	47.4

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OPERATIONAL TEMPERATURE CONTROL STUDY
N06: A-HM-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	31.	19.	28.	21.	73.	138.	66.	56.	27.	146.	101.	39.
PO-F	44.4	43.7	43.7	43.7	0.0	43.7	43.7	43.7	43.7	43.7	43.9	44.1
R-TAF	31.	19.	28.	21.	73.	138.	66.	56.	27.	146.	101.	39.
R-F	44.4	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.9	44.1
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	41.0	43.9	48.5	55.1	52.9	51.4	57.9	58.1	58.4	45.8	43.6	41.0
)C-F	41.1	43.7	47.2	52.6	53.9	52.4	63.5	60.3	60.6	48.0	44.8	40.6
IF-F	41.4	43.8	46.4	50.8	55.7	55.0	68.6	63.7	64.1	51.5	46.6	39.6
C-TAF	45.	45.	45.	0.	0.	45.	45.	0.	30.	120.	90.	30.
C-F	43.7	43.8	44.4	0.0	0.0	46.5	48.7	0.0	54.2	53.0	49.1	46.9
5742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5742-F	0.0	0.0	0.0	0.0	0.0	45.2	0.0	0.0	45.2	0.0	0.0	0.0
3815-TAF	155.	213.	410.	217.	560.	574.	823.	721.	327.	283.	185.	201.
3815-F	47.0	45.7	45.8	45.8	45.9	46.0	47.0	49.8	53.2	56.4	54.8	49.2
3942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	155.	213.	410.	217.	560.	574.	823.	721.	327.	283.	185.	201.
SH-F	47.0	45.7	45.8	45.8	45.9	46.0	47.0	49.8	53.2	56.4	54.8	49.2
KASC-F	46.6	46.3	46.5	48.5	47.8	48.1	48.7	51.3	55.1	57.0	54.3	48.7
KES-F	45.9	45.9	46.3	48.5	47.8	48.0	48.7	51.3	55.0	55.8	52.6	48.5
ACL-F	45.8	46.3	46.9	50.4	49.4	49.6	50.1	52.7	56.4	56.3	52.5	48.2
BCL-F	45.8	46.3	46.9	50.5	49.4	49.7	50.2	52.7	56.5	56.3	52.4	48.1
CC-F	45.6	46.8	47.6	52.5	51.2	51.6	51.9	54.3	58.0	56.8	52.3	47.8
BB-F	45.1	47.2	48.6	54.4	53.9	54.4	54.5	56.6	60.8	57.5	52.5	46.9
RB-F	45.1	47.5	49.1	55.5	55.0	55.6	55.7	57.7	61.6	57.8	52.4	46.8

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N07: A-LM-100.PRE CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	18.	19.	28.	21.	73.	99.	21.	56.	27.	146.	71.	39.
TPO--F	0.0	43.4	43.4	43.4	0.0	0.0	43.4	43.4	43.5	43.6	44.1	44.6
TR-TAF	18.	19.	28.	21.	73.	99.	21.	56.	27.	146.	71.	39.
TR-F	44.2	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.5	43.6	44.1	44.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.7	43.9	48.4	55.0	52.7	53.6	70.1	58.0	58.3	45.7	43.7	41.3
DC-F	40.2	43.7	47.1	52.5	53.7	54.4	72.3	60.2	60.5	47.9	44.9	40.8
NF-F	41.0	43.8	46.4	50.8	55.6	56.6	73.4	63.6	64.0	51.4	46.6	39.8
SC-TAF	32.	45.	45.	0.	2.	3.	0.	0.	30.	120.	60.	30.
SC-F	43.8	43.9	44.5	0.0	45.6	45.8	0.0	0.0	46.9	50.2	48.6	47.0
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	44.7	44.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S815-TAF	168.	136.	140.	193.	560.	616.	868.	710.	328.	329.	259.	201.
S815--F	46.8	45.5	45.5	45.6	45.6	45.9	47.4	51.3	55.8	59.7	54.6	49.1
S942 TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	168.	136.	140.	193.	560.	616.	868.	710.	328.	329.	259.	201.
SH F	46.8	45.5	45.5	45.6	45.6	45.9	47.4	51.3	55.8	59.7	54.6	49.1
KASC--F	46.4	46.5	47.7	48.6	47.6	47.8	49.0	52.8	57.4	60.0	54.3	48.6
KFS--F	46.0	45.9	46.9	48.6	47.6	47.8	49.0	52.8	56.5	57.4	53.2	48.4
ACL--F	45.8	46.4	48.1	50.7	49.2	49.4	50.4	54.1	57.8	57.7	53.1	48.1
BCL--F	45.8	46.4	48.2	50.8	49.3	49.5	50.5	54.2	57.8	57.7	53.0	48.0
CC--F	45.6	47.0	49.5	52.9	51.0	51.4	52.1	55.7	59.3	58.0	52.9	47.7
BB-F	45.2	47.5	50.8	54.8	53.7	54.2	54.8	57.9	61.8	58.6	52.9	46.9
RB--F	45.1	47.8	51.5	56.0	54.8	55.5	55.9	58.9	62.5	58.8	52.8	46.8

READY.

DY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N08: A-LO-100.PRE CVP-OCAP 7/30/92

ATION	J	F	M	A	M	J	J	A	S	O	N	D
.O-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.O-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	18.	17.	18.	21.	73.	99.	21.	56.	24.	126.	61.	49.
'O-F	0.0	0.0	0.0	42.9	0.0	0.0	43.3	43.7	0.0	45.3	46.9	46.5
R-TAF	18.	17.	18.	21.	73.	99.	21.	56.	24.	126.	61.	49.
R-F	43.7	42.9	42.9	42.9	42.9	43.0	43.3	43.7	44.2	45.3	46.9	46.5
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	39.6	43.8	49.3	54.9	52.4	53.4	70.1	58.1	59.2	47.3	45.5	43.0
C-F	40.1	43.6	47.6	52.4	53.4	54.3	72.3	60.3	61.2	49.3	46.3	42.2
F-F	41.0	43.7	46.5	50.8	55.4	56.4	73.4	63.7	64.6	52.5	47.5	40.8
C-TAF	32.	42.	35.	0.	2.	3.	0.	0.	27.	100.	50.	40.
C-F	43.8	43.9	44.3	0.0	45.1	45.4	0.0	0.0	46.5	50.7	49.7	47.1
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	44.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
815-TAF	168.	138.	149.	193.	559.	619.	868.	700.	331.	131.	173.	191.
815-F	46.8	45.5	45.5	45.6	45.6	45.9	47.4	51.4	55.9	58.5	54.7	49.2
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	168.	138.	149.	193.	559.	619.	868.	700.	331.	131.	173.	191.
H-F	46.8	45.5	45.5	45.6	45.6	45.9	47.4	51.4	55.9	58.5	54.7	49.2
ASC-F	46.4	46.4	47.6	48.6	47.6	47.8	49.0	52.9	57.5	59.4	54.2	48.7
ES-F	46.0	45.8	47.0	48.6	47.6	47.8	49.0	52.9	56.7	55.6	53.2	48.4
CL-F	45.8	46.4	48.2	50.7	49.2	49.4	50.4	54.2	57.9	56.4	53.0	48.1
CL-F	45.8	46.4	48.2	50.8	49.3	49.5	50.5	54.3	58.0	56.4	52.9	48.1
C-F	45.6	47.0	49.5	52.9	51.0	51.4	52.1	55.8	59.4	57.2	52.7	47.7
B-F	45.2	47.5	50.9	54.8	53.7	54.2	54.8	58.0	61.8	58.2	52.8	46.9
R8-F	45.1	47.8	51.5	56.0	54.8	55.4	55.9	59.1	62.6	58.7	52.7	46.8

EADY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N09: D-HI-100.PRE CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	21.	19.	23.	52.	104.	156.	171.	206.	73.	146.	72.	42.
PO--F	44.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.2	44.5	44.8
R-TAF	21.	19.	23.	52.	104.	156.	171.	206.	73.	146.	72.	42.
R-F	44.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.2	44.5	44.8
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW--F	40.2	44.0	49.0	50.7	50.9	50.9	50.5	48.9	51.5	46.2	44.0	41.6
C-F	40.5	43.8	47.4	50.2	52.2	52.0	58.1	52.1	54.8	48.3	45.1	41.1
F-F	41.2	43.8	46.5	50.0	54.7	54.6	65.6	57.3	59.8	51.8	46.8	40.0
C-TAF	20.	30.	30.	30.	30.	60.	150.	150.	75.	120.	60.	30.
C-F	43.9	43.9	44.1	44.9	46.4	49.3	54.9	54.6	55.4	52.4	49.9	47.1
5742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5815-TAF	200.	171.	210.	413.	493.	569.	726.	700.	193.	298.	250.	288.
5815-F	47.4	46.1	46.0	46.1	46.1	46.2	47.1	50.1	53.4	56.3	55.1	49.5
5942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	200.	171.	210.	413.	493.	569.	726.	700.	193.	298.	250.	288.
SH-F	47.4	46.1	46.0	46.1	46.1	46.2	47.1	50.1	53.4	56.3	55.1	49.5
KASC-F	47.0	46.8	47.5	47.6	48.3	48.3	49.0	51.7	56.5	57.0	54.7	49.1
KES-F	46.7	46.4	47.1	47.4	48.2	48.4	50.0	52.2	56.2	55.7	53.8	48.9
ACL-F	46.5	46.8	48.0	48.5	49.8	50.0	51.4	53.3	57.9	56.1	53.6	48.7
BCL-F	46.5	46.8	48.1	48.6	49.9	50.1	51.5	53.4	57.9	56.1	53.5	48.6
CC-F	46.3	47.3	49.1	49.8	51.8	51.9	53.0	54.7	59.7	56.6	53.3	48.3
BB--F	45.6	47.7	50.4	51.2	54.5	54.6	55.6	56.7	62.7	57.4	53.2	47.3
RB-F	45.5	48.0	50.9	52.1	55.6	55.8	56.7	57.7	63.5	57.7	53.1	47.2

READY.

DY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N10: D-HM-100.PRE CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	18.	17.	18.	22.	134.	156.	161.	196.	68.	176.	72.	72.
PO-F	0.0	0.0	0.0	43.8	43.8	43.8	43.8	44.0	44.6	46.0	48.4	47.2
R-TAF	18.	17.	18.	22.	134.	156.	161.	196.	68.	176.	72.	72.
R-F	44.4	43.8	43.8	43.8	43.8	43.8	43.8	44.0	44.6	46.1	48.4	47.2
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	39.8	44.0	49.5	54.9	49.4	50.7	50.7	49.1	52.3	47.5	46.8	44.5
C-F	40.3	43.8	47.7	52.4	51.0	51.8	58.3	52.3	55.4	49.5	47.3	43.5
F-F	41.1	43.8	46.6	50.8	53.9	54.5	65.7	57.5	60.3	52.7	48.1	41.7
C-TAF	17.	27.	25.	0.	60.	60.	140.	140.	70.	150.	60.	60.
C-F	43.9	44.0	44.1	0.0	45.4	49.4	55.0	54.8	55.5	52.6	50.8	47.1
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	45.6	0.0	0.0	0.0	0.0	0.0	45.7	0.0	0.0	0.0
815-TAF	183.	153.	160.	403.	493.	599.	703.	699.	288.	206.	209.	171.
815-F	47.3	45.9	45.9	46.0	46.0	46.3	47.7	52.0	57.2	60.3	55.0	49.5
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	183.	153.	160.	403.	493.	599.	703.	699.	288.	206.	209.	171.
H-F	47.3	45.9	45.9	46.0	46.0	46.3	47.7	52.0	57.2	60.3	55.0	49.5
ASC-F	46.9	46.7	47.8	47.5	48.2	48.2	49.7	53.5	58.9	60.6	54.5	48.9
ES-F	46.6	46.3	47.3	47.5	47.9	48.3	50.6	53.7	58.2	57.2	53.7	48.4
CL-F	46.4	46.8	48.5	48.7	49.5	49.8	52.0	54.8	59.4	57.6	53.5	48.1
CL-F	46.4	46.8	48.5	48.8	49.6	49.9	52.0	54.9	59.4	57.6	53.4	48.1
C-F	46.2	47.4	49.7	50.1	51.3	51.7	53.7	56.1	60.7	58.1	53.2	47.7
B-F	45.5	47.7	51.0	51.6	54.0	54.3	56.2	58.0	62.8	58.7	53.1	46.9
B-F	45.4	48.0	51.6	52.5	55.1	55.5	57.3	58.9	63.5	59.0	53.0	46.8

ADY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N11: D-LM-075.PRE CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	22.	104.	156.	121.	156.	28.	126.	72.	42.
TPO-F	44.2	43.6	43.6	43.6	43.6	43.6	43.7	44.5	45.8	47.2	49.6	47.0
TR-TAF	21.	19.	23.	22.	104.	156.	121.	156.	28.	126.	72.	42.
TR-F	44.2	43.6	43.6	43.6	43.6	43.6	43.7	44.5	45.8	47.2	49.6	47.0
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.9	48.9	54.8	50.6	50.5	52.5	50.6	58.7	48.8	47.5	42.8
DC-F	40.5	43.7	47.4	52.4	52.0	51.6	59.6	53.6	60.8	50.6	47.8	42.1
NF-F	41.2	43.8	46.5	50.8	54.5	54.3	66.4	58.5	64.3	53.5	48.4	40.7
SC-TAF	20.	30.	30.	0.	30.	60.	100.	100.	30.	100.	60.	30.
SC-F	43.9	43.9	44.1	0.0	45.0	47.5	54.7	56.8	57.2	54.4	51.5	47.4
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	45.3	45.3	0.0	0.0	0.0	0.0	45.4	0.0	0.0	0.0	0.0
S815-TAF	180.	151.	155.	343.	421.	537.	696.	576.	324.	169.	163.	201.
S815-F	47.1	45.8	45.8	45.8	45.9	46.3	48.2	52.7	58.0	60.8	54.8	49.4
S942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	180.	151.	155.	343.	421.	537.	696.	576.	324.	169.	163.	201.
SH-F	47.1	45.8	45.8	45.8	45.9	46.3	48.2	52.7	58.0	60.8	54.8	49.4
KASC-F	46.8	46.6	47.8	47.6	48.4	48.5	50.2	54.4	59.5	61.2	54.3	48.9
KES-F	46.5	46.2	47.2	47.6	48.2	48.4	50.8	54.8	59.3	58.7	53.5	48.7
ACL-F	46.3	46.7	48.4	49.0	50.0	50.1	52.2	56.0	60.4	59.0	53.3	48.4
BCL-F	46.3	46.7	48.4	49.0	50.1	50.2	52.3	56.1	60.4	59.0	53.3	48.3
CC-F	46.1	47.3	49.7	50.5	52.2	52.1	54.0	57.5	61.6	59.4	53.0	48.0
BB-F	45.4	47.7	51.0	52.2	55.2	54.9	56.6	59.6	63.6	60.0	53.0	47.0
RB-F	45.4	48.0	51.6	53.1	56.3	56.1	57.8	60.7	64.2	60.2	52.9	46.9

READY.

ΊDY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N12: D-LO-050.PRE CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	21.	19.	23.	22.	104.	156.	111.	146.	24.	107.	42.	22.
PO-F	43.9	43.2	43.2	43.2	43.2	43.7	45.5	48.2	0.0	52.7	53.1	46.4
R-TAF	21.	19.	23.	22.	104.	156.	111.	146.	24.	107.	42.	22.
R-F	43.9	43.2	43.2	43.2	43.2	43.7	45.5	48.2	50.5	52.7	53.1	46.4
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	39.9	43.8	48.8	54.7	50.3	50.6	54.5	53.8	60.8	53.2	48.4	40.4
C-F	40.3	43.6	47.3	52.3	51.7	51.7	61.0	56.5	62.6	54.4	48.5	40.1
F-F	41.1	43.7	46.4	50.8	54.3	54.4	67.2	60.7	65.6	56.5	48.8	39.3
C-TAF	20.	30.	30.	0.	30.	60.	90.	90.	26.	80.	30.	10.
C-F	43.9	43.9	44.1	0.0	45.0	47.5	54.4	58.7	59.1	57.4	53.1	47.7
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	45.0	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
815-TAF	180.	151.	155.	283.	405.	498.	614.	488.	331.	151.	193.	221.
815-F	47.0	45.7	45.7	45.7	45.8	46.4	48.6	52.8	58.0	60.8	54.8	49.4
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	180.	151.	155.	283.	405.	498.	614.	488.	331.	151.	193.	221.
H-F	47.0	45.7	45.7	45.7	45.8	46.4	48.6	52.8	58.0	60.8	54.8	49.4
ASC-F	46.7	46.5	47.7	47.8	48.4	48.8	50.8	54.9	59.4	61.2	54.3	48.9
FS-F	46.4	46.1	47.1	47.8	48.2	48.7	51.3	55.5	59.4	59.9	54.1	48.8
CL-F	46.2	46.6	48.3	49.4	50.1	50.4	52.9	56.9	60.4	60.2	53.9	48.5
CL-F	46.2	46.6	48.4	49.5	50.2	50.5	52.9	57.0	60.5	60.1	53.8	48.5
CC-F	46.0	47.2	49.6	51.2	52.3	52.5	54.8	58.6	61.6	60.5	53.5	48.1
RB-F	45.4	47.6	50.9	53.0	55.3	55.4	57.6	60.9	63.6	60.9	53.3	47.1
RB-F	45.3	47.9	51.5	54.0	56.5	56.7	58.8	61.9	64.2	61.0	53.2	47.0

EADY.

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N13: C-HI-100.PRE CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	139.	219.	182.	157.	58.	102.	46.	31.
TPO-F	44.6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.2	44.3	44.6	44.9
TR-TAF	23.	17.	38.	30.	139.	219.	182.	157.	58.	102.	46.	31.
TR-F	44.6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.2	44.3	44.6	44.9
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.4	44.0	48.0	53.4	49.5	49.2	50.2	50.3	53.1	47.1	43.8	40.8
DC-F	40.7	43.8	46.9	51.6	51.0	50.5	57.9	53.4	56.1	49.1	44.9	40.4
NF-F	41.3	43.8	46.3	50.5	53.9	53.4	65.5	58.3	60.8	52.4	46.7	39.5
SC-TAF	0.	0.	0.	0.	60.	120.	160.	100.	60.	100.	60.	10.
SC-F	0.0	0.0	0.0	0.0	44.4	51.1	54.1	55.0	55.8	54.3	51.9	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S815-TAF	200.	181.	185.	386.	529.	532.	699.	752.	389.	269.	232.	255.
S815-F	47.4	46.2	46.2	46.2	46.2	46.3	47.5	51.9	58.7	61.6	55.0	49.6
S942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	200.	181.	185.	386.	529.	532.	699.	752.	389.	269.	232.	255.
SH-F	47.4	46.2	46.2	46.2	46.2	46.3	47.5	51.9	58.7	61.6	55.0	49.6
KASC-F	47.1	46.8	47.8	47.7	48.2	48.6	49.5	53.3	59.9	61.7	54.6	49.2
KES-F	47.1	46.8	47.8	47.7	47.8	49.1	50.4	53.5	59.4	59.7	54.0	49.1
ACL-F	46.8	47.3	48.9	48.9	49.3	50.6	51.7	54.6	60.2	59.9	53.8	48.8
BCL-F	46.8	47.3	49.0	49.0	49.4	50.7	51.8	54.6	60.2	59.9	53.8	48.7
CC-F	46.5	47.7	50.1	50.4	51.1	52.4	53.4	55.9	61.2	60.1	53.5	48.4
BB-F	45.8	48.0	51.3	51.9	53.7	54.9	55.9	57.8	62.9	60.4	53.4	47.3
RB-F	45.7	48.3	51.8	52.8	54.7	56.1	57.1	58.7	63.5	60.6	53.3	47.2

READY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N14: C-HM-075.PRE CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	23.	17.	38.	30.	109.	219.	182.	217.	88.	122.	46.	51.
PO-F	44.5	43.9	43.9	43.9	43.9	43.9	44.0	44.6	46.5	49.2	51.8	47.2
R-TAF	23.	17.	38.	30.	109.	219.	182.	217.	88.	122.	46.	51.
R-F	44.5	43.9	43.9	43.9	43.9	43.9	44.0	44.6	46.5	49.2	51.8	47.2
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	40.3	44.0	47.9	53.4	50.5	49.0	50.1	49.1	52.2	50.5	47.9	43.5
IC-F	40.6	43.8	46.9	51.6	51.9	50.3	57.9	52.3	55.3	52.1	48.1	42.7
IF-F	41.2	43.8	46.3	50.5	54.4	53.3	65.4	57.5	60.2	54.7	48.6	41.1
C-TAF	0.	0.	0.	0.	30.	120.	160.	160.	90.	120.	60.	30.
C-F	0.0	0.0	0.0	0.0	44.0	49.3	54.0	54.2	54.8	55.1	52.3	47.2
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
815-TAF	200.	181.	185.	338.	496.	497.	673.	649.	314.	233.	246.	219.
815-F	47.3	46.0	46.0	46.0	46.1	46.6	49.0	55.2	62.6	61.9	54.8	49.3
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	200.	181.	185.	338.	496.	497.	673.	649.	314.	233.	246.	219.
H-F	47.3	46.0	46.0	46.0	46.1	46.6	49.0	55.2	62.6	61.9	54.8	49.3
ASC-F	46.9	46.7	47.6	47.8	48.2	48.9	51.0	56.6	63.6	62.0	54.4	48.8
ES-F	46.9	46.7	47.6	47.8	48.0	49.0	51.6	56.1	61.6	59.7	54.0	48.6
CL-F	46.7	47.2	48.7	49.2	49.6	50.6	52.9	57.1	62.4	59.9	53.8	48.3
CL-F	46.6	47.2	48.8	49.2	49.7	50.7	53.0	57.2	62.4	59.9	53.7	48.2
C-F	46.4	47.7	50.0	50.7	51.5	52.5	54.6	58.4	63.3	60.1	53.5	47.9
B-F	45.7	47.9	51.2	52.4	54.3	55.1	57.1	60.1	64.7	60.4	53.4	47.0
B-F	45.6	48.2	51.8	53.3	55.4	56.3	58.2	61.0	65.2	60.6	53.3	46.9

ADY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N15: C-LM-050.PRE CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	159.	172.	147.	28.	102.	46.	51.
TPO-F	44.3	43.7	43.7	43.7	43.7	43.7	44.3	47.0	49.5	51.8	53.0	46.6
IR-TAF	23.	17.	38.	30.	109.	159.	172.	147.	28.	102.	46.	51.
IR-F	44.3	43.7	43.7	43.7	43.7	43.7	44.3	47.0	49.5	51.8	53.0	46.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	40.3	43.9	47.8	53.3	50.4	50.5	50.7	52.9	59.8	52.6	48.6	43.1
DC-F	40.6	43.7	46.8	51.6	51.8	51.6	58.3	55.7	61.7	53.9	48.7	42.3
NF-F	41.2	43.8	46.3	50.5	54.4	54.3	65.7	60.1	65.0	56.1	48.9	40.8
SC-TAF	0.	0.	0.	0.	30.	60.	150.	90.	30.	100.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	46.5	54.5	55.9	57.6	57.0	52.8	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S815-TAF	200.	181.	185.	339.	447.	500.	520.	509.	358.	195.	163.	201.
S815 F	47.2	45.9	45.9	45.9	46.0	47.0	49.8	55.3	62.5	61.6	54.6	49.3
S942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942 F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	200.	181.	185.	339.	447.	500.	520.	509.	358.	195.	163.	201.
SH F	47.2	45.9	45.9	45.9	46.0	47.0	49.8	55.3	62.5	61.6	54.6	49.3
KASC-F	46.8	46.6	47.5	47.7	48.4	49.3	52.3	57.1	63.4	61.8	54.2	48.8
KES F	46.8	46.6	47.5	47.7	48.1	49.0	52.8	56.9	63.0	60.2	53.8	48.6
ACL-F	46.6	47.1	48.6	49.1	49.9	50.7	54.4	58.2	63.7	60.4	53.6	48.3
RCL-F	46.5	47.1	48.7	49.2	50.0	50.8	54.5	58.3	63.7	60.4	53.5	48.2
CC-F	46.3	47.6	49.9	50.7	52.0	52.8	56.3	59.7	64.5	60.6	53.3	47.9
BB F	45.6	47.9	51.1	52.3	54.9	55.6	59.0	61.8	65.7	60.9	53.2	47.0
R8-F	45.5	48.2	51.7	53.2	56.0	56.9	60.2	62.8	66.1	61.0	53.0	46.9

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N16: C-LO-025.PRE CVP-OCAP 7/30/92

ATION	J	F	M	A	M	J	J	A	S	O	N	D
O-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
O--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
'O-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	102.	36.	21.
'O-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	54.5	52.9	45.6
?-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	102.	36.	21.
?-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	54.5	52.9	45.6
:W-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
'W-F	40.2	43.9	47.7	53.2	50.2	52.7	62.1	57.6	60.4	54.6	47.8	40.0
:-F	40.5	43.7	46.8	51.5	51.6	53.6	66.5	59.8	62.2	55.6	48.1	39.7
--F	41.2	43.8	46.2	50.5	54.3	55.9	70.2	63.3	65.4	57.4	48.5	39.0
:-TAF	0.	0.	0.	0.	30.	30.	30.	30.	30.	100.	50.	0.
:-F	0.0	0.0	0.0	0.0	44.0	45.2	48.3	52.3	56.7	59.0	53.2	0.0
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
315-TAF	200.	181.	185.	258.	393.	463.	551.	475.	328.	163.	173.	231.
315-F	47.0	45.8	45.8	45.8	46.0	47.2	50.5	56.7	63.7	61.3	54.6	49.2
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	200.	181.	185.	258.	393.	463.	551.	475.	328.	163.	173.	231.
I-F	47.0	45.8	45.8	45.8	46.0	47.2	50.5	56.7	63.7	61.3	54.6	49.2
ASC-F	46.7	46.5	47.4	48.1	48.6	49.7	52.8	58.5	64.6	61.6	54.1	48.8
FS-F	46.7	46.5	47.4	48.1	48.3	49.4	52.6	58.1	63.9	60.6	53.9	48.8
CL-F	46.5	47.0	48.6	49.8	50.2	51.3	54.4	59.6	64.6	60.8	53.7	48.5
CL-F	46.4	47.0	48.6	49.9	50.3	51.4	54.5	59.6	64.6	60.8	53.5	48.4
C-F	46.2	47.5	49.8	51.7	52.5	53.6	56.5	61.2	65.4	61.0	53.3	48.1
B-F	45.5	47.8	51.1	53.5	55.5	56.6	59.6	63.4	66.5	61.2	53.2	47.1
B-F	45.5	48.1	51.7	54.6	56.7	58.0	60.9	64.5	66.9	61.4	53.0	47.0

ADY.

