

DELTA WATER QUALITY CONDITIONS

COMPLIANCE WITH



DELTA WATER QUALITY CONDITIONS
COMPLIANCE WITH
WATER QUALITY STANDARDS CONTAINED IN DECISION 1485
IN CALENDAR YEAR 1981

APRIL 1982

BAY-DELTA PROGRAM
STATE WATER RESOURCES CONTROL BOARD

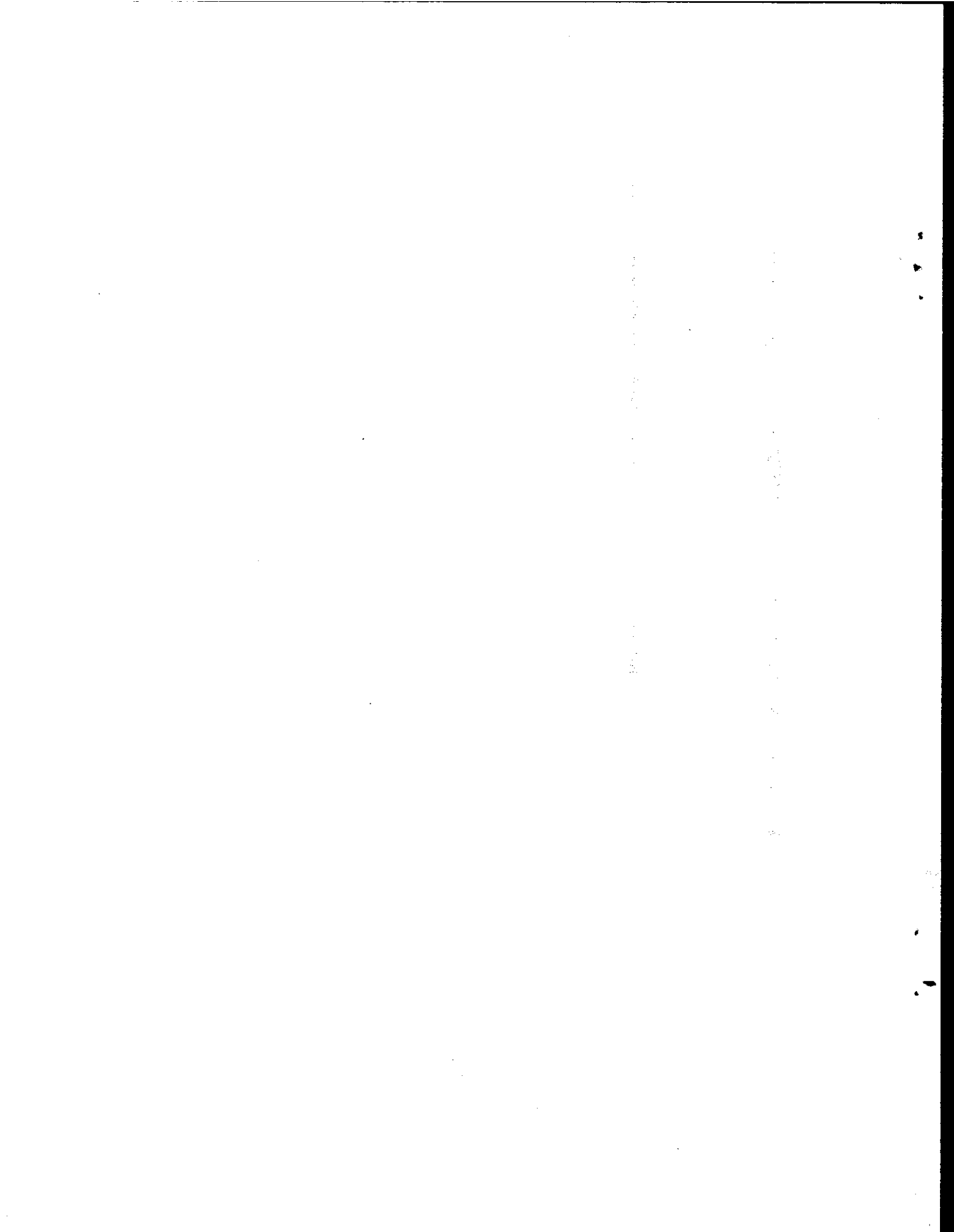
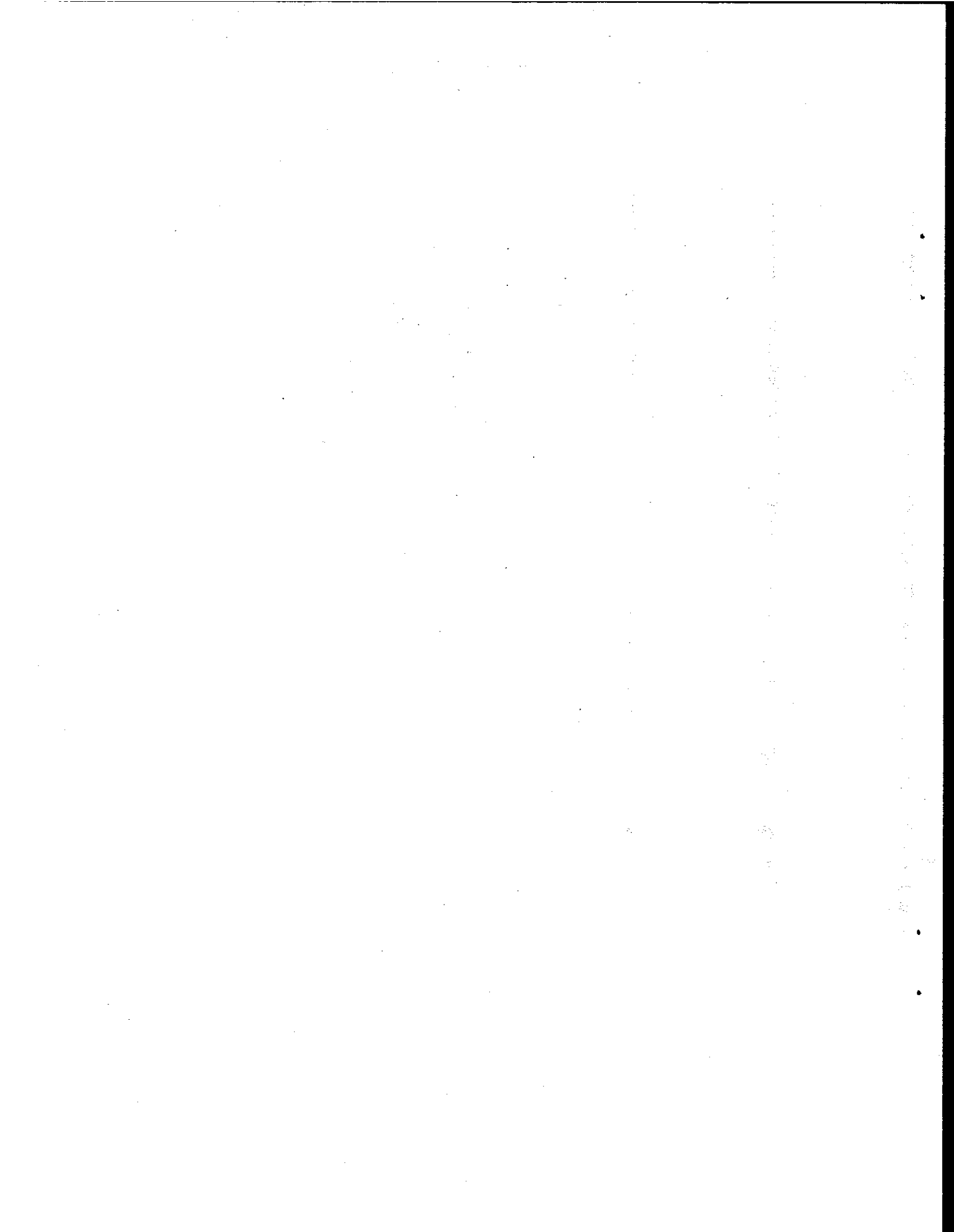


