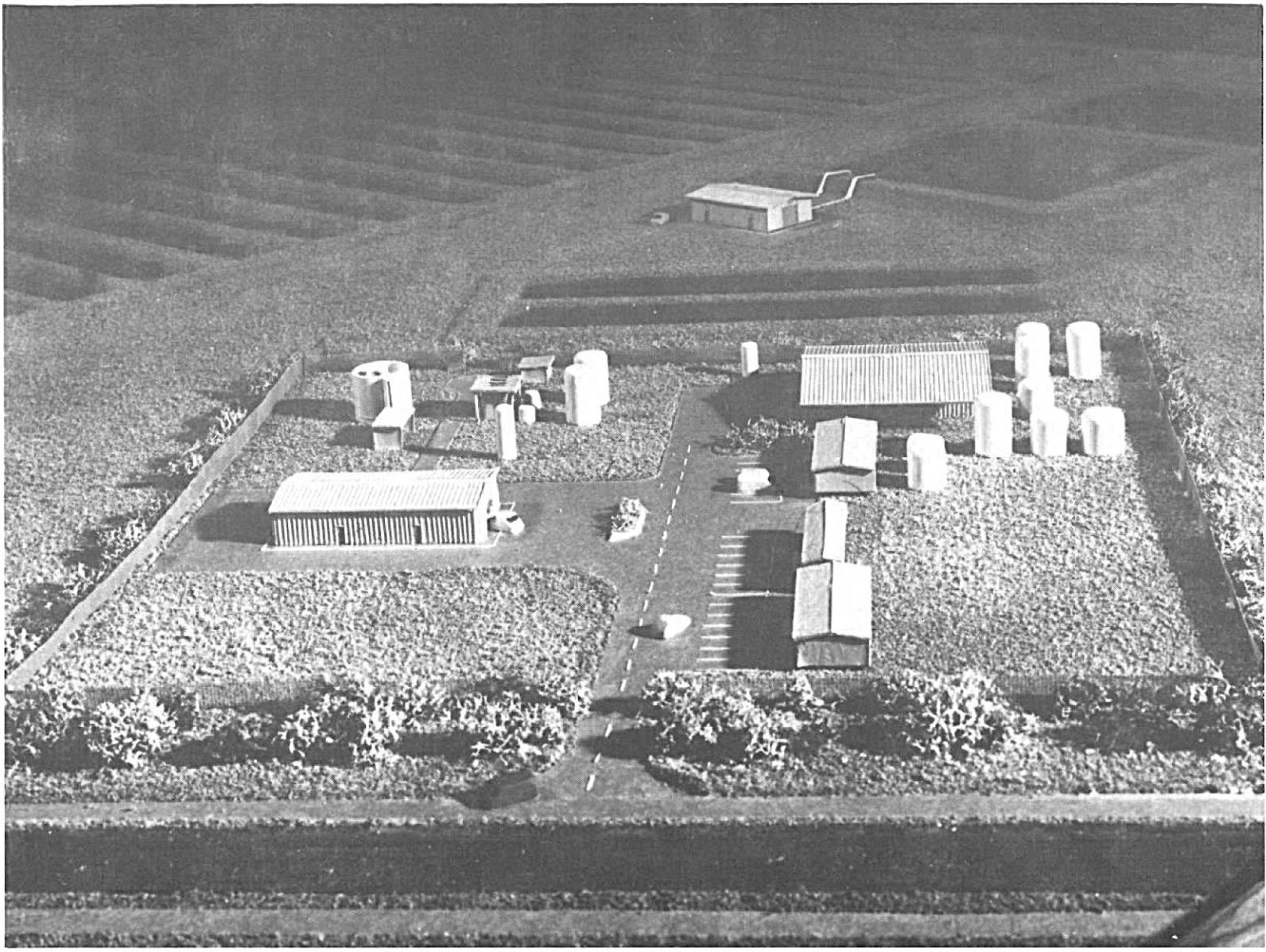

State of California
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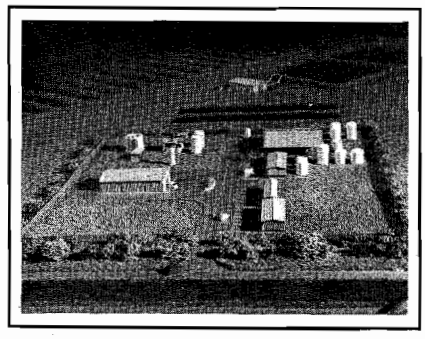
Department of
Water Resources

save water
DWR

The California State Water Project— Current Activities and Future Management Plans.

Bulletin 132-82

November 1982



ON THE COVER is a model of the Los Banos Demonstration Desalting Facility. This facility is the initial component in DWR's plans to reclaim drainage water to supplement State Water Project supplies.

Now under construction, the project will be tested for three years, starting in 1983, to demonstrate the feasibility of the project. Once the feasibility has been demonstrated, construction of other desalting facilities will follow.

Agricultural drainage water for the Los Banos facility is available from the San Luis Drain, which skirts the northeast boundary of the site (shown paralleling the bottom of the picture). The drain now receives drainage water from the San Luis Unit of the federal Central Valley Project and transports it to Kesterson Reservoir north of Los Banos.

Department of
Water Resources
Bulletin 132-82

The California State Water Project— Current Activities and Future Management Plans.

November 1982

Huey D. Johnson
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The Resources
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Edmund G. Brown Jr.
Governor
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California

Ronald B. Robie
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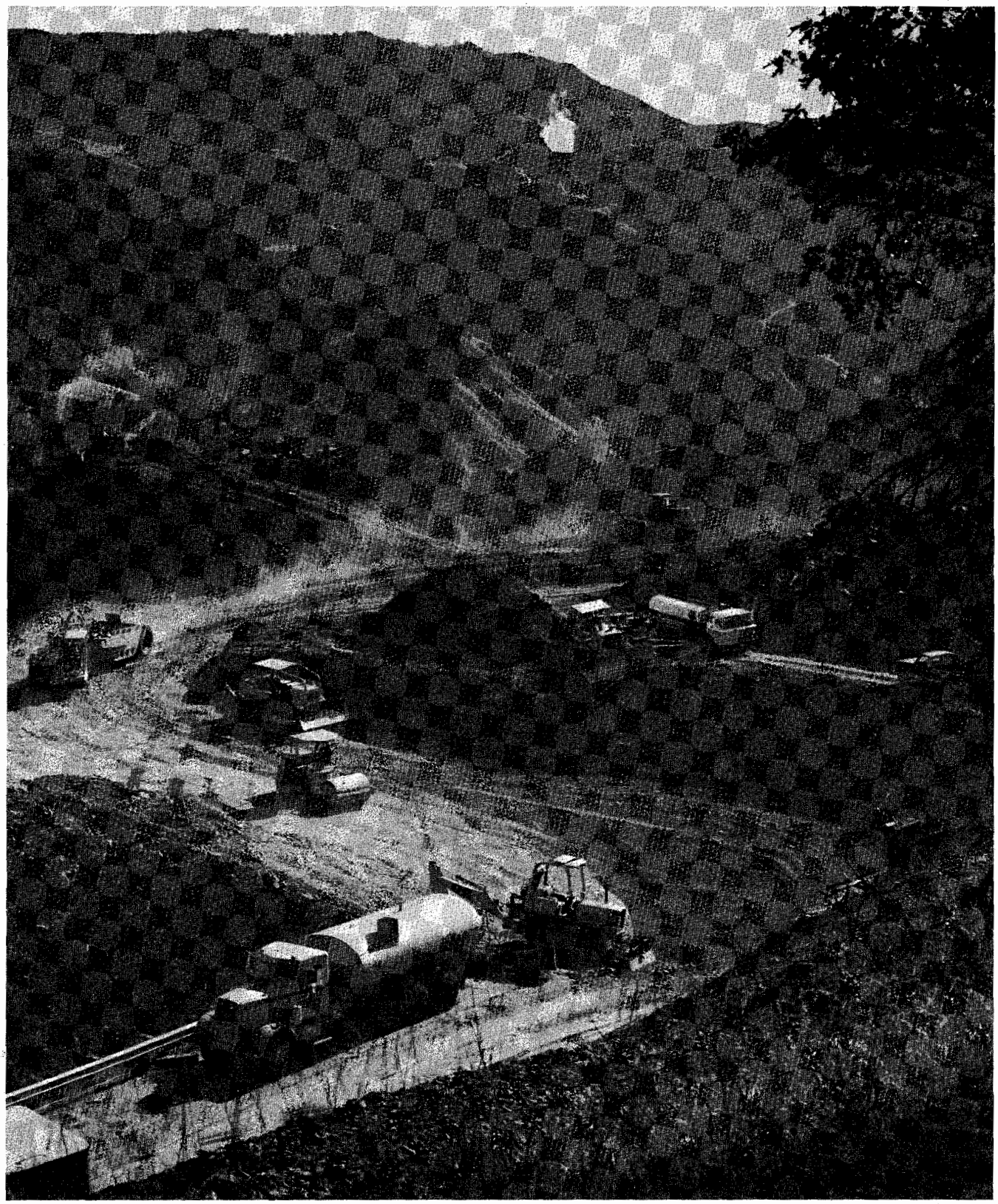
Department of
Water Resources



Construction of access road for South Geysers Powerplant. This will be the second geothermal plant to be constructed by the Department of Water Resources in "The Geysers Geothermal Resources Area" in Sonoma County. The 55-MW plant is scheduled for completion in July 1985.

FOREWORD

When the Burns-Porter Act was approved by the Legislature in 1959, and by the people in 1960, there began an era of construction. After years of planning, the State Water Project--the largest ever constructed by a state--began to take shape from one end of our State to the other. In the late 1960s, as available funds ran short, the Project was redirected, however construction remained on track so that first water was delivered to Kern County in 1971 and to the southern terminus, Perris Reservoir, in 1973. Thus ended the period of construction of the initial facilities of the Project.

In the mid 1970s the Department looked to means to obtain additional water supplies and to make more effective use of existing supplies to provide continuing service through the aqueduct system. During the last eight years, the Department has been diligently developing and successfully carrying out a comprehensive, long-range energy program that will serve the needs of the Project as it becomes the fifth largest electric utility in the State. The Project will now be energy self-sufficient.

In 1975 I said, "A program has been initiated to take a creative approach in considering all possible alternative sources of power for the Project. The program will range from jointly participating in thermal plants to state development of geothermal resources. Consideration will be given to solar and wind energy sources." We have kept that commitment.

The very advantageous contracts under which the State purchased cheap energy from public and private utilities end on March 31, 1983. That date is now but a few months away. The Department's efforts have resulted in major project-owned facilities as well as the development of facilities where the power is contracted for by the Department. Also, negotiations are now being completed with utilities in California, the Northwest and Southwest to provide sufficient resources through the 1980s. A well balanced resource mix in our energy program will assure reliability and flexibility.

Nineteen hundred and eighty-two was a disappointing year for the Project as the voters of California defeated Proposition 9, which would have carried out our long-range program for providing additional water supplies, including the Peripheral Canal, and Delta protection. Also, it is particularly regrettable that the constitutional protections for the Delta, San Francisco Bay, and north coastal rivers--which had been approved by the people only two years ago--are now gone. The decision to forego construction of the Peripheral Canal, the most effective cross-Delta facility ever proposed, will result in further adverse effects on the Delta fisheries and future water shortages. The Department of Water Resources is now reviewing its Delta operations in an effort to mitigate those adverse effects and to meet future water needs. Some State Water Project (SWP) contractors shortsightedly provided major financial assistance and moral support to the opponents of the program in an effort to eliminate the protections to Northern California. Most contractors wisely supported the program.

As a result of the election the Department has cut back on many of the activities in Proposition 9. The rejection of Proposition 9 underscores the need to obtain the cooperation of the largest Delta diverter--the Federal Central Valley Project. The Federal Government must now commit itself to meet State water rights and water quality requirements in the Delta. In Bulletin 132-75, I described the Department's new water management policy which has guided the Department in its operation since that time:

1. Water resources already developed shall be used to the maximum extent before new sources are developed.

2. All alternative sources of supply, including water exchanges, shall be considered. Conjunctive use of surface and ground water supplies and storage capacity, including planned temporary overdrafting of ground water, shall be utilized to maximize yield and improve water quality.

3. To maximize beneficial use, optimum application techniques and processes for water conservation shall be implemented and waste shall be avoided.

4. Water shall be reused to the maximum extent feasible.

5. Instream uses for recreation, fish and wildlife, and related purposes shall be balanced with other uses.

A key element of this policy is the stretching of existing water supplies. With the defeat of Proposition 9, we must rely more than ever on the implementation of comprehensive water conservation and management plans for the Project. These are now under preparation as required by Governor Edmund G. Brown Jr.'s Order B68-80 of July 1980. In addition to greater reduction of use (water conservation) we must plan on construction of a number of small projects, waste water reclamation, surface storage, ground water storage, and implementation of innovative new means of obtaining supplies such as Colorado River water banking and the Agricultural Purchase Plan (a water transfer proposal). Another possibility is the purchase of water supplies available from the Central Valley Project after area of origin requirements are met. With these efforts we may be able to eliminate shortages during many years. During 1982, the Department and the water contractors expect to complete action on important contract amendments which will help the Department proceed in the water supply directions I have described.

In addition to this activity however, the Department needs to reexamine, for the first time since before contracts were signed in the early 1960s, the ability of contractors to repay the cost of the SWP, given the water shortages which we expect (see Table 2). In addition, to assure the orderly progress of the Project, amendments should be approved by the Department and contractors to bring the yearly demands under the contracts into line with realistic projections of the future, reflecting achievable conservation goals. Estimates based on planning in 1960 are simply irrelevant to today's world.

The future of the State Water Project would also be more secure if major areas of California water law are revised. In 1978, the Governor's Commission to Review California Water Rights Law issued its final report. A major recommendation of the Commission was improvement in today's inadequate ground water law. Ground water storage continues to be one of the most viable and efficient means of providing additional storage capacity to the Project. Until legislation recommended by the Commission or something similar is provided in California, the use of ground water storage, particularly in the San Joaquin Valley, will be very difficult.

A number of significant other SWP actions occurred during 1981 and 1982. The Department:

- Delivered over 3.4 million dam^3 (2.8 million acre-feet) of water in 1981 to long-term SWP contractors from Plumas County in the north to the Los Angeles and Riverside areas in Southern California.

- Generated 3.4 million MWH and consumed 5.3 million MWH of electrical energy to operate the SWP in 1981.

- Broke ground for construction of Alamo Powerplant, a 17 megawatt hydroelectric powerplant located on the East Branch of the California Aqueduct.

- Broke ground at South Geysers Geothermal Powerplant.

- Established the DWR as an interconnected (Statewide electrical control area) utility.

- Dedicated the William E. Warne Hydroelectric Powerplant on the West Branch of the California Aqueduct. The plant will begin operation in 1982.

- Signed a comprehensive agreement with Pacific Gas and Electric (PGandE) Company to provide for electrical transmission service to Department powerplants and pumping plants, allow for energy purchases and provide access to the Northwest-Southwest backbone transmission line.

- Dedicated the wind turbine generator facility at the Bethany Wind Park.

- Began construction of the Los Banos demonstration desalting facility to reclaim brackish agricultural return water.

- Made significant progress with North Bay area contractors toward future construction of the North Bay Aqueduct - Phase II.

- Managed available water supplies to meet contractors water needs without the operational flexibility of San Luis Dam, a major storage reservoir for the SWP.

- Implemented a water exchange program to provide SWP contractors and Federal CVP contractors with additional water supplies to offset adverse effects on project operations due to the slide at San Luis Dam.

- Licensed seven small hydroelectric facilities on the SWP.

- Signed an energy exchange with Southern California Edison (SCE) to provide partial peak and off-peak energy, transmission service and energy transactions.

If it is true that adversity makes for memorable times, then 1981 and 1982 will be long remembered also because San Luis Reservoir was forced out of service following early detection of a progressive embankment slippage on the reservoir face of the dam. This had followed hard on the heels of an extended outage of the California Aqueduct for lining repair a few miles downstream from Harvey O. Banks Delta Pumping Plant. During this outage, most SWP deliveries were made from San Luis Reservoir and the reservoir was drawn down when the slippage was detected. The speed of response, and close coordination of activities in rectifying this problem by the Department, other agencies, consultants, and construction contractors set a high standard for multi-organizational cooperation during a crisis.

So far during 1982, $200 million in additional revenue bonds have been sold to finance SWP energy facilities. Investor confidence in these issues attests to the good financial health of the SWP. It is a soundly operated facility. As the Department becomes one of the State's largest electrical utilities next April, it is in a good position to assure the future of the Project and the people it serves, nearly two-thirds of those in California. Regrettably, there may be shortfalls in water deliveries due to the inability to implement Proposition 9, but as water in California was controversial in 1982--it has always been controversial.

Ronald B. Robie

Ronald B. Robie, Director
Department of Water Resources
The Resources Agency
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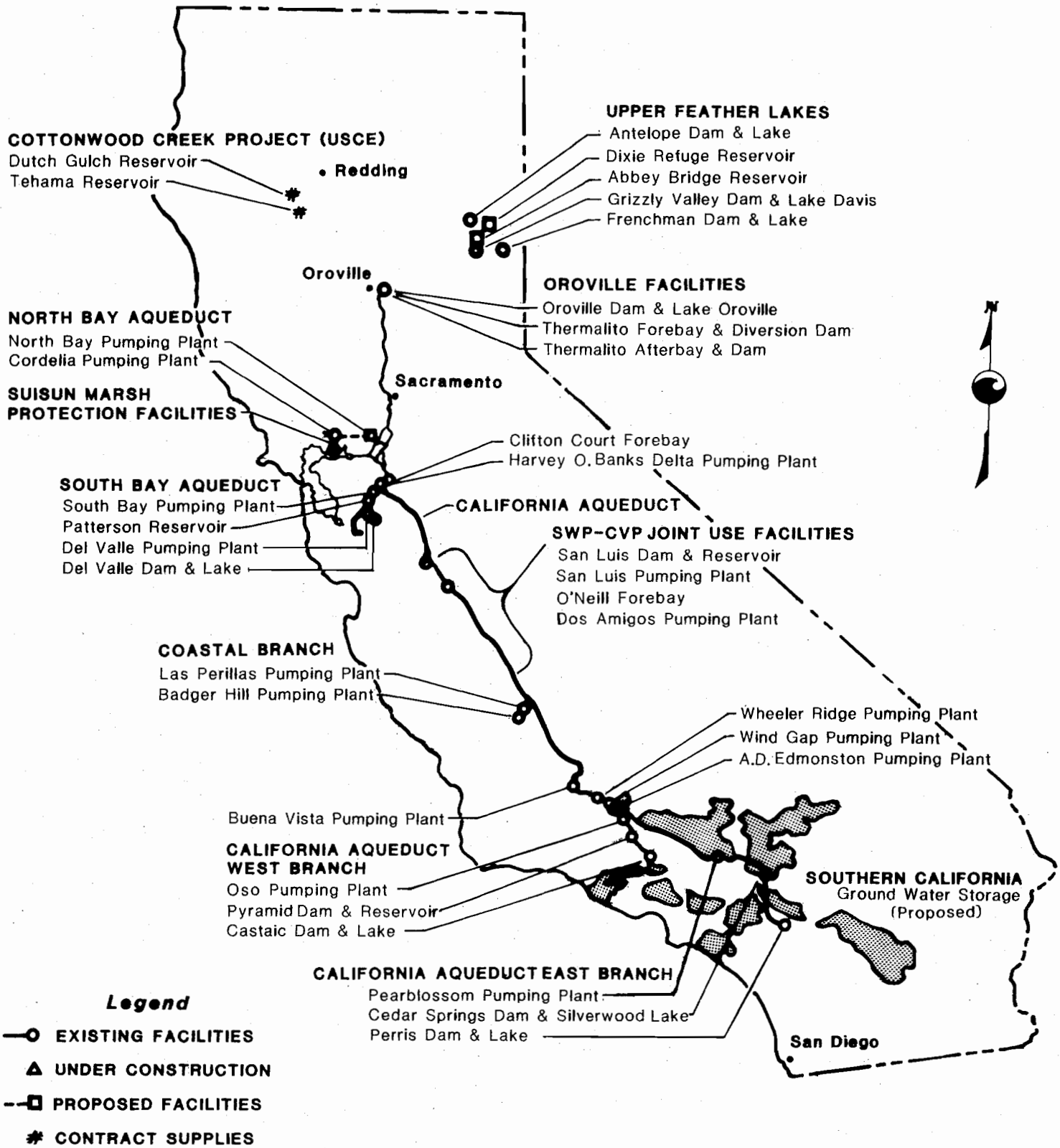
CALIFORNIA STATE WATER PROJECT

WATER FACILITIES



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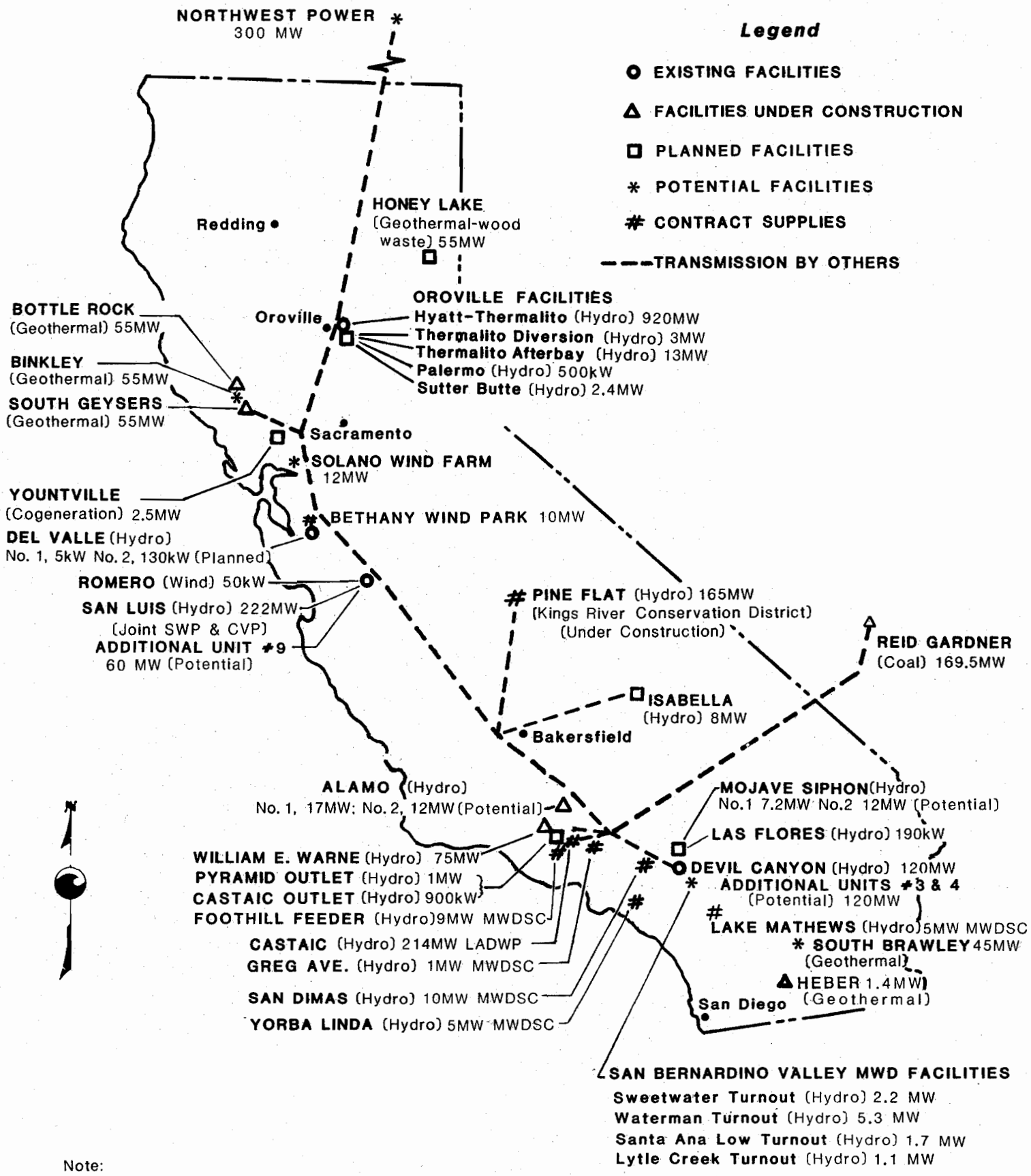

Note:

Power exchange and transmission service supplied by Pacific Gas and Electric, Southern California Edison and San Diego Gas and Electric Companies and the Los Angeles Department of Water and Power.

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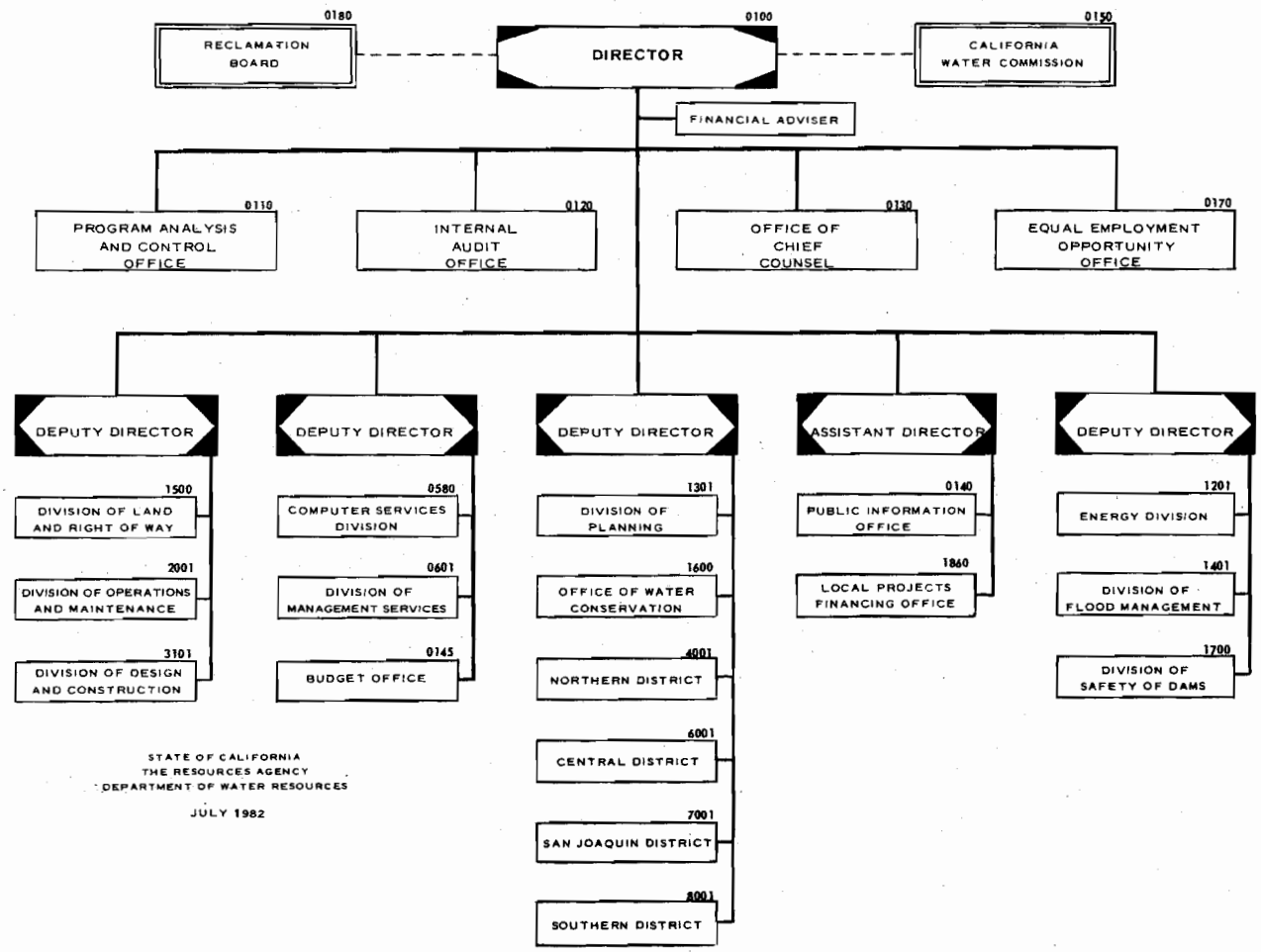

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	centimetres (cm) for snow depth	inches (in)	0.3937	2.54
	metres (m)	feet (ft)	3.2808	0.3048
	kilometres (km)	miles (mi)	0.62139	1.6093
Area	square millimetres (mm^2)	square inches (in^2)	0.00155	645.16
	square metres (m^2)	square feet (ft^2)	10.764	0.092903
	hectares (ha)	acres (ac)	2.4710	0.40469
	square kilometres (km^2)	square miles (mi^2)	0.3861	2.590
Volume	litres (L)	gallons (gal)	0.26417	3.7854
	megalitres	million gallons (10^6 gal)	0.26417	3.7854
	cubic metres (m^3)	cubic feet (ft^3)	35.315	0.028317
	cubic metres (m^3)	cubic yards (yd^3)	1.308	0.76455
	cubic dekametres (dam^3)	acre-feet (ac-ft)	0.8107	1.2335
Flow	cubic metres per second (m^3/s)	cubic feet per second (ft^3/s)	35.315	0.028317
	litres per minute (L/min)	gallons per minute (gal/min)	0.26417	3.7854
	litres per day (L/day)	gallons per day (gal/day)	0.26417	3.7854
	megalitres per day (ML/day)	million gallons per day (mgd)	0.26417	3.7854
	cubic dekametres per day (dam^3/day)	acre-feet per day (ac-ft/day)	0.8107	1.2335
Mass	kilograms (kg)	pounds (lb)	2.2046	0.45359
	megagrams (Mg)	tons (short, 2,000 lb)	1.1023	0.90718
Velocity	metres per second (m/s)	feet per second (ft/s)	3.2808	0.3048
Power	kilowatts (kW)	horsepower (hp)	1.3405	0.746
Pressure	kilopascals (kPa)	pounds per square inch (psi)	0.14505	6.8948
	kilopascals (kPa)	feet head of water	0.33456	2.989
Specific Capacity	litres per minute per metre drawdown	gallons per minute per foot drawdown	0.08052	12.419
Concentration	milligrams per litre (mg/L)	parts per million (ppm)	1.0	1.0
Electrical Conductivity	microsiemens per centimetre (uS/cm)	micromhos per centimetre	1.0	1.0
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)	(1.8 × °C)+32	(°F−32)/1.8

CHAPTER I

STATE WATER PROJECT MANAGEMENT PLANS THROUGH YEAR 2000

Introduction

In 1959, the California Legislature enacted the Water Resources Development Bond Act. This Act, popularly known as the Burns-Porter Act after its authors - Senator Hugh Burns of Fresno and Assemblyman Carley V. Porter of Compton, was approved by the California voters in 1960. Upon approval, commitments were made and contracts were signed for the eventual delivery of 5.2 million cubic dekametres (4.23 million acre-feet) annually of Project water to 31 contracting agencies.[1/]

The 1959 legislation authorized initial Project facilities including (1) a complete aqueduct system; (2) specific initial storage facilities; (3) additional, but unspecified, future storage facilities for local needs and to augment water supplies in the Delta as necessary; (4) facilities for removal of drainage water from the San Joaquin Valley; (5) facilities for generation and transmission of electrical energy and (6) provisions for water development facilities for local areas. In addition, the Act provided that additional facilities may be authorized by the legislature or the Department to augment water supplies in the Delta and to meet local needs.

Water deliveries from the State Water Project (SWP) began in 1962. Since that beginning, over 24.1 million cubic dekametres (dam^3) (19.5 million acre-feet) of water has been delivered through SWP facilities to areas in California stretching from Plumas County in the north to the Los Angeles Basin in the south; a distance between these delivery points of over 800 km (500 miles).

Bulletin 132-82 reports on the current status of the California State Water Project, the progress of planning studies for future water supply and energy producing facilities, SWP construction progress, SWP operations and management in 1981, the status of interagency agreements affecting the SWP, financial requirements, litigation and other areas of special interest.

Water Supply and Demand

Major aqueducts and initial reservoir facilities of the SWP have been constructed. These facilities store water to provide only about one-half of the maximum annual entitlement of 5.2 cubic dekametres (4.23 million acre-feet) of water under contracts between the Department and its 30 water contractors. In 1981, entitlement deliveries to contractors from SWP facilities totaled about 2.34 million cubic dekametres (1.91 million acre-feet).

The present dependable SWP water yield from existing facilities of the SWP is about 2.8 million cubic dekametres -- (2.3 million acre-feet) per year. This yield is expected to decrease to between 2.0 and 2.2 million dam^3 (1.6 and 1.8 million acre-feet) per year in the future, as (1) water use in areas of origin increases (resulting in less surface water runoff into the Sacramento River watershed), (2) Central Valley Project (CVP) contractual obligations increase and (3) use of water

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1/ Early in 1981, Hacienda Water District and Tulare Lake Basin Water Storage District executed a consolidation agreement, reducing the number of contractors from 31 to 30.

associated with other prior rights to Northern California water supplies materialize.

By year 2000, the need for SWP water is expected to grow to about 3.9 million dam^3 (3.2 million acre-feet) per year. This will occur even after substantial water conservation programs by SWP contractors have been implemented, and future waste water reclamation projects have been developed. It is readily apparent that by year 2000, without new surface and underground storage facilities, the potential water shortages in a dry period, similar to the historical dry period that California experienced between 1928 and 1934, could be as much as 1.7 to 1.9 million dam^3 (1.4 million acre-feet to 1.6 million acre-feet).

Figure 1 shows the relationship between SWP water demands and the firm water supplies developed by existing and planned SWP facilities through year 2000. The graph shows water supplies available during a period of subnormal rainfall, similar to the historical dry period of 1928 through 1934. The projected demand line in Figure 1 reflects new studies by the Department which considers updated information concerning population growth, water use and anticipated conservation and water reclamation in SWP service areas.[2/] The staging (year) of initial operation of each future facility that will increase SWP water supplies and the estimated range of SWP firm yields is also shown on Figure 1. The shaded area shows potential shortages in water supplies in future years under drought conditions.

Figure 2 shows relationships between SWP water demand and supply in dry, average, or wet water-year conditions projected for 1985, 1990, 1995, and year 2000. The figure illustrates that under wet-year (high rainfall and runoff) conditions the SWP will be able to meet project demands (adjusted for conservation and reclamation in SWP service areas) and will provide some surplus water until year 2000. However, in years of average rainfall, water supply from the SWP will be deficient; in dry years, water supplies will be critical.

Senate Bill 200 and Proposition 9 Effects

Termination of Programs

The major direction of the Department's planning for future water facilities and management of the SWP has been toward (1) development and implementation of water conservation and reclamation goals, as directed under the Governor's Executive Order B-68-80, (2) planning to provide sufficient surface and underground storage to offset potential water shortages, and (3) reversal of the decline of fishery resources in the Sacramento-San Joaquin Delta. All of these planning studies were underway on a number of the Projects authorized by Senate Bill 200 (SB 200), which was enacted by the Legislature and signed by the Governor on July 18, 1980. This was accomplished after more than 15 years of study, restudy, and debate. In 1980, however, a referendum qualified for the ballot and voters were asked under Proposition 9 to either approve or reject SB 200 at the general election in June 1982. Proposition 9 was rejected by a significant margin in that election. A Summary of the Vote on Proposition 9 by County is shown in Table 1.

To evaluate the Public's feelings on Proposition 9, and to obtain data that will be useful in future efforts to obtain approval of additional units needed in the State Water Project, the Department contracted The Field Institute to conduct a, random sample, voter survey

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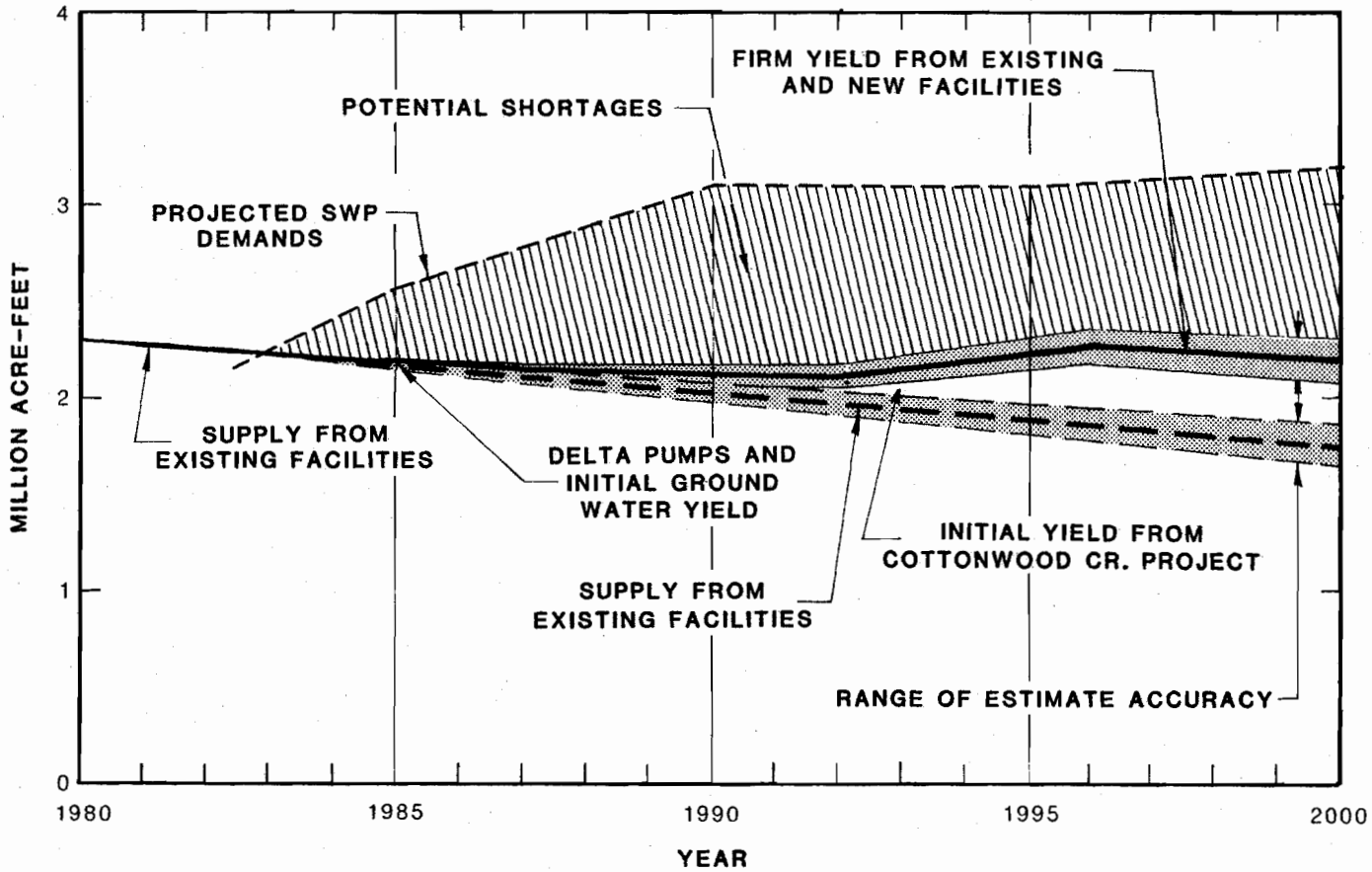
2/ The Department is working with water contractor representatives and others to develop overall plans for conservation and water reclamation in SWP service areas. (See Chapter II, "Water Conservation and Reclamation Program - Governor's Executive Order B-68-80"). These results will be published by the Department and reflected in future reports when the plans are finalized.

Figure 1. SWP WATER SUPPLY AND STAGING OF FUTURE FACILITIES



ANNUAL YIELD AND SCHEDULES FOR NEW FACILITIES

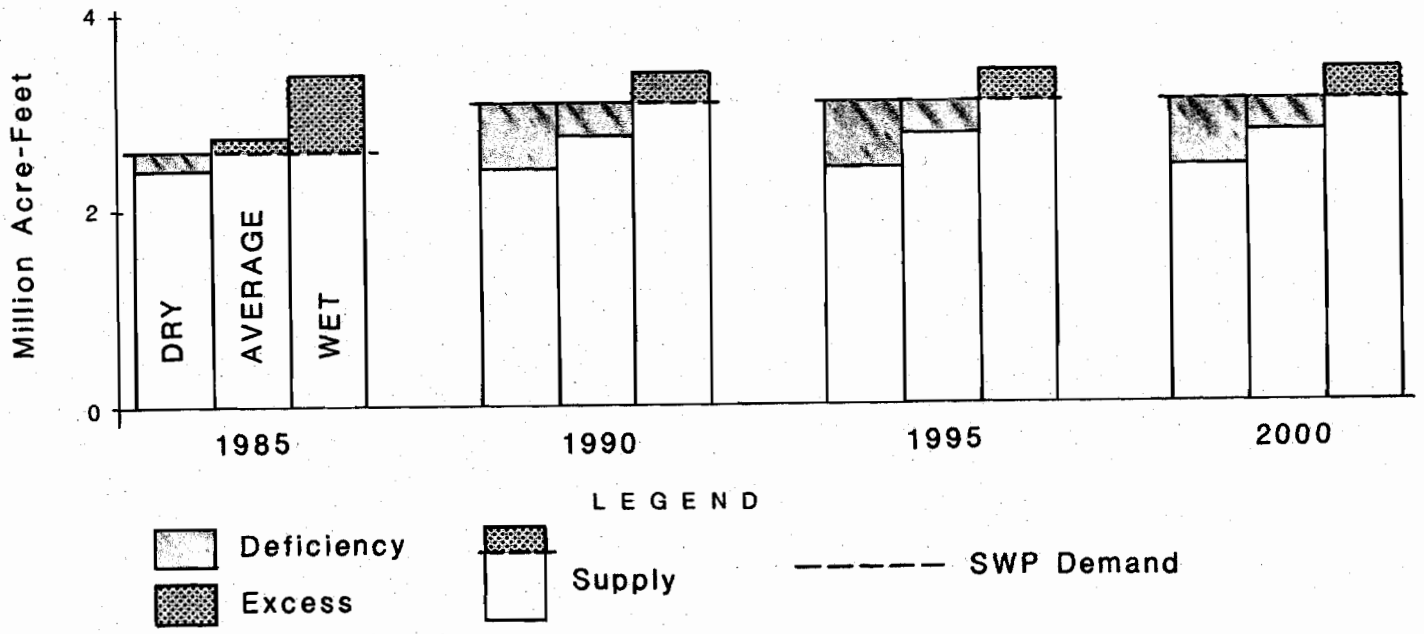
	Full Yield a/ Amount 1000 AF/YR	Begin Operation	Initial Year Yield Available (Partial)	Initial Year of Full Yield
DELTA PUMPS b/	60	1985	1985	1985
GROUND WATER STORAGE	200	1985	1985	1997
EAST BRANCH ENLARGEMENT	—	1990	—	—
COTTONWOOD CREEK PROJECT c/ (Corps of Engineers)	175	1992	1993	1996

a/ Yield estimate without Peripheral Canal.

b/ Four additional units to bring Delta Pumping Plant up to full design capacity.

c/ Assumes project will be constructed by the Corps of Engineers and will provide water supplies (yield) for the SWP.

SWP ENTITLEMENT DEMAND[a] vs SUPPLY



a) Projected entitlement demands based on applying conservation and reclamation goals in the State Water Project service areas.

Figure 2

at precincts throughout the State. Their findings included the following information:

- Proposition 9 was rejected by the voters by greater than a three to two margin (62 percent to 38 percent).

- In Northern California, Proposition 9 was rejected overwhelmingly. The margin of defeat within the San Francisco Bay area was a remarkable 94 percent to 6 percent. The proportion of voters against Proposition 9 in other parts of the North was 89 percent to 11.

- Voters in Southern California turned out in support of the initiative, but not to the extent needed to offset the anti-canal sentiment in the North. Within the ten county Southern California region, 61 percent voted Yes, while 39 percent voted No.

In their analysis of the vote on Proposition 9, The Field Institute obtained the following reasons for the voters viewpoint:

- Among No voters, a majority statewide (58 percent) said they voted that way because of the cost associated with the proposal.

TABLE 1: PROPOSITION 9 ELECTION RESULTS

Statewide Summary by County

	YES	NO
Alameda County	13,934 4.9%	272,192 95.1%
Alpine County	47 11.4%	365 88.6%
Amador County	465 5.2%	8,519 94.8%
Butte County	2,625 5.5%	44,991 94.5%
Calaveras County	429 5.4%	7,483 94.6%
Colusa County	170 4.0%	4,090 96.0%
Contra Costa County	8,612 4.3%	192,641 95.7%
Del Norte County	289 5.5%	4,950 94.5%
El Dorado County	2,075 7.8%	24,409 92.2%
Fresno County	20,824 20.5%	80,653 79.5%
Glenn County	361 5.2%	6,641 94.8%
Humboldt County	1,672 4.5%	35,493 95.5%
Imperial County	8,442 54.6%	7,012 45.4%
Inyo County	1,756 28.9%	4,317 71.1%
Kern County	50,287 59.8%	33,785 40.2%
Kings County	3,028 23.6%	9,805 76.4%
Lake County	895 6.5%	12,963 93.5%
Lassen County	485 7.4%	6,069 92.6%
Los Angeles County	909,144 61.0%	582,010 39.0%
Madera County	2,591 19.3%	10,864 80.7%
Marin County	2,470 3.0%	80,092 97.0%
Mariposa County	543 11.6%	4,141 88.4%
Mendocino County	918 4.0%	22,290 96.0%
Merced County	3,556 14.8%	20,523 85.2%
Modoc County	212 6.1%	3,254 93.9%
Mono County	542 19.0%	2,306 81.0%
Monterey County	5,375 9.5%	51,285 90.5%
Napa County	1,476 4.4%	32,425 95.6%
Nevada County	1,633 7.6%	19,859 92.4%
Orange County	279,859 62.0%	171,220 38.0%
Placer County	3,192 8.4%	34,759 91.6%
Plumas County	408 6.4%	5,960 93.6%
Riverside County	91,665 59.8%	61,672 40.2%
Sacramento County	21,408 9.2%	210,140 90.8%
San Benito County	712 11.0%	5,732 89.0%
San Bernardino County	91,975 54.0%	78,226 46.0%
San Diego County	315,504 73.4%	114,267 26.6%
San Francisco City & County	7,986 4.9%	153,860 95.1%
San Joaquin County	4,075 4.8%	81,030 95.2%
San Luis Obispo County	11,545 25.1%	34,422 74.9%
San Mateo County	11,065 6.7%	154,266 93.3%
Santa Barbara County	31,631 43.1%	41,813 56.9%
Santa Clara County	29,885 10.6%	252,615 89.4%
Santa Cruz County	4,014 6.6%	56,689 93.4%
Shasta County	3,951 10.5%	33,667 89.5%
Sierra County	146 8.0%	1,673 92.0%
Siskiyou County	714 5.5%	12,328 94.5%
Solano County	2,681 5.0%	51,398 95.0%
Sonoma County	4,419 4.9%	86,129 95.1%
Stanislaus County	4,604 8.6%	49,012 91.4%
Sutter County	767 6.2%	11,553 93.8%
Tehama County	827 6.3%	12,372 93.7%
Trinity County	278 5.5%	4,813 94.5%
Tulare County	11,219 25.7%	32,441 74.3%
Tuolumne County	910 7.1%	11,872 92.9%
Ventura County	65,544 55.5%	52,485 44.5%
Yolo County	2,515 7.0%	33,174 93.0%
Yuba County	687 6.8%	9,468 93.2%
STATE TOTALS	2,049,042 37.3%	3,444,483 62.7%

- Four in ten No voters (40 percent) felt that it would hurt the environment.

- Twenty-eight percent of No voters gave the related reason that it would hurt the Delta and the San Francisco Bay.

In a comparison of voters response to Proposition 9 between Northern and Southern California, The Field analysis determined:

- Northern Californians gave a wide range of reasons for their opposition to the initiative; 53 percent believed the cost would be too great; 49 percent said they voted No because they felt it would hurt the environment (fish, the land, wildlife); 36 percent felt that the measure was unfair to the North and that it would hurt the Delta and the San Francisco Bay.

- In Southern California, two out of three voters (67 percent) felt that the cost would be too great; 27 percent believed that the initiative was designed to benefit only a few farmers and landowners.

- The main reason among both Northern and Southern California voters who voted Yes on Proposition 9 was the future need of Southern California for water. A related reason was the understanding that Southern California would be getting less water from the Colorado River in future years increasing their reliance on the SWP for their water supply.

- Additional reasons for voting Yes included the understanding that a redistribution of water supply throughout the state is needed, that farmers and agriculture need the water; and that SB 200 is the best alternative for future water development and from an environmental standpoint.

Field noted that despite the current popularity of initiatives and referenda, the public is reluctant to decide complex issues requiring specialized knowledge. Proposition 9 was such an issue.

As the result of rejection of Proposition 9, the Department will terminate planning of the following facilities that were authorized for construction under SB 200.

a. Peripheral Canal: Studies specifically directed to the canal itself will be terminated by December 1982. Results of these studies will be documented to make them useful for possible future planning efforts. Studies directed towards Delta and San Francisco Bay impacts will continue and will provide information for:

   - the rehearing of Water Rights Decision 1485;

   - the 2-Agency Fish Agreement;

   - the status-quo impact studies.

b. Los Vaqueros Reservoir: Studies will be completed by December 1982 and preserved for future investigations.

c. Thomes-Newville Reservoir: Studies will be completed by December 1982 and preserved for future investigations.

d. Relocation of Contra Costa Canal Intake: Studies and negotiations will be terminated.

e. South Delta Water Quality Improvements: Studies will be terminated.

Planning and Implementation Programs

SWP programs that will proceed include: (a) the North Bay Aqueduct, which is in the final stages of preliminary design;

(b) the planning for management of water supplies through Colorado River water-banking and ground water storage programs; (c) continuation of studies and negotiations for the potential enlargement of the East Branch of the California Aqueduct; (d) power development activities; (e) Suisun Marsh activities, which are mandated in our water rights permits and similarly mandated environmental and fisheries studies in the Delta estuary and San Francisco Bay; (f) participation in investigations and review of the Cottonwood Creek Project reports by the U. S. Corps of Engineers; and (g) the study with the Bureau of Reclamation to evaluate enlargement of Shasta Reservoir.

A number of other potential studies and actions will be reviewed by the Department to determine the degree of effort that should be applied to each. They include such issues as:

a. The impact of island failures on the Delta. (USCE Study)
b. Project financing: Effect of legislation actions on the budget.
c. Water Supply Contracts: which, if any, provisions of the contracts should be amended.

Post Proposition 9 Water Supply Forecast

After defeat of Proposition 9, the Department initiated studies to re-examine the capability of the State Water Project to meet contractors water requests to the year 2000. This re-examination has revealed that without the additional Project facilities the additional Project facilities outlined in SB 200 the SWP in a "dry" water year will not provide sufficient water supplies to meet contractors' requests beginning in 1983.

Table 2 shows the first year that Project entitlement water demands will exceed Project water supplies for several water supply and demand scenarios.

Of primary importance are near-term forecasts of deficiencies in Project water deliveries in the absence of SB 200 water conservation features. To illustrate the extent to which deliveries will fall below water contractors' entitlement requests and projected entitlement demands, the Department has developed the information shown in Tables 3 through 6. The tables indicate the actual amounts the SWP is capable of delivering in dry, average and wet years

TABLE 2: FIRST YEAR PROJECT WATER DEMANDS EXCEED SUPPLIES

WATER SUPPLY[a]		WATER DEMAND		
		TABLE A	CONTRACTOR REQUESTS	ADJUSTED REQUESTS[b]
Present Min. Project Yield	(2.3 MAF)	1981	1983	1984
"Dry" Year	(2.4 MAF)	1982	1983	1985
"Average" Year	(2.75 MAF)	1983	1988	1988
"Wet" Year	(3.4 MAF)	1987	1992	2005

a) Water supply amounts exclude operational water losses.
b) Contractor requests adjusted downward based on water conservation and reclamation goals in Project service areas.

for 1985, 1990, 1995, and 2000 utilizing existing SWP facilities, the only facilities which can be counted on in view of defeat of Proposition 9 and rejection of SB 200.

The allocations shown in the tables assume a repetitive sequence of similar water-years occurs; i.e., a series of "dry" years or, alternatively, "average" or "wet" years. Actual year-to-year differences in rainfall amounts will, of course, affect Project delivery capabilities. However, the tables give an approximation of SWP deliveries if a series of years of similar rainfall occurs.

The tables are based on water conservation and reclamation goals identified in the Department's Bulletin 76 "Delta Water Facilities" July 1978. The Department together with water contractors are modifying and refining these goals. The results of these studies will be reported when the management plans pursuant to Governor Brown's Executive Order B68-80 are completed.

Basic Assumptions

Tables 3 through 6 are based on the assumption that, through the year 2000, there would be no additional SWP project conservation facilities other than ground water basin management in Southern California, available to provide SWP water supplies. It also assumes that the East Branch enlargement will be operational in the year 1990 -- a requirement in order for the ground water program to be physically feasible.

The result of these assumptions is that the minimum Project yield, adjusted for the area of origin depletions, is very limited in the near-term.

1983 thru 1985 -- 2.8 million dam^3 (2.3 million acre-feet)

1986 thru 1990 -- 2.6 million dam^3 (2.1 million acre-feet)

1991 thru 2000 -- 2.4 million dam^3 (1.9 million acre-feet)

Range of Project Annual Water Supplies

Project water supplies in excess of minimum Project yield in any particular year are dependent on the area-of-origin water conditions prevailing in that same year. Net Project water supplies[3/] available for delivery including ground water basin fill and replenishment in "dry", "average", and "wet" water-years are estimated to be:

"dry" years -- 3.0 million dam^3 (2.4 million acre-feet)

"average" years -- 3.4 million dam^3 (2.75 million acre-feet)

"wet" years -- 4.1 million dam^3 (3.4 million acre-feet)

Ground Water Basin Management

A net ground water basin initial fill of[4/] 2.1 million dam^3 (1.7 MAF) over a period of years is contemplated. The basins are in Southern California south of the San Gabriel and San Bernardino Mountains with percolation grounds served via contractors' distribution works from the East Branch below Devil Canyon. After initial fill is accomplished, the long-term ground water withdrawals and ground water recharge will add 185 000 to 247 000 dam^3 (150,000 to 200,000 acre-feet) to the minimum Project yield.

Water Conservation and Reclamation Goals[5/]

In allocating available Project water supplies, contractors' requests for

3/ Net Project water supply is gross Project water supply less 150,000 acre-feet per year operational losses.

4/ Net ground water basin initial fill is excess of recharge over withdrawals.

5/ See Bulletin 76, July, 1978.

TABLE 3: ESTIMATED DELIVERY CAPABILITY YEAR 1985

(in acre-feet)[a]

AGENCY NAME[b]	TABLE A ENTITLEMENT	CONTRACTOR ENTITLEMENT REQUEST[c]	CONTRACTOR SURPLUS REQUEST	PROJECTED ENTITLEMENT DEMAND[d]	REDUCED ENTITLEMENT BASED ON REDUCED MINIMUM PROJECT YIELD[e]	DELIVERY CAPABILITY[f] [g] CLASSIFICATION OF WATER YEAR[h] DRY	AVERAGE	WET
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feather River Area								
City of Yuba City	1,700	1,500	-	1,700	924	1,465	1,500	1,500
County of Butte	1,200	1,200	-	1,200	652	1,034	1,200	1,200
Plumas County FC&WCD	860	860	-	860	468	741	860	860
Subtotal	3,760	3,560	-	3,760	2,044	3,240	3,560	3,560
North Bay Area								
Napa County FC&WCD	18,750	4,570	-	7,400	10,195	4,570	4,570	4,570
Solano County FC&WCD	14,000	14,000	-	7,950	7,612	7,950	7,950	7,950
Subtotal	32,750	18,570	-	15,350	17,807	12,520	12,520	12,520
South Bay Area								
Alameda County FC&WCD, Zone 7	27,000	27,000	-	25,100	14,681	23,264	25,100	25,100
Alameda County Water District	30,800	30,800	11,200	30,200	16,747	26,539	30,200	30,200
Santa Clara Valley Water District	88,000	88,000	19,000	81,500	47,849	75,826	81,500	81,500
Subtotal	145,800	145,800	30,200	136,800	79,277	125,629	136,800	136,800
San Joaquin Valley Area								
Devil's Den WD	12,700	12,700	7,300	12,700	6,905	10,943	14,801	20,000
Dudley Ridge WD	47,200	47,200	41,700	47,200	25,664	40,620	55,011	88,900
Empire West Side ID	3,000	3,000	3,000	3,000	1,631	2,585	3,496	6,000
Kern County WA - AG	821,100	835,450	454,458	835,450	446,461	729,117	985,959	1,289,908
- M&I	93,900	79,550	-	75,050	51,057	68,304	75,050	75,050
County of Kings	3,400	3,400	-	3,400	1,849	2,930	3,400	3,400
Oak Flat WD	4,900	4,900	3,600	4,900	2,664	4,223	8,500	8,500
Tulare Lake Basin WSD	92,900	92,900	153,339	92,900	50,513	80,046	108,274	246,239
Subtotal	1,079,100	1,079,100	663,397	1,074,600	586,744	929,821	1,254,491	1,737,997
Southern California Area								
Antelope Valley-East Kern WA	100,400	53,815	-	84,400	54,591	53,815	53,815	53,815
Castaic Lake WA	29,100	13,000	-	12,300	15,823	12,300	12,300	12,300
Coachella Valley Water District	16,989	16,989	-	16,489	9,238	14,639	16,489	16,489
Crestline-Lake Arrowhead WA	4,350	2,805	-	4,150	2,365	2,805	2,805	2,805
Desert Water Agency	27,000	27,000	-	26,100	14,681	23,264	26,100	26,100
Littlerock Creek ID	1,730	1,730	240	1,730	941	1,491	1,970	1,970
Mojave Water Agency	39,000	-	-	37,150	21,206	-	-	-
Palmdale WD	14,180	4,750	-	4,800	7,710	4,750	4,750	4,750
San Bernardino Valley Municipal WD	81,500	81,500	-	78,900	44,314	70,226	78,900	78,900
San Gabriel Valley Municipal WD	21,800	18,500	-	20,300	11,853	18,500	18,500	18,500
San Gorgonio Pass WA	11,800	-	-	11,100	6,416	-	-	-
The Metropolitan Water District of Southern California	1,558,700	1,232,711	-	1,027,000	847,520	1,027,000	1,027,000	1,027,000
Ventura County Flood Control District	6,000	-	-	4,950	3,262	-	-	-
Subtotal	1,912,549	1,452,800	240	1,329,369	1,039,920	1,228,790	1,242,629	1,242,629
GROUND WATER FILL[i]	-	-	-	-	-	100,000	100,000	100,000
UNALLOCATED	-	-	-	-	-	-	-	166,494
TOTAL	3,173,959	2,699,830	693,837	2,559,879	1,725,792	2,400,000	2,750,000	3,400,000

a) To convert water volumes to cubic dekametres, multiply acre-feet by 1.2335.
b) Central Coastal Area contractors not shown because date for extension of Coastal Branch is indefinite.
c) Unadjusted contractor entitlement requests; i.e., not adjusted for conservation and reclamation goals.
d) Projected Entitlement Demands are based on applying conservation and reclamation goals in Project Service Areas (see Bulletin No. 76). The goals attainable by contractors are being evaluated as part of the Water Management Planning program with completion scheduled for June, 1984.
e) Reduced Annual Entitlements are Table A Annual Entitlements multiplied by the ratio of 1985 Minimum Project Yield (2.3 MAF) to Ultimate Minimum Project Yield(4.23 MAF).
f) Where applicable, conservation and reclamation goals have been reflected in allocating Municipal and Industrial water (see Footnote d).
g) Shaded delivery capabilities are less than the smaller of Contractor Entitlement Request or Projected Entitlement Demand.
h) Dry Year deliveries based on recurring sequence of water year 1959 (8th dryest year in 50-year record); Average Year deliveries on water year 1925; Wet Year deliveries on water year 1941 (8th wettest year in 50-year record).
i) Ground water basin management for additional Minimum Project Yield assumed in Southern California, only.

TABLE 4: ESTIMATED DELIVERY CAPABILITY YEAR 1990

(in acre-feet)[a]

AGENCY NAME[b]	TABLE A ENTITLEMENT	CONTRACTOR ENTITLEMENT REQUEST[c]	CONTRACTOR SURPLUS REQUEST	PROJECTED ENTITLEMENT DEMAND[d]	REDUCED ENTITLEMENT BASED ON REDUCED MINIMUM PROJECT YIELD[e]	DELIVERY CAPABILITY[f] [g] CLASSIFICATION OF WATER YEAR[h] DRY	AVERAGE	WET
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feather River Area								
City of Yuba City	3,800	3,800	-	3,800	1,887	2,123	2,773	3,800
County of Butte	1,200	1,200	-	1,200	596	669	876	1,200
Plumas County FC&WCD	1,040	1,040	-	1,040	516	580	759	1,040
Subtotal	6,040	6,040	-	6,040	2,999	3,372	4,408	6,040
North Bay Area								
Napa County FC&WCD	25,000	5,600	-	8,250	12,411	5,600	5,600	5,600
Solano County FC&WCD	42,000	42,000	-	21,900	20,851	21,900	21,900	21,900
Subtotal	67,000	47,600	-	30,150	33,262	27,500	27,500	27,500
South Bay Area								
Alameda County FC&WCD, Zone 7	32,000	32,000	-	25,600	15,887	17,879	23,363	25,600
Alameda County Water District	36,900	36,900	5,100	35,700	18,319	20,617	26,940	35,700
Santa Clara Valley Water District	92,000	92,000	15,000	79,000	45,674	51,403	67,168	79,000
Subtotal	160,900	160,900	20,100	140,300	79,880	89,899	117,471	140,300
San Joaquin Valley Area								
Devil's Den WD	12,700	12,700	7,300	12,700	6,305	7,095	9,272	15,070
Dudley Ridge WD	57,700	57,700	27,300	57,700	28,645	32,241	42,126	67,694
Empire West Side ID	3,000	3,000	3,000	3,000	1,489	1,677	2,191	3,560
Kern County WA - AG	1,033,800	1,039,000	319,400	1,039,000	513,234	580,513	758,541	1,237,899
- M&I	119,600	114,400	-	97,700	59,376	63,924	83,542	97,700
County of Kings	4,000	4,000	-	4,000	1,986	2,236	2,920	4,000
Oak Flat WD	5,700	5,700	3,300	5,700	2,830	3,185	4,161	9,000
Tulare Lake Basin WSD	118,500	118,500	106,500	118,500	58,830	66,209	86,515	138,237
Subtotal	1,355,000	1,355,000	466,800	1,338,300	672,695	757,079	989,268	1,573,160
Southern California Area								
Antelope Valley-East Kern WA	132,100	73,000	-	89,300	65,582	73,000	73,000	73,000
Castaic Lake WA	39,300	16,000	-	14,700	19,511	14,700	14,700	14,700
Coachella Valley Water District	23,100	23,100	-	20,500	11,468	12,906	16,864	20,500
Crestline-Lake Arrowhead WA	5,800	4,000	-	5,400	2,879	3,240	4,000	4,000
Desert Water Agency	38,100	38,100	-	36,300	18,915	21,287	27,816	36,300
Littlerock Creek ID	2,300	2,300	270	2,200	1,142	1,284	1,679	2,200
Mojave Water Agency	50,800	50,800	-	47,300	25,220	28,384	37,089	47,300
Palmdale WD	17,300	8,000	-	9,600	8,589	8,000	8,000	8,000
San Bernardino Valley Municipal WD	101,500	101,500	-	92,900	50,390	56,711	74,105	92,900
San Gabriel Valley Municipal WD	28,800	18,500	-	26,400	14,298	16,091	18,500	18,500
San Gorgonio Pass WA	17,300	11,800	-	15,900	8,589	9,666	11,800	11,800
The Metropolitan Water District of Southern California	2,011,500	1,358,800	-	1,170,800	998,617	1,123,881	1,170,800	1,170,800
Ventura County Flood Control District	20,000	3,000	-	17,900	9,929	3,000	3,000	3,000
Subtotal	2,487,900	1,708,900	270	1,549,200	1,235,129	1,372,150	1,461,353	1,503,000
GROUND WATER FILL[i]	-	-	-	-	-	150,000	150,000	150,000
TOTAL	4,076,840	3,278,440	487,170	3,063,990	2,023,965	2,400,000	2,750,000	3,400,000

a) To convert water volumes to cubic dekametres, multiply acre-feet by 1.2335.
b) Central Coastal Area contractors not shown because date for extension of Coastal Branch is indefinite.
c) Unadjusted contractor entitlement requests; i.e., not adjusted for conservation and reclamation goals.
d) Projected Entitlement Demands are based on applying conservation and reclamation goals in Project Service Areas (see Bulletin No. 76). The goals attainable by contractors are being evaluated as part of the Water Management Planning program with completion scheduled for June, 1984.
e) Reduced Annual Entitlements are Table A Annual Entitlements multiplied by ratio of 1990 Minimum Project Yield (2.1 MAF) to Ultimate Minimum Project Yield (4.23 MAF).
f) Where applicable, conservation and reclamation goals have been reflected in allocating Municipal and Industrial water (see Footnote d).
g) Shaded delivery capabilities are less than the smaller of Contractor Entitlement Request or Projected Entitlement Demand.
h) Dry Year deliveries based on recurring sequence of water year 1959 (8th dryest year in 50-year record); Average Year deliveries on water year 1925; Wet Year deliveries on water year 1941 (6th wettest year in 50-year record).
i) Ground water basin management for additional Minimum Project Yield assumed in Southern California, only.

TABLE 5: ESTIMATED DELIVERY CAPABILITY YEAR 1995

(in acre-feet) [a]

AGENCY NAME [b]	TABLE A ENTITLEMENT	CONTRACTOR ENTITLEMENT REQUEST [c]	CONTRACTOR SURPLUS REQUEST	PROJECTED ENTITLEMENT DEMAND [d]	REDUCED ENTITLEMENT BASED ON REDUCED MINIMUM PROJECT YIELD [e]	DELIVERY CAPABILITY [f] [g] CLASSIFICATION OF WATER YEAR [h] DRY	AVERAGE	WET
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feather River Area								
City of Yuba City	9,600	5,800	-	8,400	4,312	5,128	5,800	5,800
County of Butte	27,500	27,500	-	25,400	12,352	14,691	18,780	25,400
Plumas County FC&WCD	1,250	1,250	-	1,100	561	668	854	1,100
Subtotal	38,350	34,550	-	34,900	17,225	20,487	25,434	32,300
North Bay Area								
Napa County FC&WCD	25,000	9,900	-	9,400	11,229	9,400	9,400	9,400
Solano County FC&WCD	42,000	42,000	-	19,900	18,865	19,900	19,900	19,900
Subtotal	67,000	51,900	-	29,300	30,094	29,300	29,300	29,300
South Bay Area								
Alameda County FC&WCD, Zone 7	42,000	42,000	-	31,500	18,865	22,437	28,654	31,500
Alameda County Water District	42,000	42,000	-	40,600	18,865	22,437	28,654	40,600
Santa Clara Valley Water District	100,000	100,000	15,000	85,000	44,917	53,422	68,289	85,000
Subtotal	184,000	184,000	15,000	157,100	82,647	98,296	125,597	157,100
San Joaquin Valley Area								
Devil's Den WD	12,700	12,700	7,300	12,700	5,704	6,785	8,673	14,119
Dudley Ridge WD	57,700	57,700	27,300	57,700	25,917	30,824	39,402	64,141
Empire West Side ID	3,000	3,000	3,000	3,000	1,348	1,602	2,048	3,335
Kern County WA - AG	1,033,800	1,039,000	319,400	1,039,000	464,355	559,214	714,815	1,167,027
- M&I	119,600	114,400	-	93,100	53,721	56,952	72,815	93,100
County of Kings	4,000	4,000	-	4,000	1,797	2,137	7,231	4,000
Oak Flat WD	5,700	5,700	3,300	5,700	2,560	3,046	3,891	9,000
Tulare Lake Basin WSD	118,500	118,500	106,500	118,500	53,227	63,305	80,923	131,728
Subtotal	1,355,000	1,355,000	466,800	1,333,700	608,629	723,865	925,298	1,486,450
Southern California Area								
Antelope Valley-East Kern WA	138,400	88,000	-	95,135	62,165	73,936	88,000	88,000
Castaic Lake WA	41,500	19,000	-	16,700	18,641	16,700	16,700	16,700
Coachella Valley Water District	23,100	23,100	-	19,400	10,376	12,340	15,775	19,400
Crestline-Lake Arrowhead WA	5,800	4,300	-	5,250	2,605	3,099	3,961	4,300
Desert Water Agency	38,100	38,100	-	35,600	17,113	20,353	26,017	35,600
Littlerock Creek ID	2,300	2,300	270	2,150	1,033	1,229	1,570	2,150
Mojave Water Agency	50,800	50,800	-	46,300	22,818	27,138	34,690	46,300
Palmdale WD	17,300	12,000	-	16,400	7,771	9,242	11,814	12,000
San Bernardino Valley Municipal WD	102,600	102,600	-	90,200	46,085	54,810	70,063	90,200
San Gabriel Valley Municipal WD	28,800	19,900	-	25,400	12,936	15,386	19,667	19,900
San Gorgonio Pass WA	17,300	17,300	-	16,000	7,771	9,242	11,814	16,000
The Metropolitan Water District of Southern California	2,011,500	1,593,800	-	1,134,300	903,510	1,074,577	1,134,300	1,134,300
Ventura County Flood Control District	20,000	10,000	-	12,850	8,983	10,000	10,000	10,000
Subtotal	2,497,500	1,981,200	270	1,515,685	1,121,807	1,328,052	1,444,371	1,494,850
GROUND WATER FILL [i]	-	-	-	-	-	200,000	200,000	200,000
TOTAL	4,141,850	3,606,650	482,070	3,070,685	1,860,402	2,400,000	2,750,000	3,400,000

a) To convert water volumes to cubic dekametres, multiply acre-feet by 1.2335.
b) Central Coastal Area contractors not shown because date for extension of Coastal Branch is indefinite.
c) Unadjusted contractor entitlement requests; i.e., not adjusted for conservation and reclamation goals.
d) Projected Entitlement Demands are based on applying conservation and reclamation goals in Project Service Areas (see Bulletin No. 76). The goals attainable by contractors are being evaluated as part of the Water Management Planning program with completion scheduled for June, 1984.
e) Reduced Annual Entitlements are Table A Annual Entitlements multiplied by ratio of 1995 Minimum Project Yield (1.9 MAF) to Ultimate Minimum Project Yield (4.23 MAF).
f) Where applicable, conservation and reclamation goals have been reflected in allocating Municipal and Industrial water (see Footnote d).
g) Shaded delivery capabilities are less than the smaller of Contractor Entitlement Request or Projected Entitlement Demand.
h) Dry Year deliveries based on recurring sequence of water year 1959 (8th dryest year in 50-year record); Average Year deliveries on water year 1925; Wet Year deliveries on water year 1941 (6th wettest year in 50-year record).
i) Ground water basin management for additional Minimum Project Yield assumed in Southern California, only.

TABLE 6: ESTIMATED DELIVERY CAPABILITY YEAR 2000

(in acre-feet)[a]

AGENCY NAME[b]	TABLE A ENTITLEMENT	CONTRACTOR ENTITLEMENT REQUEST[c]	CONTRACTOR SURPLUS REQUEST	PROJECTED ENTITLEMENT DEMAND[d]	REDUCED ENTITLEMENT BASED ON REDUCED MINIMUM PROJECT YIELD[e]	DELIVERY CAPABILITY[f] [g] — CLASSIFICATION OF WATER YEAR[h] DRY	AVERAGE	WET
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Feather River Area								
City of Yuba City	9,600	8,000	-	8,200	4,312	5,575	7,140	8,000
County of Butte	27,500	27,500	-	23,400	12,352	16,028	20,454	23,400
Plumas County FC&WCD	1,510	1,510	-	1,310	678	880	1,123	1,310
Subtotal	38,610	37,010	-	32,910	17,342	22,483	28,717	32,710
North Bay Area								
Napa County FC&WCD	25,000	14,050	-	13,150	11,229	13,150	13,150	13,150
Solano County FC&WCD	42,000	42,000	-	18,000	18,865	18,000	18,000	18,000
Subtotal	67,000	56,050	-	31,150	30,094	31,150	31,150	31,150
South Bay Area								
Alameda County FC&WCD, Zone 7	46,000	46,000	-	31,400	20,662	26,784	31,400	31,400
Alameda County Water District	42,000	42,000	-	40,500	18,865	24,456	31,241	40,500
Santa Clara Valley Water District	100,000	100,000	15,000	83,000	44,917	58,229	74,382	83,000
Subtotal	188,000	188,000	15,000	154,900	84,444	109,469	137,023	154,900
San Joaquin Valley Area								
Devil's Den WD	12,700	12,700	7,300	12,700	5,704	7,395	9,447	15,918
Dudley Ridge WD	57,700	57,700	27,300	57,700	25,917	33,598	42,919	69,741
Empire West Side ID	3,000	3,000	3,000	3,000	1,348	1,747	2,232	3,753
Kern County WA - AG	1,033,800	1,039,000	319,400	1,039,000	464,355	609,519	778,599	1,268,863
- M&I	119,600	114,400	-	88,600	53,721	62,091	79,326	88,600
County of Kings	4,000	4,000	-	4,000	1,797	2,329	2,974	4,000
Oak Flat WD	5,700	5,700	3,300	5,700	2,560	3,319	4,240	9,000
Tulare Lake Basin WSD	118,500	118,500	106,500	118,500	53,227	69,001	88,143	142,265
Subtotal	1,355,000	1,355,000	466,800	1,329,200	608,629	788,999	1,007,880	1,602,140
Southern California Area								
Antelope Valley-East Kern WA	138,400	103,000	-	110,500	62,165	80,589	102,945	103,000
Castaic Lake WA	41,500	21,000	-	17,800	18,641	17,800	17,800	17,800
Coachella Valley WD	23,100	23,100	-	19,700	10,376	13,451	17,183	19,700
Crestline-Lake Arrowhead WA	5,800	4,600	-	5,100	2,605	3,377	4,315	4,600
Desert Water Agency	38,100	38,100	-	35,000	17,113	22,184	28,340	35,000
Littlerock Creek ID	2,300	2,300	270	2,100	1,033	1,339	1,712	2,100
Mojave Water Agency	50,800	50,800	-	45,900	22,818	29,580	37,786	45,900
Palmdale WD	17,300	15,000	-	15,900	7,771	10,073	12,868	15,000
San Bernardino Valley Municipal WD	102,600	102,600	-	86,500	46,085	59,745	76,338	86,500
San Gabriel Valley Municipal WD	28,800	21,400	-	24,400	12,936	16,771	21,400	21,400
San Gorgonio Pass WA	17,300	17,300	-	14,700	7,771	10,073	12,868	14,700
The Metropolitan Water District of Southern California	2,011,500	1,618,800	-	1,196,800	903,510	1,171,271	1,196,800	1,196,800
Ventura County Flood Control District	20,000	20,000	-	16,600	8,983	11,646	14,875	16,600
Subtotal	2,497,500	2,038,000	270	1,591,000	1,121,807	1,447,899	1,545,230	1,579,100
GROUND WATER FILL[i]	-	-	-	-	-		-	-
TOTAL	4,146,110	3,674,060	482,070	3,139,160	1,862,316	2,400,000	2,750,000	3,400,000

a) To convert water volumes to cubic dekametres, multiply acre-feet by 1.2335.
b) Central Coastal Area contractors not shown because date for extension of Coastal Branch is indefinite.
c) Unadjusted contractor entitlement requests; i.e., not adjusted for conservation and reclamation goals.
d) Projected Entitlement Demands are based on applying conservation and reclamation goals in Project Service Areas (see Bulletin No. 76). The goals attainable by contractors are being evaluated as part of the Water Management Planning program with completion scheduled for June, 1984.
e) Reduced Annual Entitlements are Table A Annual Entitlements multiplied by the ratio of year 2000 Minimum Project Yield (1.9 MAF) to Ultimate Minimum Project Yield (4.23 MAF).
f) Where applicable, conservation and reclamation goals have been reflected in allocating Municipal and Industrial water (see Footnote d).
g) Shaded delivery capabilities are less than the smaller of Contractor Entitlement Request or Projected Entitlement Demand.
h) Dry Year deliveries based on recurring sequence of water year 1959 (8th dryest year in 50-year record); Average Year deliveries on water year 1925; Wet Year deliveries on water year 1941 (6th wettest year in 50-year record).
i) Initial net ground water fill of 1.7 MAF for Project managed ground water basins in Southern California assumed accomplished prior to year 2000 (i.e., by 1996 if there are no withdrawals). After this initial fill is completed, the ground water withdrawals and recharge over an extended period of years will be equal.

municipal and industrial water were adjusted, where applicable, for conservation and reclamation goals. The effects of this adjustment are most visible in "wet" years when the available water supply imposes the least constraint in meeting entitlement water demands. In "dry" years and, generally, in "average" years, limiting water supplies resulted in municipal and industrial water deliveries that were lower than requests adjusted for conservation and reclamation goals.

Delivery Priorities

For purposes of allocating water deliveries, by contractor, shown in the tables, it was necessary to assume priorities in delivery of Project water -- especially when Project water supplies fall short of entitlement requests (adjusted for conservation and reclamation goals). The assumed priorities are:

a. First priority was given to delivering annually each contractor's requested water or reduced annual entitlement, whichever is less. The reduced annual entitlements in a particular year were computed by applying to Table A annual entitlements for each contractor the ratio of the reduced minimum Project yield in that year (see Basic Assumptions) to the original minimum Project yield 5.2 million dam^3 (4.23 MAF). This procedure is in accordance with Standard Provisions for Water Supply Contract, Article 18(b). (Note that actual implementation of Article 18(b) would have to be invoked by the Director of the Department of Water Resources.)

b. Second priority was given to ground water basin initial fill in Southern California to increase Project yield. There are two primary constraints, other than availability of Project water, to the speed with which this fill, amounting to 2.1 million dam^3 (1.7 MAF), can be accomplished:

   - East Branch Conveyance Capability - until the East Branch is enlarged, (presently scheduled for year 1990), conveyance for ground water fill will be limited to a maximum of 185 000 dam^3 (150,000 acre-feet) annually by the water transportation capability of existing East Branch facilities.

   - Spreading Grounds Percolation Capability - the percolation capability of the spreading grounds for ground water fill (and recharge after initial fill is accomplished) is limited to about 247 000 dam^3 (200,000 acre-feet) per year.

The initial filling of ground water basins is estimated to extend through year 1997. Information in Tables 3 through 6, assumes that ground water will not be withdrawn until initial fill is complete.

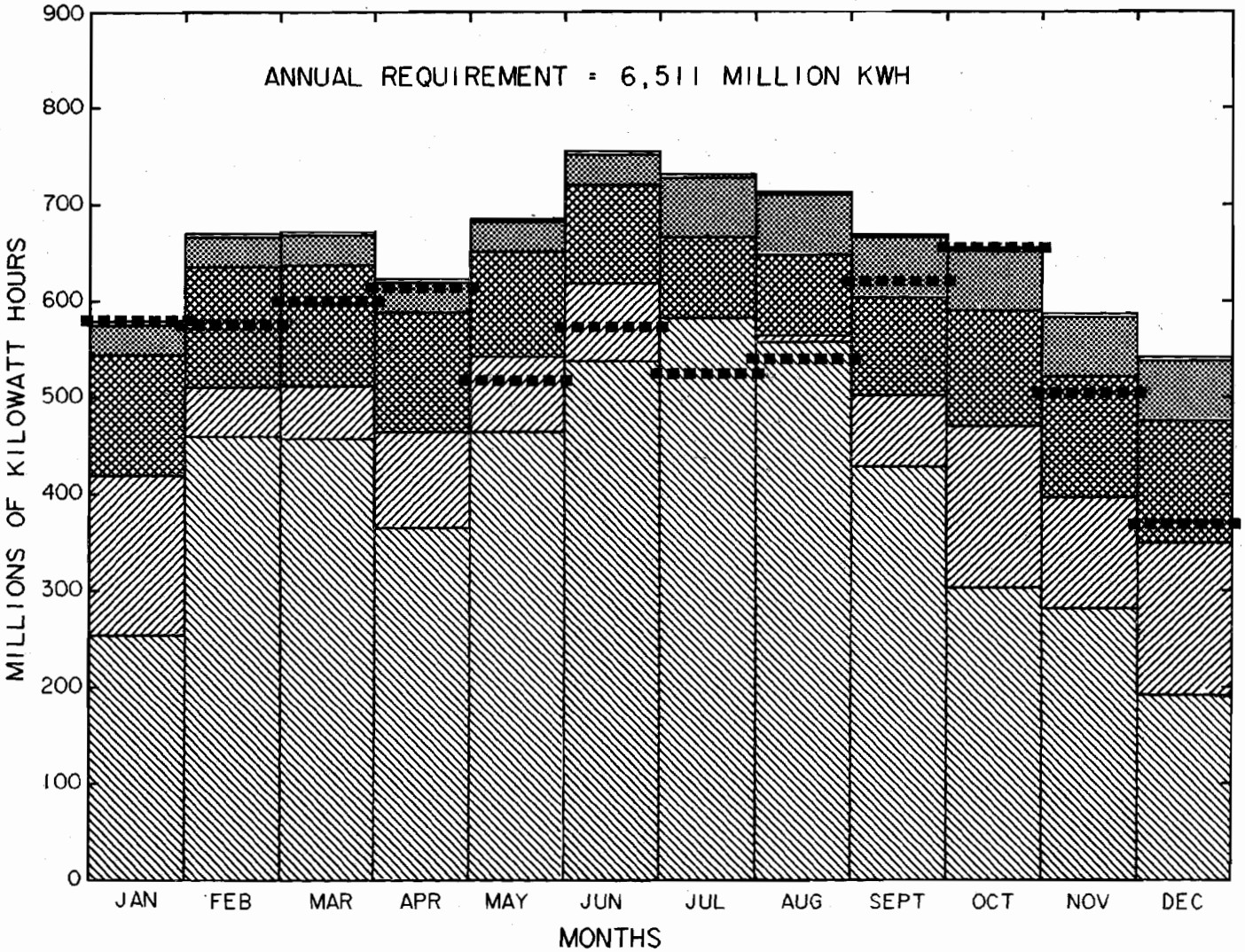
Third priority for remaining available water is to satisfy, as far as possible, the contractors' requests for water (adjusted for conservation and reclamation) or original Table A annual entitlements, whichever are less.

Any Project water that remains available for delivery is used to satisfy requests for surplus water.

Energy Requirements

In addition to a review of the ability of the State Water Project (SWP) to meet the water contractor's water demands without the SB 200 facilities, the Department has developed preliminary operation studies regarding electrical energy requirements for the "average" scenario discussed above. The results of the study are shown graphically in Figure 3, 4, 5, and 6. The energy requirements in these figures illustrate the estimated energy requirement by month for the years 1985, 1990, 1995, and 2000. These curves illustrate the timing of energy requirements and the resources to meet them on a monthly basis rather than a yearly basis. Even

Figure 3: 1985 ENERGY REQUIREMENTS - RESOURCES



Requirements based on estimated project pumping during average conditions of water supply in the Sacramento-San Joaquin Delta (2.75 million acre-feet).

Resources included are:

Hydro - Hyatt Thermalito, Aqueduct recovery, Pine Flat, MWDSC small hydro, DWR small hydro.

SCE Exchange - Energy in exchange for capacity provided to Southern California Edison.

Coal - Reid Gardner Unit No. 4

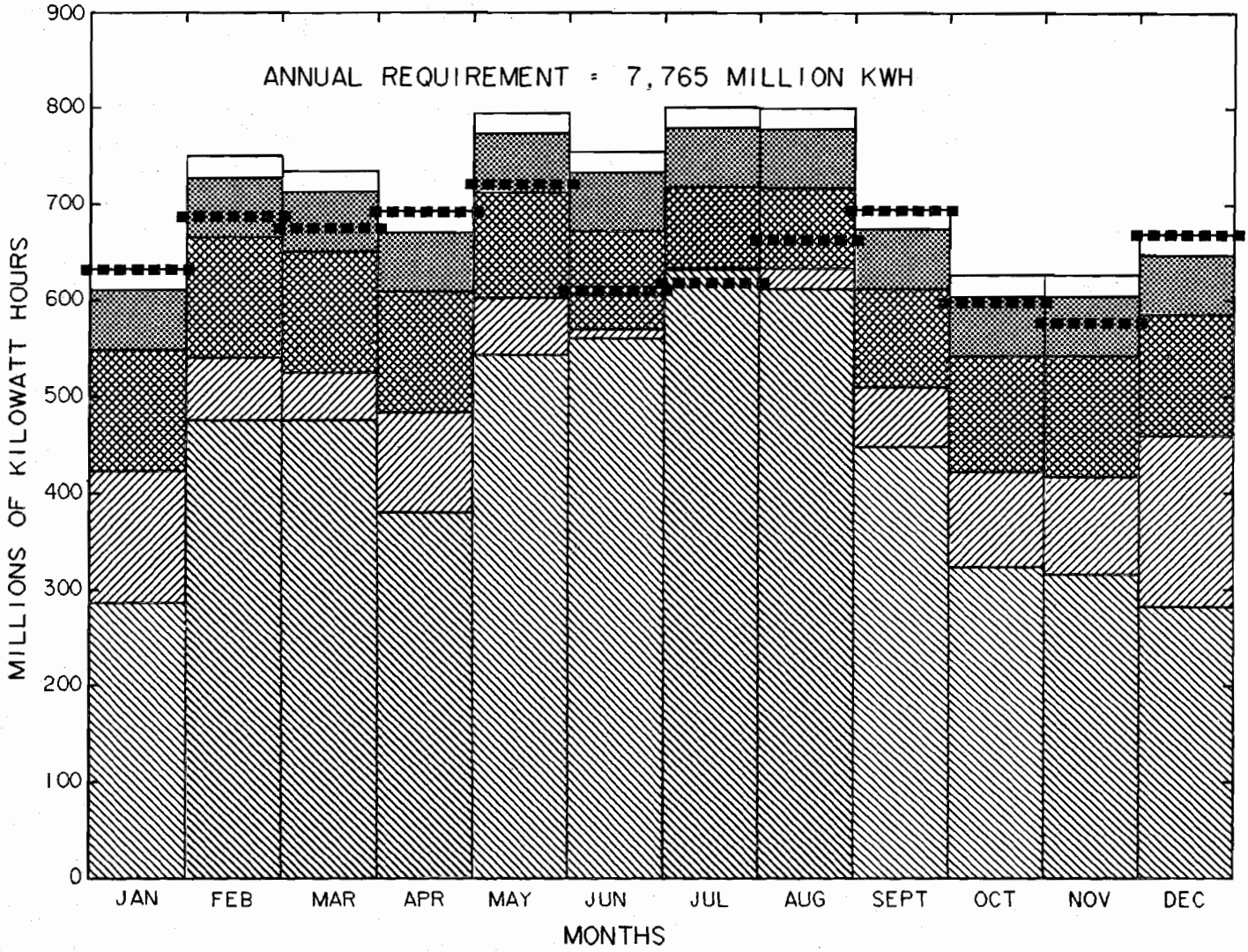
Geothermal - Bottle Rock, South Geysers

Other - Wind, Cogeneration, Honey Lake

Resources do not reflect reductions for planned maintenance or forced outages.