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N17: E-HI-050.PRE CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	55.	81.	131.	123.	201.	260.	183.	138.	28.	103.	46.	52.
TPO-F	44.7	44.2	44.2	44.2	44.2	44.2	44.5	46.1	48.2	50.8	52.7	46.5
TR-TAF	55.	81.	131.	123.	201.	260.	183.	138.	28.	103.	46.	52.
TR-F	44.7	44.2	44.2	44.2	44.2	44.2	44.5	46.1	48.2	50.8	52.7	46.5
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW F	42.3	44.1	45.6	47.5	48.0	48.5	50.5	52.5	59.4	51.8	48.5	43.1
DC-F	42.0	43.8	45.7	48.4	49.8	49.8	58.1	55.3	61.4	53.2	48.6	42.3
NF-F	41.8	43.8	45.9	49.4	53.1	52.9	65.6	59.8	64.7	55.5	48.9	40.8
SC-TAF	30.	60.	90.	90.	120.	160.	160.	80.	30.	100.	60.	30.
SC F	43.7	43.9	45.4	46.6	49.0	51.3	53.4	55.0	56.4	56.5	52.7	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S815-TAF	170.	167.	193.	275.	510.	549.	710.	693.	358.	279.	250.	216.
S815-F	47.5	46.3	46.3	46.3	46.3	46.5	49.1	58.5	66.5	62.5	54.6	48.7
S942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	170.	167.	193.	275.	510.	549.	710.	693.	358.	279.	250.	216.
SH-F	47.5	46.3	46.3	46.3	46.3	46.5	49.1	58.5	66.5	62.5	54.6	48.7
KASC-F	47.1	47.0	47.8	48.4	48.3	48.7	51.0	59.7	67.1	62.5	54.3	48.3
KES-F	46.6	46.2	47.0	48.0	48.4	49.3	51.4	59.2	66.3	60.9	54.0	48.2
ACL-F	46.4	46.6	47.9	49.2	49.8	50.7	52.8	60.1	66.7	61.0	53.8	47.9
BCL-F	46.3	46.6	47.9	49.3	49.9	50.8	52.8	60.2	66.7	61.0	53.7	47.8
CC-F	46.1	47.1	48.9	50.7	51.4	52.3	54.3	61.2	67.2	61.2	53.5	47.6
BB F	45.5	47.5	50.0	52.2	53.8	54.7	56.8	62.8	67.9	61.3	53.4	46.9
RB-F	45.4	47.8	50.5	53.1	54.8	55.8	57.8	63.5	68.2	61.4	53.3	46.8

READY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
N18: E-HM-000.PRE CVP-OCAP 7/30/92

ATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	55.	51.	72.	63.	171.	220.	143.	88.	28.	122.	46.	52.
PO-F	44.6	44.0	44.0	44.0	44.0	44.0	44.8	47.2	49.6	53.9	53.0	45.6
R-TAF	55.	51.	72.	63.	171.	220.	143.	88.	28.	122.	46.	52.
R-F	44.6	44.0	44.0	44.0	44.0	44.0	44.8	47.2	49.6	53.9	53.0	45.6
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	42.2	44.0	46.5	49.8	48.5	49.1	52.2	56.2	59.8	54.0	48.6	42.6
C-F	41.9	43.8	46.1	49.7	50.2	50.4	59.4	58.6	61.7	55.1	48.7	41.9
F-F	41.8	43.8	46.0	49.8	53.4	53.3	66.3	62.4	65.0	57.0	48.9	40.6
C-TAF	30.	30.	30.	30.	90.	120.	120.	30.	30.	120.	60.	30.
C-F	43.7	43.8	44.2	45.4	48.0	51.9	53.7	56.1	56.7	57.2	52.9	47.2
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
815-TAF	170.	195.	251.	281.	471.	524.	633.	606.	318.	170.	178.	216.
815-F	47.3	46.1	46.1	46.1	46.2	47.3	52.7	64.6	67.5	60.8	54.2	48.4
942-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
942-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H-TAF	170.	195.	251.	281.	471.	524.	633.	606.	318.	170.	178.	216.
H-F	47.3	46.1	46.1	46.1	46.2	47.3	52.7	64.6	67.5	60.8	54.2	48.4
ASC-F	46.9	46.7	47.3	48.2	48.4	49.5	54.6	65.6	68.0	61.2	53.8	48.0
ES-F	46.4	46.3	47.0	47.9	48.3	49.9	54.5	65.2	67.0	59.5	53.6	47.9
ACL-F	46.2	46.7	47.8	49.4	49.9	51.4	55.8	65.9	67.5	59.8	53.4	47.7
RCL-F	46.2	46.8	47.9	49.5	49.9	51.5	55.9	66.0	67.5	59.8	53.3	47.6
CC-F	46.0	47.2	48.8	51.1	51.7	53.2	57.4	66.9	68.0	60.1	53.1	47.3
B-F	45.4	47.6	50.0	52.7	54.3	55.7	59.8	68.0	68.5	60.5	53.1	46.8
R8-F	45.3	47.8	50.5	53.7	55.3	56.8	60.9	68.7	68.8	60.7	52.9	46.7

ADY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B01: W-HI-100.PRE - CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	100.	84.	107.	212.	270.	197.	174.	24.	142.	90.	40.
TPO-F	44.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.9	44.1	44.5	44.9
TR-TAF	21.	100.	84.	107.	212.	270.	197.	174.	24.	142.	90.	40.
TR-F	44.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.9	44.1	44.5	44.9
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.8	46.1	47.6	47.5	48.0	49.5	49.5	59.2	46.2	44.1	41.5
DC-F	40.5	43.6	45.9	48.5	49.4	49.4	57.4	52.7	61.2	48.3	45.2	41.0
NF-F	41.2	43.7	46.0	49.4	52.9	52.5	65.2	57.8	64.6	51.8	46.8	39.9
SC-TAF	60.	150.	120.	120.	150.	180.	180.	120.	0.	120.	90.	60.
SC-F	43.6	44.5	45.7	47.4	50.1	51.7	53.4	54.8	0.0	52.4	49.5	46.8
S742-TAF	0.	0.	0.	0.	0.	0.	0.	301.	536.	153.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	49.7	52.8	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	332.	605.	309.	0.	195.	3.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.3	45.6	47.7	0.0	56.7	58.7	0.0
S942-TAF	700.	750.	580.	517.	652.	226.	137.	0.	0.	0.	345.	700.
S942-F	47.2	45.8	45.8	46.4	47.7	49.6	53.0	0.0	0.0	0.0	57.5	50.4
SH-TAF	700.	750.	580.	517.	652.	558.	742.	609.	536.	348.	348.	700.
SH-F	47.2	45.8	45.8	46.4	47.7	47.0	47.0	46.4	49.7	55.0	57.5	50.4
KASC-F	47.1	46.0	46.4	47.5	49.2	49.1	48.9	48.4	51.1	55.7	57.0	50.2
KES-F	46.8	45.8	46.3	47.5	49.4	49.7	49.8	49.5	51.1	54.9	55.5	49.9
ACL-F	46.8	45.9	46.7	48.3	50.4	51.1	51.1	50.9	52.3	55.3	55.3	49.8
BCL-F	46.7	45.9	46.7	48.3	50.5	51.1	51.2	51.0	52.4	55.3	55.2	49.8
CC-F	46.7	46.1	47.2	49.2	51.7	52.6	52.7	52.6	53.7	55.8	54.9	49.6
RB F	46.4	46.3	47.9	50.3	53.6	54.9	55.2	55.1	56.5	56.6	54.5	48.6
RB-F	46.3	46.4	48.3	51.0	54.5	56.0	56.2	56.2	57.3	56.9	54.4	48.5

TARGET: RB-3W ; REDUCED SC 122.2 TAF IN SEPT.

READY.

=ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
802: W-HM-100.PRE - CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	17.	23.	47.	122.	150.	227.	174.	24.	142.	90.	40.
TPO-F	44.3	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.7	44.1	44.4
TR-TAF	21.	17.	23.	47.	122.	150.	227.	174.	24.	142.	90.	40.
TR-F	44.3	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.7	44.1	44.4
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.9	48.9	50.9	49.7	50.8	48.7	49.3	59.1	45.9	43.8	41.3
DC-F	40.5	43.7	47.4	50.3	51.2	51.9	56.8	52.5	61.1	48.1	44.9	40.8
NF-F	41.2	43.8	46.5	50.0	54.0	54.6	64.9	57.6	64.5	51.6	46.7	39.8
SC-TAF	60.	66.	60.	60.	60.	60.	210.	120.	0.	120.	90.	60.
SC-F	43.6	43.9	45.3	46.9	48.9	52.0	53.9	54.9	0.0	52.3	49.4	46.8
S742-TAF	0.	0.	0.	0.	0.	0.	371.	90.	430.	62.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	44.9	45.4	48.5	51.8	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	234.	253.	537.	0.	184.	1.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.2	45.5	47.7	0.0	56.1	57.6	0.0
S942-TAF	700.	750.	580.	517.	652.	476.	0.	41.	0.	0.	190.	260.
S942-F	47.2	45.8	45.8	46.4	47.7	49.8	0.0	58.2	0.0	0.0	57.4	50.5
SH-TAF	700.	750.	580.	517.	652.	710.	624.	668.	430.	246.	191.	260.
SH-F	47.2	45.8	45.8	46.4	47.7	48.3	45.2	48.0	48.5	55.0	57.4	50.5
KASC-F	47.1	46.0	46.4	47.5	49.2	49.9	47.6	49.8	50.4	55.9	56.6	50.0
KES-F	46.8	45.8	46.3	47.4	49.2	50.1	49.2	50.6	50.4	54.7	54.3	49.4
ACL-F	46.8	46.0	46.7	48.3	50.4	51.3	50.7	51.9	51.9	55.3	54.1	49.1
BCL-F	46.7	46.0	46.8	48.4	50.4	51.4	50.7	51.9	52.0	55.3	54.0	49.1
CC-F	46.7	46.2	47.3	49.4	51.8	52.8	52.4	53.4	53.7	55.9	53.7	48.7
BB-F	46.4	46.4	48.1	50.5	53.9	55.0	55.1	55.7	57.0	56.9	53.5	47.5
RB-F	46.3	46.5	48.4	51.2	54.8	56.0	56.3	56.7	57.9	57.3	53.4	47.4

TARGET: RB-4W ; REDUCED SC 107.1 TAF IN SEPT.

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B03: W-LM-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	21.	25.	23.	32.	92.	120.	122.	54.	24.	142.	60.	40.
PO-F	44.1	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.4	43.7	43.9
R--TAF	21.	25.	23.	32.	92.	120.	122.	54.	24.	142.	60.	40.
R--F	44.1	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.4	43.7	43.9
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	40.0	43.7	48.9	52.8	51.1	52.0	52.2	58.3	59.0	45.6	43.4	41.0
C-F	40.4	43.6	47.4	51.3	52.4	53.0	59.4	60.4	61.1	47.8	44.6	40.6
F-F	41.1	43.7	46.5	50.4	54.8	55.4	66.3	63.8	64.5	51.4	46.5	39.6
C-TAF	60.	75.	60.	45.	30.	30.	105.	0.	0.	120.	60.	60.
C-F	43.6	43.9	45.5	46.7	47.5	49.2	54.4	0.0	0.0	53.2	50.6	47.0
742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	358.	13.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.8	48.6	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	215.	487.	615.	0.	267.	1.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.0	45.4	46.8	0.0	54.8	56.8	0.0
S942-TAF	169.	750.	580.	517.	652.	343.	268.	153.	0.	12.	264.	171.
S942-F	47.1	45.7	45.7	46.3	47.7	49.5	53.1	59.7	0.0	67.4	57.3	50.3
SH-TAF	169.	750.	580.	517.	652.	558.	755.	768.	358.	292.	266.	171.
SH-F	47.1	45.7	45.7	46.3	47.7	47.8	48.1	49.4	45.8	55.0	57.3	50.3
KASC-F	46.7	45.9	46.3	47.5	49.2	49.8	49.9	50.9	48.2	55.8	56.8	49.6
KES-F	45.9	45.7	46.2	47.4	49.1	49.8	50.4	50.9	48.2	55.0	55.7	48.9
ACL-F	45.8	45.9	46.7	48.3	50.4	51.4	51.8	52.2	50.1	55.5	55.4	48.6
BCL-F	45.7	45.9	46.7	48.4	50.4	51.5	51.9	52.3	50.3	55.5	55.3	48.5
CC-F	45.6	46.1	47.2	49.4	51.8	53.3	53.5	53.8	52.4	56.1	55.0	48.1
BB-F	45.2	46.3	48.0	50.6	54.0	56.0	56.0	56.0	56.5	56.9	54.5	47.1
RB-F	45.1	46.4	48.4	51.3	54.9	57.2	57.1	57.1	57.6	57.3	54.3	47.0

TARGET: BB-1W ; REDUCED SC 45 TAF IN SEPT.

READY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
804: W-LO-100.PRE - CVP-OCAP 7/30/92

)CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	25.	23.	32.	77.	105.	32.	54.	24.	122.	50.	20.
TPO-F	43.7	42.8	42.8	42.8	42.8	42.8	42.8	42.9	43.0	43.3	43.9	44.2
TR-TAF	21.	25.	23.	32.	77.	105.	32.	54.	24.	122.	50.	20.
TR-F	43.7	42.8	42.8	42.8	42.8	42.8	42.8	42.9	43.0	43.3	43.9	44.2
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.9	43.6	48.8	52.7	52.0	52.7	65.7	58.1	58.9	45.8	43.5	39.4
)C-F	40.3	43.5	47.3	51.2	53.1	53.6	69.1	60.3	61.0	48.0	44.7	39.2
NF-F	41.1	43.7	46.4	50.4	55.2	55.9	71.7	63.7	64.4	51.5	46.5	38.7
SC-TAF	60.	75.	60.	45.	15.	15.	15.	0.	0.	100.	50.	40.
SC-F	43.6	43.9	45.5	46.7	47.4	47.9	49.0	0.0	0.0	52.1	50.2	47.4
S742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	358.	7.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.6	48.4	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	221.	463.	623.	0.	196.	1.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	44.9	45.3	46.7	0.0	54.8	56.4	0.0
S942-TAF	140.	575.	580.	517.	652.	337.	367.	148.	0.	7.	231.	191.
S942-F	47.0	45.7	45.7	46.3	47.6	49.5	53.2	60.6	0.0	67.6	57.3	50.3
SH-TAF	140.	575.	580.	517.	652.	558.	830.	771.	358.	210.	232.	191.
SH-F	47.0	45.7	45.7	46.3	47.6	47.7	48.8	49.4	45.6	55.0	57.3	50.3
KASC-F	46.6	45.9	46.2	47.4	49.2	49.7	50.4	50.9	48.1	56.1	56.7	49.7
KES-F	45.7	45.7	46.1	47.3	49.2	49.7	50.4	50.9	48.1	54.8	55.5	49.3
ACL-F	45.6	45.9	46.6	48.2	50.4	51.3	51.8	52.2	50.0	55.5	55.2	48.9
BCL-F	45.6	45.9	46.6	48.3	50.5	51.4	51.8	52.3	50.2	55.5	55.1	48.9
CC-F	45.4	46.1	47.1	49.3	51.9	53.3	53.5	53.7	52.3	56.2	54.8	48.5
BB-F	45.0	46.4	48.0	50.5	54.1	56.0	56.0	56.0	56.4	57.2	54.3	47.2
R8-F	45.0	46.5	48.3	51.2	55.1	57.2	57.2	57.1	57.5	57.6	54.1	47.1

TARGET: BB-1W ; REDUCED SC 30.4 TAF IN SEPT.

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B05: A-HI-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	31.	19.	28.	21.	86.	185.	171.	116.	24.	146.	101.	69.
PO-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.2
R-TAF	31.	19.	28.	21.	86.	185.	171.	116.	24.	146.	101.	69.
R-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.2
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	41.0	44.0	48.6	55.1	51.9	49.8	50.4	52.0	59.2	46.0	43.7	42.2
DC-F	41.1	43.8	47.2	52.6	53.0	51.0	58.1	54.9	61.2	48.2	44.9	41.6
NF-F	41.4	43.8	46.4	50.8	55.2	53.8	65.6	59.5	64.6	51.6	46.6	40.3
SC-TAF	45.	45.	45.	0.	15.	90.	150.	60.	0.	120.	90.	60.
SC-F	43.7	43.8	44.4	0.0	45.8	48.2	54.9	55.4	0.0	52.8	49.4	46.4
5742--TAF	0.	0.	0.	0.	0.	0.	0.	0.	355.	1.	0.	0.
5742--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0	47.1	0.0	0.0
3815-TAF	0.	0.	0.	0.	0.	0.	453.	577.	0.	274.	0.	0.
3815-F	0.0	0.0	0.0	0.0	0.0	0.0	45.8	46.2	0.0	53.1	55.4	0.0
S942-TAF	340.	430.	410.	217.	535.	536.	265.	181.	0.	45.	265.	380.
S942-F	47.3	46.0	46.0	46.2	46.9	48.4	51.8	60.0	0.0	66.7	57.1	50.3
SH-TAF	340.	430.	410.	217.	535.	536.	718.	759.	355.	321.	266.	380.
SH-F	47.3	46.0	46.0	46.2	46.9	48.4	48.0	49.5	46.0	55.0	57.1	50.3
KASC-F	47.1	46.3	46.8	48.9	48.8	50.5	49.9	51.0	48.4	55.7	56.6	49.9
KES-F	46.7	46.1	46.6	48.9	48.7	50.2	50.8	51.3	48.4	54.9	54.8	49.4
ACL-F	46.6	46.3	47.1	50.8	50.3	51.7	52.1	52.5	50.3	55.4	54.6	49.2
BCL-F	46.6	46.3	47.2	50.9	50.3	51.8	52.2	52.6	50.4	55.4	54.5	49.2
CC-F	46.4	46.6	47.8	52.8	52.1	53.5	53.7	54.0	52.6	55.9	54.2	48.9
BB-F	46.0	46.9	48.8	54.6	54.6	56.0	56.2	56.1	56.6	56.7	53.9	47.8
RB-F	45.9	47.1	49.3	55.7	55.6	57.1	57.3	57.1	57.8	57.1	53.8	47.7

TARGET: BB-3W ; REDUCED SC 90 TAF IN SEPT

READY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
806: A-HM-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO--F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	31.	19.	28.	21.	73.	138.	66.	56.	27.	146.	101.	39.
PO-F	44.4	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.9	44.1
R-TAF	31.	19.	28.	21.	73.	138.	66.	56.	27.	146.	101.	39.
R-F	44.4	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.9	44.1
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	41.0	43.9	48.5	55.1	52.9	51.4	57.9	58.1	58.4	45.8	43.6	41.0
C-F	41.1	43.7	47.2	52.6	53.9	52.4	63.5	60.3	60.6	48.0	44.8	40.6
F-F	41.4	43.8	46.4	50.8	55.7	55.0	68.6	63.7	64.1	51.5	46.6	39.6
C-TAF	45.	45.	45.	0.	0.	45.	45.	0.	0.	120.	90.	30.
C-F	43.7	43.8	44.4	0.0	0.0	46.5	48.7	0.0	0.0	52.7	49.2	47.1
5742-TAF	0.	0.	0.	0.	0.	0.	0.	0.	357.	7.	0.	0.
5742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.9	47.2	0.0	0.0
5815-TAF	0.	0.	0.	0.	0.	0.	424.	590.	0.	254.	1.	0.
5815-F	0.0	0.0	0.0	0.0	0.0	0.0	45.7	46.1	0.0	54.2	56.7	0.0
5942-TAF	155.	213.	410.	217.	560.	574.	399.	130.	0.	21.	184.	201.
5942-F	47.3	45.9	45.9	46.1	46.8	48.6	52.5	62.0	0.0	67.5	57.2	50.3
SH-TAF	155.	213.	410.	217.	560.	574.	823.	721.	357.	283.	185.	201.
SH-F	47.3	45.9	45.9	46.1	46.8	48.6	49.0	49.0	45.9	55.0	57.2	50.3
KASC-F	46.8	46.5	46.7	48.8	48.6	50.5	50.6	50.6	48.3	55.8	56.5	49.7
ES-F	46.1	46.0	46.5	48.8	48.6	50.2	50.5	50.6	48.3	54.9	54.1	49.4
CL-F	45.9	46.4	47.1	50.7	50.1	51.7	51.9	52.0	50.2	55.4	53.9	49.0
RCL-F	45.9	46.4	47.1	50.8	50.2	51.8	51.9	52.1	50.3	55.4	53.8	48.9
CC-F	45.7	46.9	47.8	52.7	51.9	53.5	53.5	53.6	52.5	56.0	53.6	48.5
RB-F	45.2	47.3	48.8	54.5	54.4	56.0	56.0	56.1	56.5	56.8	53.4	47.2
RB-F	45.2	47.6	49.2	55.6	55.5	57.2	57.1	57.2	57.7	57.2	53.3	47.1

TARGET: BB-1W ; REDUCED SC 30 TAF IN SEPT.

EADY.

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B07: A-LM-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	18.	19.	28.	21.	73.	99.	21.	56.	27.	146.	71.	39.
PO-F	44.2	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.5	43.6	44.1	44.6
R-TAF	18.	19.	28.	21.	73.	99.	21.	56.	27.	146.	71.	39.
R-F	44.2	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.5	43.6	44.1	44.6
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	39.7	43.9	48.4	55.0	52.7	53.6	70.1	58.0	58.3	45.7	43.7	41.3
C-F	40.2	43.7	47.1	52.5	53.7	54.4	72.3	60.2	60.5	47.9	44.9	40.8
F-F	41.0	43.8	46.4	50.8	55.6	56.6	73.4	63.6	64.0	51.4	46.6	39.8
C-TAF	32.	45.	45.	0.	2.	3.	0.	0.	30.	120.	60.	30.
C-F	43.8	43.9	44.5	0.0	45.6	45.8	0.0	0.0	46.9	50.2	48.6	47.0
742-TAF	0.	0.	0.	0.	0.	0.	0.	11.	328.	153.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.8	46.0	51.3	0.0	0.0
815-TAF	0.	0.	0.	0.	0.	122.	548.	621.	0.	176.	6.	0.
815-F	0.0	0.0	0.0	0.0	0.0	45.4	45.6	47.0	0.0	58.2	60.6	0.0
942-TAF	168.	136.	140.	193.	560.	494.	320.	78.	0.	0.	253.	201.
942-F	47.0	45.8	45.8	46.1	47.0	49.2	54.8	65.6	0.0	0.0	57.3	50.4
SH-TAF	168.	136.	140.	193.	560.	616.	868.	710.	328.	329.	259.	201.
SH-F	47.0	45.8	45.8	46.1	47.0	48.4	49.0	49.0	46.0	55.0	57.4	50.4
ASC-F	46.7	46.7	48.0	49.0	48.8	50.2	50.5	50.6	48.7	55.7	56.8	49.8
FS-F	46.2	46.0	47.1	49.0	48.8	50.2	50.5	50.6	48.5	54.2	55.3	49.4
CL-F	46.1	46.5	48.3	51.0	50.3	51.7	51.9	52.0	50.5	54.7	55.0	49.1
CI-F	46.0	46.6	48.4	51.1	50.4	51.8	51.9	52.1	50.6	54.7	54.9	49.0
CC-F	45.8	47.1	49.6	53.2	52.1	53.5	53.5	53.7	52.7	55.3	54.6	48.6
RB-F	45.3	47.6	51.0	55.1	54.6	56.0	56.0	56.1	56.7	56.2	54.2	47.3
RB-F	45.2	47.9	51.6	56.2	55.6	57.2	57.1	57.2	57.8	56.5	54.0	47.2

TARGET: BB-3W

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
808: A-LO-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
.O-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
.O-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
?O-TAF	18.	17.	18.	21.	73.	99.	21.	56.	24.	126.	61.	49.
?O-F	43.7	42.9	42.9	42.9	42.9	43.0	43.3	43.7	44.2	45.3	46.9	46.5
R-TAF	18.	17.	18.	21.	73.	99.	21.	56.	24.	126.	61.	49.
R-F	43.7	42.9	42.9	42.9	42.9	43.0	43.3	43.7	44.2	45.3	46.9	46.5
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	39.6	43.8	49.3	54.9	52.4	53.4	70.1	58.1	59.2	47.3	45.5	43.0
C-F	40.1	43.6	47.6	52.4	53.4	54.3	72.3	60.3	61.2	49.3	46.3	42.2
F-F	41.0	43.7	46.5	50.8	55.4	56.4	73.4	63.7	64.6	52.5	47.5	40.8
C-TAF	32.	42.	35.	0.	2.	3.	0.	0.	27.	100.	50.	40.
C-F	43.8	43.9	44.3	0.0	45.1	45.4	0.0	0.0	46.5	50.7	49.7	47.1
742-TAF	0.	0.	0.	0.	0.	0.	0.	45.	331.	44.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.8	46.5	50.3	0.0	0.0
315-TAF	0.	0.	0.	0.	0.	128.	554.	586.	0.	87.	1.	0.
315-F	0.0	0.0	0.0	0.0	0.0	45.4	45.6	47.0	0.0	57.4	57.7	0.0
942-TAF	168.	138.	149.	193.	559.	491.	314.	69.	0.	0.	172.	191.
942-F	47.0	45.8	45.8	46.1	47.0	49.2	55.0	65.9	0.0	0.0	57.3	50.5
H-TAF	168.	138.	149.	193.	559.	619.	868.	700.	331.	131.	173.	191.
H-F	47.0	45.8	45.8	46.1	47.0	48.4	49.0	48.7	46.5	55.0	57.3	50.5
ASC-F	46.7	46.7	47.8	49.0	48.9	50.2	50.5	50.4	49.0	56.6	56.5	49.8
ES-F	46.2	46.0	47.1	49.0	48.9	50.2	50.5	50.4	48.8	54.0	55.0	49.3
CL-F	46.1	46.6	48.3	51.0	50.4	51.7	51.9	51.8	50.7	55.0	54.6	49.0
CL-F	46.0	46.6	48.4	51.1	50.5	51.8	51.9	51.9	50.8	55.0	54.5	48.9
C-F	45.8	47.2	49.6	53.2	52.1	53.5	53.5	53.5	52.9	56.0	54.1	48.5
B-F	45.3	47.6	51.0	55.1	54.6	56.0	56.0	56.0	56.9	57.3	53.7	47.2
B-F	45.2	47.9	51.6	56.2	55.7	57.1	57.1	57.2	58.0	57.8	53.6	47.1

TARGET: B8-3W

ADY.

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B09: D-HI-100.PRE - CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	52.	104.	156.	171.	206.	24.	146.	72.	42.
TPO-F	44.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.1	44.3	44.6
TR-TAF	21.	19.	23.	52.	104.	156.	171.	206.	24.	146.	72.	42.
TR-F	44.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.1	44.3	44.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.2	44.0	49.0	50.7	50.9	50.9	50.5	48.9	59.2	46.1	43.9	41.4
OC-F	40.5	43.8	47.4	50.2	52.2	52.0	58.1	52.1	61.2	48.3	45.0	40.9
NF-F	41.2	43.8	46.5	50.0	54.7	54.6	65.6	57.3	64.6	51.7	46.7	39.8
SC-TAF	20.	30.	30.	30.	30.	60.	150.	150.	0.	120.	60.	30.
SC-F	43.9	43.9	44.1	44.9	46.4	49.3	54.9	54.6	0.0	52.2	50.0	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	16.	268.	51.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.8	46.3	48.8	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	129.	582.	613.	0.	245.	1.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	46.0	46.1	47.4	0.0	56.2	58.0	0.0
S942-TAF	200.	171.	210.	413.	493.	441.	144.	71.	0.	2.	249.	288.
S942-F	47.4	46.2	46.2	46.3	47.1	49.0	54.1	63.6	0.0	69.4	57.3	50.4
SH-TAF	200.	171.	210.	413.	493.	569.	726.	700.	268.	298.	250.	288.
SH-F	47.4	46.2	46.2	46.3	47.1	48.3	47.7	49.0	46.3	55.0	57.3	50.4
KASC-F	47.1	46.9	47.6	47.7	49.1	50.3	49.6	50.6	49.5	55.8	56.7	49.9
KES-F	46.8	46.5	47.2	47.5	48.9	50.2	50.5	51.3	49.5	54.8	55.4	49.6
ACL-F	46.6	46.9	48.1	48.6	50.5	51.7	51.9	52.5	51.9	55.3	55.1	49.3
BCL-F	46.6	46.9	48.2	48.7	50.6	51.8	51.9	52.5	52.0	55.3	55.0	49.3
CC-F	46.3	47.4	49.2	49.9	52.4	53.5	53.5	53.9	54.5	55.8	54.7	48.9
BB-F	45.7	47.7	50.4	51.3	55.0	56.0	56.0	56.0	58.9	56.7	54.3	47.6
R8-F	45.6	48.0	51.0	52.1	56.0	57.1	57.1	56.9	60.1	57.1	54.1	47.5

TARGET: BB-[redacted]; REDUCED SC 75 TAF IN SEPT
28W

READY.