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I. INTRODUCTION

In adopting Decision 1485, the State Water Resources Control Board (State Board) set specific Delta water quality standards as conditions in the permits of the Federal Central Valley Project (CVP) and State Water Project (SWP). Decision 1485 also requires the United States Bureau of Reclamation (Bureau) and the Department of Water Resources (Department) to conduct a detailed monitoring program. Reports of Delta water quality data are submitted regularly to the State Board. These reports are reviewed by the State Board to determine the status of compliance^{1/} with the Delta standards and to begin appropriate action in the event actual or potential noncompliance with the standards is observed.

The reports also provide information on Delta water quality conditions. This document is intended to provide the public with a summary of the Delta water quality conditions and the status of compliance with the Decision 1485 Delta standards during 1981.

This report is prepared annually. Comments on its content should be sent to: State Water Resources Control Board, Bay-Delta Program, P. O. Box 100, Sacramento, CA 95801. Persons interested in being included on a mailing list to receive the report should contact the Bay-Delta Program at the above address.

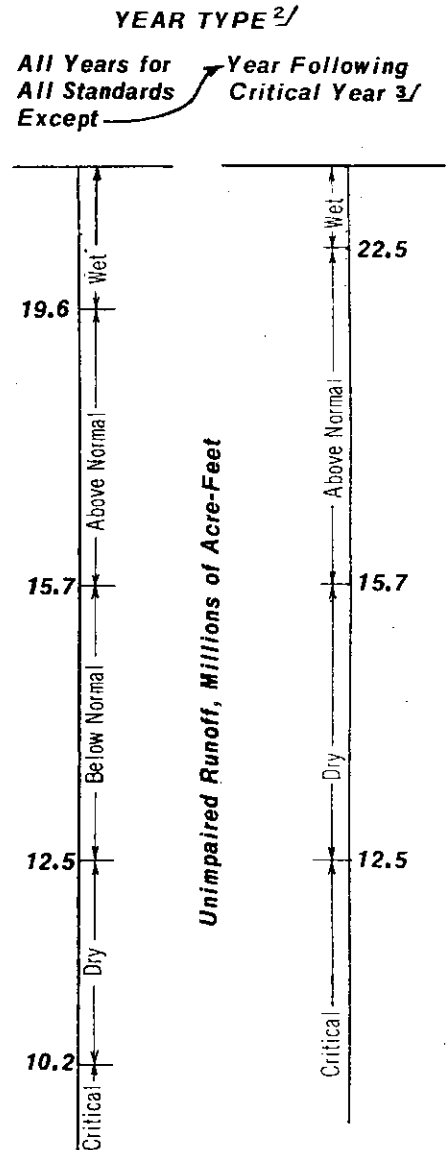
II. YEAR CLASSIFICATION

Decision 1485 established a year classification system which is used

Table 1
YEAR CLASSIFICATION

Year classification shall be determined by the forecast of Sacramento Valley unimpaired runoff for the current water year (October 1 of the preceding calendar year through September 30 of the current calendar year) as published in California Department of Water Resources Bulletin 120 for the sum of the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River at Smartville; American River, total inflow to Folsom Reservoir. Preliminary determinations of year classification shall be made in February, March and April with final determination in May. These preliminary determinations shall be based on hydrologic conditions to date plus forecasts of future runoff assuming normal precipitation for the remainder of the water year.

YEAR TYPE	RUNOFF, MILLIONS OF ACRE-FEET
Wet ^{1/}	equal to or greater than 19.6 (except equal to or greater than 22.5 in a year following a critical year). ^{3/}
Above Normal ^{1/}	greater than 15.7 and less than 19.6 (except greater than 15.7 and less than 22.5 in a year following a critical year). ^{3/}
Below Normal ^{1/}	equal to or less than 15.7 and greater than 12.5 (except in a year following a critical year). ^{3/}
Dry	equal to or less than 12.5 and greater than 10.2 (except equal to or less than 15.7 and greater than 12.5 in a year following a critical year). ^{3/}
Critical	equal to or less than 10.2 (except equal to or less than 12.5 in a year following a critical year). ^{3/}



^{1/} Any otherwise wet, above normal, or below normal year may be designated a subnormal snowmelt year whenever the forecast of April through July unimpaired runoff reported in the May issue of Bulletin 120 is less than 5.9 million acre-feet.

^{2/} The year type for the preceding water year will remain in effect until the initial forecast of unimpaired runoff for the current water year is available.

^{3/} "Year following critical year" classification does not apply to Agricultural, Municipal and Industrial standards.

forecasts of Sacramento Valley unimpaired runoff. As described in Table 1 (p. 2), the projected annual runoff figures are based on actual runoff to date, plus forecasts of future runoff assuming normal precipitation for the remainder of the water year. Preliminary determinations of water year type are usually made during February, March, and April with the final determination made in May.

During 1981 the classification system was applied on a month-by-month basis as shown in Table 2 below. The May runoff forecast of 11.5 million acre-feet was in the dry year range and was the final determination for 1981.

Table 2

Determination of Year Type for 1981

<u>Effective Date</u>	<u>Forecast of Sacramento Valley Unimpaired Runoff in Millions of Acre-feet (MAF)^{1/}</u>	<u>Year Type</u>
January 1, 1981	----	Wet ^{2/}
February 1, 1981	12.9	Below Normal
March 1, 1981	11.9	Dry
April 1, 1981	12.3	Dry
May 1, 1981	11.5	Dry ^{3/}

1/ From Department of Water Resources Bulletin 120 series.

2/ Year Type of the 1980 water year remained in effect until the February 1981 issue of DWR Bulletin 120.

3/ Final determination for the remainder of the calendar year

III. SUMMARY OF DELTA WATER QUALITY CONDITIONS

During the 1980-81 water year, the Central Valley experienced less than normal precipitation. A series of storms occurred during late January and March resulting in high Delta outflows. Balanced conditions in the Delta were declared by project operators during mid-April. Balanced conditions occur when Delta inflows are equal to Delta consumptive uses, Delta water quality needs, and exports; therefore, project operators have control of Delta outflow during balanced conditions.

Structural problems with CVP and SWP facilities had a significant impact on project operations during 1981. In May, a slippage of the lining and embankment of the SWP's California Aqueduct restricted operations at the State's export facility, the Harvey O. Banks Delta Pumping Plant. Normal export operations resumed after aqueduct repairs were completed in mid-July. However, in September the San Luis Dam, a joint State-Federal facility, experienced a slippage which halted operations to fill the reservoir for the 1982 irrigation season. CVP and SWP exports from the Delta were sharply curtailed during the remainder of the year, while the necessary repairs were being planned.