Placement of resources in chart does not indicate a priority of use or need.

Figure 4: 1990 ENERGY REQUIREMENTS - RESOURCES



Requirements based on estimated project pumping during average conditions of water supply in the Sacramento-San Joaquin Delta (2.75 million acre-feet).

Resources included are:

Hydro - Hyatt Thermalito, Aqueduct recovery, Pine Flat, MWDSC small hydro, DWR small hydro.

SCE Exchange - Energy in exchange for capacity provided to Southern California Edison.

Coal - Reid Gardner Unit No. 4

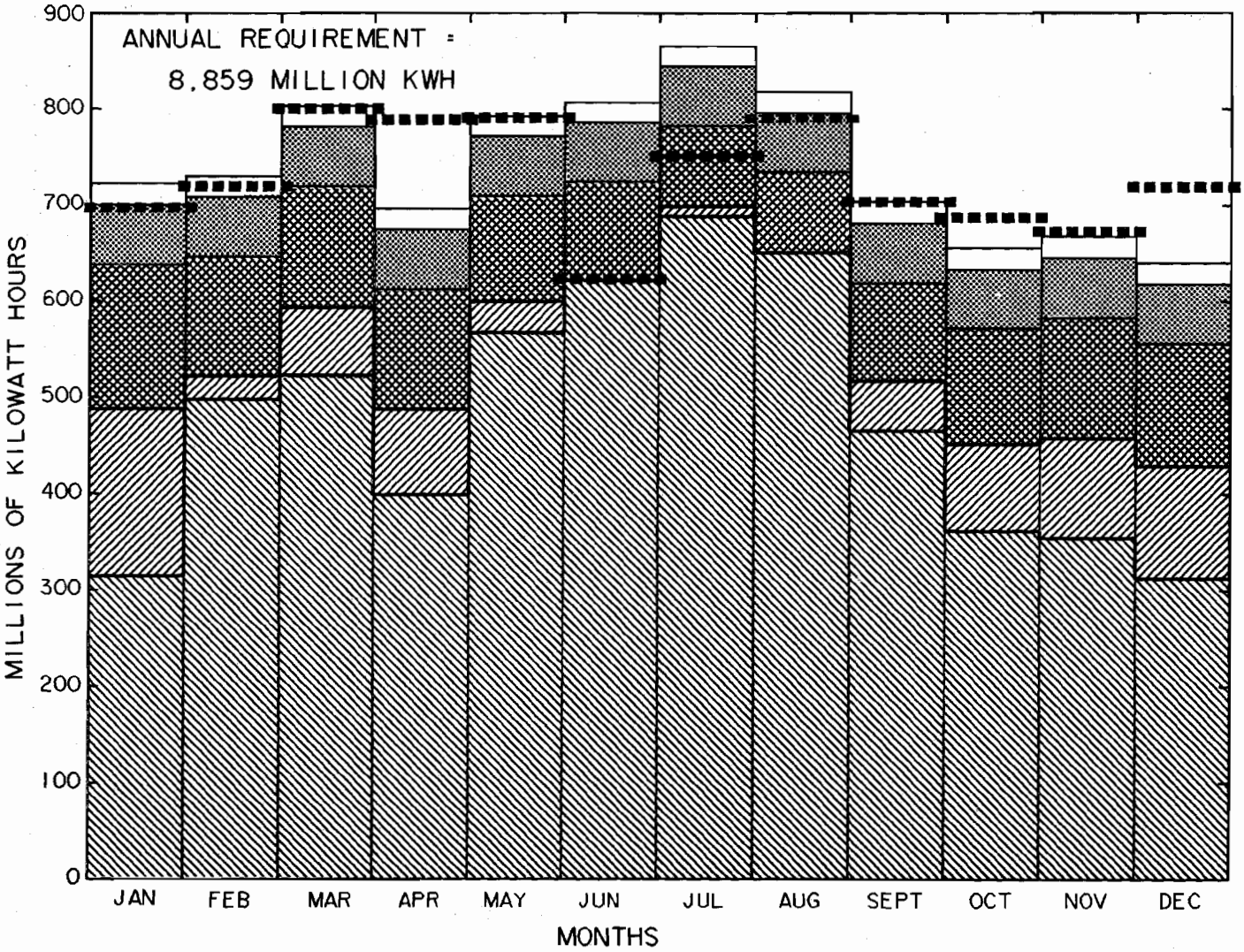
Geothermal - Bottle Rock, South Geysers

Other - Wind, Cogeneration, Honey Lake

Resources do not reflect reductions for planned maintenance or forced outages.

Placement of resources in chart does not indicate a priority of use or need.

Figure 5: 1995 ENERGY REQUIREMENTS - RESOURCES



■■■ *Requirements based on estimated project pumping during average conditions of water supply in the Sacramento-San Joaquin Delta (2.75 million acre-feet).*

Resources included are:

Hydro - Hyatt Thermalito, Aqueduct recovery, Pine Flat, MWDSC small hydro, DWR small hydro.

SCE Exchange - Energy in exchange for capacity provided to Southern California Edison.

Coal - Reid Gardner Unit No. 4

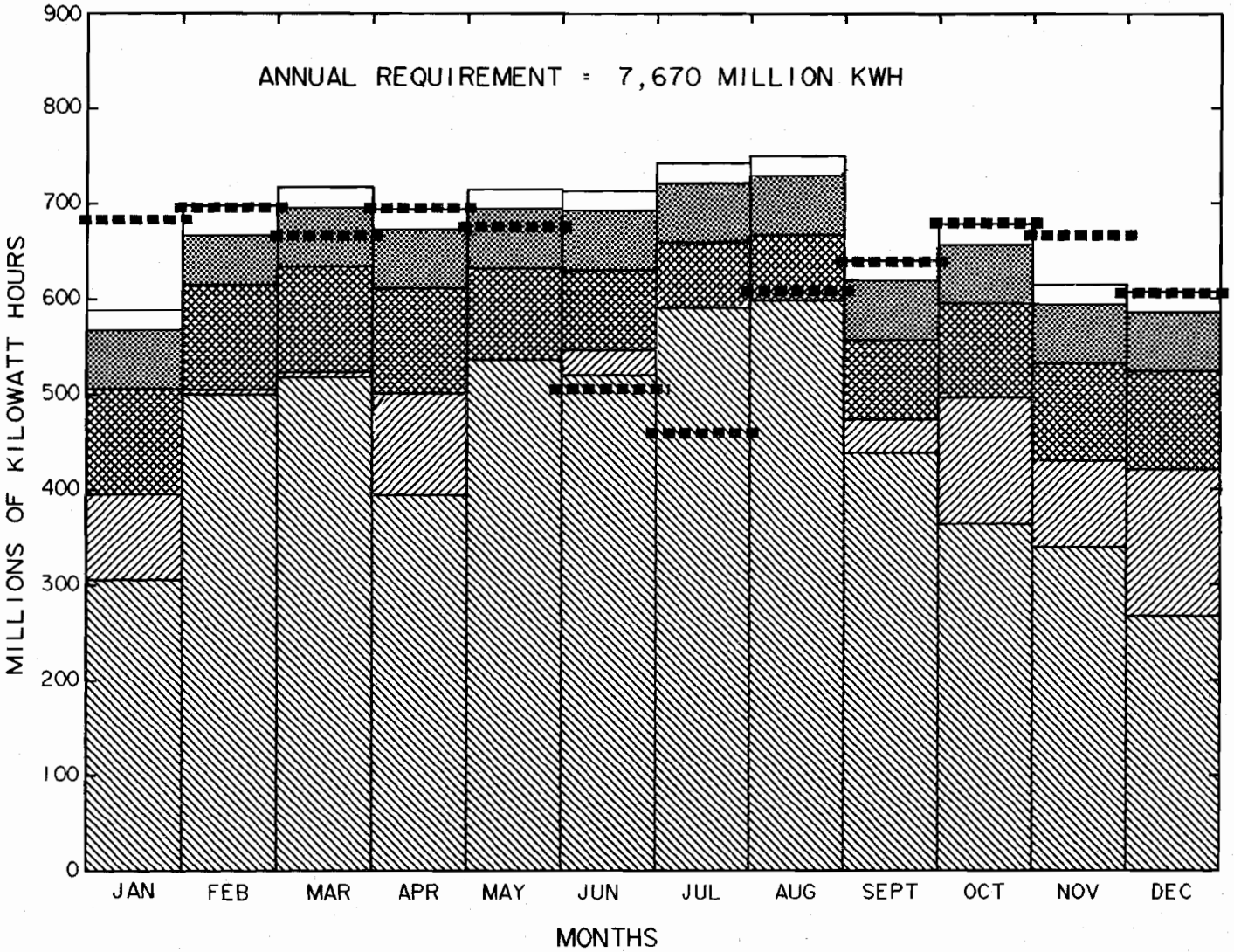
Geothermal - Bottle Rock, South Geysers

Other - Wind, Cogeneration, Honey Lake

Resources do not reflect reductions for planned maintenance or forced outages.

Placement of resources in chart does not indicate a priority of use or need.

Figure 6: 2000 ENERGY REQUIREMENTS - RESOURCES



Requirements based on estimated project pumping during average conditions of water supply in the Sacramento-San Joaquin Delta (2.75 million acre-feet).

Resources included are:

Hydro - Hyatt Thermalito, Aqueduct recovery, Pine Flat, MWDSC small hydro, DWR small hydro.

SCE Exchange - Energy in exchange for capacity provided to Southern California Edison.

Coal - Reid Gardner Unit No. 4

Geothermal - Bottle Rock, South Geysers

Other - Wind, Cogeneration, Honey Lake

Resources do not reflect reductions for planned maintenance or forced outages.

Placement of resources in chart does not indicate a priority of use or need.

though there may be some years showing net excess energy, there are months within the year where the requirement and resources are balanced or show a deficiency of energy.

The energy requirements shown in the figures are heavily dependent upon the assumptions used to allocate the available water to the contractors and to the ground water filling program. Revisions in the water allocation assumptions or in actual hydrologic occurrence will cause differences in the amount of energy required to operate the SWP in the future, particularly if the revisions would allocate more or less water through the A. D. Edmonston Pumping Plant. These figures do not reflect planned maintenance or forced outages of the resources, which would reduce energy availability during portions of a month or for an entire month. It must be noted that these energy requirements shown in the figures are based on a year of "average" water supply where water available for delivery to users is estimated to be 3.4 million dam^3 (2.75 million acre-feet) (as discussed earlier in this chapter).

Even though the scenarios assume that an equal amount of total water would be available in the Sacramento-San Joaquin Delta each year through 2000, there is an increasing amount of energy required for SWP pumping due to an increasing percentage of the total water being delivered in Southern California. The decrease in energy requirement during year 2000 reflects completion of the program to deliver water to ground water storage of 2.1 million dam^3 (1.7 million acre-feet) in Southern California. The study assumed that the initial fill of the ground water basin would be complete by 1996. Once the initial fill phase was completed, there would be additional power required to refill the storage subsequent to use of the stored water during drought years.

Figure 7 graphically illustrates energy generation assumed to be available to the Project from: (1) existing Project owned power resources, (2) power resources to be constructed, and (3) energy to be obtained under contractual arrangements. The generation shown in the figure from aqueduct recovery plants was based on the "average" water year scenario. Under the scenario, the southern California ground water filling program is assumed complete in the mid-1990's. Hence, a reduction in transportation of water to southern California and an associated reduction in energy generation by aqueduct recovery plants.

Figure 7A graphically illustrates SWP on-peak electrical capacity load for 1990 and the SWP resources planned to meet the load. Again, the requirements were based upon an "average" water year scenario discussed earlier in this chapter to determine the on-peak load-plus-a load of 225 MW to account for on-peak capacity provided to Southern California Edison under the DWR-SCE Capacity Exchange Agreement, dated September 17, 1981. The chart does not reflect reduction of resources that will occur during scheduled maintenance or forced outages. The chart does include some reduction of capacity from the Reid Gardner Unit No. 4 coal plant during the summer months. This reflects periods when Nevada Power Company (NPC) can be expected to use the plant to meet its peak loads. However, NPC can obtain peaking capacity from the Department's share of the plant at any time, up to the limitations stipulated in the DWR-NPC Participation Agreement.

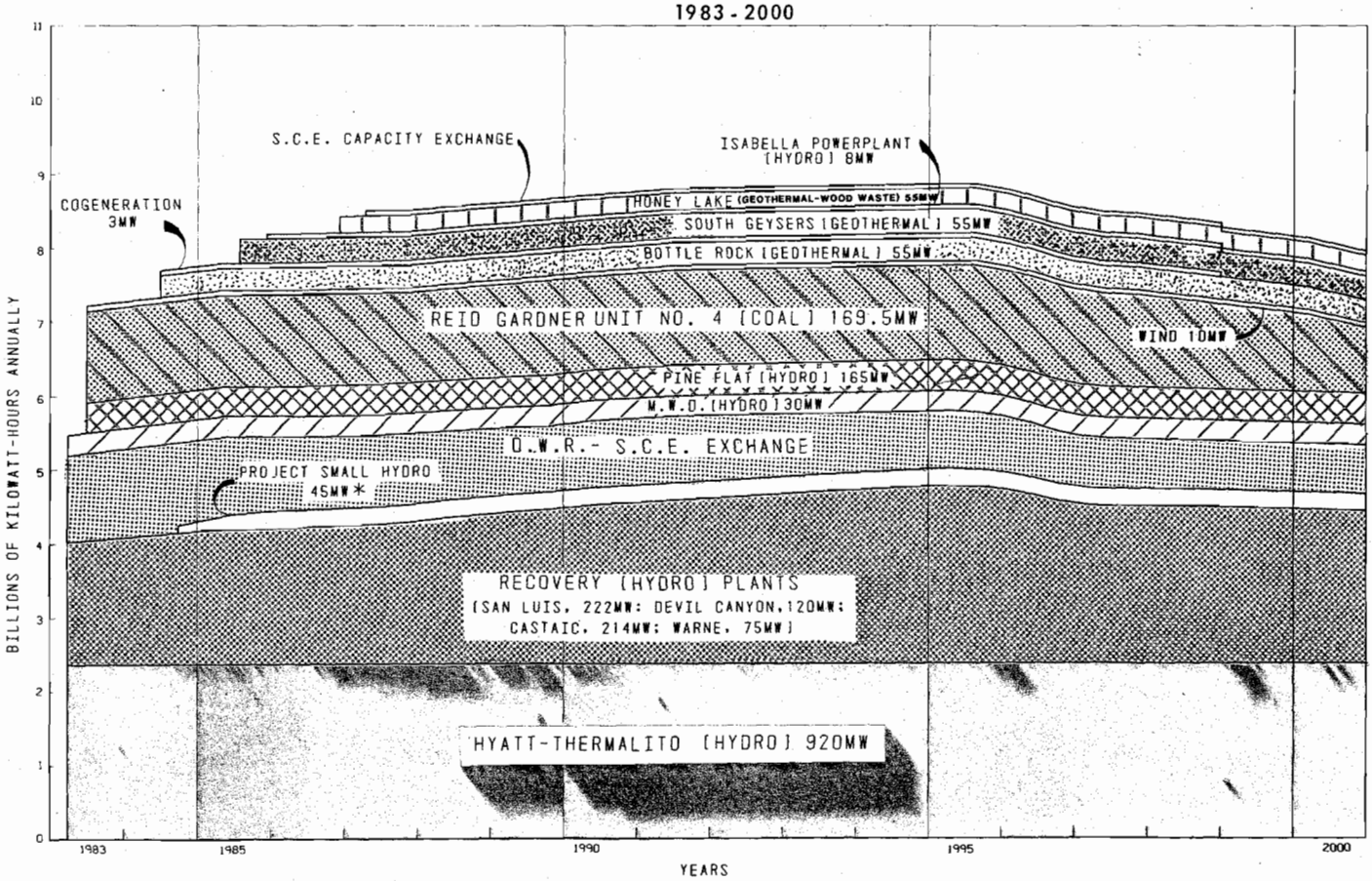
Figure 7: ENERGY RESOURCES

CALIFORNIA STATE WATER PROJECT

ESTIMATED ELECTRICAL ENERGY RESOURCES

AVERAGE SCENARIO

1983 - 2000



BASED ON ESTIMATED PROJECT PUMPING DURING AVERAGE CONDITIONS OF WATER SUPPLY (2.75 MILLION AF) IN THE SACRAMENTO-SAN JOAQUIN DELTA AND PROJECT SERVICE AREAS.

MAXIMUM GENERATING CAPACITIES SHOWN IN MEGAWATTS (MW) FOR THE RESPECTIVE PLANTS DO NOT REPRESENT DEPENDABLE CAPACITIES AND ARE SUBJECT TO INTERRUPTIONS, WATER DELIVERY REQUIREMENTS, AND OTHER LIMITATIONS.

*10 SMALL HYDROELECTRIC POWER PLANTS INCLUDING ALAMO POWERPLANT.

2000 Supply, in billions of kWh

IDENTIFIED RESOURCES

(1) DWR - Southern California Edison Capacity Exchange, the estimated amount of off-peak energy to be made available to the DWR in exchange for 225 MW of SWP on-peak capacity. This capacity is supplied to SCE under the Capacity Exchange Agreement signed Sept. 17, 1981..... 0.03

(2) Honey Lake, a proposed 55-MW wood-waste/geothermal development. Feasibility studies are underway, jointly funded by the Department of Energy, U. S. Forest Service, GeoProducts Inc., and DWR..... 0.23

(3) Isabella Powerplant, DWR is presently conducting studies for construction of a power plant at Isabella Lake outlet. DWR is proposing to construct an 8-MW powerplant at the U. S. Army Corps of Engineers owned and operated lake. It is currently planned for completion in 1986..... 0.02

(4) South Geysers, a 55 MW-geothermal development. Construction was started by DWR in July 1982 at a site in the Sonoma County portion of the Geysers area..... 0.37

(5) Bottle Rock, a 55-geothermal development. Construction was by DWR in May 1981, at a site in the Lake County portion of the Geysers area..... 0.37

(6) Wind, the output of this resource represent a contract agreement between DWR and Tera Corp. This resource is 10-MW..... 0.02

(7) Reid Gardner Unit No. 4, the estimated portion to be available to the DWR from the output of a 250-MW unit being constructed jointly by the DWR and Nevada Power Company under an executed Participation Agreement. (169.5 MW DWR share)..... 1.15

(8) Pine Flat, under an executed purchase contract, generation from a 165-MW hydroelectric plant under construction by the Kings River Conservation District at the base of the existing Pine Flat Dam..... 0.42

(9) MWD Hydro, under an executed purchase contract, the generation from five small hydroelectric powerplants constructed by The Metropolitan Water District of Southern California on its distribution system -- totaling about 30 MW capacity... 0.28

(10) DWR-Southern California Edison Exchange, the estimated amount of off-peak energy to be available to the DWR in exchange for 485 MW of SWP on-peak capacity to be provided to the Southern California Edison Company, under the Power Contract signed October 11, 1979..... 0.65

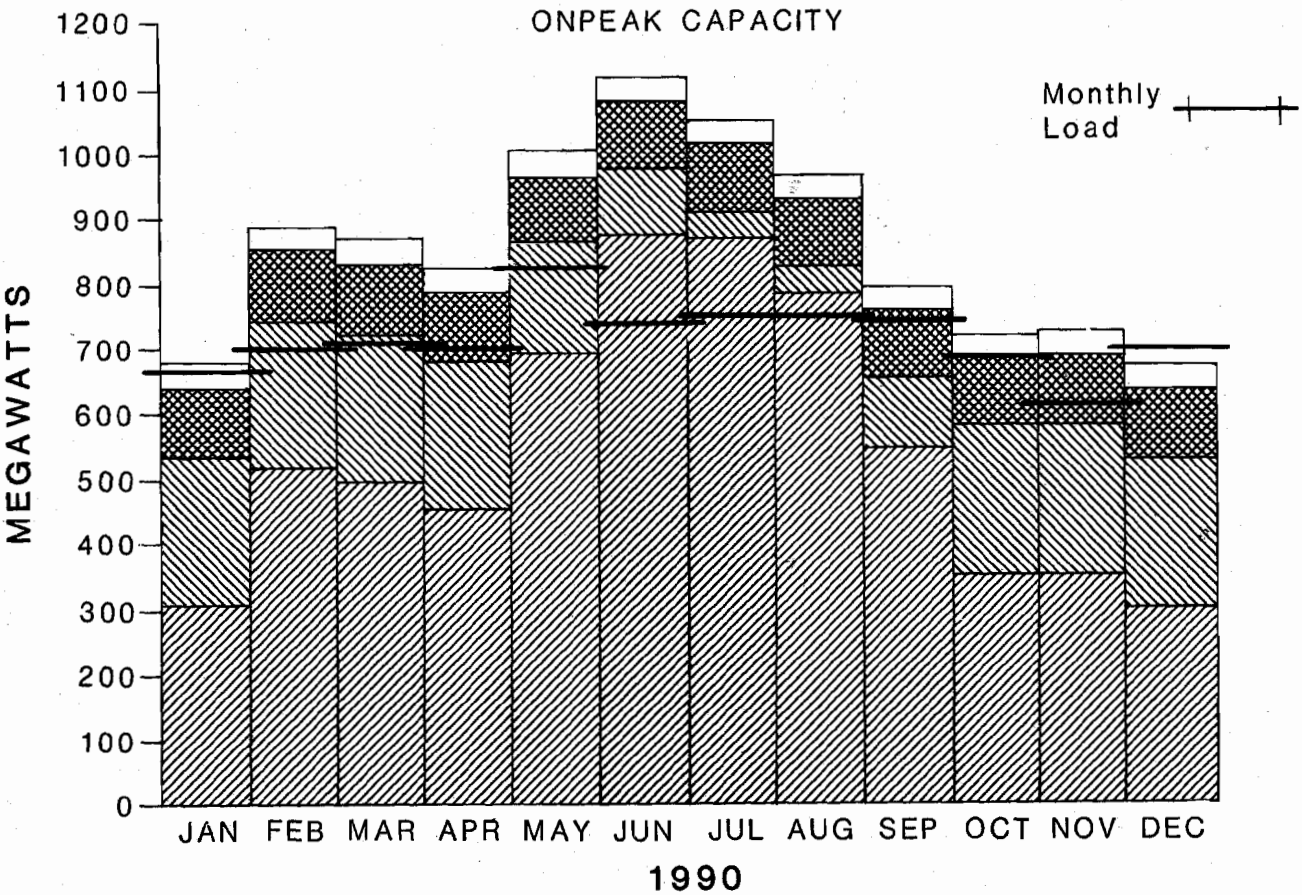
(11) Project Small Hydro, the output of 10 small hydroelectric powerplant including Alamo Powerplant (17 MW) with a total capacity of 40.6 MW..... 0.24

(12) Recovery Plants, the DWR's share of output of constructed Castaic Powerplant (214 MW), San Luis Pumping-generation Plant (222 MW), and Devil Canyon Powerplant (120 MW); William E. Warne Powerplant (75 MW)..... 2.10

(13) Hyatt-Thermalito, the output from this existing hydroelectric plants (920 MW combined capacity) located below Oroville Dam which is now sold to the California Companies under a power sale contract to be cancelled effective April 1, 1983..... 2.33

TOTAL, ALL IDENTIFIED SOURCES..... 8.21

Figure 7a:
1990 SWP ELECTRICAL CAPACITY LOADS AND RESOURCES



a) Loads based on estimated Project pumping during average conditions of water supply in the Sacramento - San Joaquin Delta (2.75 million acre-feet) plus 225 MW to be provided to Southern California Edison under the DWR-SCE Capacity Exchange Agreement.

b) Resources included are:

- Hydro - Hyatt, Thermalito, W. E. Warne, Castaic, San Luis, and Pine Flat Powerplants and DWR small hydro powerplants. (Devil Canyon, Alamo and a portion of Hyatt-Thermalito are committed to Southern California Edison.)
- Coal - Reid Gardner Unit No. 4. Availability is subject to interruption by Nevada Power Company.
- Geothermal - Bottle Rock and South Geysers Powerplants.
- Other - Honey Lake Powerplant.

c) Total Resource magnitude reflects allowances for spinning reserve requirements.

d) Resources do not reflect reductions for planned maintenance or forced outages.

e) Placement of resources in chart does not indicate a priority of use or need.

Future Costs of Water Service

Estimates of future water costs are useful to SWP contractors in short and long-range planning of their water needs, operations, and economy.

Previous bulletins since Bulletin 132-80 have shown estimated unit water rates in SWP service areas, assuming construction of future facilities authorized in SB 200.

Rejection of Proposition 9, has resulted in the Department's termination of planning for additional facilities authorized in SB 200 and a reevaluation of the ability of the SWP to provide water deliveries to SWP contractors in years of varying water supply.

Table 7 shows estimated unit water rates in SWP service areas under "status quo" conditions. These unit rates are based

TABLE 7: ESTIMATED TOTAL UNIT WATER RATES

IN SWP SERVICE AREAS THROUGH YEAR 2000[a]

The rates shown are in 1982 dollars. The values in parentheses include the effects of assumed future inflation.

(in dollars per acre-foot)[b]

SWP Service Area	1982	1985	1990	1995	2000
Feather River					
Capital, OM&R[c][d]	28	21 (21)	23 (26)	39 (62)	36 (65)
North Bay					
Capital, OM&R		162 (176)	157 (184)	171 (231)	159 (235)
Energy[e]		6 (6)	12 (14)	15 (21)	16 (29)
Total	[f]	168 (182)	169 (198)	186 (252)	175 (264)
South Bay					
Capital, OM&R	50	54 (55)	67 (82)	80 (126)	76 (146)
Energy[e]	6	40 (43)	51 (60)	51 (73)	47 (86)
Total	56	94 (98)	118 (142)	131 (199)	123 (232)
San Joaquin					
Capital, OM&R	35	28 (29)	37 (45)	52 (80)	49 (87)
Energy[e]	2	18 (19)	27 (32)	23 (32)	21 (38)
Total	37	46 (48)	64 (77)	75 (112)	70 (125)
Southern California					
Capital, OM&R	112	154 (157)	143 (173)	166 (246)	161 (287)
Energy[e]	17	102 (108)	127 (158)	147 (238)	139 (300)
Total	129	256 (265)	270 (331)	313 (484)	300 (587)

a) These unit rates are changed from those shown in Bulletin 132 81's Exhibit 2 due to many factors. The major ones are:
- *Change in projected water deliveries in all SWP service areas. These unit rates are based on the SWP's Delivery Capability shown in Table 3 through 5 for average water year conditions;*
- *Decrease in project interest rates;*
- *Change in assumed additional conservation facilities reflecting defeat of Proposition 9 and elimination of costs of facilities defined in SB 200;*
- *Change in assumptions related to repayment of "Off-Aqueduct" power facilities.*

b) Metric conversion is dollars per acre-foot times .8107 giving dollars per cubic dekametre.

c) Operations, maintenance, and replacements.

d) No energy costs are required for water delivery to Feather River area contractors.

e) Energy costs of transportation facilities to deliver project water to the service area, including costs of off-aqueduct powerplants.

f) Deliveries to North Bay contractors are currently planned to begin in 1985.

on capital costs and operating costs of:

- SWP facilities which have been completed and are in operation;
- construction and operation of the North Bay Aqueduct;
- installation of additional pumps at the Delta Pumping Plant;
- installation of additional pumps at A. D. Edmonston Pumping Plant;
- implementation of a ground water storage program;
- construction of an enlarged aqueduct in the San Luis Division;
- construction of an enlarged East Branch of the California Aqueduct;
- purchase of yield from Cottonwood Creek Project assumed to be constructed by the Corps of Engineers;
- completion of the Department's long-range energy program discussed in Chapter II.

The unit rates also assume that 1985, 1990, 1995 and 2000 will be average water (rainfall) years. Projected delivery in SWP service areas for these years are shown in Tables 3 through 6.

Escalated Rates. The unit water rates shown in Table 7 are both unescalated (rates in 1982 dollars) and escalated (reflecting assumed future inflation). The Department has developed projections of future inflation applicable to SWP construction, operation, and energy costs. The escalated unit water rates reflect application of these assumed inflation rates to 1982 cost estimates. The escalated rates assume an annual inflation rate of 9 percent for construction (capital) and 7 percent for operation, maintenance, and replacement (OMP&R) costs. The costs of future energy sources, including costs of constructing and operating off-aqueduct power plants, are escalated at rates varying from 7.5 percent to 10 percent, depending on the energy component being escalated.

Effects of Inflation. It is difficult to compare future costs, which are adjusted for inflation, with present-day standards of ability to pay. As an example, to put inflated cost projections in perspective, applying a 9-percent inflation rate for 18 years, the purchasing power of today's dollar will be reduced to only 21 cents in the year 2000. Another way of expressing the same concept is to assume a working person will receive a 9-percent annual cost-of-living adjustment to his income during each of the next 18 years. A family with an annual income of $20,000 today would earn about $94,300 in the year 2000; however, the family's purchasing power would still be only $20,000 in what could be considered as today's "real" dollars.

Delta Water Quality Without the Peripheral Canal

In July 1982, a new program was established by the Department to study the present and potential impacts in the Sacramento-San Joaquin Delta and Suisun Bay of operating existing facilities of the SWP through the year 2000. Emphasis under the new program will be to determine the impacts of Project operations on the environment in the Delta including those that may contribute to recent declines in fish, zooplankton, and phytoplankton. A continued decline in the ecology of the Delta appears likely in absence of the environmental safeguards built into SB 200 but scientific understanding of these trends is incomplete.

The program will also study water quality conditions in the Sacramento-San Joaquin Delta as exports demands from the SWP increase.

It is planned that a series of staff papers dealing with the impacts and mitigation measures will document the results of the studies. This program is scheduled to be completed by December 1983.

CHAPTER II

PLANNING AND IMPLEMENTATION PROGRAMS

Conservation, Reclamation and Water Storage - Surface and Underground

Water Conservation and Reclamation Programs - Governor's Executive Order B-68-80

Upon signing SB 200, Edmund G. Brown Jr. concurrently issued Executive Order B-68-80 directing the Department to prepare a plan of water conservation, reclamation, and management for the SWP. In addition, the Department was instructed to implement, as quickly as possible, a program to recycle agricultural drainage and other brackish water to augment SWP supplies by 439 000 dam^3 (400,000 acre-feet) by year 2000.

The Executive Order was in furtherance of Article X, Section 2 of the California Constitution, which states that "...the water resources of the State shall be put to beneficial use to the fullest extent to which they are capable and that the conservation of the State's water is to be exercised with a view to their reasonable and beneficial use." The Department of Water Resources' Water Management Policy, established by the Director in 1975, reiterates the concept that water resources already developed shall be used to the maximum extent before new sources are developed.

The Department, an advisory group of representatives from the water service contractors, environmental organizations, and others are working together to develop an overall plan for implementing goals of the Executive Order.

The plan will coordinate and maximize the use of existing water supplies and optimize the use of existing facilities in SWP service areas through water conservation. As part of the overall plan, individual plans, identifying specific conservation measures recommended for each of the SWP contractors, are being prepared.

The plans will, where practical:

1. Recommend conservation measures to reduce demand, encourage use of reclaimed waste water and conjunctive ground water-surface water operations, identify water exchanges for local consideration, and undertake other measures that could reduce or delay the need for new surface water facilities.

2. Provide sufficient flexibility in the urban conservation sector to be effective in stages; i.e., it will enable some actions to be effected as soon as possible, while other actions, which are subject to institutional, economic, or technologic constraints, can be effected as the constraints are resolved.

3. Evaluate energy impacts relating to components of the plans.

Emphasis will be placed on making maximum use of the results from other completed and ongoing studies. New work will be limited to completing feasibility and impact studies and identifying incentives for implementation of the plans. Not all of the desired work can be completed within the time available; therefore, the plans will include provisions for future modifications based on the results of ongoing work.

Significant progress has been made in developing the recommended water management plans with 11 of the 30 SWP contractors.

The status of the preparation of plans is shown below:

SWP Contractor	Status of Water Management Plans as of July 1, 1982
Napa County FC & WCD	75%
Solano County FC & WCD	75%
Alameda County FC & WCD Zone 7	75%
Santa Clara Valley W.D.	50%
Alameda County W.D.	50%
Kern County W.A.	40%
Metropolitan Water District	40%
San Bernardino Valley MWD	25%
Coachella Valley W.D.	15%
Antelope Valley East-Kern W.A.	15%
Tulare Lake Basin W.S.D.	10%
Remaining 19 Contractors	5%

The major areas to be covered in the plans are discussed below.

Water Conservation and Reclamation. Water conservation has received considerable attention in recent years; consequently, many studies have been completed or are underway. Many water saving possibilities have been identified; some are in various stages of research and some have already been implemented.

The planning team is working with the water contractors to determine which water saving possibilities are feasible in each contractor service area. Recommended programs will emphasize (a) public information and education to increase awareness and encourage adoption of water-saving techniques, (b) water management to increase system accountability and efficiency, and (c) regulations to establish a legal base for water conservation practices. Determination of conservation potential in each service area will require additional hydrologic studies and development of farm water budgets.

Water Management. In each SWP service area, the planning team will identify achievable water-reclamation and reuse projects through review of completed and ongoing studies. To project the potential for additional reclamation and reuse projects beyond those identified in current studies, sources of additional waste water that may be reclaimed for reuse in each SWP service area will be evaluated. Conjunctive ground water use programs in operation by local agencies will be identified. The potential for augmentation or expansion of these local programs by local agencies, or cooperatively with the SWP, will be determined. Ground water management possibilities will be reviewed.

Water exchanges and purchases have received increasing attention as a means to achieve more efficient water use and to stretch existing water supplies. The plans will identify, where possible, physical exchange opportunities within service areas or with external sources. Local water agencies will be encouraged to first initiate short-term interties for emergency purposes; then longer-term prospects will be encouraged while considering supplies, costs, and legal and institutional issues.

Scheduling. The schedule calls for all public reviews and final Department plans to be completed by June 1984. Eleven plans representing 90 percent of SWP maximum entitlements are scheduled

for completion by December 1982. The State Water Resources Control Board will conduct public hearings after receiving the final Department plans.

Surface Water Development Programs

Cottonwood Creek Project. The Cottonwood Creek Project is currently the only large surface water development that is planned for construction as a source of future supply for the SWP by year 2000. Under current plans, the Department will purchase water storage space in the federally authorized project to obtain a municipal and industrial water supply of 216 000 dam^3 (175,000 acre-feet) per year for the SWP (Estimated firm yield [municipal and industrial water supply] for the SWP without the Peripheral Canal in operation). A description and status report on this potential State-Federal agreement including federal cost sharing proposals is given in Chapter IV. The feasibility studies the Department was conducting on the Thomes-Newville and Los Vaqueros surface water projects are being terminated as the result of the defeat of Proposition 9.

Local Projects. Local surface water projects have been proposed as units of the SWP. If feasible each project would develop an additional yield of 2 500 to 12 000 dam^3 (2,000 to 10,000 acre-feet) per year. The Department is continuing to evaluate those proposals when submitted by SWP contracting agencies, and will approve such projects if they are economically, engineeringly, environmentally, and financially feasible. Further discussion of local projects under consideration is included later in this chapter. (See "Local Water Supply Projects.")

Colorado River Banking Plan. A cooperative reconnaissance-level investigation by DWR, MWD and the Colorado River Board was initiated in 1979 and is to be completed by late 1982. The investigation will determine the merits of a banking program for long-term storage of MWD's apportioned Colorado River water in Lake Mead. Under this plan, MWD would reduce its Colorado River deliveries below its apportionment in years when the SWP has supplies available for delivery from the Delta in excess of MWD's normal demand for SWP water. In return, MWD would receive "storage credits" in Lake Mead and would draw upon the lake during years of deficient SWP water supplies. The Colorado River Banking Plan cannot be implemented until sometime after the Central Arizona Project becomes operational. Adequate storage space is not expected to be available in the Colorado River reservoirs until then. The banking plan is also dependent upon enlargement of the East Branch of the California Aqueduct.

Purchase of CVP Water. Studies in progress in connection with the negotiation of a coordinated operating agreement between the SWP and the Federal Central Valley Project (CVP) demonstrate that the federal yield currently exceeds its contract requirements. On July 15, 1982, the Department sent a letter to the Federal Commissioner of Reclamation proposing that the State purchase CVP water. The Department is waiting for the Federal response to this proposal.

Agricultural Water Purchase Plan. The Agricultural Water Purchase Plan is a means of increasing the yield of the SWP by purchasing water upstream from the Delta from farmers or water districts willing to sell such water.

While the goal of purchase plan would be to prevent severe water shortages and economic impacts in agricultural areas served by the SWP, it appears such a plan is not without social and environmental impacts, as well as certain economic costs to the area foregoing the use of water. Nevertheless, in a reconnaissance investigation of a potential purchase plan, the Department concluded that during emergency periods such a plan is worthy of further consideration as

a means of augmenting the SWP yield. An assessment of the local socioeconomic impacts of this plan is contained in a January 1981 report by SRI International, acting as a consultant to the Department.

For the plan to be acceptable, it would need to be voluntary. The plan could be implemented upon agreement among all parties that adequate safeguards to the farmers and to the environment can be assured.

The Department is preparing to survey holders of appropriative water rights in the Sacramento and San Joaquin Valleys to determine their willingness to negotiate the sale and transfer of water during severe drought periods to augment the SWP.

Ground Water Storage Programs

Much of the planning for SWP ground water storage programs was integrated with that for other new facilities authorized by SB 200. With the defeat of Proposition 9 by the voters in June 1982, it has become necessary to reanalyze the potential for developing SWP yield by using ground water storage.

The studies have not yet been completed. However, preliminary estimates indicate that it may be possible to develop about 185 000 to 247 000 dam^3 (150,000 to 200,000 acre-feet) of new yield using ground water storage. In addition, it should be noted that a ground water program would directly compete with a Colorado River Banking program for both available water and aqueduct transportation capacity. Several proposed feasibility-level investigations have been deferred pending results of the ongoing studies. The Chino and North Santa Clara Valley basin studies will continue and studies in the San Bernardino Valley Municipal Water District area will be initiated. Cost estimates developed for this bulletin are based on a ground water program located primarily in Southern California, with minor storage in the South Bay Aqueduct service area. Additional storage capability may be developed in Kern County when local opposition is reduced. Progress during thepast year is summarized as follows:

Chino Ground Water Storage Feasibility Study. In early 1980, the Department and MWD joined together to develop and fund a feasibility study of a ground water storage program in the Chino Basin.

In 1981, the Department studied ten storage alternatives under varying limitations of ground water basin recharge and extraction capacities. Institutional roles were developed for all agencies that might be directly involved in the storage program. A series of meetings was held with the affected agencies in Chino Basin and Orange County, to discuss the institutional and financial aspects of the program.

Screening of the ten alternatives resulted in four study proposals: Project A - Direct Storage in Chino Basin; Project B - Indirect Storage in Chino Basin; Project C - Indirect Storage involving the adjacent Cucamonga Ground Water Basin, and Project D - Indirect Storage involving the adjacent Lytle Creek Ground Water Basin. These four projects appear feasible and were found to have capacity for developing over 123 000 dam^3 (100,000 acre-feet) per year of incremental yield for the SWP.

Project A involves storing SWP water either by surface spreading or by injection wells. Project B involves an indirect storage program with members of a local Joint Power Agency, who are planning to build a water treatment facility to serve filtered SWP water to the west side of Chino Basin. Project C is a "put and take" indirect storage operation using the Cucamonga Ground Water Basin. "Put and take" refers to a method whereby the water is put in storage and taken out within a specified

length of time, usually a year, as opposed to a long-term storage situation. Project D, a similar operation involving the Lytle Creek Ground Water Basin, was subsequently dropped due to lack of local interest.

Draft reports for Projects B and C were prepared in 1981-82 and two public information meetings were held. The Chino study is expected to be completed during 1982-83.

Santa Clara Valley Ground Water Storage Reconnaissance Study. The Department and Santa Clara Valley Water District have initiated a reconnaissance level study of the Santa Clara Valley ground water basin. This study began in September 1981 and is scheduled for completion in February 1983. Phase I of this study, a short investigation to evaluate the probability of successfully implementing a ground water storage program, has been completed. Phase II is underway and consists of a detailed analysis of the physical, operational, and institutional aspects of a ground water storage program. Further feasibility work will depend on results of the reconnaissance study.

San Bernardino Valley - San Gorgonio Pass Feasibility Study. The Department, San Bernardino Valley Municipal Water District, and San Gorgonio Pass Water Agency have signed an agreement to determine the feasibility of increasing the SWP's yield through ground water basin storage programs and water exchanges. The study will also benefit San Gorgonio Pass Water Agency indirectly in that it evaluates alternatives for meeting the Agency's future water demands through SWP imports.

During 1981-82, the broad concept and overall strategies for ground water basin storage programs and water exchanges in the study area were developed. The geology and hydrology of the local ground water basins were evaluated, and an inventory of local existing and proposed facilities was conducted to assess the interrelationships between ground water basin storage programs and future SWP operations within the study area. In addition, alternative storage program proposals for early implementation or further evaluation during the feasibility study were developed. This investigation is currently interrupted pending a reanalysis of the probability of successfully implementing a storage program in the basin.

Kern River Fan Ground Water Storage Feasibility Study. The Department has had discussions with the Kern County Water Agency regarding a joint feasibility-level study of the Kern River Fan area. The discussions are presently in recess pending completion of a water optimization study sponsored by water districts in Kern County. A feasibility-level investigation may be scheduled pending future successful negotiations.

San Joaquin Valley Hydrologic - Economic Model. The Department has also contracted for a San Joaquin hydrologic-economic modeling study, which is scheduled for completion in October 1982. The objective of this general-funded study is to develop a modeling system that will assist the Department in evaluating agricultural-water imports under different supply and demand situations and alternative water management scenarios.

Water Transportation Facilities

Additional transportation facilities planned for the SWP are described below. These facilities increase the conveyance capacity of the California Aqueduct system and may contribute to SWP yield either directly or indirectly.

Harvey O. Banks Delta Pumping Plant, Additional Units. Work is underway on the Environmental Impact Report for the proposed additional pumps at the

Harvey O. Banks Pumping Plant. Four additional pumps, each rated at 30 m^3/s (1,067 cfs), are being evaluated and will increase the Banks Plant capacity from 178 m^3/s (6,300 cfs) up to 291 m^3/s (10,300 cfs).

The pumps are needed to: (1) alleviate scheduling problems for maintenance of the existing units; (2) minimize the on-peak power requirements of the SWP; and (3) increase the reliability of SWP deliveries during dry periods.

The U. S. Army Corps of Engineers (USCE) has advised the Department of operational criteria for the additional pumps that would allow installation without the requirements of a USCE regulatory permit. These operating criteria were published in a USCE Public Notice issued in October 1981. The USCE decision is currently being challenged in the courts (Sierra Club v. Watt filed March 16, 1971 in U. S. District Court of Appeals for the Ninth Circuit, No. 76-1464).

The operational alternatives included in the Environmental Impact Report will evaluate the USCE criteria as well as other criteria to determine the impact of the additional pumps. The other operating criteria will investigate ground water banking problems. The Final Environmental Impact Report is scheduled for completion in February 1983.

San Luis Canal Enlargement. As a result of increases in maximum annual entitlements, the Department's share of capacity in the joint State-Federal San Luis Division of the California Aqueduct will require enlargement by approximately 28.32 m^3/s (1,000 cfs) to convey the full SWP entitlement deliveries in accordance with summer peaking requirements. A 1982 study of the aqueduct capacity indicates that the Dos Amigos Pumping Plant in the San Luis Division has excess capacity and probably would not require modification.

East Branch Enlargement. The East Branch Aqueduct enlargement is scheduled to be completed by 1990. The size of the enlargement is expected to be either 22 m^3/s (800 cfs) or 34 m^3/s (1,200 cfs). The Department and the water service contractors are reviewing the alternatives and evaluating costs and environmental impacts of the enlargement project.

Additional Aqueduct and Offstream Storage Studies. SWP water yield studies indicate that the Project needs additional surface or underground storage capacity, particularly during critical drought periods. Storage sites located south of the Delta near the California Aqueduct are particularly advantageous from an operational standpoint. Offstream storage sites located on the western edge of the San Joaquin Valley can be considered, in addition to the existing San Luis Reservoir. Additional studies of these storage sites and of possible enlargement of sections of the California Aqueduct may be proposed by the Department.

Waste Water Reclamation and Desalination - Los Banos Demonstration Desalting Facility

The feasibility study of constructing reverse-osmosis desalination plants for the SWP continues. Agricultural drainage water in the San Joaquin Valley is the projected source of water. The major feature of this study is the Los Banos Demonstration Desalting Facility. A conceptual process flowchart for the desalting process is shown in Figure 8. Groundbreaking ceremonies were held on April 2, 1982, to begin construction of the desalting facility including the solar ponds. The facility will be operable by July 1983.

Design of the demonstration facility was completed in December 1981, following site acquisition in October. Construction contracts for the biological and physical/chemical components of the

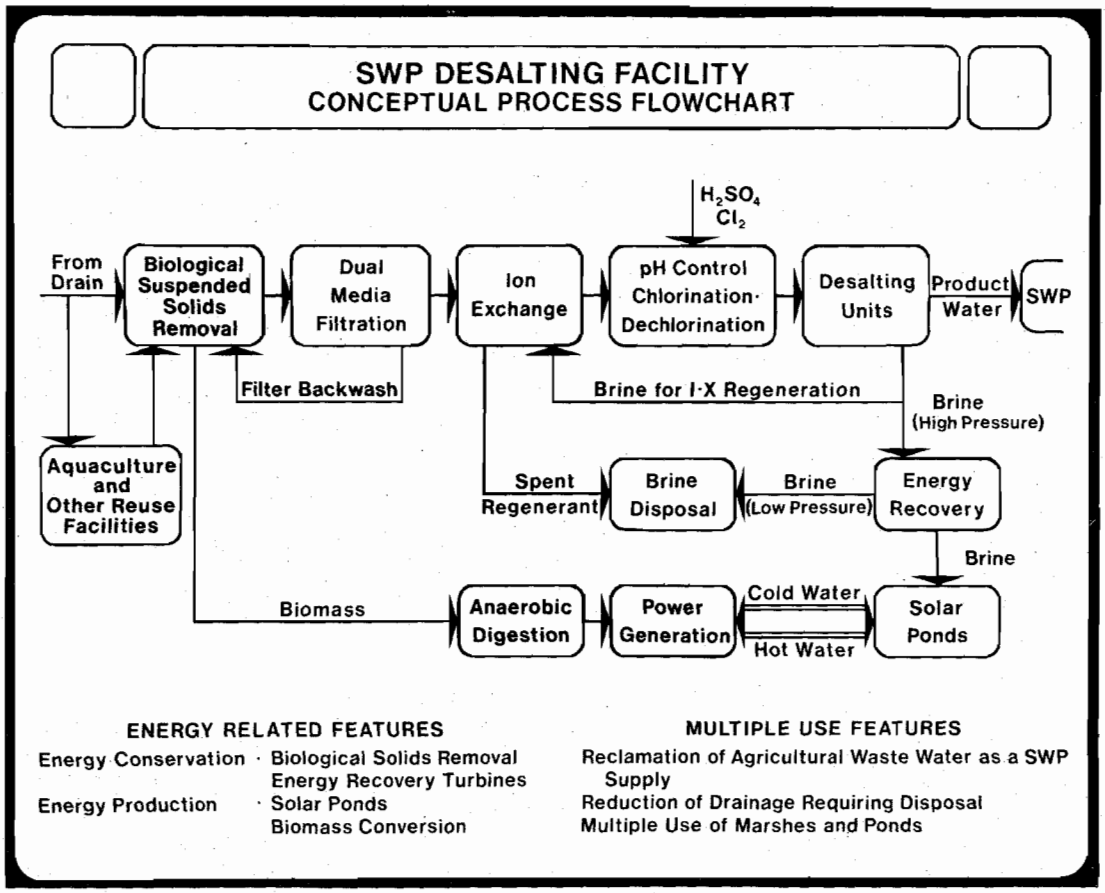


Figure 8

facility were awarded in March and April, respectively. The biological component consists of the majority of earthwork, including the marshponds and the pump station on the San Luis Drain. The physical/chemical component consists mainly of fabricating buildings and installing the water treatment equipment, including the reverse-osmosis equipment. A model of the completed facility is shown in Figure 9.

Originally, the original site for the demonstration facility was to be located Kesterson Reservoir in Merced County the terminus of the San Luis Drain. The 445-hectare (1,100-acre) reservoir stores agricultural drainage water from the federal San Luis Unit of the CVP. It is also a national wildlife refuge, however. To avoid problems of conflicting federal authorization and potential environmental impacts, the site further south at an industrial site within the city of Los Banos was chosen with the assistance of local citizens and agencies.

At its inception, the feasibility program was expected to be funded from two sources. SWP planning activities were to be Project funded, while the demonstration phase was to be funded from State Tideland Oil revenues through the Energy and Resources fund, one of the categories of the State General Fund. Because of the severe budgetary problems facing the General Fund, however, a freeze was placed on capital outlay expenditures from which no exemption was possible. On January 20, 1982, the Director designated the Los Banos Demonstration Desalting Facility a part of the San Joaquin Drainage Facilities of the SWP, thereby making the project eligible to be funded under the Burns-Porter Act.

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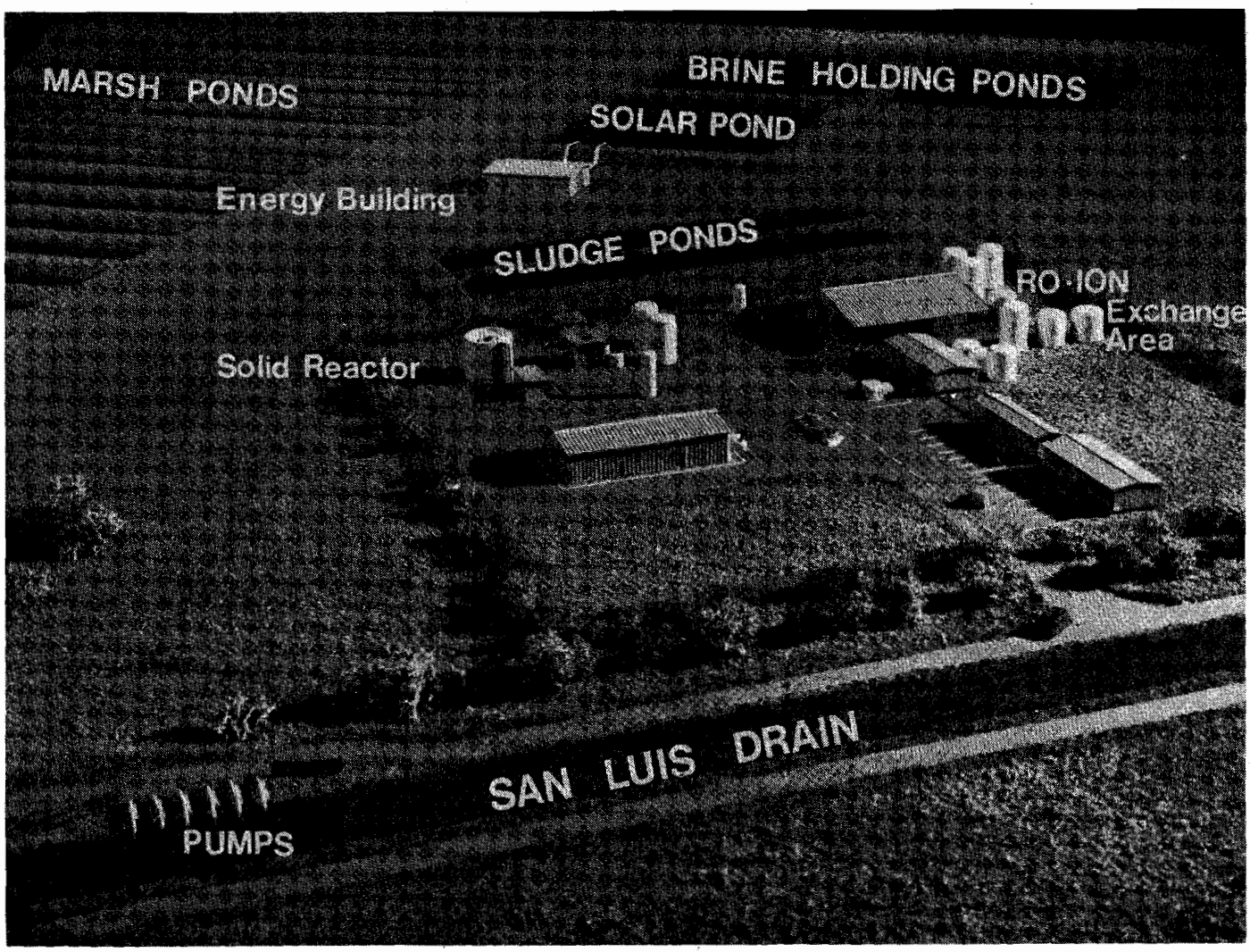
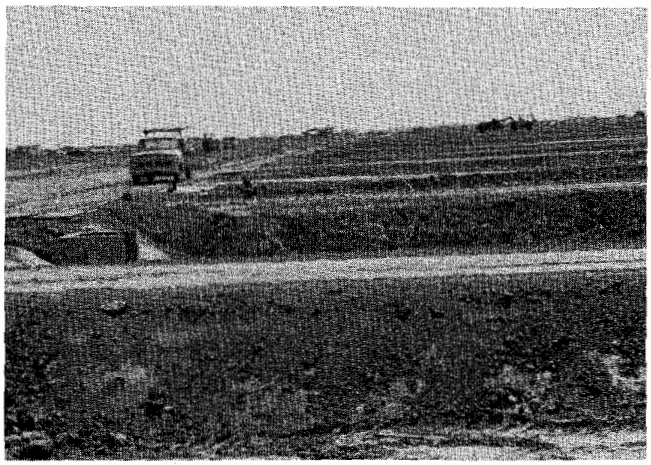


Pictured above is a model of the Los Banos Demonstration Desalting Facility as it will appear when completed.

Figure 9: SWP DESALTING FACILITY

Early stage of construction at Los Banos Desalting Facility with field offices in background. Excavation in foreground is for marsh pond effluent pump station that will feed water to the reverse osmosis units.



Marsh Pond construction at Los Banos Desalting Facility.

There will be three phases to the facility's test program. The first will consist of operating the marshponds and pilot filters and conducting other tests prior to initiating full operation of the facility. The second phase (beginning in spring 1983) will consist of operating all the components of the system and integrating them into a single, coordinated treatment process. In the spring of 1984, decisions will be made on the practicality of that process. Assuming it operates as expected, the combined system will begin sustained operation to optimize operating parameters for the range of water quality conditions within the San Luis Drain. The data will be refined for design and cost studies of a commercial-scale SWP desalting facility. This final phase will be completed by summer 1985.

Long-Range Energy Program

The purpose of the Department's "Long-Range Energy Program" is to obtain environmentally sound, cost-effective power supplies for operation of the SWP.

The significant variability in projected energy requirements for the SWP points out the importance of strategic system-wide power planning for the State Water Project; i.e., the process of understanding the dynamics of changes as they related to short-term decisions (e.g., analyzing the impact of alternative load management strategies, evaluating impacts of alternative sales and demand growth rates, and evaluating effects of conservation measures).

The 1970's turned the world upside-down for utilities, and they had to scramble to catch up. It has become increasingly difficult to react to the fast-changing conditions and complex problems utilities have been facing since the early 70's; and the 80's and 90's will likely be even more turbulent. Hence, the need for and development of more formalized strategic planning is a powerful tool that is being used. Computer-assisted decision making and more structured planning will not only differentiate successful organizations from unsuccessful ones, but will be a prerequisite for survival. For this reason, DWR is not resisting this change, but is placing increased emphasis on systemwide power planning. Initial efforts have focused on developing a comprehensive energy plan which provides for SWP energy requirements through the year 2000. The energy requirements would be met through the following planned resources.

Hydro:

- Hyatt-Thermalito Facilities
- Recovery generation from aqueduct power plants
- DWR small hydro power plants
- Metropolitan Water District of Southern California - small hydro power plants (Phase I)
- Pine Flat Powerplant
- Lake Isabella Powerplant
- San Bernardino small hydro power plants

Coal:

- Reid Gardner Unit No. 4

Geothermal:

- Bottle Rock Powerplant
- South Geysers Powerplant

Biomass:

- Honey Lake Powerplant

Wind:

- Bethany Wind Park (TERA Corp.)

Cogeneration:

- Veterans Home - Yountville, Calif.

Contracts:

- Southern California Edison Power Contract
- Southern California Edison Capacity Exchange Agreement
- PGandE Comprehensive Agreement
- Pacific Power and Light Company Agreement
- British Columbia Hydro and Power Authority Agreement

In addition to planned resources for the SWP, the Department is rapidly moving toward development of other potential resources to augment the resources shown above. These potential resources, which include biomass, cogeneration, wind, and additional hydroelectric and geothermal projects, emphasize the Department's commitment to the development of renewable energy resources. At the same time, research and development activities continue to provide the Department with new concepts for power generation which may be feasible for use on the SWP in the future. Current program activities include the solar ponds energy project -- part of the Los Banos Demonstration Desalting Facility -- and the demonstration binary cycle geothermal power plant in the Imperial Valley (Heber Powerplants).

Prior to development and implementation of the "Long-Range Energy Program", energy for operation of the Project was provided from the Department's recovery plants and through purchases from other electric utilities in California and the Pacific Northwest. These energy purchases must be replaced by new supplies after the existing contracts terminate in 1983.

Criteria For Selecting Resources

While there are several factors which influence the selection of specific resources (environmental, technical and financial constraints, etc.), efforts to secure additional energy resources are guided by the Department's energy policy to:

- provide 70 percent of the energy requirements associated with operation of the SWP through use of renewable and geothermal resources;
- become energy self-sufficient and operate the SWP as an interconnected utility system by 1983.
- acquire energy resources and transmission services for SWP in a manner that (a) is economically sound, (b) has the highest regard for environmental concerns, (c) promotes the best use of the existing capacity of SWP facilities; and (d) represents a diversified mix of energy resources;
- maximize use of energy conservation techniques and systems (including water conservation) in order to reduce energy requirements;
- use SWP resources to meet pumping loads in a manner that minimizes the need for additional capacity resources;
- identify and undertake research and demonstration projects to determine the feasibility of new energy generation technologies.

The costs of capacity and energy from potential energy projects and the feasibility of these projects are currently being evaluated based upon the needs of the Department and the performance standards the project is able to guarantee. Factors being considered include:

Capacity Resource vs. Noncapacity Resource. Projects providing firm capacity are more valuable than noncapacity resources. These projects, which are more predictably reliable, are of greater utility and value in resource planning and scheduling because they require fewer back-up resources than those projects with unproven reliability. Firm energy projects to be used for SWP pumping generally increase the need for installed and spinning reserve generation.

Resource Usability. Some projects provide a better match with our energy loads; that is, they are available when we need them. For example, flood control releases from reservoirs through hydroelectric generation plants provide a nonpolluting source of energy. However, at some periods of time, hydroelectric energy may exceed SWP load demands and must be sold to other users. Fluctuation in reservoir storage levels between wet water years and dry water years also impact the extent of future availability of the resource. Finally, the proposed project must be capable of being operated under the Western Systems Coordinating Council guidelines and standard electric utility operating practices.

Resource Risk. The long-term availability of fuel supply and sensitivity to price changes due to market demands or other institutional uncertainties are major considerations for certain projects. Today's project may utilize a fuel of marginal value and minimal cost; however, once a need for the fuel source is established, the unit price for the fuel may escalate to a point that would make the project economically infeasible. Current projections should indicate sufficient fuel throughout the project life to meet the project needs. Contractual assurances on the amount of escalation of fuel cost and firmness of supply during the project life are also required.

Technological Risk. The state-of-the-art for certain energy production systems may have significant cost impact, positive or negative, upon a project. A new system may appear innovative and cost-effective but involve a risk that future technological improvements may prove today's equipment obsolete or difficult to maintain. On the other hand, other projects use technologies that have been proven over time (e.g. hydroelectric), where certain levels of reliability, maintenance, and life can be reasonably expected. An example of technological risks which may be imposed on a project is the emissions control equipment for geothermal and biomass fueled projects.

All trade-offs and criteria considered, the Department may proceed with a high technological risk project under research and development status as a means of consolidating the elements of science and engineering, equipment performance, regulatory requirements, resource availability and costs into a working system. Where the technological risk is high, projects developed and financed by others, where the Department secures power on a "take or pay basis", can limit the Department's exposure to the risk.

Transmission Availability and Costs. Projects that can be accommodated under existing contracts have an advantage over projects in which new interconnection, energy exchange, and transmission agreements must be developed with other electric utility systems. Projects that require construction of long transmission lines for small generating facilities tend to increase cost of such facilities as compared to other alternatives.

Life Cycle Cost. Project decisions are not made solely on the basis of first cost. There are considerable uncertainties regarding inflation, escalation of fuel costs, construction delays, interest rates, and regulatory health and safety requirements, all of which influence total project development costs. Life cycle cost analysis will identify trade-offs between initial capital costs and annual operations, maintenance, and fuel costs. Projects with substantial first costs, such as hydroelectric and wind, may be attractive since no fuel is consumed that is subject to escalation.

Resource Ownership Considerations. Department ownership of generating facilities results in a freezing of a portion of the power costs rather than purchasing power at ever-escalating rates. However, purchasing power from other parties avoids the need for up-front financing and may result in lower cost to meet uncertainties in SWP energy load growth by taking advantage of current market conditions. If the project is built by others, the Department may want the first right of refusal to establish or increase an equity position in the project at some future date.

Financial Feasibility. Project financing must consider existing capital funds available, anticipated market interest rates, market competition, anticipated bond rating and discounts. Financing arrangements by others may provide an attractive alternative during periods of high interest rates by providing access to new energy projects without a capital expenditure.

Cash Flow Considerations. Assuming the capital investment in the project can be funded, the Department must assure that its obligations for debt service, operation and maintenance, and replacements can be met.

Environmental and Institutional Considerations. Mitigation measures and costs for maintaining environmental quality must be identified if a project is to be developed. Agencies which must approve permits and agreements for transmission, power sales, or exchanges must also be considered, and major factions opposed to development of a project due to environmental problems (e.g., air pollution) and the mitigation measures and costs for removing such opposition must be evaluated. Finally, each proposed project must be compatible with the State of California's energy policy, the California Environmental Quality Act (CEQA), and the State's energy resource mix.

Within the framework of the above stated policy and guidelines, Department activities to ensure that sufficient energy resources are available for operation of the SWP have moved in three general directions: (1) purchase, sale, and/or exchange of energy from other utilities; (2) acquisition of transmission service required for operation; and (3) participation in joint ventures or independent development of energy generation facilities.

Purchase, Sale, and/or Exchange

In addition to power contracts negotiated in previous years (see Chapter VI, Figure 20), during 1981, the Department initiated negotiations with interested utilities for the purchase or exchange of additional capacity from Hyatt-Thermalito (see page 20, Bulletin 132-81). As a result of these negotiations, in September 1981, Southern California Edison Company (SCE) and the Department executed an agreement providing for the exchange of 225 MW of Hyatt-Thermalito on-peak capacity and energy beginning, at the Department's option, between December 1984 and April 1987. In return, the Department will receive off-peak capacity, energy, and other services from SCE to operate the SWP.

In March 1982, the Department finalized two contracts for surplus interruptible energy with entities in the Pacific

Signing of a second contract between DWR and Southern California Edison. Seated (left to right) are: Deputy Director Mary Anne Mark; DWR Director Ronald B. Robie; Deputy Director Robert W. James; and Chief of the Energy Division Frank J. Hahn.

Northwest -- Pacific Power and Light Co. and British Columbia Hydro and Power Authority. The contracts are effective as of March 8, 1982, and may be terminated on one month's notice by either party, or December 31, 1991, whichever occurs first.

The Department is continuing to pursue arrangements for the purchase, sale, and exchange of power from Bonneville Power Administration and other Pacific Northwest sources, such as Portland General Electric, as well as sources in the Pacific Southwest.

Transmission Service

During 1981, the Department continued negotiations with PGandE on an agreement for transmission service and interconnection to operate the SWP generating, pumping, and recovery plants after April 1, 1983. On April 22, 1982, these negotiations culminated in the execution of a long-term agreement for transmission services and interconnection in PGandE's service territory. The agreement provides the Department with the following services and opportunities: (1) up to 1465 MW of firm transmission service, and rights to interruptible service; (2) the opportunity to participate in the ownership of a new 500-kV line to access energy resources in the Pacific Northwest, if, in the future, PGandE decides to construct such a line, and (3) the right to participate in the construction of PGandE's planned 230-kV transmission line from The

Signing of PGandE agreement on April 22, 1982. Left to right: Director Ronald B. Robie and Barton W. Shackelford (President and Chief Operating Officer of PGandE).

Geysers to Lakeville. In return, the Department will pay for transmission reinforcements between Table Mountain and Tesla Substations which are needed to meet DWR's requirements for transmission service under the agreement. The Department will be reimbursed for this expenditure with interest by credits to its monthly bill for transmission service. The agreement, effective April 1, 1983, is a major step in providing transmission service required for operation of the SWP, and allows the Department to meet its commitments to SCE under previous agreements.

As mentioned above, PGandE is currently planning to construct additional transmission lines in Lake, Sonoma, and Contra Costa Counties to transmit energy from The Geysers, including energy from PGandE geothermal plants, other utilities' geothermal power plants, and DWR geothermal power plants (Bottle Rock and South Geysers). These new transmission lines (approximately 91 miles) will connect the Castle Rock Junction to the Lakeville Substation, and the Lakeville Substation to the El Sobrante Substation. The California Energy Commission (CEC) issued a certificate on September 30, 1981 for PGandE to construct lines from Castle Rock Junction to Lakeville Substation. The California Public Utilities Commission (CPUC) issued a certificate for PGandE's lines from the Lakeville Substation to El Sobrante Substation.

On October 30, 1981, the Department and PGandE signed an agreement providing for the installation of a heavier transmission tower for the interconnection of Bottle Rock's transmission line with PGandE's transmission system. This will permit the delivery of energy from Bottle Rock into PGandE's system for transmission to DWR's loads.

Kings River Conservation District has also contracted with International Engineering Company for the design and construction of transmission facilities from the Pine Flat power project to PGandE's Balch-McCall 230-kV transmission line. The transmission line is less than one mile long and will permit the delivery of energy to DWR's loads. Construction is scheduled to begin in 1982.

The Department continues to maintain its right to 300 MW of transmission capacity on the Pacific Northwest EHV intertie lines under a contract that terminates in 2005. The Department's intertie capacity will be used to purchase, sell, or exchange energy with the Pacific Northwest -- an important part of the Department's Long-Range Energy Program.

Resource Development Projects

Alternative energy options are evaluated as factors affecting the energy market change and as it becomes necessary to reevaluate the Department's energy resource plan. During 1981, the range of options either being considered for development or actually being developed by the Department included the following:

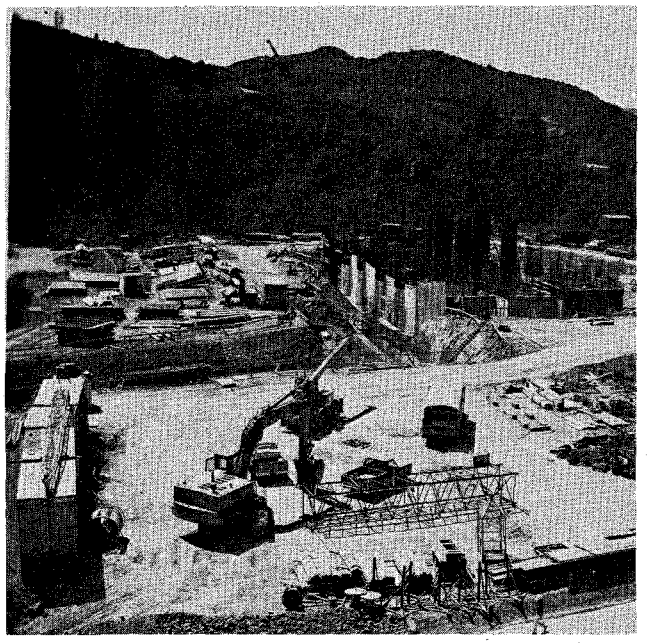
Geothermal. The Department is continuing development of this energy resource.

1. Bottle Rock Powerplant. This plant, located on the Francisco Leasehold in Lake County, is the first 55-MW geothermal unit the Department is developing in the Geysers area (also see page 20-21, Bulletin 132-81). The steam to operate the Bottle Rock Powerplant -- approximately 453,590 kg/hr (one million pounds per hour) -- will be supplied to the plant under contract with McCulloch Geothermal (MCR), Geothermal Kinetics, Inc. (GKI), and Entex Petroleum.

The power plant and related facilities will include a 55-MW turbine-generator, a condensing system cooling tower, electrical switchyard, and atmospheric emission control systems. Bottle Rock will be connected to PGandE's transmission system through the construction of a 1.77 km (1.1 mile) 230-kV transmission line. PGandE will transmit Bottle Rock energy for the Department pursuant to a recently executed agreement (see Transmission Service above).

On December 2, 1981, the Department sold $100 million of revenue bond anticipation notes to finance a portion of the capital costs of the Bottle Rock geothermal power plant and the Alamo hydroelectric power plant. The notes bear an interest rate of 9.5 percent and will mature on June 1, 1985.

In January 1982, bids for the main construction of the power plant were opened, and the Department awarded the contract to Peter Kiewit Sons. In the same month, initial site development for the Bottle Rock Powerplant was completed. The plant is scheduled to begin commercial operation in June 1984.



Initial construction of powerplant building at Bottle Rock Powerplant in Lake County.

delayed for many weeks because of unusually heavy rains this winter, GKI, the steam supplier, completed the access road to the plant site in early June. The Department awarded the contract for initial site development at South Geysers to Frank Pozar. Ground breaking ceremonies were held on July 9, 1982, and construction of the South Geysers Powerplant has commenced. The plant is scheduled for commercial operation beginning in July 1985.

2. South Geysers Powerplant. The Department's second geothermal plant in "The Geysers Geothermal Resources Area" is the South Geysers project, a 55-MW plant located on the Rorabaugh Leasehold in Sonoma County (also see page 21, Bulletin 132-81). The steam supplier for South Geysers is GKI.

   The Department filed an Application for Certification (AFC) with the CEC in March 1981, and the CEC issued a final certificate for the project on November 18, 1981. After being

Initial site work for access road at South Geysers Powerplant in Lake County.

3. Binkley. The Department owns the right to explore and develop geothermal resources on the Binkley Leasehold, a 190-hectare (471-acre) parcel of land located adjacent to the Francisco Leasehold in Lake County. During 1981, exploration drilling on the leasehold was deferred pending final negotiations on an agreement with MCR and GKI for exploration and development of the resource. The Department is continuing negotiations with MCR and GKI.

   Because geothermal development at the Binkley Leasehold is still in the exploratory stage, a decision to build a power facility at the site is not expected until some time in 1983. If a decision is made to proceed, the current schedule is for commercial operation to begin sometime in 1988.

4. South Brawley. The South Brawley project is a joint venture with MCR Geothermal and Geo Mac Incorporated (collectively known as CU I Venture). As reported in Bulletin 132-81, the Department is contributing 25 percent toward the costs for exploration, testing, and development of the geothermal resource on MCR's 4,622 hectares (11,422 acres) in return for a 25 percent share of any benefits derived from development of the resource.

   In October 1981, Milestone II testing and exploration began on the leasehold. This confirmation phase involves the drilling and testing of from one to three confirmation wells. The objectives of the two-phase program are to define the fluid properties and chemistry, measure well productivity, assess reservoir size, and to determine the commercial availability of the resource. The U. S. Department of Energy has approved release of funds for the second stage of exploratory drilling and fluid testing of the South Brawley Project. Meanwhile, the Department has come to an agreement with Bechtel Group, Inc. to formulate the conceptual design for the power plant to be located on the South Brawley Leasehold. The conceptual design will include design of a brine gathering system as well as a cooling water optimization study.

   After completion of Milestone II activities, the Department will make a decision whether or not to construct a 45-MW geothermal power plant at the site. If such a decision is affirmative, construction on the project is planned to begin in early 1984 with commercial operation beginning in 1986.

5. Heber. The purpose of the Heber Project is to demonstrate the commercial viability of utilizing a two phase "binary cycle" to generate electricity from geothermal hot water. The "binary cycle" uses heat exchangers to transfer heat from hot geothermal fluid to another fluid which, upon heating, vaporizes and drives a turbine.

   The project, managed by San Diego Gas and Electric (SDG&E), will be located in the Imperial Valley near the town of Heber. SDG&E, the Department, the State of California, and the Imperial Irrigation District are participating in the project as part owners (82, 3.2, 4.3, and 10.5 percent, respectively, based on current cost estimates). In addition, the U. S. Department of Energy, the Electric Power Research Institute, and SCE are contributing funds to the project. The Department's share of ownership is being funded by, and the energy will be utilized by, the SWP. The State's share is the result of a $2 million contribution from the Energy Resources Fund as included in the 1982 budget act (Chapter 326, Statutes of 1982). Federal funding has been authorized and appropriated by Congress for 1983.

Construction of the Heber project is scheduled to be completed in July 1985. A two-year demonstration period will begin upon completion of the plant. The demonstration power plant will have a capacity of 45 MW. If the Plant operates successfully, the Department will receive approximately 10 million kWh annually for its share of ownership in the project.

Hydro. During 1981, the Department made significant progress in its program to develop hydroelectric projects at existing hydraulic structures such as dams, canals, and pipelines.

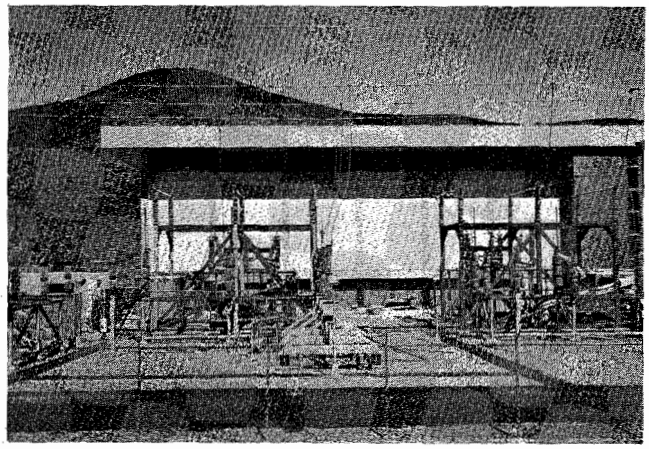
1. William E. Warne Powerplant. Facilities of the recovery project (formerly Pyramid Powerplant) include (a) Quail Lake and Lower Quail Canal; (b) Peace Valley Pipeline (Phase I), with one 3.65 metre (12 foot) diameter pipe; and (c) William E. Warne Powerplant (Phase I), with two 37.5 MW generators and appurtenant facilities.

   The Peace Valley Pipeline intake facilities and completion of Quail Lake and Lower Quail Canal work were completed in March 1982. Construction of William E. Warne Powerplant continues. The Phase I facilities are expected to be operational in late 1982 and will be adequate to convey water deliveries until at least the mid-1990s.

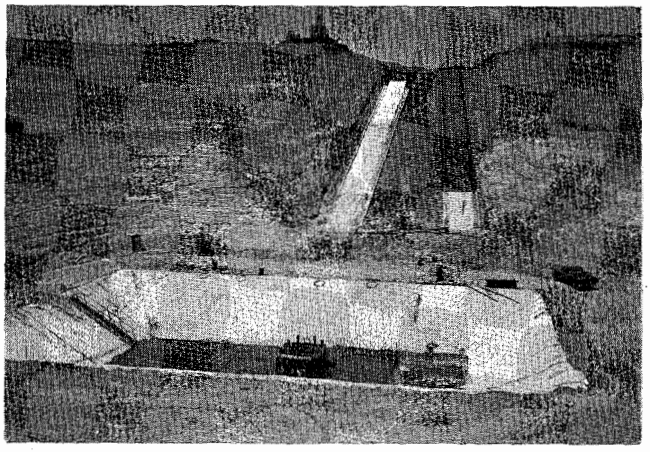
   Phase II, consisting of a parallel pipeline and two additional 37.5-MW generating units at the power plant, may be required, depending on MWD requirements for water deliveries from the West Branch of the California Aqueduct.

   The Department intends to use the electric power available from the William E. Warne hydroelectric project for SWP pumping. The electric power made available by the facility in 2000 is expected to provide approximately 5 percent of the total estimated electrical energy requirements for SWP pumping.

2. Alamo Powerplant. Alamo Powerplant (formerly Cottonwood Powerplant) will be located on the California Aqueduct approximately 16 kilometres (10 miles) east of Gorman in Los Angeles County (also see page 23, Bulletin 132-81). The first phase of this facility (Unit No. 1), now under construction, will have a capacity of 17 MW and will produce up to 115 million kWh/yr. Bids for the civil works opened in February 1982 and the $18 million contract was awarded to Granite Construction Company. In December 1981, the Department sold $100 million of bond anticipation notes to finance a portion of the cost of constructing Alamo Powerplant (Phase I). Unit No. 1 is scheduled to be on-line in May 1985.



Switchyard at recently completed William E. Warne Powerplant.



Construction of foundation at Alamo Powerplant.

Installation of the second turbine/generator unit (Unit No. 2) at Alamo depends on the future East Branch enlargement. If the aqueduct is enlarged, the Department estimates the second phase of this facility will have an installed capacity of 12 MW and will produce 90 million kWh/yr.

3. Small Hydro Projects at SWP Sites. The Department is committed to evaluating all remaining small hydro opportunities on the SWP. Further analysis of potential sites in 1981-1982 has led to a revision of previously reported scheduling of small hydro project construction. Three previously reported projects (Frenchman, Antelope, and Western-Richvale Outlet) have been indefinitely postponed. Table 8 is a list of the Department's small hydro projects and their expected commercial operation dates. In November 1982 the department plans to sell revenue bonds to fund initial construction of several of the projects shown in the table.

Federal Energy Regulatory Commission (FERC) applications were filed on all of the following projects (except Mojave Siphon No. 2) in 1982. In addition, water rights applications are being prepared. The majority of these units will be under construction by November 1983.

Revenue Bonds will be sold in November 1982 to finance construction of several of the following small hydro projects.

TABLE 8: SMALL HYDRO PROJECTS AT SWP SITES

Project	Location	Installed Capacity (kW)	Yearly Generation (million kWh)	Anticipated Operating Date
Thermalito Diversion Dam	Butte County	3,000	23.4	February 1985
Mojave Siphon No. 1	San Bernardino County	7,200	57.8	September 1985
Mojave Siphon No. 2	San Bernardino County	12,000	52.0	Depends on the enlargement of the California Aqueduct
Pyramid Outlet	Los Angeles County	1,300	3.9	May 1985
Castaic Outlet	Los Angeles County	1,000	2.7	May 1985
Sutter Butte	Butte County	2,400	8.2	May 1985
Thermalito Afterbay	Butte County	13,000	48.4	November 1984
Palermo	Butte County	430	1.5	July 1985
Las Flores	San Bernardino County	190	0.9	December 1985
Del Valle No. 1	Alameda County	5	0.04	Currently installed
Del Valle No. 2	Alameda County	130	0.8	December 1985

4. Pine Flat. After winning a competitive bid process in 1977, the Department, in November 1979, contracted with Kings River Conservation District for SWP to purchase the output from the Pine Flat project (also see page 24, Bulletin 132-81). This project will capture energy now wasted through dissipation valves. Currently under construction, the project was about 66 percent completed as of June 30, 1982. Upon completion the project is expected to generate about 420 million kWh annually. The first unit of the 165-MW power plant is scheduled for completion in April 1983 (Unit No. 1).

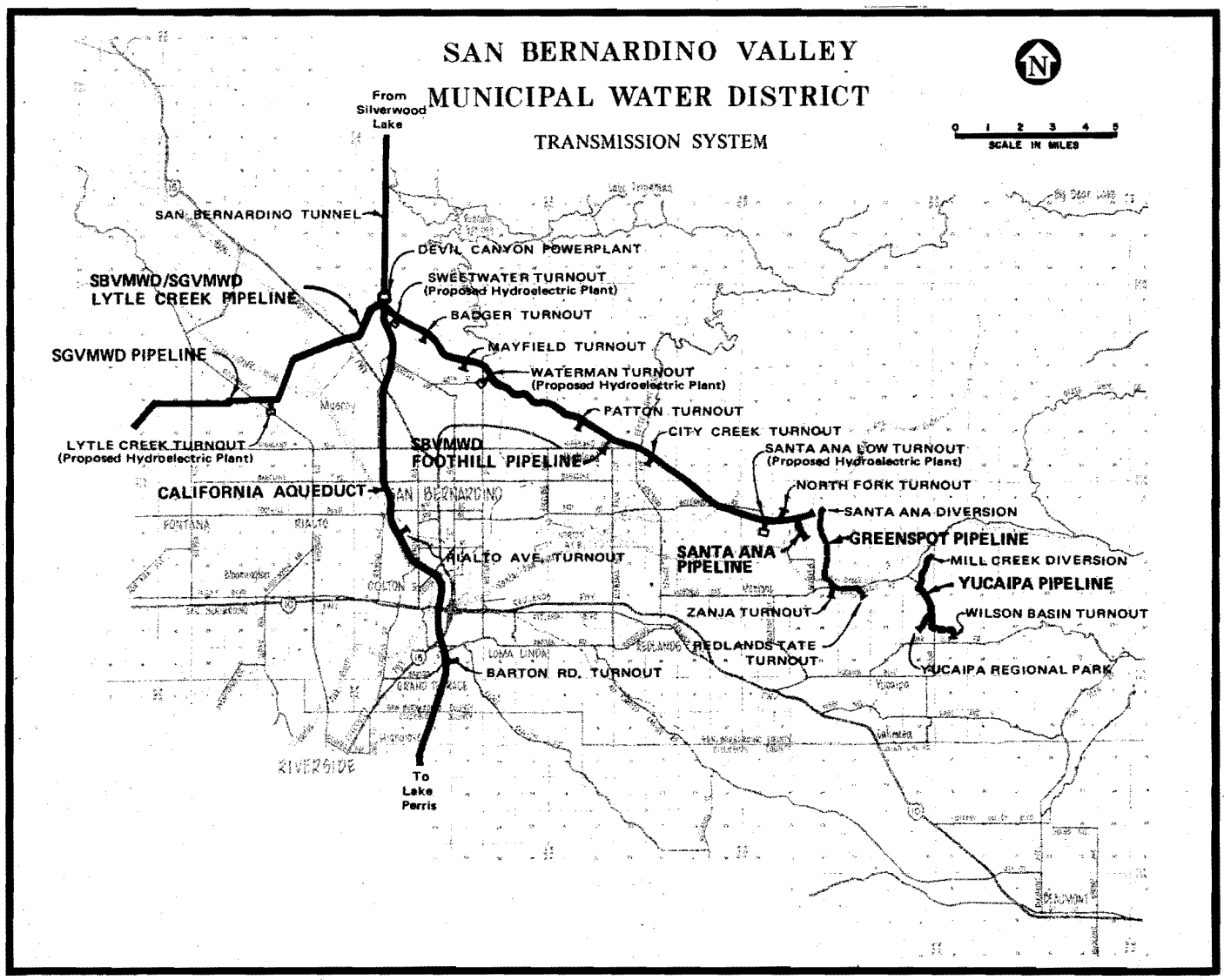
5. Isabella Lake. Isabella Lake is owned and operated by the U. S. Army Corps of Engineers. It provides for storage of irrigation water, flood control, and conservation. On June 9, 1981, the Department received a FERC Preliminary Permit to conduct studies for the preparation of a FERC license application for a power plant at this existing facility. The effective date of the permit was later suspended pending ruling by the Commission on an appeal by North Kern Water District (NKWD). Although the Department completed a draft environmental impact report and a preliminary engineering study for converting the existing outlet tunnel into a penstock for the project in 1981, all other work on the project was temporarily suspended pending a FERC ruling on the appeal. In May 1982, the FERC denied the appeal by NKWD. The Department is now preparing the license application, which is expected to be complete in November. The proposed 8-MW power plant is scheduled for completion in December 1985 and is expected to generate approximately 23.4 million kWh annually.