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
810: D-HM-100.PRE - CVP-OCAP 7/30/92

OCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	18.	17.	18.	22.	134.	156.	161.	196.	68.	176.	72.	72.
TPO-F	44.4	43.8	43.8	43.8	43.8	43.8	43.8	44.0	44.6	46.3	48.4	47.2
TR-TAF	18.	17.	18.	22.	134.	156.	161.	196.	68.	176.	72.	72.
TR-F	44.4	43.8	43.8	43.8	43.8	43.8	43.8	44.0	44.6	46.1	48.4	47.2
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.8	44.0	49.5	54.9	49.4	50.7	50.7	49.1	52.3	47.5	46.8	44.5
DC-F	40.3	43.8	47.7	52.4	51.0	51.8	58.3	52.3	55.4	49.5	47.3	43.5
NF-F	41.1	43.8	46.6	50.8	53.9	54.5	65.7	57.5	60.3	52.7	48.1	41.7
SC-TAF	17.	27.	25.	0.	60.	60.	140.	140.	70.	150.	60.	60.
SC-F	43.9	44.0	44.1	0.0	45.4	49.4	55.0	54.8	55.5	52.6	50.8	47.1
S742-TAF	0.	0.	0.	0.	0.	0.	0.	37.	288.	122.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.7	46.9	52.2	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	204.	586.	559.	0.	84.	2.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.9	46.0	48.0	0.0	59.0	60.4	0.0
S942-TAF	183.	153.	160.	403.	493.	396.	117.	102.	0.	0.	207.	171.
S942-F	47.3	46.1	46.1	46.5	47.8	50.6	57.8	69.1	0.0	0.0	57.2	50.4
SH-TAF	183.	153.	160.	403.	493.	599.	703.	699.	288.	206.	209.	171.
SH-F	47.3	46.1	46.1	46.5	47.8	49.0	48.0	51.0	46.9	55.0	57.2	50.4
KASC-F	47.0	46.8	48.0	47.9	49.8	50.8	49.9	52.5	49.8	56.1	56.6	49.7
KES-F	46.7	46.4	47.5	47.9	49.3	50.7	50.7	52.9	50.9	54.6	55.3	49.0
ACL-F	46.5	46.9	48.6	49.1	50.8	52.1	52.1	54.0	52.6	55.2	55.0	48.7
BCL-F	46.5	46.9	48.7	49.1	50.9	52.2	52.2	54.1	52.7	55.2	54.9	48.6
CC-F	46.2	47.4	49.9	50.4	52.6	53.8	53.8	55.4	54.6	55.9	54.6	48.2
BB-F	45.6	47.8	51.1	51.9	55.0	56.1	56.3	57.3	58.2	56.8	54.1	47.1
RB-F	45.5	48.1	51.7	52.7	56.0	57.2	57.5	58.2	59.2	57.3	53.9	47.0

TARGET: BB-4W

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
811: D-LM-075.PRE - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	22.	104.	156.	121.	156.	28.	126.	72.	42.
TPO-F	44.2	43.6	43.6	43.6	43.6	43.6	43.7	44.5	45.8	47.2	49.6	47.0
TR-TAF	21.	19.	23.	22.	104.	156.	121.	156.	28.	126.	72.	42.
TR-F	44.2	43.6	43.6	43.6	43.6	43.6	43.7	44.5	45.8	47.2	49.6	47.0
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.9	48.9	54.8	50.6	50.5	52.5	50.6	58.7	48.8	47.5	42.8
DC-F	40.5	43.7	47.4	52.4	52.0	51.6	59.6	53.6	60.8	50.6	47.8	42.1
NF-F	41.2	43.8	46.5	50.8	54.5	54.3	66.4	58.5	64.3	53.5	48.4	40.7
SC-TAF	20.	30.	30.	0.	30.	60.	100.	100.	0.	100.	60.	30.
SC-F	43.9	43.9	44.1	0.0	45.0	47.5	54.7	56.8	0.0	54.5	51.7	47.5
S742-TAF	0.	0.	0.	0.	0.	0.	36.	108.	354.	159.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.4	45.6	49.9	56.7	0.0	0.0
S815-TAF	0.	0.	0.	0.	144.	347.	607.	455.	0.	9.	9.	0.
S815-F	0.0	0.0	0.0	0.0	45.8	45.8	46.3	50.1	0.0	61.6	61.6	0.0
S942-TAF	180.	151.	155.	343.	277.	190.	54.	12.	0.	0.	154.	201.
S942-F	47.2	46.0	46.2	47.0	48.6	52.3	59.9	69.9	0.0	0.0	57.3	50.4
SH-TAF	180.	151.	155.	343.	421.	537.	696.	576.	354.	169.	163.	201.
SH-F	47.2	46.0	46.2	47.0	47.6	48.1	47.3	49.7	49.9	56.9	57.5	50.4
KASC-F	46.8	46.8	48.1	48.7	49.9	50.2	49.3	51.6	52.0	57.9	56.6	49.8
KES-F	46.5	[illegible]	47.4	48.7	49.6	49.9	50.0	52.4	52.0	56.6	55.3	49.5
ACL-F	46.3	46.8	48.6	50.0	51.3	51.5	51.5	53.7	53.7	57.2	54.9	49.1
BCL-F	46.3	[illegible]	48.7	50.0	51.4	51.6	51.5	53.8	53.7	57.2	54.8	49.0
CC-F	46.1	47.4	49.9	51.5	53.4	53.4	53.3	55.4	55.6	57.8	54.4	49.6
BB-F	45.4	47.7	51.1	52.9	56.0	56.0	56.0	57.8	58.9	58.6	53.9	47.3
R8-F	45.4	48.0	51.7	53.8	57.2	57.2	57.2	58.8	59.9	59.0	53.8	47.2

TARGET: BB 6AW : REDUCED SC 30 TAF IN SEPT

OPERATIONAL TEMPERATURE CONTROL STUDY
B12: D-LO-050.PRE - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	22.	104.	156.	111.	146.	24.	107.	42.	22.
TPO-F	43.9	43.2	43.2	43.2	43.2	43.7	45.5	48.2	50.5	52.7	53.1	46.4
TR-TAF	21.	19.	23.	22.	104.	156.	111.	146.	24.	107.	42.	22.
TR-F	43.9	43.2	43.2	43.2	43.2	43.7	45.5	48.2	50.5	52.7	53.1	46.4
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.9	43.8	48.8	54.7	50.3	50.6	54.5	53.8	60.8	53.2	48.4	40.4
DC-F	40.3	43.6	47.3	52.3	51.7	51.7	61.0	56.5	62.6	54.4	48.5	40.1
NF-F	41.1	43.7	46.4	50.8	54.3	54.4	67.2	60.7	65.6	56.5	48.8	39.3
SC-TAF	20.	30.	30.	0.	30.	60.	90.	90.	0.	80.	30.	10.
SC-F	43.9	43.9	44.1	0.0	45.0	47.5	54.4	58.7	0.0	57.4	53.2	47.8
S742-TAF	0.	0.	0.	0.	0.	0.	295.	488.	358.	151.	0.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.5	48.4	53.5	57.2	0.0	0.0
S815-TAF	0.	0.	0.	0.	267.	400.	318.	0.	0.	0.	12.	0.
S815-F	0.0	0.0	0.0	0.0	45.7	45.8	46.6	0.0	0.0	0.0	61.8	0.0
S942-TAF	180.	151.	155.	233.	138.	98.	2.	0.	0.	0.	181.	221.
S942-F	47.0	46.4	46.8	47.7	49.6	54.1	59.3	0.0	0.0	0.0	57.2	50.4
SH-TAF	180.	151.	155.	233.	405.	498.	614.	488.	358.	151.	193.	221.
SH-F	47.0	46.4	46.8	47.7	47.0	47.4	46.1	48.4	53.5	57.2	57.5	50.4
KASC-F	46.7	47.1	48.6	49.6	49.5	49.7	48.4	50.7	55.2	58.3	56.7	49.8
KES-F	46.4	46.6	47.9	49.6	49.2	49.5	49.2	51.9	55.2	58.0	56.2	49.7
ACL-F	46.2	47.0	49.0	51.0	51.0	51.2	50.9	53.6	56.6	58.5	55.8	49.3
BCL-F	46.2	47.1	49.0	51.1	51.1	51.3	51.0	53.6	56.6	58.5	55.6	49.2
CC-F	46.0	47.6	50.2	52.6	53.2	53.2	52.9	55.5	58.2	59.0	55.2	48.8
BB-F	45.4	47.9	51.3	54.1	56.0	56.0	56.0	58.1	60.9	59.7	54.5	47.4
RB-F	45.3	48.2	51.9	55.1	57.1	57.3	57.3	59.4	61.7	60.0	54.2	47.3

TARGET: BB-6CW ; REDUCED SC 26.4 TAF IN SEPT

OPERATIONAL TEMPERATURE CONTROL STUDY
813: C-HI-100.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	23.	17.	38.	30.	139.	219.	182.	157.	58.	102.	46.	31.
PO-F	44.6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.2	44.3	44.6	44.9
R-TAF	23.	17.	38.	30.	139.	219.	182.	157.	58.	102.	46.	31.
R-F	44.6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.2	44.3	44.6	44.9
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	40.4	44.0	48.0	53.4	49.5	49.2	50.2	50.3	53.1	47.1	43.8	40.8
C-F	40.7	43.8	46.9	51.6	51.0	50.5	57.9	53.4	56.1	49.1	44.9	40.4
F-F	41.3	43.8	46.3	50.5	53.9	53.4	65.5	58.3	60.8	52.4	46.7	39.5
C-TAF	0.	0.	0.	0.	60.	120.	160.	100.	60.	100.	60.	10.
C-F	0.0	0.0	0.0	0.0	44.4	51.1	54.1	55.0	55.8	54.3	51.9	47.2
742-TAF	0.	0.	0.	0.	0.	0.	0.	59.	389.	269.	3.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0	49.6	58.0	58.2	0.0
815-TAF	0.	0.	0.	0.	0.	306.	656.	626.	0.	0.	21.	0.
815-F	0.0	0.0	0.0	0.0	0.0	46.1	46.3	49.6	0.0	0.0	62.5	0.0
942-TAF	200.	181.	185.	386.	529.	226.	43.	66.	0.	0.	209.	255.
942-F	47.5	46.2	46.2	46.5	47.7	50.5	57.2	68.6	0.0	0.0	57.0	50.3
H-TAF	200.	181.	185.	386.	529.	532.	699.	752.	389.	269.	232.	255.
H F	47.5	46.2	46.2	46.5	47.7	48.0	47.0	51.0	49.6	58.0	57.5	50.3
ASC-F	47.1	46.9	47.8	48.0	49.6	50.1	49.0	52.4	51.5	58.5	56.8	49.8
ES-F	47.1	46.9	47.8	48.0	49.1	50.3	50.0	52.7	52.1	57.4	55.8	49.7
CL-F	46.8	47.3	48.9	49.2	50.5	51.7	51.3	53.8	53.4	57.7	55.5	49.3
CL-F	46.8	47.4	49.0	49.3	50.6	51.8	51.4	53.9	53.5	57.7	55.4	49.3
C-F	46.5	47.8	50.1	50.6	52.2	53.5	53.0	55.2	55.0	58.2	55.0	48.9
B-F	45.8	48.1	51.3	52.1	54.6	55.9	55.6	57.1	57.9	58.8	54.5	47.5
8-F	45.7	48.3	51.8	53.0	55.6	57.0	56.7	58.0	58.8	59.0	54.3	47.4

TARGET: B8-4W

ADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B14: C-HM-075.PRE - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	219.	182.	217.	24.	122.	46.	51.
TPO-F	44.5	43.9	43.9	43.9	43.9	43.9	44.0	44.7	45.9	47.5	49.9	47.2
TR-TAF	23.	17.	38.	30.	109.	219.	182.	217.	24.	122.	46.	51.
TR-F	44.5	43.9	43.9	43.9	43.9	43.9	44.0	44.6	45.9	47.5	49.9	47.2
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.3	44.0	47.9	53.4	50.5	49.0	50.1	49.1	59.7	49.1	46.9	43.5
DC-F	40.6	43.8	46.9	51.6	51.9	50.3	57.9	52.3	61.7	50.9	47.3	42.7
NF-F	41.2	43.8	46.3	50.5	54.4	53.3	65.4	57.5	64.9	53.7	48.1	41.1
SC-TAF	0.	0.	0.	0.	30.	120.	160.	160.	0.	120.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	49.3	54.0	54.2	0.0	53.8	52.0	47.3
S742-TAF	0.	0.	0.	0.	0.	0.	14.	140.	314.	233.	3.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.7	45.9	51.5	60.5	58.1	0.0
S815-TAF	0.	0.	0.	0.	65.	382.	621.	480.	0.	0.	243.	219.
S815-F	0.0	0.0	0.0	0.0	45.9	46.0	46.6	52.1	0.0	0.0	57.3	50.0
S942-TAF	200.	181.	185.	238.	431.	115.	38.	28.	0.	0.	0.	0.
S942-F	47.3	46.1	46.4	47.4	49.6	54.6	63.6	76.2	0.0	0.0	0.0	0.0
SH-TAF	200.	181.	185.	238.	496.	497.	673.	649.	314.	233.	246.	219.
SH-F	47.3	46.1	46.4	47.4	49.1	48.0	47.5	51.8	51.5	60.5	57.3	50.0
KASC-F	47.0	46.8	48.0	49.0	51.0	50.3	49.6	53.4	53.6	60.8	56.7	49.5
KES-F	47.0	46.8	48.0	49.0	50.6	50.1	50.4	53.6	53.6	58.4	55.8	49.2
ACL-F	46.8	47.3	49.1	50.3	52.1	51.6	51.9	54.7	55.3	58.7	55.5	48.9
BCL-F	46.7	47.3	49.1	50.3	52.1	51.7	51.9	54.7	55.4	58.7	55.4	48.8
CC-F	46.5	47.7	50.3	51.7	53.8	53.4	53.6	56.0	57.2	59.1	55.0	48.5
BB-F	45.7	48.0	51.4	53.2	56.1	56.0	56.1	58.0	60.5	59.6	54.5	47.3
RB-F	45.6	48.3	51.9	54.1	57.1	57.1	57.3	58.9	61.4	59.8	54.3	47.2

TARGET: BB-6RW : REDUCED SC 90 TAF IN SEPT.

OPERATIONAL TEMPERATURE CONTROL STUDY
B15: C-LM-050.PRE - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	159.	172.	147.	28.	102.	46.	51.
TPO-F	44.3	43.7	43.7	43.7	43.7	43.7	44.5	47.0	49.5	51.8	53.0	46.6
TR-TAF	23.	17.	38.	30.	109.	159.	172.	147.	28.	102.	46.	51.
TR-F	44.3	43.7	43.7	43.7	43.7	43.7	44.3	47.0	49.5	51.8	53.0	46.6
LEW-TAF	18.	17.	18.	13.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.3	43.9	47.8	53.3	50.4	50.5	50.7	52.9	59.8	52.6	48.6	43.1
DC-F	40.6	43.7	46.8	51.6	51.8	51.6	58.3	55.7	61.7	53.9	48.7	42.3
NF-F	41.2	43.8	46.3	50.5	54.4	54.3	65.7	60.1	65.0	56.1	48.9	40.8
SC-TAF	0.	0.	0.	0.	30.	60.	150.	90.	30.	100.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	46.5	54.5	55.9	57.6	57.0	52.8	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	271.	397.	358.	195.	2.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.8	48.6	56.2	60.9	58.0	0.0
S815-TAF	0.	0.	0.	0.	255.	429.	249.	112.	0.	0.	161.	71.
S815-F	0.0	0.0	0.0	0.0	45.8	45.9	46.7	51.5	0.0	0.0	57.3	51.7
S942-TAF	200.	181.	185.	339.	192.	71.	0.	0.	0.	0.	0.	129.
S942-F	47.2	46.4	47.3	48.5	51.6	58.3	64.4	0.0	0.0	0.0	0.0	49.1
SH-TAF	200.	181.	185.	339.	447.	500.	520.	509.	358.	195.	163.	201.
SH-F	47.2	46.4	47.3	48.5	48.3	47.7	46.2	49.2	56.2	60.9	57.3	50.1
KASC-F	46.9	47.0	48.7	50.0	50.4	50.0	48.9	51.5	57.7	61.2	56.5	49.5
KES-F	46.9	47.0	48.7	50.0	50.0	49.6	50.2	52.2	57.7	59.8	55.5	49.2
ACL-F	46.7	47.4	49.7	51.2	51.6	51.3	51.9	53.7	58.8	60.0	55.1	48.8
BCL-F	46.6	47.4	49.7	51.2	51.7	51.4	52.0	53.8	58.8	60.0	55.0	48.8
CC-F	46.4	47.9	50.8	52.5	53.6	53.3	53.9	55.5	60.1	60.3	54.6	48.4
BB-F	45.7	48.1	51.7	53.9	56.1	56.1	57.0	58.1	62.2	60.6	54.1	47.2
RB-F	45.6	48.4	52.3	54.7	57.1	57.3	58.3	59.3	62.9	60.8	53.9	47.1

TARGET: BB 10CH

OPERATIONAL TEMPERATURE CONTROL STUDY
B16: C-LO-025.PRE - CVP-OCAP 7/30/92

CATION	J	F	M	A	M	J	J	A	S	O	N	D
LO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
LO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PO-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	172.	36.	21.
PO-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	56.8	52.4	45.0
R--TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	172.	36.	21.
R-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	56.3	52.4	45.0
EW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
EW-F	40.2	43.9	47.7	53.2	50.2	52.7	62.1	57.6	60.4	56.0	47.5	39.8
)C-F	40.5	43.7	46.8	51.5	51.6	53.6	66.5	59.8	62.2	56.8	47.8	39.6
IF-F	41.2	43.8	46.2	50.5	54.3	55.9	70.2	63.3	65.4	58.3	48.4	38.9
C-TAF	0.	0.	0.	0.	30.	30.	30.	30.	30.	170.	50.	0.
C--F	0.0	0.0	0.0	0.0	44.0	45.2	48.3	52.3	56.7	58.8	53.2	0.0
742-TAF	0.	0.	0.	0.	0.	0.	22.	196.	328.	93.	0.	0.
742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.3	45.7	53.1	59.8	0.0	0.0
815-TAF	0.	0.	0.	50.	218.	362.	488.	276.	0.	0.	173.	209.
815--F	0.0	0.0	0.0	45.7	45.7	45.9	47.2	52.8	0.0	0.0	57.2	50.2
942-TAF	200.	181.	185.	208.	176.	101.	41.	3.	0.	0.	0.	22.
942--F	47.0	48.5	48.3	49.6	53.1	60.3	72.3	79.0	0.0	0.0	0.0	48.4
H--TAF	200.	181.	185.	258.	393.	463.	551.	475.	328.	93.	173.	231.
H-F	47.0	48.5	48.3	48.9	49.0	49.0	49.0	50.0	53.1	59.8	57.2	50.0
ASC-F	46.7	48.8	49.6	50.8	51.3	51.3	51.4	52.3	55.0	60.6	56.4	49.5
ES-F	46.7	48.8	49.6	50.8	50.8	50.9	51.2	52.3	55.1	59.4	55.7	49.5
CL-F	46.5	49.0	50.5	52.2	52.5	52.7	53.1	54.1	56.5	59.8	55.3	49.1
3CL--F	46.4	49.0	50.5	52.3	52.6	52.8	53.2	54.2	56.6	59.7	55.1	49.0
C-F	46.2	49.3	51.4	53.8	54.6	54.9	55.4	56.2	58.1	60.1	54.7	48.6
3R--F	45.5	49.0	52.2	55.2	57.1	57.7	58.6	59.1	60.9	60.5	54.1	47.3
38-F	45.5	49.2	52.7	56.1	58.2	59.0	60.0	60.4	61.7	60.7	53.9	47.2

TARGET: BB-3C ; INCREASED SC 70 TAF IN OCT

EADY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B17: I H1-050.PRE - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLD-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLD-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	55.	81.	131.	[illegible]	201.	260.	183.	138.	58.	103.	46.	52.
TPO-F	44.7	44.2	44.2	44.2	44.2	44.2	44.5	46.1	48.7	52.3	53.2	46.3
TR-TAF	55.	81.	131.	[illegible]	201.	260.	183.	138.	58.	103.	46.	52.
TR-F	44.7	44.2	44.2	44.2	44.2	44.2	44.5	46.1	48.7	52.3	53.2	46.3
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	52.	24.	26.	12.	19.
LEW-F	42.3	44.1	45.6	47.5	48.0	48.5	50.5	52.5	55.6	52.9	48.7	43.0
DC-F	42.0	43.8	45.7	48.4	49.8	49.8	58.1	55.3	58.2	54.2	48.8	42.2
NF-F	41.8	43.8	45.9	49.4	53.1	52.9	65.6	59.8	62.3	56.3	49.0	40.8
SC-TAF	30.	60.	90.	90.	120.	160.	160.	80.	60.	100.	60.	30.
SC-F	43.7	43.9	45.4	46.6	49.0	51.3	53.4	55.0	57.0	57.2	52.9	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	218.	328.	279.	3.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.3	56.0	62.8	57.5	0.0
S815-TAF	0.	0.	0.	0.	0.	392.	625.	450.	0.	0.	247.	216.
S815-F	0.0	0.0	0.0	0.0	0.0	46.3	46.7	52.9	0.0	0.0	56.9	49.5
S942-TAF	170.	167.	193.	275.	510.	157.	85.	25.	0.	0.	0.	0.
S942-F	47.5	46.3	46.4	46.9	49.3	55.8	70.4	79.0	0.0	0.0	0.0	0.0
SH-TAF	170.	167.	193.	275.	510.	549.	710.	693.	328.	279.	250.	216.
SH-F	47.5	46.3	46.4	46.9	49.3	49.0	49.5	51.8	56.0	62.8	56.9	49.5
KASC-F	47.1	47.0	47.9	49.0	51.1	51.0	51.3	53.3	57.6	62.8	56.3	49.0
KES-F	46.6	46.2	47.1	48.4	50.7	51.1	51.7	53.5	57.5	61.3	55.6	48.8
ACL-F	46.4	46.6	47.9	49.6	51.9	52.4	53.0	54.6	58.6	61.4	55.3	48.5
BCL-F	46.3	46.6	48.0	49.7	52.0	52.4	53.1	54.7	58.7	61.4	55.3	48.4
CC-F	46.1	47.1	48.9	51.1	53.4	53.9	54.6	56.1	59.9	61.5	54.9	48.1
BN-F	45.5	47.5	50.1	52.5	55.5	56.1	57.0	58.1	62.1	61.6	54.4	47.1
RB-F	45.4	47.8	50.6	53.4	56.4	57.2	58.0	59.1	62.8	61.7	54.3	47.0

TARGET: BB 10CU : INCREASED CC 30 TAF IN SEPT.

READY

OPERATIONAL TEMPERATURE CONTROL STUDY
B18: E-HM-000.PRE - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO TAF	55.	51.	72.	63.	171.	220.	143.	88.	58.	122.	46.	52.
TPO F	44.6	44.0	44.0	44.0	44.0	44.0	44.8	47.2	50.3	55.9	52.8	45.4
TR TAF	55.	51.	72.	63.	171.	220.	143.	88.	58.	122.	46.	52.
TR F	44.6	44.0	44.0	44.0	44.0	44.0	44.8	47.2	50.3	55.9	52.8	45.4
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW F	42.2	44.0	46.5	49.8	48.5	49.1	52.2	56.2	56.5	55.6	48.5	42.4
DC F	41.9	43.8	46.1	49.7	50.2	50.4	59.4	58.6	59.0	56.5	48.6	41.7
NF F	41.8	43.8	46.0	49.8	53.4	53.3	66.3	62.4	62.9	58.1	48.9	40.4
SC-TAF	30.	30.	30.	30.	90.	120.	120.	30.	60.	120.	60.	30.
SC-F	43.7	43.8	44.2	45.4	48.0	51.9	53.7	56.1	56.9	58.4	53.1	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	200.	288.	170.	0.	0.
S742 F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.2	58.1	61.5	56.5	0.0
S815 TAF	0.	0.	0.	0.	82.	387.	562.	406.	0.	0.	178.	216.
S815 F	0.0	0.0	0.0	0.0	46.1	46.1	47.2	57.0	0.0	0.0	56.4	49.2
S942 TAF	170.	195.	251.	281.	389.	137.	71.	0.	0.	0.	0.	0.
S942 F	47.4	46.3	47.2	49.2	54.3	66.7	79.0	0.0	0.0	0.0	0.0	0.0
SH-TAF	170.	195.	251.	281.	471.	524.	633.	606.	288.	170.	178.	216.
SH F	47.4	46.3	47.2	49.2	52.9	51.5	50.8	53.5	58.1	61.5	56.4	49.2
KASC-F	47.0	46.9	48.3	51.0	54.5	53.4	52.8	55.1	59.7	61.7	55.7	48.7
KES F	46.5	46.5	47.9	50.5	53.5	53.1	52.9	55.1	59.2	60.3	55.0	48.5
ACI F	46.3	46.9	48.6	51.7	54.7	54.4	54.4	56.5	60.3	60.5	54.7	48.2
BCL F	46.3	46.9	48.7	51.7	54.7	54.5	54.4	56.5	60.3	60.5	54.6	48.2
CC F	46.1	47.4	49.5	53.1	56.1	56.0	56.1	58.0	61.5	60.7	54.3	47.8
BB F	45.4	47.7	50.5	54.4	57.8	58.1	58.6	60.2	63.6	61.0	53.9	47.0
RB F	45.4	47.9	51.0	55.3	58.7	59.1	59.7	61.2	64.2	61.2	53.7	46.9

TARGET: CC-6CW ; INCREASED SC 30 TAF IN SEPT.

READY.

ld.bt12
READY.
ist.

OPERATIONAL TEMPERATURE CONTROL STUDY
BT12: D-LO-25.TEM - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	22.	104.	156.	21.	56.	24.	107.	42.	22.
TPO-F	43.9	43.2	43.2	43.2	43.2	43.7	44.8	45.4	46.2	47.6	49.5	46.7
TR-TAF	21.	19.	23.	22.	104.	156.	21.	56.	24.	107.	42.	22.
TR-F	43.9	43.2	43.2	43.2	43.2	43.7	44.8	45.4	46.2	47.6	49.5	46.7
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.9	43.8	48.8	54.7	50.3	50.6	70.3	59.0	59.7	49.4	46.4	40.5
DC-F	40.3	43.6	47.3	52.3	51.7	51.7	72.4	61.1	61.7	51.1	47.0	40.1
NF-F	41.1	43.7	46.4	50.8	54.3	54.4	73.5	64.3	64.9	53.9	47.9	39.3
SC-TAF	20.	30.	30.	0.	30.	60.	0.	0.	0.	80.	30.	10.
SC-F	43.9	43.9	44.1	0.0	45.0	47.5	0.0	0.0	0.0	53.8	51.7	47.7
S742-TAF	0.	0.	0.	0.	296.	0.	528.	527.	358.	135.	0.	0.
S742-F	0.0	0.0	0.0	0.0	45.4	0.0	45.8	47.8	51.3	53.9	0.0	0.0
S815-TAF	0.	0.	0.	0.	0.	400.	0.	0.	0.	48.	2.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.8	0.0	0.0	0.0	59.2	60.3	0.0
S942-TAF	180.	151.	155.	193.	0.	16.	0.	0.	0.	0.	191.	221.
S942-F	47.0	46.5	46.9	47.7	0.0	51.9	0.0	0.0	0.0	0.0	57.3	50.5
SH-TAF	180.	151.	155.	193.	296.	416.	528.	527.	358.	183.	193.	221.
SH-F	47.0	46.5	46.9	47.7	45.4	46.0	45.8	47.8	51.3	55.3	57.3	50.5
KASC-F	46.7	47.2	48.7	50.4	48.9	48.9	48.6	50.0	53.2	56.5	56.6	49.9
KES-F	46.4	46.7	48.0	50.4	48.5	48.7	48.6	50.0	53.2	55.7	55.9	49.8
ACI-F	46.2	47.1	49.0	52.2	51.0	50.8	50.8	51.9	54.7	56.3	55.5	49.4
BCI-F	46.2	47.1	49.1	52.3	51.1	50.9	51.0	52.0	54.8	56.3	55.4	49.3
CC-F	46.0	47.6	50.2	54.2	53.7	53.1	53.5	54.1	56.5	57.1	54.9	48.9
BB-F	45.4	47.9	51.4	55.8	57.0	56.3	57.3	57.2	59.6	58.1	54.3	47.4
RB-F	45.3	48.2	51.9	56.8	58.3	57.7	58.9	58.5	60.6	58.5	54.1	47.3

TARGET: BB-9BW : ELIMINATED SC IN JULY-SEPT.