Table 3, Page 5 shows that most of the applicable water quality standards were met by the CVP and SWP during 1981, except that the agricultural standard for Emmaton on the Sacramento River and Jersey Point on the San Joaquin River were exceeded slightly during May.

Conditions at specific locations with applicable Decision 1485 standards are summarized below. Plate I shows these locations.

ION 1485

Date: March 10, 1982

Prepared by: G. Hester/A. Shahbazi

TYPE DRY	SHORT AND LONG-TERM SAMPLE VALUES		TREND/PERIOD	VALUE	COMPLIANCE?
	PERIOD	VALUE			
/1)	1/1 - 12/31	250	12/1-12/31	105	1/1-12/31 212 Yes
	1/1 - 12/31	250	12/1-12/31	123	1/1-12/31 129 Yes
	1/1 - 12/31	250	12/1-12/31	109	1/1-12/31 113 Yes
	1/1 - 12/31	250	12/1-12/31	132	1/1-12/31 164 Yes
ean	EA. YR. 165/3652 (45%)		12/1-12/31	31/31 100%	1/1-12/31 319 87% Yes
g.	4/1 - 6/15	0.45	-	-	4/1-6/15 0.54 No
	6/16- 8/15	1.67	-	-	6/16-8/15 1.21 Yes
	4/1 - 6/15	0.45	-	-	4/1-6/15 0.46 No
	6/16- 8/15	1.35	-	-	6/16-8/15 1.23 Yes
	4/1 - 8/15	0.45	-	-	4/1-8/15 0.23 Yes
	-	-	-	-	-
	4/1 - 6/25	0.45	-	-	4/1-6/25 0.23 Yes
	6/26- 8/15	0.58	-	-	6/26-8/15 0.30 Yes
y	4/1 - 5/5	0.550	-	-	4/1 - 5/5 0.23 Yes
	4/15- 5/5	1.53/	-	-	4/15-5/5 0.73 Yes
Oct-	4/1 - 4/14	6700	-	-	4/1-4/14 16361 Yes
	5/6 - 5/31	4300	-	-	5/6-5/31 10527 Yes
lod	June	3600	-	-	June 4949 Yes
	July	3200	-	-	July 4717 Yes
g.	January	1500	-	-	January 7011 Yes
	2/1 - 3/15	1000	-	-	2/1-3/15 13573 Yes
	3/16- 6/30	2000	-	-	3/16-6/30 4372 Yes
	July	1000	-	-	July 4346 Yes
	August	1000	-	-	August 6725 Yes
	9/1 - 12/31	1500	12/1-12/31	26009	9/1-12/31 4022 Yes
g.	Jan. - May	12.5	-	-	Jan.-May 6.4 Yes
	Oct. - Dec.	15.6 14/	12/1-12/31	5.16	9/1-12/31 11.5 Yes
ally	-	-	-	-	-
s)	Jan. - May	66005/	-	-	Jan.-May 21140 Yes
z-	May - June	3000	-	-	May-June 1029 Yes
	July	4600	-	-	July 2321 Yes
	May - June	3000	-	-	May-June 2992 Yes
ly	1/1 - 4/15	All	-	-	1/1-4/15 81/81 Yes
ts	4/16-5/31	PER DFG REQUEST	-	-	4/16-5/31 8 Yes

Footnotes:

- 1/ (↑) - increasing trend, (↓)-decreasing trend, (-) - no change from values obtained for previous short term period.
- 2/ Must be provided in intervals of not less than two weeks duration
- 3/ whenever the projects impose deficiencies, this standard replaced by 4/1-5/5 relaxed standard (see Decision 1485)
- 4/ During dry and critical years, this standard relaxed to 15.6 whenever the projects impose deficiencies
- 5/ Unless exceeded by above standard, this level required whenever storage at or above minimum level in the flood control reservation envelope at 2 out of three of the following: Shasta, Oroville, CVP storage on American River
- 6/ Department of Fish and Game may request up to 20 days but no more than two out of four consecutive days.

Municipal and Industrial Supply

Table 3 (p. 5) shows the applicable chloride standards and locations for protection of municipal and industrial supplies. The 250 mg/l year-round chloride standard is based upon public health considerations, and the 150 mg/l chloride standard provides added protection for salt-sensitive industries in the Antioch area. Mean daily chlorides remained well below the 250 mg/l level throughout 1981 at all locations where the year-round 250 mg/l chloride standard applies. Figures 1, 2 and 3 show graphically mean daily chloride values^{1/} obtained at representative Delta locations during 1981. (Plate I shows these locations).

At the Contra Costa Canal Intake near Rock Slough (Figure 1) mean daily chlorides remained well below the 250 mg/l standard for the entire year. The highest chloride levels occurred during mid-September. Chlorides were under 180 mg/l throughout the year except for this brief period in September.

At the Antioch Water Works Intake (Figure 2) mean daily chlorides remained below the 150 mg/l standard for about 120 days from February to late April and from late November through December. As Figure 1 shows, additional protection at the 150 mg/l chloride level was provided for 199 days by the Contra Costa Canal. Therefore, total protection for Antioch area industries at the 150 mg/l chloride level was provided for 319 days during 1981, based on water quality available offshore at Antioch or from Contra Costa Canal for periods of at least 14 consecutive days. This surpassed the minimum Decision 1485 dry year standard of 165 days per year and would have also exceeded the wet year standard of 240 days per year

^{1/} The mean daily chloride values have been converted from mean daily electrical conductivity measurements.

CONTRA COSTA CANAL INTAKE MEAN DAILY CHLORIDES (MG/L)

STANDARD: MAXIMUM OF 250 MG/L ALL YEAR AND
MAXIMUM OF 150 MG/L FOR AT LEAST 165
DAYS OF THE YEAR EITHER HERE OR AT ANTIIOCH