6. MWD Hydro. The Department's contract to purchase the production output (30 MW) from five small hydro developments on MWD's system (Phase I) was described in Bulletin 132-79 (see page 10). Purchases will commence April 1, 1983. In addition to construction progress reported in Bulletin 132-80 (see page 116) and Bulletin 132-81 (page 25), the Foothill Feeder Plant was completed in January 1981, the San Dimas was completed in June 1981, and the Yorba Linda plant was completed in October 1981.

   In September 1981, the Department submitted a bid in competition with other utilities to purchase the output from additional plants being developed by MWD (Phases II-V). These phases consist of nine power plants having a total capacity of 42.5 MW. In April 1982, MWD selected SCE as the successful bidder for MWD Hydro (Phases II-V).

7. San Bernardino Hydro Projects. In 1981, the Department began investigating the hydroelectric potential on four turnouts on the Lytle Creek and Foothill Pipelines of the San Bernardino Valley Municipal Water District (SBVMWD). On July 14, 1982, the Department signed an agreement with the SBVMWD, in which the Department received an option to develop the four small hydro plants on the SBVMWD's water distribution system. The four small hydro facilities and the respective capacity of each facility are as follows:
   (a) Sweetwater Turnout (2.2 MW);
   (b) Waterman Turnout (5.3 MW);
   (c) Santa Ana Low Turnout (1.7 MW);
   and (d) Lytle Creek Turnout (1.1 MW).
   The hydro plants have a total combined capacity of approximately 10 MW. The San Bernardino projects are presently in the early planning stages of development. If the projects prove feasible and the Department decides to proceed with development, they would become SWP facilities. Current project scheduling anticipates commercial operation of the hydro facilities by March 1986. Figure 10 shows the location of these four facilities.

Figure 10: SAN BERNARDINO SMALL HYDROS



8. Devil Canyon Powerplant -- Additional Power Units No. 3 and 4. The Devil Canyon Powerplant is located on the California Aqueduct in the vicinity of San Bernardino in San Bernardino County.

   Presently, the Devil Canyon Powerplant hydroelectric has an installed capacity of 120 MW. The proposed East Branch enlargement would result in potential for additional capacity at the plant. The installation of two additional units at the facility, for an additional 120 MW of capacity is being studied by the Department.

9. San Luis Pumping-Generating Plant Additional Power Unit No. 9. The Department is investigating the feasibility of adding a new pumping-generating unit at the San Luis Pumping-Generating Plant. The San Luis Pumping-Generating Plant consists of eight reversible pumping-generating units located at the base of San Luis Dam. The plant has a design generation capacity of 424 MW at maximum head, of which the Department's share is about 222 MW. Power Unit No. 9 will provide an additional 60 MW of spinning reserve and pumping capacity for the

facility. Although the main purpose of the San Luis Project is water storage, it provides flexibility of the operation of the SWP because of its pump-back capability.

Energy Savings at San Luis. The Department is negotiating a contract with General Electric to rebuild two motor-generator units at San Luis Generating Plant at an approximate cost of $2 million.

Rebuilding the motor-generators will save the Department and USBR about 17 million kWh hours of electricity and over $1.4 million annually. The generators' rotating speed will increase, giving greater pumping efficiency at higher reservoir levels.

Large amounts of electricity are used at San Luis to fill the reservoir each year. Severe operational conditions are imposed on the pumps because of the great variations in the water level over the year and unstable winter flow conditions. As a result, pumping efficiency rapidly declines from a normal rate of about 90 percent during filling of lower levels to only 60 percent during filling of the top 4 metres (13 feet) of the reservoir.

The work is planned to be completed by August 1983.

Biomass Honey Lake Project. The Department is also evaluating development of the Honey Lake Project in participation with other parties. This proposed hybrid geothermal-woodwaste power plant is classified as a biomass-fueled project. In September 1979, the Department signed a 3-party agreement (Department, Geo Products Corp., and U. S. Forest Service) to study the feasibility of constructing this unique hybrid power plant. The 55-MW plant would be the first in the world to combine two abundantly available resources -- moderate temperature geothermal water and forest residues -- to generate electricity. The power plant will be located adjacent to the Wendel-Amedee known geothermal resource area. Wood refuse from forest timber harvesting and forest thinning in the area will be delivered by truck from several sawmills in the area. (For additional detail, see Bulletin 132-80, page 120.)

Studies to evaluate the technical, economic, and environmental feasibility of constructing, operating, and maintaining a 55-MW hybrid geothermal-woodwaste plant are now in progress. This work was expected to be completed by December 1981 (see page 26, Bulletin 132-81). However, the geothermal reservoir evaluation was delayed by a crack in the well casing. The damaged section was repaired, and testing and evaluation was completed in the middle of March 1982.

Preliminary test results have verified the existence of an adequate geothermal resource at the site and, overall, the results are favorable for the project. The Department is presently completing review of the results. Following review, a decision will be made on whether to proceed with the drilling of a second well at the site, and environmental document for the project will begin.

Current discussions with GeoProducts indicate there is good reason to believe that an alternative binary cycle geothermal-woodwaste design may be selected for this project. The new concept would greatly reduce the amount of wood fuel required and would put more emphasis on the use of geothermal fluids for a heat source. If this concept is selected, the capacity of the power plant would be less than 55 MW.

After confirmation of the geothermal resource and an evaluation of financing and ownership options, the Department will decide whether to proceed with the project and contract with GeoProducts. The existing agreement between the Department and GeoProducts grants the

Department the first right-of-refusal to purchase energy from the project. The agreement also allows the Department to proceed with project development should GeoProducts elect not to proceed.

If the Department decides to proceed with the development of the Honey Lake Geothermal-woodwaste project, a tentative schedule for project development anticipates the filing of regulatory applications in March 1983 with permit approval following a year later. The plant is scheduled for commercial operation by December 1985.

Cogeneration. In June 1981, the final report by Kaiser Engineers on the feasibility of a group of cogeneration projects at State-owned facilities (Porterville, Fairview, and Sonoma State Hospitals and the California Veterans Home at Yountville) indicated that a 2-1/2 MW cogeneration unit was technically feasible at each of these sites. For economic reasons, however, the Department is pursuing development at the Yountville facility only.

In January 1982, the Department presented the Department of Veterans Affairs (DVA) with a Memorandum and Principles for a cogeneration agreement at the California Veterans Home at Yountville. Under the Principles, DWR is to finance all capital costs of the cogeneration power plant. DVA would own and operate the plant and would provide the Department with all of the off-peak energy produced by the plant for a period of 15 years.

Upon an agreement, the Department would design and construct the project at the Veterans Home. The Department's first cogeneration facility could be operational in January 1984. Further activities at the other State-owned facilities mentioned above have been indefinitely deferred due to the inability of the Department to negotiate a satisfactory funding arrangement and pricing of energy at rates economically equitable to both DWR and the Department of General Services.

Wind. The Department's long-range goal is to have 100 MW of wind-powered generating capacity by 1990. This will produce about 175 million kWh per year. The capacity would come from a variety of sources, including facilities owned and operated by the Department, joint Department/utility company facilities, and power purchases from private wind energy developers.

The Department began studying wind energy conversion as a potential source of power in 1973 (see page 27, Bulletin 132-81). About two years ago, it began to appear that large-scale generation of electricity from wind would be technically possible by the mid-1980s. Accordingly, the Department, with the cooperation and assistance of PGandE and CEC, began work on a demonstration project; and, based on a wind data program, selected a site near San Luis Reservoir for the first wind turbine generator. The machine is a 50-kW vertical-axis machine manufactured by DAF Indal Ltd. The project began operating in January 1981 and was officially dedicated on March 27, 1981. The major purposes of this installation are to obtain operation and maintenance experience and to determine what problems may be associated with integrating wind energy into the electric utility grid.

Other wind energy projects being pursued by the Department include:

1. Windfarms Ltd. The Department has offered to purchase wind energy generated by private developers. In March 1981, the Department, PGandE, and Windfarms Ltd. executed a Memorandum of Understanding for the world's largest windfarm (350 MW), to be located in Solano County west of the City of Fairfield. In January 1982 the Department signed a Letter of Agreement with PGandE and Windfarms Ltd. which provides DWR with an

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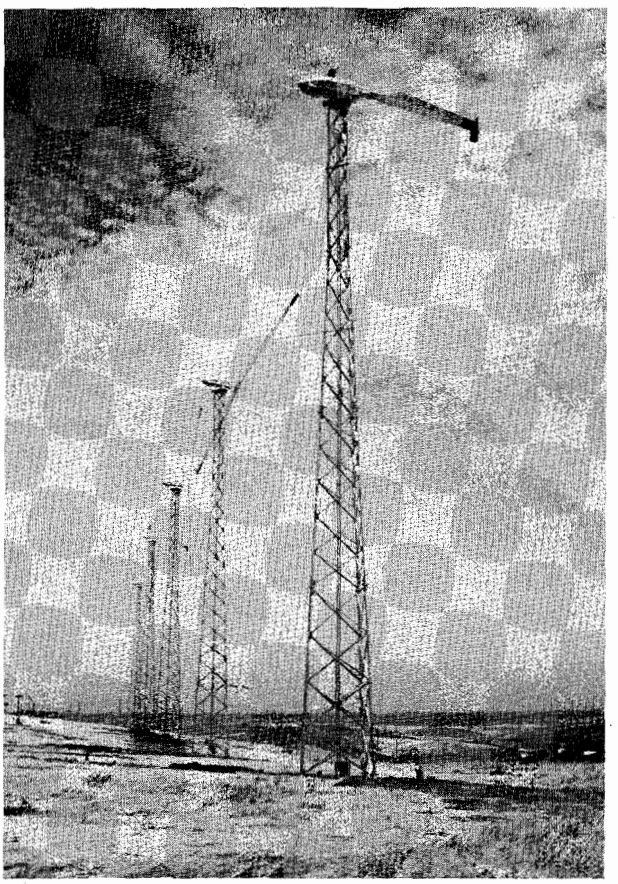
option to participate in the wind farm once the environmental documentation is complete. The Department's option permits purchase of a portion of the off-peak energy output (12.33 MW) from the first phase (72.5 MW) of the windfarm.

At the time of the January agreement, the schedule for review of the environmental issues targeted completion of that process by mid-September 1982. However, in March 1982 Windfarms Ltd. announced that it was deferring development of the project for six months, citing problems with project financing due to uncertain economic climate. Commercial operation of the first wind-turbine is scheduled to begin in June 1984. After that, the windfarm will be expanded annually in 15-MW stages through December 1990.

2. TERA Corporation. In January 1982 the Department also signed Principles for a Power Purchase Agreement with TERA Corporation for joint development of a wind energy generation facility at Bethany Reservoir. These principles were incorporated in an agreement which was executed on May 4, 1982. Under the terms of the agreement, TERA Corporation will finance, construct, operate and maintain a 10-MW windfarm on land leased from the Department. The Department will purchase all the energy generated by the project for use principally at South Bay Pumping Plant. By a separate agreement, TERA Corporation, DWR, and the California Department of Fish and Game agreed to specific environmental impact mitigation measures related to wildlife protection.

One MW of generation is presently on line. The remainder of the project will be built over the next five years on a schedule to be determined by TERA. The machines being used at Bethany Wind Park are manufactured by Energy Sciences Incorporated of Boulder, Colorado. Each machine has a rotor diameter of 16.46 metres (54 feet) and is rated to produce 5 kW at a wind speed of 48.28 kM/h (30 mph).



Wind generators at Bethany Wind Park.

The Department is also continuing the evaluation of the potential wind energy resources in the Altamont Pass, Pacheco Pass, and Tehachapi Mountain areas. A 50-metre (164.04 feet) high anemometer station, furnished by the Department of Energy (DOE), was installed in Pacheco Pass in October 1980. Wind data will be collected and evaluated through September 1982. If the results prove the feasibility of the site, a wind turbine could be installed in 1985. After September 1982 DWR has title to the DOE equipment, and may, at its option, either continue to collect and

evaluate data on wind conditions in Pacheco Pass, or relocate the station elsewhere to collect data from another site.

The Department is negotiating development rights with Tejon Ranch and tentatively plans to instrument Tejon Ranch lands sometime in 1982-83.

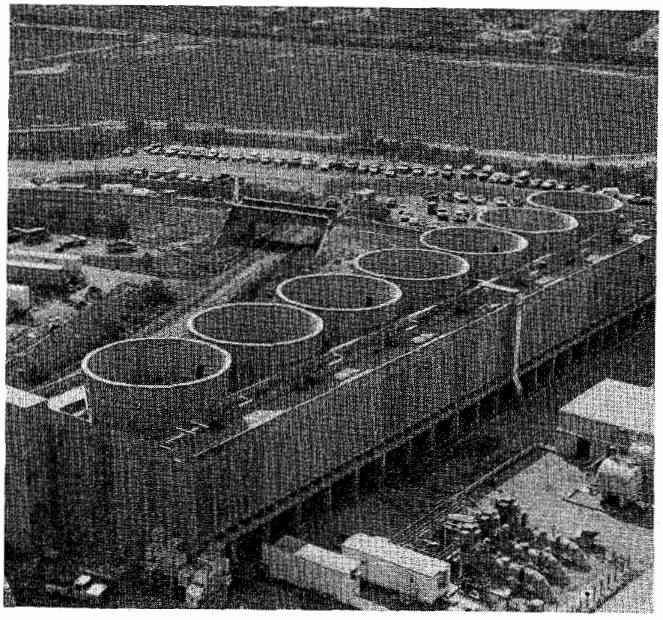
Solar. Los Banos Demonstration Desalting Facility. A decade ago, the Department began research activities to develop a concept for recycling salty agricultural waste water. In 1981 this effort resulted in the final plans for the design and construction of a demonstration desalting facility in the San Joaquin Valley.

To help offset the high energy requirements of the desalting process, some of the salty waste brine will be stored in solar salt ponds to capture solar energy to operate the 189,000-litre-per-day (50,000-gallon-per-day) desalting facility. Heat energy from the solar ponds will be used to drive the pump of the desalter and to preheat the aquaculture unit of the facility.

Groundbreaking ceremonies were held on April 2, 1982, to begin construction of the desalting facility, including the solar ponds. The facility should be commercially operable by July 1983. The energy produced at the facility will not be used to meet the pumping loads of the SWP; however, if the waste water can be recycled, less water will have to be transported to the San Joaquin Valley, thus reducing the energy required to operate the SWP.

Coal. Reid Gardner Project. As reported in Bulletin 132-81, the only coal-fired project being developed by the Department at this time is the Reid Gardner Unit No. 4 coal-fired project in Nevada. The Department's participation in events leading to the start of construction of the Reid Gardner plant is described in Bulletin 132-79 (pages 115-116) and Bulletin 132-80 (page 124). Design and construction management of the plant are by Fluor Power Services Inc. The Department is also monitoring the construction work.

Morrison-Knudson and Fegles and Lord are performing the general construction work as a joint venture. A discussion of the construction progress is included in Chapter V.



Cooling towers under construction at Reid Gardner Powerplant.

Power Costs

A well known and publicized fact is that commencing April 1, 1983, power costs for pumping SWP water will increase dramatically. The Project will no longer be purchasing inexpensive energy from utilities, and instead will be providing its own power from the various sources discussed in the previous section of this chapter. The resulting

net cost will increase almost eight times compared to the current power costs.

The Department has undertaken a long-range energy program to develop energy resources to meet future needs. The cost of energy under this program will be significantly lower than the alternative cost of purchasing energy from private utilities and will result in significant savings to SWP water contractors. Table 9 shows a current estimate of the future power costs under this program. The power requirements for this estimate are the result of the "average" water supply scenario discussed in Chapter I. The table shows each source's share of the total annual load and its respective cost in mills-per-kilowatt hour (kWh) for 1982 and every five years from 1985 through 2000. The mill rates include an allowance for future cost inflation. Also included is the composite cost for the SWP system as a whole. The composite cost is a weighted average of the resource costs. The weighting is determined by the resource's contribution to the total load required. For instance, in 1985 Hyatt-Thermalito contributes about 35 percent of the load at about 9.6 mills/kWh. This table includes only those facilities that are considered planned resources in the foregoing discussion of the long range energy plan.

Revisions of estimated mill rates, since Bulletin 132-81 was published, are primarily for those facilities that will be constructed and financed by the Department. The most significant cost increase item is for construction cost financing. The estimates for Bulletin 132-81 were done at a time when the legal limit on interest rates for Central Valley Project revenue bonds was only 8.5 percent. Due to the Department's inability to sell bonds at that interest rate in the current market, legislation was approved in 1981 which increased the upper limit from 8.5 percent to 12 percent for power facility revenue bonds sold prior to January 1, 1984. The estimates shown in the table are based upon obtaining financing at the maximum allowable interest rate of 12 percent. This has the effect of increasing the annual debt service (repayment of principal and interest) by about 30 percent for a 30-year bond.

The steam payment rates for the geothermal plants are based on estimates received from PGandE in April 1982. PGandE provided a high-range and low-range estimate. The April 1982 estimate and a March 1981 estimate from PGandE are shown below. The March 1981 estimate was used in the Department's cost estimates for Bulletin 132-81.

Mills/kWh

	1985	1990	1995	1997
March 1981	30.7	53.2	75.4	89.9
April 1982				
High	37.8	59.5	96.2	121.5
Low	28.6	48.4	82.9	104.8

The mill rate estimates shown in the "Estimated Energy Requirements and Cost" table used the high range of PGandE's estimate. PGandE based their estimates on high and low pricing scenarios for natural gas burned in their fossil-fueled plants. The low estimate assumes that natural gas prices will remain approximately 30 percent lower than prices for low sulfur residual oil. The high estimate sets natural gas prices equal to low sulfur residual oil.

As in previous estimates, the mill rates for the Honey Lake project have been set equal to the Bottle Rock Powerplant costs. It is believed that Bottle Rock costs are most representative of the anticipated costs of energy from the Honey Lake project.

TABLE 9: ESTIMATED ENERGY REQUIREMENTS AND COSTS

	Calendar Year				
	1982	1985	1990	1995	2000
TOTAL ENERGY REQUIREMENT (millions of kWh) (a	5,734	6,511	7,765	8,859	7,670
ENERGY RESOURCES (millions of kWh)					
Hyatt-Thermalito	0	2,331	2,331	2,331	2,331
Project Recovery Plants					
San Luis	71	213	214	220	199
Devil Canyon	552	905	970	1,097	756
Castiac	417	390	548	692	710
William E Warne	0	244	333	421	435
Project Small Hydro					
Alamo	0	95	117	132	98
Others	0	108	144	163	140
SCE Exchange	0	1,048	887	752	645
Pine Flat	0	423	423	423	423
MWD Hydro	0	194	257	277	275
Reid Gardner	0	1,352	1,352	1,352	1,149
Bottle Rock	0	372	372	372	372
South Geysers	0	186	372	372	372
Honey Lake	0	0	230	230	230
Isabella Lake	0	0	23	23	23
TERA Corp. (wind)	0	22	22	22	22
Cogeneration	0	10	10	10	0
Purchases (b	4,694	0	0	0	0
Potential Sales (-)	0	-1,382	-840	-30	-510
TOTAL RESOURCES	5,734	6,511	7,765	8,859	7,670
RESOURCES' PERCENTAGE					
Hyatt-Thermalito	0.000	35.801	30.019	26.312	30.391
Project Recovery Plants					
San Luis	1.238	3.271	2.756	2.483	2.595
Devil Canyon	9.627	13.900	12.492	12.383	9.857
Castiac	7.272	5.990	7.057	7.811	9.257
William E Warne	0.000	3.748	4.288	4.752	5.671
Project Small Hydro					
Alamo	0.000	1.459	1.507	1.490	1.278
Others	0.000	1.659	1.854	1.840	1.825
SCE Exchange	0.000	16.096	11.423	8.489	8.409
Pine Flat	0.000	6.497	5.448	4.775	5.515
MWD Hydro	0.000	2.980	3.310	3.127	3.585
Reid Gardner	0.000	20.765	17.411	15.261	14.980
Bottle Rock	0.000	5.713	4.791	4.199	4.850
South Geysers	0.000	2.857	4.791	4.199	4.850
Honey Lake	0.000	0.000	2.962	2.596	2.999
Isabella Lake	0.000	0.000	0.296	0.260	0.300
TERA Corp. (wind)	0.000	0.338	0.283	0.248	0.287
Cogeneration	0.000	0.154	0.129	0.113	0.000
Purchases	81.863	0.000	0.000	0.000	0.000
Potential Sales (-)	0.000	-21.225	-10.817	-0.338	-6.648
TOTAL RESOURCES	100.000	100.000	100.000	100.000	100.000
RESOURCES' COST / VALUE (mills/kWh) (c					
Hyatt-Thermalito	0.0	9.6	10.2	11.1	12.4
Project Recovery Plants					
Existing	5.5	25.0	25.0	25.0	25.0
Project Small Hydro					
Alamo	0.0	68.0	68.0	68.0	68.0
Others	0.0	115.0	110.0	112.0	117.0
SCE Exchange	0.0	0.0	0.0	0.0	0.0
Pine Flat	0.0	26.0	31.0	37.0	46.0
MWD Hydro (d	0.0	40.0	42.0	44.0	46.0
Reid Gardner	0.0	60.0	75.0	98.0	131.0
Bottle Rock	0.0	84.0	110.0	152.0	238.0
South Geysers	0.0	86.0	112.0	155.0	240.0
Honey Lake	0.0	84.0	110.0	152.0	238.0
Isabella Lake	0.0	0.0	139.0	140.0	142.0
TERA Corp. (wind)	0.0	85.3	85.3	85.3	85.3
Cogeneration	0.0	77.0	93.0	120.0	0.0
Purchases (e	3.9	30.0	46.0	71.0	110.0
Potential Sales (-) (e	0.0	30.0	46.0	71.0	110.0
COMPOSITE COST (mills/kWh)	4.2	29.7	38.6	48.3	61.1
TRANSMISSION COST (mills/kWh)	0.3	3.8	2.6	2.7	3.6
TOTAL COMPOSITE COST (mills/kWh)	4.5	33.5	41.2	51.0	64.7

(a Based on 'average' water supply scenario discussed in Chapter I.
(b Amounts shown for purchases and sales represent a net amount for years shown, i.e. total sales exceeded total purchases in 1985, 1990, 1995, and 2000.
(c Includes allowance for future cost escalation.
(d DWR-MWD small hydro contract specifies that the price of this energy resource will be determined annually based upon the Department's least costly external alternative.
(e Sale values and purchase costs after 1983 are based on estimated costs of coal-fired generation.

The Bulletin 132-81 estimate assumed that Isabella Lake would have costs similar to the aggregate cost of the other Department small hydro power plants, since Isabella Lake construction cost estimates had not been prepared. The Isabella Lake costs shown here are based on cost estimates prepared for the project.

The wind resource represents the Bethany Wind Park project and agreements with TERA Corporation that were discussed previously in this chapter.

The mill rates assumed for purchases and excess energy sales are based on estimates of fuel cost associated with coal-fired generation. The Department would be selling and purchasing short-term nonfirm energy at the "market value", therefore, at any given point in time there should not be a differential value between purchases and sales. However, the "market value" rates are highly responsive to changes in actual market conditions and will fluctuate both seasonally and by time of day and therefore, could actually be substantially higher or lower than this estimate depending upon when a specific transaction takes place.

Local Water Supply Projects

Guidelines

In February 1979 the Department issued "Guidelines on Funding Local Water Supply Projects for Inclusion in the State Water Project." Following this issuance, many questions were raised as to just how the Department would finance local water projects. In response to these questions, a second task force was established in August 1981 to (1) define and develop criteria for the development of the guidelines, (2) address the role of the State Water Supply Contractors, and (3) establish procedures for determining the feasibility of a proposed local water supply project for inclusion in SWP.

The second task force set forth two basic assumptions that were fundamental to the revised policy statement and guidelines which were to be contained in its draft report. These are:

1. Contract amendments to the State Water Service Contracts, providing for local projects, are finalized; and

2. Any yield, whether permanent or intermittent, developed by the local project which becomes a unit of SWP, becomes part of the yield of SWP to be included within the annual 5.22 million dam^3 (4.23 million acre-feet) minimum SWP yield.

The SWP contractors have an important role under the revised guidelines under consideration. The task force proposed that the contractors:

1. Propose local water supply projects and request the Department to analyze them.

2. Prepare a conceptual report and, if found promising by the Department, submit a reconnaissance report with their request;

3. Work with the Department to help determine feasibility and to prepare any necessary contracts and contract amendments for projects found feasible by the Department;

4. Assume the responsibility to repay SWP funds advanced for the construction of the local water supply projects; and

5. Local project financing and repayment should not benefit the contractor in question to the detriment of the other 29 contractors.

The guidelines for implementing the policy on funding local water supply projects for inclusion in the SWP will be ready for release in the fall of 1982.

Status of Local Water Supply Projects

Since the issuance of guidelines in February 1979 ten proposals have been submitted by the SWP water service

STATUS OF LOCAL WATER SUPPLY PROJECTS

Subject	Requesting Agency	Status	Completion Date
	Surface Storage Investigations		
Eagle Canyon Reservoir	Santa Barbara County Flood Control and Water Conservation District (SBCFCWCD) and Goleta Water District (GWD)	Review of conceptual study found project to be economically unjustified. Project denied.	-------
Lompoc Off-Stream Water Spreading	SBCECWCD/City of Lompoc	Review of conceptual study found ground water basin storage capacity too limited and quality of water in basin and that to be stored inadequate to meet standards necessary. Project denied.	--------
Cachuma/Hot Springs	SBCFCWCD	Review of conceptual study completed in June 1982. Feasibility study under consideration.	-------
Gibraltar/Camuesa	SBCFCWCD	Conceptual study under review.	September 1982
	Reclamation of Urban Waste Water		
Morro Bay	San Luis Obispo County Flood Control District (SLOCFCD)/ City of Morro Bay	Review of conceptual study terminated at request of City of Morro Bay.	-------
Oceano	SLOCFCD/South San Luis Obispo County Sanitation District (SSLOCSD)	Review of conceptual study held in abeyance pending decision by SSLOCSD.	-------
Las Virgenes	The Metropolitan Water District of Southern California (MWD)/ Las Virgenes Municipal Water District	Review of conceptual study completed. Feasibility study completed. Project appears economically justified.	
Goleta	SBCFCWCD/GWD	Review of conceptual study completed. Feasibility study completed. Project appears economically justified.	
Santa Barbara	SBCFCWCD/City of Santa Barbara	Conceptual study under review.	June 1983
	Desalting of Brackish Ground Water		
Lower Chino Basin	MWD/Western Municipal Water District/Santa Ana Watershed Project Authority	Cursory evaluation completed. Project appears economically justified.	--------

Figure 11

contractors. The status of the proposals in shown in Figure 11.

Two proposals submitted by MWD -- a desalting project in Lower Chino Basin and the Las Virgenes Waste Water Reclamation Project -- appear to have merit. As agreed with MWD, the Department will not take any further action on these two projects until MWD makes a decision whether SWP financial assistance is needed.

Review of conceptual studies has been completed for four of the proposals submitted by the Santa Barbara County Flood Control and Water Conservation District (SBCFCWCD). It was found that the Eagle Canyon Reservoir Project was not economically justified. The Lompoc Off-Stream Water Spreading Project was found not to qualify for a feasibility level study at this time because of (1) the lack of ground water basin storage space and (2) the poor quality of the ground water. The preliminary findings on the Goleta Reclamation Project showed Phase 1 of the project to be feasible for inclusion in the SWP; however, the water district has since elected to withdraw the project from consideration due to uncertainties in the project from consideration due to uncertainties in project financing as part of the SWP.

Preliminary analyses indicate that raising Lake Cachuma as a local project appears to warrant further study at the feasibility level, and it also appears to be the better alternative when compared to building Hot Springs Dam directly upstream.

The studies for the other two projects in Santa Barbara County have just begun and no conclusions can be made at this time regarding their inclusion in the SWP.

California Aqueduct Extensions

Extension of the East Branch

Five water contractors, Coachella Valley Water District, Desert Water Agency, San Gorgonio Pass Water Agency, Mojave Water Agency, and the San Bernardino Valley Municipal Water District, participated in the study to extend the California Aqueduct into Coachella Valley (see page 42, Bulletin 132-81).

To date, no decision has been reached on the final route of the Coachella Aqueduct. Until the participating contractors do reach a decision on the final route, the Department will take no action leading to the construction of the aqueduct extension.

An agreement between MWD and San Gorgonio Pass Water Agency is being negotiated for the exchange of SWP water and Colorado River water similar to the Desert-Coachella and MWD exchange. In the event the agreement is consummated, it may defer construction of the aqueduct extension.

Future Construction of the North Bay Aqueduct

The North Bay Aqueduct (NBA) to be located in Solano and southeastern Napa counties, will consist of a water conveyance system to supply SWP water for municipal and industrial use in Solano County and Napa County. The system, consisting of an aqueduct, pipelines, and pumping plant facilities, was planned to be constructed in two phases.

Phase I of the aqueduct, which extends from the Cordelia area to the City of Napa and American Canyon treatment plants near the west end of American Canyon was completed in 1968. Since that time, a temporary supply of water from the USBR Solano project has been

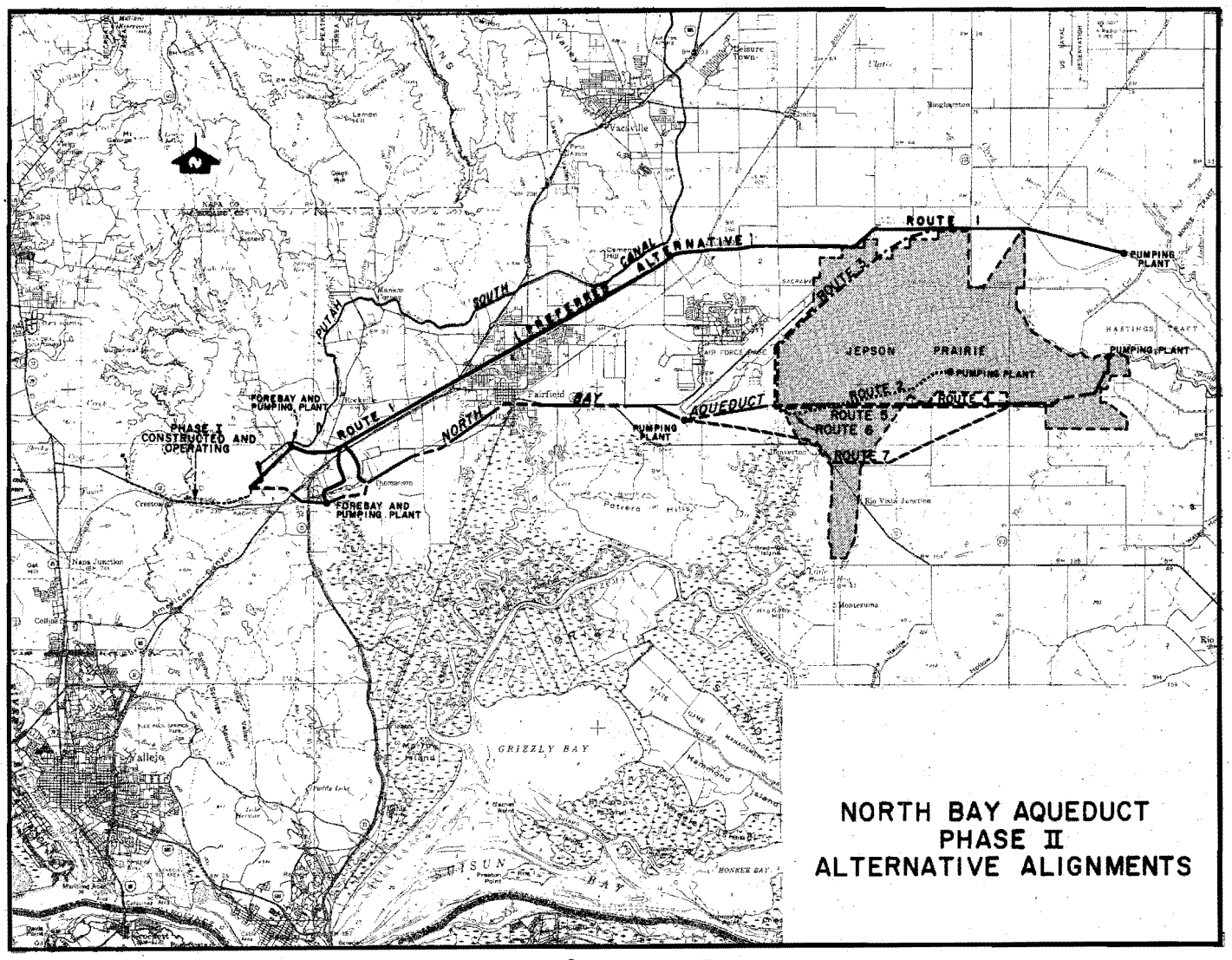


Figure 12

pumped by an interim pumping plant into Phase I facilities and delivered to Napa County for use by the American Canyon Water District and the City of Napa. When the Phase II facilities are completed, these nonproject deliveries from the Solano project are expected to cease.

Phase II of the NBA will consist of diversion facilities and a pumping plant on Cache Slough in the Delta, and a pipeline extending westward through Solano County to the Cordelia area. At Cordelia, another pumping plant and discharge lines will connect with the existing Phase I facilities.

The planning and development proposed for Phase II of the NBA included extensive participation of local officials and others in the EIR review process. The original alignment proposed for Phase II of the NBA would have resulted in extensive significant adverse environmental effects. As planning progressed, several ways were found to eliminate or minimize many of these adverse impacts including an alignment which avoids the environmentally sensitive Jepson Prairie area.

In response to specific comments on the Draft EIR and in compliance with Executive Order B 68-80 the Department prepared comprehensive draft water conservation plans for the two contracting agencies on the NBA - Napa and Solano Flood Control and Water Conservation Districts. In November 1981, these plans were presented to Napa County FC&WCD and to Solano County FC&WCD. Negotiations were then begun with these agencies to amend existing water supply contracts to include the conservation plans. The project is the first in which conservation is an integral part of water management planning between the Department and SWP contractors for future deliveries within a service area.

The final EIR for Phase II of the NBA was released in June 1982. It showed the preferred alternative for the NBA including water conservation in the service area. The Department is currently negotiating a contract with local entities which would include water conservation plans. Figure 12 shows the alternative alignments that were considered and investigated, including the preferred alternative. Construction of Phase II is scheduled for completion in 1986.

Future Construction of the Coastal Branch

Water supply contracts signed in 1963, between the State and Santa Barbara and San Luis Obispo counties stipulated that SWP water deliveries would commence in 1980; however, these contracts also provided for the deferral or the elimination of the Phase II Coastal Branch if the counties so elect. At the counties' requests, the Department has granted several delays in initiating design on the Coastal Branch since 1973; the current approved date is July 1, 1984. Under this latest schedule, initial delivery of SWP water cannot begin sooner than 1990.

The Phase I Coastal Branch Facilities, consisting of the first 15 miles leading from the California Aqueduct, were constructed in the late 1960s to provide water service to agricultural water contractors in the vicinity of Avenal Gap.

Phase II was planned to be constructed at a later date to transport project water to San Luis Obispo and Santa Barbara counties. Phase II would extend approximately 80 miles from Devil's Den Pumping Plant to a terminous near the city of Santa Maria.

The rejection by the voters of Santa Barbara County in March 1979 of a $102 million bond issue for the construction of distribution facilities for local delivery of SWP water prompted the county officials to take several actions. First, the county is evaluating local projects that may qualify for state funding under Local Project Guidelines which were prepared by the Department in 1979. The Department has been working with the county in evaluating eligibility of proposed local projects for Project funding.

During 1981, the Santa Barbara Flood Control and Water Conservation District voted to reduce its maximum annual entitlement from 71 200 dam^3 (57,700 acre-feet) to 56 100 dam^3 (45,486 acre-feet) and reduce its capacity by 0.48 m^3/sec (17 cfs). A contract amendment executed on August 31, 1981 provides for recalculation of the district's Delta Water Charge and Transportation Charge to reflect this reduction.

Because of the uncertainty regarding the timing of construction and operation of Phase II, there are no costs projected for this facility in the Financial Analysis presented in Chapter VIII or in the Statements of Charges for 1983.

CHAPTER III

SIGNIFICANT EVENT

SAN LUIS DAM SLIDE AND REPAIR

On September 14, 1981, an earth and rock slide some 340 metres (1,100 feet) long was discovered along the upstream face of San Luis Dam. About 345 000 m^3 (450,000 cubic yards) of the dam's zoned earth and rockfill material slipped about 6 metres (20 feet) down the reservoir side of the 5.7 km (3.5 mile) long dam, about 1.6 km (1 mi.) south of the north end. After the initial discovery, the embankment continued to slide slowly - 20 to 30 centimetres (8 to 12 inches) a day - and a second vertical scarp opened up about 6 metres (20 feet) above the one first noticed on September 14. Almost all of the slide was above the existing water level, which was low because of summer drawdowns for irrigation and other uses. The estimated volume of the slide was 1.2 million m^3 (1.5 million cubic yards). The dam contains a total volume of 59 million m^3 (77 million cubic yards) of material.

Analysis and Repair Plans

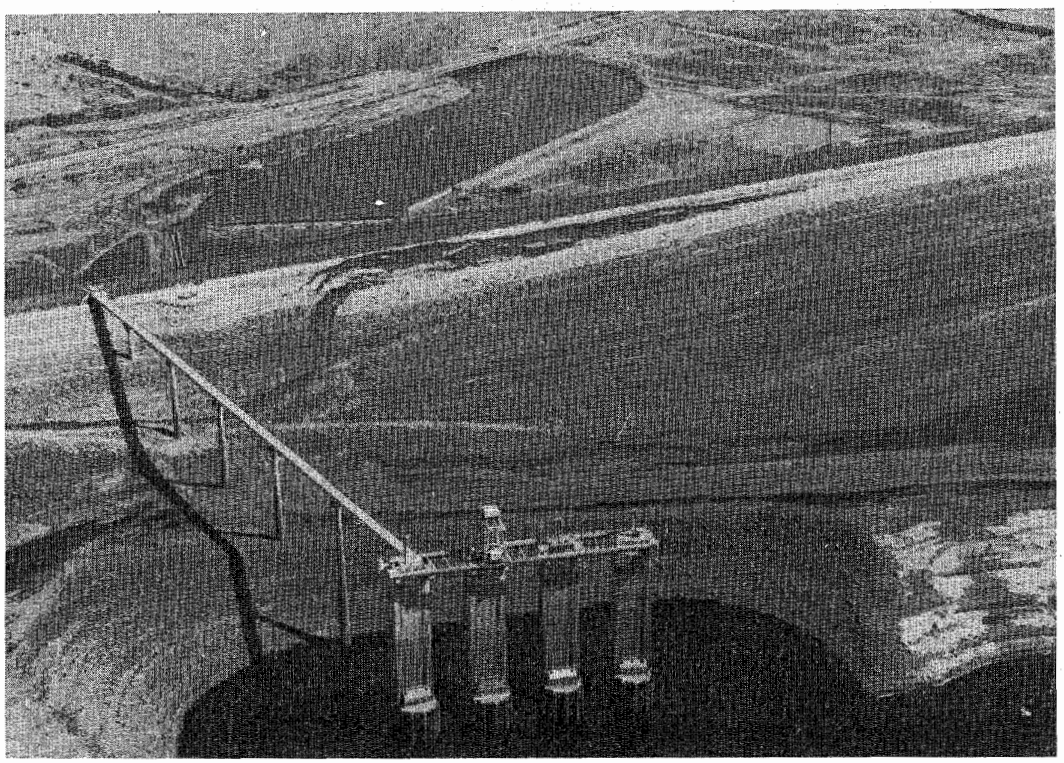
Although the Department has primary responsibility for operation of the dam, it was originally designed and constructed by the U. S. Bureau of Reclamation (USBR). Since most of the design and construction information was still in the USBR offices, the Department agreed that the analysis and repair should be performed by the USBR. Costs of the repairs will be shared 55 percent State and 45 percent Federal. The Department's staff in Operations and Maintenance, Design, and Safety of Dams reviewed the analysis and the subsequent repair plans. A major concern of the Department was that the dam be repaired for maximum storage by December 1982 and that all dam safety requirements be met.

Before repair work began, the Division of Safety of Dams set up and followed procedures which would normally be used if a similar incident occurred at a dam under Department jurisdiction. This procedure included monitoring the stability and safety of the dam as repair work proceeded. Approval by Safety of Dams was required before any partial or complete filling was allowed to proceed.

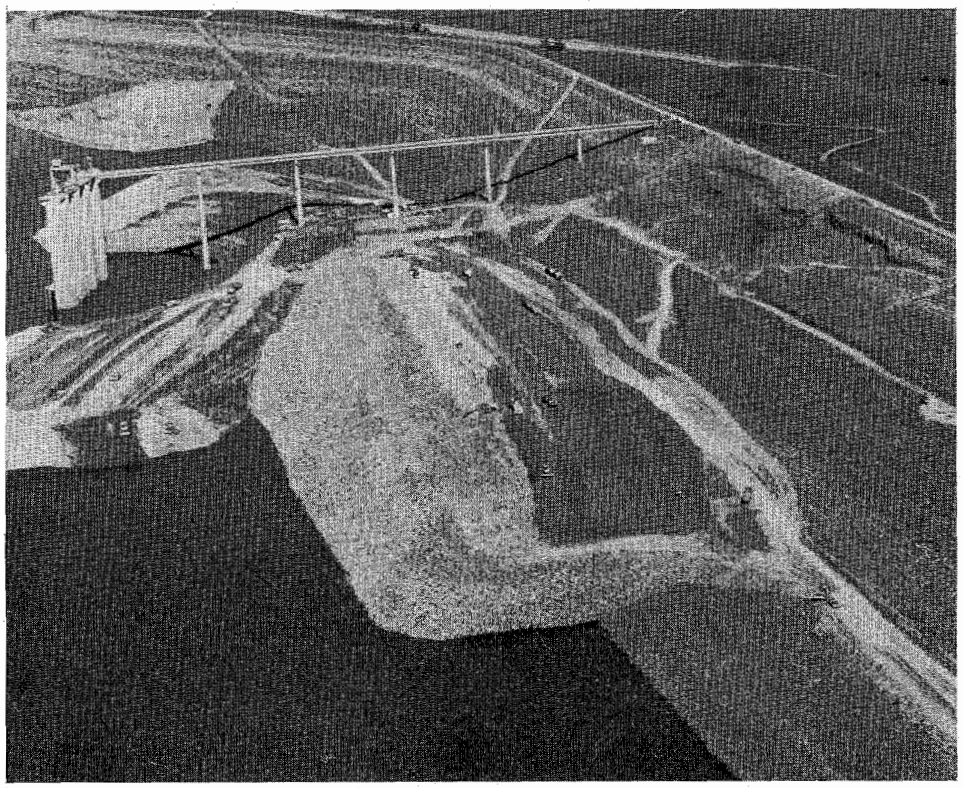
A major effort was immediately begun by the USBR and the Department to collect the necessary information for analysis of the cause of the slide and the development of a repair program. The gathering of information included a search of the original design and construction data, extensive drilling and exploration of the slide and the adjacent areas, development of soil strength factors related to the actual slide, and review of operation and maintenance data.

On October 1, 1981 a three-member Consultant Board was selected to review the slide analysis and repair proposals. Board members were James Duncan, a professor of civil engineering at the University of California at Berkeley; Thomas M. Leps, a consulting engineer from Menlo Park, California; and Floyd B. Underwood, former chief geologist with the Corps of Engineers in Omaha. Geologic and engineering analyses were presented to the Board at a meeting held in November 1981 at the dam site.

The Board agreed that the primary cause of the slide was a weak clay, commonly referred to as "slopewash", underlying the dam embankment. A significant contributing factor noted by the Board was the reservoir drawdown, which was greater than in past years due to increasing Project deliveries. Deliveries from storage at San Luis had been increased because of canal lining repairs at Mile 10 of the California Aqueduct. The 1981 drawdown, however, was within the normal design expectation and the failure should not have occurred under such operation.



View looking east at the upstream face of San Luis Dam showing slippage near the intake structure. Photo was taken on September 20, 1981, with the water level at Elevation 363.



Closeup photo of the slippage at the crest of San Luis Dam.

The repair proposal endorsed by the Consulting Board was the construction of a buttress fill against the upstream face of the dam. The weight of the buttress would be designed to hold the slide in place. Preliminary plans and specifications for placement of a buttress fill were reviewed in Denver by the Department engineering and geology staff on November 23 and 24. On December 10 and 11 the Consulting Board reviewed and agreed with the plans and specifications for the repair work.

A cross section of the San Luis Dam repair is shown in Figure 13. The repair plan was to excavate the slopewash down to bedrock along a 365-metre (1,200-foot) section where slippage occurred, emplace a drainage blanket, and build up a buttress berm by placing unprocessed basalt from the original quarries in stair-step fashion up the face of the dam. The embankment above the berm was to be rebuilt to its original slope. The minimum contract requirement called for completion of the berm to elevation 131.06 metres (430 feet) by July 1, 1982.

Repair Construction

Withdrawal of water from the reservoir in preparation for construction began in late November. By the end of December the water level had been lowered from 110.64 metres (363 feet) to the minimum operating storage level at elevation 99.36 metres (326 feet).
Three contracts were awarded for the repair of the dam. The first two contracts let were for quarrying rock and building an access road from the quarry site to the slide area. The quarry contractor, Ball, Ball and Brosomer, moved in on December 17 and began rock production on December 23. The slide access road contractor, F and M Engineering Contractors, moved in on December 21 and completed the road on December 31.

The main contract for repair of the slide went to Peter Kiewit and Sons, who began moving equipment in late December. Slopewash excavation started on December 31 and was completed on January 16; a total of 62,300 m^3 (81,500 cubic yards) was removed. Hauling and placing of berm material started on January 12, 1982. By February 5, work

View looking north toward the intake structure of San Luis Dam showing construction of buttress berm.

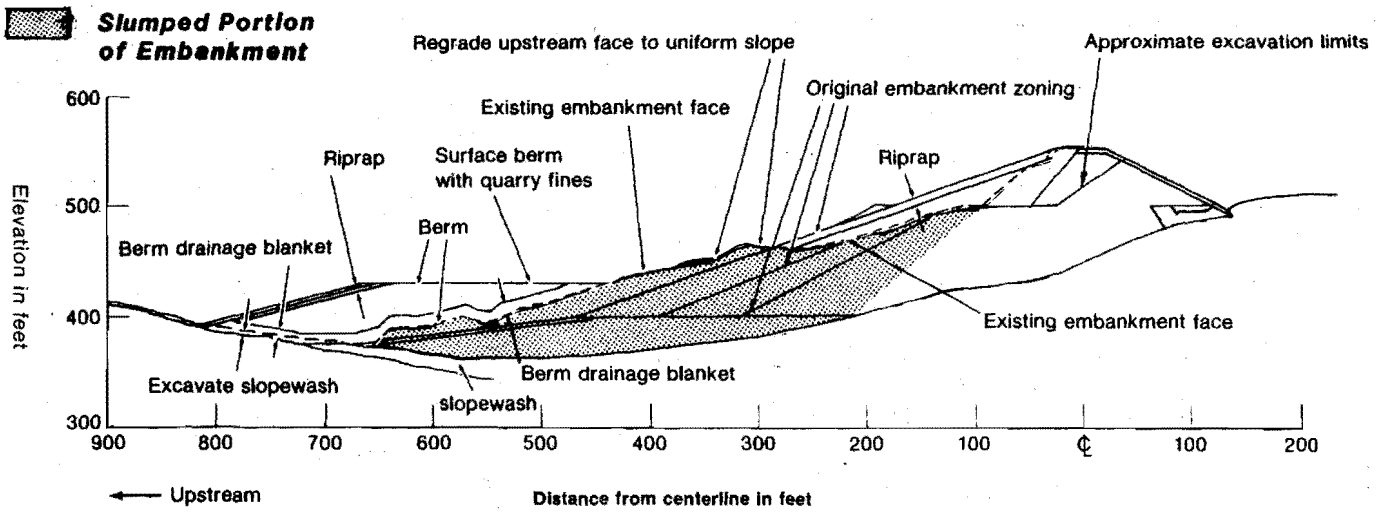


Figure 13: SAN LUIS DAM REPAIR

had sufficiently progressed to allow Federal and State pumping into San Luis Reservoir to begin. The rising water level followed the upward construction of the berm. The berm was completed to 131.06 metres (430 feet) on March 15 well ahead of the July 1 deadline. The water level reached elevation 126.80 metres (416 feet) on April 1 when the contractor shut down his operation. Construction work will continue when summer drawdown has lowered the water level below the repair areas. Work remaining to be done includes restoration of the crest section and construction of buttress berms along three other sections of the dam which have been identified as potential slide areas. All repairs are expected to be completed in time to allow refilling of reservoir storage to begin in December 1982.

Impact on SWP Operations

San Luis Dam is a key facility that allows the Department and the USBR to pump excess winter flows from the Delta and hold this water in storage for release later in the year to meet summertime water deliveries to SWP and federal CVP customers. The storage releases are particularly important during May and June, when Delta diversions are reduced to meet Decision 1485 requirements.

The slide halted the filling of San Luis Reservoir and required a reevaluation of the 1981-82 operations. At the time of the slide, it was uncertain how long the facility would be out of service. The Department looked into a number of alternative measures to make up for the San Luis outage during 1982. These included delivery of Colorado River water in lieu of a portion of SWP water deliveries in Southern California (see "MWD Exchange" discussion in Chapter IV), greater than normal use of existing Project reservoirs, Delta barriers, and other means of stretching SWP supplies.

Actual precipitation and runoff in Northern California turned out to be much higher than originally expected. By the middle of December 1981, the Department believed that the Project would be able to deliver all requested entitlement water, but no surplus water, in 1982. On February 5, 1982, repair work on the dam had progressed sufficiently to allow pumping into San Luis Reservoir to begin. The water level in the reservoir rose upward with the level of construction. The reservoir was ultimately filled to a capacity of 1,322,382 dam^3 (1,072,057 acre-feet) by May 3, 1982. The continuing wet year and the rapid progress of San Luis Dam repairs required revisions to water delivery plans. By the time the revised 1982 water delivery schedule was approved in April 1982, it included all entitlement and makeup water requested plus a portion of the surplus water requests.

CHAPTER IV

INTERAGENCY ACTIVITIES

1982 Water Exchange

Because of repairs required by the San Luis Dam slide, (see Chapter III for discussion), the San Luis Reservoir was unavailable for full use during the 1981-82 water year. As a result, it appeared in late 1981, that both the Department and the Bureau of Reclamation would be unable to meet their contractors water delivery requests for 1982.

To lessen the effect of the anticipated inability to satisfy water delivery schedules requested by State and Federal contractors, the Department initiated negotiations with MWD to develop a water exchange program. As originally planned, MWD would increase its deliveries from the Colorado River by 308 500 dam^3 (250,000 acre-feet) during the critical peak irrigation period in the San Joaquin Valley to offset a like amount of SWP water which would be released during the same period for delivery to San Joaquin Valley contractors. Only LADWP refused to cooperate, even though it would have shared in the savings resulting from this operation.

To achieve this exchange it was necessary to negotiate a contract with the SWP power suppliers to transfer energy from the SWP to MWD's Colorado River Aqueduct.

One of the contracting principles of the exchange was that a total of 308 000 dam^3 (250,000 acre-feet) of water would be earmarked for exchange. The SWP contractors would receive 154 000 dam^3 (125,000 acre-feet) and 154 000 dam^3 (125,000 acre-feet) to CVP contractors. Thirty-three CVP contractors and four SWP contractors signed agreements for this exchange water.

Another important principle of the exchange was to equalize the unit costs of the water between SWP and CVP contractors. The cost of implementing the exchange was $47.54 per acre-foot. This amount repaid MWD for its added costs, including purchase of the necessary energy from the power suppliers for pumping additional water from the Colorado River to its service area. The charge also maintained costs to SWP contractors who were not participating in the exchange at no more than they would have been charged in the absence of the exchange. An additional charge of $20 per acre-foot was made to the CVP contractors for the use of SWP facilities. This amount was to be paid through the receipt of CVP power after March 1983 and was credited to the SWP contractors. These arrangements resulted in a 1982 cost of $27.54 per acre-foot to SWP contractors participating in the exchange, in addition to their normal operation, maintenance and replacement variable costs.

To implement this exchange, the Department negotiated contracts with the following public agencies and private utilities:

- MWD
- The Department's power suppliers:

  PG&E, Southern California Edison Company and San Diego Gas and Electric Company. The fourth supplier, the Los Angeles Department of Water and Power, declined to participate in the exchange.
- The Bureau of Reclamation - for the sale of water to the CVP contractors

- Four SWP contractors: Devil's Den Water District, Dudley Ridge Water District, Kern County Water Agency, and Oak Flat Water District

The contracts were executed during February and March 1982. In addition, it was necessary to notify the State Public Utilities Commission, and obtain approvals from the Federal Energy Regulatory Commission and the SWRCB (for a temporary change in place of use for the water going to the CVP contractors).

In the late spring of 1982, it became apparent that the rainfall and runoff in the northern part of the State were abundant. Furthermore, rapid progress was made on repair of San Luis Dam enabling the filling of the reservoir to begin ahead of schedule.

These considerations led to the ultimate reduction of the exchange to a total of 148 000 dam^3 (120,000 acre-feet), with 64 000 dam^3 (60,000 acre-feet) being delivered for SWP contractors and 64 000 dam^3 (60,000 acre-feet) for CVP contractors.

The Department has pioneered the way in water exchanges between public agencies. This exchange was a significant accomplishment. As a matter of policy, the federal users paid the same as SWP contractors for water made available under this exchange agreement.

South Delta Water Agency Negotiations

Since June 30, 1981, the Department has participated in eight technical meetings with the South Delta Water Agency (SDWA) and USBR. The objective of these meetings has been to update the published joint report of SDWA and USBR to include the decade of the 1970's and to reach agreement on the quality of water required for SDWA's agricultural use. Little progress has been made in either area. The last meeting was held February 19, 1982.

In its Decision 1485, the SWRCB did not establish water quality standards for the southern Delta, because of a lack of available information, and because negotiations among USBR, SDWA, and the Department were underway. If negotiations were not successful by January 1, 1980, the SWRCB was to have intervened. This date has been repeatedly extended at the request of all parties (including SDWA), although SDWA had also filed suit against SWRCB for failing to include southern Delta standards in D-1485. On March 4, 1982, the SWRCB held a workshop session to discuss the southern Delta problems. As a result of this meeting, SDWA was informed that the Agency must petition the SWRCB if it wishes any action on the adoption of standards. SDWA responded by criticizing this position, restating its position that the SWRCB must adopt standards for the southern Delta, and stating that negotiations have come to an impasse.

On July 22, 1982, the Department was served in a lawsuit filed by SWDA against the Department and USBR over the effects of SWP and CVP operations on water quality in the Southern Delta. The Department and USBR legal staffs are now working on their initial responses to the suit. In the meantime, negotiations among the parties have been suspended.

Reauthorization of the CVP-SWP Coordinated Operating Agreement

Since January 9, 1968, the SWP and the CVP have operated under yearly reconfirmation of the terms of interim letter agreements. A draft agreement entitled "Supplemental Agreement Between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project", dated May 13, 1971, is the basis for the annual letter agreements.

Action resulting from Environmental Defense Fund, Inc. v. Morton has prevented the agreement from being signed (see page 4, Bulletin 132-72). Since 1979 the letter has included the obligation of both projects to meet all requirements of D-1485.

In 1979, the Department and the USBR began negotiating a joint operating agreement that would replace the annual letter agreements (see page 18, Bulletin 132-80).

From early 1980 through June 1982, a number of negotiating sessions resulted in significant progress on many of the complex technical items, such as agreement on base hydrology for the 1980 and 2020 levels of development, and most recently, agreement on what values will be used for Delta consumptive uses and outflow. This last item was extremely involved and time consuming because the experience during the 1976-77 drought had to be quantified and developed.

The procedure for performing operational studies, which will determine each agency's available water supplies under the new agreement, is quite different from that used in developing the May 13, 1971 formulas. The basic operational study steps to be followed are: (1) operate the CVP, excluding joint State-Federal San Luis facilities, to satisfy the CVP demands, Delta consumptive uses, and D-1485 outflows, using Central Valley hydrology that does not include Oroville Reservoir; (2) divide the flows excess to Delta requirements (from the above study) between the CVP and the SWP, assuming various percentages; (3) operate the joint San Luis facilities with the CVP share of the excess flows; (4) operate Oroville Reservoir, San Luis Reservoir and the California Aqueduct, including the joint facilities, using the SWP share of the excess flows, with the State responsible for providing any additional carriage water; (5) select the split that will provide each agency an equitable water supply; and (6) through a series of sharing studies, develop a formula that will provide each agency with the water supply determined in the previous steps.

An unresolved issue stems from the court decision in California v. United States. The decision requires USBR to comply with conditions established under State law by the SWRCB, unless there is a clear congressional directive to the contrary. USBR maintains that it does not have the legal authority to agree to meet any SWRCB criteria. USBR further maintains that it would be more appropriate to complete the agreement on coordinated operation and leave the question of CVP water obligations to Congress or the courts. However, the Department and SWRCB hold that D-1485 in California v. United States is not contrary to any congressional directive and that the USBR must operate in compliance with it. (See California v. United States, see Chapter IX "Litigation" for further discussion.)

Skylonda Mutual Water Company 1981 Water Exchange

In late October 1981, the Department received a request from Skylonda Mutual Water Company for a short-term emergency supply of water. Skylonda serves a small community of about 150 households in Woodside, San Mateo County. In September, Skylonda suffered a loss of a substantial amount of its stored water supply due to a break in a major supply line. Although emergency use limitations of 33 gallons per capita per day were imposed on Skylonda's customers, it was expected that Skylonda's water supply would be completely exhausted by early November.

The Department agreed to provide necessary water from unscheduled water that would be available at the time needed. Water would be pumped from the Delta and conveyed through the South Bay Aqueduct for delivery into San Antonio Reservoir

of the City of San Francisco. San Francisco would accept this SWP water in exchange for wheeling an equal amount of water to Skyline County Water District and Skyline would, in turn, wheel water to Skylonda.

Soon after the completion of contractual arrangements, heavy rainfall occurred in the San Franciso Bay area cancelling the need for water by Skylonda. As a result, no deliveries were made under the agreement.

Cooperative Study for Enlarging Shasta Lake

In December 1979, the Department and USBR signed a Letter of Intent to jointly fund and study the feasibility of enlarging Shasta Lake. The primary objective of the study will be to determine the feasibility of enlarging Shasta Lake as a means of increasing water supplies and power generation for the CVP and the SWP, improving fishery and recreation conditions, and providing additional flood control along the Sacramento River. Other alternatives to serve these purposes will be evaluated as part of the study. The study will be conducted over a seven-year period, with checkpoints established at critical stages of completion for evaluation of study progress. On completion of the study, a joint USBR-DWR feasibility report and Draft Environmental Impact Statement/Environmental Impact Report will be prepared.

Study costs will be shared equally by both agencies, with a provision for reallocation in the event costs are eventually divided in some other proportion. The USBR will be responsible generally for planning of the main reservoir features (including Keswick or alternative afterbay facilities), planning associated with CVP conveyance facilities and CVP service areas, and studies of some alternative water supply proposals. DWR will be responsible generally for planning along the Sacramento River downstream of Keswick Dam. This will include planning for seepage, erosion, sedimentation, floodways, and a Sacramento River parkway, along SWP conveyance facilities and SWP service areas, and studies of certain alternative water supply proposals.

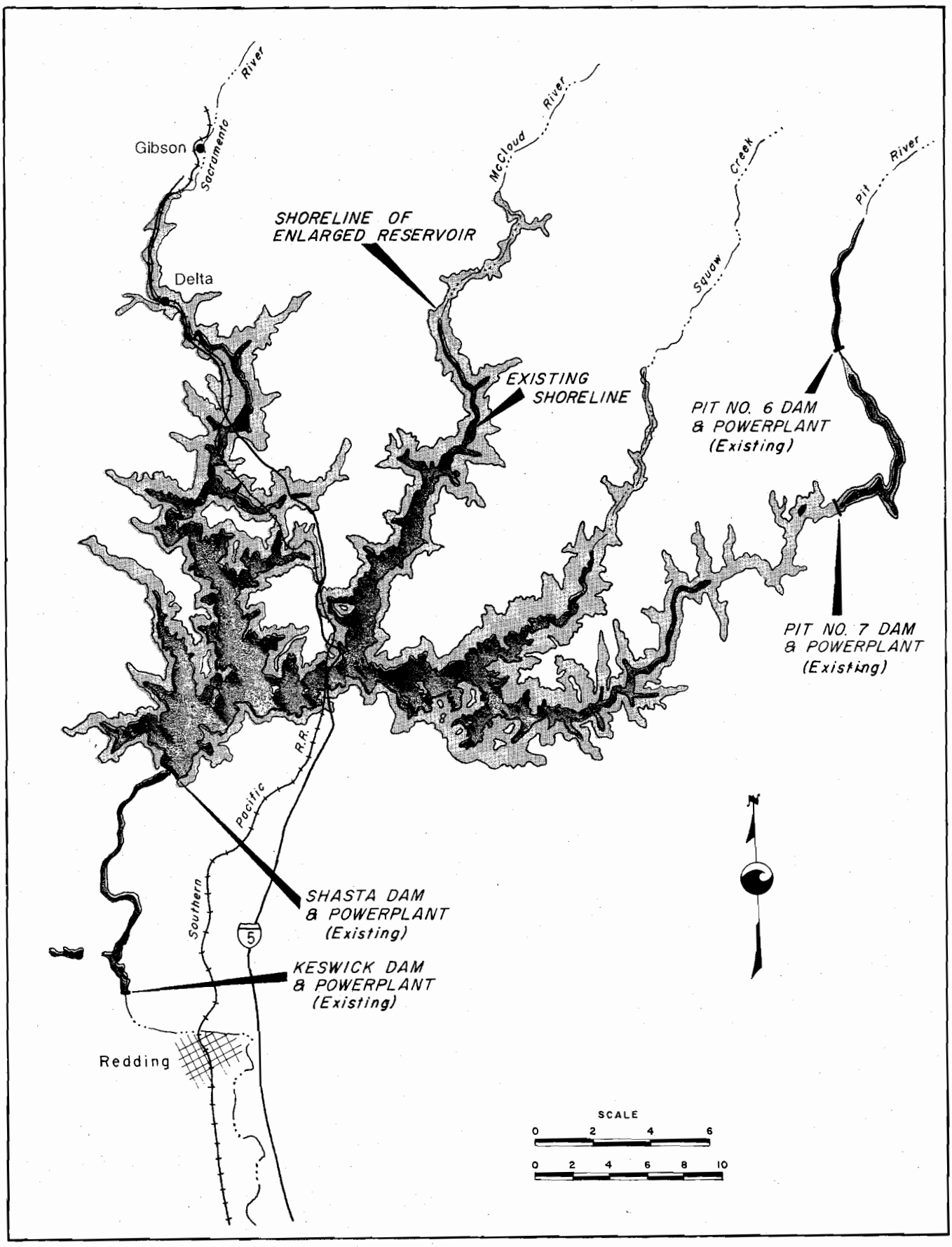
Relocation studies will be shared, with DWR handling Interstate 5 (with assistance from Caltrans) and the Southern Pacific railroad. All local road and other relocations within the reservoir area will be USBR responsibilities. All planning activities will be undertaken in accordance with current applicable Federal and State guidelines. If conflicts occur in the requirements, the work will proceed so as to satisfy the requirements of both agencies.

A Draft Plan of Study (POS) was completed in October 1981 and revised in February 1982. The POS is an outline of actions and schedule for performing the study. It also describes how data will be gathered and analyses performed as the study moves toward a recommendation. The POS also includes the organization and management of the study, a brief description of the public involvement program, and the reporting process for the study.

The POS will be revised and updated during the investigation as needed by changing conditions. It is to serve mainly as a guide for the study and not to be considered as a final plan. The schedules and networks included in the POS or the supporting documents will be revised as a result of meetings, special studies, reports, public involvement, etc., throughout the planning process.

The USBR received its first funding for the study in January 1982. Prior to that date, the Department was limited to assisting with the development of the study plan and a map of the enlarged Shasta Lake area. Four public meetings were conducted in February 1982 to lay out the plan of the study and invite public participation. The study is currently scheduled for completion in December 1988. The Shasta Lake Enlargement Plan is shown in Figure 14.

Figure 14. SHASTA LAKE ENLARGEMENT PLAN



Interagency Task Force on Increased Use of Colorado River Water

Stretching California Water Supplies

After reviewing the Department's Southern District Report, "Stretching California's Water Supplies: Increased Use of Colorado River Water in California", dated August 1980, the SWRCB recommended that the Department establish and chair a task force to (1) evaluate the merits and feasibility of the Department's proposal and (2) identify necessary actions to effect voluntary increased use of Colorado River water in lieu of SWP water by MWD. In October 1981, the task force was formed with representatives from the Department, Colorado River Board, Department of Fish and Game, Public Utilities Commission, Colorado River Basin Regional Water Quality Control Board (RWQCB), Los Angeles RWQCB, San Diego RWQCB, Santa Ana RWQCB, MWD, LADWP, PG&E, Southern California Edison, San Diego Gas & Electric, U. S. Fish and Wildlife Service, League of Women Voters, and the Environmental Defense Fund. Numerous issues were identified by the Task Force, and three committees, Electrical Energy Use/ Electrical Capacity, Water Supply/Water Quality, and Legal and Institutional/ Water Rights, developed responses.

The USBR provided information to the Task Force on the probability of future flood control releases from Lake Mead. The probabilities are the greatest (annual figures of 20 to 45 percent) up to 1987, after which they decline (annual figures of 10 to 15 percent) because of diversions by the Central Arizona Project and increased diversions in the Upper Colorado River Basin. The Task Force found that substitution of 493 000 dam^3 (400,000 acre-feet) per year of Colorado River water for SWP water would result in a net annual energy loss ranging up to 101 million kilowatthours. This loss would occur because the energy foregone at MWD's hydroelectric powerplants and Parker and Pilot Knob powerplants would more than offset the energy savings gained by delivering Colorado River water to Lake Mathews, instead of SWP water through the East and West Branches of the California Aqueduct. The loss of 101 million kilowatthours includes pumping requirements for additional water demands resulting from use of higher TDS (total dissolved solids) Colorado River water and additional pumpback operation from Castaic Lake to Pyramid Lake to maintain the firm capacity of the Castaic Powerplant. An additional on-peak power demand of 70 megawatts would be created, and 30 megawatts of generating capacity could be foregone. Water quality detriments would also result.

The Task Force found that numerous opportunities exist for benefiting fish and wildlife habitat in the State. Some possibilities also exist for ground water replenishment in Southern California. Except for some of the fish and wildlife habitat and ground water replenishment uses, which require new physical facilities, arrangements for other uses can be made over a short period of time.

The Task Force concluded that from an energy and water quality standpoint, substitution of 493 000 dam^3 (400,000 acre-feet) of Colorado River water for SWP water is not feasible in years of adequate SWP water supply. However, in years when the SWP is short of water, consideration would be given by MWD to substitute use of SWP water in their service area with water from the Colorado River. This exchange would make Project water available in the Sacramento-San Joaquin Delta to alleviate water shortages within other SWP service areas.

The Task Force recommended that:

1. MWD, Coachella Valley Water District, and Desert Water Agency continue to

negotiate the advance delivery of excess Colorado River water as exchange water.

2. The respective Regional Water Quality Control Boards discuss further the use of excess releases with local water agencies.

3. DFG consider further investigation of possible fish and wildlife uses of excess releases that would not require large capital expenditures, to accommodate excess releases. The uses of water now available to DFG should be evaluated. DFG should consider investigating sources of possible funding for capital and operating expenditures to utilize any excess water supply.

4. The Department and MWD initiate negotiations to develop principles and guidelines for future water exchanges.

Investigation of Use of Water-Imperial Irrigation District

Due to very low annual precipitation, the main source of water for the Imperial Valley is the Colorado River. The All-American Canal is the link between the Colorado River and the distribution canals that crisscross the Imperial Irrigation District. Colorado River water is used for both irrigation and urban uses within the District. Water not used consumptively drains into the Salton Sea and evaporates.

In December 1981 the Department published a report entitled "Investigation Under California Water Code Section 275 of Use of Water by Imperial Irrigation District". This report was published in response to an "Application for Department Investigation of Misuse of Water by the Imperial Irrigation District" filed by an Imperial Valley farmer, on June 17, 1980. On the basis of this investigation the Department determined that water losses were occurring within the Imperial Irrigation District's water supply and distribution facilities and elsewhere in its service area.

Article 10, Section 2 of California Constitution states in part:

> "...that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare."

In addition, Section 275 of the California Water Code provides:

> "The Department [of Water Resources] and [State Water Resources Control] Board shall take all appropriate proceedings of actions before executive, legislative, or judicial agencies to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water in this State."

While the Imperial Irrigation District is involved in programs to improve unit irrigation efficiency, water supply and distribution efficiency and to achieve water conservation, there are still opportunities for further water conservation as outlined in the Department's report. The Department also determined that there are potential uses for water that might be available as a result of improving conservation practices in the district. These potential uses include (1) possible uses by expanding irrigated acreage in the Imperial Valley if improved conservation practices were followed, (2) possible uses for this water outside the District, and (3) potential uses of the present drain water that flows to the Salton Sea. Results of the Department's report indicate that, although the operations of the District are improving, there is

water in the Imperial Valley now being wasted, which could be saved for beneficial uses. Costs of the investigation studies and the Department's report were paid from monies made available by the State General Fund.

Cottonwood Creek Project Agreement

The Cottonwood Creek Project is a dam and reservoir complex to be located on Cottonwood Creek, an uncontrolled tributary of the Sacramento River. Congress authorized the project in the Flood Control Act of 1970, and later provided funds to the U. S. Army Corps of Engineers (USCE) for advanced engineering and design studies in 1976. The draft Phase I General Design Memorandum and Environmental Impact Statement is finished and the final Phase I report is scheduled for completion in 1982. If approved in Phase I additional investigations (Phase II studies) will be undertaken for final design criteria for the project. Dam construction could begin as early as 1987, and the project could be operational by 1992, if no major institutional or funding problems are encountered.

The Department and the USCE have reached agreement on a water supply contract for the use of storage space in the Cottonwood Creek Project (letter from Ronald B. Robie to Colonel Paul F. Kavanaugh of December 28, 1979). Execution of the contract is awaiting agreement on certain details.

The incremental yield of Cottonwood Creek Project, without the Peripheral Canal would be about 216 000 dam^3 (175,000 acre-feet) per year. Under present conditions, local irrigation yield is not considered economically feasible as an initial project purpose, and there is no current demand in the local Cottonwood Creek area for additional municipal and industrial water supply. However, if future demands of local agencies develop for additional municipal and industrial water supply, water from the Cottonwood Creek Project would be made available by DWR. The Department will request assignment of the State filing for the Cottonwood Creek Project water rights at an appropriate time during development of the project.

The USCE estimates that the project has the potential to provide total generation capacity of 9 megawatts, with an average annual generation of about 30 million kilowatthours. The USCE expects to recommend to Congress that penstocks and related facilities be included in the initial project to allow for future addition of generating facilities. Under federal development, the electric power would probably be marketed by the Western Area Power Administration to preferential customers served by the CVP.

If the USCE decides not to construct the powerplant, the Department might construct it at State expense to provide energy for the SWP. However, in anticipation of construction of the Cottonwood Creek Project, the city of Redding has filed for a FERC license to develop this source of energy and this could preempt construction by the Department.

Federal Cost Sharing Proposal

State and Federal representatives met on February 1, 1982, to discuss the USCE proposal for cost sharing (up-front financing) for federal water projects and specifically for the Cottonwood Creek Project. The USCE proposes that nonfederal entities assume the following share of construction costs during the period of construction.

- Hydroelectric and Municipal/Industrial Water Supply - new proposal of 100 percent (local beneficiaries now pay zero, but they pay back all costs, with interest, over a period of time).

- Flood Control - new proposal of 35 percent (now varies - nonfederal

interests pay costs of lands, easements, and rights of way on channel projects, but not dam projects).

- Fish Enhancement - 100 percent (new proposal).
- Recreation - 50 percent (same as existing practice).
- Navigation - new proposal of 75 percent up-front and repayment of

The Cottonwood project will cost $694 million to build at October 1981 prices. The cost allocated to municipal and industrial supply is $556 million, $90 million is allocated to flood control, $19 million to fish enhancement with $29 million of non allocable costs. (This cost allocated to municipal and industrial supply would be $570 million at January 1982 prices as applied in this bulletin for SWP water cost analysis.)

Under the USCE proposal, nonfederal interests would advance $607 million during the time of construction (1985-92). Stated another way, the Federal Government would reduce its capital investment from $694 million to $87 million. The quantitative effect on the SWP, which is committed to repaying the water supply costs of this Project, is not yet known.

On March 8, 1981, the Department notified USCE that the State had considered the Federal proposal and concluded that in view of the proposed cost sharing, it would benefit the State and, specifically, the SWP, for the State to construct the Cottonwood Creek Project as a unit of the SWP. However, no final decision has been reached, because a final cost-sharing policy has not been announced by the Reagan Administration. The Assistant Secretary of the Army for Civil Works responded on March 20, 1982, that he agreed that such a decision would be premature.

The Department plans to continue negotiations and discussions with USCE regarding the purchase of reservoir storage space, fish and wildlife mitigation measures, and development of recreation facilities and hydroelectric power. There has been no formal policy announced by the Reagan Administration confirming the cost-sharing proposal. Therefore, it is doubtful that the cost-sharing formula proposed by the USCE will be an actual requirement for the Cottonwood Creek Project.

Two-Agency Fish Agreement

The Department of Water Resources and the Department of Fish and Game in September 1982 released a report titled Draft Environmental Impact Report on the Proposed Agreement to Manage the Fish and Wildlife Resources of the Sacramento-San Joaquin Estuary. Both departments believe an agreement on operation of the SWP is needed with regard to managing fish and wildlife resources in the Sacramento-San Joaquin Estuary. The goals of the proposed Agreement are to compensate for SWP impacts to preserve fish and wildlife in the Bay and Delta and to realize the Project's potential for enhancing fish and wildlife, consistent with other Project purposes.

The proposed Agreement is designed to meet its goals by maintaining suitable habitat for all fish and wildlife species, providing for natural reproduction, migration and maintenance of the species that inhabitat the area or depend on it for a portion of their life cycle. Artificial propagation, is not used when its use would eliminate the need for a water quality standard that is required to support other species.

The Department of Water Resources and the Department of Fish and Game recognize that federal participation is desirable to fully accomplish the goals of the proposed Agreement. Therefore, both departments will actively seek federal participation.

Protection provided by the proposed Agreement is somewhat better than that provided in SWRCB D-1485. Protective measures include operation of the fish screens at the Harvey O. Banks Delta Pumping Plant in the southern Delta, limitation on exports when fish are most vulnerable to diversion, minimum outflow standards to protect the entrapment zone in the estuary, and stocking of striped bass and salmon to compensate for unavoidable losses at the John E. Skinner Delta Fish Protective Facility.

The environmental assessment determined that the proposed Agreement would have no significant individual or cumulative adverse environmental impacts.

Cooperative Study of O'Neill Forebay Dam

In 1979 the U. S. Bureau of Reclamation (USBR) announced that, based on aerial photographs and topography information supplied by the United States Geological Survey, there may be a fault running the length of O'Neill Forebay Dam. The USBR is conducting an investigation, with review and participation from the Department. The Department's participation includes ongoing geologic exploration and engineering analyses of the fault's possible effect on Project facilities. A report regarding the investigation is scheduled to be completed by the USBR in December 1982.

Fish Facilities Testing Program

The 1982 fish facility program concentrated on three general areas: (1) developing a recommendation for the conceptual design for the proposed Peripheral Canal fish screens; (2) developing of new test facilities to provide information on specific components of the recommended plan; and (3) completing the evaluation of the first stage Roaring River (Suisun Marsh) fish screens.

In late March, a recommendation for the conceptual design of the Peripheral Canal fish protection facility was submitted to the Fish Facility Consulting Board for review and approval. On May 1, 1982, the six-member Board submitted to the Department, its formal approval, with comments, on the general concept. On June 8, 1982, California voters rejected Proposition 9, which included the Peripheral Canal. The Department then decided to phase out the Peripheral Canal fish facilities program by January 1, 1983. Based on this decision, field testing of the small (42-inch diameter) pump will continue through the shad season (mid-July through October). The Hood Test Facility may subsequently be used for generic fish screen studies. All Peripheral Canal fish facility reports will be completed by the end of 1982.

A program was initiated in 1981 to evaluate SWP water diversions from the South Delta. Primary emphasis is on determining where fish losses are occurring and finding ways to minimize these losses. This program also includes evaluating hatchery techniques available to rear striped bass for release as mitigation for Project-induced fishery losses.

The evaluation and construction of the Roaring River (Suisun Marsh) fish screens, is being continued. In 1981, two of the eight culverts allowing water to flow from Montezuma Slough to Roaring River were screened. A study was then started to determine the suitability of the screening system and the need to screen the remaining six culverts. The report on this study was issued in June 1981, and the major conclusion were that there could be significant losses of young salmon through the Roaring River intake and that the intake should be totally screened. The screen design selected for the two culverts appeared to be generally satisfactory, although minor modifications to improve vehicle accessibility, screen cleaning, and

screen sealing will be incorporated in the remaining screens. The complete screening of Roaring River intake is scheduled for completion by early 1983.

Interagency Drainage Program: San Joaquin Drainage Facilities

The Department is attempting to implement the State's responsibility described in the Recommended Plan of the San Joaquin Valley Interagency Drainage Program (IDP).

Interim Solution - The Department is pursuing several reuse concepts of agricultural waste waters. These reuses include desalting, developing marshes, and irrigation of salt-tolerant crops. In addition to reuse of agricultural waste waters, several local agencies or individual ranches have constructed or plan to construct evaporation ponds to solve drainage problems.

The Department is cooperating with the U. S. Salinity Laboratory (Riverside) in a demonstration project for reuse of agricultural waste waters on crops in northern Kern County.

The Department has submitted a request for funds from the Energy and Resources Fund one of the categories of the State General Fund ($940,000) in 1983-84 for a demonstration marsh management project. This demonstration project would be conducted by the U. S. Fish and Wildlife Service. These funds would be for cost of construction. The Fish and Wildlife Service would provide funds for the operation and research costs.

The monitoring of agricultural waste waters is continuing outside the San Luis service area with emphasis placed on areas with the highest potential drainage problems. These are the areas that will probably be studied for siting of desalting plants or marsh development. An update of projections for quantities and qualities of agricultural waste waters will be made during this year (1982-83).

Long-Range Program

A key feature of this program will be the extension of the existing Federal San Luis Drain to a discharge point near Chipps Island. The existing San Luis Drain would be the initial phase of the Valley Drain.

The San Luis unit of the CVP will require reauthorization to permit a joint Federal-State San Luis Drain, which could provide drainage service for the entire valley. Before funds would be advanced to the federal government for State capacity in the Drain, a repayment contract with local agencies would be required to provide assurance of repayment of State funds.

Contracting Principles

The Department's San Joaquin Valley Agricultural Drainage Office has developed contracting principles to provide a basis for drafting a contract with potential users of the Drain. The principles cover such subjects as design, construction, and operation of drainage facilities, the basis for charges to users of the drainage facilities, cost sharing between the United States and the State, cost allocation method, cost of collector systems to convey drainage water from the farm to the Drain, quantity and quality of drainage service, and quality of waste water to be discharged into the Drain.

A draft contract was approved by the Director in January 1982. It will be reviewed and discussed with potential users and an attempt will be made to obtain their approval.

Discharge Requirements

The USBR has asked the SWRCB to establish discharge requirements for the San Luis Drain, discharging at Chipps Island. SWRCB, which has held several meetings and workshops on this subject, estimates that it will be three or four years before it will be able to issue discharge

requirements. Additional studies must be conducted by the USBR to meet the needs of the SWRCB. The information from these studies will be essential in establishing appropriate waste discharge requirements. In the meantime the SWRCB has indicated that it will issue interim guidelines for establishing discharge requirements.

Legislation

Assemblyman John Thurman, Chairman of the Assembly Committee on Agriculture, introduced two pieces of legislation in the 1981 legislative session. Assembly Bill 1376 relates to the San Luis Drain and mandates that its design, construction, and operation shall be in compliance with certain additional requirements to the satisfaction of the SWRCB. Assembly Joint Resolution 12 calls upon the federal government to expedite completion of the San Luis Drain as a joint drainage facility for federal and other water users in the San Joaquin Valley. These measures were passed and signed by the Governor.

CHAPTER V

DESIGN, RIGHT OF WAY AND CONSTRUCTION ACTIVITIES, JULY 1, 1981 - JUNE 30, 1982

This chapter discusses the design of SWP facilities, acquisitions of land, and construction progress by the SWP construction divisions. Also included is a discussion of the Department's program for safety review of Department-owned dams. The SWP construction divisions are shown in Figure 15.

Design Activity

Between July 1981 and June 1982, the Department continued design work on Alamo Powerplant, the second barrel of Pastoria Siphon, hydroelectric facilities at William E. Warne Powerplant, Suisun Marsh Initial Facilities, two geothermal facilities (Bottle Rock Powerplant and South Geysers Powerplant), several small hydroelectric projects, and modifications to certain existing SWP facilities.

Other design activities included:

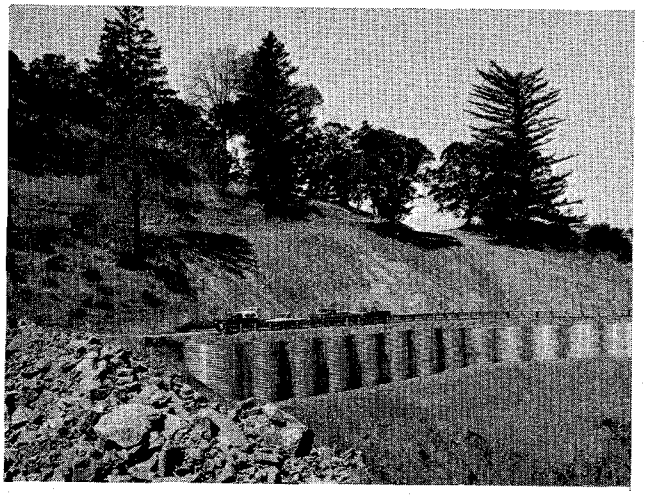
- Participation in hydraulic-model investigations at the University of California in support of the fish facility studies for the intake of the Peripheral Canal.
- Design of access roads and facilities for recreation areas at certain borrow pits along Interstate 5. (The design work has now been completed.)
- Participation in the preparation of an environmental impact report for the North Bay Aqueduct.
- Continuation of the evaluation of Pyramid Dam piezometers; a final report is due in July 1982.
- Preparation of design plans and specifications for the Los Banos Demonstration Desalting Facility.
- Participation in reconnaissance-level design and cost estimates of local water supply projects.
- Establishment of a test program for densifying foundation sand at Thermalito Afterbay.

After defeat of Proposition 9 in June 1982, the Department took steps to finalize work, in progress related to SWP facilities which were dependent on Proposition 9 passing. Design activities in progress at that time included:

- Preliminary design, exploration, and cost estimating of Los Vaqueros Reservoir Project and Thomes-Newville Project.
- Engineering feasibility studies for Thomes-Newville Project.

These activities will be completed by December 1982 and work will be preserved for future investigations.

Design activities in each SWP construction division are summarized in Table 10.



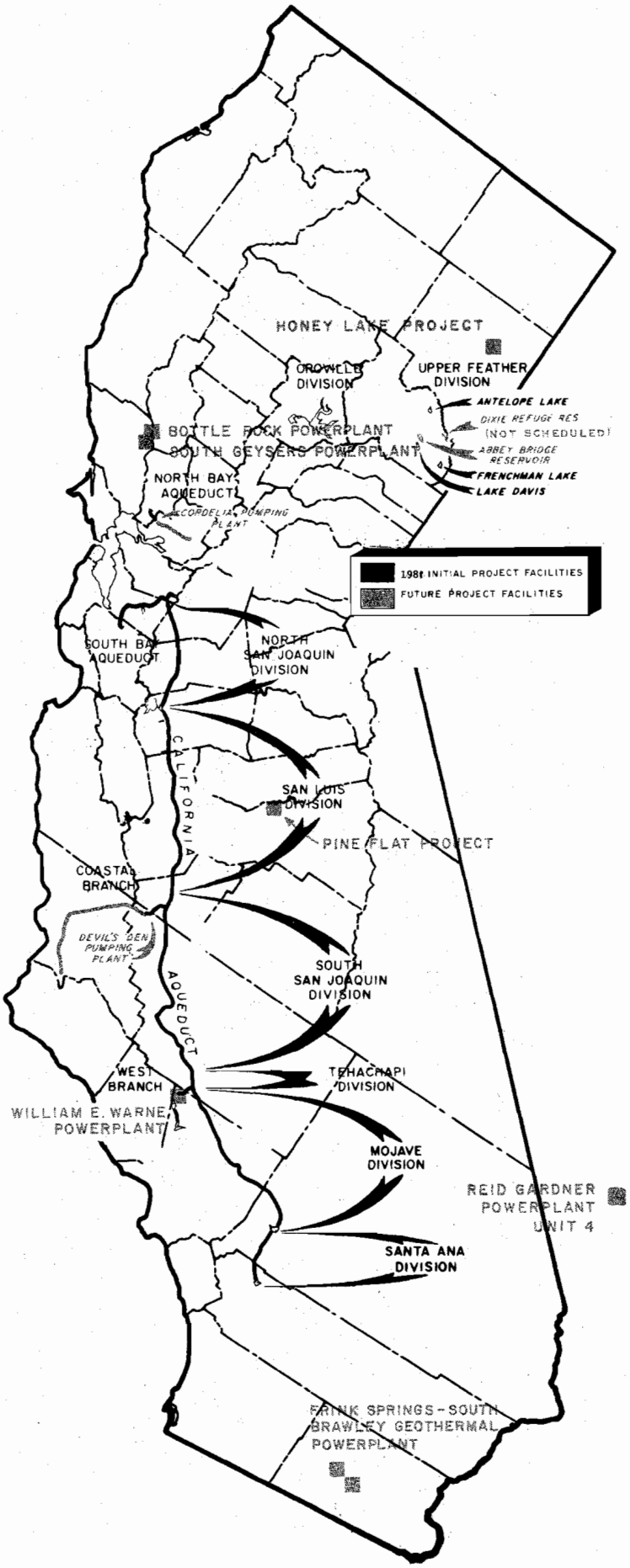
Partially completed section of access road for South Geysers Powerplant.