READY.

ld.bt14
READY.
lst

OPERATIONAL TEMPERATURE CONTROL STUDY
BT14: C-HM-50.TEM - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	219.	182.	157.	24.	122.	46.	51.
TPO-F	44.5	43.9	43.9	43.9	43.9	43.9	44.0	44.4	45.2	46.3	48.3	47.0
TR-TAF	23.	17.	38.	30.	109.	219.	182.	157.	24.	122.	46.	51.
TR-F	44.5	43.9	43.9	43.9	43.9	43.9	44.0	44.4	45.2	46.3	48.3	47.0
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	153.	24.	26.	12.	19.
LEW-F	40.3	44.0	47.9	53.4	50.5	49.0	50.1	50.5	59.5	48.2	45.9	43.4
DC-F	40.6	43.8	46.9	51.6	51.9	50.3	57.9	51.8	61.5	50.1	46.6	42.6
NF-F	41.2	43.8	46.3	50.5	54.4	53.3	65.4	54.1	64.8	53.1	47.6	41.0
SC-TAF	0.	0.	0.	0.	30.	120.	160.	0.	0.	120.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	49.3	54.0	0.0	0.0	53.6	51.8	47.3
S742-TAF	0.	0.	0.	0.	0.	0.	66.	97.	388.	111.	163.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.9	45.9	50.9	57.9	55.2	0.0
S815-TAF	0.	0.	0.	0.	75.	322.	541.	622.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	46.0	46.1	46.3	50.2	0.0	0.0	0.0	0.0
S942-TAF	200.	181.	185.	299.	363.	166.	13.	52.	0.	0.	0.	201.
S942-F	47.4	46.1	46.3	46.9	48.3	51.8	58.3	69.9	0.0	0.0	0.0	50.4
SH-TAF	200.	181.	185.	299.	438.	488.	620.	771.	388.	111.	163.	201.
SH-F	47.4	46.1	46.3	46.9	47.9	48.0	46.5	51.0	50.9	57.9	55.2	50.4
KASC-F	47.0	46.8	47.9	48.7	50.1	50.3	48.8	52.4	52.7	59.1	54.6	49.8
KES-F	47.0	46.8	47.9	48.7	49.7	50.1	49.9	52.4	52.7	56.2	53.8	49.5
ACL-F	46.8	47.3	49.0	50.1	51.4	51.7	51.4	53.6	54.2	56.9	53.6	49.1
BCL-F	46.7	47.3	49.0	50.2	51.5	51.7	51.5	53.7	54.2	56.9	53.5	49.0
CC-F	46.5	47.7	50.2	51.8	53.4	53.5	53.2	55.1	55.9	57.7	53.3	48.6
BB-F	45.7	48.0	51.3	53.4	56.0	56.1	56.0	57.2	59.0	58.6	53.2	47.3
RB-F	45.6	48.3	51.9	54.3	57.1	57.2	57.2	58.2	59.9	59.0	53.0	47.2

TARGET: BB-4AW ; ELIMINATED SC IN AUG-SEPT.

READY.

ld.bt15
ist.
READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
8T15: C-LM-25.TEM - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	159.	22.	57.	178.	102.	46.	51.
TPO-F	44.3	43.7	43.7	43.7	43.7	43.7	43.9	44.1	45.7	48.9	51.1	46.8
TR-TAF	23.	17.	38.	30.	109.	159.	22.	57.	178.	102.	46.	51.
TR-F	44.3	43.7	43.7	43.7	43.7	43.7	43.9	44.1	45.5	48.9	51.1	46.8
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	27.	26.	12.	19.
LEW-F	40.3	43.9	47.8	53.3	50.4	50.5	69.8	58.1	48.8	50.4	47.6	43.3
DC-F	40.6	43.7	46.8	51.6	51.8	51.6	72.1	60.3	52.2	52.0	47.9	42.5
NF-F	41.2	43.8	46.3	50.5	54.4	54.3	73.3	63.7	57.5	54.6	48.4	41.0
SC-TAF	0.	0.	0.	0.	30.	60.	0.	0.	180.	100.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	46.5	0.0	0.0	53.7	54.7	52.0	47.1
S742-TAF	0.	0.	0.	0.	0.	0.	283.	434.	178.	131.	163.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.8	49.6	55.4	58.2	55.1	0.0
S815-TAF	0.	0.	0.	0.	347.	423.	371.	195.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	45.9	46.0	47.2	52.6	0.0	0.0	0.0	0.0
S942-TAF	200.	181.	185.	253.	11.	15.	2.	0.	0.	0.	0.	201.
S942-F	47.2	46.2	47.0	48.1	50.0	54.6	60.0	0.0	0.0	0.0	0.0	50.4
SH-TAF	200.	181.	185.	253.	358.	438.	656.	629.	178.	131.	163.	201.
SH-F	47.2	46.2	47.0	48.1	46.0	46.3	46.6	50.5	55.4	58.2	55.1	50.4
KASC-F	46.9	46.9	48.5	50.1	48.9	49.0	48.8	52.3	58.4	59.2	54.6	49.8
KES-F	46.9	46.9	48.5	50.1	48.5	48.7	48.8	52.3	56.0	57.2	53.9	49.4
ACL-F	46.7	47.3	49.5	51.6	50.6	50.7	50.6	53.8	57.4	57.8	53.7	49.1
BCL-F	46.6	47.4	49.6	51.7	50.7	50.8	50.7	53.8	57.4	57.8	53.5	49.0
CC-F	46.4	47.8	50.6	53.3	53.0	52.9	52.8	55.5	58.9	58.4	53.3	48.6
BB-F	45.7	48.1	51.6	54.8	56.1	56.1	56.1	58.0	61.4	59.2	53.2	47.3
RB-F	45.6	48.3	52.2	55.7	57.4	57.4	57.5	59.2	62.2	59.6	53.0	47.2

TARGET: BB-6CW ; ELIMINATED SC IN JUL-AUG, INCREASED SC 150 TAF IN SEPT

READY.

ld.bt16
READY.
lst.

OPERATIONAL TEMPERATURE CONTROL STUDY
BT16: C-LO-25.TEM - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	102.	36.	21.
TPO-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	54.5	52.9	45.6
TR-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	102.	36.	21.
TR-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	54.5	52.9	45.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.2	43.9	47.7	53.2	50.2	52.7	62.1	57.6	60.4	54.6	47.8	40.0
DC-F	40.5	43.7	46.8	51.5	51.6	53.6	66.5	59.8	62.2	55.6	48.1	39.7
NF-F	41.2	43.8	46.2	50.5	54.3	55.9	70.2	63.3	65.4	57.4	48.5	39.0
SC-TAF	0.	0.	0.	0.	30.	30.	30.	30.	30.	100.	50.	0.
SC-F	0.0	0.0	0.0	0.0	44.0	45.2	48.3	52.3	56.7	59.0	53.2	0.0
S742-TAF	0.	0.	0.	0.	344.	388.	510.	464.	328.	131.	173.	0.
S742-F	0.0	0.0	0.0	0.0	45.6	45.8	46.3	49.5	54.8	58.6	55.1	0.0
S815-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S942-TAF	200.	181.	185.	223.	0.	0.	0.	0.	0.	0.	0.	231.
S942-F	47.0	48.2	48.1	49.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.3
SH-TAF	200.	181.	185.	223.	344.	388.	510.	464.	328.	131.	173.	231.
SH-F	47.0	48.2	48.1	49.4	45.6	45.8	46.3	49.5	54.8	58.6	55.1	50.3
KASC-F	46.7	48.6	49.4	51.5	48.6	48.8	49.1	51.9	56.6	59.5	54.5	49.8
KES-F	46.7	48.6	49.4	51.5	48.2	48.5	49.1	51.9	56.6	59.3	54.2	49.8
ACI-F	46.5	48.9	50.3	53.0	50.4	50.8	51.2	53.8	57.9	59.7	53.9	49.4
BCI-F	46.4	48.8	50.3	53.1	50.6	51.0	51.3	53.9	57.9	59.6	53.8	49.3
CC-F	46.2	49.1	51.3	54.7	52.9	53.5	53.8	56.0	59.3	60.0	53.5	48.9
BB-F	45.5	48.9	52.1	56.0	56.1	57.0	57.5	59.0	61.8	60.5	53.3	47.4
RB-F	45.5	49.1	52.6	56.9	57.4	58.5	59.0	60.3	62.6	60.7	53.2	47.3

TARGET: BB-16W

READY.

old.bt17
list
READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
BT17: E-HI-25.TEM - CVP-OCAP 7/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	55.	81.	131.	123.	201.	260.	183.	138.	28.	153.	46.	52.
TPO-F	44.7	44.1	44.1	44.1	44.1	44.2	44.7	46.8	49.5	54.0	53.3	45.9
TR TAF	55.	81.	131.	123.	201.	260.	183.	138.	28.	153.	46.	52.
TR F	44.7	44.1	44.1	44.1	44.1	44.2	44.6	46.8	49.5	54.0	53.3	45.9
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	42.3	44.1	45.6	47.4	48.0	48.5	50.6	53.1	59.8	54.1	48.8	42.7
DC-F	42.0	43.8	45.7	48.3	49.8	49.8	58.2	55.8	61.7	55.2	48.8	42.0
MI F	41.8	43.8	45.9	49.4	53.1	52.9	65.6	60.2	65.0	57.1	49.0	40.6
SC-TAF	30.	60.	90.	90.	120.	160.	160.	80.	30.	150.	60.	30.
SC F	43.7	43.9	45.4	46.6	49.0	51.3	53.4	55.1	56.6	57.0	52.8	47.2
S742 TAF	0.	0.	0.	0.	0.	0.	2.	183.	328.	218.	178.	0.
S742 F	0.0	0.0	0.0	0.0	0.0	0.0	46.2	46.3	51.5	59.3	55.6	0.0
S815-TAF	0.	0.	0.	0.	0.	325.	620.	439.	0.	0.	0.	201.
S815-F	0.0	0.0	0.0	0.0	0.0	46.3	46.4	49.5	0.0	0.0	0.0	50.2
S942-TAF	170.	121.	130.	234.	489.	212.	23.	11.	0.	0.	0.	0.
S942 F	47.5	46.3	46.3	46.6	47.8	51.9	62.4	73.9	0.0	0.0	0.0	0.0
SH TAF	170.	121.	130.	234.	489.	537.	645.	633.	328.	218.	178.	201.
SH F	47.5	46.3	46.3	46.6	47.8	48.5	47.0	49.0	51.5	59.3	55.6	50.2
KASC-F	47.1	47.2	48.5	49.0	49.8	50.6	49.2	50.8	53.6	59.8	55.0	49.6
KES F	46.6	46.1	47.2	48.3	49.6	50.8	50.0	51.3	53.9	58.7	54.4	49.3
ACI F	46.4	46.6	48.3	49.7	51.0	52.1	51.5	52.6	55.3	58.9	54.2	48.9
BCI F	46.3	46.7	48.3	49.8	51.1	52.2	51.6	52.7	55.4	58.9	54.1	48.8
CC-F	46.1	47.2	49.4	51.3	52.6	53.7	53.3	54.3	57.1	59.3	53.8	48.4
RB F	45.5	47.6	50.6	52.9	54.8	56.0	56.0	56.6	60.1	59.7	53.5	47.2
RB-F	45.4	47.9	51.2	53.8	55.8	57.0	57.2	57.8	60.9	59.9	53.4	47.1

TARGET: RB-4BW

READY.

old,b19
list
READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
819: W-HI-100.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	100.	84.	107.	212.	270.	197.	174.	24.	142.	90.	40.
TPO-F	44.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.9	44.1	44.5	44.9
TR-TAF	21.	100.	84.	107.	212.	270.	197.	174.	24.	142.	90.	40.
TR-F	44.5	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.9	44.1	44.5	44.9
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.8	46.1	47.6	47.5	48.0	49.5	49.5	59.2	46.2	44.1	41.5
DC-F	40.5	43.6	45.9	48.5	49.4	49.4	57.4	52.7	61.2	48.3	45.2	41.0
NF-F	41.2	43.7	46.0	49.4	52.9	52.5	65.2	57.8	64.6	51.8	46.8	39.9
SC-TAF	60.	150.	120.	120.	150.	180.	180.	120.	0.	120.	90.	60.
SC-F	43.6	44.5	45.7	47.4	50.1	51.7	53.4	54.8	0.0	52.4	49.5	46.8
S742-TAF	0.	0.	0.	0.	0.	0.	0.	505.	536.	318.	378.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.8	50.5	53.9	54.9	0.0
S815-TAF	0.	0.	0.	0.	0.	332.	658.	104.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.3	45.7	47.6	0.0	0.0	0.0	0.0
S942-TAF	700.	750.	580.	517.	652.	226.	84.	0.	0.	0.	0.	700.
S942-F	47.2	45.8	45.8	46.4	47.7	49.6	52.8	0.0	0.0	0.0	0.0	50.6
SH-TAF	700.	750.	580.	517.	652.	558.	742.	609.	536.	318.	378.	700.
SH-F	47.2	45.8	45.8	46.4	47.7	47.0	46.5	46.1	50.5	53.9	54.9	50.6
KASC-F	47.1	46.0	46.4	47.5	49.2	49.1	48.4	48.2	51.9	54.8	54.7	50.4
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.4	43.5	43.6	44.0	44.8	45.9	47.5	49.2	48.8	46.1
CLM-F	43.8	48.0	52.1	58.1	65.3	69.1	72.9	70.9	65.1	58.1	49.6	45.6
KES-F	46.8	45.8	46.3	47.5	49.4	49.7	49.4	49.3	51.9	54.1	53.7	50.1
ACL-F	46.8	45.9	46.7	48.3	50.4	51.1	50.7	50.7	53.0	54.7	53.6	50.0
BCL-F	46.7	45.9	46.7	48.3	50.5	51.1	50.8	50.8	53.1	54.7	53.5	49.9
CC-F	46.7	46.1	47.2	49.2	51.7	52.6	52.3	52.4	54.4	55.3	53.4	49.8
BB-F	46.4	46.3	47.9	50.3	53.6	54.9	54.8	54.9	57.0	56.2	53.3	48.7
RB-F	46.3	46.4	48.3	51.0	54.5	56.0	55.9	56.1	57.8	56.5	53.2	48.6

TARGET: RB-W2 ; REDUCED SC 122.2 TAF IN SEPT

READY.

old,b20
list
READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
820: W-HN-100.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	17.	23.	47.	122.	150.	227.	174.	24.	142.	90.	40.
TPO-F	44.3	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.7	44.1	44.4
TR-TAF	21.	17.	23.	47.	122.	150.	227.	174.	24.	142.	90.	40.
TR-F	44.3	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.6	43.7	44.1	44.4
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.9	48.9	50.9	49.7	50.8	48.7	49.3	59.1	45.9	43.8	41.3
OC-F	40.5	43.7	47.4	50.3	51.2	51.9	56.8	52.5	61.1	48.1	44.9	40.8
NF-F	41.2	43.8	46.5	50.0	54.0	54.6	64.9	57.6	64.5	51.6	46.7	39.8
SC-TAF	60.	66.	60.	60.	60.	60.	210.	120.	0.	120.	90.	60.
SC-F	43.6	43.9	45.3	46.9	48.9	52.0	53.9	54.9	0.0	52.3	49.4	46.8
S742-TAF	0.	0.	0.	0.	0.	0.	17.	609.	521.	258.	179.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	44.6	46.6	50.9	53.6	54.4	0.0
S815-TAF	0.	0.	0.	0.	0.	467.	653.	0.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.3	45.9	0.0	0.0	0.0	0.0	0.0
S942-TAF	700.	750.	580.	517.	652.	92.	71.	0.	0.	0.	0.	260.
S942-F	47.2	45.8	45.8	46.4	47.7	49.5	52.6	0.0	0.0	0.0	0.0	50.7
SH-TAF	700.	750.	580.	517.	652.	558.	742.	609.	521.	258.	179.	260.
SH-F	47.2	45.8	45.8	46.4	47.7	46.0	46.5	46.6	50.9	53.6	54.4	50.7
KASC-F	47.1	46.0	46.4	47.5	49.2	48.2	48.4	48.6	52.3	54.6	54.0	50.2
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLD-F	43.0	43.1	43.4	43.5	43.6	43.8	44.4	45.5	47.0	48.8	48.7	46.1
CLN-F	43.8	48.0	52.1	58.1	65.3	69.0	72.8	70.8	65.0	57.9	49.6	45.6
KES-F	46.8	45.8	46.3	47.4	49.2	48.6	49.6	49.6	52.3	53.9	52.5	49.6
ACL-F	46.8	46.0	46.7	48.3	50.4	50.2	50.9	51.0	53.5	54.5	52.4	49.3
BCL-F	46.7	46.0	46.8	48.4	50.4	50.3	51.0	51.1	53.5	54.5	52.3	49.2
CC-F	46.7	46.2	47.3	49.4	51.8	52.1	52.5	52.8	54.8	55.2	52.2	48.9
BB-F	46.4	46.4	48.1	50.5	53.9	54.8	54.9	55.2	57.4	56.2	52.4	47.6
RB-F	46.3	46.5	48.4	51.2	54.8	56.0	56.0	56.4	58.2	56.6	52.3	47.5

TARGET: RB-W2 ; SC REDUCED 107.1 TAF IN SEPT

READY.

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old,b21
 READY.
list
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OPERATIONAL TEMPERATURE CONTROL STUDY
B21: W-LN-100.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	25.	23.	32.	92.	120.	18.	54.	24.	142.	60.	40.
TPO-F	44.1	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.4	43.5
TR-TAF	21.	25.	23.	32.	92.	120.	18.	54.	24.	142.	60.	40.
TR-F	44.1	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.4	43.5
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.0	43.7	48.9	52.8	51.1	52.0	71.1	58.3	59.0	45.5	43.2	40.7
OC-F	40.4	43.6	47.4	51.3	52.4	53.0	73.0	60.4	61.1	47.7	44.5	40.3
NF-F	41.1	43.7	46.5	50.4	54.8	55.4	73.8	63.8	64.5	51.3	46.4	39.4
SC-TAF	60.	75.	60.	45.	30.	30.	0.	0.	0.	120.	60.	60.
SC-F	43.6	43.9	45.5	46.7	47.5	49.2	0.0	0.0	0.0	51.8	49.9	46.9
S742-TAF	0.	0.	0.	0.	0.	0.	0.	256.	331.	354.	110.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.9	49.6	53.8	55.2	0.0
S815-TAF	0.	0.	0.	0.	0.	450.	650.	463.	0.	0.	37.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.2	45.8	48.8	0.0	0.0	55.5	0.0
S942-TAF	210.	750.	580.	517.	652.	108.	197.	19.	0.	0.	16.	171.
S942-F	47.1	45.7	45.7	46.3	47.7	49.5	53.1	58.7	0.0	0.0	54.7	50.6
SH-TAF	210.	750.	580.	517.	652.	558.	847.	738.	331.	354.	163.	171.
SH-F	47.1	45.7	45.7	46.3	47.7	46.0	47.5	47.7	49.6	53.8	55.2	50.6
KASC-F	46.8	45.9	46.3	47.5	49.2	48.2	49.1	49.3	51.9	54.5	54.7	49.9
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.4	43.5	43.6	43.9	44.4	45.3	46.3	47.5	48.6	46.1
CLM-F	43.8	48.0	52.1	58.1	65.3	69.1	72.8	70.7	64.8	57.5	49.5	45.6
KES-F	46.1	45.7	46.2	47.4	49.1	48.3	49.1	49.3	51.9	53.8	53.4	49.1
ACL-F	46.0	45.9	46.7	48.3	50.4	50.0	50.6	50.7	53.7	54.3	53.2	48.8
BCL-F	45.9	45.9	46.7	48.4	50.4	50.1	50.6	50.8	53.8	54.3	53.1	48.7
CC-F	45.8	46.1	47.2	49.4	51.8	52.0	52.3	52.4	55.7	54.9	52.9	48.3
BB-F	45.4	46.3	48.0	50.6	54.0	54.8	55.0	54.9	59.2	55.8	52.9	47.2
RB-F	45.3	46.4	48.4	51.3	54.9	56.1	56.2	56.1	60.2	56.2	52.8	47.1

TARGET: RB-W28 ; REDUCED SC 105 TAF IN JUL & 45 TAF IN SEPT.

READY.

old,b22
list
READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B22: W-LO-100.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	25.	23.	32.	77.	105.	32.	54.	24.	122.	50.	20.
TPO-F	43.7	42.8	42.8	42.8	42.8	42.8	42.8	42.9	43.0	43.3	43.9	44.2
TR-TAF	21.	25.	23.	32.	77.	105.	32.	54.	24.	122.	50.	20.
TR-F	43.7	42.8	42.8	42.8	42.8	42.8	42.8	42.9	43.0	43.3	43.9	44.2
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.9	43.6	48.8	52.7	52.0	52.7	65.7	58.1	58.9	45.8	43.5	39.4
DC-F	40.3	43.5	47.3	51.2	53.1	53.6	69.1	60.3	61.0	48.0	44.7	39.2
MF-F	41.1	43.7	46.4	50.4	55.2	55.9	71.7	63.7	64.4	51.5	46.5	38.7
SC-TAF	60.	75.	60.	45.	15.	15.	15.	0.	30.	100.	50.	40.
SC-F	43.6	43.9	45.5	46.7	47.4	47.9	49.0	0.0	51.2	52.8	50.3	47.3
S742-TAF	0.	0.	0.	0.	0.	0.	0.	192.	327.	310.	188.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.5	48.9	53.4	54.5	0.0
S815-TAF	0.	0.	0.	0.	0.	434.	647.	532.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.0	45.7	48.7	0.0	0.0	0.0	0.0
S942-TAF	140.	519.	580.	517.	652.	124.	181.	14.	0.	0.	0.	191.
S942-F	47.0	45.6	45.6	46.3	47.6	49.5	53.1	58.1	0.0	0.0	0.0	50.7
SH-TAF	140.	519.	580.	517.	652.	558.	827.	738.	327.	310.	188.	191.
SH-F	47.0	45.6	45.6	46.3	47.6	46.0	47.3	47.8	48.9	53.4	54.5	50.7
KASC-F	46.6	45.9	46.2	47.4	49.2	48.2	49.0	49.4	51.2	54.3	54.1	50.0
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.4	43.5	43.6	43.9	44.4	45.2	46.1	46.9	48.1	46.6
CLM-F	43.8	48.0	52.1	58.1	65.3	69.1	72.8	70.7	64.7	57.3	49.2	45.9
KES-F	45.7	45.6	46.1	47.3	49.2	48.2	49.0	49.4	51.2	53.9	53.3	49.5
ACL-F	45.6	45.9	46.6	48.2	50.4	49.9	50.5	50.8	52.9	54.5	53.1	49.1
BCL-F	45.6	45.9	46.6	48.3	50.5	50.0	50.5	50.9	53.0	54.5	53.0	49.1
CC-F	45.4	46.1	47.1	49.3	51.9	52.0	52.2	52.5	54.9	55.2	52.8	48.7
BB-F	45.0	46.4	48.0	50.5	54.1	54.9	54.9	55.0	58.4	56.1	52.9	47.3
RB-F	45.0	46.6	48.3	51.2	55.1	56.2	56.1	56.1	59.4	56.5	52.8	47.2

TARGET: RB-W2A

READY.

old,b23
list
READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
823: A-HI-100.8 - 9/24/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	19.	17.	18.	20.	131.	270.	196.	86.	52.	146.	71.	39.
TPO-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.1	44.3
TR-TAF	19.	17.	18.	20.	131.	270.	196.	86.	52.	146.	71.	39.
TR-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.1	44.3
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.8	44.0	49.5	55.1	49.6	48.1	49.7	54.3	53.7	46.0	43.7	41.1
OC-F	40.3	43.8	47.7	52.5	51.1	49.5	57.6	56.9	56.6	48.2	44.9	40.6
NF-F	41.1	43.8	46.6	50.8	54.0	52.6	65.3	61.1	61.2	51.6	46.6	39.7
SC-TAF	32.	42.	35.	0.	60.	175.	175.	30.	55.	120.	60.	30.
SC-F	43.8	43.9	44.3	0.0	46.2	51.4	53.5	54.3	54.9	52.8	50.1	47.1
S742-TAF	0.	0.	0.	0.	0.	452.	162.	298.	325.	288.	338.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	45.6	45.8	46.2	48.6	50.9	53.3	0.0
S815-TAF	0.	0.	0.	0.	0.	0.	518.	354.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	0.0	46.0	47.9	0.0	0.0	0.0	0.0
S942-TAF	340.	430.	410.	217.	534.	0.	8.	6.	0.	0.	0.	340.
S942-F	47.3	46.0	46.0	46.2	46.9	0.0	50.1	55.5	0.0	0.0	0.0	50.7
SH-TAF	340.	430.	410.	217.	534.	452.	687.	659.	325.	288.	338.	340.
SH-F	47.3	46.0	46.0	46.2	46.9	45.6	46.0	47.2	48.6	50.9	53.3	50.7
KASC-F	47.1	46.3	46.8	48.9	48.8	48.3	48.1	49.0	51.0	52.1	53.1	50.3
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.2	43.6	43.7	43.8	43.9	44.1	44.6	45.7	47.5	48.7	46.1
CLM-F	43.8	48.1	52.2	58.1	65.4	69.1	72.8	70.5	64.6	57.5	49.6	45.6
KES-F	46.8	46.1	46.6	48.9	48.5	49.2	49.2	49.2	51.6	52.3	52.6	50.0
ACL-F	46.7	46.3	47.2	50.8	50.0	50.7	50.6	50.7	53.1	53.0	52.6	49.8
BCL-F	46.7	46.3	47.2	50.9	50.1	50.8	50.7	50.8	53.2	53.0	52.5	49.7
CC-F	46.5	46.6	47.9	52.8	51.7	52.6	52.3	52.6	55.0	53.8	52.4	49.4
88-F	46.0	46.9	48.9	54.6	54.2	55.2	55.0	55.2	58.3	54.9	52.5	47.9
RB-F	45.9	47.1	49.3	55.7	55.2	56.4	56.1	56.4	59.3	55.4	52.5	47.8

TARGET: RB-W2A

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
824: A-HM-100.8 - 9/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	31.	19.	28.	21.	73.	140.	66.	56.	27.	146.	101.	39.
TPO-F	44.4	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.9	44.1
TR-TAF	31.	19.	28.	21.	73.	140.	66.	56.	27.	146.	101.	39.
TR-F	44.4	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.9	44.1
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	41.0	43.9	48.5	55.1	52.9	51.3	57.9	58.1	58.4	45.8	43.6	41.0
DC-F	41.1	43.7	47.2	52.6	53.9	52.4	63.5	60.3	60.6	48.0	44.8	40.6
MF-F	41.4	43.8	46.4	50.8	55.7	54.9	68.6	63.7	64.1	51.5	46.6	39.6
SC-TAF	45.	45.	45.	0.	2.	45.	45.	0.	30.	120.	90.	30.
SC-F	43.7	43.8	44.4	0.0	45.5	46.5	48.9	0.0	54.5	53.0	49.1	46.9
S742-TAF	0.	0.	0.	0.	0.	0.	0.	96.	323.	283.	185.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.3	47.6	52.7	54.3	0.0
S815-TAF	0.	0.	0.	0.	332.	300.	652.	668.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	45.7	45.8	46.1	48.2	0.0	0.0	0.0	0.0
S942-TAF	155.	213.	410.	253.	139.	282.	123.	50.	0.	0.	0.	201.
S942-F	47.3	45.9	45.9	46.1	46.7	48.3	51.9	58.9	0.0	0.0	0.0	50.8
SH-TAF	155.	213.	410.	253.	471.	581.	774.	814.	323.	283.	185.	201.
SH-F	47.3	45.9	45.9	46.1	46.0	47.0	47.0	48.5	47.6	52.7	54.3	50.8
KASC-F	46.8	46.5	46.7	48.4	48.2	49.0	48.8	49.9	50.1	53.7	53.9	50.1
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.4	43.5	43.6	43.7	44.0	44.5	45.0	45.9	47.4	46.0
CLM-F	43.8	48.0	52.1	58.1	65.3	69.0	72.7	70.5	64.4	56.9	48.7	45.5
KES-F	46.1	46.0	46.5	48.4	48.2	48.8	48.8	49.9	50.5	53.5	52.3	49.7
ACL-F	45.9	46.4	47.1	50.1	50.0	50.4	50.3	51.2	52.3	54.1	52.2	49.3
BCL-F	45.9	46.4	47.1	50.2	50.1	50.5	50.4	51.2	52.4	54.1	52.2	49.2
CC-F	45.7	46.9	47.8	52.0	52.1	52.3	52.1	52.7	54.3	54.8	52.1	48.8
BB-F	45.2	47.3	48.8	53.7	54.9	54.9	54.9	55.0	58.0	55.8	52.3	47.3
RB-F	45.2	47.6	49.2	54.8	56.1	56.1	56.1	56.0	59.0	56.2	52.3	47.2