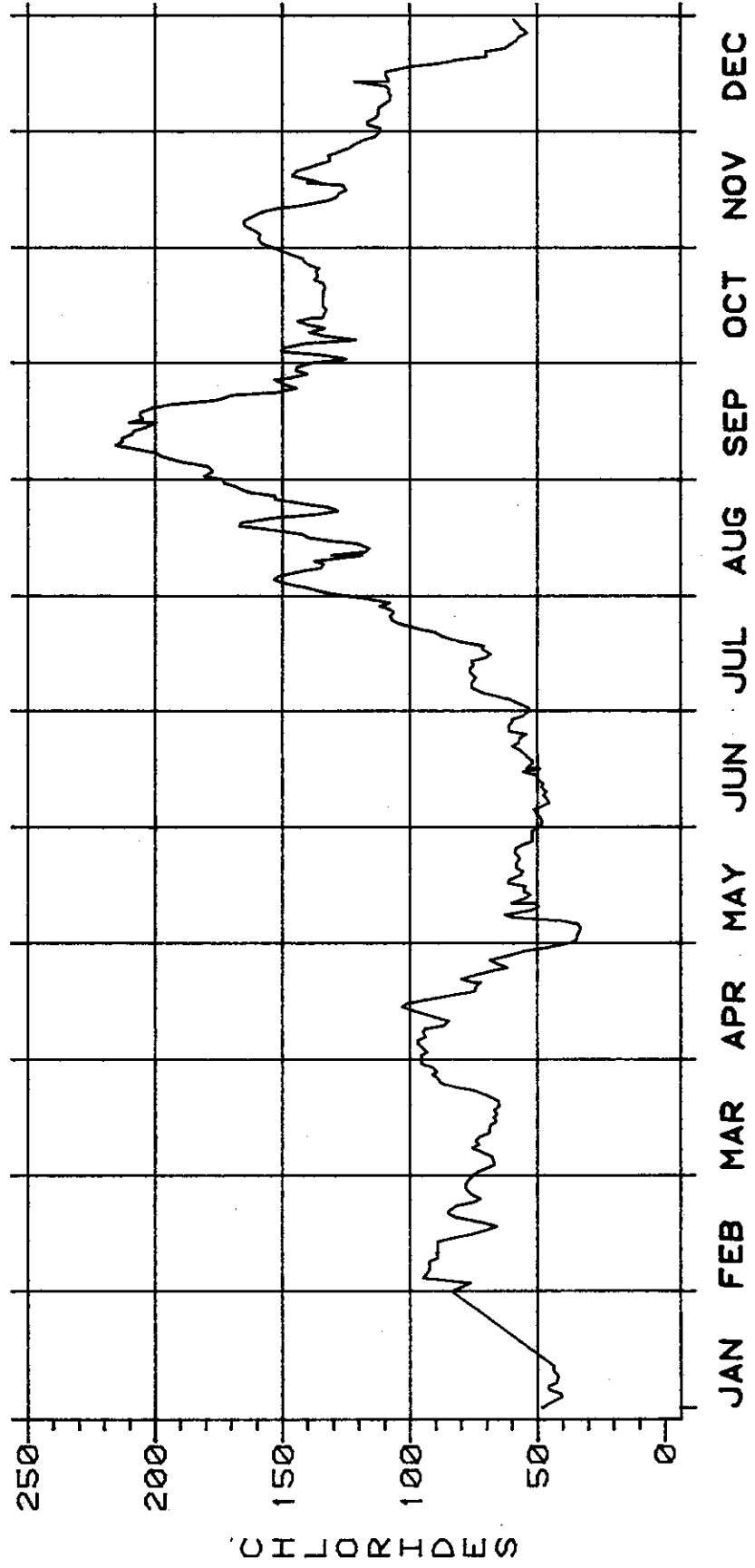
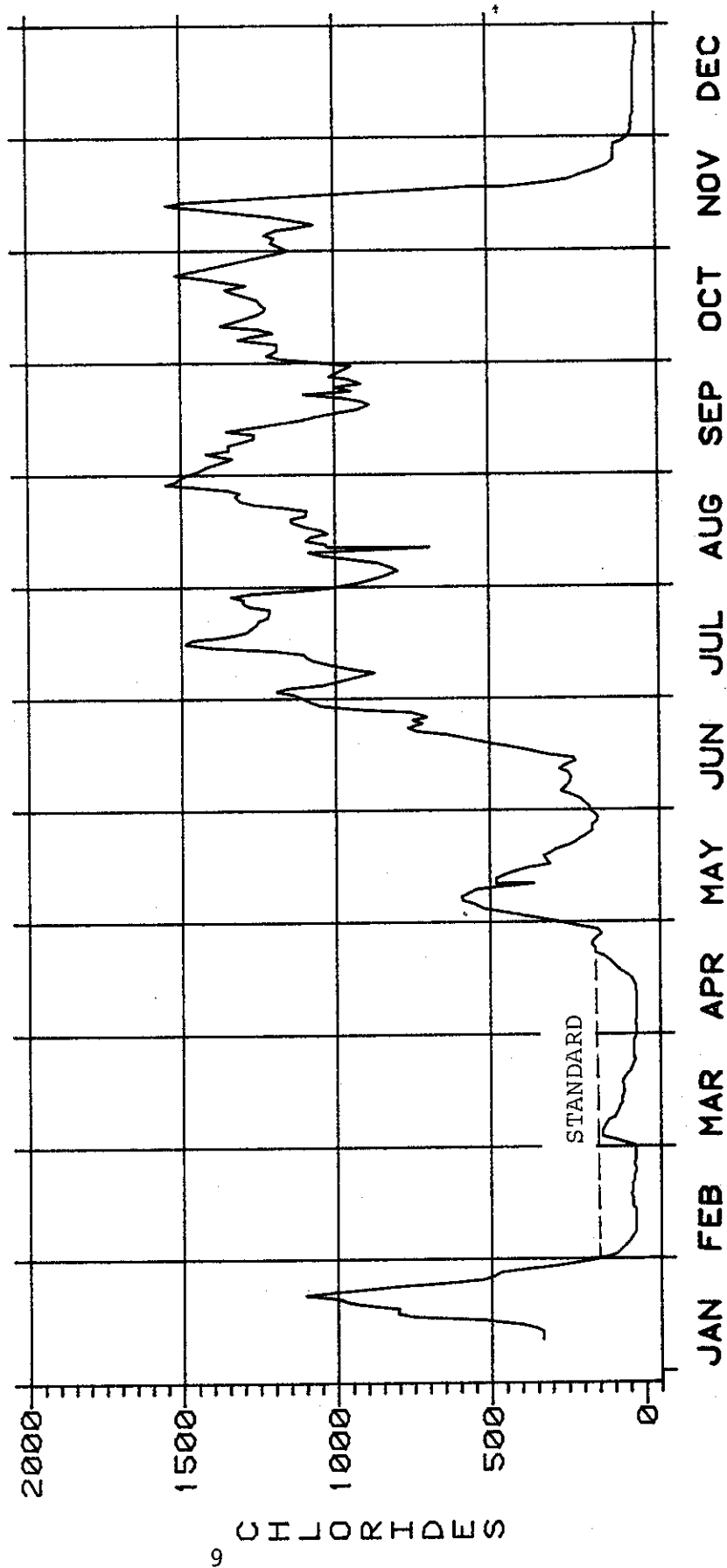


Figure 1

1981

**SAN JOAQUIN RIVER AT ANTIOCH WATER WORKS INTAKE
MEAN DAILY CHLORIDES (MG/L)**

**STANDARD: MAXIMUM OF 150 MG/L FOR 165 DAYS
AT ANTIOCH OR CONTRA COSTA CANAL**



1981

Figure 2

DELTA-MENDOTA CANAL IN DAILY CHLORIDES (MG/L)