TABLE 10: SWP DESIGN ACTIVITIES IN PROGRESS

During Period
July 1981 - June 1982

Division or Facility	Activity	Begin Design	Complete Design
Energy Supply	Bottle Rock Powerplant:		
	Construction Contract	Dec. 1978	Jan. 1982
	Furnishing Control Switchboards	Dec. 1978	Jan. 1982
	Furnishing & Installing Cooling Tower	Jan. 1980	Jul. 1982
	Furnish Floor Panels	Jan. 1982	Dec. 1982
	Road Reconstruction, Betw. B.O.L. & Sta. 60	Mar. 1981	Apr. 1983
	Road Reconstruction, Betw. Sta. 60 & 230	Mar. 1981	Jan. 1983
	Road Reconstruction, Betw. Sta. 230 & 562+60.8	May 1981	Mar. 1982
	Furnish Pump Units	May 1981	Feb. 1982
	F&I H_2S Abatement System	Jul. 1979	Apr. 1982
	F Transformer	Jul. 1980	Jun. 1982
	F Plant Auxiliaries	Jan. 1981	Apr. 1982
	Completion Contract	Jul. 1982	May 1983
	South Geysers Powerplant:		
	Initial Site Development	Aug. 1979	Apr. 1982
	F Surface Condenser	Jul. 1981	Dec. 1982
	F Switchyard Equipment	Feb. 1982	Aug. 1982
	F Switchgear, Motor Control Centers	Feb. 1982	Aug. 1982
	F Control Switchboards	Aug. 1981	Sep. 1982
	F&I Cooling Towers	Aug. 1981	Apr. 1983
	F Plant Auxiliaries Control Systems	Aug. 1981	Nov. 1982
	F&I Stretford Process	Aug. 1981	Dec. 1982
	Construction	Aug. 1981	Sep. 1982
	F&I Turbine Generator	Aug. 1981	Aug. 1982
	Completion Contract	Aug. 1981	Nov. 1983
State Water Project-General			
	Small Hydroelectric Powerplants:		
	Thermalito Afterbay Turbines & Generators	Mar. 1982	Oct. 1982
	Pyramid, Castaic, & Palermo, Turbines & Generators	Aug. 1981	Nov. 1982
	Las Flores & Del Valle 2, Turbines & Generators	Aug. 1981	Dec. 1982
	Sutter Butte Powerhouse	Aug. 1981	May 1983
Oroville Division			
	Thermalito Fish Rearing Raceways	Nov. 1980	Nov. 1982
	Thermalito Afterbay Seismic Stabilization	Feb. 1981	Jun. 1982
	Major Equipment-Thermalito Diversion Dam Powerplant	Sep. 1981	Feb. 1983
	Thermalito Diversion Dam Powerplant	Jul. 1980	Mar. 1983
	Thermalito Afterbay Powerplant	Sep. 1981	Aug. 1983
	Thermalito Afterbay Densifying Foundation Sand	Feb. 1981	Sep. 1981
Delta Facilities			
	Testing Facility-Hood Intake Works	Jul. 1981	Apr. 1982
Suisun Marsh			
	Roaring River Levee Repair Phase III	Dec. 1981	May 1982
South Bay Aqueduct			
	F Vertical Multistage Pumping Units	Sep. 1981	Sep. 1982
South San Joaquin			
	Spare Pump Impellers (1 Buena Vista, 1 Wheeler Ridge, 4 Wind Gap, 1 Pearblossom)	Jul. 1981	May 1982
Tehachapi Division			
	A. D. Edmonston Pumping Plant:		
	Power Transformer, Unit K8A	Jan. 1980	Jan. 1982
	Completion Contract	Jan. 1980	Mar. 1982
	Replacing 15KV Switchgear for Motor-Generators	Jan. 1980	Aug. 1982
Mojave Division			
	205th Street West Bridge & Aqueduct Frontage Road Relocation	Sep. 1980	Mar. 1982
	Mojave Siphon Powerplant:		
	Tunnel	Aug. 1981	Sep. 1982
	Power Plant	Jul. 1980	May 1983
	Hydroelectric Generating Equipment	Jul. 1980	Dec. 1982
	Mojave Siphon Powerplant Intake	Jul. 1980	Feb. 1982
	Check Structures Mile 379.0 & 389.5 Phase I	Dec. 1981	Feb. 1982
	Alamo Powerplant:		
	Initial Contract	Jul. 1976	Feb. 1982
	Completion Contract	Jan. 1980	Dec. 1982
	Furnish Transformers	Jul. 1981	Feb. 1983
	Furnish Control Switchboards	Jul. 1981	Apr. 1983
	F&I Generator	Jul. 1981	Dec. 1982
	F Generator Switchgear & Sta. Substation	Jul. 1981	Oct. 1982
	100 Ton Gantry Crane	Jul. 1981	Jun. 1982
	F Governor	Jul. 1981	Nov. 1982
	Section 33 Perimeter Channel - Purpus Suit	Sep. 1980	Oct. 1981
Santa Ana Division			
	Devil Canyon Powerplant:		
	Circuit Breakers	Jan. 1982	Sep. 1982
	Valve Control Modifications	Jul. 1980	Jul. 1982
West Branch			
	Modification of Southern California O&M Center & Castaic Visitor Center	Sep. 1980	Dec. 1981
	Quail Detention Embankment	Feb. 1981	Sep. 1982
San Joaquin Drainage Facility			
	Los Banos Demonstration Desalting Facility:		
	Evaporation Ponds	Mar. 1981	Aug. 1982
	Solar Ponds	Mar. 1981	Sep. 1982
	Completion Contract	Mar. 1981	Nov. 1982
	Solar Ponds - Operations Bldg.	Mar. 1981	Aug. 1982

Figure 15: STATE WATER PROJECT CONSTRUCTION DIVISIONS



Land Acquisition

The Department's current program includes land and right of way actions for the following projects:

- Access rights for Thermalito Diversion Dam Powerplant construction - two parcels required.
- Bottle Rock Powerplant. Access road rights to be acquired between this plant and South Geysers; Bottle Rock Road rights under negotiations.
- South Geysers Powerplant. Plant site and access road acquired. Towerline property acquisition still to be negotiated.
- Entry permits and permanent acquisitions for Phase II of the North Bay Aqueduct, as well as coordination of Caltrans plans with bike trail and aqueduct construction.
- Recreation development sites associated with project facilities at Orestimba Creek, Gorman Creek, and Grizzly Creek.
- Suisun Marsh lands necessary to accommodate the construction of facilities to reduce salt water intrusion in critical areas.
- Borrow Ponds 5, 6, 7, and 8 on the Peripheral Canal Alignment have been opened for fishing, hunting, or wildlife management. Ponds 1 and 4 have been leased for water skiing. A study has been commenced on the Peripheral Canal Alignment to determine the best way to handle lands owned by the Department.
- Due to rejection of Proposition 9, all entry permits received for the Future Water Supply program have been returned.
- Approximately 690 acres required for materials borrow site to repair San Luis Dam.

- San Luis Division - South San Joaquin silt removal program - Eight parcels of 18 have been acquired.

- South San Joaquin - Two parcels to be acquired for fishing access site, and two for spoil from upstream erosion.

- Gorman Creek Live Stream Project - Two parcels to be acquired.

- West Branch Completion - One ownership (Tejon Ranch) still to be acquired, offer pending.

- Transfer of Mitigation Lands to Fish and Game. Anticipate transfer of four parcels. Two transfers have been approved - 218 hectares (540 acres) at Davidson Ranch and 252 hectares (622 acres) in the Perris Borrow Area.

- Negotiations with MWD for issuing a Director's Easement Deed to cover the Lake Perris Pipeline are nearing completion.

- Santa Ana Division - One parcel to be acquired.

- Mojave Division - Completed acquisition of Purpus Suit parcels except for one parcel plus two condemnation suits.

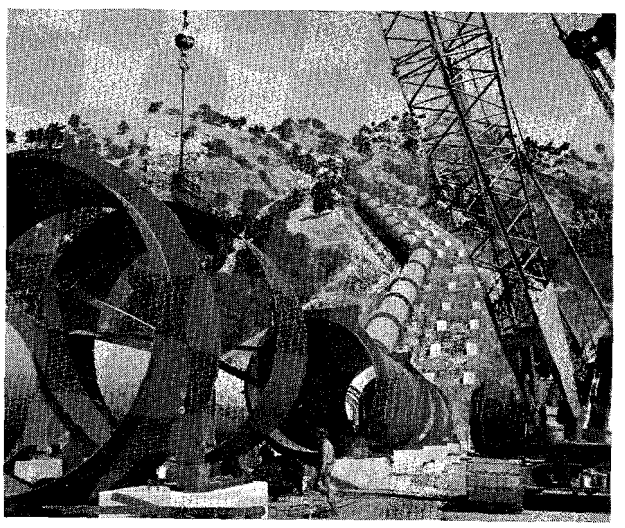
From July 1981 through June 1982 the Department spent $.9 million for land acquisition in excess of credits for sales of surplus property and return of condemnation deposits. This brings the total net expenditure through June 1982 to $115.4 million, approximately 60 percent of the $192.2 million estimated total cost of the current program. A total of 59 hectares (145 acres), comprising 36 parcels of land, was acquired from July 1981 through June 1982. Ten parcels of excess land, 362 hectares (895 acres), were sold, bringing the cumulative total of such excess lands sold through June 1982 to 838 parcels, 4885 hectares (12,070 acres).

Twenty-nine leases, consisting of new and existing leases through June 1982 were monitored; revenues received totalled $16,000. On the basis of a mitigation agreement between the Department, Department of Fish and Game, and MWD underlying property rights to 105 parcels of land in Southern California, and transfer of those rights to the Department of Fish and Game, are being analyzed.

During the 1981-82 fiscal year eleven new utility agreements were processed with total estimated relocation costs of $320,600. In addition, the Department processed three utility agreement amendments which covered an estimated $82,800 in relocation costs and 17 encroachment permits were issued for which the Department received $17,925 in fees.

The Feather River Enhancement Project is now proceeding through eminent domain.

Table 11 shows the number of land parcels required under the current land acquisition program, together with the number of parcels acquired through June 1982, for each SWP facility or construction division:



Construction of second barrel of Pastoria Siphon. Taken summer of 1982.

Construction Progress

Highlights of the Department's construction progress between July 1, 1981 and June 1982 include work on the following projects:

Reid Gardner Unit No. 4

The Department is participating with the Nevada Power Company in constructing a coal-fired energy project near Las Vegas, Nevada. The completed project will be a 250-MW addition to the existing Reid Gardner Generating Station. Design and construction management of the plant are by Fluor Power Services, Inc. under supervision of the Nevada Power Company. The Department is also monitoring the construction work.

Contracts are now in progress for installation of nearly all major equipment at the facility with Morrison-Knudsen and Fegles and Lord performing the general construction work as a joint venture. Between July 1981 and June 1982, erection of the boiler and installation of the turbine-generator continued. The 500-foot chimney structure and the cooling tower were complete, and construction of the coal-handling facilities was underway. In addition, extensive work was done on the bag house, ash handling, and water treatment facilities, along with other miscellaneous buildings.

As of June 1982, construction on the project was about 60 percent complete. Construction is behind schedule from original plans. However, an acceleration program (which provides for payments to the contractor if he achieves specific "milestones" during the remaining construction period) and a claims settlement agreement reached with the general contractor in May 1982 is expected to result in commercial operation of the facility by August 1983.

TABLE 11: ACQUISITION OF LAND PARCELS

Facility or Construction Division	Parcels Acquired July 1, 1981 Thru June 1982	Total Parcels Acquired	Total Parcels Required
Feather River Facilities			
Upper Feather Division	4	24	43
Oroville Division	3	971	983
Delta Facilities	0	39	160
Emergency Drought Facilities	0	3	3
Suisun Marsh Facilities	0	27	82
North Bay Aqueduct	0	34	130
South Bay Aqueduct	0	206	206
Future Water Facilities	0	1	3
California Aqueduct:			
North San Joaquin Division	0	209	221
San Luis Division	0	22	22
South San Joaquin Division	0	576	579
Tehachapi Division	2	4	2
Mojave Division	21	1,696	1,777
Santa Ana Division	7	697	697
West Branch	3	338	349
Coastal Branch (Phase I)	0	48	48
Coastal Aqueduct	0	0	200
Desilting Sites	8	8	18
Energy Supply Facilities	11	27	151
Total	**59**	**4,930**	**5,674**

Bottle Rock Powerplant

Bottle Rock Powerplant, when completed, will provide 55-MW of energy supply to the Project. This geothermal energy project is located on the Francisco Leasehold in Lake County. The power plant and related facilities will include a 55-MW turbine-generator, a condensing system cooling tower, electrical switchyard, and atmospheric emission control systems.

Initial site development for the Bottle Rock Powerplant was completed in early 1982. In January 1982, bids for the main construction of the power plant were opened, and the Department awarded the contract to Peter Kiewit Sons. Roadway construction, construction of a soil laboratory building on the site and power plant initial construction activities began in the spring of 1982. Work on the plant was about 15 percent complete by June 1982. Commercial operation is scheduled to begin in June 1984.

William E. Warne Powerplant

The hydroelectric power plant project located at the north shore of Pyramid Lake was about 75 percent complete in June 1982.

Facilities of the project (formerly Pyramid Powerplant) include (a) Quail Lake and Lower Quail Canal; (b) Peace Valley Pipeline (Phase I), with one 3.65 metre (12 foot) diameter pipe; and (c) William E. Warne Powerplant (Phase I), with two 37.5 MW generators and appurtenant facilities.

The Peace Valley Pipeline intake facilities and completion of Quail Lake and Lower Quail Canal work were completed in March 1982. Construction of William E. Warne Powerplant continues. The Phase I facilities are expected to be operational in late 1982 and will be adequate to convey water deliveries until at least the mid-1990s.

Phase II consisting of a parallel pipeline and additional generating units at the powerplant, may be required, depending on The Metropolitan Water District's requirement for Water Deliveries from the West Branch of the California Aqueduct.

Alamo Powerplant

Alamo Powerplant (formerly Cottonwood Powerplant) is to be located on the California Aqueduct approximately 16 kilometres (10 miles) east of Gorman in Los Angeles County (also see page 23, Bulletin 132-81).

The first phase of this facility (Unit No. 1), will have a capacity of 17 MW and will produce up to 115 million kWh/yr. Bids for the civil works were operned in February 1982 and the $18 million contract was awarded to Granite Construction Company. Unit No. 1 is scheduled to be on-line in May 1985. Ground breaking ceremonies for the powerplant were held on April 20, 1982.

The size of a second turbine/generator unit at Alamo Powerplant depends on the future enlargement of the Mojave Division of the California Aqueduct. Further discussion of the second phase of this facility is in the seciton discussing the Department's Long-Range Energy Program in Chapter II.

A. D. Edmonston Pumping Plant

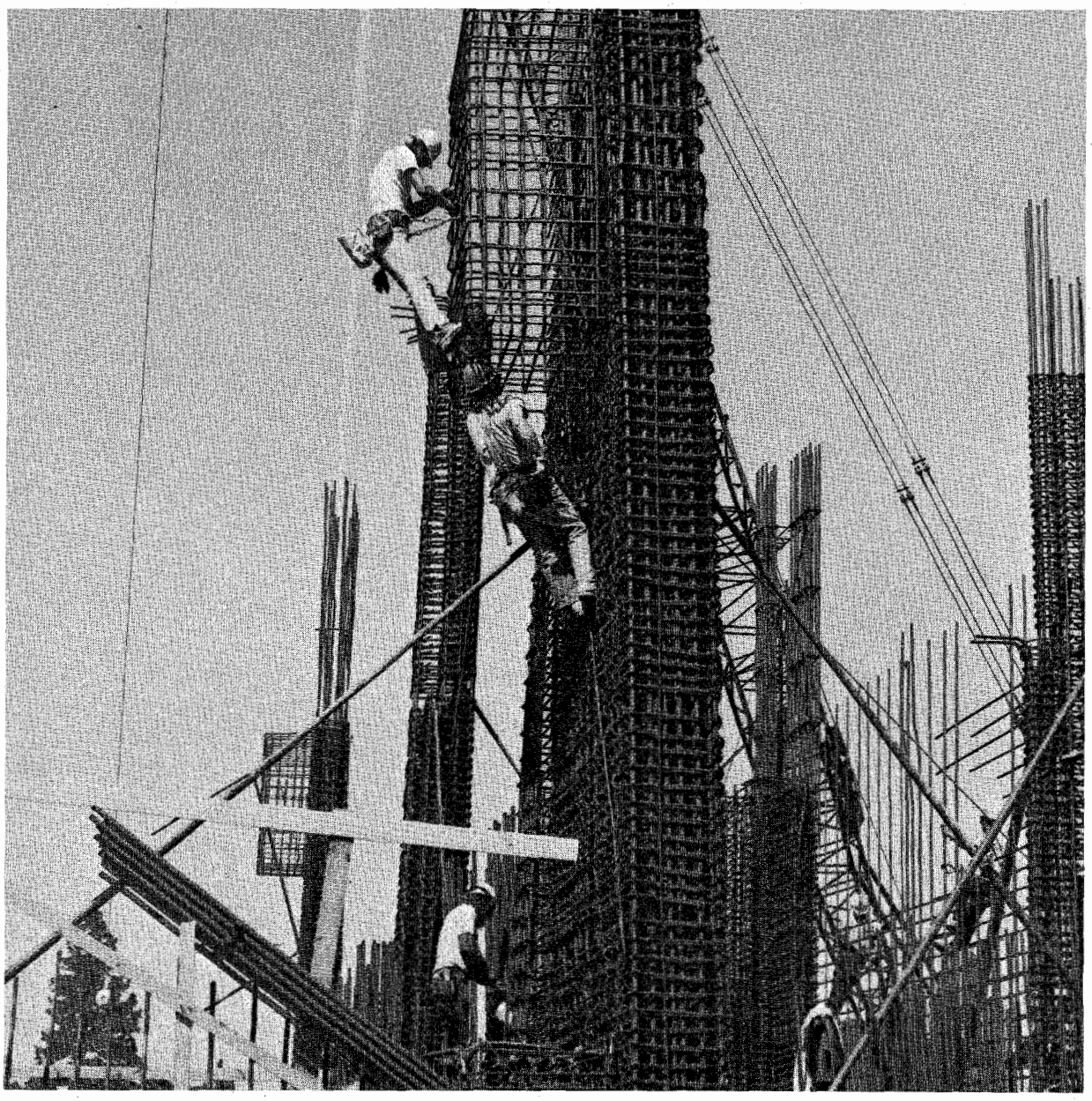
Three 59,680 kW (80,000 hp.) - 8.9 m^3/s (315 cfs) pump units with motors and auxiliary equipment are being installed at A. D. Edmonston Pumping Plant. (This will complete the installation of pumps for the transportation of water across the Tehachapi Mountains.) These 4-stage centrifugal pumps will pump Project water 587 metres (1,926 feet) in a single lift. After installation, the plant will be able to pump 116 m^3/s (4,100 cfs) at full capacity. Fabrication of the three additional pump units was about 75 percent complete by June 1982.

Initial operation of the first new pump unit is scheduled for September 1983 with operation of all new pump units scheduled for the spring of 1984. Seven contracts were in progress between July 1, 1981 and June 30, 1982 at an average cost of $3.5 million per contract.

Contract Status

On July 1, 1981, construction work under 30 contracts was in progress. Between July 1, 1981 and June 30, 1982, work called for in 49 new contracts was begun. Average low bid of the contracts in progress during the fiscal year was about $2 million.

SWP construction progress is shown in Table 12. As shown in the Table, some contracts have been completed. Also, estimated completion dates are given for those still in progress.



Closeup of steel reinforcement being installed at the Bottle Rock Powerplant.

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TABLE 12: SWP CONSTRUCTION DURING THE PERIOD

Division or Facility	Activity	Start Date	Planned Completion Date
Energy Supply	Bottle Rock Powerplant:		
	Turbine	Nov. 1980	Aug. 1984
	Initial Site Development	May 1981	Jan. 1984*
	Condenser	Oct. 1981	Mar. 1984
	Power Plant Construction	Feb. 1982	Feb. 1985
	Pump Units	May 1982	Mar. 1984
	Control Switchboards	Feb. 1982	Jul. 1983
	Auxiliary Control System	May 1982	Oct. 1983
	Road Reconstruction	May 1982	Sep. 1982
	Soils Lab Building	Mar. 1982	May 1982*
	South Geysers Initial Site Development	Jun. 1982	Jan. 1983
	Romero Overlook Wind Energy Project:		
	Main Contract	Jan. 1980	Jun. 1982*
	Second Contract	Feb. 1980	Oct. 1981*
	Reid Gardner Unit No. 4	Mar. 1979	Aug. 1983
	Pine Flat Powerplant	Feb. 1980	Jan. 1984
Oroville Division (including Upper Feather)	Edward Hyatt Powerplant:		
	Rebabbit Unit 6 Guide Bearing	Apr. 1981	Jul. 1981*
	Spherical Valve Seat Seals	Jul. 1981	Apr. 1982*
	Machine Seat Cartridge Rings	Jan. 1982	Apr. 1982*
	Densify Foundation Sand at Thermalito Afterbay	Nov. 1981	May 1982*
	Beckwourth O&M Roofing Replacement	Aug. 1981	Apr. 1982*
	Beckwourth O&M Wall Waterproofing	Oct. 1981	Nov. 1981*
Delta Facilities	Instrumentation Systems for Delta Water Quaility Monitoring	May 1979	Apr. 1982*
	Data Acquisition System for Delta Water Quality Monitoring	Jan. 1981	Oct. 1982
	Old River Closure	Oct. 1981	Nov. 1981*
Suisun Marsh Facilities	Modifications to Goodyear Slough Outlet Structure	Jul. 1981	Aug. 1981*
	Roaring River Levee Repair Phase II	Jul. 1981	Sep. 1981*
	Roaring River Levee Repair Sta. 472-478	Sep. 1981	Sep. 1981*
	Roaring River Levee Repair Sta. 132-148	Sep. 1981	Sep. 1981*
	Goodyear Slough Outlet Channel	Nov. 1981	Jun. 1982*
North San Joaquin Division	Skinner Delta Fish Facilities Phase 2	Dec. 1980	Oct. 1982
	Louver Assemblies for Skinner Delta Fish Facilities	Nov. 1980	Mar. 1982*
	Spare 1,067 cfs Pump Impeller for Harvey O. Banks Delta Pumping Plant	Feb. 1981	Jan. 1983
	Sealing Operating Roads	Jul. 1981	Aug. 1981*
	Fencing Santa Nella Borrow Area	Dec. 1981	Dec. 1981*
	Emergency Repair of Canal Lining Mile 10.3	May 1981	Jul. 1981*
	Vacuum Circuit Breakers for Harvey O. Banks Delta Pumping Plant	Nov. 1981	May 1982*
San Luis Division	Modifications of San Luis O&M Center and Romero Visitors Center	May 1981	Mar. 1982*
	Containment Areas for Asbestos Laden Sediment	Nov. 1981	May 1982*
	Emergency Crane Service Job Silt Pump Removal	Aug. 1981	Aug. 1981*
	Right-of-Way Fencing Mile 155.78-172.40	Nov. 1981	Jan. 1982*
	Romero Overlook Wind Energy Project	Jan. 1980	Jun. 1982*

* Actual Completion

ACTIVITIES IN PROGRESS

JULY 1981 – JUNE 1982

Division or Facility	Activity	Start Date	Planned Completion Date
South San Joaquin Division	Repair Pump Impeller for Unit No. 3 of Buena Vista Pumping Plant	Aug. 1981	Sep. 1981*
	Repair Pump Impeller for Unit No. 3 of Wind Gap Pumping Plant	Oct. 1981	Jan. 1982*
	Machine Pump Impeller for Unit No. 7 of Wheeler Ridge Pumping Plant	Apr. 1982	May 1982*
	Nose Cones for Wind Gap Pumping Plant 630 cfs Pumping Units	Apr. 1982	May 1982*
Tehachapi Division	A. D. Edmonston Pumping Plant:		
	Pumps	Jul. 1979	Apr. 1984
	Isolated Phase Bus Equipment	Nov. 1980	Oct. 1982
	Motors	Jun. 1981	Jul. 1984
	Switchboards	Jun. 1981	Mar. 1983
	Bumped Heads	Jul. 1981	Dec. 1981*
	Switchgear	Sep. 1981	May 1983
	Completion Phase II	Apr. 1982	Aug. 1984
	Power Transformers	Mar. 1982	Nov. 1983
	Repair Unit No. 3 Impeller	Jun. 1982	Aug. 1982
	Metal Storage Building	May 1981	Oct. 1981*
	Pastoria Siphon Second Barrel	Nov. 1981	Oct. 1983*
Mojave Division	Alamo Powerplant:		
	Turbine	Oct. 1980	Nov. 1984
	Initial Structure	Mar. 1982	Oct. 1983
	Repair Pump Impeller for Unit No. 4 of Pearblossom Pumping Plant	Aug. 1981	Sep. 1981*
	Section 33 Perimeter Channel Mile 318.9 to 319.7	Dec. 1981	Mar. 1982*
	205th Street West Bridge and Aqueduct Frontage Roads	Apr. 1982	Sep. 1982
	Mojave Siphon Powerplant Intake	Apr. 1982	Dec. 1982
	Check Structures Mile 379 & 389.5 Phase I	Mar. 1982	Nov. 1982
Santa Ana Division	Rebabbit Guide Bearing for Unit No. 1 Turbine at Devil Canyon Powerplant	Sep. 1981	Nov. 1981
West Branch	William E. Warne Powerplant:		
	Turbines	Feb. 1978	Oct. 1982
	Valves	Aug. 1978	Oct. 1982
	Initial Structures	Nov. 1978	Oct. 1981*
	Generators	Jun. 1979	Oct. 1982
	Switchboards	Mar. 1980	Oct. 1982
	Switchgear	Jul. 1980	Oct. 1982
	Transformers	Nov. 1980	Oct. 1982
	Activators	Aug. 1980	Oct. 1982
	Completion	Dec. 1980	Mar. 1983
	Flowmeter	Nov. 1981	Oct. 1982
	Peace Valley Pipeline	Apr. 1978	Jul. 1981*
	Peace Valley Pipeline Intake Facilities and Completion of Quail Lake and Lower Quail Canal	Apr. 1979	Sep. 1981*
	Repair Impeller at Oso Pumping Plant Unit No. 2	Dec. 1981	Dec. 1981*
	Rebabbit Guide Bearing for Unit No. 2 of Oso Pumping Plant	Jan. 1982	Mar. 1982*
	Modifications of Southern California O&M Center and Castaic Dam Visitors Center	Apr. 1982	Sep. 1982
San Joaquin Drainage Facilities	Los Banos Demonstration Desalting Facility:		
	Biological Component	Mar. 1982	Oct. 1982
	Information Sign	Feb. 1982	Feb. 1982*
	Physical and Chemical Components	Apr. 1982	Apr. 1983

* Actual Completion

Safety of Department-Owned Dams

In 1975 the Department, as required by Water Code Section 6056, initiated a revised program for review of the safety of Department-owned dams. Under this program a consulting board is convened to conduct independent safety reviews of each dam every five years. The Department participates in the safety review process by providing technical engineering support to the various consulting boards. The dams in the Upper Feather River Area were the last of the Department-owned dams to undergo their first safety evaluation under this review program.

Following is a summary of activities within each SWP area in progress under this program.

Upper Feather River Area

The Department's Independent Safety Review Board for Antelope, Grizzly Valley, and Frenchman Dams completed its safety evaluation and submitted a report in November 1980. The report declared the dams to be safe, but recommended some additional work and studies for each. This additional work and studies, expected to be completed by September 1983, was summarized in Bulletin 132-81.

Oroville Division

Members of the Special Consulting Board for the August 1, 1975, Oroville Earthquake are performing the independent safety review for Thermalito Forebay, Thermalito Afterbay, and Bidwell Canyon Saddle dams. During courses of the studies, the Department completed:

- Seismic evaluation of Thermalito Forebay and Thermalito Afterbay Dams and
- Extensive facilities exploration and testing of the dams.

The Department plans to complete its final technical studies of these dams for presentation to the Board in December 1982, and the Board is scheduled to conclude its evaluation of these dams by January 1983.

The Department has published two reports on the 1975 Oroville Earthquake:

1. Bulletin 203, "Performance of the Oroville Dam and Related Facilities During the August 1, 1975 Earthquake", April 1977.
2. Bulletin 203-78, "The August 1, 1975 Oroville Earthquake Investigations", February 1979.

These reports discuss in detail the 1975 earthquake and its effect on Oroville Dam.

South Bay Area

The Department's Safety Review Board completed its safety evaluation of Del Valle, Clifton Court Forebay, Patterson, and Bethany Dams and submitted its report on each dam in 1980. The Board's reports declare the dams to be safe, but recommended additional work or studies for each dam.

The recommendations included such actions as dynamic soil studies, seismic stability analyses, specific monitoring and inspection actions at each structure, and a number of remedial repairs.

Accountability statements covering all of the recommended actions have been prepared and are being reviewed by Department Management. The additional work and studies is expected to be complete about mid-1984.

San Luis Division

Dam safety evaluation programs for San Luis Dam, carried out by the Department and USBR in 1979, concluded that the dam's performance during and after a

large magnitude earthquake needed further evaluation. This evaluation was scheduled for completion in December 1982. An engineering consulting board was appointed to review the results of a seismotectonic study prior to finalizing the study's report and to advise on engineering criteria for the seismic evaluation. The consulting board is scheduled to complete their review by the end of 1982. The engineering analysis of San Luis Dam is scheduled to be complete early in 1983.

Southern California Area

The Safety Review Board for Castaic Dam submitted its report in January 1980. The Board's report declared the dam to be safe, but recommended the following additional design studies and remedial work:

- Analysis of the left abutment and installation of more pressure-sensing devices.
- Recalculation of the maximum flood hydrograph.
- Correction of movement between some concrete slabs in the spillway.

These additional studies and work are expected to be completed by mid-1984.

On April 17, 1979, the Department's Independent Safety Review Board for Cedar Springs Dam requested additional foundation exploration and a dynamic analysis of the dam. This additional work was completed and the results presented in a draft report to the Board on July 12, 1982. Based on its review of these results, the Board requested additional soil testing and analysis before preparing a final report. This additional testing and analysis is now in progress. The Board plans to issue its final report by the end of 1982.

The Safety Review Board for Perris Dam is completing the second "5-year" review of Perris Dam. The Board plans to report its findings in the fall of 1982.

Review Under FERC Requirements

A consulting engineer's report on the safety evaluation, covering requirements of the Federal Energy Regulatory Commission (FERC), for Oroville, Bidwell Canyon Saddle, Parish Camp Saddle, Thermalito Diversion, Thermalito Forebay, Thermalito Afterbay, and Feather River fish barrier dams was completed in February 1980.

Actions recommended by the consultant and the status of their implementation are:

- Review Probable Maximum Flood (PMF) calculations. The action has been completed.
- Apply the results of the PMF review to an evaluation of Oroville Dam spillway and operations at Thermalito Diversion Dam. Action to be completed by January 1983.
- Complete investigations in progress for the Special Consulting Board. Action to be completed by January 1983.
- Consider modifications to the river outlet valves in Oroville Dam to insure limited availability for future use. The river outlet has been deactivated and "moth-balled". Reactivating time, if required, is two weeks.
- Consider reducing the scope and frequency of data collection. This action has been completed.

FERC made an additional request on April 8, 1982, for an investigation concerning the susceptibility of Oroville Dam to overtopping as a result of wind and wave action. This investigation will be made and the results submitted to FERC in January 1983.

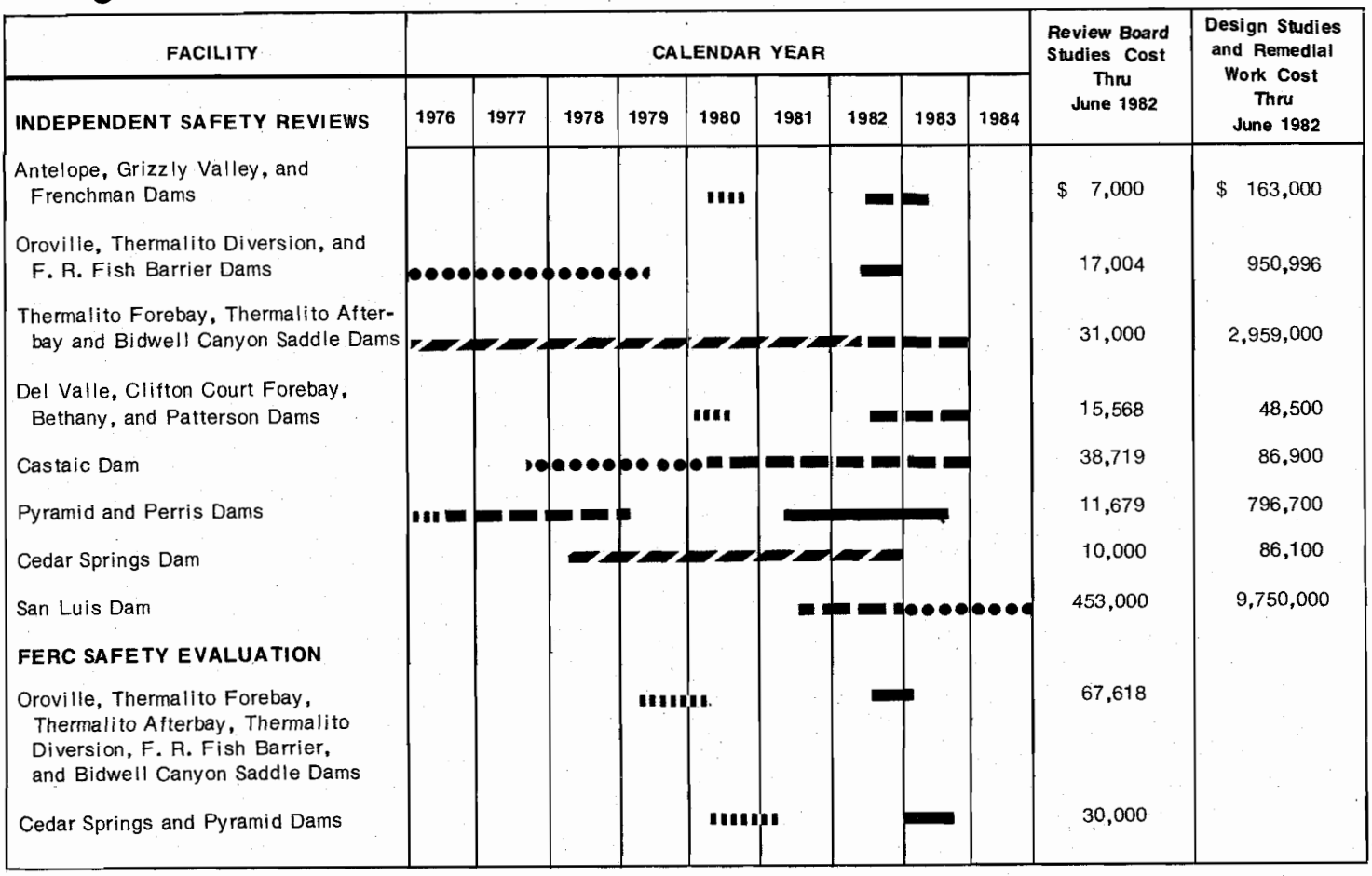
The consulting engineer's report covering FERC requirements on Cedar Springs and Pyramid Dams was completed in March

1981. The report declares the dams to be safe, but makes the following recommendations:

- Re-examine the dynamic stability or deformation of the dams.
- Determine the cause and significance of abnormal behavior in some of the pressure sensing devices in Pyramid Dam.
- Provide means for reducing the dampness in the outlet works control vault of Pyramid Dam.
- Investigate the cause of pore pressure deviations in Cedar Springs dam and its effect on overall stability.
- A revised schedule for implementing the consultant's recommendations is to be submitted to the FERC by August 1982.

The safety review schedule of Department-owned dams is shown in Figure 16 together with the Board's review costs, design costs, and costs of remedial work incurred by the Department through June 1982.

Figure 16: SCHEDULE FOR REVIEW OF DEPARTMENT OWNED DAMS



CHAPTER VI

PROJECT MANAGEMENT

Water Rights Management

Delta Water Quality Monitoring and Reporting

In August 1978 the SWRCB issued water rights decision D-1485. This Delta decision was the result of hearings on (1) SWP and CVP water rights permits and (2) water quality standards in the Sacramento-San Joaquin Delta. The decision controls, under certain conditions, the level of water exports from upstream storage reservoirs to maintain Delta water quality. It also requires implementation of a monitoring program to properly monitor the Delta's water quality. The monitoring program and associated special studies conducted by the Department have helped to gain a better understanding of the effects of SWP operation on the Delta's ecology. The program has also provided information that will determine future operating criteria to protect the Bay-Delta waters.

In 1981, the Department sampled an average of 32 parameters at each of 28 sites throughout the Delta estuary on a bi-weekly basis. On alternate weeks, continuous water-quality profiles of the main channels were recorded with automated instrumentation aboard the Department's laboratory workboat, San Carlos. Special studies conducted by the Department in 1981 included a continuing series of sampling runs to measure food web relationships in the shoal areas of San Pablo Bay.

Efforts continue to determine the causes for erratic algal production in the Central Delta. Information collected during supplemental monitoring runs in 1981 indicates that the residence time that planktonic organisms spend within the area may be a key factor.

D-1485 requires supplemental studies of significant water quality changes in the Delta and of the freshwater outflow needs of the San Francisco Bay ecosystem. The objective is to separate the effects of Delta outflow from other major changes in the Bay, such as waste discharges and filling of marshes. The Department is cooperating with the Department of Fish and Game, the lead agency for these studies. Other ecological studies are being conducted through efforts of an interagency group; USBR, U. S. Fish and Wildlife Service, SWRCB, and San Francisco Bay Conservation and Development Commission.

Construction for a network of six continuous, multi-parameter recorders located on-shore at strategic locations throughout the Delta has been completed. This network is another requirement in the appropriation permit issued by the SWRCB. Sensor packages have been installed, and computerized equipment is being calibrated. Processing of computer water quality information should begin in the fall of 1982. Three sites (Antioch, Mallard Slough, and Rio Vista) will have telemetry capabilities.

Water quality information is stored in the Department's Water Data Information System. Data for 1981 were published and transmitted to SWRCB with the Department's analysis of the information. Copies of 1975 through 1980 data tabulations are still available. The Department is cooperating with SWRCB in analyzing existing State and Federal data systems to adopt an electronic data processing system common to all State agencies. The data developed from these

efforts are also an important reference for other agencies involved in Delta study and evaluation programs.

Water Entitlement Negotiations

Suisun Marsh. The Suisun Marsh Initial Facilities, consisting of dredging and improvements on Roaring River Slough, Morrow Island Ditch, and the Goodyear Slough Outfall Structure, were completed by the Department in October 1980. In late 1981 through June 1982, the following work was done on these facilities:

- Facilities for cleaning the initial two Roaring River Slough intake fish screens were completed. Department of Fish and Game (DFG) completed its evaluation of these initial fish screens and recommended that the six remaining intake pipes be screened.

- The Goodyear Slough Outfall Structure was repaired and a channel from the Structure into Suisun Marsh was dredged.

The Department is continuing to work through the Suisun Marsh Technical Committee of the Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary to develop a coordinated plan to maintain and, where practicable, enhance the wildlife habitat in the Suisun Marsh.

The Department has acquired the Suisun Marsh Model developed for the USBR, debugged it, refined it, and determined that it correctly modeled existing data. The Model has been used to analyze alternatives and test the effectiveness of proposed facilities in meeting the requirements of D-1485. Information from the Model on channel sizes and the volumes of water to be moved is to be used in designing the facilities.

The Department, DFG, and Suisun Resources Conservation District (SRCD) have reached agreement on all items on operating the facilities except the condition requiring the Marsh to take deficiencies in dry and critical years. Agreement on all items and completion of the final EIR are expected by December 1982. The facilities will not be completed by the October 1984 date specified in D-1485. An application for a time extension will be made with the SWRCB after the schedule for the remaining work has been set.

Western Delta Municipal Water Users. Two contracts are in effect for replacement of municipal water supplies in the Antioch-Pittsburg area. (See page 20, Bulletin 132-67.) The first, signed April 21, 1967, is with the Contra Costa County Water District (CCWD) for its municipal water diversion at Mallard Slough near Pittsburg; the second, signed April 11, 1968, covers use by the city of Antioch.

Each contract provides that the SWP compensate each entity for its additional costs of purchasing a substitute water supply from the Contra Costa Canal to replace offshore supplies lost because of SWP operation. Both agencies had below-average offshore water supplies during the 1981 water year as defined in the contract. During the year, the CCWD experienced a deficiency of 90 days and received payment of $13,865.27 under the terms of the contract. The city of Antioch experienced a deficiency of 110 days; these deficient-days were more than off-set by credits accumulated in previous years, for above-average offshore water supplies, 63 days of above-average offshore water conditions remain to off-set deficient-days of availability to Antioch in future years.

Contra Costa Canal Intake Relocation. Negotiations with the CCWD for a contract to relocate the Contra Costa Canal Intake began in 1979. Agencies represented in the negotiations included the Department, USBR, CCWD and East Contra Costa County Irrigation District.

The Canal presently draws water from Old River near Rock Slough, where the intake is exposed to saline intrusion and local drainage of poor quality. Relocating

the Contra Costa Canal Intake to Clifton Court Forebay would help protect the quality of the District's water supply from degradation. The planned relocation would cross the East Bay Municipal Utility District's (EBMUD) Mokelumne Aqueduct and East Contra Costa Irrigation District's intake channel.

In view of the defeat of SB 200, the Department has terminated its role in studies and negotiations associated with the relocation.

Western Delta Industrial Water Users. Near Antioch and Pittsburg, several industries use offshore water for both processing and cooling. Each year, when the offshore water quality is below the industries' requirements for process water, the Contra Costa Canal provides a substitute supply. These industries have not agreed to participate in a contract similar to those signed by municipal interests. The reasons cited include: (1) belief that SWP should provide compensation for the entire loss of offshore water regardless of who is responsible; and (2) desire for SWP to guarantee the quality and quantity of the water from the Contra Costa Canal when it is used as a substitute supply.

On August 28, 1980, the Department resumed negotiations with Louisiana Pacific-Fibreboard and Crown Zellerbach corporations. A draft contract was submitted to both corporations.

The reaction of the corporations to the proposed contract has been favorable, but many details remain unresolved. The proposed contract was made less meaningful by the defeat of SB 200, and progress towards conclusion of these negotiations has been slowed.

Delta Agricultural Water Users. For more than a decade, the Department has sought to contract with the agricultural agencies for the SWP to meet water quality standards necessary for reasonable beneficial uses throughout each agency's respective area, with relaxation of these standards during dry and critical years, when water supplies are limited. In return, the agencies would make annual payments for SWP services in excess of any Project mitigation obligations.

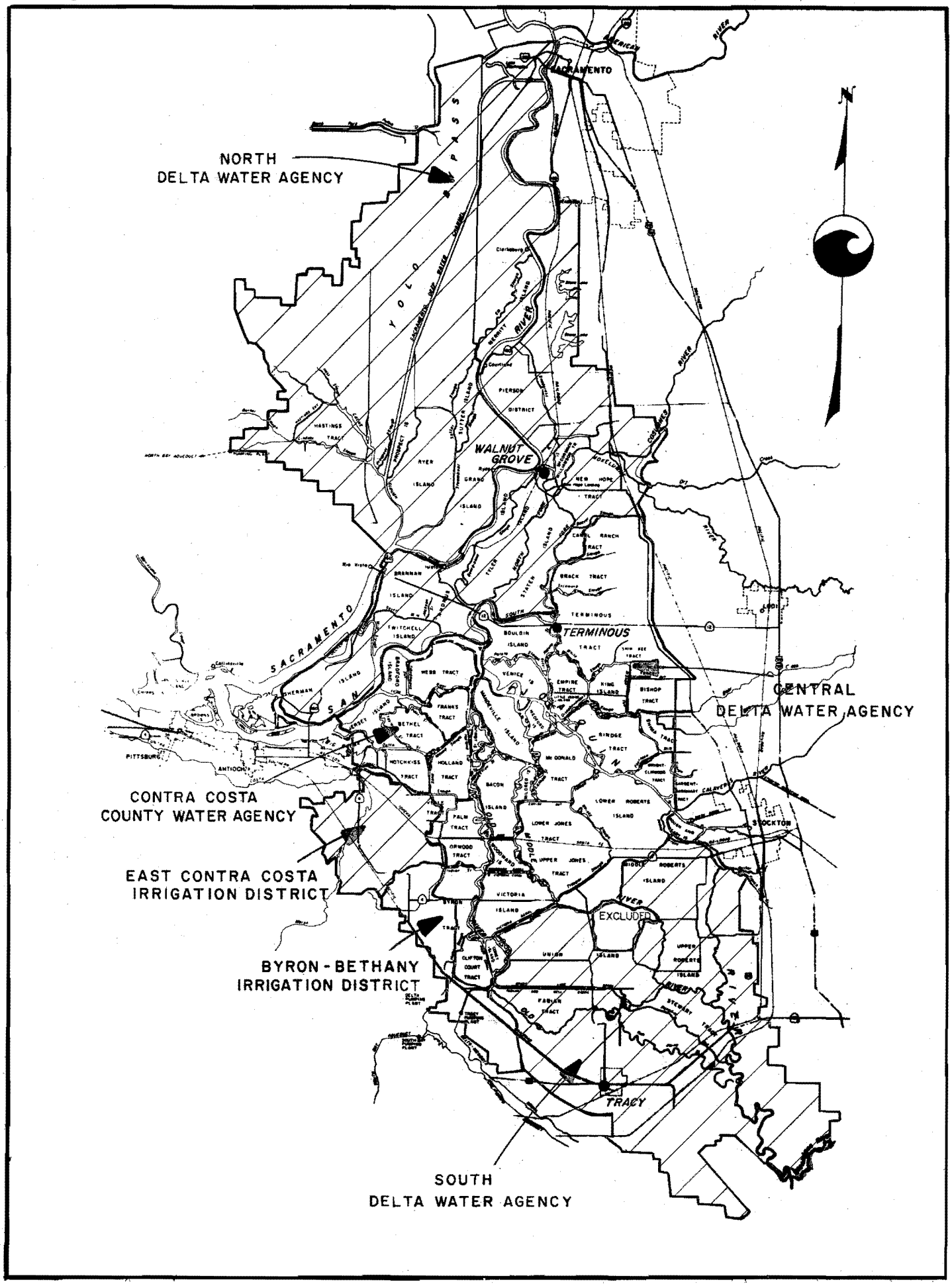
Beginning in 1974, six agencies representing agricultural water interests in the Delta succeeded to the overall interest of the Delta Water Agency, which ceased to exist December 31, 1973. These are the North, the Central, and the South Delta Water agencies, the Contra Costa Water Agency, and the East Contra Costa and Byron-Bethany Irrigation Districts. The area served by each of these agencies is shown in Figure 17. The status of negotiations is further detailed as follows:

- North Delta Water Agency (NDWA).
  A contract with the NDWA was signed in 1981 (see Bulletin 132-81, pp. 70-71 for discussion). Activities since June 30, 1981 have been devoted to monitoring water quality at four existing stations required by D-1485 and installation of three new stations required by the contract. Grab samples are being utilized until these latter three stations are operational.

- East Contra Costa Irrigation District (ECCID).
  The contract was executed on January 7, 1981. No ratification election was required because the District holds the water rights. The Installation of monitoring equipment at the ECCID intake is in progress.

- South Delta Water Agency (SDWA)
  In June 1981, discussions between SDWA, USBR and the Department were resumed. The objective of these discussions was to update the 1980 report to include the decade of the 1970s and to define the requirements of southern Delta agriculture. Little progress has been made in these matters. Further discussions and negotiations

Figure 17: SACRAMENTO - SAN JOAQUIN DELTA AGENCIES



have been placed in abeyance pending the outcome of a lawsuit filed in July 1982 by SDWA against the Department and USBR. (See Chapter 4, for additional discussion.)

- Central Delta Water Agency; Contra Costa County Water Agency and Byron-Bethany Irrigation District. Negotiations are currently inactive; there is no reason to believe that they will be resumed in the near future.

Pyramid and Castaic Water Rights Applications

In the late 1960s agreements were signed with the Newhall Land and Farming Company and the United Water Conservation District, both located in the Santa Clara River Valley of Southern California, stipulating that all local waters entering Pyramid and Castaic Lakes would be released undiminished in quantity and flow rate. The purpose of the agreements was to ensure the continued availability of these unimpaired natural flows to the downstream water users.

A portion of this local runoff, however, was periodically lost to the ocean as flood flow. In March 1978, the Department received a temporary permit from the SWRCB that allowed the storage of local runoff for later release from Pyramid and Castaic Lakes. An agreement dated October 25, 1978, covering the conservation of local flood waters, was signed with the Newhall Land and Farming Company, the United Water Conservation District, the County of Los Angeles, and the Newhall County Water District. This agreement set forth conditions under which excess flood flows originating in the watershed tributary to Castaic Lake would be stored and made available for later use by downstream water users. Under this agreement any stored water not used by May 1 of each year becomes property of the State.

In 1979, the Department filed applications with the SWRCB for permanent water rights to capture excess winter flows from local watersheds for storage in Pyramid and Castaic Lakes. The applications are to appropriate up to 67 800 dam^3 (55,000 acre-feet) per year of unappropriated Piru Creek water in Pyramid Lake and up to 104 000 dam^3 (85,000 acre-feet) per year of Castaic Creek water in Castaic Lake. As a result of protests filed against the applications, the Department, in September 1981, executed three agreements to be included in the water rights applications: (1) an agreement with the DFG stipulates that the Department will fund a $120,000 two-year study of the steelhead fishery resource potential of the Lower Santa Clara River; (2) an agreement with the United Water Conservation District provides that the District will participate in the funding of the DFG study and will act as Watermaster for the releases of natural inflow for the period of the study; and (3) an agreement with Newhall Land and Farming Company obliges the Department to recognize and provide for local water users rights as stated in the October 1978 agreement. During the study period, downstream water users shall be entitled to 25 percent of the natural inflow stored under the October 1978 agreement. The remaining 75 percent will be available for the DFG study.

The DFG study, which would be funded with SWP monies, will be conducted only if the Department receives the water right permits from the SWRCB.

If the water rights permits are granted by the SWRCB then local flood flows in Piru and Castaic Creeks would be stored and used in lieu of exporting an equal volume of SWP water from the Sacramento-San Joaquin Delta. The historical record shows that local flows to Pyramid Lake could be stored in about one out of six years, and that the average annual amount would be 6 000 dam^3 (4,900 acre-feet). Local flows to Castaic Lake could be stored in about two years out of five, and the average annual amount would be 15 200 dam^3 (12,300 acre-feet).

In addition to providing water to the SWP, the conservation of local runoff will provide savings to SWP contractors through reduced energy costs. Table 13 shows projected energy savings based on conserving these average annual water amounts of local water supply instead of pumping the same amount of water from the Delta to Pyramid and Castaic Lakes. The figures show total annual savings of about $1 million in 1985 increasing to $1.8 million in the year 2000.

All of the environmental documentation and other supporting information has been completed for the permits. No date has been scheduled by the SWRCB for action on the applications. If the permits are not issued before the upcoming water year, the Department may be required to request temporary permits for storage.

Water Contracts Management

In 1981, the State had long-term contracts with 30 water agencies for annual water supplies from the SWP (see Bulletin 132-81, page 74, for details about the consolidation of Tulare Lake Basin Water Storage District and Hacienda Water District). Figure 18 shows the location of each of the 30 water agencies and provides other information concerning each agency and its service area as it existed in 1981. The total cumulative deliveries, column 2 of Figure 18, includes both Project and nonproject water deliveries from SWP facilities.

SWP 1981 water supplies were sufficient to meet all water contractors' entitlement and repayment water requests with enough remaining to meet almost 80 percent of the water contractors' surplus water requests. In addition there was enough unscheduled water (formerly designated as extra surplus water) available during the first four months of 1981 to meet over 20 percent of the surplus water requests. On December 17, 1980, the initial schedule was approved for water deliveries in 1981, based on the 1981 rule curve criteria and using the December 1, 1980 water supply supply forecast for the 1980-81 water year. The initial approval was for the delivery of all 1981 entitlement requests except for 129 283 dam^3 (104,810 acre-feet) which was disallowed, all carry over entitlement amounts requested, 117 181 dam^3 (94,999 acre-feet) of repayment water and 164 056 dam^3 (133,000 acre-feet) of surplus water.

The disallowed entitlement requests represented the amount of water requested less that which the State estimated would actually be used in 1981. These reductions in the approved delivery schedule were held in abeyance pending contractors' demonstrations that more water would be required. If the contractor entitlement requests were, in fact, in excess of needs, that excess would be made available to others. Because of the exceptionally hot summer experienced in Southern California during 1981, all the disallowed requested entitlement water was used to meet increases in demands for entitlement water.

As monthly forecasts of the year's water conditions improved, increased amounts of surplus water were approved for delivery, reaching a maximum in April, when all but some 20 percent of the requests for surplus water were approved for delivery.

The unscheduled water program, initiated in 1980, was again carried out in 1981 with six contractors signing unscheduled water contracts. During the first four months, these six contractors took delivery of 225 784 dam^3 (183,116 acre-feet) of unscheduled water.

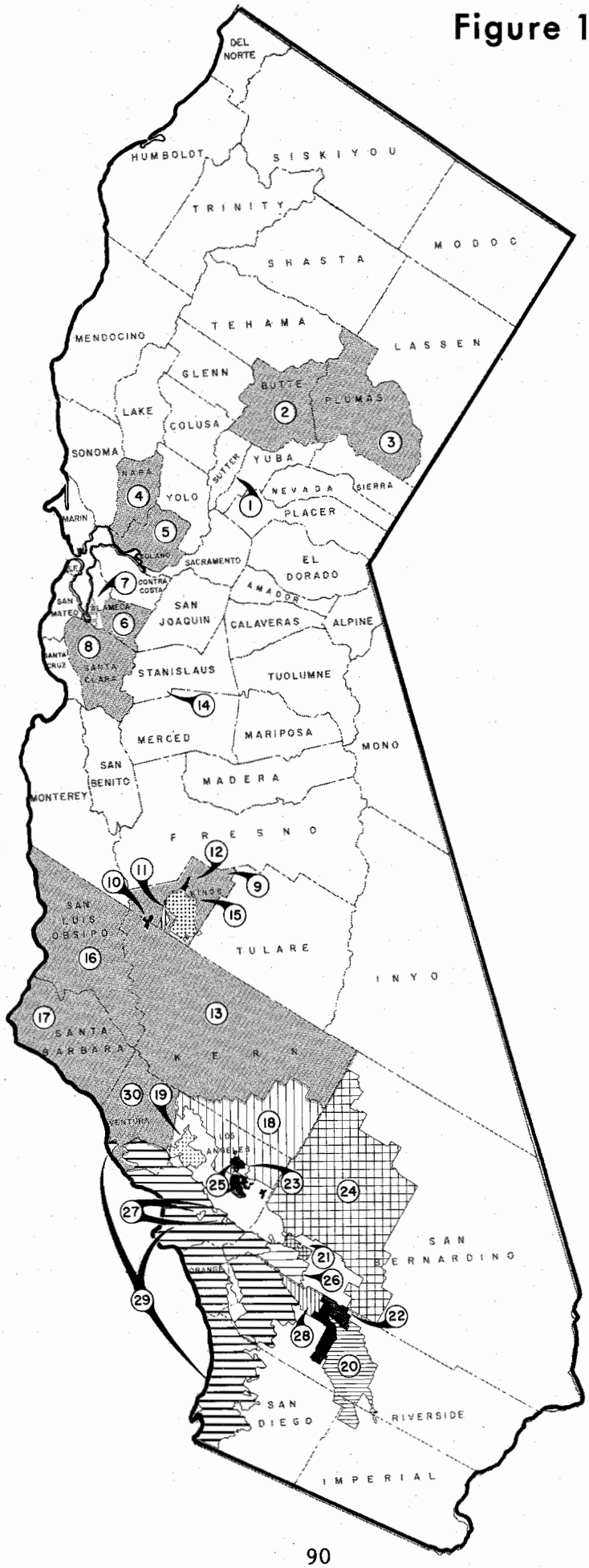
After the San Luis Dam slippage, unscheduled water again became available as a result of the required draining of San Luis Reservoir. The same six contractors took delivery of an additional

TABLE 13: ENERGY SAVINGS FROM WATER RIGHTS PERMITS FOR PYRAMID AND CASTAIC

	Energy Savings* Per Acre-Foot	Average Annual Appropriation	Total Average Annual Savings
1985			
Pyramid	$ 76.66	4,900 acre-feet	$ 375,000
Castaic	$ 48.99	12,300 acre-feet	$ 600,000
Total			$ 975,000
1990			
Pyramid	$ 91.81	4,900 acre-feet	$ 450,000
Castaic	$ 65.90	12,300 acre-feet	$ 810,000
Total			$1,260,000
2000			
Pyramid	$121.82	4,900 acre-feet	$ 595,000
Castaic	$ 96.49	12,300 acre-feet	$1,190,000
Total			$1,785,000

* Estimated pumping costs from the Delta.

Figure 18: LONG-TERM



WATER SUPPLY CONTRACTING AGENCIES

Location No.	Contracting Agency Contracting Agency	Total Cumulative Deliveries through Dec. 31, 1981 (acre-feet)[a]	Maximum Annual Entitlement (acre-feet)[a]	Total Payments through Dec. 31, 1981 (dollars)	Gross Area as of July 1, 1981 (acres)[b]	Assessed Valuation 1981-1982 (dollars)[c]	Estimated Population (July 1, 1981)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	UPPER FEATHER AREA						
1	City of Yuba City	0	9,600	0	4,314	90,243,000	18,736
2	County of Butte	3,413	27,500	283,919	1,066,000	3,401,426,272	148,000
3	Plumas County Flood Control and Water Conservation District	4,313	2,700	290,581	1,694,000[d]	195,000,000[d]	17,000[d]
	Subtotal	7,726	39,800	574,500	2,764,314	3,686,669,272	183,736
	NORTH BAY AREA						
4	Napa County Flood Control and Water Conservation District	72,840	25,000	3,775,507	512,000	2,869,537,000	99,900
5	Solano County Flood Control and Water Conservation District	0	42,000	461,041	575,000	5,747,000,000	243,000
	Subtotal	72,840	67,000	4,236,548	1,087,000	8,616,537,000	342,900
	SOUTH BAY AREA						
6	Alameda County Flood Control and Water Conservation Dist., Zone 7	229,005	46,000	11,725,774	272,000	2,772,000,000	109,000
7	Alameda County Water District	321,596	42,000	13,739,658	63,000	1,262,000,000	206,000
8	Santa Clara Valley Water District	1,379,529	100,000	52,354,671	849,000	9,025,000,000	1,330,000
	Subtotal	1,930,130	188,000	77,820,103	1,184,000	13,059,000,000	1,645,000
	SAN JOAQUIN VALLEY AREA						
9	County of Kings	22,400	4,000	441,956	893,000[e]	1,615,322,500[e]	74,200[e]
10	Devil's Den Water District	204,190	12,700	4,469,260	8,500	1,258,700[f]	50
11	Dudley Ridge Water District	745,367	57,700	9,516,695	29,900	3,539,600[f]	50
12	Empire West Side Irrigation District	55,312	3,000	699,086	7,500	744,600[f]	50
13	Kern County Water Agency	8,883,545	1,153,400	167,863,369	5,037,200[h]	21,384,270,000[h]	412,500[h]
14	Oak Flat Water District	81,297	5,700	807,075	4,000	275,000[f]	50
15	Tulare Lake Basin Water Storage District[g]	1,703,840	118,500	19,162,465	189,226	24,333,500[f]	50
	Subtotal	11,695,951	1,355,000	202,959,906	6,189,326	23,029,743,900	486,950
	CENTRAL COASTAL AREA						
16	San Luis Obispo County Flood Control and Water Conservation District	0	25,000	2,960,840	2,131,300	5,221,765,571	161,300
17	Santa Barbara County Flood Control and Water Conservation District	0	57,700	6,904,862	1,756,900	9,308,187,165	300,200
	Subtotal	0	82,700	9,865,702	3,888,200	14,529,952,736	461,500
	SOUTHERN CALIFORNIA AREA						
18	Antelope Valley-East Kern Water Agency	326,948	138,400	41,285,042	1,524,900	3,082,643,951	102,200
19	Castaic Lake Water Agency	6,978	41,500	15,681,880	125,000	2,323,085,936	79,000
20	Coachella Valley Water District	69,936	23,100	10,165,432	637,500	4,325,946,263	94,100
21	Crestline-Lake Arrowhead Water Agency	9,608	5,800	2,903,953	55,100	648,943,141	11,700
22	Desert Water Agency	108,300	38,100	16,563,165	208,900	2,861,870,999	55,200
23	Littlerock Creek Irrigation District	4,800	2,300	730,483	43,300	43,950,341	1,600
24	Mojave Water Agency	8,733	50,800	18,387,623	3,160,400	3,334,831,486	114,000
25	Palmdale Water District	0	17,300	4,887,728	73,877	456,745,450	21,500
26	San Bernardino Valley Municipal Water District	122,086	102,600	56,537,712	210,100	5,701,768,082	360,700
27	San Gabriel Valley Municipal Water District	33,894	28,800	14,841,523	16,300	3,127,747,957	163,500
28	San Gorgonio Pass Water Agency	0	17,300	8,260,609	140,600	635,798,034	36,000
29	The Metropolitan Water District of Southern California	4,239,541	2,011,500	917,846,841	3,272,600	314,726,854,882	12,177,300
30	Ventura County Flood Control District	0	20,000	6,425,364	1,179,500[i]	15,911,550,670[i]	550,200[i]
	Subtotal	4,930,824	2,497,500	1,114,517,355	10,648,077	357,181,737,192	13,767,000
	TOTAL STATE WATER PROJECT	18,637,471	4,230,000	1,409,974,114	25,760,917[j]	420,103,640,100[j]	16,887,086[j]
	NET TOTALS, STATE WATER PROJECT SERVICE AREA				24,623,417[k]	409,099,653,684[k]	16,506,835[k]
	TOTAL, STATE OF CALIFORNIA				100,314,000	657,928,000,000	24,196,000
	PERCENT, STATE WATER PROJECT OF TOTAL				24.5	62.2	68.2

a) Metric conversion is acre-feet times 1.2335 equals cubic dekametres.
b) Metric conversion is acres times 0.040469 equals hectares.
c) Statutes of 1978, Chapter 1207, added Section 155 to the Revenue and Taxation Code. "155(a) 'Assessed value' shall mean....100 percent of full value for the 1981-82 fiscal year and fiscal years thereafter..."
d) Total for Plumas County Flood Control and Water Conservation District, including Last Chance Creek Water District.
e) Total for County of Kings, including Dudley Ridge Water District, Empire West Side Irrigation District, Hacienda Water District, most of Tulare Lake Basin Water Storage District, and about 40% of Devil's Den Water District.
f) Less than 100% assessed value.
g) Hacienda Water District merged with Tulare Lake Basin Water Storage District effective January 1, 1981.
h) Total Kern County Water Agency, including about 60% of Devil's Den Water District, and about 50% of Antelope Valley-East Kern Water Agency.
i) Total for Ventura County Flood Control District, including portion of Antelope Valley-East Kern Water Agency, The Metropolitan Water District of Southern California, and Castaic Lake Water Agency.
j) Includes duplicate values. Some areas which are within two or more agencies are included in each agency's total.
k) Excludes duplicate values where agencies have overlapping boundaries.

113 394 dam^3 (91,929 acre-feet) of unscheduled water. Unscheduled water is defined as water available in the Delta in excess of that needed for scheduled SWP water deliveries, or other SWP purposes and, also, in excess of water to meet Delta requirements established by the SWRCB. In short, unscheduled water can be delivered only when Project water supplies, aqueduct conveyance capacity and energy available for Project pumping exceed all other SWP needs.

Priorities established for the use of unscheduled water provide that such water will be furnished (1) for ground water replenishment or for agricultural use in lieu of ground water pumping, and (2) for pre-irrigation to increase soil moisture prior to planting. Deliveries of unscheduled water are normally scheduled weekly in accordance with procedures set forth in the annually executed unscheduled water contracts. To maximize the availability of unscheduled water during the last three months of 1981, procedures were developed to schedule unscheduled water on a daily basis.

Column 2 of Figure 18 shows that seven contractors have yet to receive water from SWP facilities. An eighth contractor, Napa County Flood Control and Water Conservation District, has received only nonproject water, which was pumped and delivered through SWP facilities.

The two contractors who will receive Project water deliveries from the future extension of the Coastal Branch requested and received a sixth delay, until July 1, 1984, in initiating design of the uncompleted portion of the Coastal Branch.

Palmdale Water District's contract provides for deliveries of SWP water beginning in 1972; however, the District has not yet taken delivery of Project water. Contracts for the other six contractors, who have not yet taken Project water, specify initial deliveries to be made in 1980 or thereafter.

To date, some contractors have received far less water than the amounts contracted, mainly because annual needs are less than those projected in the early and mid-1960s when the contracts were signed. Table 14 shows the annual entitlements and actual water deliveries for the years 1962 through 1981. Although total entitlement deliveries are less than the contracted entitlements, cumulative State deliveries of all types of water since 1962 exceed the cumulative total of all annual contract entitlements through 1981.

Table 15 presents a summary of 1981 entitlement and surplus water service to long-term contractors. In 1981, sixteen contractors took less SWP water than their contracted 1981 entitlement amounts.

Water Deliveries in 1981

During 1981, 27 agencies were provided water service by the SWP. These included 23 long-term water contractors and four noncontractors. Table 15 summarizes deliveries to the long-term contractors during 1981. Monthly deliveries to each of the 27 contractors are shown in Table 16 and are summarized as follows:

- 2 333 863 dam^3 (1,892,066 acre-feet) of 1981 entitlement water to 22 long-term contractors.
- 781 278 dam^3 (633,383 acre-feet) of surplus water to eight long-term contractors.
- 339 268 dam^3 (275,045 acre-feet) of unscheduled water to six long-term contractors.
- 30 344 dam^3 (24,600 acre-feet) of emergency relief water to a long-term contractor.
- 43 918 dam^3 (35,604 acre-feet) of regulated local supply to three

long-term contractors and two noncontractors.

- 11 100 dam^3 (8,999 acre-feet) of Article 12 (d) entitlement makeup water to two long-term contractors from credits acquired because of reduced deliveries during the 1977 drought.

- 9 175 dam^3 (7,438 acre-feet) of entitlement water to one long-term contractor under the wet weather provisions of its contract.

- 1 306 dam^3 (1,059 acre-feet) of the 2 817 dam^3 (2,284 acre-feet) of 1980 entitlement water that was carried over in storage by one long-term contractor in Lake Oroville and delivered in 1981.

- 56 815 dam^3 (46,060 acre-feet) of preconsolidation repayment water to the two agencies holding preconsolidation repayment water contracts.

Entitlement Water Deliveries (Tables 15 & 16). In September of every year the State obtains from each contractor an estimate of future requirements for SWP water. Estimates for 1981 entitlement water received in the fall of 1980 from 23 contractors totaled 2 314 918 dam^3 (1,876,707 acre-feet) including a nominal amount of entitlement make-up water.

In addition to the entitlement water estimates, the request contained repayment preconsolidation water, demonstration ground water, and a substantial amount of surplus water.

Actual entitlement water delivered in 1981 totaled 2 385 789 dam^3 (1,934,162 acre-feet). Tables 15 and 16 show water delivered during 1981 by type and contractor. The difference between the amounts of entitlement water initially requested and those delivered resulted from increased deliveries to MWD. Exceptionally warm weather in southern California resulted in substantial increases in demands by MWD's member agencies between April and September. MWD deliveries of Colorado River water during this period were restricted and the increased demands were met almost entirely from increased Project deliveries to MWD.

By an amendment to its contract, the Santa Barbara County Flood Control and Water Conservation District permanently reduced its annual entitlements starting in 1980. The amendment reduced the agency's maximum annual entitlement by 15 066 dam^3 (12,214 acre-feet).

Makeup Water Deliveries (Tables 15 & 16). When the State is unable to deliver the requested entitlements in any year, long-term contractors are afforded relief under Articles 12(d) and 14(b) of the water supply contract. Contractors may elect to receive the undelivered entitlement water at other times during the year, or in succeeding years, to the extent that the water and delivery capability are available.

In 1977, as a result of the drought, quantities of initially scheduled water were reduced. Through these reductions, 21 long-term contractors gained a credit for future delivery totaling 563 791 dam^3 (457,066 acre-feet). These credits for undelivered entitlement water under Article 12(d) have been reduced by delivery of "makeup" water over the years, so that now only ten contractors have remaining rights. By the end of 1981, the total makeup water for future delivery totaled 158 031 dam^3 (128,116 acre-feet) consisting of 152 126 dam^3 (123,329 acre-feet) of Article 12(d) water, the remainder being Article 14(b) water.

Deliveries Under Wet Weather Provisions (Tables 15 & 16). At the beginning of 1981, four contractors had acquired credits totaling 197 449 dam^3 (160,072 acre-feet) for future delivery of entitlement water under the wet-weather provisions of their contracts. Water agencies can acquire credits to

TABLE 14: ANNUAL ENTITLEMENTS

(in acre

Calendar Year	Annual Entitlements Under Long-Term Water Supply Contracts							Annual Water
	Feather River Area	North Bay Area	South Bay Area	San Joaquin Valley Area	Central Coastal Area	Southern California Area	Total	Entitlement Water
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1962	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0
1967	0	0	11,538	0	0	0	11,538	11,538
1968	550	0	109,900	81,050	0	0	191,500	171,709
1969	620	0	98,700	168,075	0	0	267,395	193,020
1970	700	0	114,200	207,700	0	0	322,600	233,993
1971	890	0	116,200	258,500	0	0	375,590	357,340
1972	970	0	118,300	420,766	0	201,723	741,759	611,801
1973	1,100	0	120,400	392,352	0	472,400	986,252	694,388
1974	1,230	0	122,400	470,350	0	588,220	1,182,200	874,077
1975	1,610	0	124,500	556,509	0	704,250	1,386,869	1,223,990
1976	1,990	0	126,500	555,117	0	824,780	1,508,387	1,373,002
1977	2,420	0	128,600	594,100	0	942,201	1,667,321	574,155
1978	1,850	0	130,700	647,262	0	1,038,222	1,818,034	1,452,699
1979	2,130	0	132,700	715,385	0	1,177,873	2,028,088	1,659,896
1980	1,810	500	134,800	770,800	1,946	1,304,914	2,214,770	1,529,749
1981	1,940	650	137,000	830,700	2,813	1,419,365	2,392,468	1,909,562 (b
Subtotal, 1962-1981	19,810	1,150	1,726,438	6,668,666	4,759	8,673,948	17,094,771	12,870,919

a) Metric conversion is acre-feet times 1.2335 equals cubic dekametres.
b) Includes 1,892,066 acre-feet of 1981 entitlement water; 16,437 acre-feet of deferred deliveries pursuant to Articles 12(d), and 45(e) of contracts; and 1,059 acre-feet of carryover from 1980.
c) Values include deliveries to short-term contractors (Mustang Water District, 1970-71; Tracy Golf and Country Club, 1974, 1979 and 1980; Green Valley Water District 1974-75, 1978, 1979, and 1980; and Granite Construction Company, 1980).
d) Includes Emergency Relief Water, Repayment Water, Kern River Intertie Water, Exchange Water, Regulated Delivery of Local Supply and Conveyance of Federal CVP Water.

AND WATER DEMANDS

feet)[a]

Water Demands							
Contractor Demands							
Surplus Water[c]	Other Water[d]	Sub Total	Initial Fill	Operational Losses and Storage Changes	Recreation Water	Total	Calendar Year
(9)	(10)	(11)	(12)	(13)	(14)	(15)	
0	18,289	18,289	9	272	0	18,570	1962
0	22,456	22,456	71	185	0	22,712	1963
0	32,507	32,507	171	152	0	32,830	1964
0	44,105	44,105	93	729	0	44,927	1965
0	67,928	67,928	0	1,746	0	69,674	1966
0	53,605	65,143	8,328	4,212	0	77,683	1967
121,534	14,777	308,020	498,926	117,906	0	924,852	1968
72,397	18,829	284,246	510,614	72,196	0	867,056	1969
133,024	38,080	405,097	23,947	2,435	0	431,479	1970
296,019	44,119	697,478	7,853	5,812	8	711,151	1971
423,964	66,638	1,102,403	100,274	53,062	6,489	1,262,228	1972
296,416	42,511	1,033,315	204,638	53,798	1,155	1,292,906	1973
417,676	46,224	1,337,977	237,554	10,657	2,118	1,588,306	1974
622,902	63,793	1,910,685	103,352	-94,606	3,377	1,922,808	1975
580,110	115,217	2,068,329	61,122	-681,025	1,745	1,450,171	1976
0	389,065	963,220	0	-131,151	1,111	833,180	1977
16,914	121,225	1,590,838	64,443	717,370	1,691	2,374,342	1978
648,389	187,630	2,495,915	12,302	-83,401	1,766	2,426,582	1979
404,557	46,459	1,980,765	0	-30,456	2,131	1,952,446	1980
908,428	243,454	3,061,444	0	126,180	4,688	3,192,312	1981
4,942,330	1,676,911	19,490,160	1,833,697	146,073	26,279	21,496,215	20 Years, 1962-1981

TABLE 15: SUMMARY OF 1981 ENTITLEMENT AND SURPLUS WATER SERVICE TO LONG-TERM CONTRACTORS

(acre-feet)[a]

Long-Term Contractor	Entitlement and Surplus Water Service							Future Entitlement Credits			
	Entitlement Water Deliveries							Future Entitlement Delivery Credit as of 1-1-82			Future Entitlement Reduction Credit Article 7 or 45
	1981 Entitlement	Article 12(d)	Other	Total	Surplus Water	Unscheduled Water	Total Deliveries	Article 7 or 45	Articles 12(d) or 14(b)[b]	Total	
(1)	(2)	(3)	(4)	(5)=(2)+(3)+(4)	(6)	(7)	(8)=(5)+(6)+(7)	(9)	(10)	(11)	(12)
UPPER FEATHER RIVER AREA											
Butte County	221	0	-	221	-	-	221	-	0	0	-
Plumas County	355	0	-	355	-	-	355	-	0	0	-
SOUTH BAY AREA											
Alameda County FC&WCD, Zone 7	19,590	0	-	19,590	-	-	19,590	53,741	2,438	56,179	-
Alameda County WD	21,917	-	-	21,917	-	-	21,917	96,609	2,220	98,829	-
Santa Clara Valley WD	88,000	-	-	88,000	12,000	6,920	106,920	-	-	-	-
SAN JOAQUIN VALLEY AREA											
County of Kings	2,300	-	-	2,300	-	-	2,300	-	-	-	-
Devil's Den WD	12,700	-	-	12,700	7,300	3,347	23,347	-	-	-	-
Dudley Ridge WD	41,000	-	-	41,000	28,761	3,566	73,327	-	-	-	-
Empire West Side ID	3,000	1,800	1,059 [c]	5,859	1,500	1,492	8,851	0	0	0	-
Kern County WA	691,400	-	24,600 [d]	716,000	518,425	106,156	1,340,581	-	-	-	-
Oak Flat WD	4,300	-	-	4,300	2,788	-	7,088	-	-	-	2,466
Tulare Lake Basin WSD	76,000	-	7,438 [e]	83,438	62,362	153,564	299,364	0	-	0	74,852
SOUTHERN CALIFORNIA AREA											
Antelope Valley - East Kern WA	72,176	7,199	-	79,375	-	-	79,375	-	14,841	14,841	-
Castaic Lake WA	5,761	-	-	5,761	-	-	5,761	-	500	500	-
Coachella Valley WD	12,105	-	-	12,105	-	-	12,105	-	-	-	-
Crestline - Lake Arrowhead WA	1,485	-	-	1,485	-	-	1,485	-	151	151	-
Desert WA	19,000	-	-	19,000	-	-	19,000	-	-	-	-
Littlerock Creek ID	1,270	-	-	1,270	247	-	1,517	-	438	438	-
Mojave WA	4,000 [f]	-	-	4,000	-	-	4,000	-	20	20	-
San Bernardino Valley MWD	16,021	-	-	16,021	-	-	16,021	-	4,269	4,269	-
San Gabriel MWD	3,619	-	-	3,619	-	-	3,619	-	1,000	1,000	-
The Metropolitan Water District of S.C.	795,846	-	-	795,846	-	-	795,846	-	102,239	102,239	-
TOTAL	1,892,066	8,999	33,097	1,934,162	633,383	275,045	2,842,590	150,350	128,116	278,466	77,318

a) Metric conversion is acre-feet times 1.2335 equals cubic dekametres.
b) The only 14(b) water is a delivery credit of 4,787 acre-feet to Antelope Valley-East Kern WA.
c) This carryover water was undelivered 1980 entitlement that was stored in and delivered from Lake Oroville.
d) 1977 Emergency Relief Water.
e) Delivered pursuant to Article 45(e).
f) This water was recovered from Project water stored during 1978 in a ground water basin underlying the Agency.

future deliveries if above-normal supplies of local water are available within their service areas during the year, thereby, reducing their need for Project water.

In 1980 Empire Westside Irrigation District, because of an above-normal local water supply could not use all of its entitlements. Since it was receiving its maximum annual entitlement, the District requested that its undelivered 1980 entitlement water be stored in project facilities. A total of 2 817 dam^3 (2,284 acre-feet) of undelivered 1980 entitlement water was stored for future use. The water was stored on condition that space would be available in the reservoir. In early 1981, Empire took delivery of 1 308 dam^3 (1,059 acre-feet) of stored water. On February 19, 1981, the remaining 1 511 dam^3 (1,225 acre-feet) became unavailable for future delivery when Lake Oroville exceeded its flood control reservation and the water was released from storage. Accordingly, the District received a monetary credit, as provided in the October 1, 1979 storage agreement, for 1 511 dam^3 (1,225 acre-feet) less one dam^3 (one acre-foot) for operational losses.

Future Entitlement Credits (Table 15). Oak Flat Water District and Tulare Lake Basin Water Storage District are the only two contractors with entitlement reduction credit due to wet weather. Current reduction credits date back to 1972 and 1973. At that time they were allowed to increase their entitlement up to their maximum annual entitlement when their local water supply was deficient due to climatic conditions. The two contractors may reduce their annual entitlement by using the credits in any year when either agency is unable to accept all of its annual entitlements because of above-average local water supply caused by climatic conditions.

Repayment Water Deliveries (Tables 14 & 16). In 1964, the State entered into two contracts to obtain water to preconsolidate land within the right-of-way alignment of the California Aqueduct. This water was to be paid back after the aqueduct began service. The contracts, which have changed hands over the years, are currently held by the Belridge Oil Company and the J. G. Boswell Company. In 1981, 7 475 dam^3 (6,060 acre-feet) were delivered to Belridge Oil Company, leaving a balance of 53 858 dam^3 (43,663 acre-feet) yet to be delivered. In 1981, 49 340 dam^3 (40,000 acre-feet) were delivered to the J. G. Boswell Company, leaving a balance of 55 378 dam^3 (44,895 acre-feet) yet to be delivered. These contracts will terminate December 31, 1984.

An extension of both contracts (Belridge and Boswell) was discussed in Bulletin 132-81. A draft amendment to the agreement with Boswell to extend the delivery period to 1995 was considered, but was denied. The Department believes the water should be delivered by 1984, when it is more likely to be available. Although extending the contract to 1995 would reduce the rate of annual water deliveries, the increased cost of pumping energy would be an additional expense to the contractors.

Emergency Relief Water Deliveries (Tables 14, 15 & 16). At the end of 1977, the State had 117 400 dam^3 (95,176 acre-feet) of emergency relief water in storage.

This water was being retained for emergency relief in 1978. When it became apparent that the 1976-77 drought was over, the stored water was sold (see pages 88 and 89 of Bulletin 132-79). KCWA purchased 116 558 dam^3 (94,526 acre-feet) of stored water for delivery before December 31, 1983. Through 1981, KCWA had taken 58 961 dam^3 (47,800 acre-feet). Two noncontractors (Green Valley Water District and Tracy Golf and Country Club) purchased and have received the remainder.

In 1981, an amendment to the KCWA agreement was made to provide for the agency

TABLE 16: WATER

(in acre

Line No.	Contracting Agency and Type of Service	Month						
		Jan.	Feb.	Mar.	Apr.	May	June	July
	FEATHER RIVER SERVICE AREA							
	County of Butte:							
1.	Entitlement Water	21	0	105	0	0	0	5
	Last Chance Creek Water District:							
2.	Regulated Delivery of Local Supply	0	0	0	696	2,922	3,170	3,596
	Plumas County Flood Control and Water Conservation District:							
3.	Entitlement Water	1	1	1	8	34	77	89
	Thermalito Irrigation District:							
4.	Regulated Delivery of Local Supply	11	7	0	69	201	207	199
5.	AREA TOTAL	33	8	106	773	3,157	3,454	3,889
	NORTH BAY SERVICE AREA							
	Napa County Flood Control and Water Conservation District:							
6.	Regulated Delivery of Local Supply	457	524	524	672	751	894	1,094
7.	Solano County Flood Control and Water Conservation District:	0	0	0	0	0	0	0
8.	AREA TOTAL	457	524	524	672	751	894	1,094
	SOUTH BAY SERVICE AREA							
	Alameda County Flood Control and Water Conservation District, Zone 7:							
9.	Entitlement Water	716	737	6	1,471	2,335	3,080	3,076
10.	Regulated Delivery of Local Supply	697	334	904	0	0	0	0
11.	Agency Total	1,413	1,071	910	1,471	2,335	3,080	3,076
	Alameda County Water District:							
12.	Entitlement Water	735	587	0	1,268	1,379	2,079	3,513
13.	Regulated Delivery of Local Supply	1,302	298	766	439	686	685	2,003
14.	Agency Total	2,037	885	766	1,707	2,065	2,764	5,516
	Santa Clara Valley Water District:							
15.	Entitlement Water	4,500	4,500	5,000	6,126	9,274	10,000	10,100
16.	Surplus Water	312	312	623	2,400	812	295	510
17.	Unscheduled Water	1,910	617	478	143	0	0	0
18.	Agency Total	6,722	5,429	6,101	8,669	10,086	10,295	10,610
19.	AREA TOTAL	10,172	7,385	7,777	11,847	14,486	16,139	19,202
	SAN JOAQUIN VALLEY SERVICE AREA							
	Belridge Oil Company:							
20.	Repayment Water	584	475	492	464	385	492	515
	J. G. Boswell:							
21.	Repayment Water	0	2,274	4,102	3,000	4,100	4,400	5,500
	County of Kings:							
22.	Entitlement Water	230	230	230	230	0	230	230
	Devil's Den Water District:							
23.	Entitlement Water	550	825	1,550	850	750	1,500	1,925
24.	Surplus Water	367	742	600	603	305	1,140	804
25.	Unscheduled Water	1,525	784	543	60	0	0	0
26.	Agency Total	2,442	2,351	2,693	1,513	1,055	2,640	2,729
	Dudley Ridge Water District:							
27.	Entitlement Water	2,150	1,116	3,813	2,040	5,718	6,273	7,380
28.	Surplus Water	46	0	0	1,654	1,161	6,490	7,900
29.	Unscheduled Water	1,463	214	0	1,889	0	0	0
30.	Agency Total	3,659	1,330	3,813	5,583	6,879	12,763	15,280
	Empire West Side Irrigation District:							
31.	Entitlement Water	0	133	540	510	450	310	425
32.	Article 12(d) Make-Up	0	0	0	0	300	310	371
33.	Surplus Water	0	0	0	151	255	347	152
34.	Unscheduled Water	0	0	41	547	0	0	0
35.	Carryover Water	393	666	0	0	0	0	0
36.	Agency Total	393	799	581	1,208	1,005	967	948
	Kings County Water District:							
37.	Conveyance of Federal CVP Water	0	0	0	0	0	0	6,000
	Kern County Water Agency:							
38.	Entitlement Water	9,915	10,788	15,623	35,234	70,803	123,777	143,296
39.	Surplus Water	25,217	34,675	29,453	30,157	58,508	69,627	93,897
40.	Unscheduled Water	25,675	20,582	22,008	16,581	0	0	0
41.	1977 Emergency Relief Water (b	125	525	925	1,325	1,225	5,425	6,225
42.	Agency Total	60,932	66,570	68,009	83,297	130,536	198,829	243,418
	Oak Flat Water District:							
43.	Entitlement Water	248	108	250	647	770	770	770
44.	Surplus Water	0	0	114	426	228	393	747
45.	Agency Total	248	108	364	1,073	998	1,163	1,517

a) Metric conversion is acre-feet times 1.2335 equals cubic dekametres.

b) Water acquired in 1977 for emergency relief purposes and later sold when drought ended.