TARGET: RB-W2A

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
825: A-LM-100.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	18.	19.	28.	21.	73.	99.	21.	56.	27.	146.	71.	39.
TPO-F	44.2	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.5	43.6	44.1	44.6
TR-TAF	18.	19.	28.	21.	73.	99.	21.	56.	27.	146.	71.	39.
TR-F	44.2	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.5	43.6	44.1	44.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.7	43.9	48.4	55.0	52.7	53.6	70.1	58.0	58.3	45.7	43.7	41.3
OC-F	40.2	43.7	47.1	52.5	53.7	54.4	72.3	60.2	60.5	47.9	44.9	40.8
MF-F	41.0	43.8	46.4	50.8	55.6	56.6	73.4	63.6	64.0	51.4	46.6	39.8
SC-TAF	32.	45.	45.	0.	2.	3.	0.	0.	30.	120.	60.	30.
SC-F	43.8	43.9	44.5	0.0	45.6	45.8	0.0	0.0	46.9	50.2	48.6	47.0
S742-TAF	0.	0.	0.	0.	0.	0.	0.	157.	328.	187.	178.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.1	48.6	53.4	54.5	0.0
S815-TAF	0.	0.	0.	0.	0.	314.	685.	608.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.6	45.8	48.3	0.0	0.0	0.0	0.0
S942-TAF	168.	136.	155.	193.	563.	304.	134.	49.	0.	0.	0.	201.
S942-F	47.1	45.8	45.8	46.0	46.7	48.5	53.1	61.6	0.0	0.0	0.0	50.7
SH-TAF	168.	136.	155.	193.	563.	619.	819.	814.	328.	187.	178.	201.
SH-F	47.1	45.8	45.8	46.0	46.7	47.0	47.0	48.5	48.6	53.4	54.5	50.7
KASC-F	46.8	46.7	47.8	48.9	48.5	48.9	48.7	49.9	51.0	54.9	54.1	50.1
C1-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.2	43.6	43.7	43.8	43.9	44.2	44.6	45.0	45.3	45.8	45.9
CLM-F	43.8	48:1	52.2	58.1	65.4	69.1	72.8	70.5	64.4	56.7	47.7	45.5
KES-F	46.3	46.0	47.1	48.9	48.5	48.9	48.7	49.9	50.7	53.1	52.7	49.7
ACL-F	46.1	46.5	48.2	50.9	50.0	50.5	50.2	51.2	52.4	53.9	52.6	49.3
BCL-F	46.1	46.6	48.2	51.0	50.1	50.6	50.3	51.2	52.5	53.9	52.5	49.2
CC-F	45.9	47.1	49.4	53.1	51.8	52.4	52.0	52.7	54.4	54.8	52.3	48.8
BB-F	45.3	47.6	50.7	55.0	54.3	55.0	54.8	55.0	58.0	56.0	52.5	47.4
RB-F	45.3	47.9	51.3	56.1	55.4	56.2	56.0	56.0	59.1	56.6	52.4	47.2

TARGET: RB-W2A

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
826: A-LO-100.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	18.	17.	18.	21.	73.	99.	21.	56.	124.	126.	61.	49.
TPO-F	43.7	42.9	42.9	42.9	42.9	43.0	43.3	43.7	44.9	47.0	49.0	46.8
TR-TAF	18.	17.	18.	21.	73.	99.	21.	56.	124.	126.	61.	49.
TR-F	43.7	42.9	42.9	42.9	42.9	43.0	43.3	43.7	44.9	47.0	49.0	46.8
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.6	43.8	49.3	54.9	52.4	53.4	70.1	58.1	49.5	48.7	46.9	43.2
DC-F	40.1	43.6	47.6	52.4	53.4	54.3	72.3	60.3	53.1	50.5	47.3	42.4
NF-F	41.0	43.7	46.5	50.8	55.4	56.4	73.4	63.7	58.5	53.5	48.1	40.9
SC-TAF	32.	42.	35.	0.	2.	3.	0.	0.	127.	100.	50.	40.
SC-F	43.8	43.9	44.3	0.0	45.1	45.4	0.0	0.0	50.3	53.3	50.6	47.3
S742-TAF	0.	0.	0.	0.	0.	0.	0.	145.	232.	207.	188.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.9	48.1	55.0	55.0	0.0
S815-TAF	0.	0.	0.	0.	0.	394.	726.	611.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	45.4	45.9	49.9	0.0	0.0	0.0	0.0
S942-TAF	168.	138.	165.	193.	572.	225.	94.	27.	0.	0.	0.	191.
S942-F	47.0	45.7	45.8	46.2	47.3	49.7	55.4	64.6	0.0	0.0	0.0	50.6
SH-TAF	168.	138.	165.	193.	572.	619.	819.	783.	232.	207.	188.	191.
SH-F	47.0	45.7	45.8	46.2	47.3	47.0	47.0	49.5	48.1	55.0	55.0	50.6
KASC-F	46.6	46.6	47.7	49.1	49.0	48.9	48.7	51.0	51.5	56.1	54.5	50.0
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.2	43.6	43.7	43.8	43.9	44.1	44.4	44.7	45.0	45.6	46.1
CLM-F	43.8	48.1	52.2	58.1	65.4	69.1	72.8	70.5	64.3	56.6	47.6	45.6
KES-F	46.2	46.0	47.1	49.1	49.0	48.9	48.7	51.0	51.1	55.2	53.7	49.5
ACL-F	46.0	46.5	48.2	51.1	50.4	50.5	50.2	52.3	52.8	55.8	53.5	49.1
BCL-F	46.0	46.5	48.3	51.2	50.5	50.6	50.3	52.3	52.9	55.8	53.3	49.1
CC-F	45.8	47.1	49.5	53.3	52.2	52.4	52.0	53.8	54.8	56.5	53.1	48.6
88-F	45.2	47.6	50.8	55.1	54.6	55.0	54.8	56.0	58.3	57.5	53.1	47.3
R8-F	45.2	47.9	51.4	56.2	55.6	56.2	56.0	57.1	59.3	57.9	52.9	47.2

TARGET: R8-W4A ; INCREASED SC 100TAF IN SEPT.

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
827: O-HI-75.8 - 9/28/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	52.	104.	156.	171.	206.	24.	146.	72.	42.
TPO-F	44.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.1	44.3	44.6
TR-TAF	21.	19.	23.	52.	104.	156.	171.	206.	24.	146.	72.	42.
TR-F	44.6	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.1	44.3	44.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.2	44.0	49.0	50.7	50.9	50.9	50.5	48.9	59.2	46.1	43.9	41.4
DC-F	40.5	43.8	47.4	50.2	52.2	52.0	58.1	52.1	61.2	48.3	45.0	40.9
NF-F	41.2	43.8	46.5	50.0	54.7	54.6	65.6	57.3	64.6	51.7	46.7	39.8
SC-TAF	20.	30.	30.	30.	30.	60.	150.	150.	0.	120.	60.	30.
SC-F	43.9	43.9	44.1	44.9	46.4	49.3	54.9	54.6	0.0	52.2	50.0	47.2
S742-TAF	0.	0.	0.	0.	0.	509.	721.	78.	352.	268.	248.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	46.0	46.1	46.4	48.1	52.1	54.1	0.0
S815-TAF	0.	0.	0.	0.	0.	0.	0.	554.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.5	0.0	0.0	0.0	0.0
S942-TAF	180.	170.	230.	269.	481.	0.	0.	44.	0.	0.	0.	320.
S942-F	47.4	46.2	46.2	46.3	46.8	0.0	0.0	59.9	0.0	0.0	0.0	50.7
SH-TAF	180.	170.	230.	269.	481.	509.	721.	676.	352.	268.	248.	320.
SH-F	47.4	46.2	46.2	46.3	46.8	46.0	46.1	49.0	48.1	52.1	54.1	50.7
KASC-F	47.1	46.9	47.5	48.4	48.9	48.3	48.2	50.7	50.4	53.3	53.9	50.3
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLD-F	43.0	43.2	43.6	43.7	43.8	43.8	44.1	44.6	45.6	47.3	48.8	46.2
CLM-F	43.8	48.1	52.2	58.1	65.4	69.0	72.8	70.5	64.6	57.4	49.6	45.7
KES-F	46.8	46.5	47.1	48.0	48.8	48.4	49.4	51.4	50.4	53.0	53.1	50.0
ACL-F	46.6	46.9	48.0	49.6	50.4	50.2	50.8	52.6	52.2	53.6	53.0	49.7
BCL-F	46.5	46.9	48.1	49.6	50.5	50.2	50.8	52.7	52.3	53.6	52.9	49.7
CC-F	46.3	47.4	49.0	51.3	52.3	52.2	52.5	54.1	54.3	54.4	52.8	49.3
BB-F	45.6	47.7	50.2	52.9	55.0	55.1	55.1	56.2	58.0	55.5	52.8	47.9
RB-F	45.5	48.0	50.8	53.9	56.0	56.4	56.2	57.1	59.0	56.0	52.7	47.8

TARGET: RB-W4A ; REDUCED SC 75 TAF IN SEPT.

READY.

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
828: 0-HM-75.8 - 9/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	18.	17.	18.	22.	134.	156.	61.	196.	24.	176.	72.	72.
TPO-F	44.4	43.8	43.8	43.8	43.8	43.8	43.8	43.9	44.0	44.6	45.9	46.3
TR-TAF	18.	17.	18.	22.	134.	156.	61.	196.	24.	176.	72.	72.
TR-F	44.4	43.8	43.8	43.8	43.8	43.8	43.8	43.8	44.0	44.5	45.9	46.3
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.8	44.0	49.5	54.9	49.4	50.7	58.8	48.9	59.2	46.2	44.9	43.8
DC-F	40.3	43.8	47.7	52.4	51.0	51.8	64.1	52.1	61.2	48.3	45.8	42.9
NF-F	41.1	43.8	46.6	50.8	53.9	54.5	68.9	57.3	64.6	51.8	47.2	41.3
SC-TAF	17.	27.	25.	0.	60.	60.	40.	140.	0.	150.	60.	60.
SC-F	43.9	44.0	44.1	0.0	45.4	49.4	53.5	55.5	0.0	52.2	50.3	47.0
S742-TAF	0.	0.	0.	0.	0.	511.	68.	71.	352.	176.	209.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	45.8	45.9	45.9	48.9	54.5	55.0	0.0
S815-TAF	0.	0.	0.	0.	0.	0.	657.	532.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	0.0	46.4	49.9	0.0	0.0	0.0	0.0
S942-TAF	183.	153.	190.	293.	490.	0.	59.	22.	0.	0.	0.	171.
S942-F	47.3	46.1	46.1	46.4	47.4	0.0	55.0	65.1	0.0	0.0	0.0	50.6
SH-TAF	183.	153.	190.	293.	490.	511.	784.	625.	352.	176.	209.	171.
SH-F	47.3	46.1	46.1	46.4	47.4	45.8	47.0	50.0	48.9	54.5	55.0	50.6
KASC-F	47.0	46.8	47.7	48.4	49.5	48.2	48.8	51.8	51.1	55.8	54.5	49.9
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.2	43.7	43.8	43.8	43.9	44.0	44.3	45.2	46.9	48.9	46.2
CLN-F	43.8	48.1	52.2	58.2	65.4	69.1	72.7	70.4	64.5	57.3	49.7	45.7
KES-F	46.7	46.4	47.3	48.4	49.1	48.3	49.0	52.5	51.1	54.1	53.6	49.1
ACL-F	46.5	46.9	48.3	49.9	50.6	50.1	50.5	53.7	52.8	54.8	53.4	48.8
BCL-F	46.5	46.9	48.4	50.0	50.6	50.2	50.6	53.8	52.9	54.8	53.3	48.7
CC-F	46.2	47.4	49.5	51.6	52.3	52.1	52.3	55.2	54.8	55.6	53.1	48.3
BB-F	45.6	47.8	50.7	53.2	54.8	55.0	55.1	57.3	58.4	56.7	53.1	47.2
RB-F	45.5	48.1	51.3	54.2	55.9	56.3	56.3	58.3	59.4	57.1	53.0	47.1

TARGET: RB-W6A ; REDUCED SC 100 TAF IN JUL & 70 TAF IN SEPT.

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
829: D-LM-75.8 - 9/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLD-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLD-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	22.	104.	196.	121.	156.	28.	126.	72.	42.
TPO-F	44.2	43.6	43.6	43.6	43.6	43.6	43.8	44.9	46.4	48.0	50.5	47.0
TR-TAF	21.	19.	23.	22.	104.	196.	121.	156.	28.	126.	72.	42.
TR-F	44.2	43.6	43.6	43.6	43.6	43.6	43.8	44.9	46.4	48.0	50.5	47.0
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.1	43.9	48.9	54.8	50.6	49.3	52.6	51.0	58.9	49.4	48.2	42.8
OC-F	40.5	43.7	47.4	52.4	52.0	50.6	59.7	54.0	61.0	51.1	48.4	42.1
NF-F	41.2	43.8	46.5	50.8	54.5	53.5	66.4	58.8	64.4	53.9	48.7	40.7
SC-TAF	20.	30.	30.	0.	30.	100.	100.	100.	30.	100.	60.	30.
SC-F	43.9	43.9	44.1	0.0	45.0	49.2	54.6	56.8	57.0	54.7	51.8	47.4
S742-TAF	0.	0.	0.	0.	0.	0.	37.	173.	329.	207.	178.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.4	45.7	52.1	59.4	55.0	0.0
S815-TAF	0.	0.	0.	0.	113.	386.	606.	393.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	45.7	45.8	46.5	51.7	0.0	0.0	0.0	0.0
S942-TAF	180.	151.	170.	500.	376.	85.	66.	4.	0.	0.	0.	201.
S942-F	47.2	46.0	46.3	47.5	49.9	54.6	63.1	72.7	0.0	0.0	0.0	50.3
SH-TAF	180.	151.	170.	500.	489.	471.	709.	570.	329.	207.	178.	201.
SH-F	47.2	46.0	46.3	47.5	48.9	47.4	48.0	50.0	52.1	59.4	55.0	50.3
KASC-F	46.8	46.8	48.0	48.6	50.8	49.8	49.9	51.9	54.1	59.9	54.5	49.7
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.2	43.6	43.7	43.8	43.8	44.0	44.3	45.1	46.9	49.7	46.5
CLM-F	43.8	48.1	52.2	58.1	65.4	69.0	72.7	70.4	64.4	57.3	50.2	45.9
KES-F	46.5	46.3	47.4	48.6	50.5	49.7	50.5	52.6	54.3	58.2	53.8	49.4
ACL-F	46.3	46.8	48.5	49.5	52.0	51.4	51.9	54.0	55.8	58.6	53.6	49.0
BCL-F	46.3	46.8	48.6	49.6	52.0	51.5	52.0	54.1	55.9	58.6	53.5	48.9
CC-F	46.1	47.4	49.7	50.6	53.7	53.3	53.7	55.7	57.5	59.0	53.3	48.5
BB-F	45.4	47.7	50.9	51.8	56.0	56.1	56.3	58.0	60.4	59.5	53.2	47.3
RB-F	45.4	48.0	51.5	52.5	57.0	57.3	57.5	59.1	61.2	59.8	53.1	47.2

TARGET: BB-W68

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
830: 0-LO-50.8 - 9/30/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	21.	19.	23.	22.	104.	156.	111.	56.	24.	107.	42.	22.
TPO-F	43.9	43.2	43.2	43.2	43.2	43.7	45.5	47.2	48.1	49.8	51.7	46.6
TR-TAF	21.	19.	23.	22.	104.	156.	111.	56.	24.	107.	42.	22.
TR-F	43.9	43.2	43.2	43.2	43.2	43.7	45.5	47.2	48.1	49.8	51.7	46.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	39.9	43.8	48.8	54.7	50.3	50.6	54.5	59.9	60.2	51.0	47.6	40.5
OC-F	40.3	43.6	47.3	52.3	51.7	51.7	61.0	61.9	62.1	52.5	47.9	40.1
NF-F	41.1	43.7	46.4	50.8	54.3	54.4	67.2	64.9	65.2	55.0	48.4	39.3
SC-TAF	20.	30.	30.	0.	30.	60.	90.	0.	26.	80.	30.	10.
SC-F	43.9	43.9	44.1	0.0	45.0	47.5	54.4	0.0	58.2	56.4	52.9	47.6
S742-TAF	0.	0.	0.	0.	0.	0.	239.	479.	331.	227.	208.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.4	48.3	54.4	59.3	55.0	0.0
S815-TAF	0.	0.	0.	0.	214.	409.	282.	0.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	45.6	45.7	46.4	0.0	0.0	0.0	0.0	0.0
S942-TAF	180.	151.	170.	443.	272.	10.	2.	0.	0.	0.	0.	221.
S942-F	47.0	46.9	47.1	48.4	51.7	57.3	63.1	0.0	0.0	0.0	0.0	50.3
SH-TAF	180.	151.	170.	443.	486.	419.	522.	479.	331.	227.	208.	221.
SH-F	47.0	46.9	47.1	48.4	49.0	46.0	46.0	48.3	54.4	59.3	55.0	50.3
KASC-F	46.7	47.5	48.7	49.6	50.9	48.8	48.7	50.8	56.2	59.7	54.6	49.7
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLD-F	43.0	43.2	43.6	43.7	43.8	43.8	44.0	44.3	45.0	46.5	49.7	47.1
CLN-F	43.8	48.1	52.2	58.1	65.4	69.0	72.7	70.4	64.4	57.1	50.2	46.3
KES-F	46.4	46.9	48.0	49.6	50.6	48.6	49.5	50.8	56.3	58.8	54.4	49.6
ACL-F	46.2	47.3	49.0	50.6	52.1	50.7	51.4	52.8	57.6	59.2	54.1	49.2
BCL-F	46.2	47.4	49.1	50.6	52.1	50.8	51.6	52.9	57.7	59.1	54.0	49.1
CC-F	46.0	47.8	50.1	51.7	53.8	53.0	53.7	55.1	59.1	59.5	53.7	48.7
BB-F	45.4	48.1	51.2	52.9	56.1	56.2	57.0	58.3	61.7	60.0	53.5	47.3
RB-F	45.3	48.3	51.8	53.6	57.1	57.6	58.5	59.7	62.4	60.2	53.3	47.2

TARGET: BB-W10C ; REDUCED SC 90 TAF IN AUG.

END OF FILE
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READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
831: C-HI-75.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	139.	219.	182.	157.	58.	102.	46.	31.
TPO-F	44.6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.2	44.3	44.6	44.9
TR-TAF	23.	17.	38.	30.	139.	219.	182.	157.	58.	102.	46.	31.
TR-F	44.6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.2	44.3	44.6	44.9
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.4	44.0	48.0	53.4	49.5	49.2	50.2	50.3	53.1	47.1	43.8	40.8
OC-F	40.7	43.8	46.9	51.6	51.0	50.5	57.9	53.4	56.1	49.1	44.9	40.4
NF-F	41.3	43.8	46.3	50.5	53.9	53.4	65.5	58.3	60.8	52.4	46.7	39.5
SC-TAF	0.	0.	0.	0.	60.	120.	160.	100.	60.	100.	60.	10.
SC-F	0.0	0.0	0.0	0.0	44.4	51.1	54.1	55.0	55.8	54.3	51.9	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	0.	34.	327.	285.	248.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0	47.7	55.1	55.3	0.0
S815-TAF	0.	0.	0.	0.	0.	366.	596.	582.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	0.0	46.1	46.3	49.0	0.0	0.0	0.0	0.0
S942-TAF	200.	181.	200.	409.	513.	85.	74.	114.	0.	0.	0.	260.
S942-F	47.5	46.2	46.2	46.6	47.9	50.7	56.9	68.9	0.0	0.0	0.0	50.4
SH-TAF	200.	181.	200.	409.	513.	452.	670.	730.	327.	285.	248.	260.
SH-F	47.5	46.2	46.2	46.6	47.9	47.0	47.5	52.0	47.7	55.1	55.3	50.4
KASC-F	47.1	46.9	47.7	48.0	49.8	49.6	49.6	53.4	50.2	55.9	54.9	49.9
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.5	43.6	43.6	43.7	43.8	44.1	45.0	46.9	48.9	46.0
CLM-F	43.8	48.0	52.1	58.1	65.3	69.0	72.7	70.4	64.4	57.3	49.7	45.5
KES-F	47.1	46.9	47.7	48.0	49.2	49.9	50.5	53.6	51.1	55.5	54.3	49.8
ACL-F	46.8	47.3	48.8	49.1	50.7	51.6	51.9	54.7	52.7	56.0	54.1	49.4
BCL-F	46.8	47.4	48.8	49.2	50.8	51.7	52.0	54.7	52.8	56.0	54.0	49.4
CC-F	46.5	47.8	49.9	50.5	52.4	53.5	53.6	56.0	54.5	56.5	53.8	49.0
BB-F	45.8	48.1	51.1	51.9	54.8	56.2	56.2	57.9	57.9	57.3	53.6	47.5
RB-F	45.7	48.3	51.6	52.7	55.8	57.4	57.3	58.9	58.9	57.7	53.4	47.4

TARGET: BB-W6

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
B32: C-HN-50.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	219.	22.	217.	88.	122.	46.	51.
TPO-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.5	45.7	47.4	46.8
TR-TAF	23.	17.	38.	30.	109.	219.	22.	217.	88.	122.	46.	51.
TR-F	44.5	43.9	43.9	43.9	43.9	43.9	43.9	44.0	44.5	45.7	47.4	46.8
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.3	44.0	47.9	53.4	50.5	49.0	69.8	48.6	50.8	47.8	45.5	43.3
OC-F	40.6	43.8	46.9	51.6	51.9	50.3	72.1	51.9	54.2	49.7	46.3	42.5
MF-F	41.2	43.8	46.3	50.5	54.4	53.3	73.3	57.1	59.3	52.9	47.5	41.0
SC-TAF	0.	0.	0.	0.	30.	120.	0.	160.	90.	120.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	49.3	0.0	53.7	54.1	53.7	51.7	47.1
S742-TAF	0.	0.	0.	0.	0.	0.	40.	220.	295.	281.	264.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.7	46.1	52.5	60.0	55.4	0.0
S815-TAF	0.	0.	0.	0.	67.	381.	633.	231.	0.	0.	0.	201.
S815-F	0.0	0.0	0.0	0.0	45.9	46.0	46.7	51.8	0.0	0.0	0.0	50.1
S942-TAF	200.	181.	200.	382.	442.	127.	32.	0.	0.	0.	0.	0.
S942-F	47.3	46.1	46.5	47.7	50.3	56.0	65.6	0.0	0.0	0.0	0.0	0.0
SH-TAF	200.	181.	200.	382.	509.	508.	706.	451.	295.	281.	264.	201.
SH-F	47.3	46.1	46.5	47.7	49.7	48.5	47.5	49.0	52.5	60.0	55.4	50.1
KASC-F	47.0	46.8	48.0	49.1	51.5	50.7	49.5	51.5	54.7	60.3	55.0	49.5
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.5	43.6	43.6	43.7	43.8	44.0	44.7	46.3	48.8	45.9
CLM-F	43.8	48.0	52.1	58.1	65.3	69.0	72.7	70.4	64.3	57.1	49.6	45.5
KES-F	47.0	46.8	48.0	49.1	51.1	50.4	49.5	52.1	54.6	58.3	54.4	49.2
ACL-F	46.8	47.3	49.0	50.2	52.5	51.9	51.2	53.6	55.9	58.6	54.2	48.8
BCL-F	46.7	47.3	49.1	50.3	52.6	52.0	51.3	53.7	56.0	58.6	54.1	48.7
CC-F	46.5	47.7	50.1	51.6	54.1	53.7	53.2	55.4	57.5	58.9	53.9	48.4
BB-F	45.7	48.0	51.2	52.9	56.3	56.2	56.2	58.0	60.2	59.4	53.6	47.2
RB-F	45.6	48.3	51.8	53.7	57.3	57.3	57.5	59.2	61.0	59.6	53.5	47.1

TARGET: BB-W68 ; SC REDUCED 160 TAF IN JULY

READY.

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
833: C-LN-25.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	159.	22.	57.	128.	102.	46.	51.
TPO-F	44.3	43.7	43.7	43.7	43.7	43.7	43.9	44.1	45.1	47.5	49.7	46.8
TR-TAF	23.	17.	38.	30.	109.	159.	22.	57.	128.	102.	46.	51.
TR-F	44.3	43.7	43.7	43.7	43.7	43.7	43.9	44.1	45.1	47.5	49.7	46.8
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.3	43.9	47.8	53.3	50.4	50.5	69.8	58.1	49.5	49.4	46.8	43.3
DC-F	40.6	43.7	46.8	51.6	51.8	51.6	72.1	60.3	53.1	51.1	47.3	42.5
NF-F	41.2	43.8	46.3	50.5	54.4	54.3	73.3	63.7	58.5	53.9	48.1	41.0
SC-TAF	0.	0.	0.	0.	30.	60.	0.	0.	130.	100.	60.	30.
SC-F	0.0	0.0	0.0	0.0	44.0	46.5	0.0	0.0	54.4	54.6	51.9	47.1
S742-TAF	0.	0.	0.	0.	0.	0.	91.	520.	259.	188.	188.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	45.6	49.2	56.1	60.1	55.0	0.0
S815-TAF	0.	0.	0.	0.	289.	425.	508.	0.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	45.8	46.0	47.4	0.0	0.0	0.0	0.0	0.0
S942-TAF	200.	181.	200.	283.	129.	43.	28.	0.	0.	0.	0.	201.
S942-F	47.2	46.4	47.4	48.5	51.2	57.4	66.5	0.0	0.0	0.0	0.0	50.2
SH-TAF	200.	181.	200.	283.	418.	468.	626.	520.	259.	188.	188.	201.
SH-F	47.2	46.4	47.4	48.5	47.5	47.0	48.0	49.2	56.1	60.1	55.0	50.2
KASC-F	46.8	47.0	48.7	50.3	49.8	49.5	50.2	51.4	58.1	60.5	54.5	49.6
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLD-F	43.0	43.1	43.5	43.6	43.6	43.7	43.8	43.9	44.3	45.3	47.6	46.0
CLM-F	43.8	48.0	52.1	58.1	65.3	69.0	72.7	70.3	64.2	56.7	48.9	45.5
KES-F	46.8	47.0	48.7	50.3	49.4	49.2	50.2	51.4	56.9	58.4	53.9	49.3
ACL-F	46.6	47.4	49.6	51.7	51.2	51.0	52.0	53.2	58.0	58.8	53.7	48.9
BCL-F	46.5	47.4	49.7	51.7	51.3	51.1	52.1	53.3	58.1	58.8	53.5	48.8
CC-F	46.3	47.9	50.7	53.2	53.3	53.1	54.2	55.3	59.4	59.2	53.3	48.4
BB-F	45.6	48.1	51.6	54.6	56.0	56.1	57.4	58.3	61.7	59.8	53.2	47.2
RB-F	45.5	48.4	52.1	55.5	57.1	57.4	58.8	59.6	62.4	60.0	53.1	47.1

TARGET: BB-W10C ; REDUCED SC 150 IN JUL, 90 IN AUG, INCREASED SC 100 IN SEPT

READY.