STANDARD: MAXIMUM OF 250 MG/L ALL YEAR

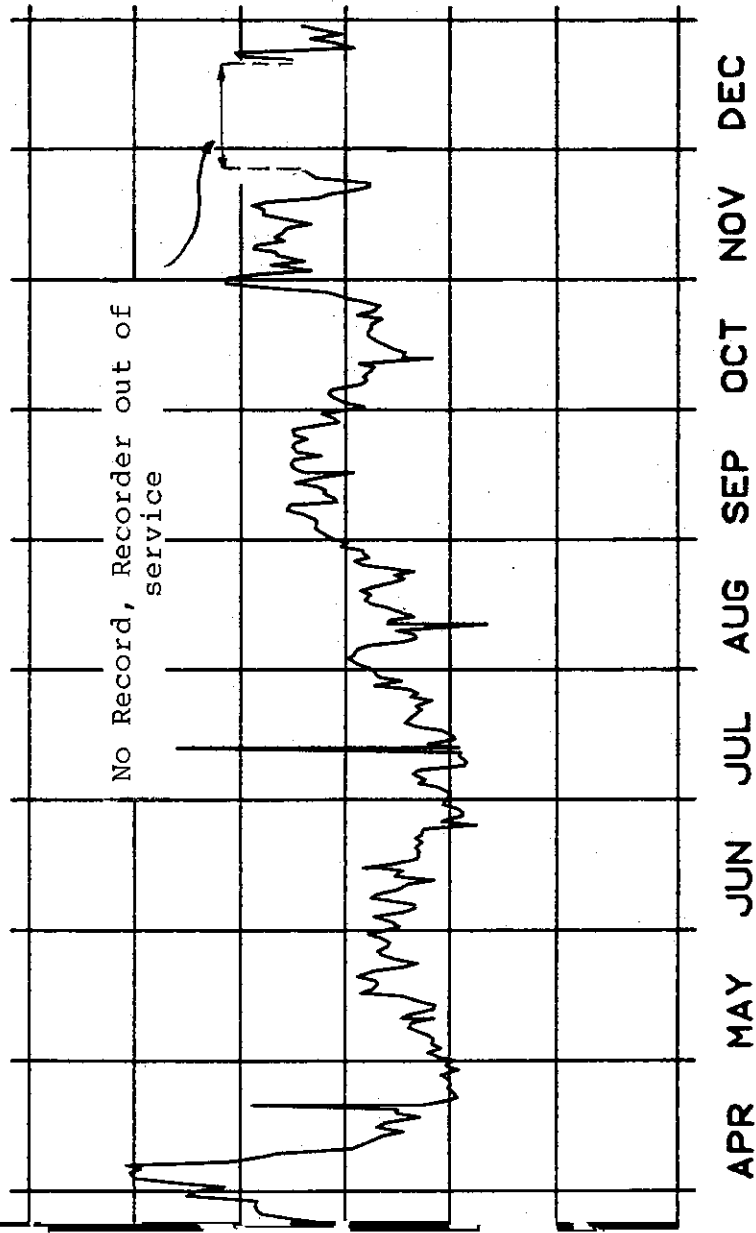


Figure 3

1981

had that standard been in effect. Only during the periods of August 18 through September 24 and November 2-9 could Antioch area industrial users not obtain water quality better than the 150 mg/l chloride level either offshore at Antioch or from the Contra Costa Canal. At the Delta-Mendota Canal (Figure 3) mean daily chlorides also remained well below the standard of 250 mg/l during 1981. The highest levels occurred during mid-March.

Agricultural Supply

Table 3 (p. 5) shows the applicable electrical conductivity standards and locations for protection of Delta agriculture during the irrigation season (from April 1 through August 15). The 450 micromhos (0.45 millimhos) standard (for a maximum 14-day running average) was based upon estimated applied water salinity required to provide 100 percent crop yield for corn in Delta sub-irrigated organic soils. In dry years the