DELIVERIES IN 1981

feet) (a

Month						1981 Contract Entitlement	1981 Entitlement Not Delivered	Net Cumulative Entitlement Not Delivered Thru		Line No.
Aug.	Sept.	Oct.	Nov.	Dec.	Total			1980	1981	
6	0	0	71	13	221	1,200	979	8,108	9,087	1.
1,615	146	0	0	0	12,145	-	-	-	-	2.
94	38	11	1	0	355	740	385	2,612	2,997	3.
220	177	110	92	8	1,301	-	-	-	-	4.
1,935	361	121	164	21	14,022	1,940	1,364	10,720	12,084	5.
1,119	1,129	832	633	372	9,001	-	-	-	-	6.
0	0	0	0	0	0	650	650	500	1,150	7.
1,119	1,129	832	633	372	9,001	650	650	500	1,150	8.
2,780	2,527	1,468	529	865	19,590	23,000	3,410	67,796	71,206	9.
0	16	78	615	65	2,709	-	-	-	-	10.
2,780	2,543	1,546	1,144	930	22,299	-	-	-	-	11.
3,453	4,229	2,505	1,648	521	21,917	26,000	4,083	144,887	148,970	12.
2,078	0	0	0	2,191	10,448	-	-	-	-	13.
5,531	4,229	2,505	1,648	2,712	32,365	-	-	-	-	14.
10,100	10,000	8,730	5,500	4,170	88,000	88,000	0	38,776	38,776	15.
560	277	1,762	1,182	2,955	12,000	-	-	-	-	16.
0	0	140	1,488	2,144	6,920	-	-	-	-	17.
10,660	10,277	10,632	8,170	9,269	106,920	-	-	-	-	18.
18,971	17,049	14,683	10,962	12,911	161,584	137,000	7,493	251,459	258,952	19.
540	522	528	505	558	6,060	-	-	-	-	20.
4,000	624	0	2,210	9,790	40,000	-	-	-	-	21.
230	230	230	0	230	2,300	2,300	0	-	0	22.
2,000	550	325	975	900	12,700	12,700	0	5	5	23.
930	369	0	583	857	7,300	-	-	-	-	24.
0	0	0	0	435	3,347	-	-	-	-	25.
2,930	919	325	1,558	2,192	23,347	-	-	-	-	26.
7,380	1,134	1,396	1,086	1,514	41,000	41,000	0	0	0	27.
4,488	2,411	3,920	0	691	28,761	-	-	-	-	28.
0	0	0	0	0	3,566	-	-	-	-	29.
11,868	3,545	5,316	1,086	2,205	73,327	-	-	-	-	30.
395	140	0	97	0	3,000	3,000	0	5,175	2,316	31.
86	65	63	328	277	1,800	-	-	-	-	32.
29	0	0	5	561	1,500	-	-	-	-	33.
0	0	0	329	575	1,492	-	-	-	-	34.
0	0	0	0	0	1,059	-	-	-	-	35.
510	205	63	759	1,413	8,851	-	-	-	-	36.
4,000	0	0	0	0	10,000	-	-	-	-	37.
136,968	64,147	28,429	26,678	25,742	691,400	691,400	0	0	0	38.
71,646	10,808	41,213	24,669	28,555	518,425	-	-	-	-	39.
0	0	2,586	12,014	6,710	106,156	-	-	-	-	40.
5,491	2,559	525	125	125	24,600	-	-	-	-	41.
214,105	77,514	72,753	63,486	61,132	1,340,581	-	-	-	-	42.
700	37	0	0	0	4,300	4,300	0	0	0	43.
179	450	222	29	0	2,788	-	-	-	-	44.
879	487	222	29	0	7,088	-	-	-	-	45.

TABLE 16: WATER

(in acre

Line No.	Contracting Agency and Type of Service	Month						
		Jan.	Feb.	Mar.	Apr.	May	June	July
	Tracy Golf and Country Club:							
46.	Conveyance of Federal CVP Water	0	0	0	0	22	80	84
	Tulare Lake Basin Water Storage District:							
47.	Entitlement Water	4,370	370	1,670	7,630	11,002	13,680	13,680
48.	Surplus Water	0	0	0	0	0	13,569	6,758
49.	Unscheduled Water	34,574	15,190	14,914	23,378	0	0	0
50.	Article 45(e) Wet Weather Water	0	0	0	0	0	0	0
51.	Agency Total	38,944	15,560	16,584	31,008	11,002	27,249	20,438
	United States Bureau of Reclamation:							
52.	Conveyance of Federal CVP Water (c	0	0	7,137	10,764	21,313	24,165	26,045
	Pleasant Valley Water District:							
53.	Conveyance of Federal CVP Water	0	0	0	0	0	165	187
54	AREA TOTAL	107,432	89,697	104,005	138,140	177,295	273,143	322,891
	CENTRAL COASTAL SERVICE AREA							
55.	San Luis Obispo County Flood Control and Water Conservation District:	0	0	0	0	0	0	0
56.	Santa Barbara County Flood Control and Water Conservation District:	0	0	0	0	0	0	0
57.	AREA TOTAL	0	0	0	0	0	0	0
	SOUTHERN CALIFORNIA SERVICE AREA							
	Antelope Valley-East Kern Water Agency:							
58.	Entitlement Water	1,111	1,421	2,475	7,737	8,929	10,966	12,385
59.	Article 12(d) Make-Up Water	0	0	201	1,505	1,415	605	1,850
60.	Agency Total	1,111	1,421	2,676	9,242	10,344	11,571	14,235
	Castaic Lake Water Agency:							
61.	Entitlement Water	203	171	200	247	311	378	475
	Coachella Valley Water District:							
62.	Entitlement Water	1,008	1,008	1,008	1,008	1,008	1,008	1,008
	Crestline-Lake Arrowhead Water Agency:							
63.	Entitlement Water	100	79	87	81	137	153	170
	Desert Water Agency:							
64.	Entitlement Water	1,583	1,583	1,583	1,583	1,583	1,583	1,583
	Littlerock Creek Irrigation District:							
65.	Entitlement Water	0	0	0	0	0	0	452
66.	Surplus Water	0	0	0	0	0	0	88
67.	Agency Total	0	0	0	0	0	0	540
	Mojave Water Agency:							
68.	Entitlement Water (d	0	0	0	1,000	3,000	0	0
69.	Palmdale Water District:	0	0	0	0	0	0	0
	San Bernardino Valley Municipal Water District:							
70.	Entitlement Water	0	0	0	0	0	0	0
	San Gabriel Valley Municipal Water District:							
71.	Entitlement Water	0	0	0	0	0	0	0
72.	San Gorgonio Pass Water Agency:	0	0	0	0	0	0	0
	The Metropolitan Water District of Southern California:							
73.	Entitlement Water	42,203	31,982	32,097	53,117	69,450	85,478	98,782
74.	Ventura County Flood Control District:	0	0	0	0	0	0	0
75.	AREA TOTAL	46,208	36,244	37,651	66,278	85,833	100,171	116,793
	ALL AGENCIES							
76.	Entitlement Water	69,644	55,639	66,238	120,787	186,933	261,342	299,344
77.	Surplus Water	25,942	35,729	30,790	35,391	61,269	91,861	110,856
78.	Article 12(d) Make-Up Water	0	0	201	1,505	1,715	915	2,221
79.	Article 45(e) Wet Weather Water	0	0	0	0	0	0	0
80.	Carryover Water	393	666	0	0	0	0	0
81.	Repayment Water	584	2,749	4,594	3,464	4,485	4,892	6,015
82.	1977 Emergency Relief Water (b	125	525	925	1,325	1,225	5,425	6,225
83.	Unscheduled Water	65,147	37,387	37,984	42,598	0	0	0
84.	Subtotal	161,835	132,695	140,732	205,070	255,627	364,435	424,661
85.	Regulated Delivery of Local Supply	2,467	1,163	2,194	1,876	4,560	4,956	6,892
86.	Conveyance of Federal CVP Water (e	0	0	7,137	10,764	21,335	24,410	32,316
87.	TOTAL WATER	164,302	133,858	150,063	217,710	281,522	393,801	463,869

a) *Federal CVP water delivered to the Cross Valley Canal.*
d) *This entitlement water was put in storage by the State in a ground water basin underlying the Agency in 1978 and pumped from that basin for use by the Agency in 1981.*
e) *Includes 125,780 acre-feet delivered to the Cross Valley Canal.*

DELIVERIES IN 1981

feet)[a]

Month						1981 Contract Entitlement	1981 Entitlement Not Delivered	Net Cumulative Entitlement Not Delivered Thru		Line No.
Aug.	Sept.	Oct.	Nov.	Dec.	Total			1980	1981	
61	59	35	5	5	351	-	-	-	-	46.
6,242	719	2,406	551	13,680	76,000	76,000	0	7,438	0	47.
4,505	11,060	10,389	9,199	6,882	62,362	-	-	-	-	48.
0	0	12,273	28,654	24,581	153,564	-	-	-	-	49.
7,438	0	0	0	0	7,438	-	-	-	-	50.
18,185	11,779	25,068	38,404	45,143	299,364	-	-	-	-	51.
22,346	9,061	4,949	0	0	125,780	-	-	-	-	52.
243	20	100	147	197	1,059	-	-	-	-	53.
279,897	104,965	109,589	108,189	122,865	1,938,108	830,700	0	12,618	2,321	54.
0	0	0	0	0	0	1,000	1,000	1,000	2,000	55.
0	0	0	0	0	0	2,300	2,300	1,200	3,500	56.
0	0	0	0	0	0	3,300	3,300	2,200	5,500	57.
12,150	9,821	3,430	1,261	490	72,176	75,000	2,824	167,779	163,404	58.
1,114	509	0	0	0	7,199	-	-	-	-	59.
13,264	10,330	3,430	1,261	490	79,375	-	-	-	-	60
800	920	750	668	638	5,761	20,100	14,339	84,219	98,558	61.
1,008	1,008	1,008	1,008	1,017	12,105	12,105	0	12,779	12,779	62.
198	164	109	103	104	1,485	3,190	1,705	7,482	9,187	63.
1,583	1,583	1,583	1,583	1,587	19,000	19,000	0	19,700	19,700	64.
432	209	107	70	0	1,270	1,270	0	3,248	3,248	65.
84	41	21	13	0	247	-	-	-	-	66.
516	250	128	83	0	1,517	-	-	-	-	67.
0	0	0	0	0	4,000	29,600	25,600	152,051	177,651	68.
0	0	0	0	0	0	11,700	11,700	60,300	72,000	69.
0	287	5,384	5,191	5,159	16,021	68,500	52,479	331,327	383,806	70
300	0	1,076	697	1,546	3,619	18,300	14,681	85,247	99,928	71.
0	0	0	0	0	0	7,800	7,800	6,800	14,600	72.
106,379	76,000	61,633	68,316	70,409	795,846	1,157,300	361,454	2,029,773	2,391,227	73.
0	0	0	0	0	0	2,000	2,000	1,000	3,000	74.
124,048	90,542	75,101	78,910	80,950	938,729	1,425,865	494,582	2,961,705	3,449,088	75.
293,198	173,743	120,580	116,033	128,585	1,892,066	2,399,455	507,389	3,239,202	3,729,095	76.
82,421	25,416	57,527	35,680	40,501	633,383	-	-	-	-	77.
1,200	574	63	328	277	8,999	-	-	-	-	78.
7,438	0	0	0	0	7,438	-	-	-	-	79.
0	0	0	0	0	1,059	-	-	-	-	80.
4,540	1,146	528	2,715	10,348	46,060	-	-	-	-	81.
5,491	2,559	525	125	125	24,600	-	-	-	-	82.
0	0	14,999	42,485	34,445	275,045	-	-	-	-	83.
394,288	203,438	194,222	197,366	214,281	2,888,650	-	-	-	-	84.
5,032	1,468	1,020	1,340	2,636	35,604	-	-	-	-	85.
26,650	9,140	5,084	152	202	137,190	-	-	-	-	86.
425,970	214,046	200,326	198,858	217,119	3,061,444	2,399,455	507,389	3,239,202	3,729,095	87.

taking less than the original minimum scheduled deliveries during 1980. This relaxation was allowed because of the abundance of local water in the area. All other provisions of the original contract remained the same.

1978 Exchange Water Deliveries. During 1978, the State acquired 37 005 dam^3 (30,000 acre-feet) of SWP water from MWD through an exchange agreement. Under the agreement, MWD pumped additional Colorado River water for its use in lieu of taking delivery of the SWP water in January of that year. The exchange water was intended for use in meeting 1978 emergency needs in case the 1976-77 drought continued. Arrangements had been made to obtain up to 246 200 dam^3 (200,000 acre-feet) for such purposes. The substantial change in weather conditions in California beginning in early 1978 ended the need to acquire further exchange water when it became apparent that the drought had ended. Under an agreement between the State, MWD and KCWA and another agreement between the State, MWD and Dudley Ridge Water District, KCWA purchased 30 838 dam^3 (25,000 acre-feet) and Dudley Ridge Water District purchased 6 168 dam^3 (5,000 acre-feet) of exchange water. The agreements provided that KCWA and Dudley Ridge Water District must use the water prior to March 31, 1983. As of December 31, 1981, neither contractor had taken delivery of its 1978 emergency relief water.

Ground Water Demonstration Deliveries (Tables 15 & 16). The State and Mojave Water Agency entered into a contract in 1978 establishing a ground water demonstration project involving the storage of 27 754 dam^3 (22,500 acre-feet) of SWP water in a ground water basin within Mojave's service area (see pages 89 and 90 of Bulletin 132-79). A total of 27 754 dam^3 (22,500 acre-feet) was considered available for extraction from the basin for future use by the agency. As of December 31, 1981, 14 802 dam^3 (12,000 acre-feet) of entitlement water had been withdrawn from the basin by Mojave.

In accordance with the guidelines for funding costs under the ground water demonstration program, the agency paid Transportation Charges for this project water in the year of withdrawal from ground water storage as though it had been delivered through SWP facilities from the Delta.

A second ground water demonstration project was established in 1978 under agreements between the State and the San Bernardino Valley Municipal Water District (see page 90 of Bulletin 132-79). Total water stored as of January 1, 1982 under the project was 17 257 dam^3 (13,990 acre-feet). All State costs and District incremental costs incurred in connection with the storage of this water, including the power costs incurred by the State in transporting the water from the Delta to Reach 26A and the Delta Water Charge on each acre-foot stored, have been assigned as SWP conservation costs. During 1980, San Bernardino Valley Municipal Water District negotiated a Letter of Agreement with City of San Bernardino for withdrawal of water from the recharge area.

Surplus Water Deliveries (Tables 14, 15 & 16). In September 1980, eight contractors submitted estimates that they could use a total of 1 041 049 dam^3 (843,980 acre-feet) of surplus water during 1981. Based on the December 1, 1980 forecast of the Four Basin Index, the Rule Curve criteria for 1981 allowed the delivery of 164 056 dam^3 (133,000 acre-feet) of surplus water to be included with the initial schedules of 1981 water deliveries approved in December 1980. Regular monthly meetings between contractors and Department representatives were held from December 1980 through March 1981 to review the latest forecasts of water supply conditions and update SWP water delivery capability as described by the Rule Curve Criteria for 1981. At the April meeting, the Department announced that

all surplus water requests could be satisfied. Approved schedules calling for surplus water deliveries totaling 685 826 dam^3 (556,000 acre-feet) were issued on April 1, 1981.

Unscheduled Water (Tables 14, 15, & 16). Unscheduled water is water in excess of that required to meet Delta water quality requirements and all SWP needs, and that can be delivered to contractors when delivery capability is available. The water must be used primarily for ground water replenishment or for agricultural use in lieu of ground water pumping. If availability exceeds the amount required for these purposes, it can also be delivered for pre-irrigation. Unscheduled water is scheduled separately, in accordance with unscheduled water contracts, and cannot be substituted for scheduled entitlement or surplus water deliveries.

In previous years, unscheduled water was delivered on an as-available basis before it was known if surplus water requests could be met. This year's unscheduled water deliveries were initiated at the start of 1981 and continued until the end of April on a daily basis. At that time, the year's water supply had been defined and the amount of surplus water available for delivery during 1981 determined. Deliveries of unscheduled water were resumed in October and continued through December when it became necessary to de-water the San Luis Reservoir because of the San Luis Dam problem. These October through December deliveries were scheduled weekly.

The unscheduled water program was developed as a result of contractor requests. By 1980, nine qualified contractors, who had expressed an interest in unscheduled water, received and signed an amendment to Article 21 of the basic water supply contract. Eight of these contractors signed contracts to receive unscheduled water in 1981. Five of these contractors took delivery of 339 268 dam^3 (275,045 acre-feet) of unscheduled water in 1981.

Local Water Deliveries (Table 16). Project facilities are used to deliver nonproject water to both contractors and noncontractors. During 1981, three contractors and two noncontractors received a total delivery of 43 918 dam^3 (35,604 acre-feet) of regulated local water supplies.

Wheeling of Federal Water

During 1981 there were basically three arrangements for wheeling CVP water through SWP facilities. In each arrangement, the USBR provided the electrical energy required for wheeling the federal water through SWP facilities.

Cross Valley Canal. Contracts with nine local agencies provide for wheeling federal CVP water through SWP facilities to KCWA's Cross Valley Canal. Another contract between the State and the USBR provides the water, as well as the electrical energy, needed for wheeling. The contracts provide that up to 155 214 dam^3 (125,832 acre-feet per year may be wheeled. The State's charges for the wheeling service under the nine contracts are for use of SWP facilities to transport water from the Delta to the Cross Valley Canal.

Aqueduct capacity is shared by both the SWP and the CVP in the San Luis Division. Therefore, in the wheeling contracts, it was assumed that in the San Luis Division, Federal rather than State capacity would be used, and the agencies have not been charged for transportation of water through Federal-State joint facilities. In reevaluation of this assumption, the Department's policy now is to charge for wheeling through State capacity in the joint-use facilities. Federal use of State facilities upstream of O'Neill Forebay precludes State use of State capacity in the San Luis Division and thus requires compensation. Charges associated with all future wheeling contracts will use this concept in determining acceptable charges for wheeling service.

During 1981, 155 150 dam^3 (125,780 acre-feet) of federal CVP water

was wheeled through Reach 12E for the KCWA's Cross Valley Canal.

D-1485 Water. As part of the annual letter agreement, the CVP and SWP operate as if the draft agreement entitled "Supplemental Agreement Between the United States of America and the State of California for Coordinated Operations of the Central Valley Project and the State Water Project", dated May 13, 1971, were signed. A total of 238 793 dam^3 (193,590 acre-feet) of federal water was to have been wheeled in 1981 to replace capacity foregone in May and June by CVP export reduction conforming to SWRCB D-1485. SWRCB D-1485 curtails exports by both the CVP and SWP from the Delta during May, June, and July to protect the striped bass fishery in the Sacramento River. Because damage of San Luis Dam left the USBR without enroute storage capability, only 44 045 dam^3 (35,707 acre-feet) of the 1981, D-1485 water was wheeled. The remainder is subject to conditions of the 1982 exchange agreement between the USBR and the State.

Other Service. In April 1981, the Department executed an interim agreement with the USBR to wheel CVP water through SWP facilities to the Kings County and Pleasant Valley Water Districts and possibly others who would enter into temporary contracts with the USBR. As part of this same contract, USBR agreed to provide its share of water to meet Delta water quality requirements and curtail its Delta exports in accordance with the SWRCB's D-1485, provided the SWP would furnish export capacity from the Delta to replace the May and June curtailment of federal pumping from the Delta in conformance with SWRCB's D-1485. The July curtailment does not impose a limitation on existing federal pumping capability.

During 1981, 12 335 dam^3 (10,000 acre-feet) of federal water was conveyed to the Kings County Water District and 1 306 dam^3 (1,059 acre-feet) to the Pleasant Valley Water District.

A provision of SB 200 required a permanent contract between SWP and CVP for wheeling CVP water through SWP facilities. Although, SB 200 was rejected by the voters in June 1982, negotiations on a permanent contract are continuing.

Future Project Water Delivery Plans

In September 1981, SWP contractors submitted their estimated monthly Project water delivery requirements for the six-year period 1982 through 1987. Their estimates included delivery of entitlement, surplus, makeup (Article 12(d) and Article 45), emergency relief, local and ground water demonstration water.

Entitlement Water. Estimated entitlement plus makeup water needs submitted in 1981, as well as estimates submitted in the five previous years, are shown in Table 17.

The 1981 estimate reversed a trend where total estimates for a given year were generally lower than previous estimates. In general, the 1981 contractors' estimates were lower except for MWD which, besides increasing its annual amounts by some 49 340 dam^3 (40,000 acre-feet), requested an additional 296 040 dam^3 (240,000 acre-feet) to be delivered between January 1982 and March 1983 for ground water storage. Also, San Bernardino Valley Municipal Water District increased its estimate to its full Table A annual entitlements reflecting some 24 670 dam^3 (20,000 acre-feet) per year increase through 1985. Except for these adjustments by MWD and San Bernardino, the trend of the estimates continues downward. This trend reflects each contractor's historical deliveries which, in turn, are based on actual growth experience and actual water saving realized from current conservation and reclamation programs including those initiated during the 1976-77 drought.

In July 1981, the Department sent a letter to each contractor requesting (1) estimates of monthly SWP water require-

TABLE 17: WATER CONTRACTORS TOTAL REQUESTS FOR ENTITLEMENT WATER 1975 THRU 1987

Year Estimate Submitted	Delivery Amount in Acre-Feet[a][b][c] by Year						
	1981	1982	1983	1984	1985	1986	1987
1981[d]		2,317,249	2,335,841	2,383,586	2,699,830	2,788,111	2,901,175
1980[d]	1,886,795	2,096,692	2,245,197	2,405,844	2,561,970	2,709,710	
1979[d]	2,040,068	2,186,196	2,279,942	2,461,223	2,617,594		
1978[d]	2,164,013	2,300,401	2,403,652	2,495,503			
1977[e]	2,374,135	2,574,831	2,371,140	2,482,275			
1976[e]	2,168,335	2,273,925	2,376,990				
1975[e]	2,027,770	2,131,960					

a) Metric Conversion is acre-feet times 1.2335 equals cubic dekametres.

b) Includes project entitlement water recaptured from ground water storage pursuant to Mojave demonstration project agreement.

c) For the years 1981 through 1984 amounts include nonproject water pumped through interim facilities to Napa County Flood Control and Water Conservation District.

d) Submitted requests covered the following six years.

e) Submitted request covered the following seven years.

ments during 1982 through 1987 and (2) annual requirements for 1988 through 1990. For those contractors whose maximum annual entitlement would occur after 1990, estimates were requested for every fifth year from 1990 though the year maximum entitlements would be used on a regular basis. Also, as in the 1979 request, contractors were asked to provide estimates of how much they expect to reduce their future SWP water requirements through conservation and reclamation. Responses to the latter request did not fully support the view that conservation and reclamation goals would be accomplished voluntarily.

In accordance with the Governor's Executive Order B-68-80 (see Chapter I, page 14, Bulletin 132-81), the Department began development of a Water Management Plan for the SWP. In preparing the management plan, the Department is contacting each water service contractor to discuss procedures and goals. The Department's objective is to make the plan as mutually acceptable as possible. Pending development of the Water Management Plan and allocation of the water-conservation and waste-water reclamation goals among the contractors, this bulletin assumes the Project-wide water-conservation and reclamation goals shown in Table 18 of the Department's Bulletin 76 ("Delta Water Facilities", July 1978) will be attained.

Because of uncertainty over the cause of the slide at San Luis Dam, and whether San Luis Reservoir storage would be available in 1982, the initial (December 30, 1981) water delivery schedules for 1982 were approved for the first two months of 1982 only. With the determination of the basic repairs needed for San Luis Dam, new water delivery schedules were approved March 10, 1982, for the delivery of entitlement and makeup water in the requested amounts but, generally, on different monthly delivery schedules than requested. These water deliveries were scheduled on the basis of the February 1, 1982 water conditions and the Department's Rule Curve

criteria which included updated assumptions for San Luis Reservoir. These March 10 schedules approved the delivery of 2 320 598 dam^3 (1,881,312 acre-feet) of 1982 entitlement water and 58 865 dam^3 (47,723 acre-feet) of makeup water. The March 10 schedule also included an exchange water program between MWD, CVP and SWP water users. This exchange was for 308 375 dam^3 (250,000 acre-feet) of MWD entitlement water to be diverted to water users north of the Tehachapi Mountains, one-half to CVP customers and one-half to SWP customers to make up for water that could otherwise not be delivered during the peak irrigation season in the San Joaquin Valley because of the San Luis Reservoir outage. In exchange, SWP power would be used to pump 308 375 dam^3 (250,000 acre-feet) from the Colorado River for MWD. Details of the 1982 Exchange Agreement are presented in Chapter IV. In April 1982 it became apparent that California was experiencing one of its ten wettest years of record. Also, progress on the repairs at San Luis Dam exceeded all but the most optimistic of forecasts. Consequently, water delivery plans were again revised. The 1982 exchange program between MWD, CVP and SWP water users was reduced to 148 020 dam^3 (120,000 acre-feet), still half to CVP customers and half to SWP customers. Although entitlement and makeup totals for the year remained the same, revised water delivery schedules approved April 16, 1982 reflected the availability of surplus water and regulatory storage capability in San Luis Reservoir to allow greater peaking flexibility during the summer of 1982.

Surplus Water. Of the 1 026 193 dam^3 (831,936 acre-feet) of surplus water (including repayment of construction water) requested in September 1981, none was approved for delivery until April except for 635 dam^3 (515 acre-feet) per month of construction repayment water to Belridge Oil Company. Surplus water, in the amount of 335 496 dam^3 (271,997 acre-feet), was allocated in the revised approved schedules of April 16, 1982. Nine contractors signed 1982 surplus water contracts. While regular monthly updates of water supply conditions were made, it wasn't until the April 1, 1982 update that the Rule Curve criteria provided for surplus water.

Unscheduled Water. The unscheduled water program established in 1980 was continued in 1982. Unscheduled water is available when Delta water supplies and aqueduct delivery capability exceed that necessary to meet scheduled water deliveries and other SWP requirements (see Water Contracts Management).

From January 1 through February 28,1982, unscheduled water was allocated on a daily basis. During this period, unscheduled water available ranged from zero to 56.6 m^3/s, (2,000 cfs). Allocated unscheduled water during this period reached a peak of 54.6 m^3/s (1,927 cfs) on February 4. Starting March 1 and continuing through April, 51 m^3/s (1,800 cfs) of unscheduled water was declared available for allocation on a weekly basis. During this period, requests for unscheduled water ranged from 12.4 m^3/s (439 cfs) to 51 m^3/s (1,800 cfs). Six contractors took delivery of 221 051 dam^3 (179,206 acre-feet) of unscheduled water through April 1982.

Miscellaneous Project Water Deliveries. Approved delivery schedules issued in April 1982, included water for ground water demonstration, emergency relief, and recreation. These deliveries accounted for 58 732 dam^3 (47,614 acre-feet) of the deliveries scheduled in 1982.

Contract Amendments

Each of the 30 long-term water supply contracts has been amended. Some of the contracts have been amended seventeen times. A list of the amendments for each contractor, and the general subject of each, is shown in Figure 19. Not

Figure 19: WATER SUPPLY CONTRACT AMENDMENTS AS OF APRIL 1, 1982

Contracting Agency	Minimum Project Yield Increased	Supplemental Conservation Facilities Costs Delayed			Project Interest Rate Modified	Surcharge and Surcharge Credit Provisions						"Wet Weather" Provisions Added	"A & R" Surplus Water Provisions		Turnout Construction by Agency	Peaking Service		Annual Entitlements Revised	Excess Capacity Purchased	Article 28 Revised	Project Repayment Period and Term of Contract Revised	Special Conditions
		1970	1971	1972 till construction		Added	Revised	Moratorium Declared Thru 1969	Moratorium Declared 1970	Moratorium Declared 1971	Deleted		Added	Revised		Increased	Decreased					
FEATHER RIVER AREA																						
City of Yuba City	1	2	2	2	2		1							1				1,4		NA	3	
County of Butte	1	3	3	3	3		1	2		4	5			1				6,8		NA	7 1/	
Plumas County Flood Control and Water Conservation District	1	3	5	6	3		1	2	4	7	8			10						9	11	
NORTH BAY AREA																						
Napa County Flood Control and Water Conservation District	1	3	4	5	3		1				6			1				8,9			7	1,2
Solano County Flood Control and Water Conservation District	1	2	3P	3P	2		1							1,5		1		6			6	6
SOUTH BAY AREA																						
Alameda County Flood Control and Water Conservation District, Zone 7	2	6	8	9	6	2		5	7	10	11	1		2,12	3			1,4			13	1
Alameda County Water District	1	4	5	7	4	1		3		8	9	S		1,11,12	2					10	13	1,6
Santa Clara Valley Water District	2	6	8	10	6	2		5	7	11	12	1		1,2,14, 15	3			1,4		13	16	1,9
SAN JOAQUIN VALLEY AREA																						
County of Kings		2	3	4	2			1		5	6	S	S	8						7	9	
Devil's Den Water District	1	5	7	8	5			4	6	9	10			1,12,				1,3		11	14	2
Dudley Ridge Water District	1	6	8	9	6			5	7	10	11			15,13, 1,13,				1,2 3,4		12	15	
Empire West Side Irrigation District	1	4	6	7	4			3	5	8	9	S		16,14 1,11,				2		10	13	
Hacienda Water District 1/	1	4	6	7	4			3	5	8	9	S		14,12 1,11,				2		10	12	7
Kern County Water Agency	1	4	6	8	4			3	5	9	10			13 1,12,				1,2		11	15	7,13
Oak Flat Water District		3	5	6	3			2	4	7	9	S	S	16,14 12,11	1			8		10	13	
Tulare Lake Basin Water Storage District	2	5	6	7	5			4		8	10	S		14 2,13, 17,14,				1,3,9 12		11	15	16
CENTRAL COASTAL AREA																						
San Luis Obispo County Flood Control and Water Conservation District	2	3	4	5	3	1	2				6		1	2,8						7	9	
Santa Barbara County Flood Control and Water Conservation District	2	3	4	5	3	1	2				6		1	2,7				2,9			8	
SOUTHERN CALIFORNIA AREA																						
Antelope Valley-East Kern Water Agency	1	5	6	7	5	1					8		1	10		3	2	1	4	9	12	2,3,4
Castaic Lake Water Agency	2	4	5	6	4	1	2				7		1	2,10		2		2,3 9		8	11	
Coachella Valley County Water District	2	3	4	5	3	1	2				6		1	2,8				2		7	9	
Crestline-Lake Arrowhead Water Agency	2	5	6	7	5	1	2				8		1	2,11	4	3		2,10		9	12	
Desert Water Agency	2	3	4	5	3	1	2				6		1	2,8				2		7	9	
Littlerock Creek Irrigation District	2	3	4	5	3	1	2				6		1	2,7				2			8	
Mojave Water Agency	2	4	5	6	4	1	2				7		1	2			3	2,10		8	9	3
Palmdale Water District	2	3	4	5	3	1	2				6		1	2,8				2		7	9	
San Bernardino Valley Municipal Water District	2	4	5	6	4	1	2				7		1	2				1,2 3,9		8	10	
San Gabriel Valley Municipal Water District	2	4	5	6	4	1	2				7		1	2,10		2		2,9	3	8	11	
San Gorgonio Pass Water Agency	2	4	5	6	4	1	2				7		1	2		2					8	2,3
The Metropolitan Water District of Southern California	1	9	10	11	9	1					13		1	16				1,3 8V,15	2,6 7	14	17	(a
Ventura County Flood Control District	1	2	3	4	2		1				5			1,7						6	8	

P = Pending
S = Special provisions of basic contract.

V = Amendment voided by subsequent actions.
a) Amendment Numbers 2, 3, 4, 5, 7, 8V, 12.

1/ Hacienda Water District was consolidated into Tulare Lake Basin Water Storage District effective January 1, 1981.

included are some revisions to annual Table A entitlement for several contractors by unnumbered amendments or notices of Table A revisions. Contract amendments forwarded for signature prior to 1977 that have yet to be signed by the contractors include:

- An amendment to the contract with Solano County Flood Control and Water Conservation District concerning calculation of the Delta Water Charge.

- An amendment to contracts with the City of Yuba City and Solano County Flood Control and Water Conservation District, which deletes the surcharge, surcharge credit, and power credit provisions. All other contracts reflect this amendment.

- An amendment to realign and clarify the surplus water provisions. The amendment has been signed by 24 contractors. Those that have not signed it are City of Yuba City, County of Butte, Mojave Water Agency, Napa County Flood Control and Water Conservation District, San Bernardino Valley Municipal Water District, and San Gorgonio Pass Water Agency.

As of June 30, 1982, in addition to those reported in Bulletin 132-81, the following amendment was signed:

- The San Luis Obispo County Flood Control and Water Conservation District and the Santa Barbara County Flood Control and Water Conservation District requested and received deferment until July 1, 1984 in initiating design of the uncompleted portion of the Coastal Aqueduct.

Agricultural Repayment Method. During 1981 all agricultural contractors exercised the option in their contracts to amortize past over and under payments of transportation capital costs (except KCWA which had already exercised this option).

Local Projects. During 1982 Department staff and contractor representatives held a number of meetings for the purpose of developing a contract amendment on the addition of Local Projects as a source of Project water. The amendment transmitted to the contractors for signature adds, as additional project conservation facilities, facilities and programs which are engineeringly feasible and produce project water which is economically competitive with alternative new water supply sources. The specific facilities and programs added include:

1. On-stream and off-stream surface storage reservoirs not provided for in Section 12938 of the Water Code, that will produce project water for the System for a period of time agreed to by the sponsoring contractor;

2. Groundwater storage facilities that will produce project water for the System for a period of time agreed to by the sponsoring contractor;

3. Wastewater reclamation facilities that will produce project water for the System for a period of time agreed to by the sponsoring contractor;

4. Water and facilities for delivering water purchased by the State for the System for a period of time agreed to by the sponsoring contractor; provided that the economic test specified shall be applied to the cost of the facilities together with the cost of the purchased water; and

5. Future water conservation programs and facilities that will reduce demands by the sponsoring contractor for project water from the System for a period of time agreed to by the sponsoring contractor and will thereby have the effect of increasing project water available in the Delta for distribution.

Local Projects are not to be constructed until an agreement between the State and the sponsoring contractor is executed which includes the sponsoring contractors approval, specifies the yield, and the period of time during which the water from the Local Project will constitute project water and specifies the disposition of the Local Project or its yield upon the expiration of the time period.

Contract Issues. Contract issues identified in early 1981 have yet to be resolved. These issues are summarized as follows:

1. Repayment of "Off-Aqueduct" Power Plant Costs. The contractors dispute the Department's position that the water supply contracts provide for recovery of capital costs of those facilities under the Transportation capital cost component. (Negotiations active)

2. Retroactive Cost Adjustments. Municipal and industrial contractors prefer to spread all cost adjustments of water charges resulting from recalculation of the Project interest rate over the remainder of the repayment period.

3. Extra Service Charge. Contractors want the right, without charge, to (a) request greater entitlement service, and (b) use to a greater extent any facility in which they have purchased basic capacity rights, provided such use does not result in an increased cost to themselves or to any other contractor.

4. Transfer of Entitlements. Contractors want the ability to transfer entitlements among themselves without any adjustment in cost.

5. Wet Year Provisions. KCWA requests the "carryover provisions", which are a part of the contracts of the three South Bay Agencies and several other San Joaquin Valley contractors.

6. Delinquency Penalty. The Department has proposed a revision to Article 32(b) of the water contracts to provide for an interest penalty on late payments, to be computed at the State's Surplus Money Investment-Fund interest rate, rather than the present rate of one-half percent per month.

7. Interest on Tideland Oil Funds. The Department has suggested that the Surplus Money Investment Fund rate be applied in the calculation of the Project interest rate to future California Water Fund monies used for funding SWP construction. (Negotiations active)

8. Authority to Include Other Types of Projects as Additional Conservation Facilities. The Department wants the water contracts amended to provide for inclusion of other projects such as reclamation and ground water storage as additional conservation facilities, as defined in Bulletin 76, "Delta Water Facilities", July 1978. (See discussion above on amendment to add Local Projects.)

9. Delta Water Charge Credit for Annual Entitlement Reductions. Some contractors have requested reductions in "Table A" annual entitlements. The Department has proposed a reduction procedure that would not reduce SWP's cash flow. Other contractors object to any reduction because it would increase future Delta Water Rates.

10. Revised Sharing of Deficiencies. Agricultural contractors have suggested equal sharing of deficiencies.

11. Replacement Reserves. Some contractors prefer the option to manage their own replacement reserve accounts.

12. Interest During Construction. The present Project interest-rate provi-

sions (calculation of the Project interest rate) do not include that portion of a bond issue used for payment of interest during construction. The Department has proposed an amendment to include interest on these funds.

13. Project Purpose Cost Allocation - Dos Amigos to Termini. MWD objects to the present cost allocation because it is not the sole beneficiary of all the benefits attributable to Lake Perris and Castaic Lake.

14. Accurate Scheduling. The Department proposed, as part of the entitlement credit amendment covering "Table A" reductions, a procedure that would limit the timing of the credit relative to a contractor's success in minimizing deviations from projected deliveries. Contractors are objecting to the range of scheduling accuracy as being too restrictive. (Negotiations active)

15. Project Interest Rate Calculation. MWD has proposed that the method for calculating the Project interest rate be maintained for the initial SWP facilities, but that each additional conservation facility have its own Project interest rate.

16. Use of Southern California Reservoirs to Provide Project Yield. MWD suggests that if Southern California reservoirs provide future yield to the SWP, an allocation be made for conservation, with the costs included in the Delta Water Charge.

17. Use of Southern California Reservoirs to Reduce Project Power Costs. MWD suggests that the benefits of reduced power costs revert to the contractors who are paying for the reservoirs.

18. Reservoir Inventory. MWD wants the Department to modify the procedures for allocating Transportation variable OMP&R costs associated with fluctuations in reservoir storage.

19. Implementation of Water Conservation Plans. The Department believes that water conservation for SWP service areas must be an integral part of contractors' future water management plans.

Negotiations of Water Charge Settlements. The task force, consisting of representatives of the State Water Contractors Audit Committee, MWD, and the Department's Water Service Contract Cost Negotiation Committee, did not meet during 1981.

Protests of Water Contractor Charges. The water supply contracts require water contractors to give the State notices of contest-of-accuracy of statements of charges 10 days prior to the date payments of the stated amounts are due. The great majority of all contractors' charges since 1962 have remained open to challenge because of several blanket extensions of time granted by the Department. In 1976, to promote fiscal management and responsibility, the Department adopted a policy to resolve contested charges within two years of the end of the fiscal year, the maximum time permitted for adjustments to General Fund expenditures.

Since this policy was adopted, two specific dates have been provided for contractors to file notices of contest and to pursue all remedies available to them on statements of charges submitted prior to that date. For 1982, these dates were established as:

- June 20, 1982: A contractor must file a notice of contest with the State by this date and pursue all remedies available to it on the statements of charges submitted prior to that date for all costs incurred during the 1979-80 fiscal year.

- December 21, 1982: A contractor has until this date to file notices of contest with the State and pursue other available remedies on statements of charges submitted prior to

that date insofar as the charges fall in the following categories:

1. All costs incurred after June 30, 1980.

2. All costs insofar as they are affected by the procedures for allocation to project purposes.

3. All costs insofar as they are affected by procedures for allocating transportation variable charges for fluctuations in reservoir storage.

Also, the policy requires that the water contractors' audit reports be submitted to the Department by December 1 of the calendar year following the year of audit: the audit report for 1981 is due by December 1, 1982 in order to complete the review by the cut-off date of June 20, 1983. This time frame is well within established procedures for such audits.

Project Purpose Cost Allocation - Grizzly Valley Dam and Lake Davis

The project purpose cost allocation for Grizzly Valley Dam and Lake Davis was first reported to the Legislature under Davis-Dolwig Act procedures in Bulletin 153-68, dated February 1968. That derivation resulted in the following allocation percentages of joint costs:

- Water Supply

  Capital - - - - - - 5.1%
  Minimum OMP&R - - - 8.8%

- Recreation and Fish and Wildlife Enhancement

  Capital - - - - - - - 94.9%
  Minimum OMP&R - - - - 91.2%

The above project purpose cost allocation for Grizzly Valley Dam and Lake Davis was reviewed by the Department in 1982 and the following revisions were made:

- Project purpose cost allocations for facilities of the SWP generally are based on estimates of costs in the year following completion of the facility. The initial cost allocation for Grizzly Valley Dam and Lake Davis was based on cost estimates made in 1964, and construction was essentially completed in 1967. Therefore, the revised allocation for Grizzly Valley Dam and Lake Davis is based on 1968 costs to conform to the convention established in other cost allocations reported to the Legislature under the Davis-Dolwig Act.

- The initial derivation of allocation percentages for Grizzly Valley Dam and Lake Davis was computed at 4.0 percent interest. In the revised allocation all costs and benefits are expressed in equal annual equivalent values for the 50-year period 1968 through 2017 at the estimated 1982 Project Interest Rate of 4.630 percent.

- To date, recreation use at Lake Davis has been significantly higher than that estimated for the initial allocation. Recreation benefits in the revised allocation were computed using actual visitor-days for 1968 through 1981, and future use was projected at a much lower growth rate than in the initial allocation.

- In the initial allocation for Grizzly Valley Dam and Lake Davis water supply benefits were based on the contracted entitlement of Plumas County Flood Control and Water Conservation District. However, actual and projected water deliveries to Plumas County are lower than those anticipated in the initial allocation. Water supply benefits in the revised allocation are based on Plumas County's actual deliveries and requests as shown in Bulletin 132-81, Table B-5B.

The revised allocation was reported to the Legislature in Appendix D to Bulletin 132-82 (bound separately). This revision results in joint costs of Grizzly Valley Dam and Lake Davis being allocated to project purposes as follows:

- Water Supply

  Capital - - - - - - - - 1.0%
  Minimim OMP&R - - - - 1.8%

- Recreation and Fish and Wildlife Enhancement

  Capital - - - - - - - - 99.0%
  Minimum OMP&R - - - - 98.2%

Copies of Appendix D to Bulletin 132-82 are available from the Department on request.

The Department of Finance, in October 1979, issued a staff report on the project purpose cost allocation methods used by the Department to allocate SWP costs under the Davis-Dolwig Act. If implemented, the Department of Finance recommendations would reduce the magnitude of SWP costs allocated to recreation and fish and wildlife enhancement.

The Department has reviewed the Department of Finance report and, on March 20, 1981, responded by memorandum that the recommendations are not in conformance with SWP water supply contracts and the intent of the Davis-Dolwig Act.

Power Contracts Management

Periodic updates on the status of power contract management and energy matters are included in the bimonthly meetings of the Water Service Contractors' Council, the Director's monthly report to the California Water Commission, and the quarterly meetings of the Energy Committee, which consists of technical representatives of the water contractors and the Department (see Bulletin 132-77, page 72).

Emergency Service to PGandE

On June 22, 1981, the Department provided emergency assistance to PGandE by reducing SWP pumping load for about two hours. PGandE paid $32,300 for the service.

On August 7, 27, and 28, 1981, the Department provided additional capacity to PGandE by generation at the San Luis Pumping-Generating Plant. Water used for generation was pumped back into San Luis Reservoir during off-peak hours, using energy supplied by PGandE. The Department received $20,776 for this service.

Use of DWR Pacific Northwest Intertie Capacity

The Department is entitled to use 300 MW of EHV transmission line capacity from the Oregon-California border to the Tesla and Los Banos substations. During July and August 1981, the Department made 150 MW of EHV line capacity available to PGandE. The company paid $83,750 for use of the transmission line.

Comprehensive Agreement with PGandE

On April 22, 1982, the Department signed a Comprehensive Agreement with PGandE. The Agreement provides for transmission service within the PGandE service area for the Department's power sources and pumping plants. It also provides for either party to make available emergency service to the other party. The Department may sell excess energy to PGandE or may purchase energy from PGandE if necessary to meet SWP pumping needs. The Agreement contains principles for the interconnected operation of the Department's and PGandE's systems. A consultant has been retained by the Department and PGandE to study the establishment of a control area to permit the Department to control its generating facilities to meet Department's load requirements. The consultant will also study the feasibility of dynamic scheduling to transfer power through the PGandE and Southern California Edison systems. Dynamic scheduling is a computer controlled process which continuously varies power flow to meet changing conditions.

Summary of Major Power Contracts

By the end of June 1982, 23 major electric power contracts had been executed for the SWP. Some of those contracts will terminate on March 31, 1983. The service provisions under certain other contracts will become effective after that date. A brief summary of the 23 contracts is shown in Figure 20.

Figure 20

SUMMARY OF MAJOR ELECTRIC POWER CONTRACTS FOR THE CALIFORNIA STATE WATER PROJECT

	Contract Title (short-form)	Signed:	With:	Providing:	To:
1.	West Branch Cooperative Development	September 2, 1966	Los Angeles Department of Water and Power	Joint Development of Castaic Powerplant on the California Aqueduct	January 1, 2042
2.	Suppliers	November 18, 1966	Pacific Gas and Electric Co., Southern California Edison Co., Los Angeles Department of Water and Power, San Diego Gas & Electric Co.	Purchase of all capacity and energy required for SWP not available from other sources and transmission service for all power used by SWP plants	Cancelled effective April 1, 1983
3.	Extra High Voltage Intertie	August 1, 1967	Pacific Gas and Electric Co., Southern California Edison Co., San Diego Gas and Electric Co.	Transmission from the Oregon border to specific points in California, sale of Canadian Entitlement Power not needed by SWP, and purchase of off-peak energy to the extent of purchased transmission capacity	January 1, 2005
4.	Boneville Power Administration	September 5, 1967	Bonneville Power Administration	Purchase of surplus BPA energy at Oregon-California border	August 30, 1986
5,6,7.	Canadian Entitlement Power Contracts (3)	October 30, 1967	City of Seattle, City of Tacoma, Puget Sound Power and Light Co.	Purchase of specified amounts of power (now 150 MW) with associated energy	April 1, 1983
8.	Oroville-Thermalito Power Sale	November 29, 1967	Pacific Gas and Electric Co., Southern California Edison Co., San Diego Gas & Electric Co.	Sale of entire output of Hyatt Thermalito Powerplants for a firm annual payment to support Oroville Revenue Bonds	Cancelled effective April 1, 1983
9.	Fourth Supplemental Resolution, Oroville Revenue Bonds	September 28, 1977	Department of Water Resources' Resolution	Replacement of Power Sale Contract, effective April 1, 1983	Last repayment Bonds or November 29, 2017, whichever later
10.	MWD Hydro	January 9, 1978	The Metropolitan Water District of Southern California	Effective April 1, 1983 provides for purchase of output from five small hydro developments totaling 29.5 MW in capacity	At least to April 1, 2008
11.	San Diego Gas & Electric EHV Settlement	May 25, 1978	San Diego Gas & Electric Company	Establishes extent of San Diego Gas & Electric's obligation to supply off-peak energy during the remaining term of the EHV contract.	January 1, 2005
12.	Reid Gardner Unit 4 Participation	July 11, 1979	Nevada Power Company	Joint ownership of an additional unit at an existing coal-fired plant near Las Vegas	April 1, 2013-based on 30 yrs. from estimated operating date of Reid Gardner Unit 4
13.	Power Contract	October 11, 1979	Southern California Edison Co.	Commencing April 1, 1983 provides: (a) Transmission service in Edison's service area (b) Rights to purchase up to 300 MW firm capacity and/or spinning reserves (c) Rights to purchase off-peak energy (d) Exchange of off-peak energy for 485 MW of DWR's on-peak capacity	January 1, 2005
14.	Firm Transmission Service	October 11, 1979	Southern California Edison Co.	Provides for service between Nevada and Edison's service area	April 1, 2013 - based on 30 yrs. from estimated operating date of Reid Garnder Unit 4
15.	Edison-DWR 1979	October 11, 1979	Southern California Edison Co.	Establishes rate for Edison's off-peak energy under the EHV contract after January 1, 1983	January 1, 2005
16.	Pine Flat	November 6, 1979	Kings River Conservation	Purchase of output from a proposed power plant to be located at Pine Flat Dam	April 1, 2033 - based on 50 yrs. from estimated operating date
17.	Pacific Gas and Electric Firm Services Agreement	January 18, 1980	Pacific Gas and Electric Co.	Emergency electric system assistance to Pacific Gas and Electric	April 1, 1983
18.	Southern California Edison Agreement for Emergency Services	July 21, 1980	Southern California Edison Co.	Emergency Service between the parties	December 31, 2004
19.	Capacity Exchange Agreement	September 17, 1981	Southern California Edison Co.	Exchanges 225 MW of on-peak capacity from Hyatt-Thermalito for: (a) Up to 600 MW of SCE's capacity during off-peak periods (b) Up to 225 MW of SCE's capacity during partial-peak periods (c) A 75% reduction in transmission service charges for transmission under Power Contract and Firm Transmission Service Agreement	December 31, 2004
20.	Agreement for Sale of Interruptable Energy	March 8, 1982	British Columbia Hydro and Power Authority	Sale of B. C. Hydro surplus interruptable energy to the Department	December 31, 1991 or upon one month's notice by either party, whichever occurs first
21.	Agreement for Sale of Nonfirm Thermal Energy	March 8, 1982	Pacific Power and Light Co.	Sale of nonfirm thermal energy to the Department	December 31, 1991 or upon one month's notice by either party, whichever occurs first
22.	Comprehensive Agreement	April 22, 1982	Pacific Gas and Electric Co.	Up to 1465 MW of firm transmission service in PGandE's service area effective April 1, 1983	December 31, 2004 with an option for ten years of additional service
23.	Generation Replacement Agreement/ Energy Purchase Agreement	June 14, 1982	Southern California Edison Co./San Bernardino Valley Municipal Water District	Provides energy from DWR generating resources to replace cost generation of two SCE plants on San Bernardino's water distribution system/San Bernardino will reimburse DWR for energy provided to SCE and give DWR the option to develop four small hydro plants on San Bernardino's system	June 1, 2007

CHAPTER VII

PROJECT OPERATIONS

Water Operations in 1981

This section summarizes SWP water operations during calendar year 1981, including (1) water conditions, (2) water delivery scheduling, and (3) other 1981 activities.

Water Conditions

Statewide precipitation during the water year (October 1, 1980 through September 30, 1981) was about 75 percent of normal, compared with 130 percent of normal for the 1979-80 water year. The 1980-81 precipitation pattern ranged from 75 percent of normal in the North Coastal area to 65 percent of normal in the South Coastal area. Precipitation, in percentage of normal is shown for all areas of California on Figure 21.

Streamflow in California for the 1980-81 water year averaged 65 percent of the 50-year normal. In the Feather River Basin, runoff was 60 percent of the 50-year average.

The Delta outflow index during calendar year 1981 ranged from 1.5 m^3s (54 cfs) on May 3, 1981, to 2 552 m^3/s (90,142 cfs) on December 22, 1981. All water quality standards of the SWRCB D-1485 were satisfied during 1981, except that for part of May, the 14-day average salinity was exceeded to a small degree at Emmaton on the Sacramento River and for only one day at Jersey Point on the San Joaquin River. The 1980-81 water year was classified a "dry year", using SWRCB D-1485 criteria. This classification is indexed to the sum of unimpaired runoff computed for the Sacramento River near Red Bluff, Feather River into Lake Oroville, Yuba River at Smartville, and American River into Folsom Reservoir (Four Basin Index). The index total was computed to be 13 707 000 dam^3 (11,112,000 acre-feet) for the 1980-81 water year.

Figure 22 presents a pictorial summary of the operations of SWP reservoirs during 1981. The figure also presents information on total SWP and CVP deliveries to Project service areas during 1981, and areas of the SWP's five field divisions, responsible for operations and maintenance activities. Details of water supply conditions during the 1980-81 water year are available in the Department's Bulletin 120-80, "Water Conditions in California".

The curves shown in Figure 23 give cumulative natural runoff to Shasta and Oroville Reservoirs for the three years (1981; maximum 1974; and minimum 1977), and a multiyear average for the basins. Also shown is the cumulative natural runoff through June 1982 for comparison.

In Figure 24, end-of-the-month storage in Lake Oroville and San Luis Reservoir are compared to 1980 end-of-month storages and storages projected in the May update of the Plan of Operations for 1981, dated June 29, 1981.

Table 18 shows a comparison of actual year-end storage of Project water in major SWP reservoirs to those projected in the May Plan of Operations.
At the end of 1981 reservoir storage in the four Southern California SWP reservoirs shown in Table 18, totalled 666 000 dam^3 (540,000 acre-feet). This total is about 3 percent more than the 1980 year-end amount.

Figure 21: STATEWIDE PRECIPITATION 1980-81 WATER YEAR

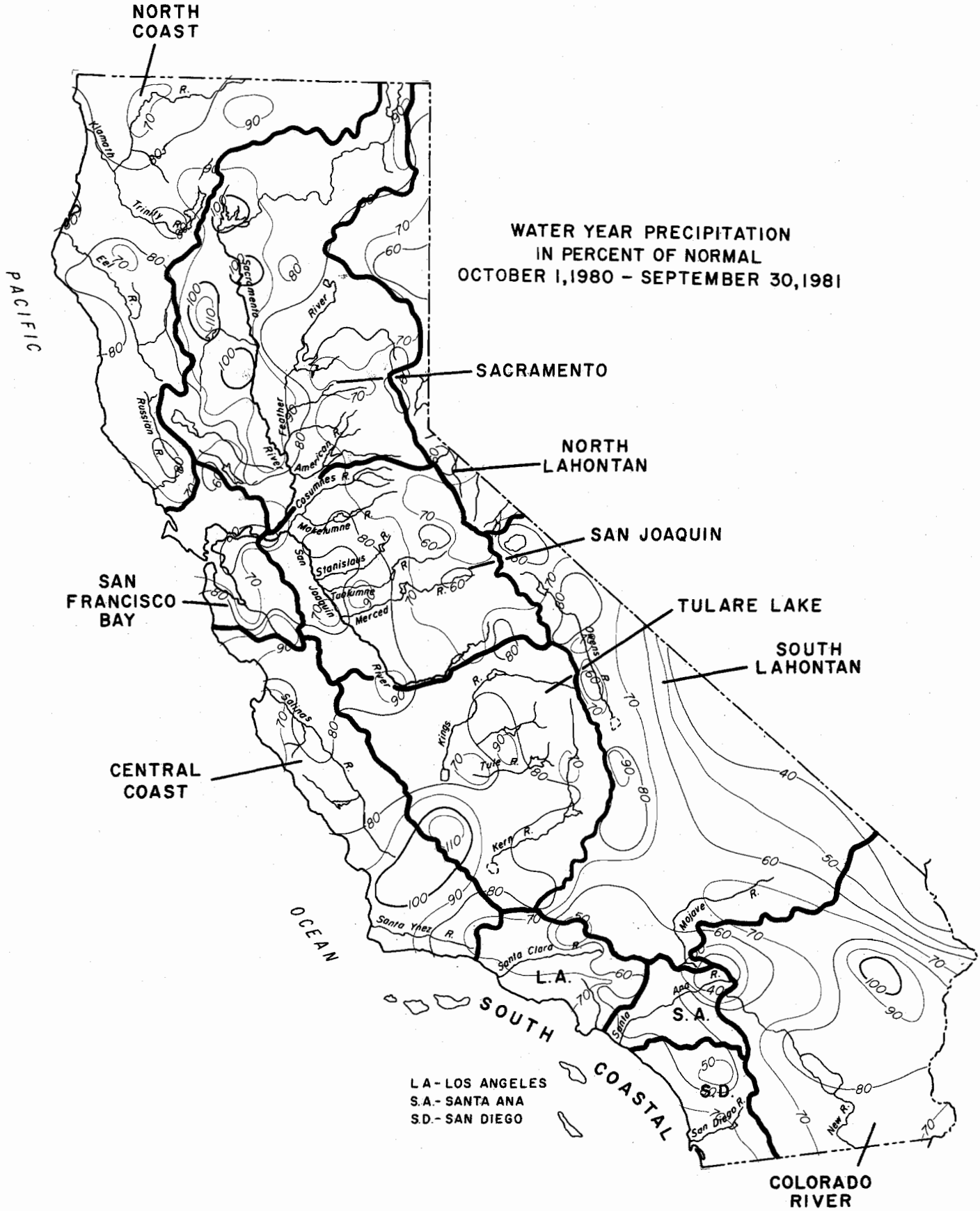
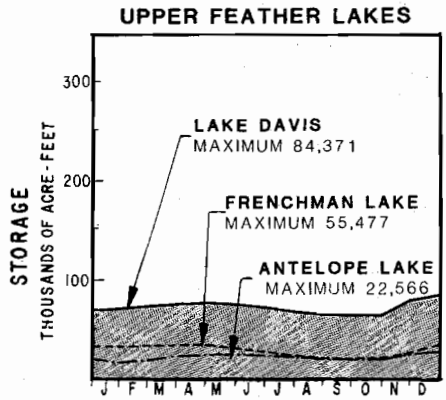
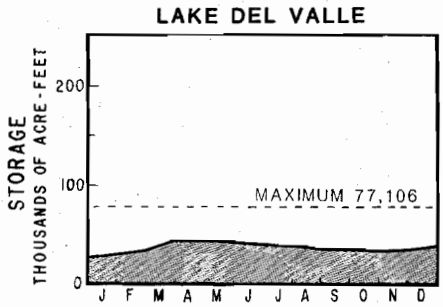
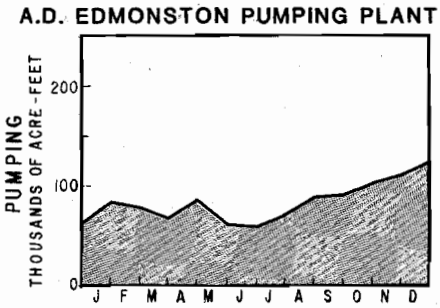
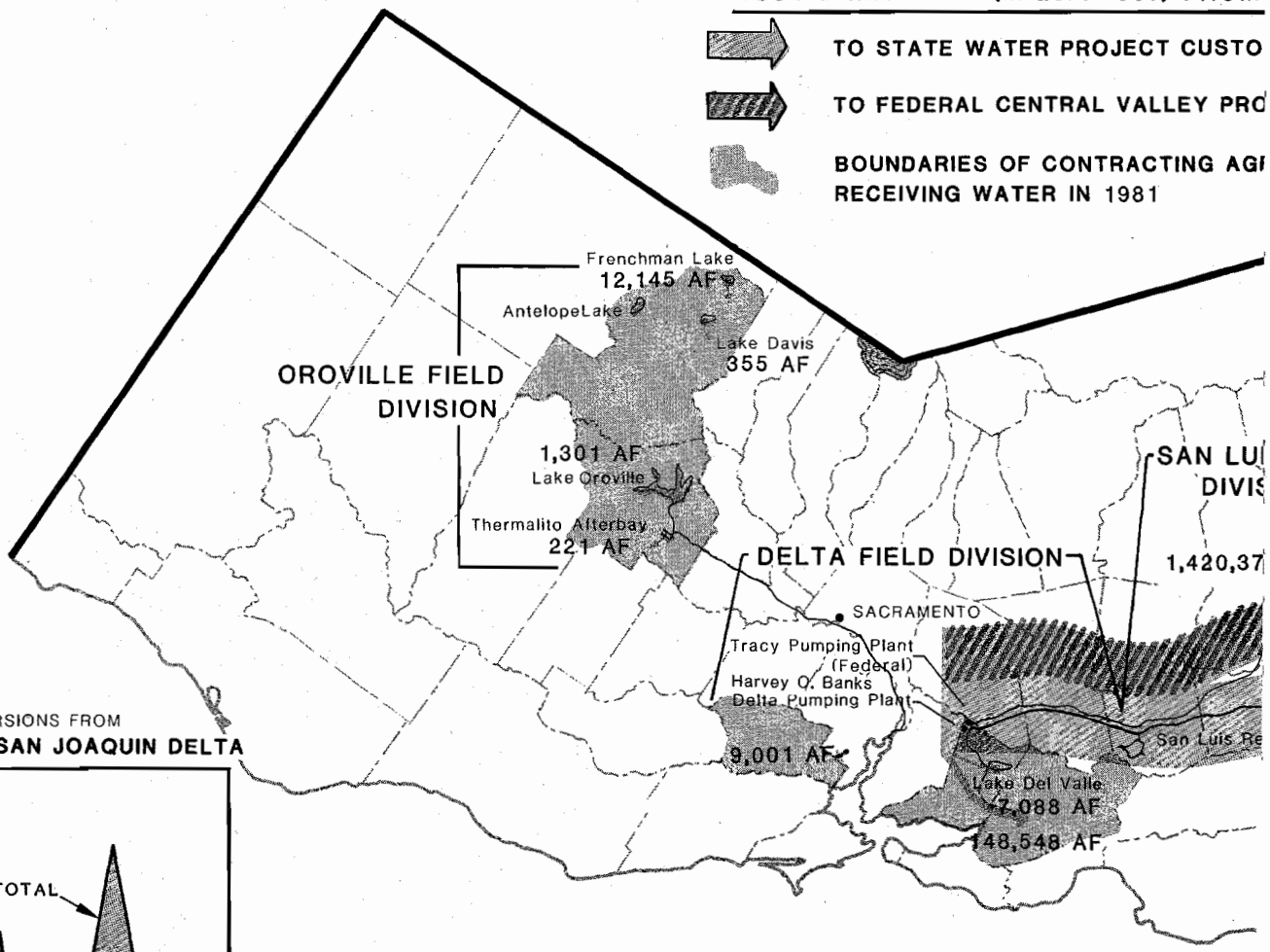


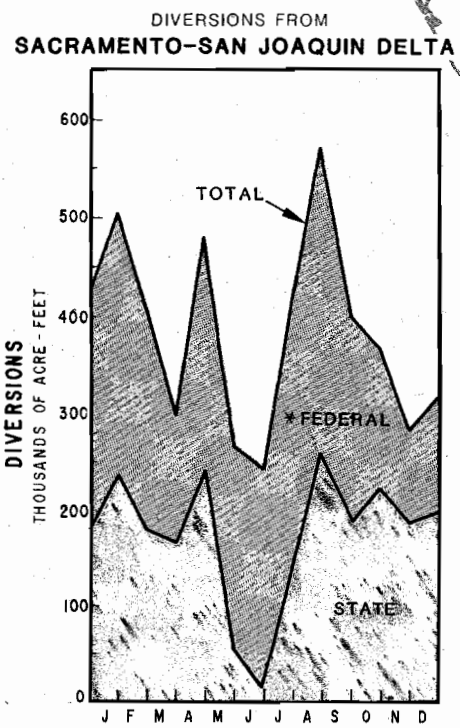
Figure 22: SUMMARY OF PROJECT



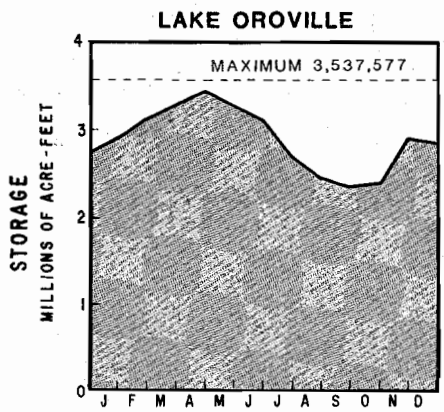


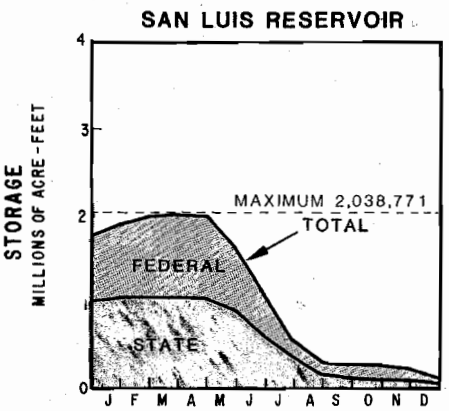




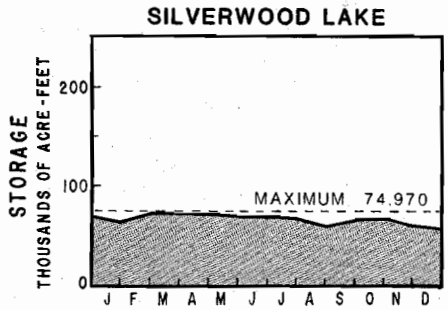


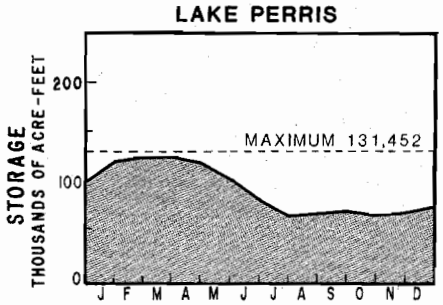
* Includes Diversions for Delta Mendota Canal and Contra Costra Canal





WATER OPERATIONS, 1981



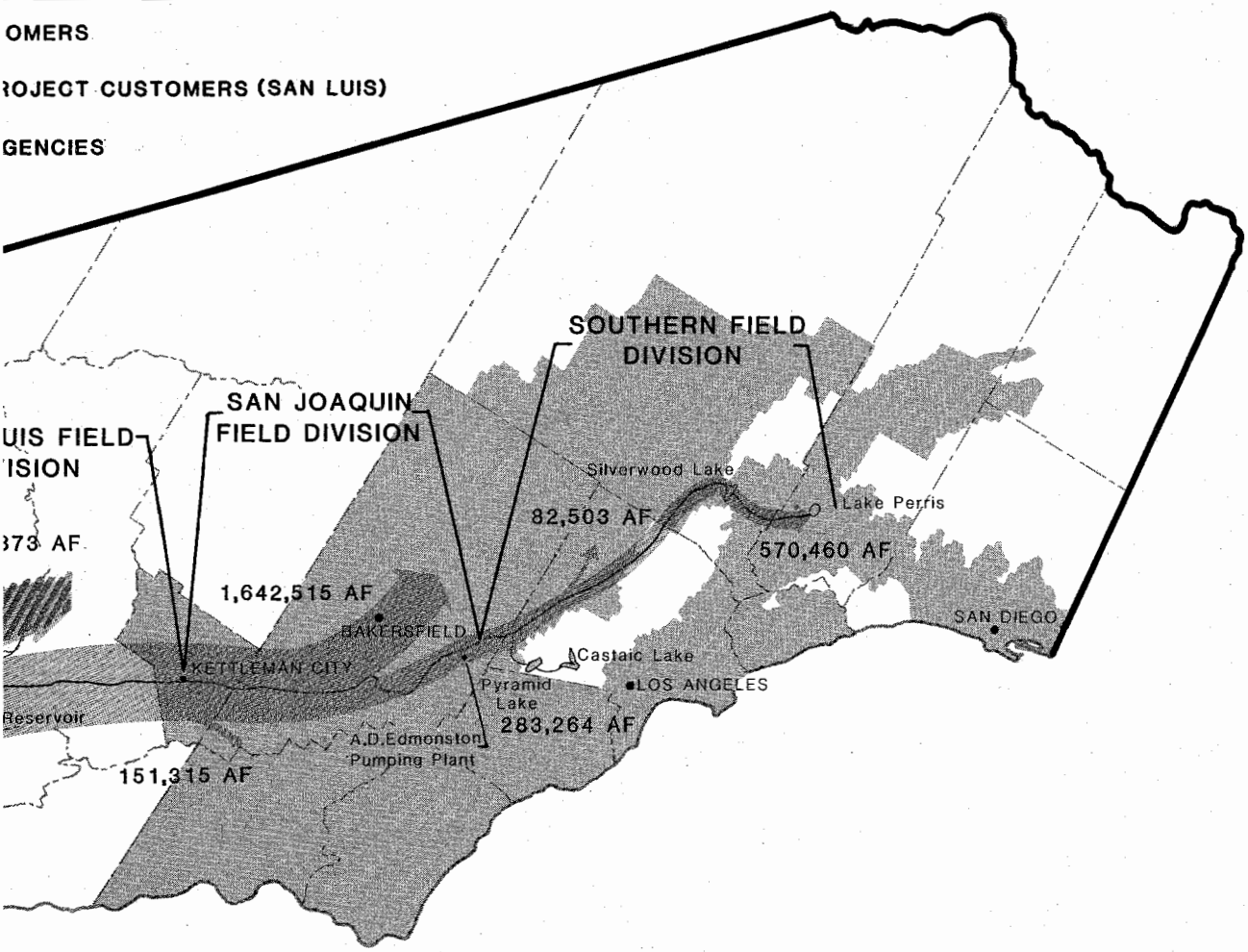


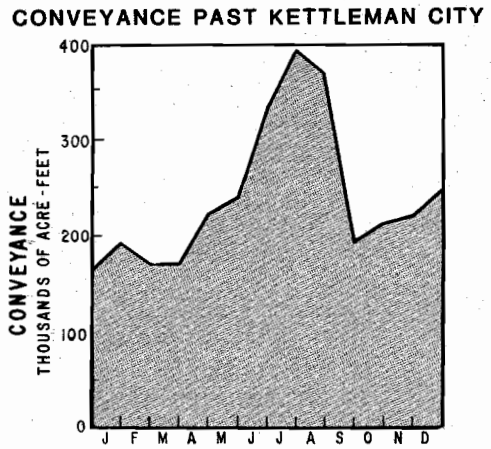
M PROJECT FACILITIES

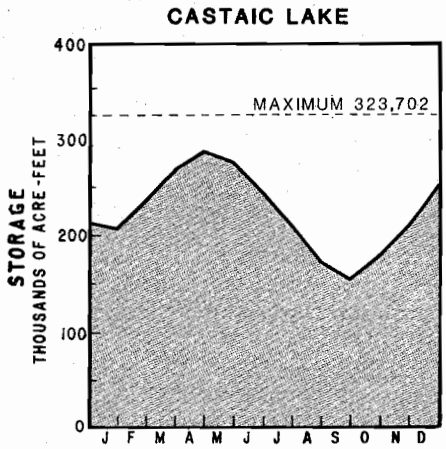
OMERS

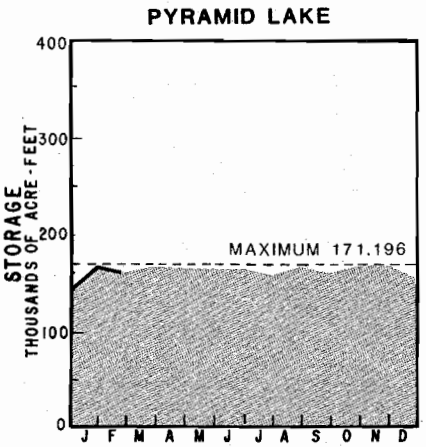
ROJECT CUSTOMERS (SAN LUIS)

GENCIES









ACCUMULATIVE NATURAL RUNOFF TO SELECTED RESERVOIRS

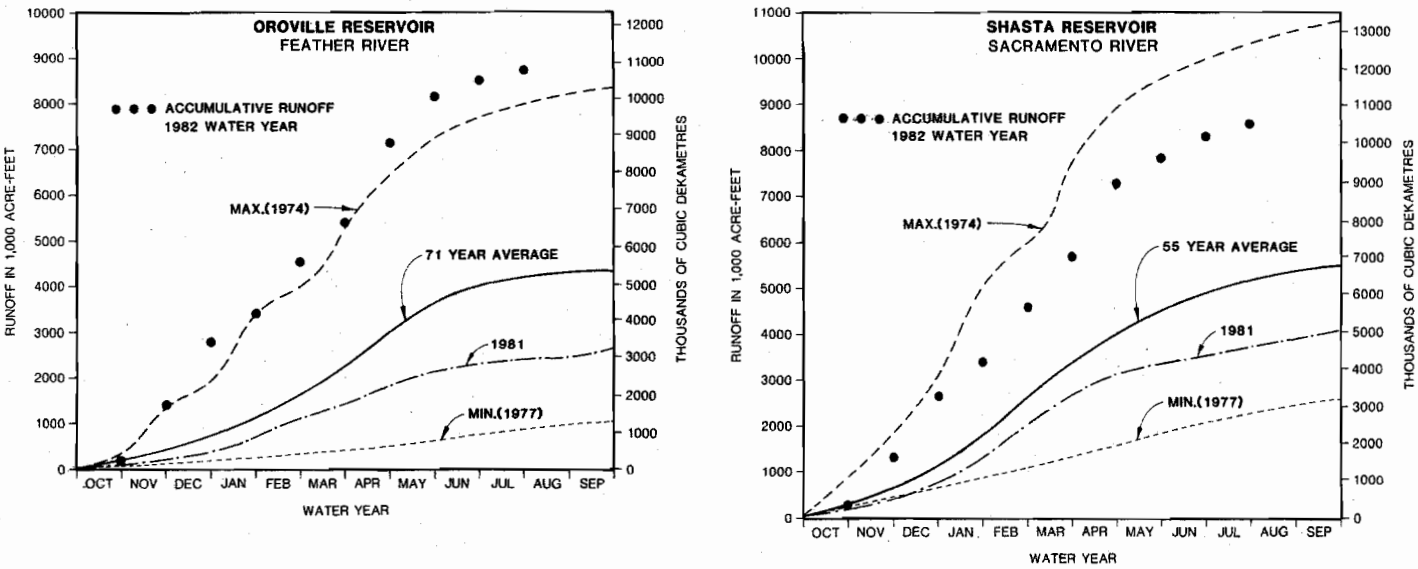


Figure 23

MONTHLY RESERVOIR STORAGE DURING 1981
FOR LAKE OROVILLE AND SAN LUIS RESERVOIR
January 1, 1981 – December 31, 1981

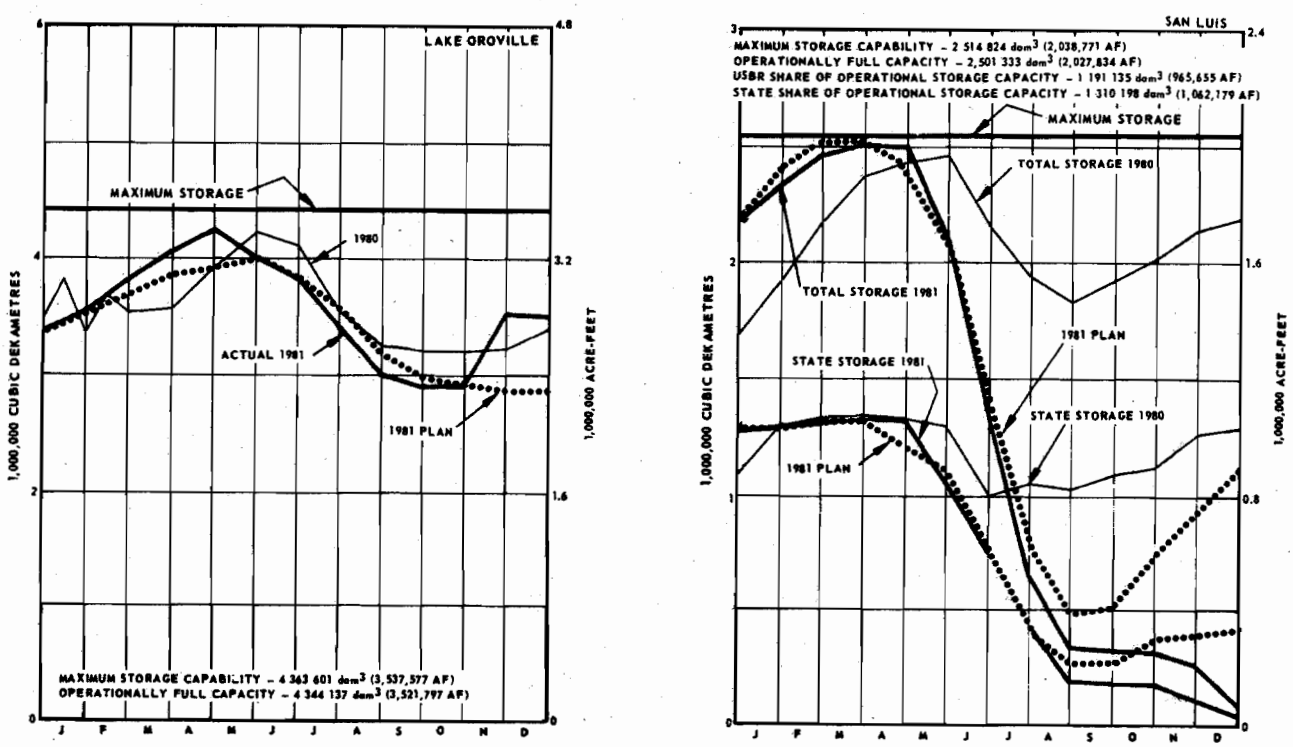


Figure 24

TABLE 18: COMPARISON OF ACTUAL STORAGE WITH PLAN OF OPERATIONS

in 1 000 cubic dekametres
(1,000 acre-feet)

Reservoir	Plan of Operations	Actual Storage on Dec. 31, 1981	Difference
Oroville	2 875	3 529	654
	(2,331)	(2,861)	(530)
Del Valle	31	42	11
	(25)	(34)	(9)
San Luis (State share)	461	49	-412
	(374)	(40)	(-334)
Pyramid	205	190	-15
	(166)	(154)	(-12)
Castaic	200	311	111
	(162)	(252)	(90)
Silverwood	80	72	-8
	(65)	(58)	(-7)
Perris	69	94	25
	(56)	(76)	(20)
TOTALS	**3 921**	**4 287**	**366**
	(3,179)	**(3,475)**	**(296)**

Water Delivery Scheduling

In 1981, the Department again used the "Rule Curve" method to forecast water supplies available to the SWP and to schedule water deliveries to contractors. The "Rule Curve" determines the quantity of water available for SWP deliveries after sufficient water is reserved to meet Delta water-quality requirements and year-end storage requirements for entitlement deliveries during the following year.

The normal water delivery scheduling procedure is as follows: In December, the Department approves an initial water delivery schedule, using the Rule Curve, a conservative projection of runoff and an estimate of end of water year storage in SWP reservoirs. Actual reservoir storage and runoff conditions are reviewed early in each of the next several months (until the May water supply report is available) and the estimates of SWP water availability are revised. If the revised estimates indicate that the available supply will be greater than that previously estimated, scheduled deliveries are increased, up to the requested amounts.

During the year, the Department prepares weekly reports on the status of Project operations through its monitoring of Project water supplies, reservoir storage quantities, and water deliveries. The Department closely controls SWP operations to meet the approved Rule Curve Criteria. These procedures are to assure water contractors that supplies will be available for the following year's water deliveries.

In 1981, a total of 3 782 074 dam^3 (3,066,132 acre-feet) was delivered from SWP facilities, excluding deliveries to satisfy prior water rights. This total includes 3 563 150 dam^3

(2,888,650 acre-feet) to State customers, 169 224 dam^3 (137,190 acre-feet) wheeled through SWP facilities for delivery to Federal customers, 43 918 dam^3 (35,604 acre-feet) of regulated delivery of local runoff, and 5 783 dam^3 (4,688 acre-feet) for recreation and wildlife mitigation. The deliveries to State customers were 49 percent higher than the deliveries during 1980. These deliveries included State Water Contractors' entitlement water, surplus, wet weather makeup, carryover, repayment of preconsolidation water, emergency relief, unscheduled water, and water delivered from groundwater-recharge demonstration storage.

A total of 1 751 116 dam^3 (1,419,632 acre-feet) was delivered to Federal customers in the joint facilities (San Luis) service area in 1981, including wildlife mitigation water, up 13 percent over 1980.

The various water types, amounts of water, and contracting agencies receiving water service in 1981 are detailed in Table 16 and discussed in Chapter VI, Project Management (see "Water Deliveries in 1981" and "Wheeling of Federal Water").

Other Activities

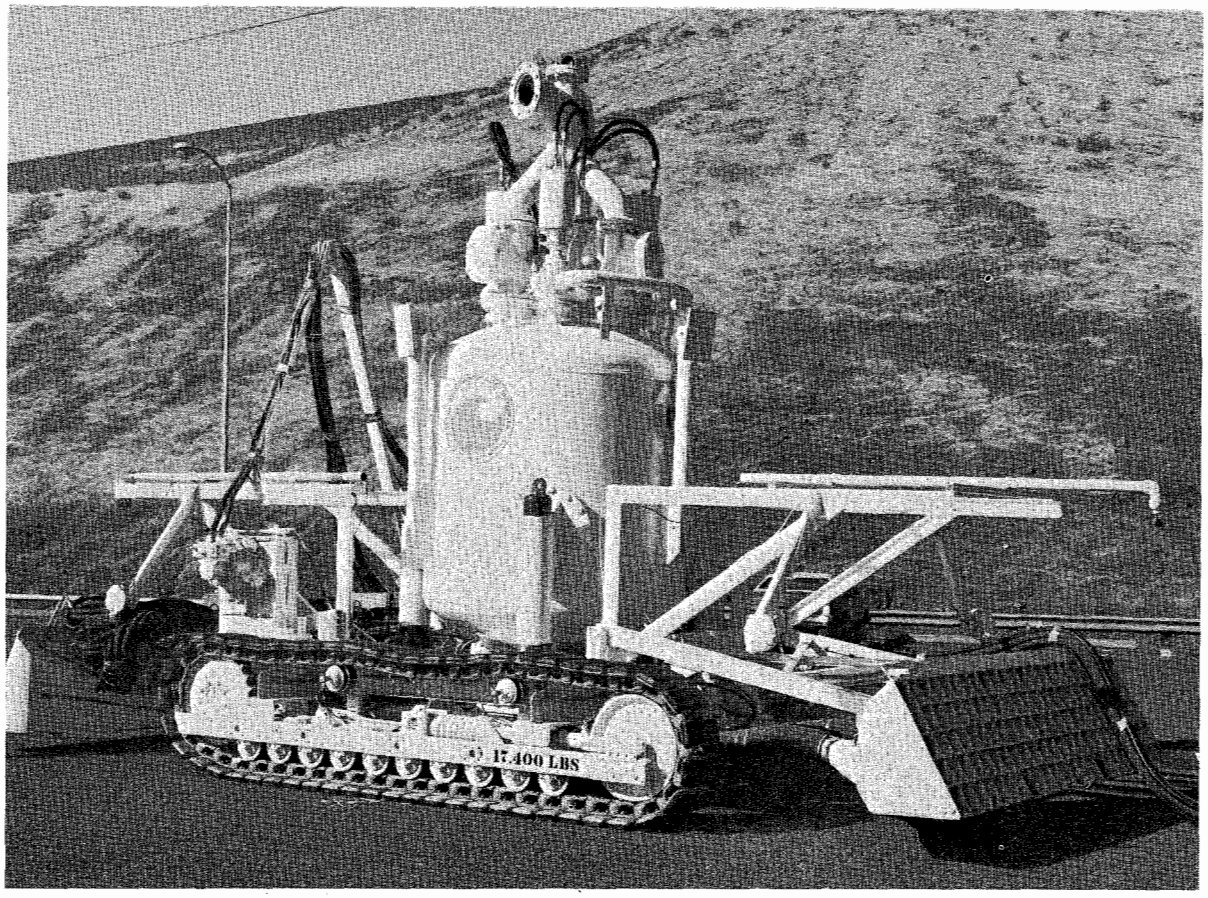
California Aqueduct Sediment Removal. In October of 1981, regular dredging operations began for the removal of about 765,000 cubic metres (1 million cubic yards) of asbestos-laden silt from the California Aqueduct. The dredging will cover a 225-kilometre (140-mile) segment of the Aqueduct from Check 19 (km 250) south to the A. D. Edmonston Pumping Plant (km 472). Most of the sediment originated from periodic flood inflows to the aqueduct from Arroyo Pasajero near Coalinga in Fresno County, an area containing serpentine rocks and asbestos mines. Concern over the potential health hazard of the high concentrations of asbestos in sediment deposited in the aqueduct, led to the decision that it should be removed. In addition, the sediment was causing pump impellers to wear out more quickly.

A unique underwater dredge, a self-propelled tractor guided by sonar, was developed for the task. The tractor, controlled from a truck on the bank, is hydraulically driven. The dredge pump is operated by compressed air. After the mud is pumped up, it is discharged through flexible pipe into containment areas along the aqueduct. The containment areas will be seeded with native plants to provide erosion protection and to ensure preservation of wildlife habitat.

By August of 1982, approximately 200,000 cubic metres (250,000 cubic yards) of sediment had been removed from the first 9-mile reach (Pool 20). The originally estimated quantity for this reach was 140,000 cubic metres (175,000 cubic yards). Over the period September 1981 to August 1982, the dredge operated approximately 3700 hours. Current estimates are that it will take approximately three more years to complete the project.

The USCE and the USBR have been working on a long-range solution to the Arroyo Pasajero flooding problem. USBR is expected to release their draft report late in 1982. The Department's San Joaquin District staff is currently investigating some additional alternatives not addressed in USBR's preliminary draft. The Department intends to make specific recommendations to USBR on a course of action upon completion of San Joaquin District's study, probably in late 1983.

Should flood flows from Arroyo Pasajero again enter the Aqueduct within the next few years (before a long-range solution can be implemented), every effort will be made to confine the sediment inflow to the first three pools downstream of the Gale Avenue inlets. Dredging would commence on this 48-kilometre (30-mile) reach as soon as possible to prevent transportation of asbestos-laden sediment futher downstream.



SOAP NO. 1 (Silt Operation Automated Pump) - Underwater dredge designed to remove silt from the California Aqueduct.

Sacramento-San Joaquin Delta. Water Right Decision 1485 sets water quality standards, export limitations, and outflow requirements for the Sacramento-San Joaquin Delta. This information appears in Appendix E to Bulletin 132; it is published separately under the title "Water Operations in the Sacramento-San Joaquin Delta".

Table 19 shows summary data on the quality of water delivered during 1981 as measured at selected stations. Also shown at the bottom of Table 19 are corresponding monthly average objectives for maximum concentrations of constituents as set forth in long-term water contracts. Note that the mineral analyses are based on one each month, while the objectives are stated in terms of average conditions within a month.