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
834: C-L0-0.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	102.	36.	21.
TPO-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	54.5	52.9	45.6
TR-TAF	23.	17.	38.	30.	109.	129.	52.	87.	28.	102.	36.	21.
TR-F	44.0	43.3	43.3	43.3	43.5	45.0	47.2	49.2	51.3	54.5	52.9	45.6
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	40.2	43.9	47.7	53.2	50.2	52.7	62.1	57.6	60.4	54.6	47.8	40.0
OC-F	40.5	43.7	46.8	51.5	51.6	53.6	66.5	59.8	62.2	55.6	48.1	39.7
NF-F	41.2	43.8	46.2	50.5	54.3	55.9	70.2	63.3	65.4	57.4	48.5	39.0
SC-TAF	0.	0.	0.	0.	30.	30.	30.	30.	30.	100.	50.	0.
SC-F	0.0	0.0	0.0	0.0	44.0	45.2	48.3	52.3	56.7	59.0	53.2	0.0
S742-TAF	0.	0.	0.	0.	246.	386.	59.	410.	338.	131.	173.	0.
S742-F	0.0	0.0	0.0	0.0	45.5	45.7	45.8	48.1	55.1	59.1	55.0	0.0
S815-TAF	0.	0.	0.	0.	93.	0.	465.	51.	0.	0.	0.	0.
S815-F	0.0	0.0	0.0	0.0	45.7	0.0	47.6	51.6	0.0	0.0	0.0	0.0
S942-TAF	200.	181.	200.	223.	0.	0.	18.	0.	0.	0.	0.	231.
S942-F	47.0	48.2	48.1	49.5	0.0	0.0	65.6	0.0	0.0	0.0	0.0	50.3
SH-TAF	200.	181.	200.	223.	340.	386.	543.	461.	338.	131.	173.	231.
SH-F	47.0	48.2	48.1	49.5	45.6	45.7	48.0	48.5	55.1	59.1	55.0	50.3
KASC-F	46.7	48.6	49.4	51.6	48.7	48.8	50.5	51.0	56.8	59.9	54.5	49.7
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.4	43.6	43.6	43.7	43.8	43.9	44.1	44.9	47.5	47.0
CLM-F	43.8	48.0	52.1	58.1	65.3	69.0	72.7	70.3	64.1	56.6	48.8	46.2
KES-F	46.7	48.6	49.4	51.6	48.3	48.5	50.4	51.1	56.8	59.5	54.2	49.7
ACL-F	46.5	48.9	50.3	53.1	50.5	50.8	52.4	53.0	58.0	59.9	53.9	49.3
BCL-F	46.4	48.8	50.3	53.2	50.7	51.0	52.5	53.1	58.1	59.8	53.8	49.2
CC-F	46.2	49.1	51.2	54.7	53.1	53.5	54.7	55.3	59.4	60.2	53.5	48.8
BB-F	45.5	48.9	52.0	56.1	56.2	57.0	58.1	58.4	61.8	60.6	53.3	47.4
RB-F	45.5	49.1	52.4	57.0	57.5	58.5	59.5	59.8	62.6	60.8	53.2	47.3

TARGET: BB-W14

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
835: E-HI-25.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	55.	81.	131.	123.	201.	260.	183.	138.	28.	103.	46.	52.
TPO-F	44.7	44.2	44.2	44.2	44.2	44.2	44.5	46.1	48.2	50.8	52.7	46.5
TR-TAF	55.	81.	131.	123.	201.	260.	183.	138.	28.	103.	46.	52.
TR-F	44.7	44.2	44.2	44.2	44.2	44.2	44.5	46.1	48.2	50.8	52.7	46.5
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	42.3	44.1	45.6	47.5	48.0	48.5	50.5	52.5	59.4	51.8	48.5	43.1
OC-F	42.0	43.8	45.7	48.4	49.8	49.8	58.1	55.3	61.4	53.2	48.6	42.3
NF-F	41.8	43.8	45.9	49.4	53.1	52.9	65.6	59.8	64.7	55.5	48.9	40.8
SC-TAF	30.	60.	90.	90.	120.	160.	160.	80.	30.	100.	60.	30.
SC-F	43.7	43.9	45.4	46.6	49.0	51.3	53.4	55.0	56.4	56.5	52.7	47.2
S742-TAF	0.	0.	0.	0.	0.	0.	2.	206.	357.	247.	235.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	46.1	46.2	52.9	60.9	55.7	0.0
S815-TAF	0.	0.	0.	0.	0.	371.	610.	387.	0.	0.	0.	245.
S815-F	0.0	0.0	0.0	0.0	0.0	46.2	46.5	50.4	0.0	0.0	0.0	50.0
S942-TAF	214.	166.	192.	203.	430.	116.	34.	11.	0.	0.	0.	0.
S942-F	47.5	46.3	46.4	46.9	48.6	53.6	65.0	77.3	0.0	0.0	0.0	0.0
SH-TAF	214.	166.	192.	203.	430.	486.	646.	604.	357.	247.	235.	245.
SH-F	47.5	46.3	46.4	46.9	48.6	48.0	47.5	49.5	52.9	60.9	55.7	50.0
KASC-F	47.2	47.0	47.9	49.6	50.8	50.3	49.6	51.4	54.7	61.1	55.3	49.5
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLD-F	43.0	43.1	43.5	43.6	43.7	43.9	44.5	45.5	46.9	48.6	50.4	45.9
CLM-F	43.8	48.0	52.1	58.1	65.4	69.1	72.9	70.8	65.0	57.9	50.7	45.5
KES-F	46.8	46.2	47.1	48.7	50.4	50.5	50.4	51.8	54.8	59.8	54.8	49.2
ACL-F	46.6	46.6	47.9	50.1	51.8	52.0	51.8	53.2	56.1	60.0	54.5	48.9
BCL-F	46.5	46.6	48.0	50.2	51.9	52.1	51.9	53.3	56.2	60.0	54.4	48.9
CC-F	46.3	47.1	48.9	51.8	53.5	53.7	53.6	54.9	57.7	60.2	54.2	48.5
BB-F	45.7	47.5	50.1	53.4	55.8	56.1	56.2	57.3	60.4	60.5	53.9	47.3
RB-F	45.6	47.8	50.6	54.4	56.7	57.2	57.4	58.4	61.2	60.7	53.7	47.2

TARGET: BB-W48

READY.

OPERATIONAL TEMPERATURE CONTROL STUDY
836: E-HN-0.8 - 9/29/92

LOCATION	J	F	M	A	M	J	J	A	S	O	N	D
TLO-TAF	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TLO-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TPO-TAF	55.	51.	72.	63.	171.	220.	143.	238.	28.	122.	46.	52.
TPO-F	44.6	44.0	44.0	44.0	44.0	44.0	44.8	51.0	58.8	60.7	51.2	44.3
TR-TAF	55.	51.	72.	63.	171.	220.	143.	238.	28.	122.	46.	52.
TR-F	44.6	44.0	44.0	44.0	44.0	44.0	44.8	50.5	58.8	60.7	51.2	44.3
LEW-TAF	18.	17.	18.	18.	73.	99.	18.	53.	24.	26.	12.	19.
LEW-F	42.2	44.0	46.5	49.8	48.5	49.1	52.2	53.8	62.5	59.4	47.6	41.7
DC-F	41.9	43.8	46.1	49.7	50.2	50.4	59.4	56.5	64.0	59.8	47.9	41.1
NF-F	41.8	43.8	46.0	49.8	53.4	53.3	66.3	60.7	66.7	60.6	48.4	40.0
SC-TAF	30.	30.	30.	30.	90.	120.	120.	180.	30.	120.	60.	30.
SC-F	43.7	43.8	44.2	45.4	48.0	51.9	53.7	56.9	57.3	58.9	53.2	47.1
S742-TAF	0.	0.	0.	0.	0.	0.	0.	136.	295.	176.	193.	0.
S742-F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0	54.0	61.4	54.4	0.0
S815-TAF	0.	0.	0.	0.	74.	371.	604.	340.	0.	0.	0.	216.
S815-F	0.0	0.0	0.0	0.0	46.1	46.1	47.2	55.8	0.0	0.0	0.0	49.4
S942-TAF	170.	195.	251.	251.	357.	162.	99.	0.	0.	0.	0.	0.
S942-F	47.3	46.3	47.3	49.2	53.9	65.4	78.8	0.0	0.0	0.0	0.0	0.0
SH-TAF	170.	195.	251.	251.	431.	534.	703.	476.	295.	176.	193.	216.
SH-F	47.3	46.3	47.3	49.2	52.5	52.0	51.7	53.0	54.0	61.4	54.4	49.4
KASC-F	47.0	46.9	48.4	51.1	54.3	53.8	53.4	55.1	56.0	61.6	54.0	48.9
CL-CFS	50.	50.	50.	50.	50.	50.	50.	50.	50.	50.	101.	99.
CLO-F	43.0	43.1	43.4	43.5	43.6	43.7	44.1	44.9	46.3	48.3	50.3	45.5
CLM-F	43.8	48.0	52.1	58.1	65.3	69.0	72.8	70.6	64.8	57.8	50.6	45.2
KES-F	46.5	46.5	48.0	50.5	53.2	53.5	53.4	55.6	56.1	60.5	53.8	48.7
ACL-F	46.3	46.9	48.7	51.8	54.5	54.7	54.7	56.8	57.5	60.7	53.6	48.4
BCL-F	46.3	46.9	48.8	51.9	54.6	54.8	54.8	56.9	57.6	60.7	53.5	48.3
CC-F	46.1	47.4	49.6	53.3	56.0	56.2	56.3	58.3	59.2	60.9	53.3	48.0
BB-F	45.4	47.7	50.6	54.7	57.9	58.3	58.6	60.4	61.9	61.1	53.2	47.0
RB-F	45.4	47.9	51.1	55.6	58.8	59.3	59.7	61.4	62.7	61.3	53.1	47.0

TARGET: CC-WGA ; INCREASED SC 150 TAF IN AUGUST

READY.

Appendix D

Selected Data Used in CVP-OCAP Water Year Operations Studies

Appendix D

Table of Contents

CVP-OCAP DELTA OUTFLOW REQUIREMENTS AND CONTROLLING STANDARD

MONTH	WET	ABOVE NORMAL	DRY	CRITICAL	EXTREME CRITICAL
	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife
OCT	Chipps Island EC	Chipps Island EC	Relaxed	Relaxed	Relaxed
			Chipps Island EC	Chipps Island EC	Chipps Island EC
DOI - CFS	4,500	4,500	3,500	3,500	3,500
	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife
NOV	Chipps Island EC	Chipps Island EC	Relaxed	Relaxed	Relaxed
			Chipps Island EC	Chipps Island EC	Chipps Island EC
DOI - CFS	4,500	4,500	3,500	3,500	3,500
	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife
DEC	Chipps Island EC	Chipps Island EC	Relaxed	Relaxed	Relaxed
			Chipps Island EC	Chipps Island EC	Chipps Island EC
DOI - CFS	4,500	4,500	3,500	3,500	3,500
	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife
JAN	Chipps Island EC	Chipps Island EC	Chipps Island EC	Chipps Island EC	Chipps Island EC
DOI - CFS	4,500	4,500	4,500	4,500	4,500
	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife
FEB	Chipps Island DOI	Chipps Island EC	Chipps Island EC	Chipps Island EC	Chipps Island EC
DOI - CFS	10,000	4,500	4,500	4,500	4,500
	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife	Fish & Wildlife
MAR	Chipps Island DOI	Chipps Island EC	Chipps Island EC	Chipps Island EC	Chipps Island EC
DOI - CFS	10,000	4,500	4,500	4,500	4,500
	Fish & Wildlife	Agriculture	Agriculture	Fish & Wildlife	Fish & Wildlife
APR	Chipps Island DOI	Emmaton EC	Emmaton EC	Chipps Island EC	Chipps Island EC
		Jersey Point EC	Jersey Point EC		
DOI - CFS	10,000	7,600	7,600	4,500	4,500
	Fish & Wildlife	AG - F&W	Agriculture	Ag - M&I	Agriculture
MAY	Chipps Island DOI	Emmaton EC	Emmaton EC	Emmaton EC	Emmaton EC
		Jersey Point EC	Jersey Point EC	Jersey Point EC	Jersey Point EC
		Chipps Island DOI		Contra Costa CI	Contra Costa CI
DOI - CFS	13,350	13,000	7,600	4,000	4,000
	Fish & Wildlife	Fish & Wildlife	Agriculture	Ag - M&I	Agriculture
JUN	Chipps Island DOI	Chipps Island DOI	Emmaton EC	Emmaton EC	Emmaton EC
			Jersey Point EC	Jersey Point EC	Jersey Point EC
				Contra Costa CI	Contra Costa CI
DOI - CFS	13,160	10,700	6,200	3,900	3,900
	Fish & Wildlife	Fish & Wildlife	Agriculture	Ag - M&I	Agriculture
JUL	Chipps Island DOI	Chipps Island DOI	Emmaton EC	Emmaton EC	Emmaton EC
			Jersey Point EC	Jersey Point EC	Jersey Point EC
				Contra Costa CI	Contra Costa CI
DOI - CFS	10,000	7,700	4,700	3,900	3,900
	Agriculture	Ag - M&I	Ag - M&I	Ag - M&I	Ag - M&I
AUG	Emmaton EC	Emmaton EC	Emmaton EC	Emmaton EC	Emmaton EC
	Jersey Point EC	Jersey Point EC	Jersey Point EC	Jersey Point EC	Jersey Point EC
		Contra Costa CI	Contra Costa CI	Contra Costa CI	Contra Costa CI
DOI - CFS	5,000	4,500	3,600	3,200	3,200
	Municipal & Industrial	Municipal & Industrial	Municipal & Industrial	Municipal & Industrial	Municipal & Industrial
SEP	Contra Costa CI	Contra Costa CI	Contra Costa CI	Contra Costa CI	Contra Costa CI
DOI - CFS	2,500	2,500	2,500	2,500	2,500

Ag = Agriculture
DOI = Delta Outflow Index
F&W = Fish & Wildlife
M&I = Municipal & Industrial
CFS = Cubic Feet Per Second
CI = Chlorides
EC = Electrical Conductivity

LONG-TERM CVP-OCAP
ALLOCATION SCENARIO

	ANNUAL QUANTITY	WR: 100% AG: 100%	100% 75%	100% 50%	75% 50%	75% 25%	75% 0%
WATER RIGHTS SETTLEMENTS							
AGRICULTURE	2,172.0	2,172.0	2,172.0	2,172.0	1,629.0	1,629.0	1,629.0
MUNICIPAL & INDUSTRIAL	1.7	1.7	1.7	1.7	1.3	1.3	1.3
WEST SACRAMENTO	23.6	23.6	23.6	23.6	17.7	17.7	17.7
REDDING	16.6	16.6	16.6	16.6	12.5	12.5	12.5
SUBTOTAL - WATER RIGHTS	2,213.9	2,213.9	2,213.9	2,213.9	1,660.4	1,660.4	1,660.4
PROJECT							
COLUSA DRAIN	57.6	57.6	43.2	28.8	28.8	14.4	0.0
SUTTER BUTTE	17.7	17.7	13.3	8.9	8.9	4.4	0.0
BUTTE SLOUGH	4.2	4.2	3.2	2.1	2.1	1.1	0.0
FEATHER RIVER	20.0	20.0	15.0	10.0	10.0	5.0	0.0
TEHAMA-COLUSA CANAL	356.3	356.3	267.2	178.2	178.2	89.1	0.0
BLACK BUTTE	3.6	3.6	2.7	1.8	1.8	0.9	0.0
CORNING CANAL	43.8	43.8	32.9	21.9	21.9	11.0	0.0
SHASTA LAKE	14.2	14.2	10.7	7.1	7.1	3.6	0.0
TRINITY RIVER DIVISION	40.8	40.8	30.6	20.4	20.4	10.2	0.0
SUBTOTAL - PROJECT	558.2	558.2	418.7	279.1	279.1	139.6	0.0
TOTAL - SACRAMENTO RIVER	2,772.1	2,772.1	2,632.6	2,493.0	1,939.5	1,800.0	1,660.4
AMERICAN RIVER							
FOLSOM LAKE							
WATER RIGHTS	59.0	59.0	59.0	59.0	59.0	59.0	59.0
PROJECT	50.8	50.8	38.1	25.4	25.4	12.7	0.0
PLACER COUNTY	155.0	8.0	6.0	4.0	4.0	2.0	0.0
SUBTOTAL - FOLSOM LAKE	264.8	117.8	103.1	88.4	88.4	73.7	59.0

	ANNUAL	WR: 100%	100%	100%	75%	75%	75%
	QUANTITY	AG: 100%	75%	50%	50%	25%	0%
AMERICAN RIVER (CON'T)							
FOLSOM SOUTH CANAL							
WATER RIGHTS	25.0	20.0	20.0	20.0	20.0	20.0	20.0
PROJECT	210.0	0.0	0.0	0.0	0.0	0.0	0.0
SUBTOTAL - FOLSOM SOUTH	235.0	20.0	20.0	20.0	20.0	20.0	20.0
CITY OF SACRAMENTO	230.0	60.0	60.0	60.0	45.0	45.0	45.0
TOTAL AMERICAN RIVER	729.8	197.8	183.1	168.4	153.4	138.7	124.0
CONTRA COSTA	195.0	135.0	135.0	101.0	101.0	101.0	101.0
DMC/MENDOTA POOL							
CONTRACT ENTITIES	840.0	840.0	840.0	840.0	630.0	630.0	630.0
OTHER WATER RIGHTS	37.3	37.3	37.3	37.3	28.0	28.0	28.0
SUBTOTAL - WATER RIGHTS	877.3	877.3	877.3	877.3	658.0	658.0	658.0
DMC	463.8	463.8	347.9	231.9	231.9	116.0	0.0
SLC/DMC	111.7	111.7	83.8	55.8	55.8	27.9	0.0
REFUGE WATER (ADDITIONAL)	52.0	52.0	39.0	26.0	26.0	13.0	0.0
SUBTOTAL - PROJECT	627.5	627.5	470.7	313.7	313.7	156.9	0.0
LOSSES	110.0	110.0	110.0	110.0	110.0	110.0	110.0
TOTAL DMC/MP	1,614.8	1,614.8	1,458.0	1,301.0	1,081.7	924.9	768.0

	ANNUAL	WR: 100%	100%	100%	75%	75%	75%
	QUANTITY	AG: 100%	75%	50%	50%	25%	0%
SAN FELIPE	196.3	196.3	147.2	147.2	147.2	147.2	147.2
ONEILL FOREBAY	27.9	27.9	20.9	14.0	14.0	7.0	0.0
SAN LUIS CANAL/CVC							
WATER RIGHTS	6.0	6.0	4.0	4.0	3.0	3.0	3.0
M&I	16.5	16.5	16.5	16.5	12.4	12.4	12.4
AGRI:							
CROSS VALLEY	128.3	128.3	96.2	64.2	64.2	32.1	0.0
SLWD/PANOCHE	139.6	139.6	104.7	69.8	69.8	34.9	0.0
WESTLANDS	1,100.0	1,100.0	825.0	550.0	550.0	275.0	0.0
REFUGES	8.2	8.2	6.2	4.1	4.1	2.1	0.0
LOSSES	15.0	15.0	15.0	15.0	11.3	11.3	11.3
TOTAL - SAN LUIS CANAL/CVC	1,413.6	1,413.6	1,067.6	723.6	714.7	370.7	26.6
GRAND TOTAL - CVP	6,949.5	6,357.5	5,644.4	4,948.2	4,151.5	3,489.5	2,827.2

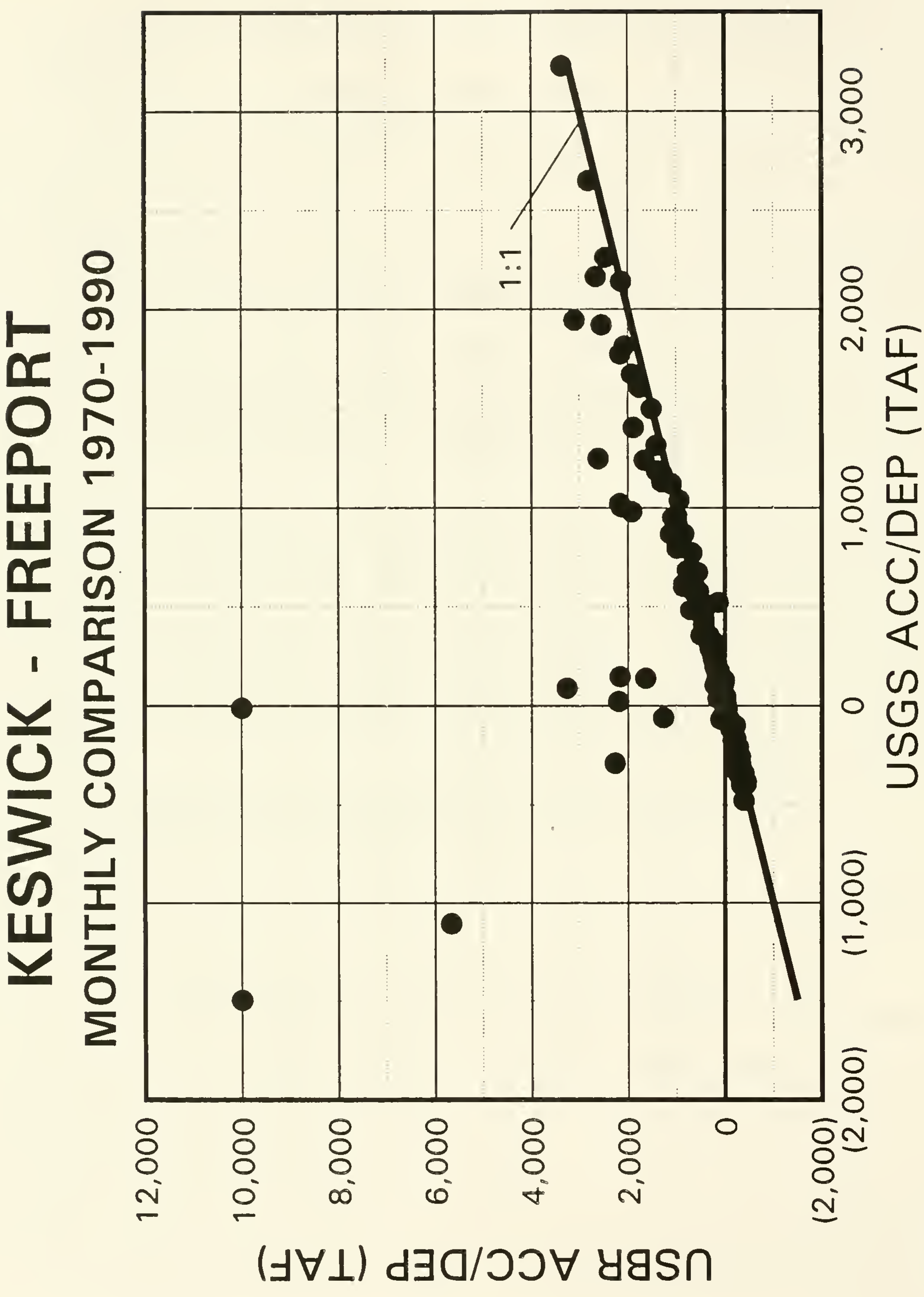
Development of Accretion/Depletion Input for Long-Term CVP-OCAP Studies

Water accretions/depletions (acc/dep) to the Sacramento River and its tributaries are a result of many causes related to precipitation, land use, and water project operations, and their magnitude and timing vary from month to month and year to year. Because the Long-Term CVP-OCAP studies were performed for a range of hydrologic and reservoir conditions, it was necessary to develop acc/dep data that were representative of the conditions that would exist in each of the twenty model scenarios (5 runoff conditions, times 4 starting reservoir storages).

Information exists to compute acc/dep on a daily basis. For the purposes of these studies, however, data are required for monthly time steps. To obtain monthly values, calculations were performed to determine the daily acc/dep and then the results of the daily values were summed. An examination of these results indicated that the magnitude and timing of acc/dep are most influenced by the factors that determine annual runoff. As a consequence, a typical acc/dep pattern was determined for each of the four hydrologic year types and those same patterns were used with all beginning reservoir storage conditions.

Keswick-Freeport

Reclamation has daily data back to 1970 with which the Sacramento River acc/dep between Keswick and Freeport (Kes-Fpt) has been computed. USGS data is available back to 1949 which would, if it could be used, double the period of record available for analysis. To determine if the USGS data "matched" Reclamation data, a comparison was made of Reclamation calculated monthly acc/dep, for the water years 1970 through 1990, with the acc/dep calculated using USGS data. A graphic representation of that comparison is shown in Figure A, with the straight line representing the results if there was a perfect match. From observation it was determined that the two methods



KESWICK - FREEPORT
MONTHLY COMPARISON 1970-1990
1:1
USGS ACC/DEP (TAF)
USBR ACC/DEP (TAF)
(2,000)
(1,000)
0
1,000
2,000
3,000
12,000
10,000
8,000
6,000
4,000
2,000
0
(2,000)

Figure A

(Reclamation and USGS) provided equivalent results and that the period of record could be extended with USGS data back to 1949. Monthly acc/dep values were determined with the USGS data and used in further analyses.

Keswick-Wilkins Slough

Similar Reclamation and USGS data is available for calculating Sacramento River acc/dep between Keswick and Wilkins Slough (Kes-Wlk). Again, Reclamation data is limited to the 1970 through 1990 period and an extension of the data using USGS data might be valuable. Applying the comparison technique used for the Kes-Fpt analysis, it was determined that the two methods for determining the Kes-Wlk acc/dep were equivalent (see Figure B). Monthly acc/dep values were determined with the USGS data and used in further analyses.

Keswick-Freeport versus Keswick-Wilkins Slough

Because of water operation constraints in the model, it was necessary to determine a relationship between Kes-WLK acc/dep and Kes-Fpt acc/dep. This relationship makes it possible to calculate a Kes-Wlk acc/dep given a Kes-Fpt acc/dep. The relationship between the two river reaches is probably dependent to some extent on cropping patterns and land development in the region, thus, the period of record used in this analysis was limited to 1970 through 1990 which is most representative of current conditions. Plotting the monthly Kes-Wlk acc/dep versus monthly Kes-Fpt acc/dep provides a visual means of identifying the relationship (see Figure C). Using regression analysis, a "best-fit" line was determined and an equation was developed that describes the Kes-Wlk acc/dep as a function of the Kes-Fpt acc/dep.

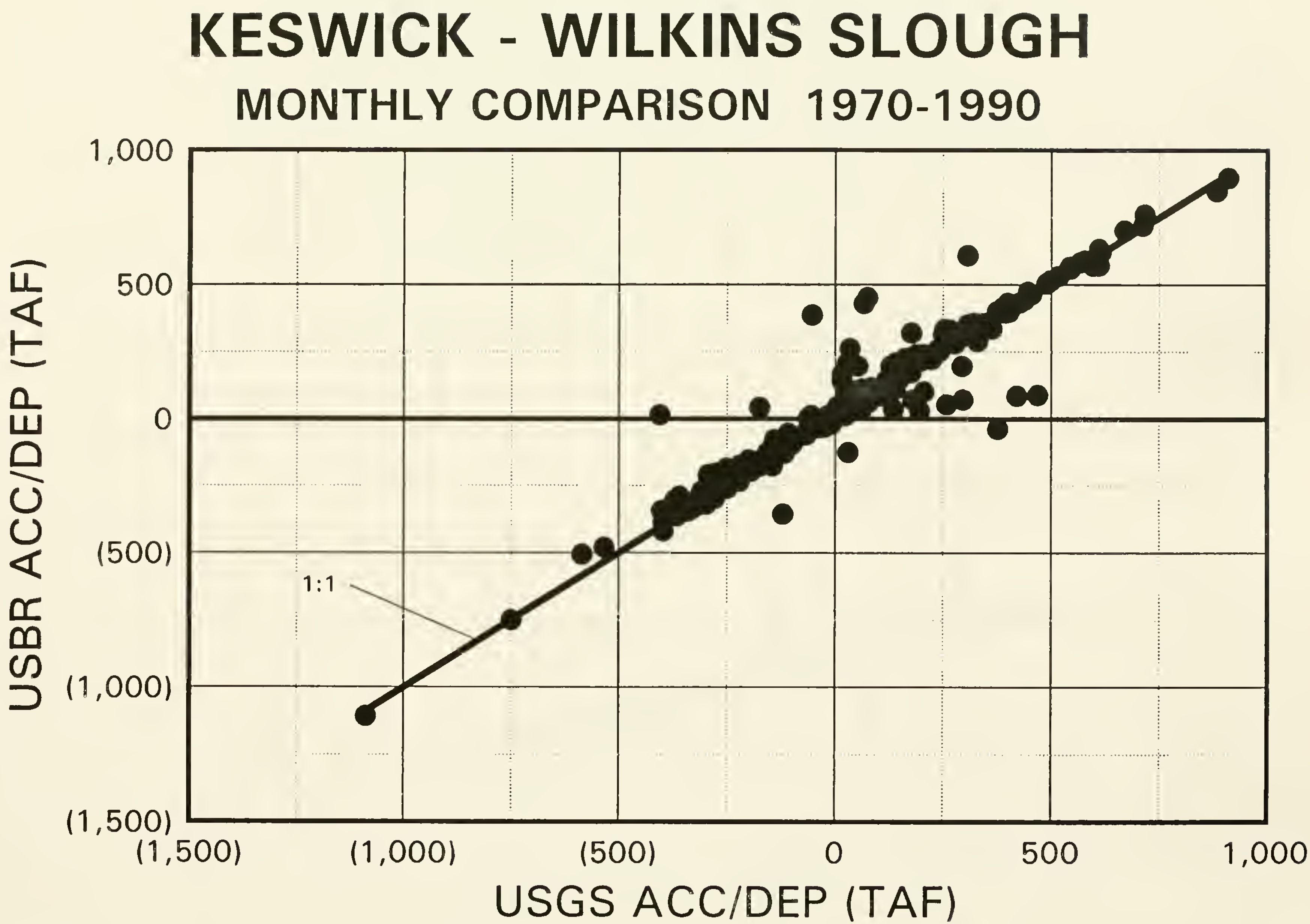

KESWICK - WILKINS SLOUGH
MONTHLY COMPARISON 1970-1990
USBR ACC/DEP (TAF)
1,000
500
0
(500)
(1,000)
(1,500)
(1,500)
(1,000)
(500)
0
500
1,000
USGS ACC/DEP (TAF)
1:1

Figure B

KES-FPT VS KES-WLK

MONTHLY COMPARISON 1970-1990

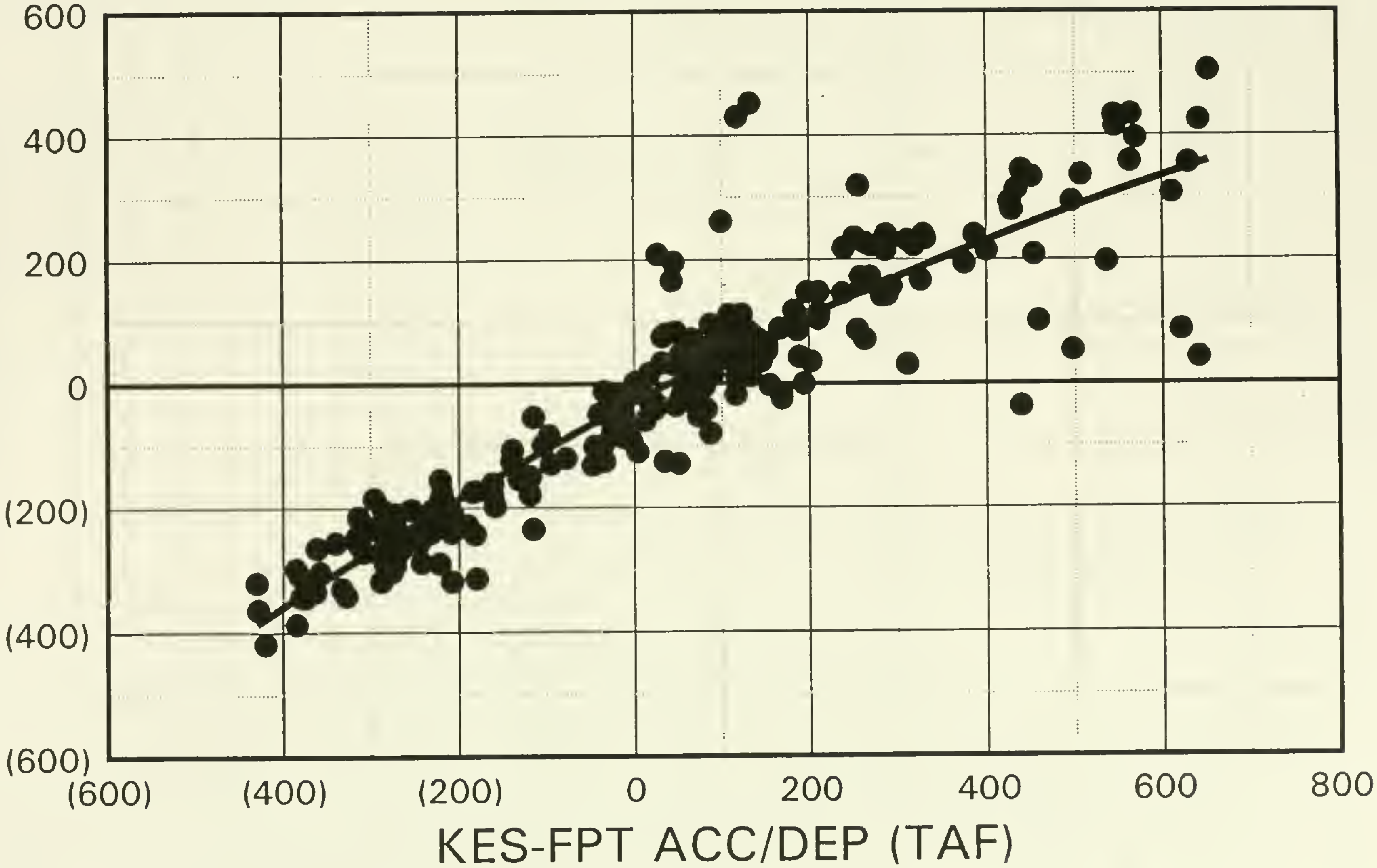


Figure C

Keswick-Freeport Accretions/Depletions by Year Type

In order to determine the "typical" acc/dep for the hydrologic year types, the years 1949 through 1990 were divided into five groups; wet, above normal, dry, critical, and extreme critical. The group boundaries and each year's placement in a group was determined by the Sacramento River Index defined in SWRCB D-1485. Once the groups were established, an average monthly acc/dep was determined for each month. Figure D illustrates the initial results of this analysis.