standards allow for increase from the 450 millimhos level during the latter part of the irrigation season to reflect water quality which would have occurred in the absence of the Central Valley Project and State Water Project.

Figures 4 and 5 show the mean daily electrical conductivity values at the two western Delta locations (San Joaquin River at Jersey Point and Sacramento River at Emmaton) where agriculture is most susceptible to salinity increases due to seawater intrusion (Plate I shows these locations). Figures 6 and 7 represent the 14-day running average values for these two locations. These Figures show that standards at these stations were exceeded during May 1981. As shown in Figure 9, a significant decrease in the Delta Outflow Index occurred in mid-April soon after balanced conditions

*SAN JOAQUIN RIVER AT JERSEY POINT
MEAN DAILY ELECTRICAL CONDUCTIVITY (MICROMHOS)*

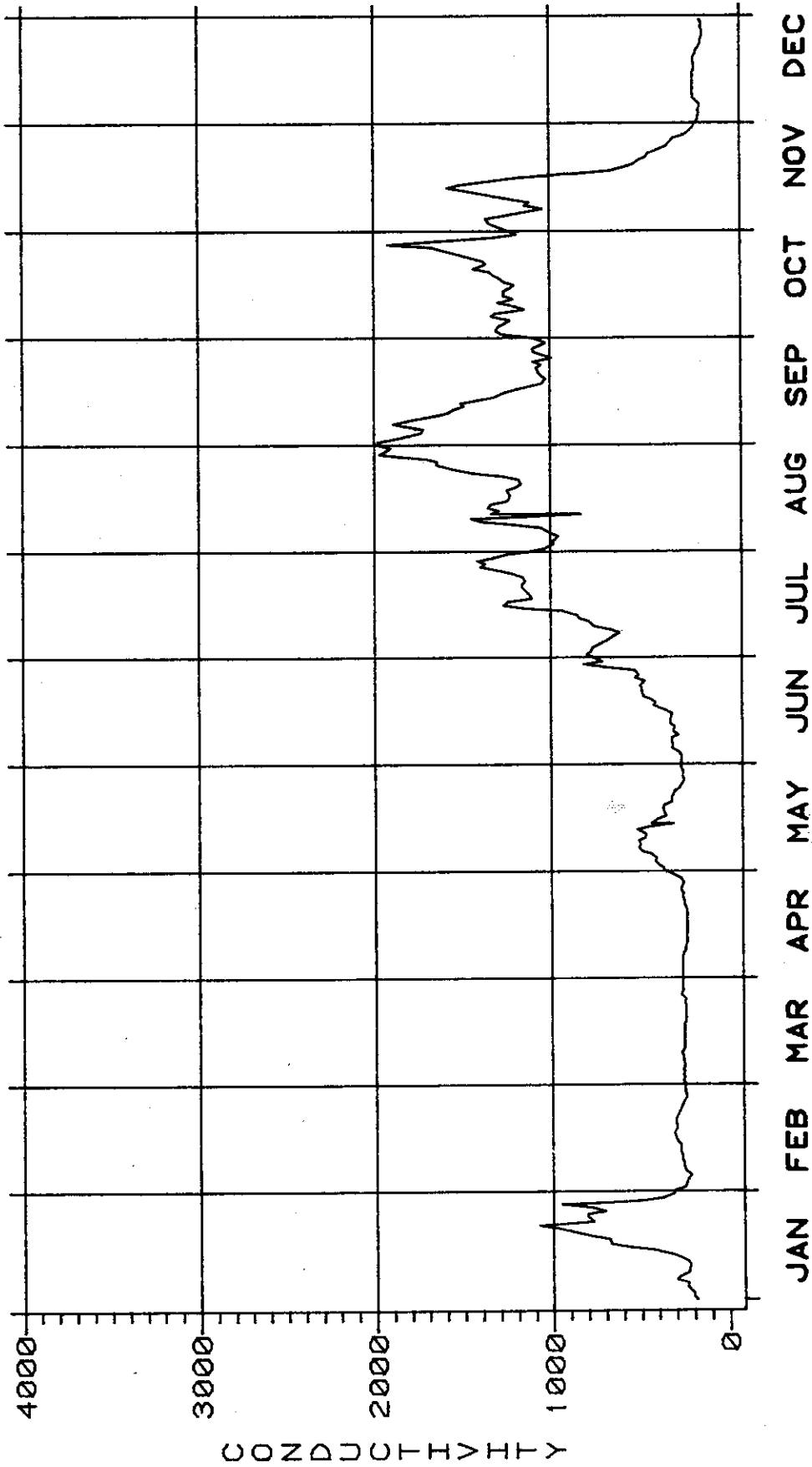
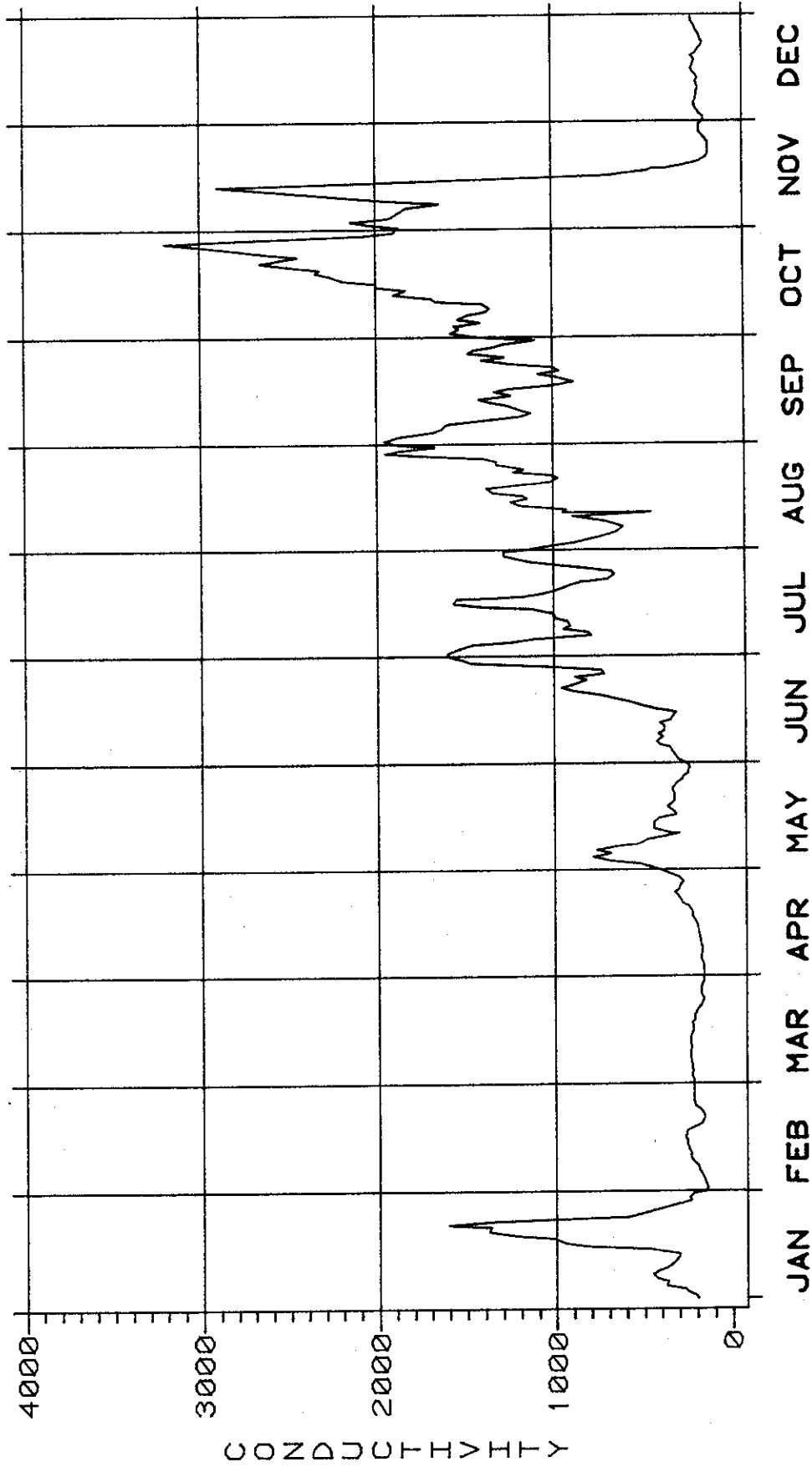