Benefits of SWP Operations. The SWP provides numerous benefits to the people of California through its operations. These benefits include water supply, recreation, and energy production. Table 20 summarizes the SWP benefits through 1981.

TABLE 19: WATER QUALITY MEASUREMENTS AT SELECTED STATIONS IN 1981

Station	Monthly Samples	Concentrations (in parts per million unless otherwise noted)					
		Total Dissolved Solids	Total Hardness	Chlorides	Sulfates	(a Sodium (%)	Boron
Thermalito Afterbay, Outlet to Feather River	Minimum	37	32	1	0	15	0.0
	Average	56	35	1	3	18	0.0
	Maximum	64	39	2	3	20	0.1
Sacramento-San Joaquin Delta, Delta Pumping Plant	Minimum	133	61	22	20	42	0.1
	Average	245	95	57	42	49	0.2
	Maximum	344	122	93	63	54	0.3
South Bay Aqueduct, Santa Clara Terminal Facility	Minimum	176	86	29	29	38	0.1
	Average	254	125	50	44	40	0.2
	Maximum	340	167	67	61	41	0.3
California Aqueduct: Entrance to O'Neill Forebay	Minimum	169	73	32	27	45	0.1
	Average	244	92	56	42	50	0.2
	Maximum	333	113	88	61	55	0.2
Outlet from O'Neill Forebay	Minimum	201	85	43	35	47	0.2
	Average	285	109	72	48	51	0.2
	Maximum	351	128	98	58	54	0.3
Near Kettleman City	Minimum	207	86	42	35	47	0.2
	Average	306	117	58	60	50	0.2
	Maximum	367	135	67	77	51	0.4
Coastal Branch near Devil's Den	Minimum	204	83	43	34	47	0.1
	Average	257	96	70	41	48	0.2
	Maximum	318	115	92	49	55	0.4
Near Buena Vista Pumping Plant	Minimum	214	86	48	34	48	0.1
	Average	262	99	67	45	47	0.2
	Maximum	330	122	89	58	53	0.4
At Tehachapi Afterbay	Minimum	198	84	43	35	48	0.1
	Average	256	102	64	45	51	0.2
	Maximum	305	116	83	53	53	0.4
At Pearblossom Pumping Plant	Minimum	210	94	43	31	45	0.1
	Average	283	112	74	50	51	0.2
	Maximum	346	141	102	91	57	0.4
Silverwood Lake, Outlet to San Bernardino Tunnel	Minimum	200	84	40	34	47	0.1
	Average	267	102	66	42	51	0.2
	Maximum	315	115	99	59	55	0.2
Lake Perris, Outlet from Santa Ana Pipeline	Minimum	205	76	50	34	51	0.2
	Average	231	84	58	37	53	0.2
	Maximum	275	98	75	42	54	0.2
Pyramid Lake, Entrance to Angeles Tunnel	Minimum	285	134	40	64	35	0.2
	Average	333	145	60	85	44	0.3
	Maximum	375	170	79	111	48	0.4
Castaic Lake, Outlet Tower	Minimum	361	172	42	100	32	0.3
	Average	382	197	48	129	35	0.4
	Maximum	435	218	63	153	41	0.4
Monthly Average Quality Objectives		440	180	110	110	50	0.6

a) *Amount of sodium in solution expressed as a percentage of the total sodium, calcium, magnesium and potassium in solution.*

TABLE 20: SWP BENEFITS THROUGH 1981

Year	Water Delivered (acre-feet) [a]							Recreation Supported (Recreation days) [c]	Electrical Energy Generated (Megawatt-hours) [d]
	Entitlement Water			Other Deliveries					
	Municipal and Industrial Use	Agricultural Use	Total	Surplus		Other Water [b]	Total Delivery		
				Agr.	M&I				
1962						18,289	18,289	30,000	
1963						22,456	22,456	105,000	
1964						32,507	32,507	331,600	
1965						44,105	44,105	499,800	
1966						67,928	67,928	482,700	
1967	5,747	5,791	11,538			53,605	65,143	455,200	
1968	46,472	125,237	171,709	111,534	10,000	14,777	308,020	931,300	628,000
1969	34,434	158,586	193,020	72,397	0	18,829	284,246	1,554,800	2,614,000
1970	47,996	185,997	233,993	133,024	0	38,080	405,097	1,804,800	2,679,000
1971	85,286	272,054	357,340	293,619	2,400	44,127	697,486	2,085,900	3,302,000
1972	181,066	430,735	611,801	401,759	22,205	73,127	1,108,892	1,971,200	1,922,000
1973	293,824	400,564	694,388	293,255	3,161	43,666	1,034,470	2,502,000	3,298,000
1974	418,521	455,556	874,077	412,923	4,753	48,342	1,340,095	4,073,600	4,672,000
1975	641,621	582,369	1,223,990	601,859	21,043	67,170	1,914,062	4,189,300	3,159,000
1976	818,588	554,414	1,373,002	547,622	32,488	116,962	2,070,074	4,239,600	2,131,000
1977	280,919	293,236	574,155	0	0	390,176	964,331	3,951,900	958,000
1978	742,385	710,314	1,452,699	13,348	3,566	122,916	1,592,529	5,773,700	2,882,000
1979	690,659	969,237	1,659,896	582,308	66,081	189,396	2,497,681	5,298,700	2,485,000
1980	730,545	799,204	1,529,749	384,835	19,722	48,590	1,982,896	5,701,900	2,988,000
1981	1,057,273	852,289	1,909,562	896,428	12,000	248,142	3,066,132	6,017,800	3,358,000
Total [e]	6,075,336	6,795,583	12,870,919	4,744,911	197,419	1,703,190	19,516,439	52,000,800	37,139,000

a) Metric conversion is acre-feet times 1.2335 equals cubic dekametres.
b) Includes Emergency Relief Water, Kern River Intertie Water, Exchange Water, Repayment Water, Regulated Delivery of Local Supply, Conveyance of Federal CVP Water, and Recreation Water.
c) A recreation day is the visit of one person to a recreation area for any part of one day.
d) Includes State's share of generation from Hyatt-Thermalito, San Luis, Castaic and Devil Canyon Powerplants.
e) In addition, dams of the State Water Project have prevented millions of dollar's worth of flood damage.

Power Operations in 1981

During 1981 the power requirements of SWP pumping plants were supplied by (1) generation by SWP recovery generating plants, (2) purchases of Canadian Entitlement Power, and (3) purchases from California electric utilities. As shown in Table 21, the total energy from all sources was 5,263.61 kWh.

SWP Recovery Plants

During 1981 SWP recovery plants (San Luis Pumping-Generating Plant and Devil Canyon Generating Plant) contributed 821 million kWh. Energy is generated at San Luis Reservoir when water is released from the reservoir for delivery downstream. The San Luis plant can also be operated in a daily or weekly pumped-storage generating mode. The Devil Canyon plant, in San Bernardino County, recovers part of the energy used to deliver water to Silverwood Lake.

Castaic Pumping-Generating Plant

Castaic Pumping Plant is owned and operated by the City of LADWP. Under terms of the contract with LADWP, the SWP receives energy in proportion to the quantities of SWP water scheduled for delivery through the Castaic plant. During 1981, the SWP received 296 million kWh from LADWP.

Canadian Entitlement Power

The SWP obtains Canadian Entitlement Power (CEP) from three electric utilities in the Pacific Northwest at a maximum rate of 150 megawatts. During

TABLE 21: MONTHLY POWER

(in millions of

Operations	MONTH						
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.
ENERGY GENERATED BY EDWARD-HYATT AND THERMALITO POWERPLANTS [a]							
Gross Generation	57.00	71.14	120.40	111.71	237.25	199.19	326.22
Power Plant Use and Pumpback Requirements	12.96	7.65	6.30	4.28	10.97	40.62	2.65
Delivered to California Power Pool Companies	44.04	63.49	114.10	107.43	226.28	158.57	323.57
ENERGY USED BY PROJECT PUMPING PLANTS							
Cordelia Pumping Plant	.21	.26	.24	.36	.39	.48	.59
South Bay Pumping Plant	8.60	8.94	12.96	10.33	12.99	14.13	16.31
Del Valle Pumping Plant	.01	.23	.58	.01	.01	.01	.01
Tracy Pumping Plant (State Share)	0	1.14	0	0	2.74	11.05	0
Harvey O. Banks Delta Pumping Plant	69.88	53.14	49.40	71.95	16.69	5.03	42.52
San Luis Pumping-Generating Plant (State Share)	10.90	1.48	.80	.25	.15	.07	.05
Dos Amigos Pumping Plant (State Share)	25.61	23.58	21.00	29.46	28.47	42.79	49.84
Las Perillas Pumping Plant	.45	.47	.60	1.11	1.66	1.82	2.06
Badger Hill Pumping Plant	1.18	1.22	1.55	2.97	4.63	5.00	5.53
Buena Vista Pumping Plant	22.84	23.24	18.66	23.24	19.85	25.64	31.06
Wheeler Ridge Pumping Plant	24.35	23.15	19.84	25.54	19.36	21.03	25.69
Wind Gap Pumping Plant	53.44	51.31	44.24	56.08	40.56	42.13	52.19
A. D. Edmonston Pumping Plant	185.08	174.38	149.09	192.71	134.01	128.68	158.06
Oso Pumping Plant	8.49	11.21	12.89	9.31	3.15	1.16	2.20
Pearblossom Pumping Plant	33.65	23.68	10.91	28.20	25.34	28.10	31.97
Devil Canyon Power Plant (for Station Service)	0	.04	.12	0	0	0	0
Total	444.69	397.47	342.88	451.52	310.00	327.12	418.08
SOURCES OF ENERGY FOR PROJECT							
San Luis Pumping-Generating Plant (State Share)	0	0	0	0	43.92	65.96	45.83
Castaic Power Plant (State Share)	10.01	39.46	44.64	31.85	7.78	2.59	6.63
Devil Canyon Power Plant	61.76	33.27	19.87	47.62	46.78	47.79	57.59
Canadian Entitlement Power	47.98	43.33	47.74	43.80	45.15	43.98	45.36
Bonneville Power Administration	0	0	0	0	0	0	0
California "Suppliers"	324.76	281.41	230.63	328.25	166.37	166.80	262.67
PG&E for San Luis Generation	.18	0	0	0	0	0	0
Total	444.69	397.47	342.88	451.52	310.00	327.12	418.08

a) Sold under terms of the Oroville-Thermalito Power Sale Contract, November 29, 1967.

OPERATIONS IN 1981

kilowatthours)

MONTH						
Aug.	Sept.	Oct.	Nov.	Dec.	Total	Operations
						ENERGY GENERATED BY EDWARD-HYATT AND THERMALITO POWERPLANTS[a]
188.18	139.52	87.98	193.08	509.54	2,241.21	Gross Generation
11.58	36.16	50.96	12.78	.99	197.90	Power Plant Use and Pumpback Requirements
176.60	103.36	37.02	180.30	508.55	2,043.31	Delivered to California Power Pool Companies
						ENERGY USED BY PROJECT PUMPING PLANTS
.60	.62	.43	.33	.20	4.71	Cordelia Pumping Plant
16.11	13.67	13.08	9.77	11.35	148.24	South Bay Pumping Plant
.01	.01	.01	.01	.01	.91	Del Valle Pumping Plant
0	0	0	0	0	14.93	Tracy Pumping Plant (State Share)
76.38	55.70	66.38	55.45	58.88	621.40	Harvey O. Banks Delta Pumping Plant
.13	.28	.31	.24	.27	14.93	San Luis Pumping-Generating Plant (State Share)
45.29	24.20	28.07	30.16	32.98	381.45	Dos Amigos Pumping Plant (State Share)
1.59	.44	.76	.62	.49	12.07	Las Perillas Pumping Plant
4.28	1.14	2.01	1.66	1.31	32.48	Badger Hill Pumping Plant
32.65	24.24	26.02	27.81	32.60	307.85	Buena Vista Pumping Plant
29.44	26.89	29.42	32.16	36.24	313.11	Wheeler Ridge Pumping Plant
62.25	58.42	65.32	70.43	78.79	675.16	Wind Gap Pumping Plant
194.81	197.50	228.99	246.93	275.02	2,265.26	A. D. Edmonston Pumping Plant
2.94	6.12	13.43	14.85	15.35	101.10	Oso Pumping Plant
40.90	36.59	31.87	34.92	43.72	369.85	Pearblossom Pumping Plant
0	0	0	0	0	.16	Devil Canyon Power Plant (for Station Service)
507.38	445.82	506.10	525.34	587.21	5,263.61	Total
						SOURCES OF ENERGY FOR PROJECT
12.31	1.21	0	4.85	3.52	177.60	San Luis Pumping-Generating Plant (State Share)
8.93	16.44	24.29	50.61	52.82	296.05	Castaic Power Plant (State Share)
75.14	56.86	53.80	67.81	75.03	643.32	Devil Canyon Power Plant
45.07	44.04	45.33	43.74	44.99	540.51	Canadian Entitlement Power
0	0	0	0	0	0	Bonneville Power Administration
365.93	327.27	382.68	358.33	410.85	3,605.95	California "Suppliers"
0	0	0	0	0	.18	PG&E for San Luis Generation
507.38	445.82	506.10	525.34	587.21	5,263.61	Total

10—75489

1981, the SWP received 541 million kWh of CEP energy. SWP contracts for CEP will expire on March 31, 1983.

California Suppliers' Energy

During 1981, the SWP received most of its power from four California utilities (called the "Suppliers"): Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas and Electric Company, and the City of Los Angeles Department of Water and Power. The total 1981 Suppliers' Energy obtained by the SWP during the year was 3,606 million kWh. Most of this was off-peak power; that is, it was delivered when the Suppliers' electrical loads were at minimum levels.

The SWP also sells energy from Edward Hyatt and Thermalito powerplants, at Lake Oroville, to three of the "Suppliers": Pacific Gas and Electric, Southern California Edison, and San Diego Gas and Electric companies. After allowing for station service and pump-back energy, net 1981 Hyatt- Thermalito generation was 2,043 million kWh. On April 1, 1983, Hyatt-Thermalito generation will be available for pumping and other SWP purposes.

Preparation for SWP Utility Operations in 1983

Operational Actions: Operational consequences of the Department's future role as an "interconnected" electric utility were generally discussed in last year's Bulletin 132-81 (pages 52-54).

Historically, the SWP's power load, generation, and schedules have been integrated with those of the control areas of others -- namely, Pacific Gas and Electric Company and Southern California Edison Company. In terms used by the electric utility industry, the power operation of the SWP is characterized as an "integrated" type. Effective April 1, 1983, when existing contracts expire the SWP will administer its own control area(s), "interconnected", through purchased capacity in the transmission lines of others, with the electric utilities of the western states.

The primary advantages of an "interconnected" operation are (1) security -- protection from system and equipment failures -- and (2) economy -- the ability to purchase and sell in an expanded power market. However, to qualify for the advantages of an interconnected operation, the Department must shoulder additional responsibilities. It must be ready to balance SWP power loads with SWP power resources, real-time, and maintain its procedures and capacity reserve margins appropriate to the interconnected system.

Organizational Actions. During the past year, the Department continued to make adjustments organizationally as well as procedurally to fulfill its impending increased operational responsibilities.

Described in last year's report was the reorganization of the Division of O&M, effective July 1, 1981, to strengthen SWP utility management. That reorganization, shown in Figure 25, consolidated the day-to-day utility operation sub-organizations of O&M into the SWP operations office, the State Water Project Analysis Office, and a new Systems Development Branch. In December 1981, Lawrence A. Mullnix was appointed Chief of Operations to head this consolidation.

During the past year, the following structural changes took place within the Chief of Operations' organization:

(1) The Compliance Monitoring Section was established within the Water Operations Branch to consolidate and strengthen such activities of the Department with regard to Federal Energy Regulatory Commission Licenses, Decision 1485 of the State Water Resources Control

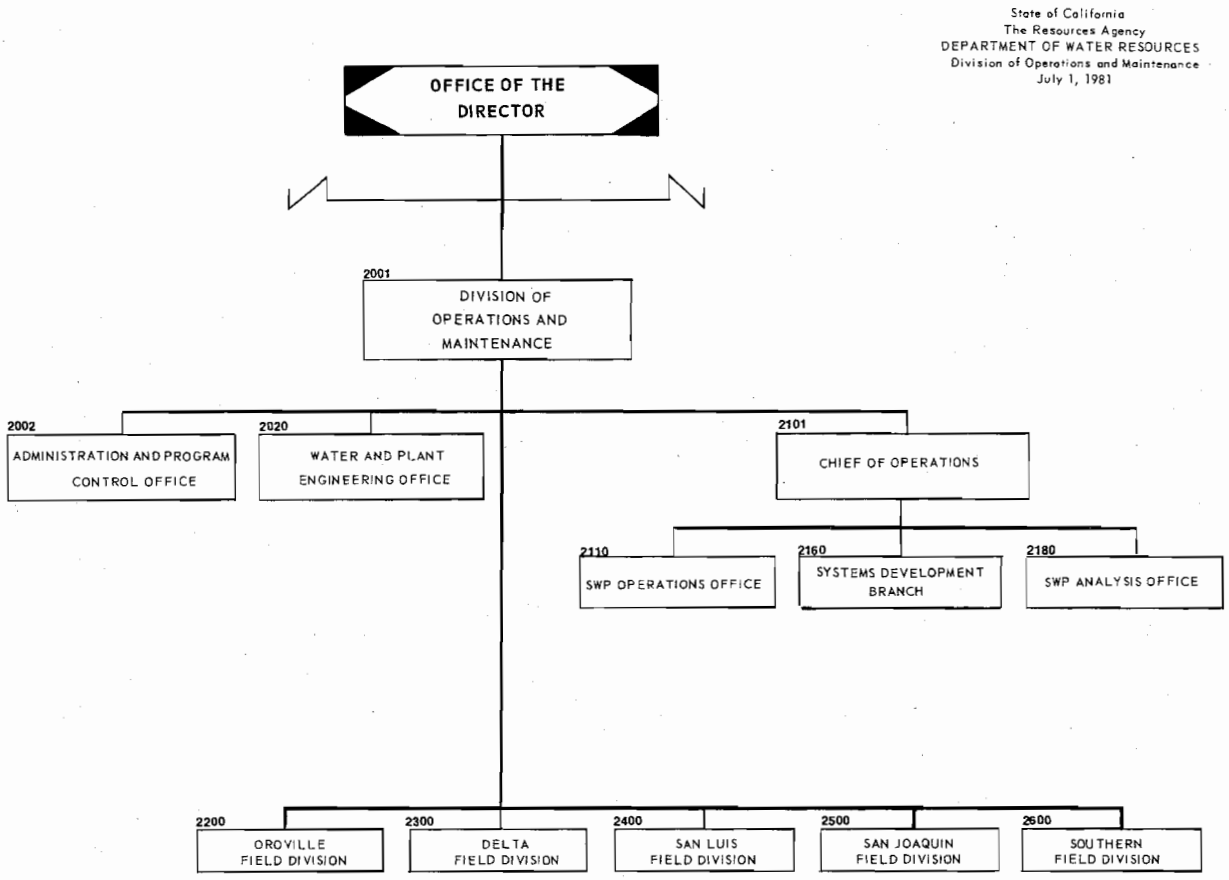
Board, and California Energy Commission requirements and future permits by regulatory agencies.

(2) In addition to (1), staff augmentations were made for the Systems Development Branch, (four positions, for assisting in the development of computer models needed for scheduling and planning future operations), the Operations Control Branch (four positions, for an additional dispatcher and three for accomplishing increased records and reporting requirements), and the State Water Project Analysis Office (two positions, required to meet scheduled commitments on a timely basis).

Lawrence A. Mullnix, Chief of Operations

Figure 25

DIVISION OF OPERATIONS AND MAINTENANCE ORGANIZATION CHART



Within the Control Systems Branch of the Division of O&M, but outside of the Chief of Operations organization, the former Chief of the Control Systems Engineering Section was transferred to a new special position to permit fulltime overview of new computer software development for the SWP Control System.

Early in 1982, the consulting firm of R. W. Beck and Associates was retained by the department to review its plans for 1983 power system operation. In its report, dated May 1982, the firm submitted its conclusions and recommendations resulting from an overview in the areas of (1) area control requirements, (2) transmission system and reliability considerations, (3) area control hardware, (4) software development, and (5) personnel requirements. The Department's staff is reviewing specific areas of the report with the consultant prior to implementation of their recommendations.

Other Services

In 1981, the Department provided emergency service to PGandE during June by reducing the pumping load at the SWP pumping plants and during August by increasing the generation at San Luis Powerplant. PGandE paid $53,076 for this service.

The Department also agreed not to schedule power on its uncommitted 150 MW of EHV line capacity in order to allow PGandE the use of this capacity. PGandE paid $83,750 for this service during July and August.

Recreation and Fish and Wildlife Activities

Over 6 million people used SWP recreation facilities during 1981. This was a 5 percent increase over use in 1980. This use included camping, boating, swimming, fishing (lake or aqueduct), bicycling, and other recreational activities. In addition, over 508,000 visitor-days of use occurred at SWP visitor centers. This was a 17-percent increase from the 434,000 people who visited the facilities in 1980.

Figure 26 shows the location of fishing sites, recreation developments and the bikeway on the California Aqueduct at the end of 1981.

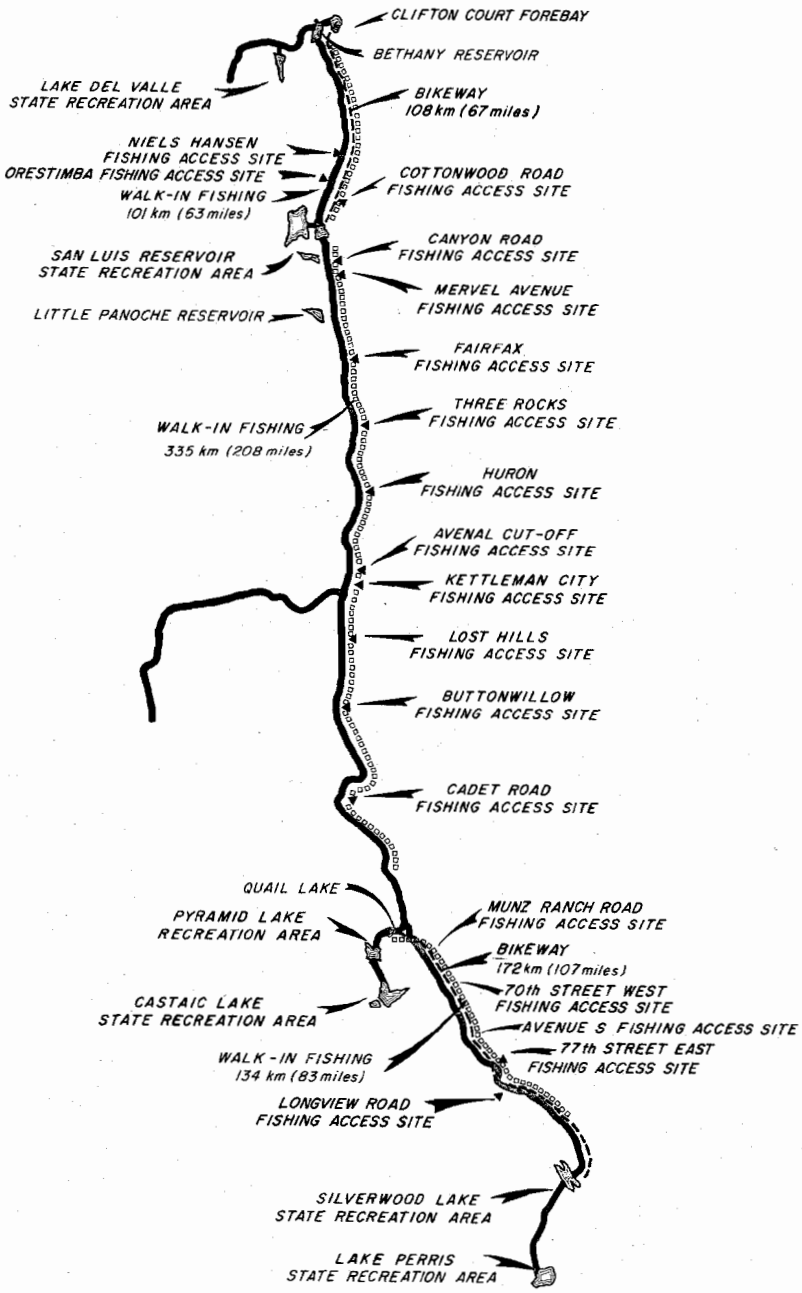
Use of recreation facilities in recreation days during 1980 and 1981 is shown in Table 22.

California Aqueduct Bikeway

Approximately 2,600 cyclists used the Aqueduct Bikeway in 1981: 400 along the aqueduct from Bethany Reservoir to O'Neill Forebay, and 2,200 in the Antelope Valley area. The total use of the bikeway decreased about 9 percent from 1980. On March 15, 1981, the United States Cycling Federation, under its Olympic Development Project, sanctioned bicycle races along the bikeway in Southern California. The race was held to select the nation's top men and women amateur racers for the 1984 Olympics in Los Angeles. The men's race covered 109 km (68 miles) with 65 riders participating. The women's race covered 55 km (34 miles) with 25 participants.

These races were part of the ceremony marking the opening of the Platt Ranch section of the bikeway, and the completion of the Southern California section of the bikeway, providing 172 km (107 miles) of uninterrupted bikeway. The total length of the bikeway along the Aqueduct is now 280 km (174 miles).

Figure 26: AQUEDUCT RECREATION DEVELOPMENTS



Recreation at SWP Field Divisions

Following are details of recreation and fish and wildlife activity within each field division. In addition **Table 23** shows the fish planted at SWP Facilities in 1981 by the Department of Fish and Game.

Grizzly Creek Fishing Access Project. Big Grizzly Creek is situated in eastern Plumas County, generally north of Portola. Its source is in the mountains 16 kilometres (10 miles) north of Blairsden. Prior to the construction of the Grizzly Valley Dam and Lake Davis the stream flow was not continuous throughout the year. Since the completion of Lake Davis in 1966, the outflow from the lake has been regulated to create a year-round stream which traverses from the dam to the Creek's confluence with the middle fork of the Feather River about 3.2 kilometres (two miles) east of Portola.

The Department is in the process of purchasing a narrow strip of land in and along the east side of Big Grizzly Creek for public fishing access. The Grizzly Creek Project will enable the public to enjoy the stream year-round. Besides providing public access, the project would accord riparian control of several kilometres of an excellent fishing stream, regularly stocked by the Department of Fish and Game.

The portion of Big Grizzly Creek involved in the Project is a stretch of land approximately four kilometres (two and one-half miles) long beginning at a point 0.8 kilometres (half-mile) below Lake Davis. The stretch of land ranges from approximately 35 metres (114 feet) to 183 metres (600 feet) in width, measured from the centerline of the Creek. The acquisition involves five ownerships totaling 37.44 hectares (92.5 acres). (See Figure 27 for vicinity map.)

The project is funded 50 percent by the State Water Project and 50 percent by

TABLE 22: RECREATION USE AT SWP FACILITIES IN 1980 AND 1981

Facility	Recreation Use in Recreation Days		Facility	Recreation Use in Recreation Days	
	1981	1980		1981	1980
Oroville Field Division			**San Luis Field Division (Cont'd)**		
Frenchman Lake	179,900	187,700	California Aqueduct		
Antelope Lake	212,400	223,100	Walk-in fishing	17,100	12,600
Lake Davis	287,800	287,700	**TOTAL**	**650,800**	**732,600**
Lake Oroville Complex	800,000	810,900			
TOTAL	**1,480,100**	**1,509,400**	**San Joaquin Field Division**		
			Lost Hills F.A.S.*	2,100	900
Delta Field Division			Buttonwillow F.A.S.*	2,300	800
Lake Del Valle	326,500	328,400	Cadet Road F.A.S.*	800	300
Bethany Reservoir	30,400	39,000	Kettleman City F.A.S.*	2,000	700
Cottonwood Road F.A.S. *	600	800	California Aqueduct		
Niels Hansen F.A.S.*	600	800	Walk-in fishing	16,500	16,100
Orestimba F.A.S.*	900	1,100	**TOTAL**	**23,700**	**18,800**
California Aqueduct					
Walk-in fishing	14,000	21,200	**Southern Field Division**		
California Aqueduct			Castaic Lake	1,266,800	1,053,500
Bikeway	400	500	Silverwood Lake	590,300	570,200
White Slough Wildlife Area	8,000	–	Pyramid Lake	149,900	232,700
TOTAL	**381,400**	**391,800**	Lake Perris	1,467,300	1,186,000
			77th Street, East F.A.S.*	300	300
San Luis Field Division			Longview Road F.A.S.*	1,600	1,500
San Luis Reservoir			California Aqueduct		
O'Neill Forebay, and			Walk-in fishing	3,400	2,700
Los Banos Reservoir	625,000	715,200	California Aqueduct		
Canyon Road F.A.S.*	1,300	1,000	Bikeway	2,200	2,400
Mervel Avenue, F.A.S.*	900	700			
Fairfax F.A.S.*	2,000	1,000	**TOTAL**	**3,481,800**	**3,049,300**
Three Rocks F.A.S.*	1,300	600			
Huron F.A.S.*	1,600	700			
Avenal Cutoff F.A.S.*	1,600	800	**GRAND TOTAL, SWP**	**6,017,800**	**5,701,900**

Fishing Access Site

TABLE 23: FISH PLANTED BY DEPARTMENT OF FISH AND GAME SWP FACILITIES DURING 1981

Facility	Species				Total
	Trout	Striped Bass	Steelhead	Channel Catfish	
Frenchman Lake	224,400				224,400
Antelope Lake	203,600				203,600
Lake Davis	388,800				388,800
Lake Oroville	85,400				85,400
Thermalito Forebay	38,300				38,300
Feather River			497,900		497,900
Thermalito Afterbay		2,500			2,500
Lake Del Valle	52,830				52,830
California Aqueduct				17,600	17,600
Castaic Lake	213,900			10,080	223,980
Castaic Lagoon	17,025				17,025
Pyramid Lake	159,600			8,000	167,600
Lake Perris	172,360			10,200	182,560
Silverwood Lake	238,720			6,020	244,740
TOTAL	**1,794,935**	**2,500**	**497,900**	**51,900**	**2,347,235**

the Federal Land and Water Conservation Fund. The Department will operate the Project and develop modest improvements such as roadways, parking areas, and trash facilities. Three small easements, totaling 0.44 hectares (1.09 acres), have been purchased for $15,400. Another parcel, 0.77 hectares (1.91 acres), has been purchased for $2,900. The last and largest parcel 30.58 hectares (75.57 acres) is being purchased for $392,000 and includes a 5.65 hectare (13.95 acre) road easement.

Oroville Field Division. Visitors to the Oroville Wildlife area participated in the following activities:

Activity	Recreation Days
Fishing	68,264
Hunting	5,940
Camping and Picnics	14,215
Sightseeing	3,603
All Other Activities	45,688
Group Activities	1,034
Total	138,744

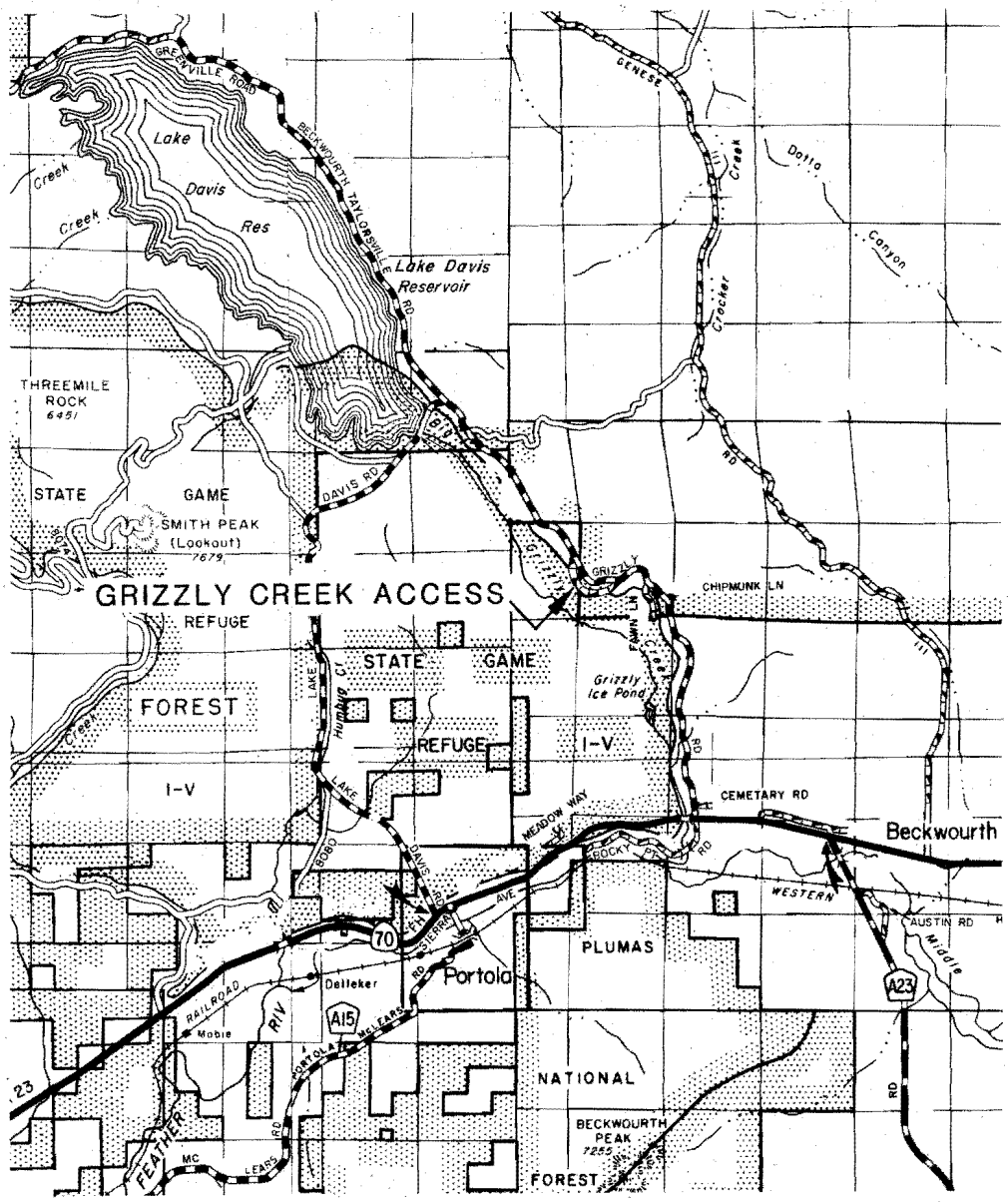


Figure 27: GRIZZLY CREEK ACCESS VICINITY MAP

In 1981, the Department of Fish and Game enhanced the Oroville Wildlife Area with the following improvements:

- The public target shooting area was upgraded with grading, backstop construction, and shaping.
- 294 tree and shrub seedlings were planted and maintained.
- 4 hectares (10 acres) were seeded with ground cover.
- An enclosed restroom was constructed in the shop building.
- Levee subsidence was repaired.
- Mosquito abatement ponds were deepened.
- 55 wildlife nest boxes were replaced.
- 553 metres (1,815 feet) of drainage ditch were enlarged.
- 400 male pheasants were planted during pheasant hunting season.

The Feather River Fish Hatchery had a very successful year, producing a total of 13,116,500 king salmon and 497,900 steelhead.

The Thermalito Afterbay area was open to fishing and hunting and received about 5,500 angler-days and 400 hunter-days of use in 1981. Along with the planting of 2,500 yearling striped bass, the area was further enhanced by the placing of 150 male pheasants during the pheasant season.

At Lake Davis in northern California an additional two-lane boat ramp was opened at Camp 5.

Delta Field Division. Clifton Court Forebay was open to waterfowl hunters with boats on Wednesdays and weekends during the waterfowl season. This hunting program is conducted by the Department of Fish and Game. The 1981-82 season included 413 hunter-days and approximately 5,500 angler-days (estimated average of 15 anglers a day).

White Slough Wildlife Area is the name given by the Fish and Game Commission to the five southernmost Interstate (I-5) borrow ponds and adjacent State-owned land in San Joaquin County. The area was opened to the public for fishing and hunting on September 30, 1980. In June 1981, this area was extended to include two additional ponds located immediately north of State Highway 12 (Ponds 7 and 8). This extension was largely due to the area's success as a recreational area and as an excellent wildlife habitat. The majority of users are from the Stockton-Lodi area, which has few areas open to the general public offering such enjoyable recreational opportunities. In addition to the public use, the land areas adjacent to the ponds provide excellent wildlife habitat because they are bounded on all sides by farm land, which furnishes wildlife cover and food.

Through December 1981, this area has supported more than 7,500 user-days involving fishing, hunting, nature walks and bird watching. Development of the borrow ponds has been funded by the Wildlife Conservation Board. While the Department is responsible for monitoring and maintenance, game warden service is provided by the Department of Fish and Game. Facilities at the wildlife area include a paved access road and parking area, portable chemical toilets, a fishing platform and parking facilities for the handicapped. Although no boat ramp is provided, a moderately sloped shoreline allows launching of car-top boats or other flotation devices in the four southernmost ponds. The Department of Fish and Game has planted large mouth bass, sunfish, bluegill and channel catfish as well as 250 pheasants.

Lake Del Valle in Alameda County was stocked with 52,830 catchable rainbow trout in 1981.

Orestimba Creek in Stanislaus County is the site of a proposed recreation and wildlife enhancement project. Under the Department's proposal, wildlife habitat and public access facilities along Orestimba Creek will be developed between the California Aqueduct and the Delta-Mendota Canal. The Department has completed a draft environmental impact report and the development plan on the project.

San Luis Field Division. Continued use was made of the existing fishing access sites.

San Joaquin Field Division. During October 1981 the Department's project to remove asbestos laden silt from a 163 km (140-mile) stretch of the California Aqueduct was in full operation. The operation is not without adverse impact on the wildlife habitat.

The dredged material is being disposed of in several miles of trenches excavated along the State-owned right-of-way. Many more miles of trenches will be necessary for disposal of the dredgings. The area utilized for trenches has been the sole source of wildlife habitat along the aqueduct. The EIR prepared by the Department recognizes the adverse impact on wildlife and has provided a program for re-establishing the habitat, mainly through planting of drought-resistant shrubs (atriplex).

Southern Field Division. At Castaic Lake construction of new onshore recreation and boating facilities is underway.

- Construction began on June 29, 1981 at Sharons Rest and Lauras Landing. Facilities will include 70 family campsites at each area, 45 picnic sites at Lauras Landing, and comfort stations at both areas. Both projects are funded by the Department of Boating and Waterways at a total cost of about $1,327,000.

- Also on June 29, 1981, construction began on the Main Reservoir Development - Phase I at the Castaic Ridge area and Baal Point. Facilities at Castaic Ridge will include the marine patrol headquarters with boatdocks and fueling facilities. Facilities at Baal Point will include 78 picnic sites, 95 parking sites, two comfort stations and a fish cleaning shelter. The total cost of this project is about $2,000,000.

- Construction is scheduled for the Vista Ridge area. A multi-use facility with 60 sites for either day-use or camping, and comfort stations are planned for the Vista Ridge development. Total cost of this development will be about $1,300,000.

At Silverwood Lake additional areas were opened for fishing and day-use near the dam. Construction of 41 new camp sites was completed in the Lower Mesa area of the lake, making a total of 146 campsites in this area. Six bicycle campsites were also added.

Lake Perris provided hunting opportunities for both upland game and waterfowl during the 1981-82 waterfowl season. Approximately 50 upland game hunters and 310 waterfowl hunters used the hunting area in the 1981-82 seasons. Hunters harvested 245 waterfowl during the 1981-82 season.

Perris Visitors Center. The Visitors Center at Perris Reservoir has been closed since 1979 due to minimal use. Recently, the Department reached a preliminary agreement to sell the Center to the State Department of Parks and Recreation for use as an Indian History Center.

Southern California Wildlife Preservation

San Jacinto Valley. SWP facilities in Southern California have impacted a

number of different vegetation and habitat types, affecting a great variety of wildlife. Bulletin 132-80 reported (page 144) on the October 23, 1979 agreement to mitigate wildlife damage. To summarize here, it was agreed that 1 227 hectares (3,033 acres) of SWP lands at several designated locations and 1 038 hectares (2,565 acres) of MWD lands at Lake Mathews would be made available to the Department of Fish and Game for Wildlife management. The Department plans to begin transfer of the lands to Department of Fish and Game in late 1982. In addition, $7 million of SWP funds and $1 million of other funds were provided to the Department of Fish and Game for use in conducting mitigation programs.

The Department of Fish and Game, assisted by staff of the Wildlife Conservation Board, has advanced plans for acquisition and development of a wildlife management area in the San Jacinto Valley northeast of Lake Perris. The Department of Fish and Game has initiated action to implement the agreement to mitigate damage to wildlife caused by construction and operation of the SWP in Southern California.

The Department of Fish and Game is giving initial emphasis to the acquisition and development of a wildlife management area in the San Jacinto Valley. A primary objective of the wildlife mitigation agreement is to replace habitats that would support diverse wildlife populations. Consistent with this objective, the proposal for the San Jacinto area includes the development of wetland areas, riparian and woodland zones, and a fishing and wildlife lake. The annual cultivation of food crops for wildlife will also be included in the management of the area to provide maximum wildlife benefits.

Starting with the 263-hectare (650-acre) borrow area for Perris Dam, the Department of Fish and Game has begun to acquire a sizable area for wildlife management in the San Jacinto Valley. Assisted by the staff of the Wildlife Conservation Board, the Department of Fish and Game has acquired several large parcels in the area. Figure 28 shows the proposed wildlife areas. The boundary shown is tentative, since the acquisition program is not yet complete. It is possible that some lands within the exterior boundary of the wildlife area will remain in private ownership.

The Department of Fish and Game has prepared a plan for development and use of the San Jacinto Wildlife area and has recently completed a negative declaration on the proposal. The site layout design that is being formulated takes advantage of the fact that the wildlife area will be located adjacent to the eastern boundary of the Lake Perris State Recreation Area. It will augment the existing recreation facilities of Lake Perris. Proposed public uses of the wildlife area include hunting, fishing, camping, hiking, nature study, photography and field trails. Facilities to accommodate these uses will consist of access roads and parking areas, trails, campgrounds, a wildlife viewing station, restrooms, domestic water and electricity, and a check station. Facilities to aid wildlife viewing by the handicapped will also be provided. Much of the wetlands habitat area will require construction of a low perimeter levee system. This system will also be used as a public access way for visitor use of the wetlands area.

Although the San Jacinto project has received initial high priority, the Department of Fish and Game is also considering wildlife management alternatives at other lands made available under the mitigation agreement. Plans for use of the lands adjoining Lake Mathews assigned to wildlife mitigation are being coordinated with MWD and with the Department of Parks and Recreation. The Department of Fish and Game has tentatively decided to designate the mitigation lands at Lake Mathews as an ecological reserve to facilitate management objectives.

WILDLIFE MITIGATION LAND AT SAN JACINTO BORROW SITE

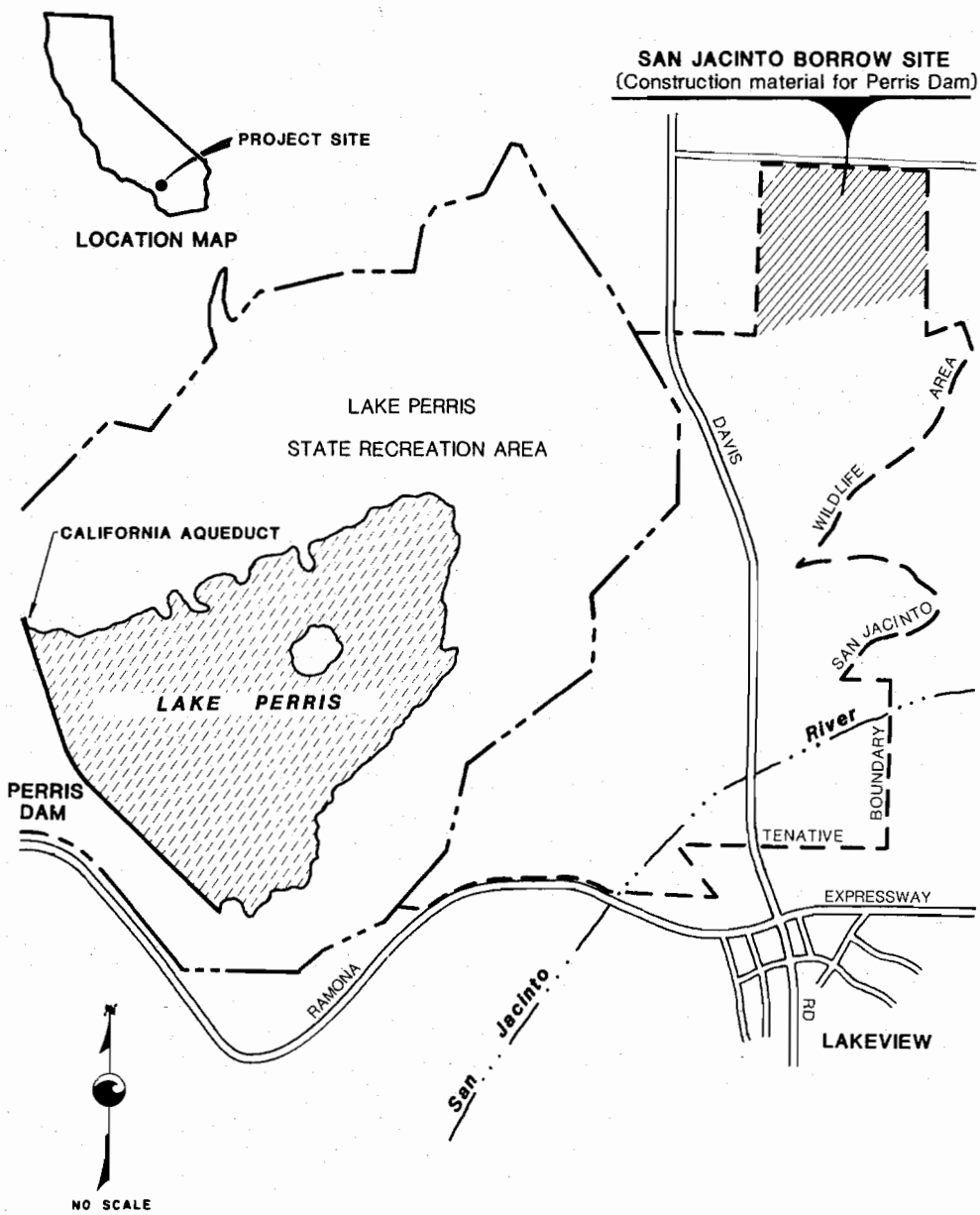


Figure 28

Forest Lands in Southern California. The Department has signed an agreement with the U. S. Forest Service to mitigate SWP damage to Forest Service lands in Southern California. The agreement, dated November 1, 1979, provides that the Department will purchase and transfer to the Forest Service approximately 607 hectares (1,500 acres) of land to be used for wildlife mitigation. The Department will also provide funds to the Forest Service for development of wildlife habitat. As of June 30, 1982, $389,600 and title to some 541 hectares (1,337 acres) has been transferred to the Forest Service. The Department plans to complete the transfer of lands in the fall of 1982.

CHAPTER VIII

FUTURE CONSTRUCTION COSTS, OPERATING COSTS AND PROJECT FINANCING

The defeat of Proposition 9 and rejection of Sb 200 at the June 1982 election has resulted in a substantial reduction in the scope of the Department's plans for future development of the SWP. The financial analysis shown in Table 24 and Table 25 reflects this reduction in future development and presents the SWP financial plans under "status quo" conditions as of June 30, 1982.

Total Capital Requirements are now shown to be $4.6 billion through 1990. This compares with the $7.4 billion through 1990 shown in Bulletin 132-81. Since most planned future development will be completed by 1990, Table 24 -- Project Financial Analysis -- shows annual expenditures and revenues to that year only.

The reduction is mainly due to elimination of costs from the financial plan for:

- Peripheral Canal Facilities
- Thomes-Newville Facilities
- Los Vaqueros Facilities
- Reduction in scope of the ground water storage program
- Buttes Reservoir (construction is uncertain)
- Coastal Aqueduct - Phase II Facilities (construction of these facilities is uncertain due to local opposition)

Major SWP facilities planned for completion are:

- North Bay Aqueduct - Phase II
- Suisun Marsh Facilities
- Final Four units at Harvey O. Banks Delta Pumping Plant
- San Luis Canal Enlargement
- Final three units at A. D. Edmonston Pumping Plant
- William E. Warne Powerplant and Peace Valley Pipeline
- Enlargement of the California Aqueduct (Mojave Division)
- Ground Water storage program
- Small Hydroelectric and off-Aqueduct Power Generation Facilities sufficient to secure an economical and reliable power supply to meet SWP energy needs.
- Cottonwood Creek Project assumed in this analysis to be constructed by the USCE and that the Department will purchase storage space in Cottonwood Reservoir pursuant to the federal Water Supply Act of 1958. (The USCE continues to plan on this basis.)

The analysis demonstrates that adequate revenues are available to pay annual costs of operations and maintenance, and to meet all repayment obligations on funds used to finance project construction and other authorized costs. Prior to January 1, 1982, about $2.9 billion had been expended by the Department for SWP facilities, of which $2.6 billion has been disbursed for construction expenditures, and $0.3 billion for other capital requirements. These expenditures include the costs of planning, design, financing, relocations, land acquisition, and operations during the construction period of each facility.

The Department's current assumptions indicate that capital requirements through 1990 for power and water facilities, the Davis-Grunsky Program, and special requirements for revenue bond financing will be about $4.35 billion at prices prevailing on January 1, 1982. Future escalation of costs will add another $0.25 billion for a total of $4.6 billion. This represents a decrease of $2.8 billion from the $7.4 billion shown in Bulletin 132-82.

Changes in costs from those presented in last year's bulletin (except for an additional year of price increases that occurred during 1981) are discussed in the descriptions for individual line items later in this chapter.

The current financial analysis of the State Water Project is shown in Table 24 in two parts. Actual and projected capital expenditures and sources of financing are shown in Part 1. Actual and anticipated revenues and their applica-

TABLE 24: PROJECT FINANCIAL

PART 1

LINE NO.	LINE ITEM	CALENDAR YEARS 1952 1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL 1952-1990	TOTAL 1991-2035
	PROJECT CONSTRUCTION EXPENDITURES												
1.	Initial Project Facilities	2,180,126	0	0	0	0	0	0	0	0	0	2,180,126	0
2.	Abbey Bridge and Dixie Refuge Dams and Reservoirs	761	0	0	0	0	0	0	0	0	0	761	0
3.	Phase II North Bay Aqueduct	3,808	3,225	5,276	23,826	24,626	927	202	58	34	10	61,992	0
4.	Delta Facilities and Suisun Marsh Facilities	78,010	1,636	21,228	38,553	417	91	0	0	0	0	139,935	0
	California Aqueduct:												
5.	Final Four Units at Harvey O. Banks Delta Pumping Plant	956	378	952	2,977	7,320	13,165	10,296	2,519	0	0	38,563	0
6.	San Luis Canal Enlargement	3,459	14,100	3,966	850	870	9,275	18,650	20,000	14,400	3,790	89,360	0
7.	Final Three Units at A.D. Edmonston Pumping Plant	9,608	8,131	12,686	4,456	47	0	0	0	0	0	34,928	0
8.	Staged Units and Pipelines South of A.D. Edmonston	19,735	5,030	5,674	150	2,595	4,100	960	0	0	0	38,244	0
9.	Final Three Units at Las Perillas and Badger Hill	891	0	0	0	0	0	0	0	0	254	1,145	0
10.	William E. Warne Power Plant and Peace Valley Pipeline	101,068	20,776	3,134	73	0	0	0	0	0	0	125,051	0
11.	Enlargement of California Aqueduct, Mojave Division	0	800	7,300	60,900	75,700	62,100	35,300	30,200	20,900	6,800	300,000	0
12.	General Costs	86,417	25,194	9,469	6,281	3,980	763	685	467	142	171	133,569	146
13.	SUBTOTAL, California Aqueduct	222,134	74,409	43,181	75,687	90,512	89,403	65,891	53,186	35,442	11,015	760,860	146
14.	Miscellaneous Project Costs	16,736	2,107	13,739	7,650	3,956	2,613	1,691	1,512	1,524	1,303	52,831	9,315
15.	Additional Conservation Facilities	8,492	0	0	12,990	11,075	22,790	26,947	8,796	10,061	15,293	116,444	127,155
16.	Small Hydroelectric Power Generating Facilities	7,928	19,346	41,358	40,576	12,626	175	0	0	0	0	122,009	0
17.	Power Generating Facilities	112,810	129,326	68,275	51,223	26,470	1,471	20	0	0	0	389,595	0
18.	San Joaquin Drainage Facilities	9,984	4,766	3,758	4,058	1,486	159	158	159	158	159	24,845	1,585
19.	SUBTOTAL, PROJECT CONSTRUCTION EXPENDITURES	2,640,789	234,815	196,815	254,563	171,168	117,629	94,909	63,711	47,219	27,780	3,849,398	138,201
20.	Cost Escalation Allowance	0	2,039	10,857	36,610	42,732	47,242	43,798	32,407	26,162	8,027	249,874	34,552
21.	TOTAL PROJECT CONSTRUCTION EXPENDITURES	2,640,789	236,854	207,672	291,173	213,900	164,871	138,707	96,118	73,381	35,807	4,099,272	172,753
	OTHER CAPITAL REQUIREMENTS												
22.	Davis-Grunsky Act Program	110,373	5,203	5,203	9,221	0	0	0	0	0	0	130,000	0
23.	Additional Conservation Facilities-Storage Payments	0	0	0	0	0	0	0	0	0	0	0	3,612,150
24.	Special Capital Requirements Under Revenue Bond Financing	102,992	98,492	87,106	0	42,496	0	28,331	0	0	0	359,417	0
25.	TOTAL OTHER CAPITAL REQUIREMENTS	213,365	103,695	92,309	9,221	42,496	0	28,331	0	0	0	489,417	3,612,150
26.	TOTAL CAPITAL REQUIREMENTS	2,854,154	340,549	299,981	300,394	256,396	164,871	167,038	96,118	73,381	35,807	4,588,689	3,784,903
27.	APPLICATION OF CALIFORNIA WATER FUND MONEYS	429,940	18,762	29,292	162,990	80,012	76,632	74,120	69,366	68,260	29,328	1,038,702	3,784,903
	APPLICATION OF PROCEEDS FROM SALE OF BONDS:												
28.	Oroville Revenue Bonds	244,995	0	0	0	0	0	0	0	0	0	244,995	0
29.	Devil Canyon-Castaic Revenue Bonds	139,100	65	0	0	0	0	0	0	0	0	139,165	0
30.	Pyramid Hydroelectric Power Revenue Bonds	87,987	5,855	1,958	0	0	0	0	0	0	0	95,800	0
31.	Reid Gardner Power Revenue Bonds	62,754	137,246	0	0	0	0	0	0	0	0	200,000	0
32.	Bottlerock-Alamo Power Revenue Bond Anticipation Notes	34,571	29,284	19,623	16,522	0	0	0	0	0	0	100,000	0
33.	Supplemental Power Revenue Bonds	0	125,028	209,715	75,750	23,949	40,558	0	0	0	0	475,000	0
34.	Supplemental Water Revenue Bonds	0	0	0	0	110,155	32,547	85,546	21,752	0	0	250,000	0
35.	Water Bonds, Davis-Grunsky Program	110,373	5,203	5,203	9,221	0	0	0	0	0	0	130,000	0
36.	Water Bonds, Additional Conservation Facilities	8,491	0	0	0	0	0	0	0	0	0	8,491	0
37.	Water Bonds, Initial Project Facilities	1,443,758	0	0	0	0	0	0	0	0	0	1,443,758	0
38.	TOTAL, Application of Proceeds from Sale of Bonds	2,132,029	302,681	236,499	101,493	134,104	73,105	85,546	21,752	0	0	3,087,209	0
39.	APPLICATION OF MISCELLANEOUS RECEIPTS TO CONSTRUCTION	292,185	19,106	34,190	35,911	42,280	15,134	7,372	5,000	5,121	6,479	462,778	0
40.	TOTAL FINANCING OF CAPITAL REQUIREMENTS	2,854,154	340,549	299,981	300,394	256,396	164,871	167,038	96,118	73,381	35,807	4,588,689	3,784,903

ANALYSIS, JUNE 30, 1982

PART 2

LINE NO.	LINE ITEM	1952 1981	CALENDAR YEARS 1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL 1952-1990	TOTAL 1991-2035
	MISCELLANEOUS RECEIPTS												
41.	Federal Payments for Project Capital Expenditures	77,045	0	0	0	0	0	0	0	0	0	77,045	0
42.	Appropriations for Capital Costs Allocated to Recreation and Fish and Wildlife Enhancement	80,000	0	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	120,000	225,000
43.	Appropriations for Project Capital Expenditures	181,654	0	0	0	0	0	0	0	0	0	181,654	0
44.	City of Los Angeles Payments for Castaic Power Development	36,502	0	0	0	0	0	0	0	0	0	36,502	0
45.	Water Contractor Advances for Construction of Requested Works	83,838	71	111	24	26	17	0	0	0	0	84,087	0
46.	Investment Earnings on Unexpended Miscellaneous Receipts	111,146	12,544	31,619	15,186	12,254	10,037	2,372	73	121	1,479	196,831	0
47.	TOTAL MISCELLANEOUS RECEIPTS	570,185	12,615	36,730	20,210	17,280	15,054	7,372	5,073	5,121	6,479	696,119	225,000
	PROJECT OPERATING REVENUES												
48.	Payments under Oroville Power Sale Contract	206,337	16,150	29,909	16,927	16,927	16,927	16,927	16,927	16,927	16,927	370,885	761,715
49.	Payments under Devil Canyon-Castaic Contract	73,315	8,030	7,898	10,539	10,530	10,522	10,514	10,508	10,496	10,490	162,842	339,291
50.	Payments under Long Term Water Supply Contracts	1,263,623	182,947	272,015	294,109	371,357	404,382	405,170	423,861	454,355	480,823	4,552,642	31,711,059
51.	Federal Payments for Project Operating Costs	25,238	8,073	7,077	7,331	5,129	4,817	4,813	4,809	4,811	4,805	76,903	438,167
52.	Appropriations for Operating Costs Allocated to Recreation	16,657	2,470	3,704	4,688	4,830	4,242	4,116	4,030	4,840	5,201	54,778	321,564
53.	Payments under Davis-Grunsky Loan Repayment Contracts	5,007	1,684	1,694	1,879	1,902	1,962	1,984	1,960	2,012	1,977	22,061	53,279
54.	Miscellaneous Revenues	247,479	94,387	101,785	8,564	49,112	7,366	34,954	6,972	6,889	6,882	564,390	310,978
55.	TOTAL PROJECT OPERATING REVENUES	1,837,656	313,741	424,082	344,037	459,787	450,218	478,478	469,067	500,330	527,105	5,804,501	33,936,053
56.	TOTAL MISCELLANEOUS RECEIPTS & PROJECT OPERATING REVENUES	2,407,841	326,356	460,812	364,247	477,067	465,272	485,850	474,140	505,451	533,584	6,500,620	34,161,053
57.	CARRYOVER (+) AND APPLICATION (-) OF RECEIPTS AND REVENUES HELD TEMPORARILY IN RESERVE	150,150	14,386	-97,305	-26,848	-24,758	65	1,072	15,281	49,668	2,712	84,423	-84,423
58.	PROJECT OPERATING COSTS	521,937	86,259	156,292	189,462	197,299	195,200	186,758	194,357	216,764	224,348	2,168,676	19,078,234
59.	DEPOSITS TO SPECIAL RESERVES UNDER REVENUE BOND FINANCING	113,552	79,884	50,847	-100,050	-14,972	-22,087	9,671	-20,157	-7,403	-7,400	81,885	-81,885
	PAYMENTS OF BOND SERVICE												
	Bonds Sold Through July 7, 1982												
60.	Interest Payments	1,211,222	101,355	116,166	114,906	113,532	111,943	110,257	108,481	106,648	104,764	2,199,274	1,710,926
61.	Principal Repayments	118,795	21,380	23,665	25,745	27,960	29,565	31,590	33,255	35,045	36,800	383,800	1,866,160
	ASSUMED FUTURE BOND SALES												
	Water Revenue and General Obligation Bonds												
62.	Interest Payments	0	0	1,348	1,348	14,098	14,098	22,598	22,598	22,598	22,537	121,223	521,563
63.	Principal Repayments	0	0	0	0	0	0	0	0	714	774	1,488	260,762
	Power Revenue Bonds												
64.	Interest Payments	0	3,986	37,619	68,761	68,761	68,573	68,174	67,694	67,170	66,296	517,034	1,069,549
65.	Principal Repayments	0	0	0	0	1,235	3,661	3,992	4,371	4,798	5,274	23,331	551,669
66.	TOTAL BOND INTEREST PAYMENTS	1,211,222	105,341	155,133	185,015	196,391	194,614	201,029	198,773	196,416	193,597	2,837,531	3,302,038
67.	TOTAL BOND PRINCIPAL REPAYMENTS	118,795	21,380	23,665	25,745	29,195	33,226	35,582	37,626	40,557	42,848	408,619	2,678,591
	REPAYMENT OF THE CALIFORNIA WATER FUND												
68.	Required for Construction	0	0	137,990	55,012	51,632	49,120	44,366	43,260	4,328	71,000	456,708	3,784,903
69.	Not Required for Construction	0	0	0	0	0	0	0	0	0	0	0	581,994
70.	APPLICATION OF MISCELLANEOUS RECEIPTS TO CONSTRUCTION	292,185	19,106	34,190	35,911	42,280	15,134	7,372	5,000	5,121	6,479	462,778	0
71.	SUBTOTAL, Repayment of Capital Financing	410,980	40,486	195,845	116,668	123,107	97,480	87,320	85,886	50,006	120,327	1,328,105	7,045,488
72.	RESERVATION FOR FUTURE CONSTRUCTION	0	0	0	0	0	0	0	0	0	0	0	4,901,601
73.	TOTAL APPLICATION OF MISCELLANEOUS RECEIPTS AND PROJECT OPERATING REVENUES	2,407,841	326,356	460,812	364,247	477,067	465,272	485,850	474,140	505,451	533,584	6,500,620	34,161,053

tion to (1) pay SWP operating expenses and principal and interest on bonds, and (2) repay the California Water Fund are shown in Part 2. Excluded from the cost estimates in the financial analysis are costs of project-associated works which, although essential for realizing full project benefits, are financed and constructed by local and State agencies other than the Department. These works include onshore recreation developments at SWP facilities and local distribution facilities.

In addition to paying their allocated share of SWP costs, many long-term water contractors must finance construction of local distribution facilities needed to transport SWP water deliveries to local water users. The Department currently estimates that the 30 long-term contractors will spend a total of $3.2 billion for such facilities. Total expenditures through 1981 are estimated at $1.2 billion. None of these costs are included in this analysis.

The Department's capital expenditures for the SWP also include requirements other than those for construction, such as:

- disbursements under the Davis-Grunsky Program (see Line 22);
- annual principal and interest payments for additional water conservation storage capacity (Cottonwood Creek Project) assumed to be constructed by the federal government; and
- special capital requirements under revenue bond financing (see Line 24).

The financial analysis is based on the following assumptions:

1. Pursuant to the provisions of Sections 12937 and 12938 of the Water Code, available contractor revenues will be transferred to the California Water Fund. The 1982 Budget Act contains language which appropriates, to the General Fund, $80 million if it should accrue to the California Water Fund. This analysis assumes that (a) no monies will be available for transfer to the California Water Fund prior to 1984, and (b) at that time all funds available will be required for SWP construction and should be transferred and expended for that purpose.

2. The Department will continue to pursue the sale of sufficient revenue bonds to meet all needs for supplemental financing. (Supplemental financing refers to funds required in excess of [a] those on hand including proceeds remaining from previously issued revenue bonds; [b] those anticipated pursuant to current agreements and legislative enactments; and [c] authorized water bonds.) The analysis indicates a total need from 1952 through 1990 for supplemental financing of $1.5 billion, which includes $1.1 billion for construction expenditures and $0.4 billion for the special capital requirements of revenue bond financing. The analysis also assumes no change in the present statutory provisions regarding appropriation of State tideland oil and gas revenues with the exception of 1982. In 1982, the legislature appropriated $14.7 million, instead of the $25 million authorized in the Public Resources Code.

Future conditions undoubtedly will cause changes in the financial analysis. For this reason, basic assumptions are reviewed and the financial analysis is updated periodically. Notable contingencies that could change the financial analysis are:

- deviation from the assumptions regarding SWP energy resources;
- deviation of actual rates of future construction price inflation from those currently assumed for cost estimates;
- rescheduling of currently planned construction for future facilities;

- development of alternative sources of water not foreseen at this time;
- extension of SWP facilities to serve Desert Water Agency, Coachella Valley County Water District, San Gorgonio Pass Water Agency, the Coastal Branch to serve San Luis Obispo County FC&WCD and Santa Barbara County FC&WCD and Buttes Reservoir for Antelope Valley-East Kern Water Agency;
- changes in contractors' entitlements due to changing needs;
- increases or decreases in planned water conservation and reclamation;
- inability of the Department to market sufficient revenue bonds;
- changes in the statutory limits on bond interest rates and discounts;
- adverse impacts on water contractors resulting from shortages due to insufficient supplies (see Chapter I, Tables 3, 4, 5, and 6); and
- the outcome of certain lawsuits now pending before the courts (see Chapter IX).

Project Construction Expenditures

Actual and projected construction expenditures for each division of the SWP are shown in Table 25, together with a preliminary allocation of such expenditures among SWP purposes. A generalized construction schedule for current and future contracts is shown in Figure 29.

Described in the following sections are the Department's current assumptions concerning the costs of each facility of the future construction program through 1990, as shown in Table 24. As to any project not yet constructed, a decision to proceed will be made only after examination of all alternatives and completion of a final environmental impact reporting and other review processes.

Lines 1 through 19 show costs based on prices and salaries prevailing on January 1, 1982. The portion of cost attributed to escalation is shown in Line 20.

Line 1: Initial Project Facilities.

Facilities included in the initial construction program are those that were completed before 1974 (see Chapter II, Bulletin 132-74). Additional costs after 1973 and estimated costs of remaining work on the initial SWP facilities are included in Lines 12 and 14, "California Aqueduct, General Costs" and "Miscellaneous Project Costs."

Line 2: Abbey Bridge and Dixie Refuge Dams and Reservoirs.

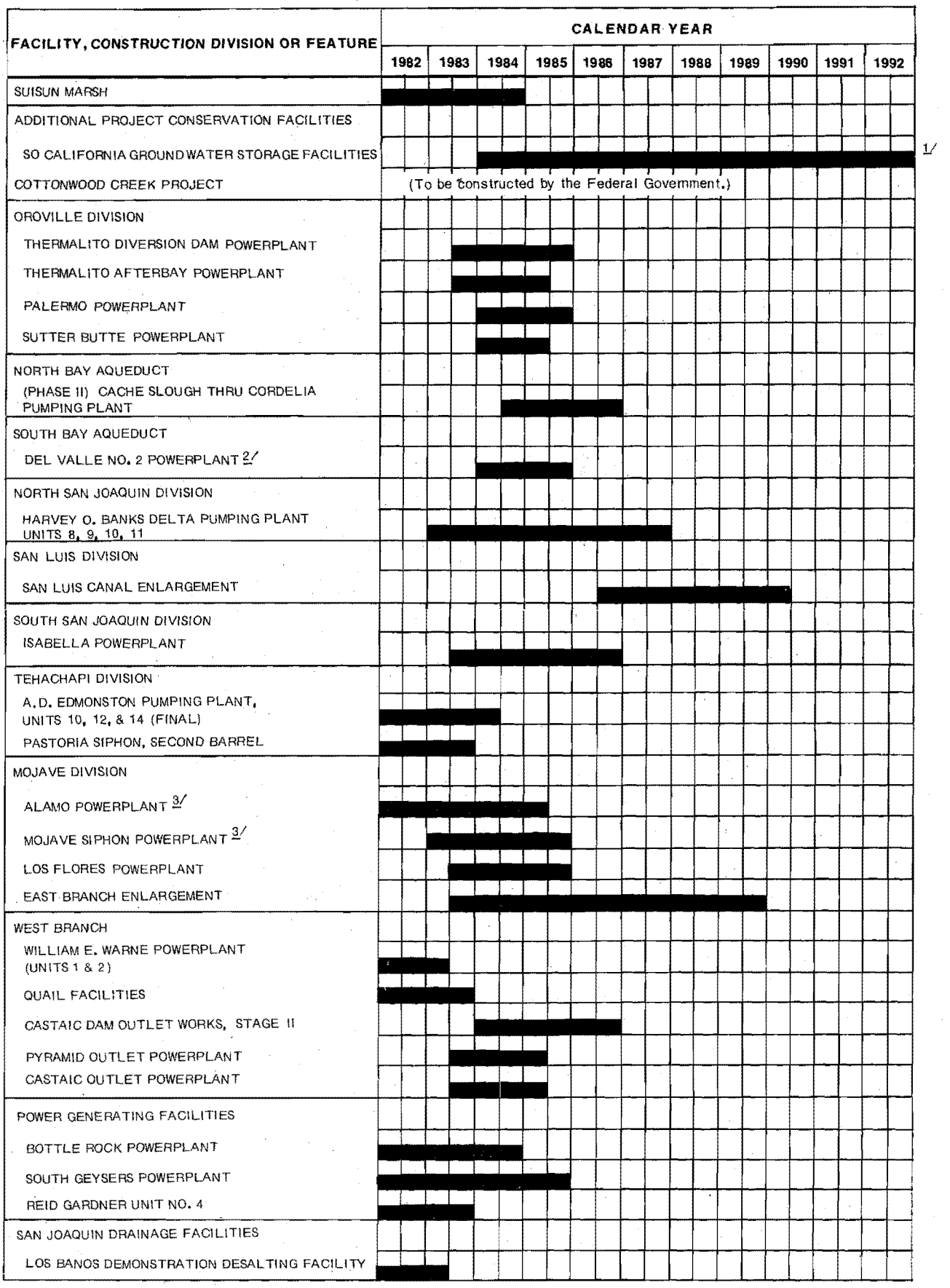
The Department continues to assume that Abbey Bridge and Dixie Refuge Dams and Reservoirs will be postponed indefinitely until there is local support and demonstrated need for these facilities.

Line 3: Phase II of the North Bay Aqueduct.

Phase II of the North Bay Aqueduct consists of pipelines and pumping plants and a small reservoir necessary to divert water from the Western Delta to Napa and Solano Counties for domestic and municipal use. The facilities begin in the Western Delta and extend approximately 45 kilometres (28 miles) to the terminus at Napa. The costs shown in this line include all costs for design, construction and rights-of-way at the facilities described in Chapter II.

The estimated costs differ from those shown in Bulletin 132-81, because of a change in alignment corresponding to the preferred alternative in the draft EIR which was completed after publication of Bulletin 132-81.

Figure 29: GENERALIZED CONSTRUCTION SCHEDULE



1/ Assumed to extend thru 2000.

2/ Del Valle No. 1 completed.

3/ Unit No. 2 to be constructed as part of East Branch Enlargement.

TABLE 25: PROJECT CAPITAL EXPENDITURES

(thousands of dollars)

FACILITIES AND CONSTRUCTION DIVISIONS	EXPENDITURES INCURRED THRU 1981	FUTURE EXPENDI-TURES	TOTAL	PRELIMINARY ALLOCATION AMONG PROJECT PURPOSES			
				Water Supply and Power Generation	Flood Control (a	Recreation and Fish and Wildlife Enhancement	Other (b
PROJECT CONSTRUCTION EXPENDITURE							
Upper Feather Division	14,975	2,618	17,593	1,454	0	16,139	0
Oroville Division	534,766	12,667	547,433	464,327	70,661	12,445	0
North Bay Aqueduct	6,358	67,435	73,793	73,793	0	0	0
Delta Facilities	78,010	69,186	147,196	127,524	0	19,424	248
South Bay Aqueduct	70,825	1,081	71,906	50,458	7,220	14,204	24
California Aqueduct:							
North San Joaquin Division	163,834	53,701	217,535	209,510	0	8,025	0
San Luis Division	179,117	122,107	301,224	285,370	0	15,644	210
South San Joaquin Division	267,665	2,206	269,871	254,564	0	15,307	0
Tehachapi Division	275,243	36,349	311,592	295,896	0	15,696	0
Mojave Division(c	225,342	440,741	666,083	647,322	0	18,761	0
Santa Ana Division	191,562	490	192,052	175,289	0	16,763	0
West Branch	468,623	45,562	514,185	481,384	0	32,393	408
Coastal Branch	16,368	1,275	17,643	17,538	0	0	105
SUBTOTAL, CALIFORNIA AQUEDUCT	1,787,754	702,431	2,490,185	2,366,873	0	122,589	723
Additional Conservation Facilities(a	0	3,890,640	3,890,640	3,890,640	0	0	0
Small Hydroelectric Power Generating Facilities	7,928	121,927	129,855	129,855	0	0	0
Off-Aqueduct Power Generating Facilities	112,810	287,422	400,232	400,232	0	0	0
San Joaquin Drainage Facilities	9,984	20,862	30,846	0	0	0	30,846
Planning and Preoperations(d	8,492	59,162	67,654	65,332	0	0	2,322
Unassigned	8,887	7,955	16,842	1,259	0	0	15,583
SUBTOTAL, PROJECT CONSTRUCTION EXPENDITURES	2,640,789	5,243,386	7,884,175	7,571,747	77,881	184,801	49,746
OTHER CAPITAL REQUIREMENTS							
Davis-Grunsky Act Program	110,373	19,627	130,000	0	0	0	130,000
TOTAL	2,751,162	5,263,013	8,014,175	7,571,747	77,881	184,801	179,746

a) Reflects Department's allocation to this purpose, irrespective of federal payments.
b) Includes costs currently unassigned to purpose, planning costs of deleted features of project facilities, initial costs of inventoried items, joint costs assigned to the Federal Government, and cost assigned to the Davis-Grunsky Act Program.
c) Includes expenditures for East Branch enlargement.
d) Includes planning and preoperation expenses allocated to conservation facilities.

Line 4: Delta Facilities and Suisun Marsh Facilities.

The history column (1952-1981) of line 4 includes costs for general Delta facilities and planning costs associated with the Peripheral Canal, Western Delta overland facilities, and Suisun Marsh facilities and, for Suisun Marsh, construction costs through 1981.

The columns for 1982-1990 show costs for the Suisun Marsh facilities only. These facilities are necessary to facilitate maintenance of brackish marsh lands in and on the north shores of Suisun, Honker, and Grizzly Bays, and are required under Condition 7(c) of SWRCB D-1485. The overall facilities will help mitigate the adverse effects of the SWP and CVP caused by reduced Delta outflow. The initial facilities provide water from Montezuma Slough in lieu of Suisun Bay water for many of the managed wetlands in southerly portions of the marsh.

The Suisun Marsh facilities under construction are essentially as proposed by the four agencies involved in the San Francisco Bay and Sacramento-San Joaquin estuary ecological study program. The four agencies involved are the California Departments of Water Resources and Fish and Game, the U. S. Fish and Wildlife Service, and the U. S. Bureau of Reclamation. It is expected that the Federal Government will contribute one-half the cost of these facilities.

Line 5: California Aqueduct, Final Four Units at Harvey O. Banks Delta Pumping Plant

Design for the final four units of the Harvey O. Banks Delta Pumping Plant began in 1974. The first two of the 30.2 cubic-metre-per-second (1,067-cubic-foot-per-second) units are scheduled to be operational in 1987 and the last two in 1988. The U. S. Corps of Engineers has agreed that a permit pursuant to Section 10 of the Rivers and Harbors Act will not be required for expansion of the pumping plant, provided that historical diversion rates are not exceeded.

Line 6: California Aqueduct, San Luis Canal Enlargement.

This enlargement is required to maintain and augment the present conveyance capability between Dos Amigos Pumping Plant and Kettleman City. The capacity of the San Luis Canal will be increased by 28.3 cubic metres per second (1000 cfs), with a scheduled operational date of 1990. Damage caused during the floods of 1978 indicate that additional flood protection facilities are also necessary. Subsidence correction work will be performed by U. S. the Bureau of Reclamation.

The costs included in Line 6 represent about $21.0 million (State share) for the subsidence work and about $68.4 million between 1981 and the operational date of 1990 for increased conveyance capacity.

Line 7: California Aqueduct, Final Three Units at A.D. Edmonston Pumping Plant.

The current schedule for these 8.9-cubic-metre-per-second (315-cubic-foot-per-second) units is for the first to be operational in 1983 and the two final units in 1984.

Line 8: California Aqueduct, Staged Units and Pipelines South of A. D. Edmonston Pumping Plant

Additional capacity will be installed as needed to convey increasing SWP water deliveries through this portion of the aqueduct. Included is the second barrel of Pastoria Siphon (to be completed in 1983) and Castaic Dam Outlet Works, Second Stage (to be completed in 1987).

Line 9: California Aqueduct, Final Three Units at Las Perillas and Badger Hill Pumping Plants.

These 3.2-cubic-metre-per-second (112-cubic-foot-per-second) units were installed by the Berrenda Mesa Water District in 1971, at the District's expense, under special agreement with the Department. Units No. 5 and the second discharge line at Badger Hill were purchased, at depreciated value, in January 1977. The Department purchased Units No. 4 at a depreciated value in 1981, and plans to purchase Unit No. 6 at a depreciated value in 1990 from Berrenda Mesa Water District.

Line 10: California Aqueduct, Peace Valley Pipeline and William E. Warne (Pyramid) Powerplant.

The first stage of the pipeline and power plant complex are scheduled to be operational in 1982. A portion of these costs allocable to power generation ($75.0 million) is being financed by the Pyramid Hydroelectric Project Revenue Bonds issued in November 1979. The Pyramid Hydroelectric Project consists of the portion of facilities allocable to power generation and transmission of electrical energy from the first stage of William E. Warne Powerplant. Included are Quail Lake, together with Lower Quail Canal and the first stage of the Peace Valley Pipeline. William E. Warne Powerplant is designed for eventual installation of four 37.5 MW generating units with a total capacity of 150 MW. The first stage of the powerplant encompasses two of the four units and is capable of producing about 600 million kilowatthours annually when water flows reach design capacity.

Line 11: Enlargement of the California Aqueduct, Mojave Division.

The purpose of the enlargement of the California Aqueduct between the Cottonwood Powerplant and Devil Canyon Powerplant Afterbay, exclusive of the San Bernardino Tunnel, is to provide enough capacity to transport increased amounts of entitlement water for The Metropolitan Water District of Southern California, for ground water storage in Southern California ground water basins, and for Colorado River banking. The analysis assumes the enlargement will be completed in 1990; however, the operation studies which determined projected energy requirements for this analysis do not reflect this potential enlargement.

Line 12: California Aqueduct, General Costs.

These expenditures cover such items as general design and construction costs, completion of operation and maintenance facilities, and other completion activities for the initial facilities of the California Aqueduct. Portions of these costs would be allocated to the aqueduct units described in the preceding paragraphs.

Line 13: Subtotal, California Aqueduct.

The total of Line 5 through 12.

Line 14: Miscellaneous Project Costs.

These expenditures cover such items as the completion of monitor and control systems and other completion activities for SWP facilities other than the California Aqueduct.

Line 15: Additional Conservation Facilities.

This history column (1952-1981) of line 15 include costs of planning studies for SWP future water supply programs.

The columns for 1982-1990 show costs for the ground water storage program only. This includes construction costs, capitalized use of facility charges, and initial fill costs.

Line 16: Small Hydroelectric Power Generating Facilities.

Expenditures included in Line 16 are for the costs of the small hydroelectric powerplants described in the "Long Range Energy Program" section in Chapter II.

Line 17: Power Generation and Transmission Facilities

Power generating facilities' costs in Line 17 include the Reid Gardner coal-fired powerplant; Bottle Rock and South Geysers geothermal plants; Pine Flat transmission line; and Lake Isabella hydroelectric powerplant.

Line 18: San Joaquin Drainage Facilities.

Included are the costs of (1) securing commitments for repayment from local agencies, (2) assuring that local waste disposal plans are compatible with the recommended Plan of the Interagency Drainage Program, (3) monitoring and reporting the quality and quantity of agricultural waste waters in the San Joaquin Valley, and (4) the Los Banos Demonstration Desalting Facility (see Chapter II).

Line 19: Subtotal: Project Construction Expenditures.

The total of Lines 1 through 18.

Line 20: Cost Escalation Allowance.

Estimates of future construction expenditures shown in Lines 1 through 19 are based on prices and salaries prevailing on January 1, 1982. The amounts in Line 20 are the estimated cost increases that could be expected to occur due to cost escalation. The following assumed percentages per annum were applied to allow for escalation for the years 1982 through 1990: 7 percent for state salaries, 9 percent for construction prices, and 10 percent for land acquisition costs.

Line 21: Total Project Construction Expenditures.

The total of Lines 19 and 20.

Other Capital Requirements

Line 22: Davis-Grunsky Act Program.

This State financial assistance program for water developments constructed by local public agencies is associated with the SWP to the extent of $130 million in capital expenditures. Such expenditures include disbursements under approved loans and grants and the Department's administrative costs incurred while the respective developments are under construction. (Administrative costs following construction are funded by project revenues.)

As of December 31, 1981, the Department and the California Water Commission had approved more than $110.4 million in grants and loans for 91 local agencies located throughout the State as indicated on Figure 30.

Of the total approved applications, over $46 million (42 percent) were for loans and the remaining $64 million (58 percent) were for grants. The Department estimates that funds presently authorized for the program would be disbursed prior to 1985.

Line 23: Additional Conservation Facilities-Storage Payments.

In addition to the additional conservation facilities construction shown in Line 15, and although it is reevaluating the matter due to new Federal cost-sharing proposed, for this analysis the Department assumes the State will purchase water storage rights in the future federal Cottonwood Creek Project. The storage rights would be purchased pursuant to the federal Water Supply Act of 1958. A contract would be entered into in which annual payments of principal and interest would be made to the federal government. Line 23 is an estimate

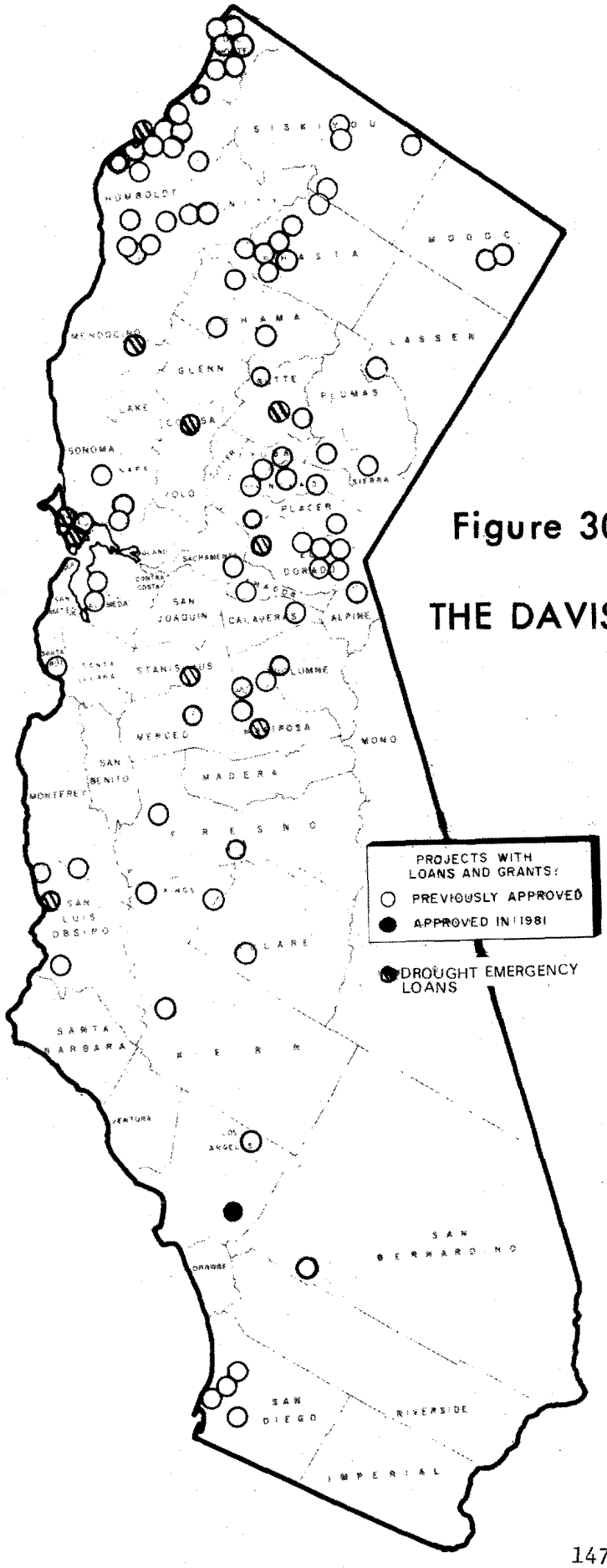


Figure 30: LOCAL PROJECTS UNDER THE DAVIS-GRUNSKY ACT PROGRAM

of the annual payments through year 2035.

Line 24: Special Capital Requirements Under Revenue Bond Financing.

The authority under which revenue bonds are sold provide that proceeds may also fund the interest on and operation of the financed facilities through one year following completion of construction.