It was apparent from the plotted results that some anomalies in monthly averages were evident during the months when rainfall can be significant. To ameliorate these anomalies, certain years (particularly the extremely wet years and/or years with runoff distributions well outside typical ranges) were selectively removed from the analysis to avoid unduly influencing results because of isolated rainfall events. Figure E is a graphical representation of the adjusted Kes-Fpt acc/dep distributions used in all Long-Term CVP-OCAP studies.

Yuba River Accretion/Depletions

Yuba River operations are not controlled in the spreadsheet model used for the Long-Term CVP-OCAP studies. It was, therefore, necessary to estimate Yuba River operations for each of the hydrologic year types. In a procedure similar to that used for the Sacramento River, USGS data for the period 1970 through 1990 were segregated by hydrologic year type and plotted on a monthly basis (see Figure F). Water years 1970, 1971, 1973, 1978, 1980, 1984, and 1986 were described as wet; water years 1975 and 1989 were described as above normal; water years 1972, 1979, 1981, and 1985 were described as dry; water years 1976, 1987, and 1988 were described as critical; and, 1977 was an extreme critical year. Upon observation of the results, certain adjustments were made to the values to create distributions that ignore extreme events and are believed to be plausible in temporal distribution and magnitude (see Figure G).

KESWICK - FREEPORT ACC/DEP

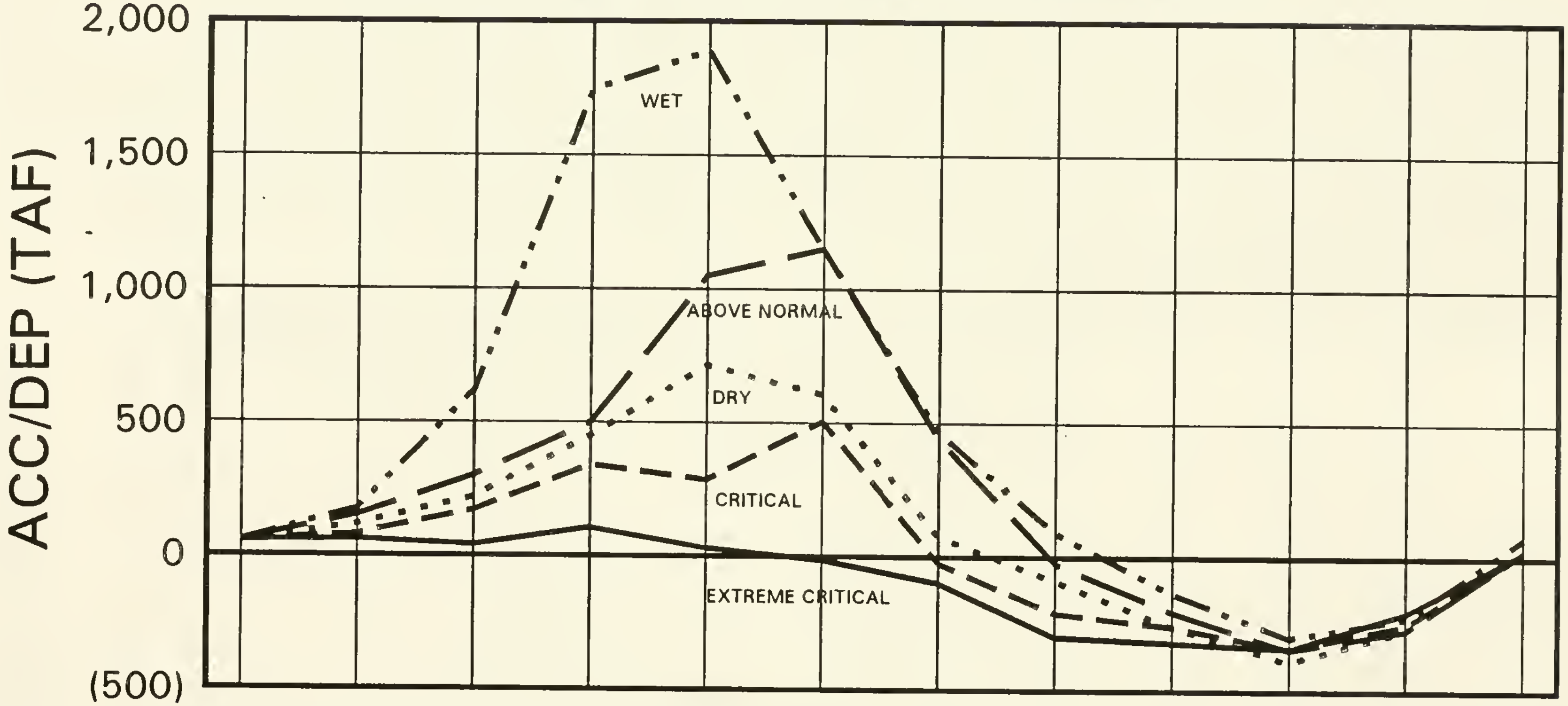
ACTUAL DATA BY YEAR TYPE 1949-1991

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	44.0	80.9	166.4	198.0	126.9	286.0	(45.0)	(164.4)	(258.6)	(363.4)	(222.0)	17.0
CRITICAL	65.0	200.8	315.9	377.8	591.0	616.0	124.2	(276.3)	(384.6)	(375.6)	(243.0)	23.9
DRY	25.5	118.6	204.1	441.6	525.6	980.9	278.0	(106.4)	(312.4)	(341.2)	(223.8)	91.2
ABOVE NORMAL	107	263	439	2,201	2,276	2,159	429	(3)	(221)	(300)	(190)	116
WET	115.2	325.5	980.2	1,592.1	2,694.7	2,879.9	1,012.7	179.5	(95.4)	(218.6)	(196.5)	111.1

Figure D

KESWICK - FREEPORT ACC/DEP

ADJUSTED DATA BY YEAR TYPE

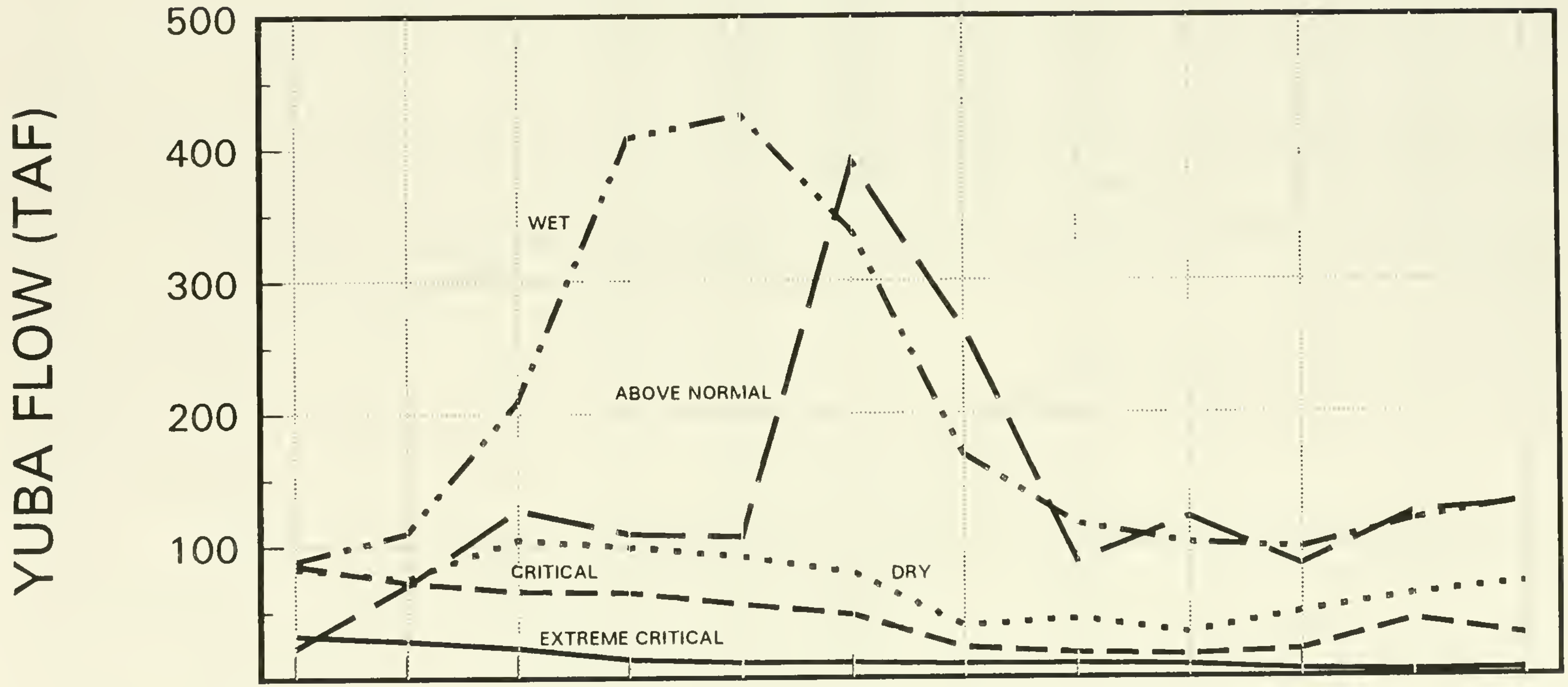


	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	55	60	40	105	30	(15)	(100)	(300)	(320)	(340)	(205)	25
CRITICAL	55	80	170	340	285	505	(25)	(210)	(260)	(340)	(250)	25
DRY	55	115	220	450	715	605	75	(90)	(260)	(390)	(270)	25
ABOVE NORMAL	55	150	300	500	1,050	1,150	440	(25)	(205)	(345)	(270)	25
WET	55	175	620	1,745	1,890	1,150	465	90	(135)	(300)	(225)	75

Figure E

YUBA RIVER @ MARYSVILLE

ACTUAL VALUES 1970-1990

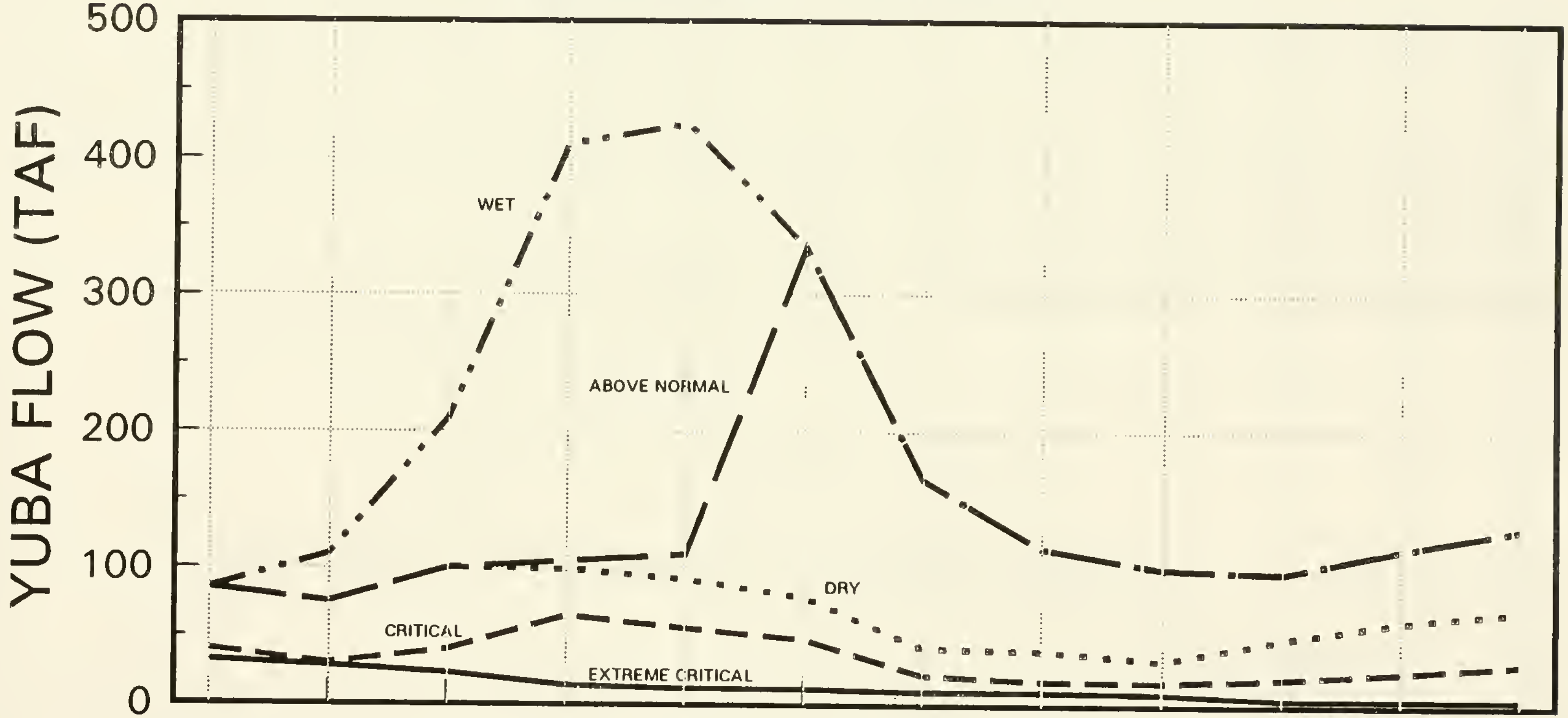


	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	32,422	28,328	22,788	14,122	11,738	11,534	10,294	10,219	9,213	5,435	4,407	5,107
CRITICAL	85,560	72,633	65,662	64,611	55,556	47,618	22,390	18,163	16,761	20,299	42,834	30,783
DRY	83,096	75,372	104,747	98,858	91,727	79,455	39,071	44,229	33,493	48,767	61,825	70,309
ABOVE NORMAL	22,876	69,939	126,922	108,775	106,760	390,307	263,465	87,647	120,747	84,639	124,136	130,083
WET	88,616	109,565	208,824	408,205	425,160	337,529	167,747	115,906	101,183	97,120	117,996	131,991

Figure F

YUBA RIVER @ MARYSVILLE

ADJUSTED VALUES



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	32	28	23	14	12	12	10	10	9	5	5	5
CRITICAL	40	30	40	65	56	48	22	18	17	20	25	31
DRY	85	75	100	99	92	79	42	40	33	49	62	70
ABOVE NORMAL	85	75	100	105	110	335	165	115	100	97	115	130
WET	85	110	210	410	425	335	165	115	100	97	115	130

Figure G

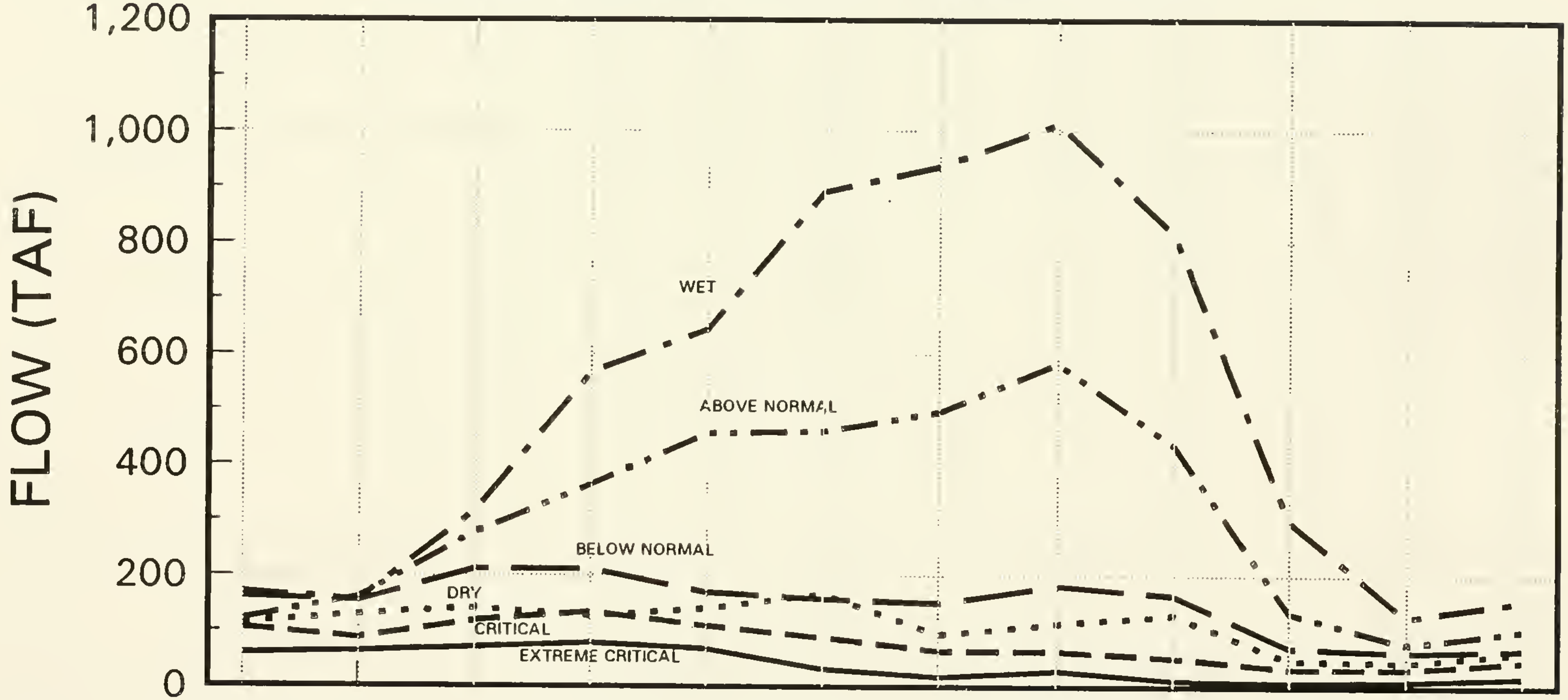
San Joaquin River at Vernalis

San Joaquin River operations are not controlled in the spreadsheet model used for the Long-Term CVP-OCAP studies. It was, therefore, necessary to estimate San Joaquin River flows at Vernalis for each of the hydrologic year types. In a procedure similar to that used for the Yuba River, USGS data for the period 1924, and 1930 through 1989 were segregated by hydrologic year type and plotted on a monthly basis (see Figure H). Because the San Joaquin River watershed does not mirror the Sacramento River watershed, it was not possible to use the Sacramento River Index as a means to designate hydrologic year types so. As a substitute method, based on annual totals, 25 percent of the years were classified as wet; 25 percent of the years as above normal; 35 percent of the years as dry; 10 percent of the years as critical; and, 5 percent of the years as extreme critical.

A second means of estimating Vernalis flow, using data from DWRSIM, was used as a check on the USGS data. Since New Melones Dam was only recently completed and since it has a major affect on the San Joaquin River flow, the early USGS data is probably not very representative of current conditions. The DWRSIM data for water years 1922 through 1978 were segregated in a manner like that used for the USGS data (see Figure I). Observation of the results from these two procedures combined with historic 1990, 1991, and 1992 operations resulted in certain adjustments to the values to create distributions that ignore extreme events and are believed to be plausible in temporal distribution and magnitude (see Figure J).

SAN JOAQUIN RIVER @ VERNALIS

USGS DATA 1924, 1930-1989

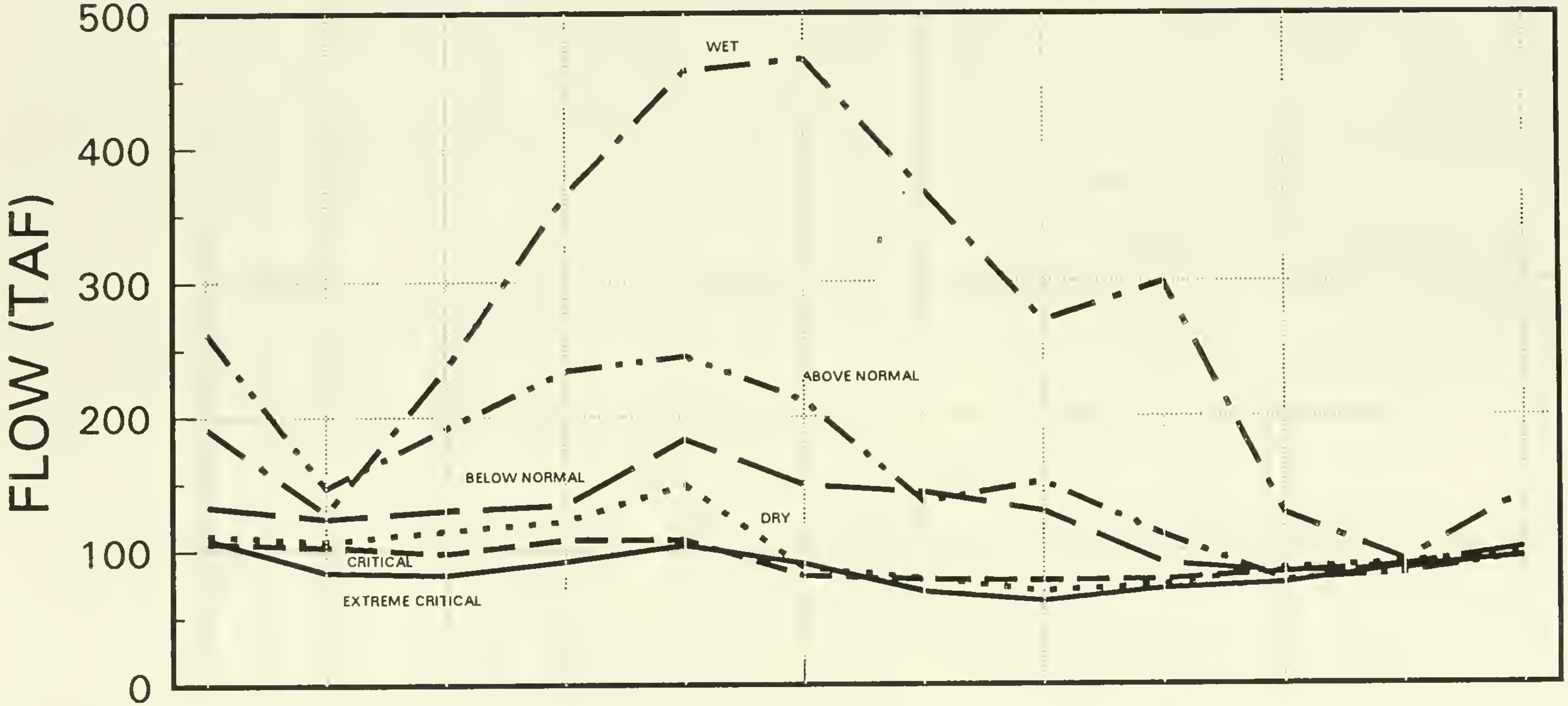


	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	59	63	70	78	68	32	18	29	12	9	11	18
CRITICAL	105	87	118	134	109	88	64	64	52	33	33	47
DRY	113	129	141	127	140	167	94	114	129	48	45	63
BELOW NORMAL	161	154	211	211	169	158	150	182	164	71	63	68
ABOVE NORMAL	121	160	277	363	456	460	495	583	435	133	77	103
WET	170	155	316	567	643	891	937	1,014	815	298	126	156

Figure H

SAN JOAQUIN RIVER @ VERNALIS

DWRSIM DATA 1922-1978

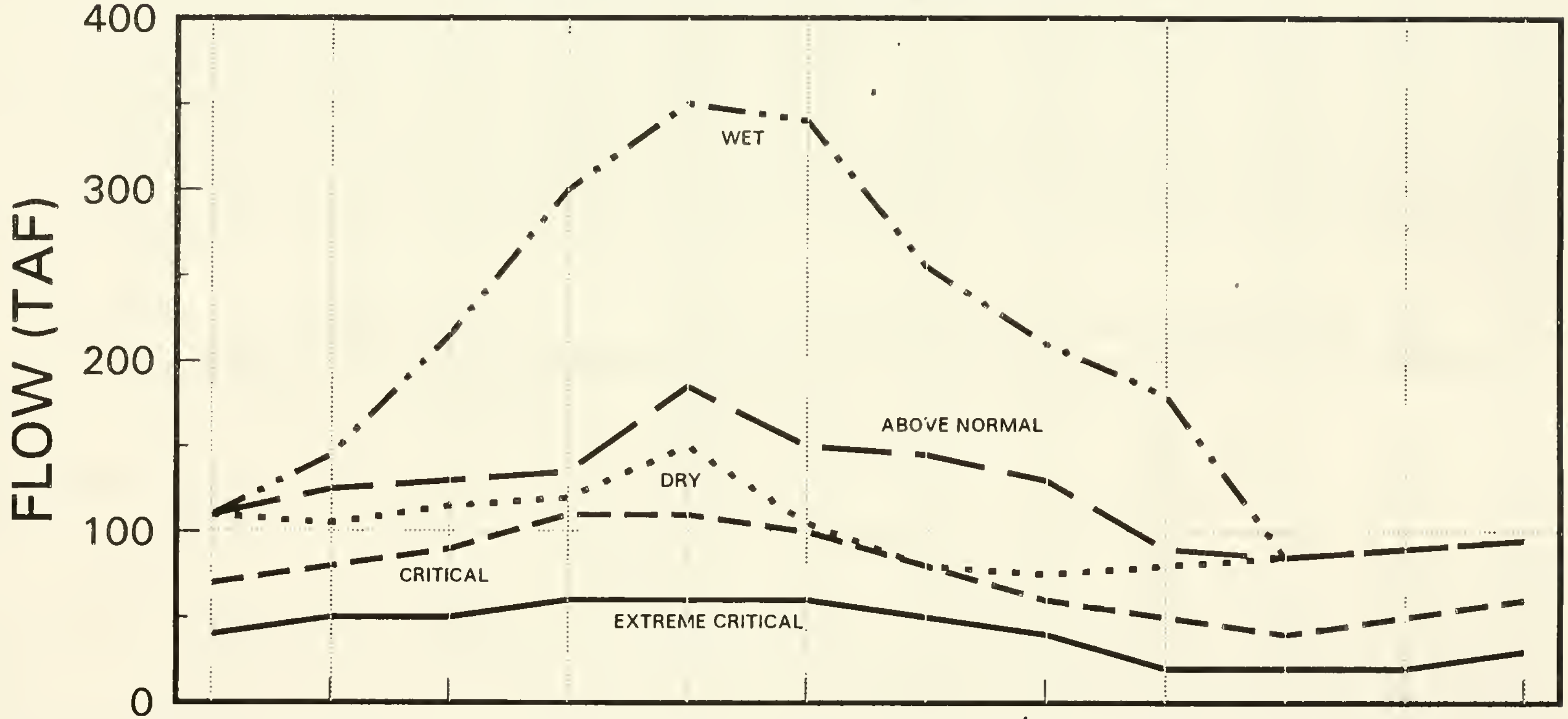


	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	109	84	82	92	104	90	69	62	71	75	87	94
CRITICAL	106	103	98	108	108	81	78	77	78	83	85	95
DRY	112	107	115	122	149	87	79	.69	74	86	90	97
BELOW NORMAL	133	124	130	134	183	149	143	129	90	83	88	101
ABOVE NORMAL	262	147	191	234	245	212	136	151	111	77	82	95
WET	191	128	235	365	457	466	368	271	300	127	92	142

Figure I

SAN JOAQUIN RIVER @ VERNALIS

ADJUSTED VALUES



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EXTREME CRITICAL	40	50	50	60	60	60	50	40	20	20	20	30
CRITICALC	70	80	90	110	110	100	80	60	50	40	50	60
DRY	110	105	115	120	150	105	80	75	80	85	90	95
ABOVE NORMAL	110	125	130	135	185	150	145	130	90	85	90	95
WET	110	145	215	300	350	340	255	210	180	85	90	95

Figure J

Sacramento River Deliveries

The performance of operations studies for the Long-Term CVP-OCAP require a knowledge of deliveries to both water rights holders and CVP project contractors. Because accomplishing certain survival goals for the winter-run salmon require applying deficiencies to water deliveries, a method of estimating actual water use for a defined deficiency was developed. The method recognizes a difference between water rights holders and project water contractors and determines separate deliveries for a given deficiency. Since the model used for the Long-Term CVP-OCAP studies does not have a direct input for Sacramento River water demands, differences between 100 percent deliveries and those determined by applying delivery deficiencies are applied to the accretions/depletions on the Sacramento River.