Figure 4

1981

Figure 5

SACRAMENTO RIVER AT EMMATON
MEAN DAILY ELECTRICAL CONDUCTIVITY (MICROMHOS)



1981

**SAN JOAQUIN RIVER AT JERSEY POINT
 14 DAY RUNNING AVERAGE OF
 MEAN DAILY EC (MICROMHOS)**

STANDARD: MAXIMUM OF 450 MICROMHOS FROM APRIL 1 TO AUGUST 15

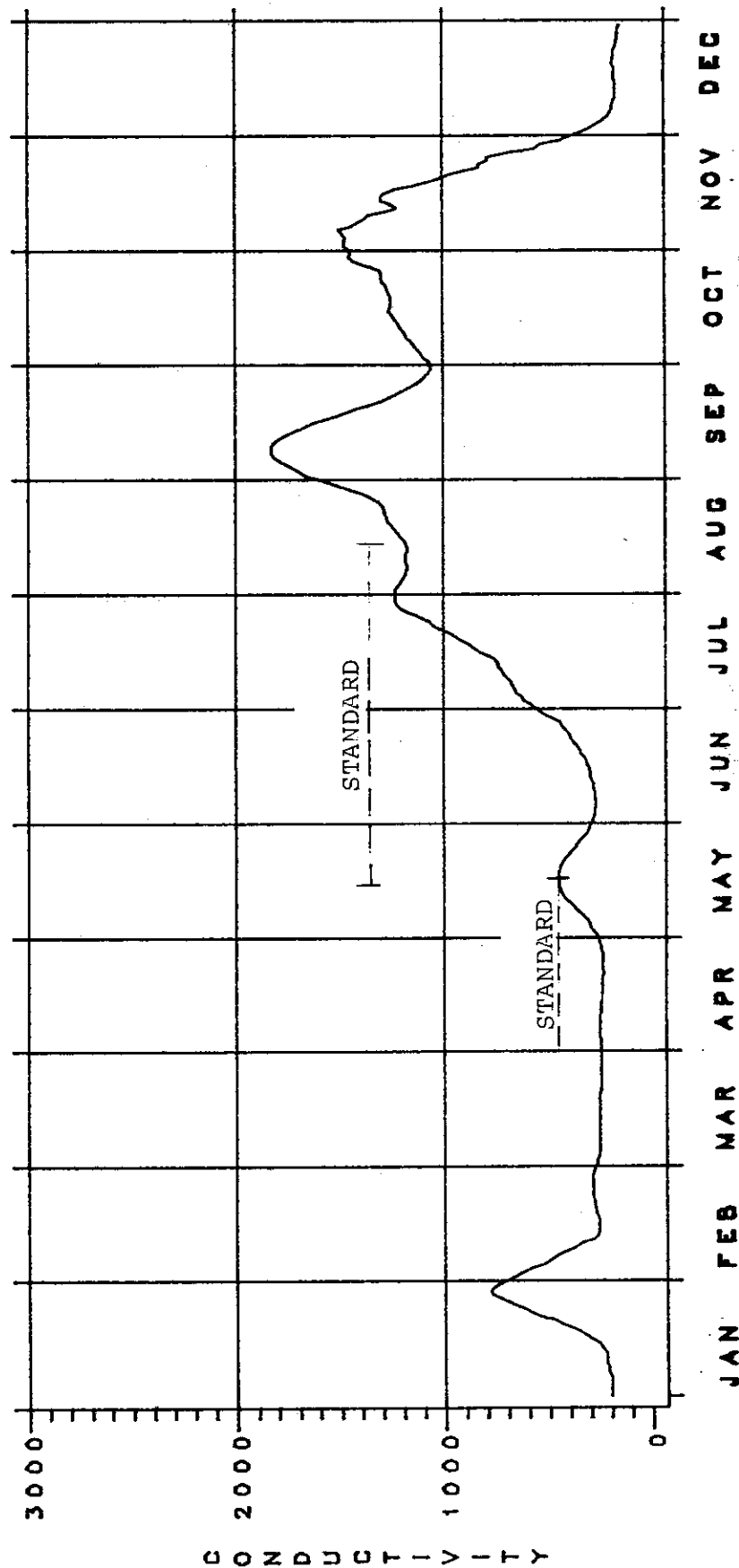
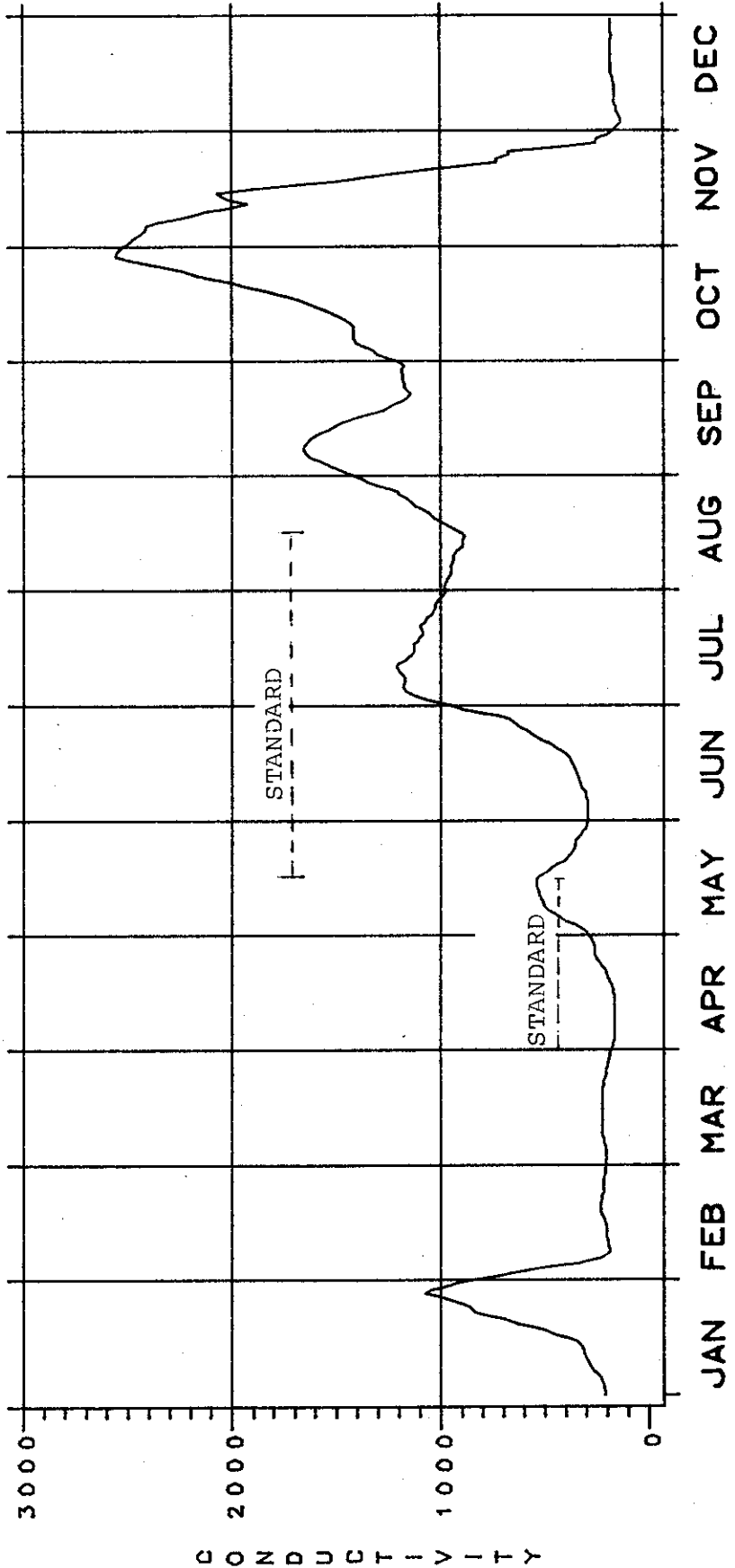


Figure 6

1951

Figure 7

SACRAMENTO RIVER AT EMMATON
14 DAY RUNNING AVERAGE OF
MEAN DAILY EC (MICROMHOS)



1981

had been declared by the project operators. These low Delta outflows in April and early May were rapidly followed by salinity intrusion into the western Delta.

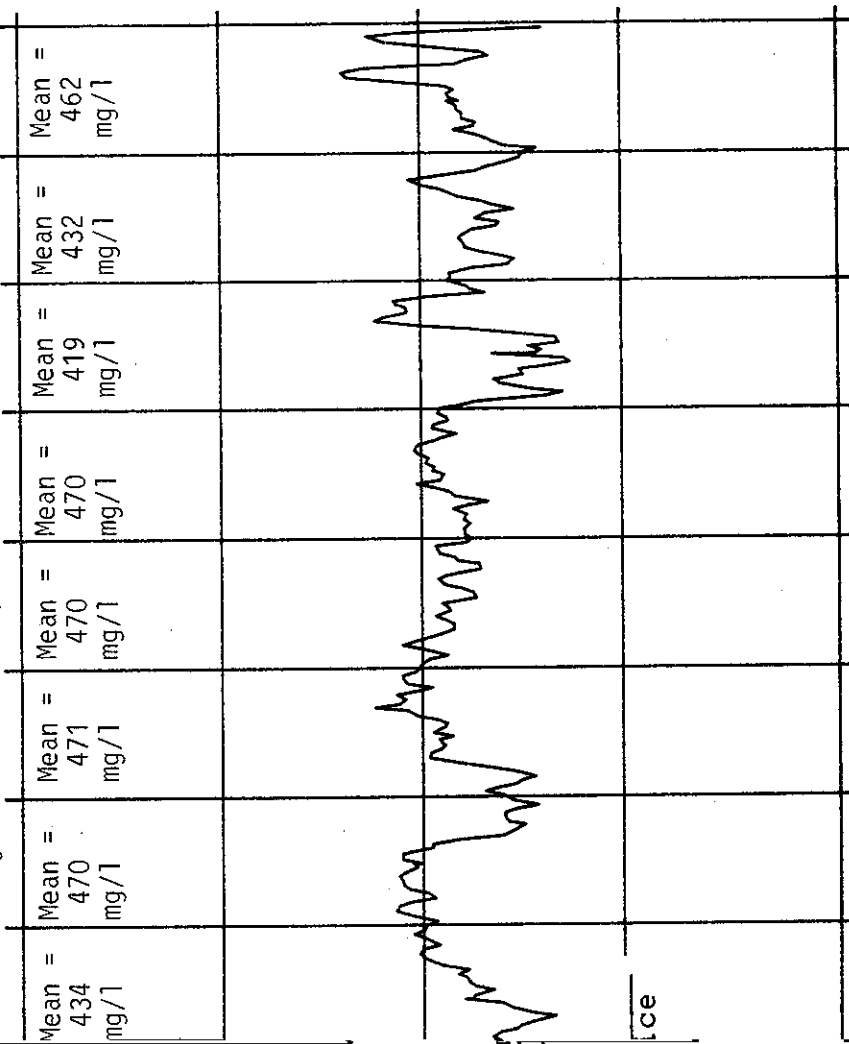
The Emmaton standard was exceeded during the period from May 7 through May 19, and the standard at Jersey Point was exceeded for one day on May 16, 1981. At the June 3, 1981 State Board Workshop, staff presented an item to the State Board discussing this non-compliance with the standards. The CVP and SWP subsequently offset the effects of this non-compliance by extending protection at 0.45 mmhos/cm EC level longer than required by the standards. In accepting this corrective action, the State Board admonished CVP and SWP operators to take greater care in the future to assure that Decision 1485 standards are maintained as the first priority for the SWP and CVP.