The analysis assumes that power facility revenue bond proceeds will pay bond interest during the construction period and for one year following the completion of construction, and operating costs for one year following the completion of construction. The revenue bonds for facilities other than power generating facilities (hereafter termed water revenue bonds) include proceeds for four years' bond interest. These proceeds are also included in Line 54 as a Miscellaneous Revenue. Application of proceeds to these special requirements for actual and assumed revenue bond sales is as follows:

TABLE 26: APPLICATION OF REVENUE BOND PROCEEDS [a]

(in millions)

Application of Revenue Bond Proceeds	Oroville (Actual)	Devil Canyon-Castaic (Actual)	Pyramid (Actual)	Reid Gardner (Actual)	Supplemental Power (Assumed)	Supplemental Water (Assumed)
Construction Expenditures	$218.0	$126.4	$74.0	$145.1	$410.6	$180.0
Plus, Other Capital requirements:						
Reimbursement of General Fund	$ 2.6	$ 0.0	$ 0.0	$ 0.0	$ 0.0	$ 0.0
Bond interest through one year following completion of construction	$ 19.9	$ 10.0	$19.2	$ 41.9	$113.4	$ 68.8
Operating costs for one year following completion of construction	$ 1.5	$ 0.7	$ 1.0	$ 0.0	$ 14.5	$ 0.0
Bond discount and financing costs	$ 3.0	$ 2.1	$ 1.6	$ 13.0	$ 34.5	$ 1.2
SUBTOTAL	$ 27.0	$ 12.8	$21.8	$ 54.9	$165.3	$ 70.0
TOTAL, Principal amount of bonds	$245.0	$139.2	$95.8	$200.0	$575.0	$250.0

a) Includes funds set aside to repay Bottle Rock-Alamo bond anticipation notes when due.

Line 25: Total Other Capital Requirements.

The total of Lines 22, 23 and 24.

Line 26: Total Capital Requirements.

The total of Lines 21 and 25.

Financing of Capital Expenditures

Three general types of financing have been used for the SWP:

- Burns-Porter financing, derived from the sale of California Water Resources Development Bonds (Water Bonds) and the State's tideland oil and gas revenues that are deposited in the California Water Fund as authorized by the Burns-Porter Act (California Water Code Sections 12930- 12944), approved by the electorate in November 1960.

- Revenue Bond Financing, derived from the sale of revenue bonds as authorized by the Central Valley Project Act (California Water Code Sections 11100-11925). The Department's authority to issue revenue bonds was confirmed by a decision of the Supreme Court of California in 1963 (Warne v. Harkness 60 Cal., 2d 579).

- Miscellaneous Receipts, derived from payments and appropriations (including tideland oil and gas revenues) as authorized by a variety of special contracts, cost-sharing agreements, and legislative actions concerning the State Water Project.

To date, Water Bonds have financed most of the construction costs of the Project. The Burns-Porter Act authorized an issue of $1.75 billion of general obligation bonds of the State, which are made self-supporting by revenues received under the water supply contracts. This authorization includes a reservation of $130 million specifically for the Davis-Grunsky Act Program. Proceeds from the sale of Water Bonds are deposited in the California Water Resources Development Bond Fund-Bond Proceeds Account, from which monies may be expended only for the construction of SWP facilities and for the Davis-Grunsky Act Program.

Monies deposited in the California Water Fund are appropriated for purposes of the Burns-Porter Act. Such deposits are derived from a portion of the State's tideland oil and gas revenues under a continuing authorization. In the past, the Legislature has acted both to decrease and increase the level of deposits to the Fund. Monies may be expended from the Fund only for the construction of SWP facilities.

About $730 million of revenue bonds and revenue bond anticipation notes had been sold by the Department as of December 31, 1981. (Note: On July 7, 1982 the Department sold $200 million of revenue bonds for the Reid Gardner Project. Approximately $143 million of these bond proceeds have been set aside to repay the bond anticipation notes sold in June, 1981.

Additional issues of revenue bonds are planned to aid in future SWP financing. Proceeds from the sale of revenue bonds are deposited in the Central Valley Water Project Construction Fund, from which money is expended only for purposes specified in the resolution authorizing such sale. These purposes, in addition to construction, planning, and right of way costs, may include the payment of (1) bond interest during the construction period, and for one year following completion of construction and (2) operating costs for one year after completion of construction.

Miscellaneous receipts are deposited in the Central Valley Water Project Construction Fund and may be expended for (1) Water Bond interest and (2) construction of SWP facilities. Under the Department's financial management, miscellaneous receipts are first used to the extent needed for coverage of any

Water Bond interest which exceeds available Burns-Porter Act second priority revenues.

The financing of capital expenditures is described in Lines 27 through 40:

Line 27: Application of California Water Fund Monies.

The Burns-Porter Act provides that any available money in the California Water Fund shall be used for construction in lieu of proceeds from the sale of Water Bonds. When the Act became effective in late 1960, approximately $97 million had been accumulated in the Fund. This balance and continuing annual appropriations to the Fund through June 28, 1968 financed a total of $176 million of project construction costs. On June 28, 1968, SB 261 became effective (California Statutes of 1968, Chapter 411), which transferred the remaining balance to the Central Valley Water Project Construction Fund and deferred accruals to the California Water Fund until July 1, 1972. Since the latter date, appropriations have been deposited in the California Water Fund in annual amounts of $25 million with the following exceptions. For 1981, the Legislature reduced the appropriation to $22,789,800; and for 1982 it reduced the appropriation to $14,710,000.

This analysis assumes that appropriations to the Fund will continue hereafter in the full annual amounts provided for by law. The Department also expects that repayments to the California Water Fund, to be derived from SWP revenues in excess of operating costs and Water Bond debt service, would be available to aid in financing future capital expenditures beginning in 1984.

The financial analysis indicates that full annual appropriations of tideland revenues to the California Water Fund would be required to assist in financing construction expenditures through 1990. Annual repayments to the Fund (see Line 68), which are projected to commence in 1984, are needed to supplement the annual appropriations. After 1990, it is expected that all future financing could be provided by such repayments.

Line 28: Application of Proceeds From Sale of Oroville Revenue Bonds.

All proceeds from sale of Oroville Revenue Bonds in April 1968 (Series A) and in April 1969 (Series B) had been applied as of December 31, 1973.

Line 29: Application of Proceeds from Sale of Devil Canyon-Castaic Revenue Bonds.

Construction funds provided by the sale of Devil Canyon-Castaic Revenue Bonds, in August 1972, included (1) $98.9 million which reimbursed other project funds used to finance construction of the Devil Canyon and Castaic Facilities prior to the delivery of the bonds; and (2) $28.2 million that was reserved to complete construction of the Facilities. Two and one-half million dollars was transferred to the trustee during 1981 as required by the bond resolution.

Line 30: Application of Proceeds From Sale of Pyramid Hydroelectric Project Revenue Bonds.

Revenue bonds were sold in October 1979 for the construction of the portion of the Pyramid Powerplant (renamed William E. Warne Powerplant) and related facilities allocated to power. The construction proceeds provided (1) $31.8 million which reimbursed other project funds used to finance construction of these facilities prior to delivery of the bonds; and (2) $42.4 million which was reserved to complete construction of the Pyramid Hydroelectric Project. The remaining proceeds are used for other requirements as stated in Line 24. Line 30 shows the assumed expenditures schedule of these bond proceeds.

Line 31: Application of Proceeds From Sale of Reid Gardner Power Revenue Bonds

On July 7, 1982 the Department sold $200 million of Reid Gardner Bonds. They were sold at the statutory limits of a 12 percent interest rate and 6 percent discount for an effective interest rate of 12.81 percent. Approximately $143 million was set aside to repay the bond anticipation notes sold on June 30, 1981. After mandatory reserves were set aside, there remained about $22 million which reimbursed other project funds used to finance construction of these facilities prior to delivery of the bonds.

Line 32: Application of Proceeds From Sale of Bottle Rock-Alamo Power Revenue Bond Anticipation Notes.

To obtain financing for the Bottle Rock-Alamo (formerly Cottonwood Powerplant) facilities, notes for $100 million were sold on December 1, 1981. These notes will be redeemed from long-term bonds planned to be sold in 1983. (See Table 29.)

Line 33: Application of Proceeds From Sale of Supplemental Power Revenue Bonds.

Future power revenue bond issues (those sold after July, 1982) are assumed to provide $575 million for construction of power generating facilities and other special capital requirements (interest during and one year following construction, one year of operating cost and to defease the Bottle Rock-Alamo note sold on December 1, 1981) under revenue bond financing.

Supplemental power revenue bonds will be sold for Reid Gardner, Bottle Rock, and South Geysers Powerplants; for small hydroelectric generating power plants; and for Isabella hydroelectric generating power plant. Other future generating facilities can be adequately financed from other sources of SWP financing. The schedule for assumed future sales of these bonds is shown in Table 29.

Line 34: Application of Proceeds From Sale of Supplemental Water Revenue Bonds.

Future water revenue bond issues are assumed to provide about $250 million for application to the construction expenditures and other special capital requirements under revenue bond financing. This is the supplemental amount necessary to complete the facilities of the State Water Project currently scheduled and would most likely be issued in conjunction with construction of the North Bay Aqueduct and enlargement of the East Branch of the California Aqueduct. However, current interest limits, coupled with current market interest rates would not permit their sale.

Line 35: Application of Proceeds From Sale of Water Bonds, Davis-Grunsky Act Program.

For simplification, the entire $130 million of capital expenditures authorized for the Davis-Grunsky Act Program under the Burns-Porter Act are shown to be funded solely by proceeds from the sale of Water Bonds. Actually, $28.0 million of the California Water Fund was used for the Program in lieu of bond proceeds prior to 1969. This simplification does not in any way affect the validity of the analysis. The schedule for assumed future sales of bonds authorized but not yet sold is shown in Table 29.

Line 36: Application of Proceeds From Sale of Water Bonds, Additional Conservation Facilities.

The Burns-Porter Act provides that to the extent California Water Fund monies are expended, an equal amount of Water Bonds is reserved ("offset") for financing the construction of certain additional conservation facilities in certain watersheds.

In mid-1972, the maximum reservation of "offset" bonds was effectively limited to $176 million -- the total amount of California Water Fund monies which had been expended up to that time. By mid-1972, all remaining Water Bond proceeds

from the Burns-Porter authorization had either been "offset" or reserved for the Davis-Grunsky Act Program.

Approximately $8.5 million of the "offset" bonds have been used to finance planning studies of the Eel River Development. This analysis assumes that the offset bonds will not be sold. (If at some future time the State constructs a conservation facility north of the Delta - the offset bonds could be sold.)

Line 37: Application of Proceeds From Sale of Water Bonds, Initial Project Facilities.

Financing of initial facilities from water bonds was completed in mid-1972, and amounted to $1.444 billion -- i.e., the total of $1.75 billion Burns-Porter authorization less $130 million reserved for the Davis-Grunsky Program and $176 million "offset" for additional conservation facilities.

Line 38: Total Application of Proceeds From Sale of Bonds.

The total of Lines 28 through 37. See Tables 28 and 29 for a summary of actual and future bond sales.

Line 39: Application of Miscellaneous Receipts to Construction.

This line shows the application of Miscellaneous Receipts for capital expenditures scheduled on Line 70.

Line 40: Total Financing of Capital Requirements.

This line -- the total of Lines 27, 38 and 39 -- matches Line 26 and confirms that all estimated capital expenditures would be funded under the analysis.

Miscellaneous Receipts

Sources of Miscellaneous Receipts are described in the following paragraphs:

Line 41: Federal Payments for SWP Capital Expenditures.

The federal share of the State's capital expenditures includes payments for (1) "open-space" grants at certain project reservoirs, (2) costs of Lakes Oroville and Del Valle allocated to flood control under existing agreements, and under current expectations.

About $1.6 million in federal payments has been received for acquisition costs of project and recreation lands reserved for open space at Lakes Perris and Del Valle, Castaic and Silverwood Lakes. The final payment for "open space" was received in 1975.

Federal payments received through December 31, 1980 for project costs allocated to flood control totalled $75.4 million -- $70.0 million for Lake Oroville and $5.4 million for Lake Del Valle.

Since this analysis assumes no further federal-State sharing of joint facilities there are no further payments expected from the Federal Government.

Line 42: Appropriations for Capital Costs Allocated to Recreation and Fish and Wildlife Enhancement.

In accordance with Public Resources Code Section 6217, $5 million of the State's tideland oil and gas revenues is deposited annually in the Central Valley Water Project Construction Fund for repayment of (1) costs of constructing multipurpose SWP facilities that are allocated to recreation and fish and wildlife enhancement and (2) costs of acquiring land for recreation developments associated with SWP facilities. As indicated in Table 25, such costs are now estimated to total about $185 million for Project facilities to be constructed prior to the year 2000. This is a decrease of $370 million from that shown in Table 8 of Bulletin 132-81. This reduction results from the elimination of the Peripheral Canal, and Los Vaqueros and Thomes-Newville reser-

voirs from the projected capital costs. The $5 million annual appropriation would not be adequate to reimburse the SWP for these allocated costs by the year 2035 (end of project repayment period). Efforts will be made to reduce the costs of the future recreation program or provide additional funding to reimburse the SWP for costs allocated to recreation and fish and wildlife enhancement.

Release of the $5 million annual appropriations to the Department for expenditures is dependent on legislative approval for the costs reported annually by the Department. The appropriation for 1982 was not approved by the Legislature. In 1982 the Department reported costs totalling over $188 million, including over $47 million of accrued interest (Appendix D, "Costs of Recreation and Fish and Wildlife Enhancement", Bulletin No. 132-82). This was an increase of about $4 million over the previous report (see page 9, Appendix D, Bulletin No. 132-81). Most of this increase was due to costs incurred in 1981 and interest accrued during 1981 on recreation costs not yet reimbursed by the continuing annual appropriation.

Line 43: Appropriation for Project Capital Expenditures.

This line includes appropriations prior to the Burns-Porter Act and appropriations under SB 261 (1968).

Year to year appropriations by the Legislature financed all capital expenditures prior to the effective date of the Burns-Porter Act on November 8, 1960. Expenditures so financed substantially ended in 1963 and totalled about $11 million from the General Fund and $88 million from the Investment Fund (succeeded by the California Water Fund in 1959). While these special appropriations do not fit the general definition of "miscellaneous receipts", in that they were not deposited in the Central Valley Water Project Construction Fund, they are so classified herein for simplifying the presentation of the financial analysis.

By enactment of SB 261, June 29, 1968, the balance in the California Water Fund was transferred to the Central Valley Water Project Construction Fund, together with appropriations of tideland oil and gas revenues in the annual amounts of $11 million through June 30, 1970, and $25 million thereafter, until June 30, 1972, totalling $82.7 million.

Line 44: City of Los Angeles Payments for Castaic Power Development.

Under a 70-year contract executed September 2, 1966 (see page 12, Bulletin No. 132-67), the State constructed the Angeles Tunnel with a 30-foot diameter instead of with a 17-foot diameter as originally planned. In return, the City financed, constructed, operates, and maintains 1,250-megawatt Castaic Powerplant and supplies the State, without charge, power equivalent in value to that which the State would have produced in its originally planned 214-megawatt plant. The value of this equivalent power is accounted for in Line 58 as a credit to SWP operating costs in the same manner as other aqueduct power credits. In addition, the City has made certain payments, shown in Line 44, to ensure that the benefits of joint development are equally realized by both the State and the City. Neither the estimated capital expenditures for the Project nor the payments shown in Line 44 include amounts for the Castaic surge chamber, which was constructed by the State but directly financed by the City.

Line 45: Water Contractor Advances for Construction of Requested Works.

Water supply contractors are required to finance, in advance, the construction costs of delivery structures (turnouts) and of any excess capacity the Department is requested to construct in SWP facilities. Advance payments for State construction requested by contractors

are summarized on page 178 of Bulletin 132-80.

Excess capacity may be requested for the purpose of increasing the instantaneous rates of water delivery over the "peaking" rates normally provided for by the contracts.

Advance payments for requested excess capacity are determined by contract formula to assure that more than enough funds are available to cover the additional construction costs. After construction of the excess capacity, differences between advance payments and actual additional costs are to be credited to the contractor's account. The advance payments exceed the additional construction costs involved, with interest, by about $46.4 million as of December 31, 1981. Therefore, a credit of $46.4 million has been applied to the contractors' accounts.

Line 46: Investment Earnings on Unexpended Miscellaneous Receipts.

Unexpended SWP funds are invested through the State Treasurer's Surplus Money Investment Fund. Interest earnings during the last half of 1981 were at a rate of 12.19 percent per annum, and 11.93 percent per annum for the first half of 1982. For the financial analysis, the Department estimates that future interest earnings of the Fund will average 8.5 percent per annum.

This line also includes the interest earning on the Revenue Bond proceeds used to reimburse prior Burns-Porter bond expenditures and unexpended Supplemental Bond proceeds.

Line 47: Total Miscellaneous Receipts.

The total of Lines 41 through 46.

Project Operating Revenues

Project operating revenues are deposited in two funds: the Central Valley Water Project Revenue Fund, in which are placed all revenues pledged to revenue bonds, and the California Water Resources Development Bond Fund-Revenue Account, in which are placed all other SWP operating revenues, including interest earnings on any unexpended proceeds from the sale of Water Bonds.

Line 48: Payments Under Oroville-Thermalito Power Sales Contract.

Until April 1, 1983 all of the generation from Hyatt-Thermalito Powerplants will be sold under a Power Sale Contract dated November 29, 1967 to three electric utilities (Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas and Electric Company). Revenues under the Contract are pledged to the payment of annual operating expenses of Hyatt-Thermalito Powerplants (limited to $1.5 million annually) and annual debt service on Oroville Revenue Bonds. Firm revenues consist of $8,075,000 paid semiannually. Revenues are also received from energy adjustments accounts for cumulative theoretical generation in excess of 2.1 billion kilowatthours annually.

During 1981, a 633-million-kilowatthour debit was made to the energy adjustment accounts reducing the cumulative positive balance on December 31, 1981 to 3.7 billion kilowatthours (equivalent to a credit as of that date of about $9.6 million).

On April 1, 1983, the State Power Contract will replace the existing Power Sale Contract (for Oroville) and the generation will be available for use in the SWP. The State Power Contract will remain the same as under the Power Sale Contract for purposes of SWP cost accounting and for determining water charge revenues and the application of revenues, except that the firm semiannual payments will be increased to cover the actual operating expenses of Hyatt-Thermalito Powerplants in excess of $1.5 million annually. Thus, the amounts shown on Line 48 after March 31, 1983 include additional revenue for in-

creased operating expenses and additional transmission and station service charges.

Also, Line 48 includes an additional revenue of $13.5 million from the electric utilities in 1983 to clear an estimated positive balance in energy adjustment accounts. Thereafter, Line 48 includes estimated revenues for energy generation in excess of 2.1 billion kilowatthours annually equivalent to 300 million kilowatthours ($777,000) annually.

For the financial analysis, the Department assumes that revenues from the sale or other disposal of Hyatt Thermalito power will continue after termination of the State Power Contract (November 29, 2017, or until all Oroville Revenue Bonds have been retired, whichever occurs later), in the same amounts as under the Contract.

Line 49: Water Contractor Payments Under Devil Canyon-Castaic Contract.

These payments by the six water contractors located down-aqueduct from Devil Canyon and Castaic Facilities are equal to (1) the annual service on Devil Canyon-Castaic Revenue Bonds and (2) annual operating costs of the Facilities allocated to power generation (see page 2, Bulletin 132-73).

Line 50: Water Contractor Payments Under Long-Term Water Supply Contracts.

Water supply contracts provide for payments of two general charges: (1) a Delta Water Charge and (2) a Transportation Charge.

The Delta Water Charge is assessed for each acre-foot of water the contractors are entitled to receive. The Charge is computed to return to the State during the contract term all appropriate costs of SWP conservation facilities, together with interest thereon. SWP conservation facilities are defined as those facilities which conserve water, including Lake Oroville, Delta Facilities, additional conservation facilities and San Luis Reservoir, together with a portion of the California Aqueduct from the Delta to Dos Amigos Pumping Plant. Current studies of operating ground water basins to provide for conservation of SWP water may result in an amendment of water supply contracts to include costs of such facilities as conservation facilities. Costs allocated to flood control, recreation, and fish and wildlife enhancement are not paid under the water supply contracts. Both charges for power costs and credits for power revenues are included in the determination of the Delta Water charge.

The Transportation Charge is computed to return to the State during the contract term the costs of the aqueducts necessary to deliver water to the respective contractors, including interest costs. Such costs exclude those allocated to flood control, recreation, and fish and wildlife enhancement. The costs of the Devil Canyon and Castaic Facilities allocable to power are excluded from the Transportation Charge and are paid under the Devil Canyon- Castaic Contract.

Each year's costs of each aqueduct reach are allocated among contractors whose deliveries are, or will be, conveyed through that reach. For contractors with predominantly municipal and industrial water use, the allocated amounts of each year's construction expenditures are required to be repaid, together with interest, in not more than 50 equal annual installments. For contractors with predominantly agricultural water use, allocated construction costs are repaid by a uniform charge per acre-foot of water entitlement, computed to return those costs with interest to the State during the contract term.

Operating costs are paid currently under the Transportation Charge and therefore do not include any interest charges. Construction costs under the Transportation Charge and all construction and

annual operating costs under the Delta Water Charge are to be repaid with interest at the Project Interest Rate.

The Project Interest Rate is defined in Article 1(r) of the Standard Provisions for Water Supply Contracts as the weighted average of the rates paid on securities issued and loans obtained to finance SWP facilities, excluding Oroville Revenue Bonds. Under original contract provisions, the basis for determining the Project Interest Rate was the weighted average of rates paid on Water Bond sales only. Under contract amendments executed in 1969, after issuance of Oroville Revenue Bonds, the basis was expanded to include rates on all other securities sold and loans obtained thereafter for financing SWP facilities, including revenue bonds (see page 28, Bulletin No. 132-70).

However, not all proceeds from the sale of revenue bonds are melded in the calculation of the Project Interest Rate -- only those proceeds applied to construction costs (the only application of general obligation bonds permitted by law) and those consumed by the bond discount (a component of the total interest cost of a revenue bond issue). Table 27 shows the percentage of total proceeds from revenue bond issues that affect the actual and projected calculation of the Project Interest Rate.

Tables 28 and 29 present information basic to the calculation of the actual and projected Project Interest rates. The discussion of water charges for each contractor in Chapter XI is based on presently known conditions and supports the Department's determination of 1983 water charges -- billed July 1, 1982. However, there are the following significant differences between the projection of charges shown in Line 50 and the substantiation of 1983 charges discussed in Chapter XI:

- Future capital costs discussed in Chapter XI are based on prices prevailing on January 1, 1982. Those shown in the financial analysis include allowances for future price escalation.

- The Project Interest Rate basic to charges discussed in Chapter XI includes actual bond sales (4.627 percent) through June 30, 1982. Bonds sold and planned to be sold after that date are not included in the calculation of the Project Interest Rate. This is a change from the assumption in Bulletin 132-81 that all bonds planned for sale in the calendar year would be included in the Project Interest Rate for purposes of calculating contractor charges. In the future, only bonds sold by June 30, the billing date, will be included.

- Pre-1982 charges discussed in Chapter XI represent what the charges should have been under presently known conditions. Pre-1982 charges shown in Line 50 are those actually paid under previously determined bills.

- Charges discussed in Chapter XI are unadjusted for past over or underpayments. Charges for 1982 and thereafter, shown in Line 50, include adjustments for any apparent overpayments or underpayments of pre-1981 charges. Line 50 also includes credits due to pre-payments of the capital cost components resulting under various contract amendments involving excess aqueduct capacity.

- The charges discussed in Chapter XI are those that would apply in the absence of the Devil Canyon-Castaic Contract. The charges shown in Line 50 exclude those under the Contract (see Line 49).

- The charges discussed in Chapter XI do not include a capital cost component for the repayment of the Enlargement of the California Aqueduct, Mojave Division. Line 50 includes an estimate of the repayment for the enlargement expenditure.

TABLE 27: REVENUE BOND PROCEEDS AFFECTING THE PROJECT INTEREST RATE

(in millions of dollars)

Revenue Bond Proceeds	Devil Canyon Castaic Revenue Bonds	Pyramid William E. Warne Hydroelectric Revenue Bonds	Reid Gardner Bond Anticipation Notes	Bottle Rock-Alamo Bond Anticipation Notes
Applied to construction costs	$126.4	$74.0	$114.9	$ 70.9
Less portion of such proceeds derived from interest earnings prior to delivery of bonds	1.6	0	0	0
Plus bond discount and financing costs	2.1	1.6	4.4	2.2
Subtotal, proceeds included in calculating the project interest rate	$126.9	$75.6	$119.3	$ 73.1
Principal amount of bonds	139.2	95.8	150.0	100.0
Percent total principal amount included in calculating the Project Interest Rate	91%	79%	79.5%	73.1%

TABLE 28: ACTUAL BOND SALES AND PROJECT INTEREST RATES

Bond Sales	Date of Sale	Dollar-Years (a	Interest Cost (b	Percent Interest Cost (c	Project Interest Rate (%) (d
	(1)	(2)	(3)	(4)	(5)
Actual Issues					
$50,000,000 Bond Anticipation Notes	11/21/63	26,944	531	1.970	1.970
$100,000,000 Series "A" Water Bonds	2/18/64	3,402,000	119,750	3.520	3.508
$50,000,000 Series "B" Water Bonds	5/ 5/64	1,726,000	60,986	3.533	3.516
$100,000,000 Series "C" Water Bonds	10/ 7/64	3,452,000	123,764	3.585	3.544
$100,000,000 Series "D" Water Bonds	2/16/65	3,497,900	122,403	3.499	3.531
$100,000,000 Series "E" Water Bonds	11/23/65	3,497,900	130,029	3.717	3.573
$100,000,000 Series "F" Water Bonds	6/ 8/66	3,497,900	137,359	3.927	3.638
$100,000,000 Series "G" Water Bonds	11/22/66	3,497,900	143,788	4.111	3.711
$100,000,000 Series "H" Water Bonds	3/21/67	3,497,900	129,261	3.695	3.709
$100,000,000 Series "J" Water Bonds	7/18/67	3,497,900	143,199	4.094	3.754
$100,000,000 Series "K" Water Bonds	11/14/67	3,497,900	163,887	4.685	3.853
$150,000,000 Revenue Bonds, Oroville Division, Series "A"	4/ 3/68	5,228,700	270,289	5.197	-
$100,000,000 Series "L" Water Bonds	7/11/68	3,497,900	166,918	4.772	3.941
$100,000,000 Series "M" Water Bonds	10/22/68	3,497,900	169,989	4.860	4.021
$94,995,000 Revenue Bonds, Oroville Division, Series "B"	4/ 1/69	3,423,460	195,902	5.767	-
$46,761,000 Cumulative 1970 General Fund Borrowing; repaid 7/10/70	-	4,938	346	7.007	4.021
$200,000,000 Series "N" and "P" Bond Anticipation Notes	6/16/70	200,000	11,660	5.830	4.030
$100,000,000 Series "N" Water Bonds	2/ 2/71	3,447,900	190,292	5.519	4.148
$100,000,000 Series "Q" Bond Anticipation Notes	3/10/71	100,000	2,349	2.350	4.143
$100,000,000 Series "P" Water Bonds	4/21/71	3,397,900	193,377	5.691	4.255
$150,000,000 Series "Q" and "R" Water Bonds	11/ 9/71	5,171,850	265,734	5.138	4.342
$40,000,000 Series "S" Water Bonds	3/28/72	1,399,160	76,509	5.468	4.371
$139,165,000 Devil Canyon-Castaic Revenue Bonds (e	8/ 8/72	4,776,204	258,839	5.419	4.457
$10,000,000 Series "T" Water Bonds	3/20/73	185,265	9,491	5.122	4.459
$10,000,000 Series "U" Water Bonds	1/13/76	158,750	8,731	5.50	4.462
$10,000,000 Series "V" Water Bonds	11/15/77	158,750	7,573	4.769	4.462
$95,800,000 Pyramid Hydroelectric Revenue Bonds (f	10/23/79	2,364,917	180,496	7.632	4.584
$150,000,000 Reid-Gardner Project, Series A, Bond Anticipation Notes	7/ 1/81	347,906	29,572	8.500	4.606
$100,000,000 Bottle Rock-Alamo Bond Anticipation Notes	12/ 1/81	256,004	24,320	9.500	4.627
$200,000,000 Reid-Gardner Project Series B, Revenue Bonds	7/7/82	4,623,137	553,793	11.979	-
TOTAL (Excluding Oroville CVP Revenue Bonds and Reid-Gardner Series B Revenue Bonds)		62,057,588	2,871,153		

a) A unit equivalent to one dollar of principal amount outstanding for one year, in thousands.
b) In thousands of dollars.
c) The total interest cost (without regard to premiums received) divided by the total dollar-years, expressed as a percent.
d) Determined by dividing cumulative interest costs by cumulative dollar-years, expressed as a percent. Excluding Central Valley Project Revenue Bonds, Oroville Division, which do not affect the calculation of the "project interest rate".
e) Bonds sold at a net interest cost of 5.446 percent. Net proceeds for financing construction costs plus bond discount amounting to $126,893,000 are used for purposes of the project interest rate.
f) Bonds sold at a net interest cost of 7.680 percent. Net proceeds for financing construction costs plus bond discount amounting to $75,586,000 are used for purposes of the project interest rate.

TABLE 29: PROJECTED BOND SALES

Bond Sales	Purpose	Date of Sale
$200,000,000 Power Revenue Bond	Reid-Gardner South Geysers Small Hydro	11-82
$ 12,250,000 Series "W" Water-Bond	Davis-Grunsky Act	1-83
$200,000,000 Power Revenue Bond	Bottle Rock-Alamo South Geysers	7-83
$175,000,000 Power Revenue Bond	Small Hydro Alamo Isabella	11-83
$150,000,000 Supplemental Water Revenue Bond	California Aqueduct Construction	1-85
$100,000,000 Supplemental Water Revenue Bond	California Aqueduct Construction	1-87

The payments shown in Line 50 also include revenue which would be pledged to provide bond cover to support supplemental revenue bonds. The amount of revenue pledged is that portion identifiable with the facilities financed with revenue bonds. The analysis assumes, with regard to future revenue bonds, that there will be no revenue payment defaults.

Line 51: Federal Payments for Project Operating Costs.

Under the December 31, 1961, Agreement between the State and the United States, the Department operates and maintains the San Luis joint-use facilities. Under the January 12, 1972, Supplement to the Agreement, the United States pays 45 percent of the costs incurred by the Department for these activities. (The percentage does not apply to power costs. The United States and the Department provide their own power to pump their respective amounts of water through the joint facilities). This percentage was reviewed in 1980, and will now be 44.47 percent through December 31, 1985, subject to review again in 1985. The amounts shown in Line 51 are based on the assumption that the 44.47 percent federal share will continue.

Line 52: Appropriations for Operating Costs Allocated to Recreation.

Under the Davis-Dolwig Act, the Legislature declared its intent that, except for funds provided pursuant to AB 12 (1966), the Department's budget shall include appropriations from the General Fund of monies necessary for enhancement of fish and wildlife and for recreation in connection with State water projects. Annual operation, maintenance, power and replacement costs allocated to recreation and fish and wildlife enhancement are paid by annual General Fund appropriations.

Line 53: Local Agency Payments Under Davis-Grunsky Loan Repayment Contracts.

As pointed out in the description of Line 22, $45.1 million in loan applications had been approved as of December 31, 1981. The amounts shown in Line 52 are based on the assumption that $16.1 million in future contracts would be approved -- bringing estimated total loans under the $130 million authorization (which excludes an initial loan of about $1.3 million) to $61.2 million (47 percent). All future loans are assumed to be repaid in 50 years at 2.5 percent interest, with an initial five-year deferment of principal repayment.

Line 54: Miscellaneous Revenues.

Miscellaneous revenues include annual payments by the City of Los Angeles for a share of the maintenance costs of the Angeles Tunnel, interest earnings on unexpended proceeds from sale of Water Bonds, and other short-term investment earnings on SWP revenues. Based on experience to date, an allowance of $2 million annually is included in Line 54 to approximate these revenues.

This line also includes bond proceeds that are special reserves under revenue bond financing, described in Line 24. These proceeds are not classified as revenues, but are shown in this line to simplify the financial presentation since they are used for operation and maintenance costs and revenue bond service.

Line 55: Total Project Operating Revenues.

The total of Lines 48 through 54.

Line 56: Total Miscellaneous Receipts and Project Operating Revenues.

The total of Lines 47 and 55.

Application of Revenues and Miscellaneous Receipts

Revenues pledged to revenue bonds, deposited in the Central Valley Water Project Revenue Fund, are disbursed in accordance with resolutions authorizing the issuance of such bonds. All other operating revenues, deposited in the California Water Resources Development Bond Fund-Revenue Account, are disbursed in accordance with the following priorities of use as specified in the Burns-Porter Act.

(1) Project operating maintenance and replacement costs.

(2) Water Bond Debt Service.

(3) Repayment of expenditures from the California Water Fund.

(4) Deposits to a reserve for future construction of the State Water Resources Development System -- a system of facilities which may be added to under certain authorizations of the Legislature and designations by the Department as specified in the Burns-Porter Act, and which includes the State Water Project.

Line 57: Carryover (+) and Application (-) of Miscellaneous Receipts and Revenues Held Temporarily in Reserve.

The carryover of reserves from year to year has primarily accumulated in the Central Valley Water Project Construction Fund from appropriations for recreation capital expenditures (Line 44) and interest earned from unexpended revenue bond reimbursement funds. These carryovers are assumed to be used for construction expenditures prior to the sale of supplemental water revenue bonds. Also included in this line is a carryover to ensure that future annual service on water bonds will be met. Receipts accruing after 1990 -- not needed for either bond service or construction expenditures under this analysis -- are included in Line 72 as being available for financing future construction of the State Water Resources Development System.

Line 58: Project Operating Costs.

Historical and estimated project operating costs are presented in Table 30 by project facilities. Line 58 in the financial analysis is composed of operating costs that are assumed to occur under the assumptions of water demands adjusted to reflect use of waste water reclamation and water conservation. This line also includes the operating costs for the Federal share of joint facilities and operating costs allocated to recreation, which are offset by revenues shown in Lines 51 and 52, respectively. Allowances for future cost escalation are included for power costs through 1985 and operation, maintenance and replacement costs through 1984. Allowances for further future long-term price escalation are not included in these estimates since such operating costs do not substantially affect the overall results of the financial analysis. (For the most part, changes of operating costs cause direct offsetting changes of operating revenues.)

Power cost is the major item of annual operating expense for the SWP, and there have been significant changes in the assumptions regarding the future development of power sources and costs. (See Chapters II and VII.)

Line 59: Deposits to Special Reserves Under Revenue Bond Financing.

In regard to Oroville Revenue Bonds, deposits include the following:

- Payments to the Department for energy and generating capability prior to April 1, 1969, under terms of interim

TABLE 30: PROJECT OPERATING COSTS

(in thousands of dollars)

FEATURE	CALENDAR YEAR											TOTAL
	1962-1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991-2035	
BY PROJECT FACILITY												
Feather River Facilities	77,108	8,938	-914	-10,733	-14,261	-14,824	-15,157	-15,327	-15,343	-15,333	-670,780	-686,626
North Bay Aqueduct	1,106	214	270	250	589	574	549	577	626	674	54,111	59,540
Delta Facilities	0	92	442	606	463	480	490	488	489	490	22,329	26,369
South Bay Aqueduct	24,848	2,877	5,067	5,933	6,049	6,080	5,950	6,074	6,350	6,491	402,998	478,717
CALIFORNIA AQUEDUCT:												
Main Line - Delta to A. D. Edmonston	237,284	40,562	85,692	108,931	109,803	116,797	115,211	118,600	131,318	131,723	10,048,030	11,243,951
Main Line - A. D. Edmonston to Perris	122,144	25,701	62,843	81,493	95,491	86,777	82,805	88,960	99,937	106,815	9,643,658	10,496,624
West Branch	24,546	3,947	-1,915	-2,228	-6,179	-5,998	-8,251	-10,154	-11,817	-14,404	-913,903	-946,356
Coastal Branch	13,137	1,536	2,141	2,361	2,485	2,561	2,502	2,526	2,583	2,815	169,125	203,772
Additional Conservation Facilities	0	0	0	0	0	0	0	0	0	0	180,798	180,798
Water Quality Monitoring Program - Sacramento-San Joaquin Delta	20,838	2,242	2,516	2,699	2,709	2,603	2,509	2,463	2,471	4,927	135,118	181,095
Davis Grunsky Act Program (continuing administrative costs)	926	150	150	150	150	150	150	150	150	150	6,750	9,026
TOTAL OPERATING COSTS	521,937	86,259	156,292	189,462	197,299	195,200	186,758	194,357	216,764	224,348	19,078,234	21,246,910
BY COMPOSITION:												
Salaries & Expenses of Headquarters Personnel	184,546	22,110	23,958	28,563	32,432	30,419	23,887	20,126	19,837	19,826	1,044,237	1,449,941
Salaries & Expenses of Field Personnel	274,325	37,454	54,428	58,404	54,330	53,834	54,526	54,368	54,352	56,697	2,531,331	3,284,049
Pumping Power												
Used by Pumping Plants	138,579	29,028	119,108	160,966	196,876	198,346	200,377	213,114	236,649	243,981	20,508,088	22,245,112
Produced by Recovery Plants	-35,623	-9,580	-52,554	-69,816	-97,133	-98,084	-102,607	-104,418	-105,858	-108,253	-5,989,396	-6,773,322
Deposits to Replacement Reserves	21,364	7,349	11,327	11,283	10,551	10,384	10,264	10,852	11,472	11,785	969,210	1,085,841
Oroville-Thermalito Insurance Premiums	4,077	305	338	355	355	355	355	355	355	355	15,975	23,180
Less, Portion of Costs Incurred During Construction	65,331	407	313	293	112	54	44	40	43	43	1,211	67,891
TOTAL OPERATING COSTS	521,937	86,259	156,292	189,462	197,299	195,200	186,758	194,357	216,764	224,348	19,078,234	21,246,910
BY PROJECT PURPOSE:												
Water Supply & Power Generation	477,745	78,922	145,057	176,949	186,864	185,724	177,415	185,102	207,182	214,503	18,385,676	20,421,139
Recreation & Fish & Wildlife Enhancement	12,606	2,470	3,704	4,688	4,830	4,242	4,116	4,031	4,353	4,622	248,745	298,407
Flood Control	584	94	149	153	128	68	66	67	70	70	3,947	5,396
Miscellaneous Purposes:												
Federal Share, San Luis and Delta Facilities	28,835	4,475	7,077	7,331	5,129	4,818	4,813	4,809	4,811	4,805	424,206	501,109
Other (Davis-Grunsky, Drainage, City of Los Angeles)	2,167	298	305	341	348	348	348	348	348	348	15,660	20,859
TOTAL OPERATING COSTS	521,937	86,259	156,292	189,462	197,299	195,200	186,758	194,357	216,764	224,348	19,078,234	21,246,910

letter agreements, and all other power revenues for one year following completion of construction.

- Payments to the Department from the energy adjustment account for net annual energy generation in excess of 2.1 billion kilowatthours.

- Federal flood control contributions in the amount of $1.65 million for allocated operations and maintenance costs.

- Annual amount of Oroville power sales revenue in excess over the operating cost and Oroville bond service payment.

In regard to Devil Canyon-Castaic Revenue Bonds, such deposits consist of about $9.2 million to provide a reserve approximating maximum annual bond service.

Deposits for the Pyramid Hydroelectric Project Revenue Bonds consisted of about $19.6 million to pay bond interest through July 1983 and $1.0 million for the first year of operating expense. The deduction of the annual bond service for the Pyramid bonds and first year's operating expense reduced the deposits in reserve through 1983. Deposits for the Reid Gardner Project Revenue Bonds total about $25 million, and an additional deposit has been made for the Bottlerock-Alamo Bond Anticipation Notes.

This line also includes bond proceeds from supplemental water and power revenue bonds in the year of assumed sale to provide for interest during construction and the first year after completion of construction, a reserve approximating the maximum annual bond service, and an allowance for the first year of operating expense. These reserves were reduced in subsequent years as the reserved amounts were used for their respective purposes. When all revenue bonds are retired (2035), all reserves will have been used.

Lines 60-61: Payment of Service on Bonds Sold.

These two lines show the total interest and principal payments on bonds sold to date. Table 31 provides a summary of Water Bonds (Series A through V), Oroville Revenue Bonds, Devil Canyon-Castaic Revenue Bonds, Pyramid Hydroelectric Project Revenue Bonds and Reid Gardner Project Bonds. The last bonds sold were Reid Gardner Project Bonds in July, 1982.

Annual interest and principal payments on individual series are shown in the following bulletins.

Series A-R	Table 13, Bulletin 132-72
Series S	Table 10, Bulletin 132-73
Series T	Table 10, Bulletin 132-74
Series U	Table 11, Bulletin 132-76
Series V	Table 11, Bulletin 132-79
Oroville Series A and B	Table 12, Bulletin 132-72
Devil Canyon-Castaic	Table 10, Bulletin 132-73

The Oroville Revenue Bond service schedule shown in Table 31 is based on the initial bond maturity schedule. Since 1978, the trustee has been retiring bonds prior to the fixed maturity date as follows:

Year	Bonds Retired	Cost
1978	$4,045,000	$3,845,099
1979	9,730,000	8,933,093
1980	1,350,000	1,227,600
1981	2,865,000	1,805,862

In effect, this will decrease the annual interest cost and the principal due in subsequent years. This action will increase the annual deposit to reserve (Line 59), which is held by the trustee and does not affect the basic validity of the financial analysis.

Line 60 also includes over $0.3 million in interest payments to the General Fund for the temporary loan of $46.8 million in 1970 -- repaid by proceeds from the sale of Series N Water Bonds.

TABLE 31: ANNUAL SERVICE ON BONDS SOLD AS OF DECEMBER 31, 1981

(in thousands of dollars)

Calendar Year	Bonds Sold Through December 31, 1981											
	Series A through V Water Bonds		Oroville Revenue Bonds		Devil Canyon-Castaic Revenue Bonds		Pyramid Hydroelectric Project Revenue Bonds Sold 10/23/79		Reid Gardner Project Revenue Bonds-Sold July 7, 1982 *		Total	
	Principal	Interest	Principal	Interest	Principal	Interest	Principal	Interest	Principal	Interest	Principal [a]	Interest
1964	0	3,333	0	0	0	0	0	0	0	0	0	3,333
1965	0	11,114	0	0	0	0	0	0	0	0	0	11,114
1966	0	16,742	0	0	0	0	0	0	0	0	0	16,742
1967	0	26,912	0	0	0	0	0	0	0	0	0	26,912
1968	0	37,760	0	3,876	0	0	0	0	0	0	0	41,636
1969	0	47,461	0	10,448	0	0	0	0	0	0	0	57,909
1970	0	53,291	0	13,145	0	0	0	0	0	0	0	66,436
1971	0	63,035	0	13,145	0	0	0	0	0	0	0	76,180
1972	0	69,148	1,260	13,112	0	0	0	0	0	0	1,260	82,260
1973	1,200	69,348	1,330	13,042	0	7,708	0	0	0	0	2,530	90,098
1974	3,000	69,533	1,400	12,969	0	7,708	0	0	0	0	4,400	90,210
1975	5,000	69,366	1,475	12,893	0	7,708	0	0	0	0	6,475	89,967
1976	7,000	69,408	1,555	12,811	0	7,708	0	0	0	0	8,555	89,927
1977	10,200	69,323	1,635	12,727	0	7,708	0	0	0	0	11,835	89,758
1978	12,700	69,312	1,725	12,637	0	7,708	0	0	0	0	14,425	89,657
1979	13,650	68,690	1,815	12,540	0	7,708	0	0	0	0	15,465	88,938
1980	16,050	67,968	1,915	12,441	0	7,708	0	7,900	0	0	17,965	96,017
1981	18,050	67,109	2,020	12,334	0	7,708	0	7,292	0	0	20,070	94,443
1982	19,250	66,162	2,130	12,221	0	7,708	0	7,292	0	7,972 [b]	21,380	101,355 [b]
1983	20,520	65,148	2,245	12,101	900	7,708	0	7,292	0	23,917 [b]	23,665	116,166 [b]
1984	21,785	64,068	2,365	11,982	955	7,647	640	7,292	0	23,917 [b]	25,745	114,906 [b]
1985	22,555	62,932	2,485	11,862	1,010	7,583	675	7,238	1,235	23,917	27,960	113,532
1986	23,830	61,742	2,605	11,737	1,070	7,515	715	7,180	1,345	23,769	29,565	111,943
1987	25,495	60,492	2,735	11,602	1,135	7,442	755	7,120	1,470	23,607	31,590	110,263
1988	26,770	59,165	2,870	11,464	1,205	7,366	795	7,055	1,615	23,431	33,255	108,481
1989	28,145	57,825	3,015	11,314	1,275	7,284	840	6,988	1,770	23,237	35,045	106,648
1990	29,385	56,473	3,175	11,152	1,355	7,198	890	6,916	1,955	23,025	36,760	104,764
1991	30,365	55,070	3,335	10,983	1,435	7,107	940	6,841	2,165	22,790	38,240	102,791
1992	31,295	53,640	3,510	10,806	1,520	7,010	995	6,761	2,390	22,530	39,710	100,747
1993	32,940	52,183	3,695	10,618	1,610	6,907	1,050	6,693	2,655	22,267	41,950	98,668
1994	34,525	50,660	3,885	10,421	1,705	6,799	1,115	6,622	2,945	21,970	44,175	96,472
1995	35,660	49,073	4,085	10,215	1,810	6,684	1,180	6,545	3,280	21,634	46,015	94,151
1996	36,900	47,436	4,300	9,996	1,920	6,561	1,250	6,464	3,650	21,254	48,020	91,711
1997	36,595	45,818	4,525	9,767	2,035	6,432	1,325	6,376	4,075	20,823	48,555	89,216
1998	36,675	44,226	4,760	9,524	2,155	6,295	1,405	6,283	4,555	20,334	49,550	86,662
1999	37,600	42,655	5,005	9,265	2,285	6,160	1,490	6,184	5,090	19,787	51,470	84,051
2000	38,890	41,033	5,280	8,987	2,420	6,040	1,580	6,078	5,700	19,177	53,870	81,315
2001	39,980	39,351	5,565	8,693	2,565	5,912	1,680	5,964	6,385	18,493	56,175	78,413
2002	41,120	37,620	5,865	8,384	2,720	5,773	1,785	5,842	7,150	17,726	58,640	75,345
2003	42,970	35,835	6,180	8,057	2,885	5,626	1,900	5,712	8,015	16,868	61,950	72,098
2004	45,160	33,957	6,520	7,714	3,055	5,470	2,020	5,573	8,970	15,907	65,725	68,621
2005	46,450	31,995	6,870	7,349	3,240	5,305	2,150	5,424	10,045	14,830	68,755	64,903
2006	47,740	29,971	7,245	6,968	3,435	5,130	2,290	5,268	11,255	13,625	71,965	60,962
2007	49,230	27,883	7,635	6,564	3,640	4,945	2,445	5,102	12,605	12,274	75,555	56,768
2008	51,220	25,727	8,050	6,138	3,860	4,749	2,605	4,925	14,115	10,762	79,850	52,301
2009	53,560	23,478	8,490	5,690	4,090	4,540	2,780	4,736	15,810	9,068	84,730	47,512
2010	55,250	21,134	8,950	5,216	4,335	4,319	2,960	4,534	17,710	7,171	89,205	42,374
2011	56,740	18,717	9,435	4,717	4,595	4,085	3,160	4,305	19,830	5,045	93,760	36,869
2012	58,530	16,216	9,945	4,192	4,875	3,837	3,370	4,060	22,215	2,666	98,935	30,971
2013	60,370	13,676	10,485	3,636	5,165	3,574	3,600	3,799	0	0	79,620	24,685
2014	57,900	11,244	11,055	3,051	5,475	3,303	3,840	3,520	0	0	78,270	21,118
2015	53,690	8,838	11,655	2,435	5,805	3,015	4,095	3,222	0	0	75,245	17,510
2016	46,130	6,626	12,290	1,782	6,150	2,710	4,370	2,905	0	0	68,940	14,023
2017	38,060	4,614	12,960	1,097	6,520	2,388	4,665	2,566	0	0	62,205	10,665
2018	25,350	2,980	13,665	371	6,910	2,045	4,975	2,204	0	0	50,900	7,600
2019	16,890	1,778	0	0	7,325	1,682	5,310	1,819	0	0	29,525	5,279
2020	17,320	934	0	0	7,765	1,298	5,665	1,407	0	0	30,750	3,639
2021	8,510	301	0	0	8,230	890	6,045	968	0	0	22,785	2,159
2022	1,800	48	0	0	8,725	458	6,450	500	0	0	16,975	1,006
TOTAL	1,570,000	2,377,577	244,995	466,191	139,165	283,872	95,800	228,767	200,000	553,793	2,249,960	3,910,200

* *Bonds sold in year 1982.*
a) Serial maturities or mandatory redemption requirements for term bonds.
b) Interest on the Series B bonds is capitalized to August 1, 1984.

Line 62-63: Assumed Payments of Service on Future Bond Sales.

These lines show the projected annual service on future Supplemental Water Revenue Bonds and Water Bonds (Series W and X).

Assumptions concerning the service on future Supplemental Water Revenue Bonds are as follows:

- The net interest cost would average 8.5 percent.
- The service pattern would provide for no maturities during the first 4 years after issuance, with a final maturity 40 years after issuance.

Assumptions concerning the service on future Water Bonds are as follows:

- The net interest cost would average 8.5 percent.
- The service pattern would provide for no maturities during the first 9 years after issuance, with a final maturity for Series W and X Water Bonds 20 years after.

Lines 64-65: Assumed Payments of Service on Future Power Revenue Bonds Sales.

These lines show the projected annual service for the supplemental power revenues bonds discussed in Line 33. Assumptions concerning the service on these future bonds are as follows:

- The net interest cost for the power revenues bonds would average 12 percent.
- The service pattern would provide for no maturities during the construction period of the facility being financed. Final maturity for the bonds would be 30 years after construction is complete.

Lines 66-67: Total Payments of Bond Service.

The total of interest payments shown on Lines 60, 62, and 64 and the total of principal payments shown on Lines 61, 63 and 65 respectively.

Lines 68-69: Repayment of the California Water Fund.

The Burns-Porter Act requires that, after operation, maintenance, and replacement and bond service requirements have been satisfied, project revenues shall be transferred to the California Water Fund as reimbursement to the Fund for monies expended for construction of the State Water Resources Development System. For the financial analysis, the repayment amounts through 1990 (Line 68), together with the $25 million of tidelands revenue appropriated each year to the California Water Fund, are required for financing capital expenditures (Line 27).

Line 69 indicates that repayment to the Fund of monies not required to be appropriated for further construction would commence after 1990. Continuing annual repayments shown thereafter in Line 68 represent repayment of the continuing appropriation from the fund for annual principal and interest payments to the federal government for the additional conservation storage costs shown in Line 23.

The totals of Line 68 and Line 69 equal the total of Line 27 and indicate that all California Water Fund appropriations are repaid as required by the Burns-Porter Act. Line 68 shows that repayment of the California Water Fund will begin later than the projections shown in Bulletin 132-81. This is mainly because future water contractor repayments are projected to be less than that shown in Bulletin 132-81 due to reductions in future SWP construction expenditures (see line 50).

Line 70: Application of Miscellaneous Receipts to Construction Expenditures.

All projected annual accruals of miscellaneous receipts would be totally applied to Water Bond service and construction expenditures through 1990 on the schedule shown in Line 39.

Line 71: Subtotal, Repayment of Capital Financing.

This line is the subtotal of Lines 67, 68, 69 and 70. Under the assumptions of this analysis, Line 71 demonstrates the schedule by which the SWP would eventually repay, with SWP revenues and miscellaneous receipts, all funds used to finance capital expenditures.

Line 72: Reservation for Future Construction.

In accordance with the Burns-Porter Act, all SWP revenues in excess of SWP operating costs, Water Bond service, and California Water Fund repayment shall be deposited in a reserve account for financing future construction of the State Water Resources Development System. Also included in the amounts shown in Line 72 are those miscellaneous receipts (reimbursements of capital costs allocated to recreation and fish and wildlife enhancement) which accrue too late to be applied to construction expenditures under this analysis.

Within the constraints of timing, accruals to the reserve could be available for financing additional SWP costs after 1990, since additional facilities will need to be constructed to meet the contractual minimum yield of the Project.

Line 73: Total Application of Miscellaneous Receipts and Project Operating Revenues.

This summary of the application of revenues and receipts matches the total accruals of such money as shown in Line 56.

CHAPTER IX

LITIGATION

Control Over SWP Operation

Tulare Lake Basin Water Storage District v. State of California, filed October 19, 1976, Sacramento County Superior Court, No. 263582.

A decision in favor of the Department on all counts has been rendered by the trial court. The intended decision, which the judge adopted, was fully discussed in Bulletin 132-81. The judge's final decision was entered on September 25, 1981.

The judge held that the Department did not breach its water supply contracts by releasing stored water to control salinity levels in the Delta because (a) the Department has broad discretion to operate and manage the SWP to protect the public interest; (b) the Porter-Cologne Water Quality Control Act, is a proper exercise of the police power and does not impair the obligations of the water supply contracts; and (c) the Porter-Cologne Act specifically requires State agencies to comply with Basin Plan objectives.

The court also held that contracts between the Department and the Delta water agencies are not a precondition to the delivery of water in excess of Delta vested rights if it is in the public interest to provide such water. The court further concluded that the Department did not violate the injunction staying operation of Decision 1379 of the Water Resources Control Board because the Department is authorized to voluntarily operate the SWP to meet the most recent and comprehensive water quality standards.

The plaintiffs and intervenor appealed and have submitted opening briefs with the Third District Court of Appeal. MWD filed an amicus brief in support of the appellants and intervenor. The State's brief was filed on August 17, 1982.

Salyer Land Company v. Department of Water Resources, filed May 9, 1977, Sacramento County Superior Court No. 267012. The issues in this suit are very similar to those in the Tulare Lake case. However, the plaintiff, a landowner in the service area of the Tulare Lake Basin Water Storage District, is pursuing this action on its own behalf and as a class action on behalf of all other similarly situated landowners. On August 21, 1978, the Department filed its answer to the complaint. The plaintiffs have since taken no action in this case.

Department of Water Resources v. Contra Costa County Water Agency, et al., filed June 22, 1979, Sacramento County Superior Court, No. 282495.

This suit was filed by the Attorney General on behalf of the Department against the Contra Costa County Water Agency, North Delta Water Agency, Central Delta Water Agency, South Delta Water Agency, Byron-Bethany Irrigation District, East Contra Costa Irrigation District, City of Vallejo, Union Properties and 10,000 Does. The suit seeks a declaratory judgment that the defendants must contract with the Department and pay for SWP water used in excess of that available in the absence of the SWP. The suit also seeks $6,050,000 to compensate the Department for water illegally used by the defendants during July and August of 1977.

The Department's actions are based on common law claims (quasi contract) and statutory obligations (Burns-Porter Act, Central Valley Project Act, Delta Protection Act, and Watershed or Origin statutes).

On March 12, 1980, a motion for change of venue was granted and the case transferred to San Franciso (No. 765609). All defendents filed answers to the declaratory relief action. Union Properties filed a cross complaint. Four defendents filed demurrers to the damage causes of action, three of which were sustained. The court ruled that the State can seek a declaration of the parties' rights and obligations including whether the water agencies must contract with the Department to pay for the benefits they received from the SWP. In sustaining the three demurrers, the court ruled that three water agencies, the South Delta Water Agency, the Central Delta Water Agency, and the Contra Costa Water Agency, could not be sued as representatives of the landowners within their boundaries for unauthorized diversion of water.

The City of Vallejo, North Delta Water Agency and East Contra Costa Irrigation District were dropped from the suit as they signed contracts to pay for SWP benefits.

The State Attorney General refused to represent the Department and transferred the case to the Department which is pursuing it through its Office of the Chief Counsel. Approximately 50 additional defendants originally named as Does were served. These defendants were landowners or farm operators in the Delta during 1977. They were served after the court's ruling on the demurrers that the three water agencies could not be sued as the representatives of these defendants.

Demurrers were filed by most of the additional defendants raising the statute of limitations and claiming that the Department had failed to join other parties indispensable to the resolution of the lawsuit. On August 31, 1982, the court ruled on these demurrers in favor of the Department and ordered the defendants to file answers.

Proposition 13 - Project Financial Feasibility

Goodman vs. County of Riverside, filed November 15, 1979, Riverside County Superior Court No. 133871.
This suit was filed in Riverside County seeking recovery of taxes collected by the County for the Desert Water Agency (Desert). Desert does not receive water directly from the SWP but gives its Project entitlement to MWD in exchange for MWD water from the Colorado River.

Desert uses the tax revenues to meet its contract obligations to the State. The Plaintiffs contend that the taxes were collected in violation of Article XIII A of the California Constitution (Proposition 13).

The Department through the Attorney General, filed a complaint in intervention seeking to preserve the financial integrity of the SWP. MWD, San Gorgonio Pass Water Agency and five banks have also intervened. At issue was an opinion, issued by the Attorney General's Office in 1978, concluding that taxes necessary for Burns-Porter Act bonds were not precluded by Article XIII A.

On August 3, 1981, judgment was entered for Defendants and intervenors. The judgment holds that the taxes levied by local agencies to provide funds for payment under the State Water Contracts are taxes levied to pay interest and redemption charges on an indebtedness approved by the voters prior to July 1, 1978, falling within the exception granted by Section 1(b) of Article XIII A. The judge further held that if such taxes did not fall within the exception, Article XIII A would unconstitutionally impair the obligations of the water supply contracts. Thus, the decision upholds the validity of necessary taxes levied to meet payment obligations of the water supply contracts. This, of course, is of utmost importance to the continued financial feasibility of the SWP.

The plaintiffs have appealed the decision of the trial court. The Department filed its response to this appeal in September 1982. The plaintiffs have until December 1982 to submit additional arguments to the court.

Corps of Engineers Permits for Delta Pumps

Sierra Club v. Watt (formerly Sierra Club v. Morton and Sierra Club v. Andrus), filed March 16, 1971, U. S. District Court of Appeal for the 9th Circuit, No. 76-1464. (The District Court Decision is found at 400 F. Supp. 610 (N.D. Cal. 1975).

This suit seeks to enjoin federal and state defendants, including the Director of the Department from constructing or continuing to construct or operate the Delta Pumping Plant, the proposed Peripheral Canal and certain existing or proposed federal CVP facilities because of an alleged failure to meet environmental requirements. The principle statutes involved are the National Environmental Policy Act of 1969 (NEPA), the California Environmental Quality Act of 1970 (CEQA), the Rivers and Harbors Act of 1899, and the Civil Rights Act.

The plaintiff's amended complaint, as supplemented, states four claims for relief: (1) against the State under civil rights statutes; (2) against the State and the Federal Government under the Administrative Procedure Act and the due process clause of the U. S. Constitution for determinations of the Corps of Engineers that the Tracy Pumping Plant and the existing and proposed Delta Pumping Plants, if operated under certain constraints, need no further permits; (3) against the Federal Government for the Bureau of Reclamation's active participation in planning of the proposed Peripheral Canal without an Environmental Impact Statement; and (4) against the State for the planning of the new Delta Pumping Plant and the proposed Peripheral Canal without an Environmental Impact Report as required by CEQA.

The defendant and intervenors have filed motions to dismiss and for summary judgment. The judge ruled on several issues on July 2, 1982. The first was the Sierra Club's claim that the Corps' action violated the plaintiff's civil rights. The judge found there was no such violation. With regard to the Peripheral Canal, the judge found its construction was too speculative to fall within NEPA and CEQA. With regard to the new pumps, he found the Department had already agreed that CEQA required an EIR and the Department was proceeding with its preparation.

The final issue involved the Administrative Procedure Act. The judge found the Corps' decision that the Tracy Pumping Plant and the existing Delta Pumping Plant did not need a permit, was not an abuse of discretion, and he would not overturn the Corps' decision. As to the additional pumps, he found there was not a sufficient record regarding the Corps' decision to determine whether the decision was an abuse of discretion.

The judge has requested additional information from the parties and established a schedule for submission of additional briefs. A hearing will be held in January 1983, on this last remaining issue.

Sacramento - San Joaquin Delta Water Cases

Eight cases have been brought to challenge the merits of Decision 1485 of the SWRCB establishing conditions of water rights permits of the SWP and CVP and the SWRCB's revised water quality control plan for the Delta and Suisun Marsh.

Following is a list of the cases:

a. San Joaquin County Flood Control and Water Conservation District v. State Water Resources Control Board, filed November 11, 1978, Contra Costa County Superior Court No. 193377.

b. Central Valley East Side Project Assoc. v. State Water Resources Control Board, filed November 13, 1978, Sacramento County Superior Court No. 277506.

c. Contra Costa Water Agency v. State Water Resources Control Board, filed November 13, 1978, Contra Costa County Superior Court No. 193298.

d. Crown Zellerbach Corp. v. State Water Resources Control Board, filed November 13, 1978, Contra Costa County Superior Court No. 193368.

e. Fibreboard Corp. v. State Water Resources Control Board, filed November 13, 1978, Contra Costa Superior Court No. 193313.

f. Kern County Water Agency v. State Water Resources Control Board, filed November 13, 1978, Sacramento County Superior Court No. 277555.

g. South Delta Water Agency v. State Water Resources Control Board, filed November 13, 1978, Contra Costa Superior Court No. 193342.

h. United States v. State Water Resources Control Board, filed November 13, 1978, Sacramento County Superior Court No. 277544.

Six other cases have been brought to invalidate the Environmental Impact Report on which Decision 1485 and the revised water quality control plan are based. Following is a list of these cases: cases:

i. The Metropolitan Water District of Southern California, Kern County Water Agency and Tulare Lake Basin Water Storage District v. State Water Resources Control Board, filed October 6, 1978, Sacramento County Superior Court No. 276390.

j. Contra Costa County Water District, City of Antioch, City of Pittsburgh, City of Martinez, Oakley County Water District, City of Concord, City of Clayton and City of Pleasant Hill v. State Water Resources Control Board, filed October 6, 1978, Contra Costa County Superior Court No. 191277.

k. South Delta Water Agency, San Joaquin County Flood Control and Water Conservation District, Albert Muller and Alexander Hildebrand v. State Water Resources Control Board, filed October 11, 1978, Superior Court, City and County of San Francisco, No. 743341.

l. San Joaquin County Flood Control and Water Conservation District, Central Delta Water Agency, Delta Farms, Reclamation District No. 2030, Reclamation District No. 563 and Conrad Silva v. State Water Resources Control Board, filed October 11, 1978, Superior Court, City and County of San Francisco, No. 743342.

m. Central Valley East Side Project Assoc., Friant Water Users Assoc., County of Tulare, Westlands Water District, Central Valley Project Water Association and San Luis and Delta-Mendota Users Assoc. v. State Water Resources Control Board of the State of California, filed October 11, 1978, Sacramento County Superior Court No. 276337.

n. Contra Costa County Water Agency v. State Water Resources Control Board, filed October 13, 1978, Superior Court, City and County of San Francisco, No. 743385.

The Department is either a real party in interest or an intervenor in all fourteen of these cases in which the Attorney General has authorized the Department to represent itself. The cases have been coordinated and an order was issued on March 3, 1980, establishing liaison counsel, a discovery schedule, a procedure for certifying the record, and a schedule for further actions. A status conference is scheduled for November 1982.

South Delta Water Agency v. United States, et al., filed July 9, 1982. Federal District Court for the Eastern District of California, CIV S-82-567 MLS.

This suit was filed in Sacramento by the South Delta Water Agency (SDWA) against the Bureau of Reclamation and the Department. It involves the effects of the operation of the CVP and the SWP on the southern Delta.

As to the Department and the SWP, SDWA alleges that the operation of the SWP pumps violate southern Delta rights by lowering water levels, reversing flows, and diminishing the influence of the tides. The suit seeks a declaration that (1) the CVP and SWP must be operated in a manner that will neither diminish the quantity nor degrade the quality of the inchannel water of the southern Delta below that which would exist in the channels in the absence of the two projects, and (2) the United States and the State of California may not appropriate or divert water from the Delta or any Delta tributary which is needed for the reasonable uses of the southern Delta. The suit also seeks preliminary and permanent injunctions along the same lines and seeks further relief against the Bureau.

The case has been assigned to Judge Milton Schwartz. A status conference is scheduled for November 5, 1982.

Seepage Suits, Sacramento and Feather River

During 1975 and 1976, several suits were filed against the State and the United States by more than 25 landowners adjacent to the Sacramento and Feather Rivers for damages alleged to have been caused by erosion and seepage in March and April of 1974. The plaintiffs claim damages, in excess of $30,000,000, resulting from the coordinated operation of the CVP and SWP.

One such case is H. S. Sanborn, et al. v. United States, filed March 22, 1976, U. S. District Court CIV. 5-76-154, a complaint in inverse condemnation, negligence, and trespassing.

The claim arises from damages allegedly caused by high flows in the Sacramento River in March and April of 1974 due to a heavy and late storm. The levels were partially controlled by releases from Shasta Dam and diversions from the Trinity Project. The plaintiffs contend that the CVP kept the river levels high for an extended period causing erosion and seepage which damaged their orchards and crops. The defendants also sued the State of California claiming that the Department participated as a joint venturer in the planning and operation of the CVP.

On September 19, 1977, the judge ruled in favor of the defendants. The only remaining basis which the plaintiffs have for recovery is to show they suffered damage which resulted from activity of the U. S. which was unrelated to the operation of the CVP.

Kern River Intertie

River West Incorporated v. State of California, et al., filed August 5, 1980, Kern County Superior Court, No. 174778, injunctive relief.

This case involves local water rights and the Department's operation of the Kern River Intertie, a flood control project. The plaintiffs have sued the Department and landowners upstream of them on the Kern River alleging that the Department and the upstream landowners are infringing upon the riparian and appropriative rights of the plaintiffs to water of the Kern River. Plaintiffs contend, as to the Department, that water in excess of flood waters and water subject to appropriation is being accepted into the Intertie contrary to the Intertie's flood control purpose.

As to the upstream landowners, the plaintiffs contend they are diverting water to which plaintiffs have rights and that some of these defendants have made improper transfers of water.

The Department and each of the other defendants have filed answers to the plaintiff's complaint and discovery is in progress. The plaintiffs and some of the other defendants are attempting to have a judge assigned to the case to hear various pending motions.

Construction Claim

Pascal and Ludwig, Inc. (formerly Zurn Engineers) v. Department of Water Resources, filed January 8, 1980, L. A. Superior Court, No. C309428.

Pascal and Ludwig, Incorporated (formerly Zurn Engineers), has refiled its claims arising out of the construction of the Grizzly Valley Dam Complex (see Bulletin 132-79). Plaintiff, who was contractor for the construction of the dam, contended in the first lawsuit that the Department owed it an additional $1.4 million for work done because of changes in the work, forced acceleration, and added quantities of excavation and fill. In this first suit filed in state court the District Court of Appeal found in favor of the Department. The California and United States Supreme Courts denied petitions to hear the case.

Pascal and Ludwig, Inc. is now contending in this suit that Civil Code Section 1670 provides additional rights to resolve these claims through arbitration.

The Department's answer, filed on March 31, 1980 contests the retroactive application of Civil Code Section 1670 and relies on law of the case, res judicata, and other affirmative defenses. An at issue memorandum was filed on September 23, 1980. However, no action has been taken by either party to move the case to trial.

Wild and Scenic River Cases

In July 1980, Governor Brown requested that then United States Secretary of the Interior, Cecil Andrus, add approximately 6,400 kilometres (4,006 miles) of rivers in the California Wild and Scenic Rivers System to the National Wild and Scenic River System. Governor Brown took this action under the authority of the National Wild and Scenic Rivers Act (16 U.S.C. 1271 et seq.). The National Act permits the Governor of any state to apply to the Secretary of the Interior for national designation of State designated rivers. On January 19, 1981, Secretary Andrus acted on the California's applications by adding approximately 1,988 kilometres (1,235 miles) of California rivers to the National System.

After Secretary Andrus' decision, three lawsuits were filed in federal court. County of Del Norte v. United States (N.D. Cal., No. C-81-0467 WAI, filed February 2, 1981) was brought by four Northern California counties (two of which have subsequently withdrawn from the litigation) and Northern California timber interests. The lawsuit claims that the Final Environmental Impact Statement on inclusion of the California rivers in the National Wild and Scenic Rivers System was prepared in violation of regulations of the Council on Environmental Quality. The plaintiffs seek a declaration that California's application violated federal law.

County of Josephine v. Watt (D. Ore., No. 81085, filed January 28, 1981) was brought by the Southern tier of Oregon Counties and by timber interest seeking a declaration that Secretary Andrus' decision was illegal and seeking an injunction, overturning his action. On July 29, 1981, this case was transferred to Northern California Federal District Court, where the other Wild and Scenic Rivers cases are pending.

On April 7, 1981, the Association of California Water Agencies (ACWA) and ten SWP water contractors filed ACWA v. United States (N.D. Cal. No. C-81-1457 WAI), in Northern California Federal District Court. This suit claims that inclusion of the rivers in the national system jeopardizes the plaintiffs' maximum annual entitlements from the SWP. It claims California's application for national status for the rivers was defective and also claims violations of the National Environmental Policy Act and rules promulgated by the CEQ. Like the other federal lawsuits, it seeks a declaration and an injunction against implementation of Secretary Andrus' decision.

The State of California was originally not a party to any of these lawsuits. However, the State as well as four environmental groups, the Environmental Defense Fund, the Sierra Club, California Trout, and Save the American River Association have intervened in each of the suits.

In the case brought by the Oregon plaintiffs, the court has ruled in favor of the State and the United States on every point except the adequacy of the Environmental Impact Statement. The court has ordered a trial to be held on this issue. In the two suits brought by the California plaintiffs the court has given some preliminary indication that it is inclined to rule for the plaintiffs on their claim that the State failed to comply with a regulation of the Council on Environmental Quality concerning distribution of the Environmental Impact Statement. However, the court has not yet issued a final decision in these two cases.

Federal-State Water Rights Relationships

California v. United States (formerly U.S. v. State of California), United States District Court (Sacramento, CIV S-3014, filed October 1973) Ninth Circuit Court of Appeals.

This suit arose from conditions imposed by the SWRCB in Decision 1422 on the U. S. Bureau of Reclamation's water rights for the New Melones Dam project. The dispute centers on whether Section 8 of the Federal Reclamation Act of 1902 gave the states authority to place conditions on federal reclamation projects.

Several other cases involving the SWRCB's jurisdiction over the federal CVP are being held in abeyance in the U. S. District Court of Sacramento pending the outcome of this case. They are: People ex rel. SWRCB v. Morton (an action by the State to compel CVP compliance with SWRCB water rights permits); and San Joaquin County Flood Control and Water Conservation District v. SWRCB (to set aside the Lower American River Water Rights Decision 1400).

The United States was sustained in both the District Court and U. S. Court of Appeal. The U. S. Supreme Court accepted the State's petition to review the case and on July 3, 1978, the Supreme Court decided in favor of California. It held that the Bureau must comply with conditions in its water rights permits that are not inconsistent with congressional directives. The case was remanded for a determination as to whether the U. S. was estopped from attacking the SWRCB's decision on the merits and, if not, whether any conditions in the New Melones permits are inconsistent with congressional directives.

On February 26, 1981 Judge Price, of the U. S. District Court in Fresno, decided that the Bureau was not bound by conditions in D-1422 relating to power production, but that most other significant

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conditions were binding. On April 8, 1981, the State filed an appeal to the Ninth Circuit. On June 5, 1981, the U. S. filed a cross-appeal. The case was argued before the Ninth Circuit on November 12, 1981.

On January 15, 1982, the water level in New Melones Reservoir exceeded elevation 257 metres (844 feet), the maximum authorized by the SWRCB. On January 29, 1982 the State filed in the Ninth Circuit for a temporary restraining order and an injunction pending appeal.

On February 2, 1982, the Court issued an injunction ordering release of water stored in excess of elevation 257 metres (844 feet), except when such releases will cause damage or potential damage to downstream properties or to other legitimate downstream interests. The U. S. developed a plan which called for minimal releases from the reservoir in order to prevent seepage damage to downstream properties.

On March 10, 1982, in response to a State request, the Ninth Circuit modified the February 2, 1982 injunction. The modification requires the Bureau to (1) release water from New Melones Reservoir through alternative waterways and facilities to the extent that releases are physically and economically feasible and flows are nondamaging, and (2) describe the extent to which specific downstream properties are covered by flood control easements and provide estimates of damage that will occur to downstream properties at release rates between 34 m^3/s (1,200 cfs) and 99 m^3/s (3,500 cfs). Additionally, the Court stated that nothing in the order authorizes the U. S. to fail to release water necessary for prior rights. The Bureau has been releasing varying amounts of water from the reservoir, taking into account flows of the San Joaquin River. However, the water level will not recede to that specified by the SWRCB unless water year 1983 is relatively dry.

Electrical Power Cases

State of California v. Los Angeles City Department of Water and Power (LADWP), filed September 26, 1978, L. A. Superior Court No. C-255911.

The Department filed this suit to obtain monies owed by LADWP under the Cooperative Development Contract for Hydroelectric facilities at Castaic Lake. In July of 1975 LADWP withheld approximately $69,000 from the Peaking Capacity Foregone payment owed to the Department. In subsequent years, LADWP has withheld larger amounts from the Peaking Capacity Foregone payment. LADWP has asserted that the clause, which permits a reduction in that payment if there is a forty-five day or longer failure to schedule water through the Angeles tunnel, has been triggered in these instances.

On May 27, 1982, the parties agreed upon a process for settlement of the litigation. This process involves amendment of the Castaic contract in accordance with principles already agreed upon and payment by LADWP of a specified amount of money to the Department. As part of this settlement process, the Department has submitted draft amendments to LADWP.

Southern California Edison Company v. Los Angeles City Department of Water and Power, filed October 18, 1979, Los Angeles Superior Court No. C-301654.

This suit was filed by Edison to compel LADWP to continue to meet its obligations to supply the Department with electrical power under the Suppliers Contract. LADWP has claimed that under the legal doctrine of commercial impracticability, it is entitled to be excused from its obligations under this contract. LADWP had earlier given notice to the Department that, unless the Department paid a higher price for the power than that set in the Contract, it would no longer provide the Department with service. After the Department

refused to deviate from the terms of the Suppliers Contract, LADWP informed the Department and the other parties to the contract that as of October 21, 1979, it would terminate service. PGandE and San Diego Gas and Electric, which, along with Edison and LADWP, are the suppliers under the contract, are named as defendants in the lawsuit.

On October 18, 1979 Edison obtained a temporary restraining order (TRO) requiring LADWP to continue to supply power under the Suppliers Contract. On November 7, 1979 a preliminary injunction was issued in place of the TRO requiring LADWP to supply power. The Department filed its complaint to intervene in the suit on January 14, 1980. On April 10, 1981 LADWP and Edison stipulated that Edison would potentially be liable for damages for an improperly issued preliminary injunction to the same extent as
if Edison posted a bond as it was required to do when it requested the preliminary injunction. This stipulation will serve in lieu of the $14 million bond and any increased bond that would otherwise be required. The case is in the discovery stage and the parties are attempting to reach agreement on a Statement of Stipulated Facts.

Pacific Gas and Electric Company v. Los Angeles City Department of Water and Power, filed October 12, 1979, San Francisco Superior Court No. 759086.

This suit was filed by PGandE to compel LADWP to continue to meet its obligations to supply the Department with electrical power under the Suppliers Contract or, in the alternative, to restrain the Department from taking more than 85 percent of the power scheduled under the Suppliers Contract. This is the amount of power available if LADWP does not supply its proportionate share. As in, Southern California Edison Company v. Los Angeles City Department of Water and Power, (L. A. Superior Court No. 301654) LADWP is claiming that the legal doctrine of commercial impracticability excuses it from performing its obligations under the Suppliers Contract.

A hearing on PGandE's application for a temporary restraining order against LADWP has been indefinitely postponed by PGandE pending the outcome of Southern California Edison Company v. LADWP.

In the Matter of Pacific Gas and Electric Company (Stanislaus Nuclear Project), October 15, 1976, Nuclear Regulatory Commission No. P-564-A.

On April 15, 1977, the Department, along with several California municipal utilities, was permitted to intervene in a proceeding investigating the antitrust implications of granting a nuclear powerplant license to PGandE for its proposed Stanislaus Nuclear Project. The thrust of the proceeding involves a review of the adequacy of license conditions that were negotiated between PGandE and U. S. Attorney General to eliminate the anticompetitive consequences of the issuance of the nuclear powerplant license.

Extensive discovery has taken place, although the proceeding has yet to go to trial. On May 3, 1982, PGandE requested the Nuclear Regulatory Commission (NRC) to permit it to withdraw from the proceeding. The primary ground for the withdrawal is that the estimated operation date for the Stanislaus Nuclear Project has drastically slipped to the late 1990s and, therefore, a license from the NRC will not be required in the foreseeable future. The Department has indicated that it is not opposed to the withdrawal request, provided that adequate provisions for the retention of documents are adopted by the NRC so that the parties will not be disadvantaged if the proceeding is resumed. The NRC intends to hold a hearing on the withdrawal request.

State of California v. Pacific Gas and Electric Company, U. S. District Court, E. D. Cal., No. Civ. S-82-164 (LKK), February 25, 1982.

The Department filed this lawsuit against the Pacific Gas and Electric Company (PGandE) to obtain relief from certain restrictions on the Department's use of 300 MW of Pacific Transmission Intertie capacity contained in the Contract Between the State of California and California Companies for the Sale, Interchange and Extra High Voltage Transmission of Electric Capacity and Energy, dated August 1, 1967. The Department claims that these restrictions violate the antitrust laws.

The Department and PGandE are negotiating in an attempt to arrive at a settlement of this litigation. Accordingly, the Department has not served the complaint on PGandE.

City of Anaheim, et al. v. Southern California Edison Company, U. S. District Court, C. D. Cal., Docket No. 78-0810-MML (KY).

This lawsuit was brought by several Southern California municipalities against the Southern California Edison Company (Edison) to obtain relief from alleged violations of the antitrust laws.

At the request of Edison, the Court issued a subpoena for documents from the Department for use in this lawsuit. The Department is in the process of providing Edison with the documents called for in the subpoena. The Department is not a party to this lawsuit.

Southern California Edison Company, Federal Energy Regulatory Commission (FERC) Docket No. ER 78-170, San Diego Gas and Electric Company, FERC Docket No. ER 78-171, Pacific Gas and Electric Company, FERC Docket Nos. ER 78-163 and EL 78-3, Southern California Edison Company, Public Utilities Commission Advice No. 451-E.

These proceedings involve requests by Edison, San Diego Gas and Electric Company (SDG&E), and PGandE for an increase in the rate, effective July 1, 1983, charged by each such utility for off-peak energy sold to the Department under the Contract Between the State of California and California Companies for the Sale, Interchange and Extra High Voltage Transmission of Electric Capacity and Energy, dated August 1, 1967.

The Department has settled the cases with Edison and SDG&E. These settlements are pending FERC approval. The Department and PGandE are in the process of negotiating a settlement of the PGandE initiated cases.

Pacific Gas and Electric Company, Federal Energy Regulatory Commission Docket No. E-7777 (II).

This proceeding involves an investigation into the Pacific Intertie and California Power Pool arrangements. The Department is not a party to this proceeding. However, the Department has been required to produce witnesses and documents during the proceeding.

Department of Water Resources v. Westinghouse, filed February 21, 1979, Sacramento Superior Court, No. 279649.

The Department filed suit against Westinghouse Electric Corporation to recover $1 million in damages for failure of Hyatt-Thermalito Powerplant Motor/Generators. Damage to motor/generator coils supplied by Westinghouse caused the coils to be replaced sooner than expected. The suit was settled on September 20, 1982.

Without admitting liability, Westinghouse has agreed to a commercial settlement, i.e.: Westinghouse will supply two bearing feasibility studies (valued at $100,000) without cost to the Department and provide credits totalling $370,000 against future purchases of Westinghouse equipment.

State of California v. Oroville Wyandotte Irrigation District, filed July 23, 1982, Sacramento County Superior Court No. 305174.

The Department filed this suit to obtain a writ of mandate to compel the Oroville-Wyandotte Irrigation District (OWID) to prepare an Environmental Impact Report (EIR) on OWID's proposed Kelly Ridge II powerplant. If it proceeds as proposed, the Kelly Ridge II plant would divert 50 cfs of water around Lake Oroville and the Edward Hyatt Powerplant. The Department currently uses the water to generate approximately 20 million Kilowatt hours of energy annually at the Hyatt plant. The Department contends that OWID violated the California Environmental Quality Act by failing to consult with the Department during preparation of its Initial Study of the Kelly Ridge II project. The Department also contends that an EIR should have been prepared to examine the significant environmental impacts of the proposed project. These include the possibility that the Department would have to resort to additional consumption of fossil fuels and other nonrenewable resources to replace lost energy and firming capacity. Another hearing on OWID's demurrer to the Department's petition is scheduled for October 12, 1982. Another hearing on the case is scheduled to take place before November 15, 1982.

Oroville Wyandotte Irrigation District v. State of California, Department of Water Resources filed January 4, 1982, Sacramento County Superior Court, No. 301927.

The Oroville Wyandotte Irrigation District, owner of the Palermo Canal, has filed suit against DWR alleging that construction of the Palermo Powerplant would violate a 1963 agreement between DWR and the District. The Palermo Powerplant will consist of a 500 kilowatt hydroelectric powerplant at the tunnel exit of Palermo Canal on the left abutment of Oroville Dam. The agreement provided for substitute water service to the District for the portion of the Palermo Canal which was inundated by the construction of Oroville Dam. The District claims in its suit that a trust should be imposed on the proceeds of the powerplant for the benefit of the District. The District also seeks an order preventing DWR from proceeding with construction of the plant until obtianing permission from the California Public Utilities Commission and authorization from the State Water Resources Control Board to use the water for hydropower generation. Finally, the District seeks to rescind the agreement for substitute water service, alleging misrepresentation.

Trial of this case is set for October 19, 1982.

CHAPTER X

SPECIAL EVENTS

From June 1981 through mid-1982, the Department participated in several SWP special events. These, along with other topics of special interest, are summarized in this chapter.

Los Banos Demonstration Desalting Facility

On April 2, 1982, local water leaders, SWP water contractors, and Department personnel participated in groundbreaking ceremonies for the Los Banos Demonstration Desalting Plant, which is under construction in the City of Los Banos. A model of the plant was on display at the ceremonies; earlier, the model was displayed at the Merced County Fair in Los Banos. A photograph of the model appears on the cover of this report.

The Los Banos plant will be the main component in the Department's program to both demonstrate the feasibility of reclaiming drainage water and supplement SWP supplies with reclaimed water. It will also be a part of the Department's participation in the Resources Agency 20-year plan, "Investing for Prosperity", the objectives of which are to enhance and restore California's forests, fisheries, wildlife, and other natural resources. Once the feasibility of the Los Banos plant has been demonstrated, other plants will be constructed, all of which will contribute toward meeting the Governor's objective of reclaiming 493 000 dam^3 (400,000 acre-feet) of water annually by year 2000. The operation of the Los Banos plant and its role in the future of the SWP are described in Chapter II.

At the time of the groundbreaking ceremony, the biological portion of the plant was under construction. Full operation of the facility is scheduled for 1983, after which it will be tested for three years.

John E. Thurman, Assemblyman of the 27th District and Chairman, Assembly Committee on Agriculture, addresses the audience at the groundbreaking ceremony for the Los Banos Demonstration Desalting Facility at the Merced County Fairgrounds Building.

Alamo Powerplant

On April 20, 1982, the Department conducted groundbreaking ceremonies for the Alamo Powerplant on the East Branch of the California Aqueduct. The Powerplant will be located in southern Kern County, east of Gorman and north of Quail Lake.

Scott E. Franklin, Chairperson of the California Water Commission and William E. Warne, former Director of the Department, joined Director Ronald B. Robie and Deputy Director Robert W. James in observing this significant event. Wallace Spinarski, General Manager of Antelope Valley-East Kern Water Agency and Joseph Sage, Secretary-Treasurer, of Palmdale Water District represented the SWP water contractors. Douglas Dixon, President of the Antelope Valley Board of Trade, and Board Directors George and Frank Lane of Lancaster also participated in the ceremony. They were accompanied by local officials representing the water and community interests of the Antelope Valley.

Alamo Powerplant, scheduled for operation in 1985, will be the largest of 13 small hydroelectric units on the SWP. The first Alamo unit is rated at 17 megawatt capacity. It will generate energy to serve 18,300 households and will save about 192,000 barrels of oil annually. The estimated construction costs of the initial unit of Alamo Powerplant are about $43 million. A second 12-megawatt unit will be added to the power plant when the California Aqueduct East Branch is enlarged.

The turbine for the power plant is being manufactured in Japan by Toshiba Manufacturing Company under a contract with Mitsui and Company, the U. S. bidder who was awarded the contract.

A further discussion of the power plant's operational capabilities is presented in Chapter II.

Wallace Spinarski (left) General Manager of Antelope Valley-East Kern Water Agency, Director Ronald B. Robie (center), Past Director William E. Warne (right) and Douglas Dixon of the Antelope Valley Board of Trade (standing behind Director Robie) wave flags to begin the Alamo Powerplant groundbreaking ceremony on April 20, 1982. Seated on the right is Scott Franklin, Chairperson of the California Water Commission.

South Geysers Geothermal Powerplant

On a remote mountain site in Sonoma County, ground was broken for the 55-megawatt South Geysers Geothermal Powerplant on July 9, 1982. The groundbreaking ceremony was also a testimonial to Ed Terhaar, former chief of the Department's Energy Division from 1970 to 1980. A bronze plaque honoring Mr. Terhaar will be placed in the completed South Geysers Powerplant commemorating his work in developing the Department's energy supply program. The long-range energy program is aimed at assuring adequate energy for SWP needs after the existing contracts with electric utility companies expire in April 1983. South Geysers Powerplant, scheduled to be on line in 1985, is part of the mix of energy sources in that program.

The South Geysers Plant is discussed more fully in Chapter II.