Examination of Reclamations monthly records for the purpose of determining patterns in deliveries show that 85 percent of the water is delivered from April through August. Of that volume, 13 percent is used in April; 20 percent is used in May; 23 percent is used in June; 24 percent is used in July; and, 20 percent is used in August. September and October water deliveries were found to equal 13 percent of the annual total, with September receiving 65 percent and October receiving 35 percent of the amount. The November through March water deliveries amount to only 6 percent of the annual total. Distribution of the November through March volume is 36 percent in November; 15 percent in December; 14 percent in January; 15 percent in February; and, 20 percent in March.

Water rights contracts on the Sacramento River are 2,214,000 acre-feet and CVP project water contracts are 558,000 acre-feet for a total of 2,772,000 acre-feet. Examination of Reclamation records indicate, however, that the average annual total delivery to both water rights and project contractors is only about 2,075,000 acre-feet when no deficiencies are placed on water use. Of this amount, it is estimated that about 500,000 acre-feet of the project water is being used and about 1,575,000 acre-feet of the water rights water is being used.

In years when deficiencies have been placed on CVP water contractors, about 1,800,000 acre-feet of water was delivered to Sacramento water users. In these instances (1977 and 1991), the deliveries to water rights users are limited to 75 percent of contractual values while the project deliveries have been cut by as much as 75 percent. We assume that with a 75 percent reduction in deliveries, project contractors will take the maximum amount of water available under contract. In this instance, project contractors are assumed to be taking 140,000 acre-feet meaning that the difference, 1,660,000, acre-feet is being served to water rights contractors.

Since, over the course of CVP operations, there have been so few occasions when deficiencies have been declared, it is difficult to describe a relationship between actual deliveries and imposed deficiencies. This difficulty holds true for both water rights contracts and project water contracts. For use in the Long-Term CVP-OCAP studies a relationship was developed that appears to be reasonable but is, by no means, the only one that can be hypothesized.

Water Rights Contracts

The deficiency versus delivery relationship for water rights contracts was developed for the April through August period. These months are the primary irrigation months and account for 85 percent of annual water deliveries. Analysis of the September through March data shows that deliveries during this time period are similar despite differences in deficiencies.

In developing a curve of deliveries versus imposed deficiency only two points are available from historic records. Historic April through August water rights deliveries with no deficiencies are about 1,325,000 acre-feet and historic water rights deliveries for the same period with 25 percent deficiency is about 1,120,000 acre-feet.

To estimate additional points on the delivery-deficiency curve, it was assumed that if a 70 percent or greater deficiency was imposed on the water rights contractors then deliveries would equal the contract allowable amount. In other words, if the imposed deficiency was less than 70 percent, actual water rights deliveries would probably be something less than the contract allowable but if bigger deficiencies were imposed deliveries would be maximized. Figure K is a graphical representation of the contract maximum (solid line) and the estimated delivery (dashed line) versus deficiency.

Project Water Contracts

The delivery versus deficiency relationship for project water contracts was developed for the April through August period. These months are the primary irrigation months and account for 85 percent of annual water deliveries. Analysis of the September through March data shows that deliveries during this time period are similar despite differences in deficiencies.

In developing a curve of deliveries versus imposed deficiency only a limited number of points are available from historic records. Historic April through August project water deliveries with no deficiencies are about 420,000 acre-feet and historic water rights deliveries for the same period with 75 percent deficiency is about 120 acre-feet.

To estimate additional points on the delivery-deficiency curve, it was assumed that if a 50 percent or greater deficiency was imposed on the water rights contractors then deliveries would equal the contract allowable amount. In other words, if the imposed deficiency was less than 50 percent, actual water rights deliveries would probably be something less than the contract allowable but if bigger deficiencies were imposed deliveries would be maximized. Figure L is a graphical representation of the contract maximum (solid line) and the estimated delivery (dashed line) versus deficiency.

SACRAMENTO RIVER

APRIL - AUGUST WATER RIGHTS

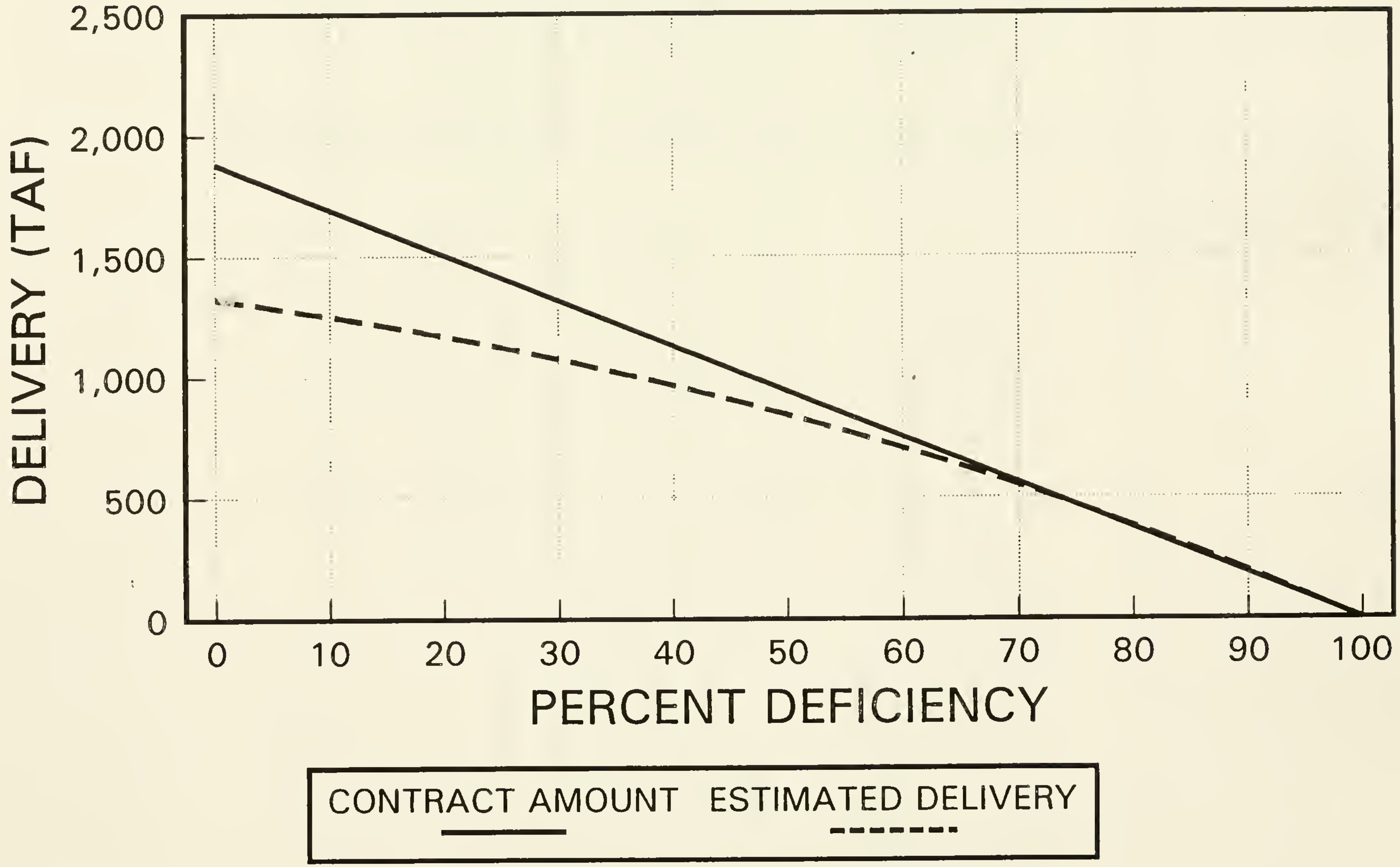


Figure K

SACRAMENTO RIVER

APRIL - AUGUST PROJECT WATER

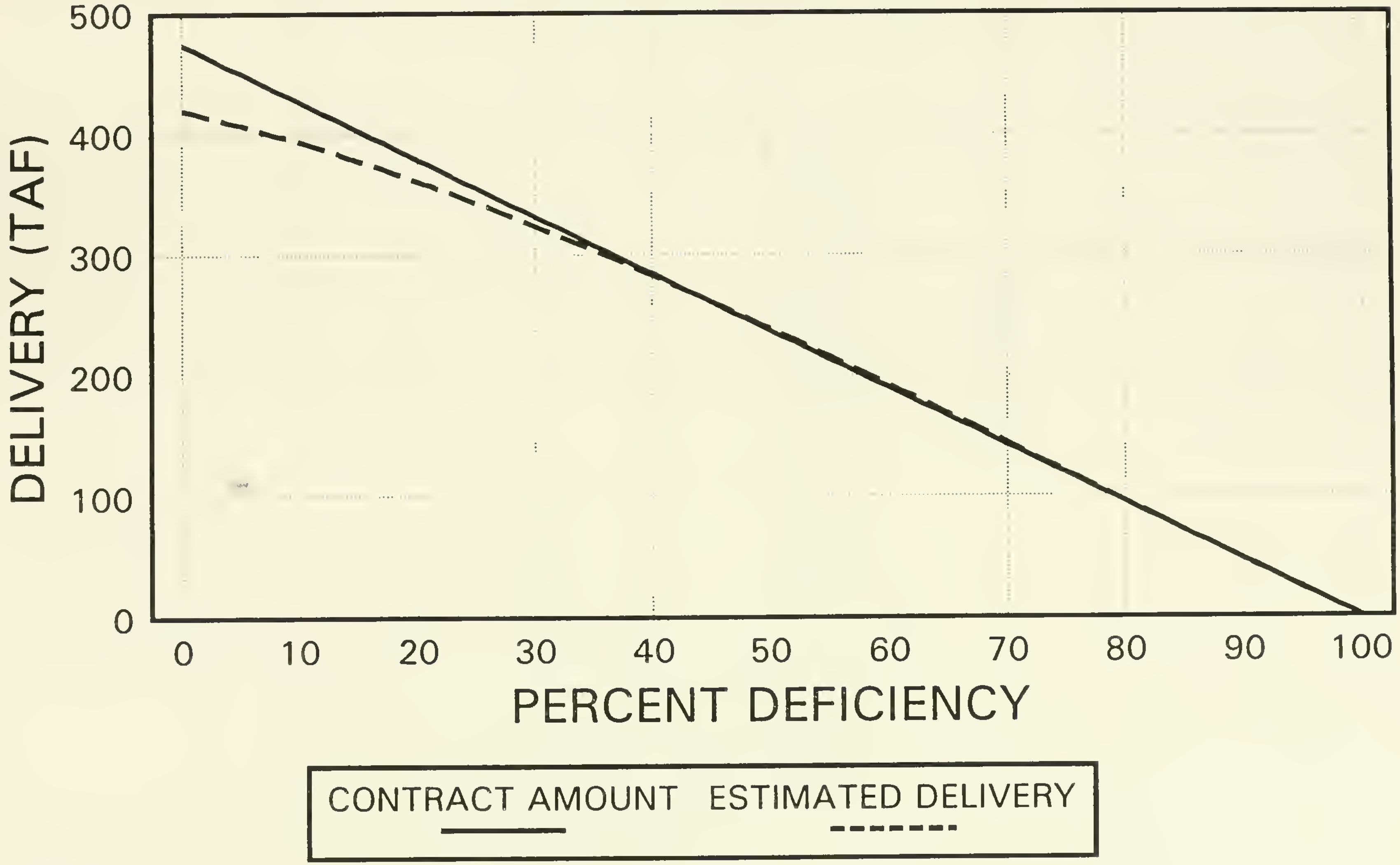


Figure L

Appendix E

Central Valley Project Statistical Data Tables

Appendix E

Table of Contents

CENTRAL VALLEY PROJECT RESERVOIRS Watershed Characteristics						
			Water year runoff (millions of acre-feet)			April-Julyrunoff (millions of acre-feet)
Reservoir	Drainage area (square miles)	Major tributaries	Mean	Maximum	Minimum	Mean
Clair Engle (Trinity)	719	Trinity	1.21 (1912-1990)	2.89 (1983)	.23 (1977)	.60 (1912-1990)
Shasta	6,665	Pit, Mccloud, Sacramento	5.58 (1922-1990)	10.80 (1974)	2.48 (1924)	1.74 (1922-1990)
Whiskeytown	228	Clear Creek	.26 (1922-1990)	.88 (1983)	.06 (1924)	.07 (1922-1990)
Folsom	1875	American	2.71 (1906-1990)	6.38 (1983)	.35 (1977)	1.35 (1906-1990)
New Melones	904	Stanislaus	1.16 (1906-1990)	2.98 (1983)	.15 (1977)	.74 (1906-1990)

CENTRAL VALLEY PROJECT

Reservoir Characteristics

	Dam		Gross pool			Bottom of flood control pool			Minimum active contents		
Reservoir	Type	Height (feet)	Storage (TAF)	Elevation (feet)	Surface area (acres)	Storage (TAF)	Elevation (feet)	Surface area (acres)	Storage (TAF)	Elevation (feet)	Surface area (acres)
Clair Engle	Zoned Earthfill	537.5	2,448.0	2370	16,535	2,100.0*	2347.8	14,899	312.6	2145.0	4,044
Shasta	Concrete Curved Gravity, Embankment Wing	602	4,552.0	1067	29,740	3,252.0	1018.5	23,942	587.1	840	7,528
Clair A. Hill/ Whiskeytown	Zoned Earthfill	281.5	241.1	1210	3,220	205.7**	1198.5	2,946	27.5	1100	787
Folsom	Concrete Gravity, Earth Wings	340	974.0	466	11,450	574.0	425.7	8631	82.0	327	1917
New Melones	Zoned Earth and Rockfill	625	2,419.5	1088	12,462	1,970.0	1049.6	10,962	300.0	808.2	3,448
San Luis	Zoned Earthfill	382	2,041.0	544	13,000		N/A		79.2	326	3,630

* Safety of dams drawdown criteria (to control inflow design flood)

**Normal wintertime drawdown to avoid spills

CENTRAL VALLEY PROJECT FEATURES
Discharge Capabilities

	Powerplant			Spillway			Outlets		
Dam/powerplant	# of Units	Total capacity (in MW)	Total discharge (in ft^3/s)	Crest elev. (in feet)	Discharge (in ft^3/s)	@ Elev. (in feet)	# of Outlets	Discharge @ (in ft^3/s)	Elev. (in feet)
Trinity	2	140	3,900	2370.0	22,530	2370.0	2	9,725 7,200 2,500 (Aux)	2370.0
Lewiston	1	.5	100	1874.5	30,000	1902.0	1	320	N/A
Clear Creek Tunnel/JF Carr Powerplant	2	154.4	3,600		N/A			N/A	
Clair A. Hill (Whiskeytown)	1^	3.5^		1210.0	28,892	1220.5	2	1,250	1220.5
Spring Creek Tunnel/ Powerplant	2	200	4,400		N/A			N/A	
Spring Creek Debris Dam	-	-	-	795.0	5138	809.5	2	710	809.5
Shasta	7	583	18,000	1037.0	183,600	1065.0	18	81,800	6 - 942.0 8 - 842.0 4 - 742.0
Keswick	3	105	16,000	537.0	250,000	587.0		N/A	
Folsom	3	197.7	8,600	418.0	567,000	475.4	8	30,960	466.0
Nimbus	2	13.5	5,500	102.4	300,000	126.5		N/A	
New Melones	2	300	9,600	1088.0	112,600	1123.4	3	2,300 3,200	808.0 1088.0
San Luis/Gianelli	8	424	11,000	544.0	875	545.8		N/A	
O'Neill	6	25.2	4,200	225.0	3,300	228.0		N/A	

*Federal share is 187 MW

^City of Redding

CENTRAL VALLEY PROJECT

Pumping Plants

Pumping plant	# of Units	Total discharge capacity (in ft^3/s)	Lift (in feet)	From	To
Tracy	6	4,600	197	Delta	Delta-Mendota Canal
Dos Amigos	6	13,200	107 - 125	Pool 13, California Aqueduct	Pool 14, San Luis Canal
San Luis/Gianelli Pump Generating Plant	8	11,000	99 - 327	O'Neill Forebay	San Luis Reservoir
O'Neill Pump Generating Plant	6	4,200	44 - 56	Delta-Mendota Canal	O'Neill Forebay
Folsom	6	350	0 - 100	Folsom Lake	North Fork Pipeline
Pacheco	12	480	85 - 300	San Luis Reservoir	Pacheco Tunnel
Coyote	6	300	40 - 210	Santa Clara Conduit	Coyote Creek or Calero Reservoir
Pleasant Valley	9	1,185	197	San Luis Canal	Coalinga Canal
Contra Costa #2	6	410	25 - 28	Rock Slough	Contra Costa Canal
Corning	6	477	59 - 71	Tehama Colusa Canal	Corning Canal

CENTRAL VALLEY PROJECT

Carriage Facilities

Canals/conveyances	Point of diversion	Terminus	Conveyance capacity	Length
Delta-Mendota Canal	Tracy Pumping Plant	Mendota Pool	4,600 to 3,211 ft^3/s	116.6 miles
San Luis Canal	O'Neill Forebay	Check 21, California Aqueduct	13,100 to 8,350 ft^3/s	101.3 miles
Folsom-South Canal	Nimbus Dam/Lake Natoma	Dry Creek	3,500 ft^3/s	26.7 miles
Tehama-Colusa Canal	Red Bluff Diversion Dam	Dunnigan, California	2,530 to 1,700 ft^3/s	111 miles
Corning Canal	Corning Canal Pumping Plant	Tehama County	500 to 88 ft^3/s	21 miles
Contra Costa Canal	Rock Slough	Martinez Reservoir	350 to 22 ft^3/s	47.7 miles
Pacheco Tunnel	San Luis Reservoir	Through Diablo Mountain Range to Bifurcation of Santa Clara and Hollister Conduits	480 ft^3/s	7 miles
Santa Clara Tunnel & Conduit	Pacheco Conduit	Coyote Pumping Plant	330 ft^3/s	22.1 miles
Hollister Conduit	Pacheco Conduit	San Justo Reservoir	83 ft^3/s	19.5 miles
Coalinga Canal	Pleasant Valley Pumping Plant at Mile 74.0 on the San Luis Canal	Coalinga Area	1,100 ft^3/s	11.6 miles

GLOSSARY

GLOSSARY

GLOSSARY

ACRE-FOOT -- The quantity of water (43,560 cubic feet or 325,900 gallons) that would cover 1 acre to a depth of 1 foot.

ANADROMOUS FISH -- Fish, such as salmon, that migrate up rivers from the sea to spawn in freshwater.

BALANCED WATER CONDITIONS -- Periods when it is agreed that releases from upstream reservoirs plus unregulated flow approximately equal the water supply needed to meet Sacramento Valley inbasin uses, plus exports.

CAPACITY -- The maximum power output or load for which a turbine-generator, station, or system is rated. Measured in kilowatts (kW) or megawatts (MW).

CAPITAL COST -- Costs associated with the development and construction of a hydropower facility, including land, structures, improvements, power generation and transmission equipment, engineering, administrative fees, legal fees, financing costs, and contingencies.

CARRIAGE WATER -- That amount of Delta outflow needed to meet all of the water quality requirements of D-1485 (see glossary term) minus that needed to meet the requirements, excluding those for Contra Costa Canal at Pumping Plant No. 1 (D5) and Clifton Court Forebay Intake at West Canal (C9). The quantity of additional Delta outflow (carriage water) is a function of Delta export pumping and South Delta inflow rates. Carriage water is necessary to reduce the effects of sea water intrusion into the Delta around the south side of Sherman Island (reverse flows up the San Joaquin River).

CARRYOVER STORAGE -- Total amount of water in CVP storage as of September 30 of each year (i.e., "carried over" from one water year to the next).

CENTRAL VALLEY PROJECT YIELD -- The annual amount of water made available by operation of the CVP over a specified period of time and subject to certain operating, hydrologic, and management assumptions.

CONJUNCTIVE USE -- Used to describe operation of a ground-water basin in coordination with a surface-water system.

CONSUMPTIVE USE -- The total amount of water taken up by vegetation for transpiration or building of plant tissue, the unavoidable evaporation of soil moisture, and intercepted precipitation associated with vegetative growth.

CONVEYANCE CAPACITY -- The volume of water that can be transported by a canal, aqueduct, or ditch; generally measured in cubic feet per second (ft^3/s).

CUBIC ACRE-FEET PER SECOND -- A measure of a moving volume of water; i.e., cubic feet per second (ft^3/s). Synonymous with "second-feet."

DECISION-893 (D-893) -- American River water rights decision on major applications to appropriate water from the American River system.

DECISION-1400 (D-1400) -- American River water rights decision regarding the operation of Auburn and Folsom Reservoirs and Lake Natoma.

DECISION-1485 (D-1485) -- The State Water Resources Control Board (SWRCB) decision specifying water-quality standards for the Sacramento-San Joaquin Delta (Delta) and Suisun Marsh.

DEFICIENCIES -- Reductions in deliveries of contracted firm water caused by critically dry hydrologic conditions. The amount of these reductions is expressed as the percent of the full water supply delivered annually.

DELTA OUTFLOW INDEX -- Calculated net Delta flow past Chipps Island.

DRAWDOWN -- Lowering the water level of a reservoir by releasing water at a greater rate than the inflow to the reservoir.

ENDANGERED SPECIES -- Generally taken to mean any species or subspecies whose survival is threatened with extinction and is included in the Federal list of endangered species (covered under the Endangered Species Act of 1973).

EXCEEDANCE LEVEL -- Expressed as a percentage, used to assist in quantifying the numerical range within which a predicted or estimated quantity may occur, it is the probability that a specified threshold value will be exceeded.

EXCESS WATER CONDITIONS -- When releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley inbasin uses plus exports.

FIRM YIELD -- That water supply available in all years from the operation of CVP facilities, except in dry and critically dry years when shortages occur. The amount of yield is based on the premise of: (1) ultimate conditions (traditionally equated to the year 2020 level of development), and (2) operations studies of the 1928-34 critically dry period to establish deficiency criteria. CVP operations studies use historical hydrology modified to show the level of depletions, accretions, and demands appropriate for the 2020 development level and reflect coordinated operations with the State of California as set forth in the Coordinated Operations Agreement of 1986 (COA). Based on assumptions used in the COA Environmental Impact Statement/Environmental Impact Report (EIS/EIR), the firm yield of the northern portion of the CVP was estimated at 8.3 million acre-feet (MAF), with 7.2 MAF committed under contracts existing in 1986.

HINDCASTING -- Process of validating the accuracy of forecast procedures by estimating past runoff quantities and comparing with observed or measured quantities.

INBASIN USES, SACRAMENTO VALLEY -- Legal uses of water in the Sacramento Basin, including the water required under the provisions of D-1485 (see glossary term).

INFLOW DESIGN FLOOD -- Inflow that the dam is designed to safely release to protect the dam structure.

INTERIM WATER -- Interim water is defined as the difference between firm yield and the level of firm yield demand in any year. Before 2020, demands for firm yield supplies are assumed to be below their contractual maximum; thus, interim water can be contracted until the firm yield demand has built up to its contractual maximum.

INTERMITTENT WATER -- Reclamation is proposing to use this term to denote a supply of water above firm yield which, when added to the supply, would constitute the total amount of water that could be contracted. This supply would be used in combination with ground water through a conjunctive use program to expand the total supply of water that Reclamation could contract for. The water could be contracted on an annual, short-term (longer than 1 year but less than 20 years) or long-term (20 to 40 years) basis. The amount of water that could be delivered under this type of contract would not be as dependable as firm yield, since the intermittent supply would depend on the type of water year (wet, normal, or dry) and the quantity of water delivered each year to firm yield contractors. The probability of delivering an intermittent supply would be calculated on the basis of past hydrology and the ability to meet firm yield demands based on the 1928-34 dry year period (e.g., 75 years out of 100, 80 years out of 100, 85 years out of 100, etc.).

PREFERENCE CUSTOMER -- Entities entitled to preference under Reclamation law, including several municipalities, utility and irrigation districts, military installations, and various Federal and State agencies.

PROJECT DEPENDABLE CAPACITY (PDC) -- The lowest electric capacity available to meet preference customer loads, which could be available with energy support from CVP powerplants in any given month during the most adverse period of streamflow conditions of record (after deducting the estimated capacity required from CVP powerplants for project load (see glossary term) during the water contractor's peak load period).

PROJECT LOAD -- Power that Reclamation's CVP powerplants are using at any particular time.

RAMPING FORMULA -- Increments at which release changes can be made for fishery or levee purposes.

REDDS -- Depression in river or lakebed dug by fish for the deposition of eggs.

REVERSE FLOW -- Flow going in the opposite direction of the natural riverflow, caused by pumping.

SHASTA CRITERIA -- Used to determine the year type for contracts and release schedules that reference the forecasted Shasta annual inflow.

STOPLOGS -- A plate or beam, typically made of timber, metal, or concrete and used to cover the opening of a structure and stop the flow of water.

WATER YEAR -- Starting October 1 and ending on September 30 each year.

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