On July 9, 1982 Director Ronald Robie and Ed Terhaar, former Chief of the Energy Division, participated in a groundbreaking ceremony at South Geysers. The plaque shown honors Terhaar and will be placed in the future plant.

Groundbreaking for the South Geysers Geothermal Powerplant. Left to Right: Frank J. Hahn, Chief, Energy Division, DWR; Gerald H. Meral, Deputy Director, DWR; Nolan H. Daines, Vice President of Planning and Research, PGandE; M. Catherine Bergren, Assistant Director, DWR; Ronald B. Robie, Director, DWR; Edward J. Terhaar, Former Chief, Energy Division, DWR.

Bethany Wind Park

As part of the Department's long-range program to provide energy for the SWP, a 10-megawatt Bethany Wind Park is being built in the hills of eastern Alameda County near Bethany Reservoir. The Department held a Media Day on July 7, 1982 to introduce the benefits of converting the Delta winds into electricity.

Two-hundred of the 50-kilowatt windmills will be installed over the next five years at Bethany Wind Park. The energy will be used by the South Bay Pumping Plant, which delivers water to Alameda and Santa Clara Counties. The windmills will provide about 20 percent of the South Bay plant's energy needs.

The wind turbines are built by Energy Sciences, Inc. of Boulder, Colorado, and are being installed by TERA Corporation of Berkeley. TERA owns and operates the project on land leased to TERA by the Department. The Department will purchase the energy produced.

Wind generators in operation at Bethany Wind Park. California Aqueduct is shown on the left.

William E. Warne Powerplant

On September 17, 1982, the Department held a dedication ceremony for the William E. Warne Powerplant. The ceremony was held at the location of the hydroelectric plant in the Tehachapi Mountains at the north end of Pyramid Lake.

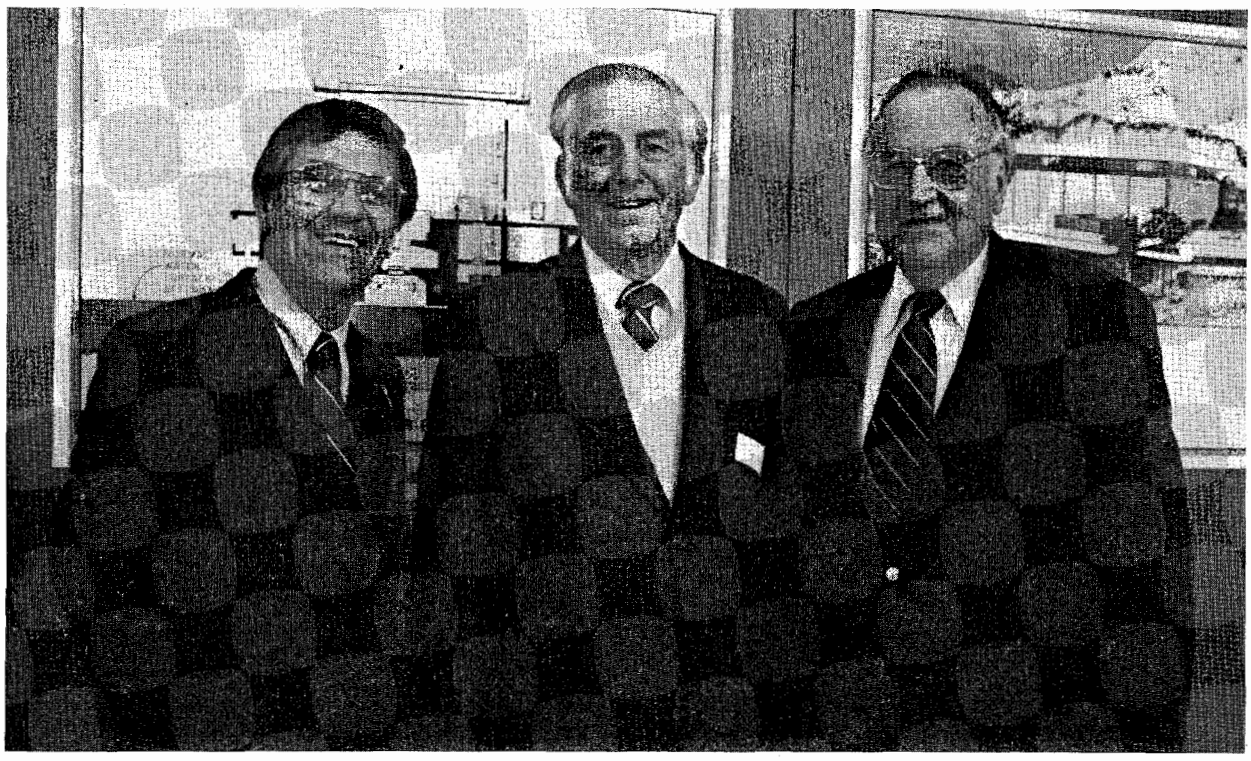
The powerplant will contribute 75 megawatts to hydropower generation for use by the SWP. The energy generated will help offset the energy used by project pumps to move water from Northern California, through the San Joaquin Valley, to Southern California. Built into the powerplant are passive energy conservation measures which will be utilized in the operation of the powerplant, along with systems to heat and cool the plant interior using sunlight, waste heat from the generators and the temperature-stabilizing capability of Pyramid Lake. Initial operation of the powerplant is scheduled in late 1982.

The plant was named in honor of William E. Warne, the Department's second Director, who held the position from 1961 through 1966. This was an eventful time for the Department's history. This was the period when contracts were signed with the 30 SWP long-term water contractors and the initial construction of the SWP was taking place.

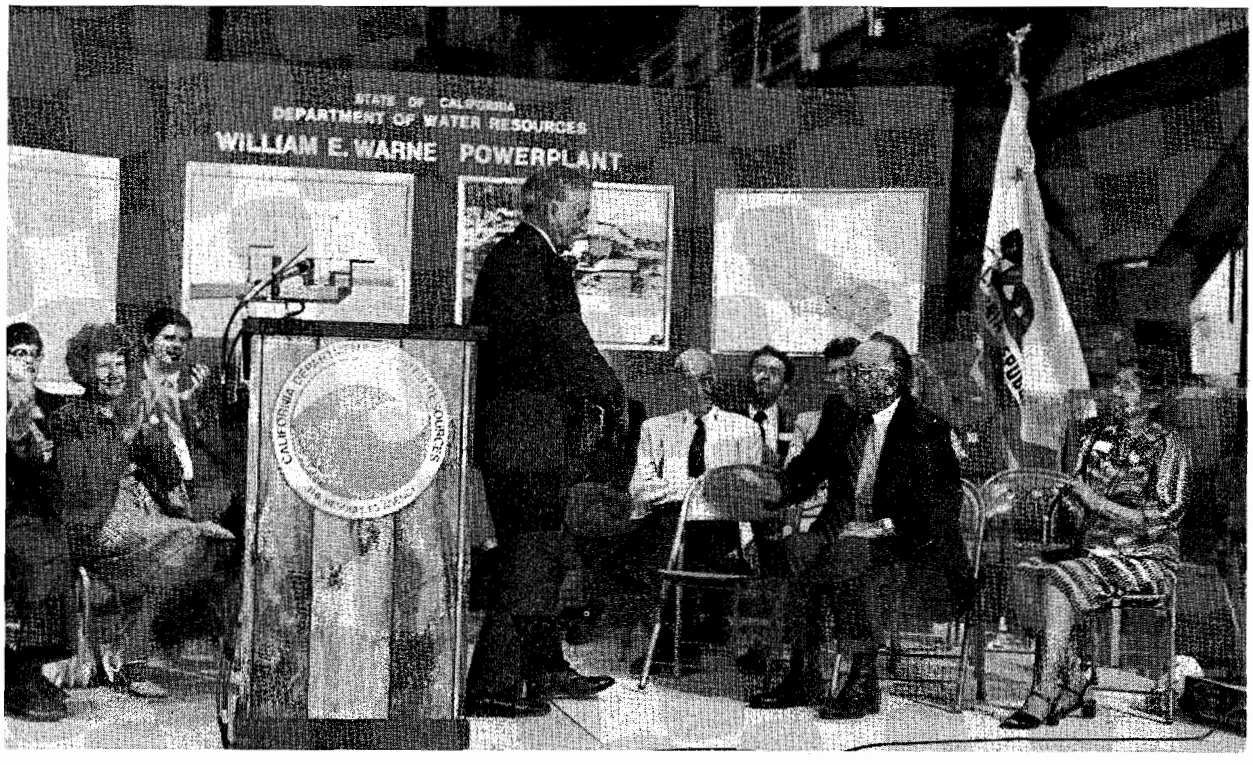
William E. Warne was also the first administrator of the Resources Agency (October 1961 to January 1963), Director of the Department of Agriculture (1960), and Director of the Department of Fish and Game (1959). He served with the U. S. International Cooperation Administration (Point 4), the United Nations Command in Korea, and was a vice president of the Development and Resources Corporation.

Ronald B. Robie, Director of Water Resources, was Master of Ceremonies at the dedication. Special guests included Mr. and Mrs. William E. Warne, and speakers former Governor of California, Edmund G. "Pat" Brown, Scott Franklin, Chairperson, California Water Commission, Judge B. Abbott Goldberg, former Chief Deputy Director, Department of Water Resources.

William E. Warne, DWR's Second Director, addresses the audience at the dedication ceremony for the William E. Warne Powerplant. Mr. Warne is accompanied at the podium by former Governor Edmund G. "Pat" Brown (right), DWR Director Ronald B. Robie (left), and DWR first Director, Harvey O. Banks.



William E. Warne (center), former Governor Edmund G. "Pat" Brown, and DWR Director Ronald B. Robie at the William E. Warne Powerplant dedication on September 17, 1982.



Former Governor Edmund G. "Pat" Brown (seated) congratulates William E. Warne. Seated to the right is Mrs. William E. Warne.

The Department's Emergency Responsibilities

On December 28, 1978 Governor Brown issued Executive Order No. B-48-78, in which he declared that it is the responsibility of the State to maintain a high degree of preparedness in the event of an earthquake, flood, fire, riot, epidemic, attack by a foreign power, and other emergencies. The Governor also mandated that the following steps be taken:

- The Director, Office of Emergency Services, is responsible for preparation of the State of California Emergency Plan and the submission thereof, through the California Emergency Council, to the Governor for approval;
- The head of each department, bureau, board, commission and independent institution of State government, hereinafter referred to as an agency, is responsible for the emergency planning and preparedness of the agency;
- Specific assignments of emergency functions to a given agency will be made in an Administrative Order by the Director, Office of Emergency Services, following consultation with the respective agency head.
- Draft copies of agency procedures designed to carry out emergency assignments shall be submitted to the Director, Office of Emergency Services, for review and approval prior to publication.

Under authority of the Executive Order, the Department of Water Resources and the Office of Emergency Services signed Administrative Order 79-39 on April 13, 1979. In the Order, specific tasks were assigned to the Department in times of State or National emergency.

The Department's emergency responsibilities were updated and redefined on July 8, 1981 in Administrative Order 79-39 as follows:

- The protection of its personnel, equipment, supplies, facilities, and vital public records against the destructive forces of nature or man.
- The continuation of essential services during an emergency utilizing a minimum of resources.
- The redirection of all other resources to accomplish the following:
  1. Providing flood protection and flood fighting services statewide;
  2. Furnishing engineering and communications support to the state emergency organization;
  3. Providing engineering advice and technical assistance to the State Office of Emergency Services on flood hazard mitigation planning; and
  4. Assisting with the management of the Heavy Construction Division, State Construction Organization.

The pre-emergency functions of the Department include the following:

- Designate by name and provide a primary and alternate representative to the State Office of Emergency Services (OES), and to each regional OES office, for the purpose of planning and coordinating interagency emergency plans and procedures.

- In coordination with the OES, develop and maintain plans and procedures to carry out the responsibilities enumerated in the above paragraph. Submit draft plans from State and regional levels to OES for review and approval.

- Determine departmental resources required to provide for the continuance of essential services and maintain an inventory of resources needed to accomplish emergency functions. Stockpile supplies and materials for use prior to, during and following an emergency.

- Monitor flood conditions, earth movements, and dams.

- Provide advance information and warning regarding possible or impending emergencies, including weather information, stream flow information, and flood forecasts; notify OES of information regarding possible emergency situations.

- Coordinate plans, procedures, and preparations with affected agencies, entering into working agreements as necessary to promote the effectiveness of the emergency systems concerned.

- Establish, in conjunction with the OES, procedures for coordinating and disseminating emergency public information through the California Emergency Public Information System.

- Establish departmental alerting and mobilization procedures.

- Prepare and submit to the Division of State Police, Department of General Services, an employee protection plan in emergency situations.

- Provide for the training of personnel assigned emergency functions to insure operational readiness and make such personnel available for periodic test exercises conducted by the OES.

In an emergency alert, when an emergency appears imminent or actually exists but prior to declaration of emergency by the Governor, the Department shall be responsible to provide flood protection and flood fighting services immediately required for the protection of lives and property. The Department may perform the work itself or in cooperation with any other state department or agency, the federal government, or any political subdivision, city, or district.

Upon a declaration of emergency by the Governor, the Department's duties lie principally in flood fighting and protection, providing support to OES, advising and aiding OES on flood hazard mitigation plans, and assisting with the management of the heavy construction division of the State Construction organization.

In the recovery phase of a declared emergency, the Department shall:

- Continue to provide emergency services as conditions require.

- Accomplish restoration of SWP facilities and all other flood protection control facilities under departmental jurisdiction.

- Oversee repair of damaged dams.

- Develop detailed damage survey reports describing the nature and extent of damage to facilities, proposed repair work, and estimated cost of restoration.

- Resume normal departmental activities as able.

Energy Reduction at SWP Facilities

Since the energy crisis of 1973-74, the Department has given particular attention to developing and implementing practical, systematic energy reduction procedures at all SWP facilities.

The magnitude of the Department's achievements in energy reduction are exemplified by the following:

- In 1981, the Department reduced its energy use 24 percent Departmentwide, compared to 1979-80 use. In recognition of this achievement, the Department received the Governor's Energy Achievement Award for being the most outstanding of seven departments receiving awards for energy reduction.

- The Department began an all-encompassing and continuous energy reduction program in 1978; since then, reduced energy use has resulted in a savings of 3.7 million kilowatthours of energy and $137,750 annually.

- The Oroville Field Division was presented with the PGandE Colgate's Division's 1981 Grand Energy Conservation Achievement Award, on March 26, 1982, for outdistancing its competitors according to PGandE's records. Oroville reduced its overall consumption by 46 percent since 1973, when the Department began its energy reduction program.

- Energy consumption at operation and maintenance centers has been reduced by 38 percent since 1973, when energy coordinators first began monitoring energy use at these facilities.

- The Delta Field Division was given a PGandE Energy Conservation Achievement Award for reducing energy use by 45 percent since 1973. Deputy Director Robert W. James accepted the award on June 24 from George F. Clifton, Jr., Vice President, PGandE, San Francisco.

- Reductions in energy use since 1973 at other SWP Divisions are: Southern - 40 percent; San Luis - 36 percent; and San Joaquin - 28 percent.

To maintain this high standard of energy efficiency and to obtain continuing compliance with the Governor's Executive Order 78-81 issued March 25, 1981, the Department developed an energy conservation plan with a goal of achieving a 20 percent reduction in SWP energy needs by fiscal year 1983-84. The energy conservation plan includes the following steps:

- Energy audits to discover areas of excess energy use were performed at all Department facilities by the energy reduction administrator assisted by the energy coordinator appointed for each facility. Plans were developed to implement low-cost no-cost measures to be taken for immediate savings. Department engineers or the appropriate utility representative performed technical audits of the Department's operation and maintenance centers and maintenance yards to identify and plan for additional measures, including capital cost items, which would result in additional energy savings.

- All Department managers were informed on life-cycle cost analysis procedures set up by the Governor's Energy Task Force, for evaluating capital cost energy-saving projects and submitting them through the budget process.

- A rating system was set up to compare energy reduction measures at each facility. A flow chart was used to gauge the progress of each facility in attaining its energy-saving objectives.

- Comparison of monthly energy use provided an indication of progress being made at each facility. These data were reported to the Governor's Energy Task Force on a quarterly basis.

- A communications network was set up among SWP facility energy coordinators to exchange ideas on new energy reduction measures.
- Training sessions and workshops were established to familiarize coordinators with new energy techniques.
- An energy reduction achievement award program was established to provide recognition for the facility achieving the greatest reduction in energy use.

Medfly and Water Quality in the SWP

In 1981, the Department assigned personnel and equipment to assist in the Santa Clara County medfly spraying program. Sixteen Department ground spray rigs and more than 40 employees were mobilized for mixing spray, maintaining vehicles, and ground spraying.

In August, fertile medfiles were discovered near Westley in San Joaquin County and near Livermore in Alameda County. Aerial spraying of malathion began August 15 in those areas. The Westley spray zone spanned 24 kilometres (15 miles) of the California Aqueduct, and the Livermore spray zone included 2.6 kilometres (1.6 miles) of the South Bay Aqueduct. The Department tested water samples from both aqueducts during the aerial spraying program. The tests indicated that the spraying did not endanger SWP water supplies.

The malathion spraying program and the Department's involvement ended in December 1981. The Department was reimbursed for all costs with emergency funds allocated by the Legislature for the Medfly program.

Tree Ring Study - Climate Analysis

In July 1981, the Department cooperated with the Tree-Ring Laboratory of the University of Arizona in collecting field data for climatological analyses. One person with a vehicle was assigned for three weeks to assist University researchers who sampled about 300 trees in Northern California.

The Tree-Ring project is part of a continuing effort to develop a comprehensive Tree-Ring chronology for the State, which will improve our knowledge of the State's long-term climatic history. This knowledge may lead to the development of techniques for predicting future climate patterns, which would be useful in predicting future water supplies. Cost of the program was funded from the General Fund.

CHAPTER XI

CRITERIA FOR STATEMENTS OF CHARGES

Charges Under Long-Term Water Supply Contracts

Statements of Charges to long-term SWP water contractors are furnished by the Department on or before July 1 of each year. Information concerning these charges is described in Articles 29(e) and (d) of the "Standard Provisions for Water Supply Contract" and summarized as follows:

Transportation Charge. Article 29(e) provides that:

"....All such statements shall be accompanied by the latest revised copies of the document amendatory to Article 22 and of Tables B, C, D, E, F, and G of this contract, together with such other data and computations used by the State in determining the amounts of the above charges as the State deems appropriate."

Delta Water Charges. Article 22(f) requires, in part, the yearly recomputation of the Delta Water Charge, and provides that:

"Upon each such recomputation, an appropriately revised copy of the document establishing such rates be prepared by the State and attached to this contract as an amendment of this article."

Redetermination of Charges

To comply with Article 29(e), the Department compiles a comprehensive annual redetermination of all water supply aspects of the SWP for the entire project repayment period. This annual redetermination is specifically provided for in Article 22(f), concerning the Delta Water Rate per acre-foot of future entitlement, and in Article 28, with regard to the Annual Transportation Charges for the entire project repayment period.

Transportation Charges

All information required under the Water Supply Contracts for Transportation Charges has been provided by the Department to the long-term water supply contractors in Statements of Charges for 1983. These charges are for repayment of reimbursable capital and operating costs of SWP Transportation Facilities including:

- Grizzly Valley Pipeline
- North Bay Aqueduct
- South Bay Aqueduct (including Del Valle Dam and Lake Del Valle)
- A portion of the California Aqueduct from the Delta Pumping Plant to Dos Amigos Pumping Plant allocated to Transportation
- California Aqueduct Facilities south of Dos Amigos Pumping Plant (including Dos Amigos Pumping Plant and dams and lakes in Southern California)

- All Off-Aqueduct Power Facilities:

  1. Reid Gardner Unit No. 4
  2. Bottle Rock Powerplant
  3. South Geysers Powerplant
  4. Lake Isabella Powerplant
  5. Pine Flat liaison costs -- (the project is being constructed by Kings River Conservation District)

Project Interest Rate for 1983 Charges

The 1983 capital cost component of the Transportation Charge was computed at 4.627 percent, the Project Interest Rate in effect on June 30, 1982.

Amortization of Capital Costs-Capital Cost Components

Criteria for the types of amortization schedules for the respective contractors

which apply to allocated Transportation capital costs, except costs of Off-Aqueduct Power Facilities, are summarized in Figure 31. The accounting of interest charges included in the capital cost components of the Transportation Charge follows the procedure established in Settlement Letter No. 2 between the Department and the water supply contractors.

The amortization of capital costs for Off-Aqueduct Power Facilities described above are handled on a separate schedule from other capital costs. For municipal and industrial (M&I) water contractors, the costs are to be repaid over a 27-year period with the initial payment in 1982 and final payment in 2008. For agricultural water contractors, allocated costs will be paid on a unit rate basis over the remaining project repayment period (1982-2035).

FIGURE 31: CRITERIA FOR AMORTIZATION SCHEDULES

Contractor	Amortization of Allocated Capital Costs in 50 Equal Annual Installments, With Initial Payment Due in:								
	1963	1964	1965	1966	1968	1970	1973	a	b
Alameda County FC&WCD, Zone 7	● c								
Alameda County WD	●								
Antelope Valley-East Kern WA	●								
Castaic Lake WA		●							
County of Butte									●
County of Kings					●				
City of Yuba City									●
Coachella Valley WD		●							
Crestline-Lake Arrowhead WA		●							
Desert WA	● d								
Devil's Den WD								●	
Dudley Ridge WD								●	
Empire West Side ID								●	
Kern County WA: Ag use								●	
M&I use			●						
Littlerock Creek ID		●							
Mojave WA		●							
Napa County FC&WCD				●					
Oak Flat WD								●	
Palmdale WD		●							
Plumas County FC&WCD						●			
San Bernardino Valley MWD	●								
San Gabriel Valley MWD	● d								
San Gorgonio Pass WA	● d								
San Luis Obispo County FC&WCD		● e							
Santa Barbara County FC&WCD		● e							
Santa Clara Valley WD	●								
Solano County FC&WCD							●		
The Metropolitan WD-SC	●								
Tulare Lake Basin WSD								●	
Ventura County FCD		●							

a Amortization of allocated capital costs on basis of equivalent unit rate applied to annual entitlements (Table B-4) within project repayment period.
b Payments on Delta Water Charge only.
c Principal payments on each annual capital cost prior to 1971 delayed until calendar year 1972, except payments for 1963.
d Deferred and added to 1964 payment with accrued interest.
e Exception: all principal and interest payments for costs of "Coastal Stub" are assumed deferred until 1976.

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Future Transportation Facilities and Off-Aqueduct Power Facilities

Transportation facilities and Off-Aqueduct Power Facilities are reflected in the projection of future charges shown in contractors annual Statements of Charges. These facilities are shown in the following schedule. Also shown are planned initial operating dates for these facilities which were assumed when preparing the 1983 Statements of Charges, together with the initial operation dates assumed in preparing the Statements of Charges for 1982.

	Date of Initial Operation of SWP Facilities Assumed in Preparing Statement of Charges for:	
	1983	1982
Transportation Facilities		
North Bay Aqueduct		
Phase II Facilities	1985	1985
South Bay Aqueduct		
Del Valle No. 2 Powerplant		
California Aqueduct	1985	1985
Harvey O. Banks Delta Pumping Plant		
Units 8 and 9	1987	1987
Units 10 and 11	1988	1988
San Luis Canal Enlargement	1990	1990
A. D. Edmonston Pumping Plant		
Unit 10	1983	1983
Units 12 and 14	1984	1984
Buttes Dam and Reservoir	-	1990
Alamo Reservoir	1985	1984
Mojave Siphon Powerplant	1985	1984
Los Flores Powerplant	1985	1985
William E. Warne Powerplant	1982	1982
Castaic Outlet Powerplant	1985	1985
Pyramid Outlet Powerplant	1985	1985
Coastal Branch, Phase II Facilities	-	1990
Off-Aqueduct Power Facilities		
Reid Gardner Unit No. 4	1983	1983
Bottle Rock Powerplant	1984	1984
South Geysers Powerplant	1985	1985
Lake Isabella Powerplant	1985	1984

There are no projected costs in the 1983 Statements of Charges for construction and operation of Buttes Dam and Reservoir and the remaining unconstructed portion of the Coastal Aqueduct. The participating contractors are presently evaluating their needs for these facilities. If constructed, these facilities will be allocated solely to three long-term water supply contractors; Antelope Valley East Kern Water Agency (Buttes Dam and Reservoir), San Luis Obispo County FC&WCD and Santa Barbara County FC&WCD (Coastal Aqueduct - Phase II).

Delta Water Charges

Information required to substantiate the 1983 Delta Water Charge under Article 22(f) of the contracts is included in Tables 32 and 33 . Summarized in column (1) and (3) on sheet 1 of Table 32 are actual and projected reimbursable capital and operating costs of Initial Conservation Facilities including the following:

- Frenchman Dam and Lake
- Grizzly Valley Dam and Lake
- Oroville Complex (including Oroville Dam, Lake Oroville and Oroville Power Facilities and Hyatt-Thermalito Power Facilities)
- A portion of the California Aqueduct (a portion of the works, Harvey O. Banks Delta Pumping Plant through O'Neill Forebay)
- Suisun Marsh Facilities
- San Luis Dam, Reservoir and Pumping Generating Plant (including repair work due to failure of San Luis Dam embankment)
- Costs and credits from generation of small hydroelectric power plants to be built at:

  1. Lake Davis
  2. Palermo Outlet at Lake Oroville
  3. Thermalito Diversion Dam
  4. Thermalito Afterbay
  5. Sutter-Butte Outlet at Lake Oroville

SB 200 included future construction of the Peripheral Canal and related facilities as a part of the Department's plans to provide future water for the SWP. With the defeat of Proposition 9 in the June 1982 referendum, the Department has taken steps to exclude projected costs of the Peripheral Canal and related SB 200 facilities from the Delta Water Rate and from water contractor charges. These costs are excluded from Table 32 and are not reflected in charges to SWP water contractors for 1983.

Column (2) of Table 32 shows credits applied to the reimbursable capital costs of the project conservation facilities. These credits are from negotiated settlements with water contractors concerning the magnitude of project planning costs for the period 1952 through 1978.

Columns (4) and (5) of Table 32 reflect that portion of value of Oroville Power generation to be credited to the Delta Water Rate.

Column (6) of Table 32 shows reimbursable SWP planning costs and preoperating costs incurred through 1981 for Initial Conservation Facilities and in planning for future water supplies.

Column (7) of Table 32 shows payments by water contractors through 1982 under the Delta Water Charge. These payments are credited against the costs of the Initial Conservation Facilities in determining the Delta Water Rate for 1983.

Summarized on sheet 2 of Table 32 are projected costs of Additional Conservation Facilities. Columns 9 and 10 of Table 32 show reimbursable costs of the Department's ground water storage program. Column (11) and (12) show reimbursable costs of the Cottonwood Creek Project. These costs in column (11) and (12) reflect assumptions that the Project would be constructed by the Corps of Engineers with the Department contracting for water supply from the facilities. Discussion of the Department's plans for these projects are included in Chapters II and IV.

Calculation of Delta Water Rate for 1983, for repayment of the Initial Conservation Facilities, is shown in Table 33 . The Table also shows Delta Water Rates associated with the ground water storage program projected to begin in 1984, and rates associated with Cottonwood Creek Project, planned to begin in 1990. The Project Interest Rate used

TABLE 32: CAPITAL & OPERATING COSTS OF PROJECT CONSERVATION FACILITIES

(in dollars)

Calendar Year	INITIAL PROJECT CONSERVATION FACILITIES (Portions of Upper Feather Lakes, Oroville-Thermalito Facilities and California Aqueduct)					Planning and Pre-operating Costs (a & (d	Contractor Payments	Total
	Capital Costs (a	Capital Cost Credits (b	Operating Costs (c	Application of Oroville Power Revenues to: Capital Costs	Application of Oroville Power Revenues to: Operating Costs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1952	171,322	0	0	0	0	0	0	171,322
1953	312,190	0	0	0	0	0	0	312,190
1954	308,624	0	0	0	0	0	0	308,624
1955	194,645	0	0	0	0	0	0	194,645
1956	1,357,077	0	0	0	0	0	0	1,357,077
1957	6,210,803	0	0	0	0	0	0	6,210,803
1958	9,510,981	0	0	0	0	0	0	9,510,981
1959	11,391,101	0	0	0	0	0	0	11,391,101
1960	14,463,378	-4,850,000	0	0	0	0	0	9,613,378
1961	18,688,438	-431,527	0	0	0	0	0	18,256,911
1962	9,003,384	-479,280	0	0	0	0	0	8,524,104
1963	72,946,419	-478,743	-14,000	0	0	0	0	72,453,676
1964	62,493,879	-751,330	-14,000	0	0	107,780	0	61,836,329
1965	70,920,176	-763,541	-14,000	0	0	551,850	0	70,694,485
1966	130,830,263	-748,649	-14,000	0	0	1,081,023	0	131,148,637
1967	94,014,864	-812,145	-11,282	0	0	1,189,212	-241,150	94,139,499
1968	39,871,722	-431,574	1,295,760	-951,000	0	793,399	-583,631	39,994,676
1969	5,268,038	-259,015	2,872,140	-11,007,000	0	601,867	-827,578	-3,351,548
1970	4,132,026	-203,733	4,800,820	-14,650,000	-1,500,000	516,659	-2,160,886	-9,065,114
1971	3,877,149	-193,631	6,007,737	-14,650,000	-1,500,000	408,754	-2,696,792	-8,746,783
1972	4,568,851	-196,361	5,361,455	-14,650,000	-1,500,000	287,374	-7,206,052	-13,334,733
1973	3,985,350	-136,997	6,065,882	-14,650,000	-1,500,000	203,384	-7,456,998	-13,489,379
1974	6,661,577	-137,503	6,856,514	-17,950,000	-1,500,000	201,907	-10,683,514	-16,551,019
1975	8,085,984	-234,567	7,605,357	-14,650,000	-1,500,000	146,188	-12,440,851	-12,987,889
1976	5,871,312	-204,944	7,089,361	-14,650,000	-1,500,000	55,097	-15,299,760	-18,638,934
1977	21,236,310	-150,214	11,255,973	-14,650,000	-1,500,000	3,036	-15,869,924	325,181
1978	7,380,801	-64,566	15,989,989	-14,650,000	-1,500,000	4,546	-19,379,856	-12,219,086
1979	8,531,569	0	11,600,626	-14,650,000	-1,500,000	4,869	-23,083,725	-19,096,661
1980	9,431,378	0	14,999,620	-14,650,000	-1,500,000	5,179	-27,552,829	-19,266,652
1981	9,451,309	0	16,471,591	-14,650,000	-1,500,000	5,181	-43,389,053	-33,610,972
1982	22,166,075	0	16,288,891	-14,650,000	-3,225,000	8,044,723	-49,109,855	-20,485,166
1983	45,234,622	0	22,390,028	-28,409,000	-7,871,000	6,272,550	0	37,617,200
1984	59,599,854	0	27,659,542	-15,427,000	-8,064,000	4,409,306	0	68,177,702
1985	7,322,429	0	16,213,478	-15,427,000	-6,866,000	2,618,687	0	3,861,594
1986	5,939,064	0	17,564,220	-15,427,000	-6,866,000	1,479,364	0	2,689,648
1987	5,096,632	0	18,160,473	-15,427,000	-6,623,000	1,043,881	0	2,250,986
1988	2,988,011	0	14,705,679	-15,427,000	-6,472,000	1,039,661	0	-3,165,649
1989	2,103,084	0	19,662,631	-15,427,000	-6,389,000	1,042,959	0	992,674
1990	464,815	0	17,753,737	-15,427,000	-6,382,000	1,042,912	0	-2,547,536
1991	1,691,620	0	19,257,538	-15,427,000	-6,387,000	1,041,595	0	176,753
1992	5,280,400	0	19,410,046	-15,427,000	-6,402,000	1,039,793	0	3,901,239
1993	2,769,200	0	20,519,049	-15,427,000	-6,402,000	1,048,985	0	2,508,234
1994	8,600	0	23,028,265	-15,427,000	-6,433,000	1,065,034	0	2,241,899
1995	0	0	17,928,494	-15,427,000	-6,475,000	1,067,948	0	-2,905,558
1996	0	0	18,735,074	-15,427,000	-6,525,000	1,066,255	0	-2,150,671
1997	0	0	21,995,790	-15,427,000	-6,581,000	1,062,899	0	1,050,689
1998	0	0	19,027,999	-15,427,000	-6,581,000	1,062,909	0	-1,917,092
1999	0	0	19,764,856	-15,427,000	-6,659,000	1,062,920	0	-1,258,224
2000	0	0	24,549,425	-15,427,000	-9,740,000	1,062,930	0	445,355
2001	0	0	21,749,447	-15,427,000	-6,950,000	1,062,930	0	435,377
2002	0	0	20,699,460	-15,427,000	-7,087,000	1,062,930	0	-751,610
2003	0	0	18,802,958	-15,427,000	-7,692,000	1,062,930	0	-3,253,112
2004	0	0	21,506,703	-15,427,000	-7,687,000	1,062,930	0	-544,367
2005	0	0	23,114,740	-15,427,000	-7,572,000	1,062,930	0	1,178,670
2006	0	0	19,699,574	-15,427,000	-7,459,000	1,062,930	0	-2,123,496
2007	0	0	20,671,258	-15,427,000	-7,461,000	1,062,930	0	-1,153,812
2008	0	0	21,745,272	-15,427,000	-7,558,000	1,062,930	0	-176,798
2009	0	0	20,632,185	-15,427,000	-7,597,000	1,062,930	0	-1,328,885
2010	0	0	30,422,185	-15,427,000	-7,506,000	1,062,930	0	8,552,115
2011	0	0	25,990,075	-15,427,000	-7,412,000	0	0	3,151,075
2012	0	0	21,870,700	-15,427,000	-7,315,000	0	0	-871,300
2013	0	0	23,412,621	-15,427,000	-7,315,000	0	0	670,621
2014	0	0	19,619,090	-15,427,000	-7,315,000	0	0	-3,122,910
2015	0	0	24,769,363	-15,427,000	-7,317,000	0	0	2,025,363
2016	0	0	22,452,491	-15,427,000	-7,318,000	0	0	-292,509
2017	0	0	21,462,382	-15,427,000	-7,318,000	0	0	-1,282,618
2018	0	0	21,471,899	-15,427,000	-7,318,000	0	0	-1,273,101
2019	0	0	23,946,564	-15,427,000	-7,215,000	0	0	1,304,564
2020	0	0	25,925,167	-15,427,000	-7,107,000	0	0	3,391,167
2021	0	0	16,632,078	-15,427,000	-6,088,000	0	0	-4,882,922
2022	0	0	24,003,106	-15,427,000	-5,788,000	0	0	2,788,106
2023	0	0	17,225,687	-15,427,000	-5,603,000	0	0	-3,804,313
2024	0	0	18,067,279	-15,427,000	-5,541,000	0	0	-2,900,721
2025	0	0	18,364,351	-15,427,000	-5,541,000	0	0	-2,603,649
2026	0	0	20,945,122	-15,427,000	-5,541,000	0	0	-22,878
2027	0	0	14,465,991	-15,427,000	-5,193,000	0	0	-6,154,009
2028	0	0	15,574,914	-15,427,000	-4,846,000	0	0	-4,698,086
2029	0	0	15,080,420	-15,427,000	-4,498,000	0	0	-4,844,580
2030	0	0	17,515,008	-15,427,000	-4,410,000	0	0	-2,321,992
2031	0	0	13,113,797	-15,427,000	-4,212,000	0	0	-6,525,203
2032	0	0	16,961,963	-15,427,000	-4,014,000	0	0	-2,479,037
2033	0	0	11,273,654	-15,427,000	-3,905,000	0	0	-8,058,346
2034	0	0	6,610,355	-15,427,000	-3,797,000	0	0	-12,613,645
2035	0	0	27,333,463	15,427,000	-3,797,000	0	0	8,109,463
TOTAL	801,835,326	-11,528,320	1,195,952,080	-1,036,321,000	-365,236,000	54,371,916	-237,982,454	401,091,548

a) Reimbursed thru payments of the capital cost component of the Delta Water Charge, except for a portion of the costs of the Initial Project Conservation Facilities that will be reimbursed through project power revenues shown in column 4.

b) Negotiated settlements as to the magnitude of project planning costs from 1952 through 1978 to be reimbursed through water charges. Credits are applied to the reimbursable capital costs of the Initial Conservation Facilities.

c) Reimbursed through payments of the minimum OMP&R component of the Delta Water Charge, except for those costs that will be reimbursed through project power revenues shown in column 5. San Luis power credits are included in these costs.

d) Under the long-term amendments of Articles 22(e) and 22(g), those planning and pre-operating costs of Additional Project Conservation Facilities which are incurred through the previous year (1981) will be included in current calculations of the Delta Water Charge.

AND CONTRACTOR PAYMENTS TO BE USED IN COMPUTING THE DELTA WATER RATE FOR 1983

Additional Project Conservation Facilities					Grand Total	Calendar Year
Ground Water Storage		Cottonwood Creek Project		Total		
Capital Costs	Operating Costs	Capital Costs	Operating Costs			
(9)	(10)	(11)	(12)	(13)	(14)	
0	0	0	0	0	171,322	1952
0	0	0	0	0	312,190	1953
0	0	0	0	0	308,624	1954
0	0	0	0	0	194,645	1955
0	0	0	0	0	1,357,077	1956
0	0	0	0	0	6,210,803	1957
0	0	0	0	0	9,510,981	1958
0	0	0	0	0	11,391,101	1959
0	0	0	0	0	9,613,378	1960
0	0	0	0	0	18,256,911	1961
0	0	0	0	0	8,524,104	1962
0	0	0	0	0	72,453,676	1963
0	0	0	0	0	61,836,329	1964
0	0	0	0	0	70,694,485	1965
0	0	0	0	0	131,148,637	1966
0	0	0	0	0	94,139,499	1967
0	0	0	0	0	39,994,676	1968
0	0	0	0	0	-3,351,548	1969
0	0	0	0	0	-9,065,114	1970
0	0	0	0	0	-8,746,783	1971
0	0	0	0	0	-13,334,733	1972
0	0	0	0	0	-13,489,379	1973
0	0	0	0	0	-16,551,019	1974
0	0	0	0	0	-12,987,889	1975
0	0	0	0	0	-18,638,934	1976
0	0	0	0	0	325,181	1977
0	0	0	0	0	-12,219,086	1978
0	0	0	0	0	-19,096,661	1979
0	0	0	0	0	-19,266,652	1980
0	0	0	0	0	-33,610,972	1981
0	0	0	0	0	-20,485,166	1982
0	0	0	0	0	37,617,200	1983
12,990,000	0	0	0	12,990,000	81,167,702	1984
11,075,000	0	0	0	11,075,000	14,936,594	1985
22,790,000	0	0	0	22,790,000	25,479,648	1986
26,947,000	0	0	0	26,947,000	29,197,986	1987
8,796,000	0	0	0	8,796,000	5,630,351	1988
10,061,000	0	0	0	10,061,000	11,053,674	1989
15,293,000	0	0	0	15,293,000	12,745,464	1990
19,631,000	0	41,640,000	0	61,271,000	61,447,753	1991
18,990,000	0	41,640,000	1,660,773	62,290,773	66,192,012	1992
19,590,000	0	41,640,000	1,670,883	62,900,883	65,409,117	1993
19,907,000	0	41,640,000	1,688,537	63,235,537	65,477,436	1994
19,678,000	0	41,640,000	1,691,742	63,009,742	60,104,184	1995
19,311,000	0	41,640,000	1,689,881	62,640,881	60,490,210	1996
10,042,000	0	41,640,000	1,686,189	53,368,189	54,418,878	1997
0	2,805,378	41,640,000	1,686,201	46,131,579	44,214,487	1998
0	2,805,378	41,640,000	1,686,213	46,131,591	44,873,367	1999
0	2,805,378	41,640,000	1,686,223	46,131,601	46,576,956	2000
0	2,805,378	41,640,000	1,686,223	46,131,601	46,566,978	2001
0	2,805,378	41,640,000	1,686,223	46,131,601	45,379,991	2002
0	2,805,378	41,640,000	1,686,223	46,131,601	42,878,489	2003
0	2,805,378	41,640,000	1,686,223	46,131,601	45,587,234	2004
0	2,805,378	41,640,000	1,686,223	46,131,601	47,310,271	2005
0	2,805,378	41,640,000	1,686,223	46,131,601	44,008,105	2006
0	2,805,378	41,640,000	1,686,223	46,131,601	44,977,789	2007
0	2,805,378	41,640,000	1,686,223	46,131,601	45,954,803	2008
0	2,805,278	41,640,000	1,686,223	46,131,601	44,802,716	2009
0	2,805,378	41,640,000	1,686,223	46,131,601	54,683,716	2010
0	2,805,378	41,640,000	1,687,396	46,132,774	49,283,849	2011
0	2,805,378	41,640,000	1,687,396	46,132,774	45,261,474	2012
0	2,805,378	41,640,000	1,687,396	46,132,774	46,803,395	2013
0	2,805,378	41,640,000	1,687,396	46,132,774	43,009,864	2014
0	2,805,378	41,640,000	1,687,396	46,132,774	48,158,137	2015
0	2,805,378	41,640,000	1,687,396	46,132,774	45,840,265	2016
0	2,805,378	41,640,000	1,687,396	46,132,774	44,850,156	2017
0	2,805,378	41,640,000	1,687,396	46,132,774	44,859,673	2018
0	2,805,378	41,640,000	1,687,396	46,132,774	47,437,338	2019
0	2,805,378	41,640,000	1,687,396	46,132,774	49,523,941	2020
0	2,805,378	41,640,000	1,687,396	46,132,774	41,249,852	2021
0	2,805,378	41,640,000	1,687,396	46,132,774	48,920,880	2022
0	2,805,378	41,640,000	1,687,396	46,132,774	42,328,461	2023
0	2,805,378	41,640,000	1,687,396	46,132,774	43,232,053	2024
0	2,805,378	41,640,000	1,687,396	46,132,774	43,529,125	2025
0	2,805,378	41,640,000	1,687,396	46,132,774	46,109,896	2026
0	2,805,378	41,640,000	1,687,396	46,132,774	39,978,765	2027
0	2,805,378	41,640,000	1,687,396	46,132,774	41,434,688	2028
0	2,805,378	41,640,000	1,687,396	46,132,774	41,288,194	2029
0	2,805,378	41,640,000	1,687,396	46,132,774	43,810,782	2030
0	2,805,378	41,640,000	1,687,396	46,132,774	39,607,571	2031
0	2,805,378	41,640,000	1,687,396	46,132,774	43,653,737	2032
0	2,805,378	41,640,000	1,687,396	46,132,774	38,074,428	2033
0	2,805,378	41,640,000	1,687,396	46,132,774	33,519,129	2034
0	2,805,378	41,640,000	1,687,396	46,132,774	54,242,237	2035
235,101,000	106,604,364	1,873,800,000	74,193,772	2,289,699,136	2,690,790,684	Total 1952-2035

in computing these Delta Water Rates is 4.627 percent.

Attachment III to water contractors' 1983 Statements of Charges projects future charges under cost and interest rates in effect on June 30, 1982. The attachment does not account for increases in Delta Water Charges to repay future ground water storage program costs nor to repay future costs of Cottonwood Creek Project. We are including these costs and the Delta Water Rate information in Tables 32 and 33 to aid water contractors in their financial planning.

Charges Under Extra Service and Wheeling Agreements

Table 34 presents a summary of the equivalent unit transportation costs of conveying entitlement water through respective aqueduct reaches of the project Transportation Facilities. These unit costs provide the basis of charges assessed: (a) for certain "extra service" (such as for delivery of entitlement water down-aqueduct from a contractor's turnout); (b) for transporting non-project water through SWP facilities; and, together with the Delta Water Charge per acre-foot, (c) for surplus water service to entities other than SWP long-term water supply contractors.

TABLE 33: CALCULATION OF DELTA WATER RATE

[values in millions of dollars ($) or millions of acre-feet (AF)[a] discounted to 1982 at 4.627 percent per annum]

Procedure	Capital Cost Component		Minimum Operation, Maintenance, Power and Replacement Component[b]		Total Delta Water Rate[c]	
In accordance with amendment to Articles 22(e) and 22(g)[d]						
Commencing in 1983:						
Total costs of "intial conservation facilities" to be reimbursed, and project water entitlements during the project repayment period	$1,454.31[e]	102.07 AF	$568.02[f]	102.07 AF	$2,022.33	102.07 AF
less, project power revenues to be realized during the project repayment period	595.26		162.19		757.45	
less, Delta Water Charges paid, and project water entitlements, prior to 1983[g]	209.83	24.36 AF	70.63	24.36 AF	280.46	24.36 AF
Total	$ 649.22	77.71 AF	$335.20	77.71 AF	984.42	77.71 AF
Rate applicable in 1983	$ 8.35 per acre-foot		$4.32 per acre-foot		$12.67 per acre-foot	
Commencing in 1984:						
Additional costs to be reimbursed during the project repayment period for ground water storage facilities	$ 169.68		$ 25.25		$ 194.93	
less, Delta Water Charges paid, and project water entitlements during 1983	22.13	2.65 AF	11.45	2.65 AF	33.58	2.65 AF
Cumulative Subtotal	$ 796.77	75.06 AF	$349.00	75.06 AF	$1,145.77	75.06 AF
Rate applicable 1984 through 1990	$10.61 per acre-foot		$4.65 per acre-foot		$15.26 per acre-foot	
Commencing in 1991:						
Additional costs to be reimbursed during the project repayment period for Cottonwood Creek Project	$ 570.99		$ 20.93		$ 591.92	
less, Delta Water Charges paid, and project water entitlements during the period 1984-1990	211.29	19.91 AF	92.60	19.91 AF	303.89	19.91 AF
Cumulative Subtotal	$1,156.47	55.15 AF	$277.33	55.15 AF	$1,433.80	55.15 AF
Rate applicable 1991 through 2035	$20.97 per acre-foot		$5.03 per acre-foot		$26.00 per acre-foot	

a) Metric conversion is acre-feet times 1.2335 equals cubic dekametres.
b) Considering that all operating costs of project conservation facilities will not vary with annual amounts of project water delivered, and therefore are properly classified as "minimum" OMP&R costs.
c) Metric conversion is dollars per acre-foot times .8107 equals dollars per cubic dekametres.
d) Additional conservation facilities shown in 1984 and after are assumed needed to meet project water requirements through year 2000. Costs of additional facilities required after 2000 to meet the full State Water Project yield have not been identified and are not included.
e) Including net credits of $4,850,000 for settlements as to the magnitude of project capital costs incurred prior to December 31, 1960, and net credits of $6,678,320 for settlement as to the magnitude of project capital costs incurred during the 1961 through 1978 period.
f) Includes conservation power costs and credits at San Luis.
g) Applying all Delta Water Charges paid prior to 1970 to reimburse capital costs (the Charge is not divided into components until 1970).

TABLE 34: EQUIVALENT UNIT TRANSPORTATION COSTS OF WATER DELIVERED FROM OR THRU EACH AQUEDUCT REACH [a]

(in dollars per acre-foot) [b]

AQUEDUCT REACH	Unit Costs of Reach [c]				Cumulative Unit Costs from the Delta			
	Capital Costs	Minimum OMP&R	Variable OMP&R	Total	Capital Costs	Minimum OMP&R	Variable OMP&R	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NORTH BAY AQUEDUCT								
1	36.60	1.93	5.67	44.20	36.60	1.93	5.67	44.20
2	21.05	1.24	0	22.29	57.65	3.17	5.67	66.49
3	35.99	19.03	14.15	69.17	93.64	22.20	19.82	135.66
SOUTH BAY AQUEDUCT								
1	6.39	8.86	16.26	31.51	8.26	10.63	24.17	43.06
2	.53	1.30	0	1.83	8.79	11.93	24.17	44.89
4	1.79	1.70	0	3.49	10.58	13.63	24.17	48.38
5	3.94	.86	0	4.80	14.52	14.49	24.17	53.18
6	.22	.05	0	.27	14.74	14.54	24.17	53.45
7	1.78	.19	0	1.97	16.52	14.73	24.17	55.42
8	2.63	.22	0	2.85	19.15	14.95	24.17	58.27
9	5.13	1.23	0	6.36	24.28	16.18	24.17	64.63
CALIFORNIA AQUEDUCT								
1	1.87	1.77	7.91	11.55	1.87	1.77	7.91	11.55
2A	.99	.20	0	1.19	2.86	1.97	7.91	12.74
2B	.49	.24	0	.73	3.35	2.21	7.91	13.47
3	.40	.12	0	.52	3.75	2.33	7.91	13.99
4	1.08	.87	3.75	5.70	4.83	3.20	11.66	19.69
5	.84	.15	0	.99	5.67	3.35	11.66	20.68
6	.25	.06	0	.31	5.92	3.41	11.66	20.99
7	.63	.22	0	.85	6.55	3.63	11.66	21.84
8C	.02	.04	0	.06	6.57	3.67	11.66	21.90
8D	.32	.17	0	.49	6.89	3.84	11.66	22.39
9	.23	.14	0	.37	7.12	3.98	11.66	22.76
10A	.27	.17	0	.44	7.39	4.15	11.66	23.20
11B	.40	.12	0	.52	7.79	4.27	11.66	23.72
12D	.38	.11	0	.49	8.17	4.38	11.66	24.21
12E	.25	.17	0	.42	8.42	4.55	11.66	24.63
13B	.55	.22	0	.77	8.97	4.77	11.66	25.40
14A	2.47	2.05	7.11	11.63	11.44	6.82	18.77	37.03
14B	.32	.19	0	.51	11.76	7.01	18.77	37.54
14C	.28	.17	0	.45	12.04	7.18	18.77	37.99
15A	1.94	2.00	7.51	11.45	13.98	9.18	26.28	49.44
16A	3.52	3.34	17.56	24.42	17.50	12.52	43.84	73.86
17E	12.93	8.14	65.05	86.12	30.43	20.66	108.89	159.98
17F	2.29	.08	0	2.37	32.72	20.74	108.89	162.35
18A	2.04	.28	-6.92	-4.60	34.76	21.02	101.97	157.75
19	1.45	.85	0	2.30	36.21	21.87	101.97	160.05
20A	1.14	.58	0	1.72	37.35	22.45	101.97	161.77
20B	1.57	.47	0	2.04	38.92	22.92	101.97	163.81
21	.78	.33	0	1.11	39.70	23.25	101.97	164.92
22A	.52	.24	0	.76	40.22	23.49	101.97	165.68
22B	7.12	5.97	19.79	32.88	47.34	29.46	121.76	198.56
23	1.55	.05	-6.97	-5.37	48.89	29.51	114.79	193.19
24	4.02	1.53	0	5.55	52.91	31.04	114.79	198.74
25	2.13	.08	0	2.21	55.04	31.12	114.79	200.95
26A	2.89	2.53	-28.01	-22.59	57.93	33.65	86.78	178.36
28G	5.54	.85	0	6.39	63.47	34.50	86.78	184.75
28H	5.32	.58	0	5.90	68.79	35.08	86.78	190.65
28J	13.08	6.54	0	19.62	81.87	41.62	86.78	210.27
WEST BRANCH								
29A	3.57	4.50	8.38	16.45	36.29	25.24	117.27	178.80
29F	2.03	.72	0	2.75	38.32	25.96	117.27	181.55
29G	6.42	.83	-12.05	-4.80	44.74	26.79	105.22	176.75
29H	4.04	1.96	0	6.00	48.78	28.75	105.22	182.75
29J	7.30	.54	-23.18	-15.34	56.08	29.29	82.04	167.41
30	11.96	2.44	0	14.40	68.04	31.73	82.04	181.81
COASTAL BRANCH								
31A	5.85	8.78	6.04	20.67	12.74	12.62	17.70	43.06
33A	10.55	1.11	0	11.66	23.29	13.73	17.70	54.72
34	.21	.08	0	.29	23.50	13.81	17.70	55.01
35	.54	.18	0	.72	24.04	13.99	17.70	55.73

a) Representative of transportation unit costs only; does not include a unit cost for conservation. The Delta Water Rate should be added to these values in order to approximate total unit costs at canalside. Includes surplus water prior to May 1, 1973.

b) Metric conversion is dollars per acre-foot times .8107 equals dollars per cubic dekametre.

c) Hypothetical charges which, if assessed on all entitlement water delivered to date, all surplus water delivered prior to May 1, 1973, and all entitlement water now estimated to be delivered during the remainder of the project repayment period, would provide a sum at the end of the period financially equivalent to all Transportation Charges required under the water supply contract, considering interest at the project interest rate; 4.627 percent per annum.

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ELECTION RESULTS	1	Proposition 9 Election Results	none	none	none	none	none	none	none	none	none	none	none
PROJECTED ANNUAL OPERATIONS	2	First Year Project Water Demands Exceed Supplies	none	none	none	none	none	none	none	none	none	none	none
	3	Estimated Delivery Capability Year 1985	none	none	none	none	none	none	none	none	none	none	none
	4	Estimated Delivery Capability Year 1990	none	none	none	none	none	none	none	none	none	none	none
	5	Estimated Delivery Capability Year 1995	none	none	none	none	none	none	none	none	none	none	none
	6	Estimated Delivery Capability Year 2000	none	none	none	none	none	none	none	none	none	none	none
	7	Estimated Total Unit Water Rates	Ex. 2										
	8	Small Hydro Projects at SWP Sites	Ex. 4										
	9	Estimated Energy Requirements and Costs	Ex. 29										
DESIGN, RIGHT OF WAY AND CONSTRUCTION IN PROGRESS	10	SWP Design Activities in Progress	Ex. 10										
	11	Acquisition of Land Parcels	Ex. 13										
	12	SWP Construction Activities in Progress	Ex. 14										
ENERGY SAVINGS	13	Energy Savings From Water Rights Permits for Pyramid and Castaic	none	none	none	none	none	none	none	none	none	none	none
ACTUAL OPERATIONS FOR PRIOR YEAR	14	Annual Entitlements and Water Demands	2	1	1	1	1	1	1	1	1	1	1
	15	Summary of 1981 Entitlement and Surplus Water Service to Long-Term Contractors	3	2	2	2	2	2	2	none	none	none	none
	16	Water Deliveries in 1981	4	3	3	3	3	3	3	2	2	2	2
	17	Water Contractors Total Requests for Entitlement Water 1975 thru 1987	Ex. 17										
	18	Comparison of Actual Storage with Plan of Operations	Ex. 23										
	19	Water Quality Measurements at Selected Stations in 1981	5	5	5	5	5	5	5	4	4	none	none
	20	SWP Benefits thru 1981	Ex. 25										
	21	Monthly Power Operations in 1981	6	6	6	6	6	5	6	5	5	7	7
	22	Recreation Use at SWP Facilities in 1980 and 1981	Ex. 26										
	23	Fish Planted by Department of Fish and Game - SWP Facilities During 1981	Ex. 27										
PROJECTED ANNUAL FINANCING OF CAPITAL AND OPERATING EXPENDITURES	24	Project Financial Analysis June 30, 1982	7	7	7	7	*	7	7	6	5	8	14-16
	25	Project Capital Expenditures	8	8	8	8	7	8	8	7	7	9	9,11
	26	Application of Revenue Bond Proceeds	none	none	none	none	none	none	none	none	none	none	none
	27	Revenue Bond Proceeds Affecting the Project Interest Rate	none	none	none	none	none	none	none	none	none	none	none
	28	Actual Bond Sales and Project Interest Rates	9	9	9	9	*	9	9	8	8	10	8
	29	Projected Bond Sales	9A	9A	9A	none	none	none	none	none	none	none	none
	30	Project Operating Costs	10	10	10	10	8	10	10	9	9	11	12,13
	31	Annual Service on Bonds Sold as of December 31, 1981	11	11	11	11	*	11	11	10	10	12,13	none
CRITERIA FOR STATEMENTS OF CHARGES	32	Capital and Operating Costs of Project Conservation Facilities and Contractor Payments	B-13	B-13	B-13	B-13	B-13	B-13	B-13	B-13	B-13	B-13	B-13
	33	Calculation of Delta Water Rate	B-20A	B-20	B-20	B-20	B-20	B-20	B-20	B-20	B-20	B-20	B-20
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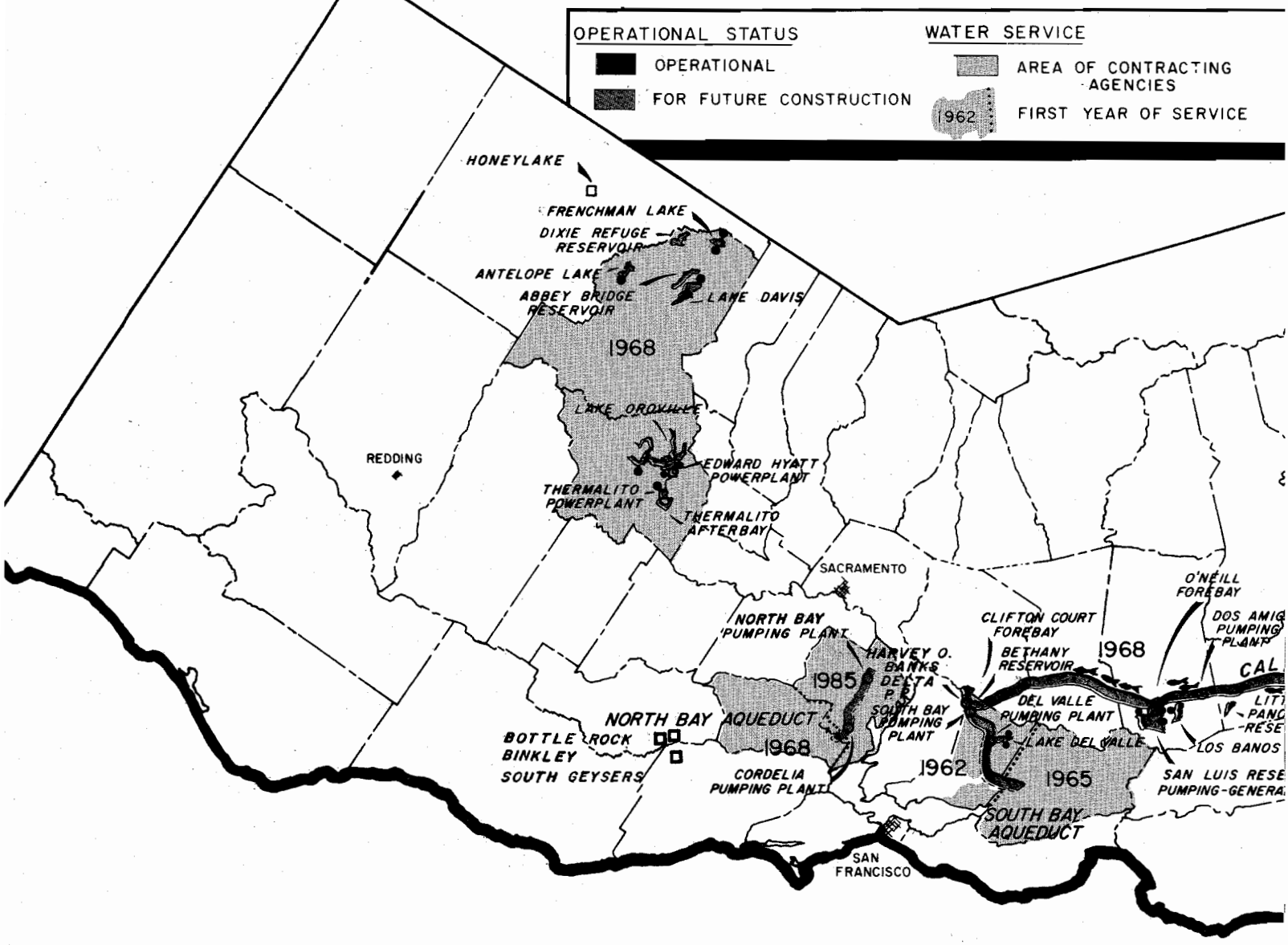
* This table not included in Bulletin

PROJECT
(METRIC



DAMS AND RESERVOIRS

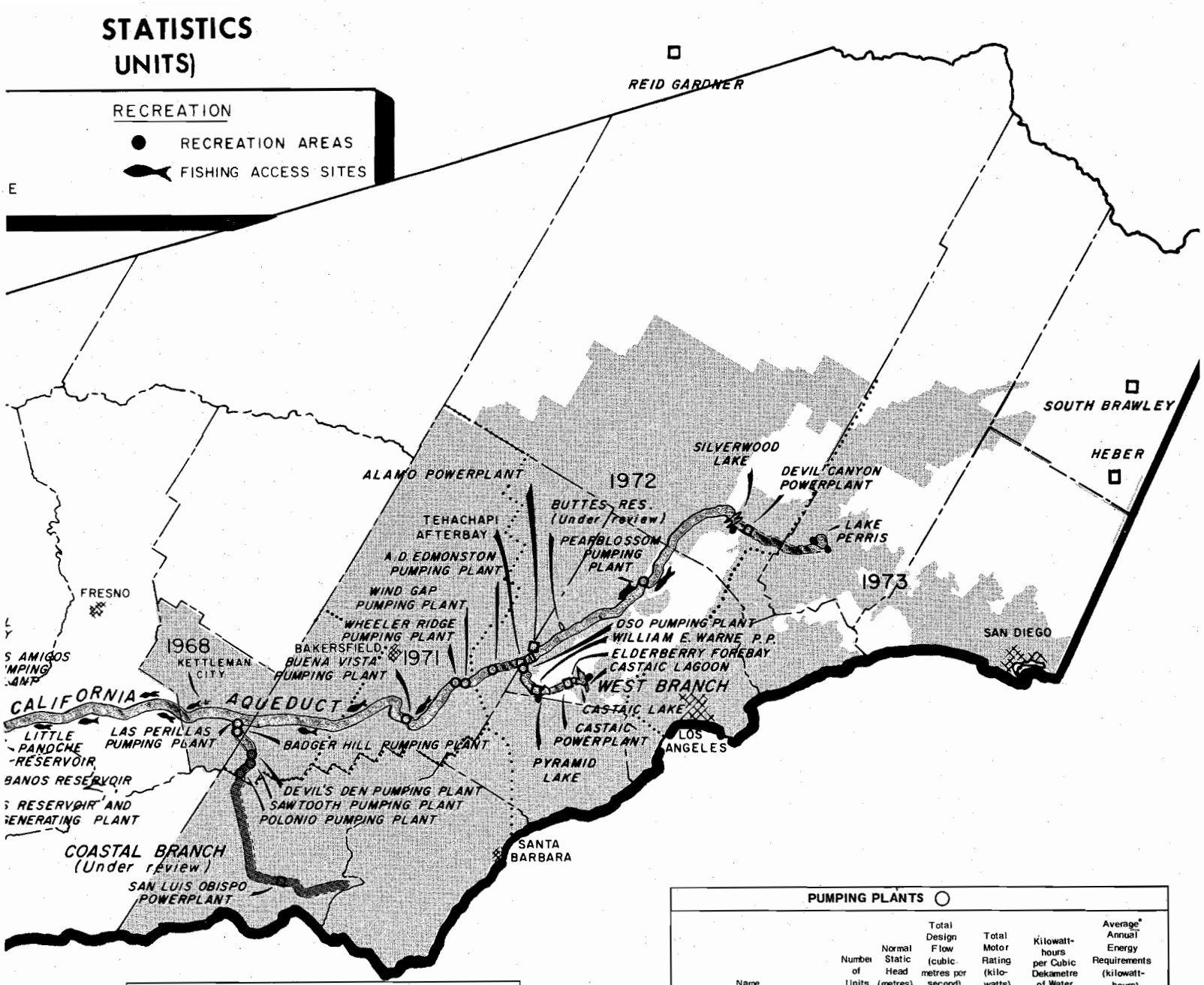
	Reservoirs			Dams			
	Capacity (millions of cubic metres)	Surface Area (hectares)	Shore-line (kilo-metres)	Crest Eleva-tion(1 (metres)	Struc-tural Height (metres)	Crest Length (metres)	Volume (cubic metres)
Frenchman Lake	68.43	639	33.8	1 709	42	219	410 600
Antelope Lake	27.84	377	24.1	1 532	37	402	290 500
Lake Davis	104.07	1 629	51.5	1 763	40	244	193 400
Lake Oroville	4 363.60	6 396	268.8	281	235	2 109	61 164 000
Thermalito Diversion Pool	16.44	131	16.1	71	44	396	117 700
Fish Barrier Pool	0.72	21	1.6	55	28	183	8 000
Thermalito Forebay	14.52	255	16.1	70	28	4 846	1 406 800
Thermalito Afterbay	70.36	1 741	41.8	43	12	12 802	3 838 000
Clifton Court Forebay	35.34	853	12.9	4	9	11 125	1 865 500
Bethany	5.93	65	9.7	76	37	1 201	1 070 400
Lake Del Valle	95.11	429	25.7	236	72	268	3 172 900
San Luis	2 514.82(2	5 140	104.6	169	117	5 669	59 363 500
O'Neill Forebay	69.60	1 093	19.3	71	27	4 374	2 293 700
Los Banos	42.63	252	19.3	117	51	418	1 605 600
Little Panoche	16.33	143	16.1	206	46	439	925 100
Buttes (under review)	26.89	235	9.7	850	58	680	2 393 000
Silverwood Lake	92.48	395	20.9	1 030	76	680	5 810 600
Lake Perris	162.15	938	16.1	488	39	3 536	15 291 000
Quail Lake	6.19	90	4.8	NA	12	–	–
Pyramid Lake	211.17	525	33.8	794	122	332	5 244 800
Elderberry Forebay	34.82	186	11.3	472	61	607	4 587 300
Castaic Lake	399.29	904	46.7	468	130	1 494	35 169 300
Castaic Lagoon	6.98	79	4.8	NA	8	–	–
Totals	8 385.71	22 516	809.5			52 024	206 221 700

1) Above sea level.
2) State share 1 317.26 million cubic metres.

AQUEDUCTS

Name	Length (kilometres)				
	Total	Canal	Pipeline	Tunnel	Channel and Reservoir
North Bay Aqueduct	40.0	20.4	19.6	0	0
South Bay Aqueduct	69.1	13.5	53.0	2.6	0
Subtotal	109.1	33.9	72.6	2.6	0
California Aqueduct (main line):					
Delta to O'Neill Forebay	110.1	107.8	0	0	2.3
O'Neill Forebay to Kettleman City	170.1	166.6	0	0	3.5
Kettleman City to A.D. Edmonston Pumping Plant	194.6	194.6	0	0	0
A. D. Edmonston Pumping Plant thru Tehachapi Afterbay	17.0	0.3	4.0	12.7	0
Tehachapi Afterbay thru Lake Perris	222.7	150.3	61.6	6.1	4.7
Subtotal, main line	714.5	619.6	65.6	18.8	10.5
California Aqueduct (branches)					
West Branch	51.3	14.6	10.3	11.6	14.8
Coastal Branch (under review)	154.8	23.8	131.0	0	0
Subtotal, branches	206.1	38.4	141.3	11.6	14.8
Totals	1 029.7	691.9	279.5	33.0	25.3

STATISTICS
UNITS)



POWERPLANTS □

Name	Number of Units	Normal Static Head (metres)	Total Design Flow (cubic metres per second)	Power Generator Output (kilowatts)	Kilowatt-Hours per Cubic Dekametre of Water	Average** Annual Energy Output (kilowatt-hours)
Edward Hyatt (Oro.)	6	125/206 (1	412.0	678 750	371/491	2 475 000 000
Thermalito	4	26/30 (1	476.6	119 600	59/74	383 000 000
San Luis						
Total	8	30/100 (1	371.6	424 000	83/229	
State Share			194.6	222 100		165 000 000
Alamo	1	43	46.4	15 000	101	113 000 000
Devil Canyon	2	432	34.0	119 700	980	877 000 000
W. E. Warne	4	226	87.8	157 000	469	854 000 000
Castaic						
Total	7	324	521.0	1 250 000	806	
State Share (2			87.6	214 000		1 396 000 000
San Luis Obispo (3	1	223	3.1	5 900	530	24 000 000
Small Hydroelectric Powerplants				42 500		253 000 000
South Geysers	1			55 000		372 000 000
Bottle Rock	1			55 000		372 000 000
Reid Gardner Unit No. 4						
Total	1			250 000		
State Share				169 500		1 081 000 000
Binkley	1			55 000		372 000 000
Honeylake*						
Total	1			55 000		
State Share				38 500		230 000 000
South Brawley *	1			45 000		270 000 000
Heber *						
Total	1			45 000		
State Share				1 500		10 000 000
Total, State Share						9 247 000 000

1) Minimum and maximum values.
2) The City of Los Angeles Department of Water and Power constructed and operates a 1 250 000-kilowatt Castaic Powerplant and will supply the Project with electrical power and energy equivalent to the generation from a 213 964-kilowatt powerplant the State originally planned to construct.
(3 Under review
** Under full development
* Potential

PUMPING PLANTS ○

Name	Number of Units	Normal Static Head (metres)	Total Design Flow (cubic metres per second)	Total Motor Rating (kilowatts)	Kilowatt-hours per Cubic Dekametre of Water	Average* Annual Energy Requirements (kilowatt-hours)
Edward Hyatt (Oro.) (pumped stor.)	3	152/201 (1	158.9	387 174	503/670	– (2
Thermalito (pumped storage)	3	26/31 (1	254.9	89 520	75/97	– (2
North Bay Aqueduct:						
North Bay	7	37	3	2 696	224	15 000 000
Cordelia	5	113	2	2 438	448	11 000 000
South Bay Aqueduct:						
South Bay	9	166	9.3	20 702	667	160 000 000
Del Valle	4	0/12 (3	3.4	746	61	2 000 000
California Aqueduct (main line):						
Delta	11	74	291.8	248 418	251	1 374 000 000
San Luis (pumped stor.)						
Total	8	30/100 (3	311.5	375 984	135/435	
State Share			163.2	196 944		304 000 000
Dos Amigos						
Total	6	34	373.8	179 040	112	
State Share			201.1	96 980		585 000 000
Buena Vista	10 (4	62	143.0	101 456	204	748 000 000
Wheeler Ridge	9 (4	71	130.2	104 440	212	726 000 000
Wind Gap	9 (4	158	124.9	229 268	501	1 683 000 000
A. D. Edmonston	14 (4	587	116.0	775 840	1 837	6 061 000 000
Pearblossom	6	165	39.1	84 447	561	633 000 000
California Aqueduct (branches):						
Oso	8	70	88.6	69 975	223	435 000 000
Las Perillas	6	17	12.7	3 021	70	18 000 000
Badger Hill	6	46	12.7	7 833	152	38 000 000
Devil's Den (under review)	4	125	3.6	5 968	503	36 000 000
Sawtooth (under review)	4	101	3.6	4 849	395	28 000 000
Polonio (under review)	4	247	3.6	11 936	1 061	76 000 000
Total State Share						12 933 000 000

1) Minimum and maximum total pumping heads.
2) Pump-back capability will be used only under economically favorable conditions.
3) Minimum and maximum values.
4) Includes ones spare unit.
* Under full development.

PROJECT
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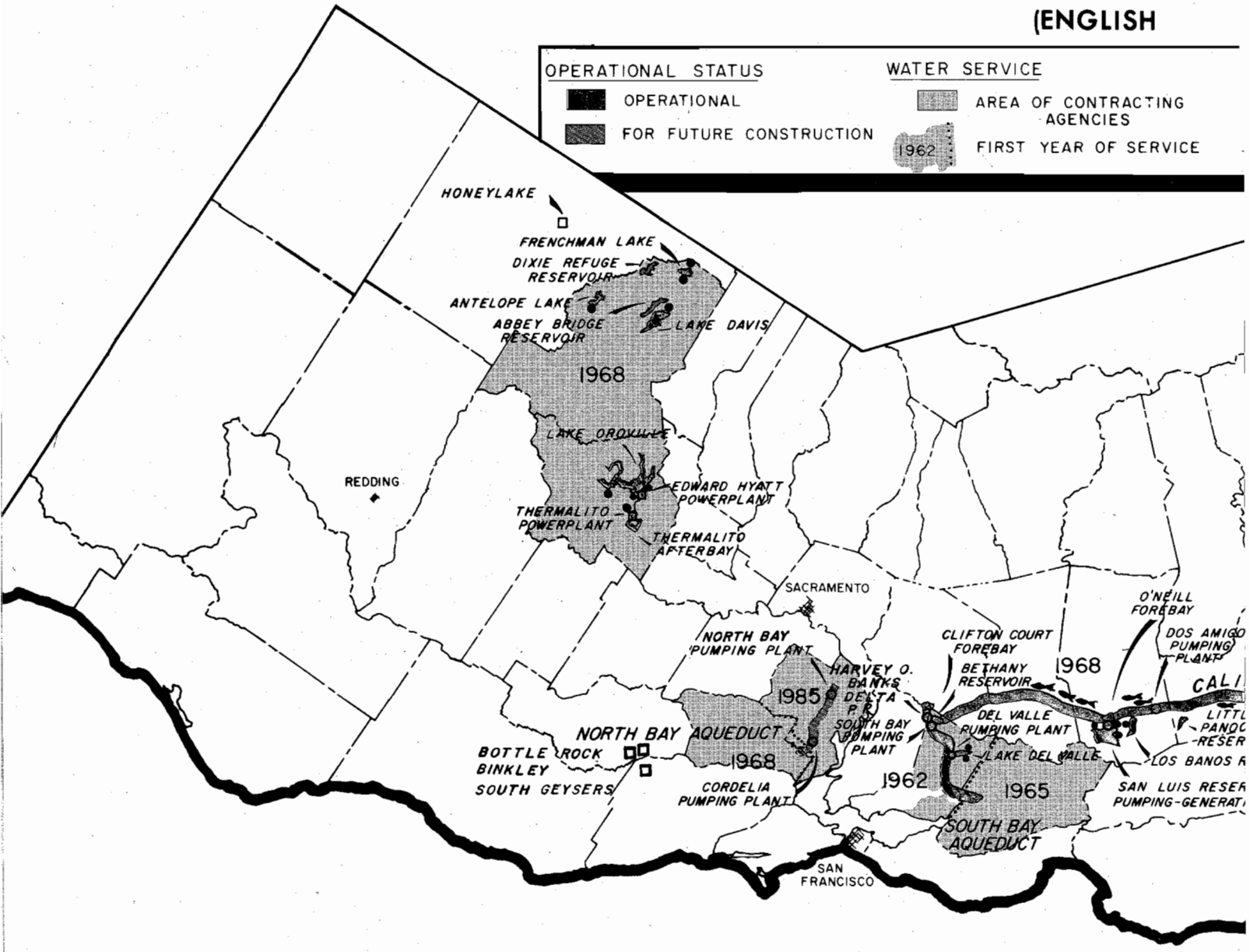


DAMS AND RESERVOIRS

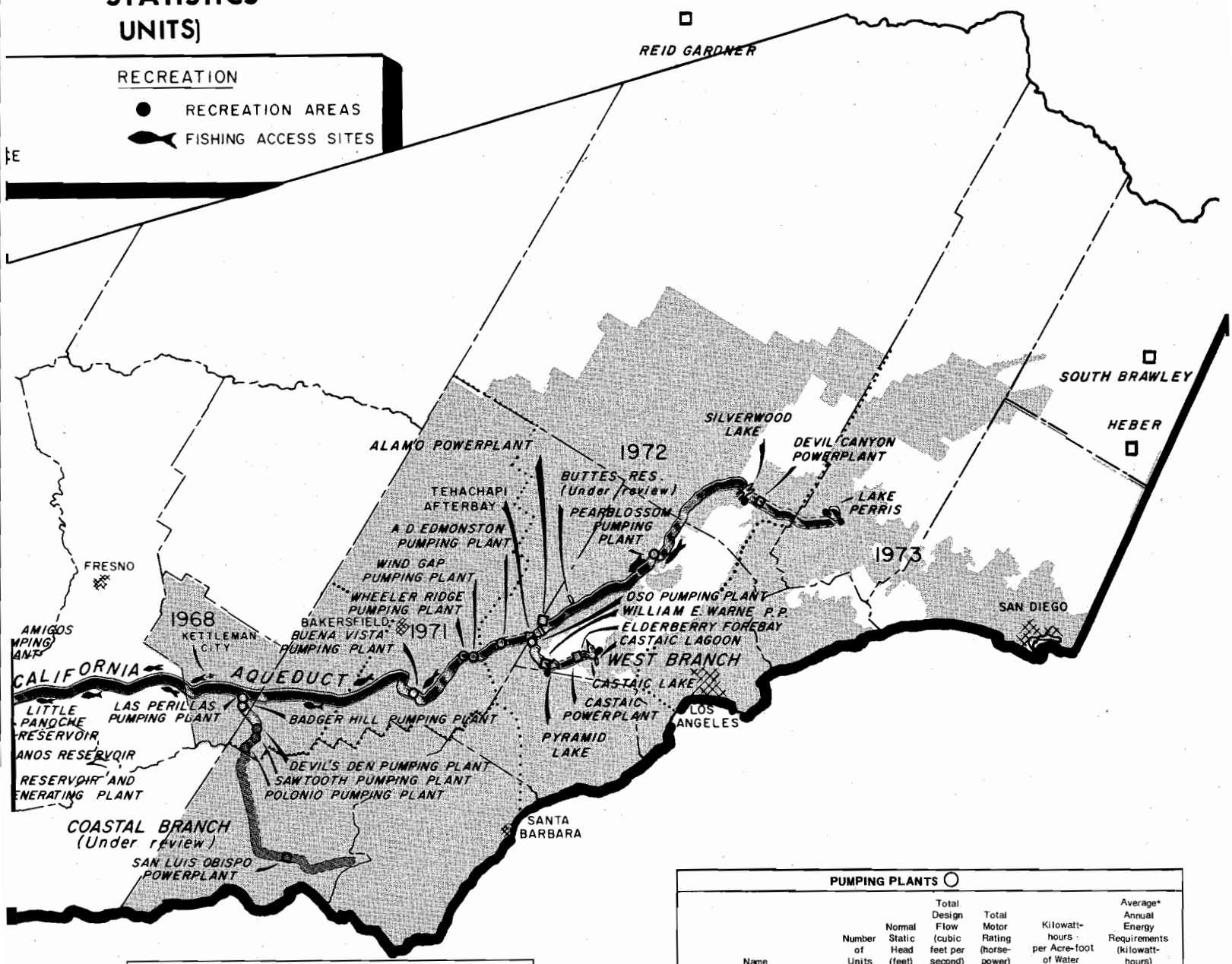
Name of Reservoir	Reservoirs: Capacity (Acre-feet)	Reservoirs: Surface Area (acres)	Reservoirs: Shore-line (miles)	Dams: Crest Elevation (1 (feet)	Dams: Structural Height (feet)	Dams: Crest Length (feet)	Dams: Volume (cubic yards)
Frenchman Lake	55,477	1,580	21	5,607	139	720	537,000
Antelope Lake	22,566	931	15	5,025	120	1,320	380,000
Lake Davis	84,371	4,026	32	5,785	132	800	253,000
Lake Oroville	3,537,577	15,805	167	922	770	6,920	80,000,000
Thermalito Diversion Pool	13,328	323	10	233	143	1,300	154,000
Fish Barrier Pool	580	52	1	181	91	600	10,500
Thermalito Forebay	11,768	630	10	231	91	15,900	1,840,000
Thermalito Afterbay	57,041	4,302	26	142	39	42,000	5,020,000
Clifton Court Forebay	28,653	2,109	8	14	30	36,500	2,440,000
Bethany	4,804	161	6	250	121	3,940	1,400,000
Lake Del Valle	77,106	1,060	16	773	235	880	4,150,000
San Luis	2,038,771(2	12,700	65	554	385	18,600	77,645,000
O'Neill Forebay	56,426	2,700	12	233	88	14,350	3,000,000
Los Banos	34,562	623	12	384	167	1,370	2,100,000
Little Panoche	13,236	354	10	676	152	1,440	1,210,000
Buttes (under review)	21,800	580	6	2,790	190	2,230	3,130,000
Silverwood Lake	74,970	976	13	3,378	249	2,230	7,600,000
Lake Perris	131,452	2,318	10	1,600	128	11,600	20,000,000
Quail Lake	5,020	223	3	NA	40	–	–
Pyramid Lake	171,196	1,297	21	2,606	400	1,090	6,860,000
Elderberry Forebay	28,231	460	7	1,550	200	1,990	6,000,000
Castaic Lake	323,702	2,235	29	1,535	425	4,900	46,000,000
Castaic Lagoon	5,662	196	3	NA	25	–	–
Totals	6,798,299	55,641	503			170,680	269,729,500

1) Above sea level.
2) State share 1,067,908 acre-feet.

AQUEDUCTS

Name	Length (miles): Total	Canal	Pipeline	Tunnel	Channel and Reservoir
North Bay Aqueduct	24.9	12.7	12.2	0	0
South Bay Aqueduct	42.9	8.4	32.9	1.6	0
Subtotal	67.8	21.1	45.1	1.6	0
California Aqueduct (main line):					
Delta to O'Neill Forebay	68.4	67.0	0	0	1.4
O'Neill Forebay to Kettleman City	105.7	103.5	0	0	2.2
Kettleman City to A. D. Edmonston Pumping Plant	120.9	120.9	0	0	0
A. D. Edmonston Pumping Plant thru Tehachapi Afterbay	10.6	0.2	2.5	7.9	0
Tehachapi Afterbay thru Lake Perris	138.4	93.4	38.3	3.8	2.9
Subtotal, main line	444.0	385.0	40.8	11.7	6.5
California Aqueduct (branches):					
West Branch	31.9	9.1	6.4	7.2	9.2
Coastal Branch (under review)	96.2	14.8	81.4	0	0
Subtotal, branches	128.1	23.9	87.8	7.2	9.2
Totals	639.0	430.0	173.7	20.5	15.7

STATISTICS
UNITS)



POWERPLANTS □

Name	Number of Units	Normal Static Head (feet)	Total Design Flow (cubic feet per second)	Power Generator Rating (kilowatts)	Kilowatt-hours per Acre-foot of Water	Average** Annual Energy Output (kilowatt-hours)
Edward Hyatt (Oro)	6	410/676(1	14,550	678,750	458/606(1	2,475,000,000
Thermalito	4	85/100(1	16,900	119,600	73/91(1	383,000,000
San Luis						
Total	8	99/327(1	13,120	424,000	102/283(1	
State Share			6,872	222,100		165,000,000
Alamo	1	140	1,637	15,000	125	113,000,000
Devil Canyon	2	1,418	1,200	119,700	1,209	877,000,000
W. E. Warne	4	740	3,100	157,000	578	854,000,000
Castaic						
Total	7	1,063	18,400	1,250,000	994	
State Share(2			3,092	214,000		1,396,000,000
San Luis Obispo(3	1	730	111	5,900	654	24,000,000
Small Hydroelectric Powerplants				42,600		253,000,000
South Geysers	1			55,000		372,000,000
Bottle Rock	1			55,000		372,000,000
Reid Gardner Unit No. 4						
Total	1			250,000		
State Share				169,500		1,081,000,000
Binkley	1			55,000		372,000,000
Honeylake*						
Total	1			55,000		
State Share				38,500		230,000,000
South Brawley*	1			45,000		270,000,000
Heber*						
Total	1			45,000		
State Share				1,500		10,000,000
Total, State Share						9,247,000,000

1) Minimum and maximum values.
2) The City of Los Angeles Department of Water and Power constructed and operates a 1,250,000-kilowatt Castaic Powerplant and will supply the Project with electrical power and energy equivalent to the generation from a 213,984-kilowatt powerplant the State originally planned to construct.
3) Under Review
** Under full development
* Potential

PUMPING PLANTS ○

Name	Number of Units	Normal Static Head (feet)	Total Design Flow (cubic feet per second)	Total Motor Rating (horse-power)	Kilowatt-hours per Acre-foot of Water	Average* Annual Energy Requirements (kilowatt-hours)
Edward Hyatt (Oro.)(pumped stor.)	3	500/660(1	5,610	519,000	621/826	(2
Thermalito (pumped storage)	3	85/102(1	9,000	120,000	93/120	(2
North Bay Aqueduct:						
North Bay	7	120	120	3,600	276	15,000,000
Cordelia	5	372	55	3,300	552	11,000,000
South Bay Aqueduct:						
South Bay	9	545	330	27,750	823	160,000,000
Del Valle	4	0/38(3	120	1,000	75	2,000,000
California Aqueduct (main line):						
Delta	11	244	10,303	333,000	309	1,374,000,000
San Luis (pumped stor.)						
Total	8	99/327(3	11,000	504,000	166/537	
State Share			5,762	264,000		304,000,000
Dos Amigos						
Total	6	113	13,200	240,000	138	
State Share			7,100	130,000		585,000,000
Buena Vista	10(4	205	5,049	136,000	252	748,000,000
Wheeler Ridge	9(4	233	4,598	140,000	261	726,000,000
Wind Gap	9(4	518	4,410	308,000	618	1,683,000,000
A. D. Edmonston (Tehachapi)	14(4	1,926	4,095	1,040,000	2,266	6,061,000,000
Pearblossom	6	540	1,380	113,200	692	633,000,000
California Aqueduct (branches):						
Oso	8	231	3,128	93,800	275	435,000,000
Las Perillas	6	55	450	4,050	86	18,000,000
Badger Hill	6	151	450	10,500	187	38,000,000
Devil's Den (under review)	4	409	126	8,000	621	36,000,000
Sawtooth (under review)	4	331	126	6,500	487	28,000,000
Polonio (under review)	4	810	126	16,000	1,309	76,000,000
Total, State Share						12,933,000,000

1) Minimum and maximum total pumping heads.
2) Pump-back capability will be used only under economically favorable conditions.
3) Minimum and maximum static heads.
4) Includes one spare unit.
* Under full development.

State of California—Resources Agency
Department of Water Resources
P.O. Box 388
Sacramento
95802

CALIFORNIA DEPARTMENT OF WATER RESOURCES
THE RESOURCES AGENCY