The existing standard for protection of southern Delta agriculture is in Decision 1422 as a condition of the Bureau's water right permit for operation of New Melones Reservoir. This standard specifies a maximum mean monthly Total Dissolved Solids (TDS) value of 500 mg/l at Vernalis on the San Joaquin River. The standard went into effect in the fall of 1980 when the New Melones Reservoir became operational. Figure 8 shows that high salinity values were recorded during the first weeks in April. Water quality releases from CVP storage in New Melones Reservoir resulted in improved salinity conditions during the latter part of April. The mean TDS value for April was 496 mg/l which closely approached the standard of 500 mg/l. Mean monthly TDS remained below the standard of 500 mg/l during April through December of 1981.

Figure 8

**IN RIVER AT VERNALIS
AL DISSOLVED SOLIDS (MG/L)**

Mean Monthly Value of 500 mg/l



MAY JUN JUL AUG SEP OCT NOV DEC
1981

Fish and Wildlife Conditions

The Decision 1485 dry year standards for protection of fish and wildlife are listed in Table 3 (p. 5). These flow and salinity standards were designed primarily to protect spawning and survival of striped bass, migration of salmon, and the Suisun Marsh wildlife habitat. The standards were easily met during 1981. Despite the compliance with D-1485 standards in 1981, the recent decline observed in young striped bass abundance since 1977 continued. In January 1982 the State Board appointed a Work Group of highly qualified experts to investigate this matter fully, determine the reasons for this decline and identify corrective action that could be initiated immediately. Specific examples of water quality conditions at key locations are provided below:

Figure 9 shows graphically the Daily Delta Outflow Index at Chipps Island in the Sacramento River during 1981. Note that the mean monthly values for January through May greatly surpassed the standard of a minimum of 6600 cubic feet per second, which is required to provide salinity protection to Suisun Marsh. The resulting salinities at Chipps Island^{1/} (see Figure 10) remained well below the marsh standard of 12,500 micromhos (12.5 millimhos) for a 28-day

^{1/} The Department's electrical conductivity recorder at Chipps Island was destroyed in January 1980 high flood flows. A recorder installed across the channel at Mallard Island began operating in June 1980 and a correlation was used to estimate salinity at Chipps Island during 1981. The State Board has not taken action on whether the Mallard Island correlation is an acceptable substitute for Chipps Island data.

SACRAMENTO RIVER AT CHIPPS ISLAND DAILY DELTA OUTFLOW INDEX (CFS)

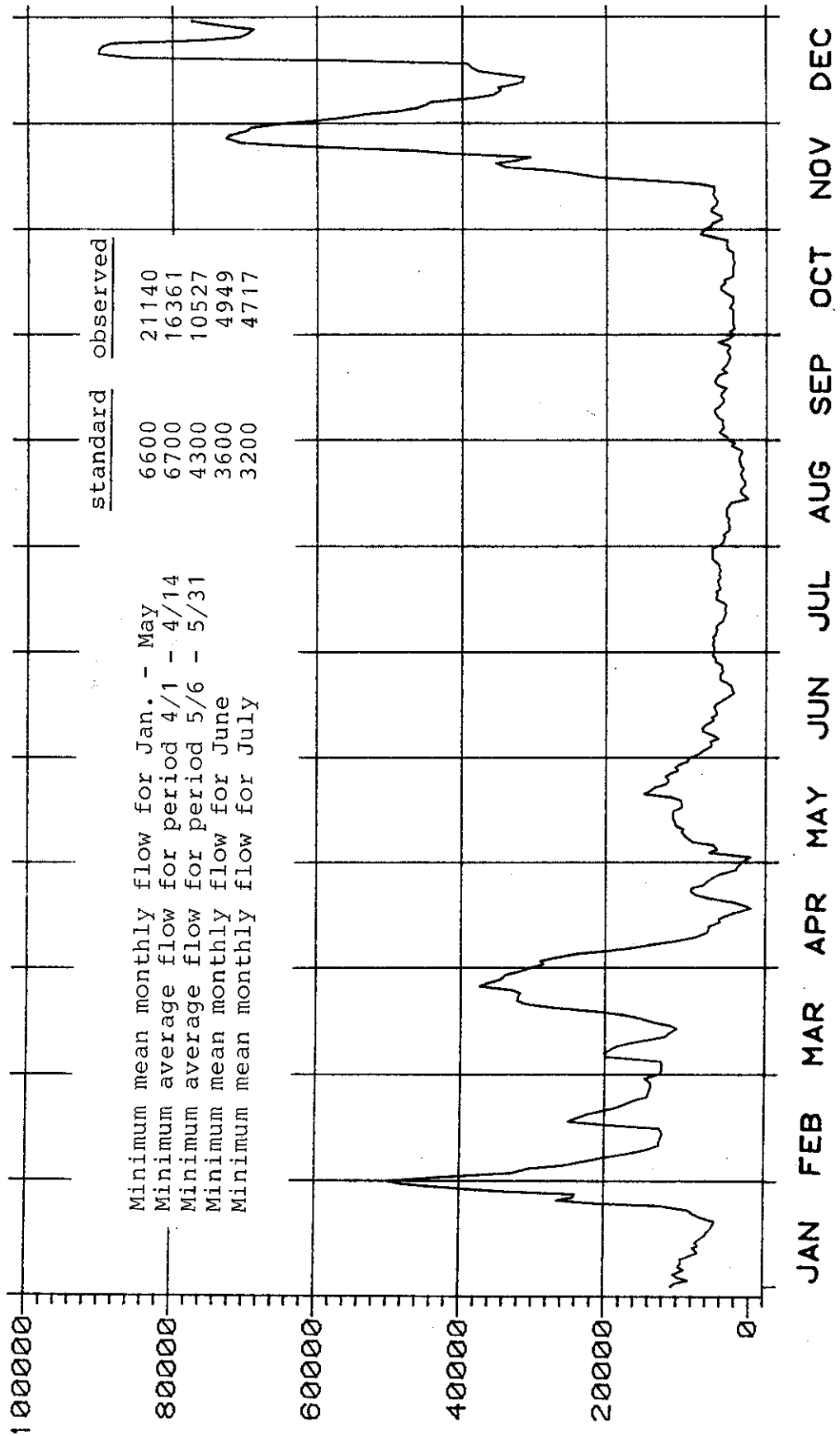


Figure 9

1981

running average during January through May. Since project water users did not take deficiencies in scheduled water supplies in 1981, the October through December marsh salinity standard of 12,500 micromhos (for a 28-day running average) was also in effect. Figure 10 shows that compliance with this standard was achieved easily.

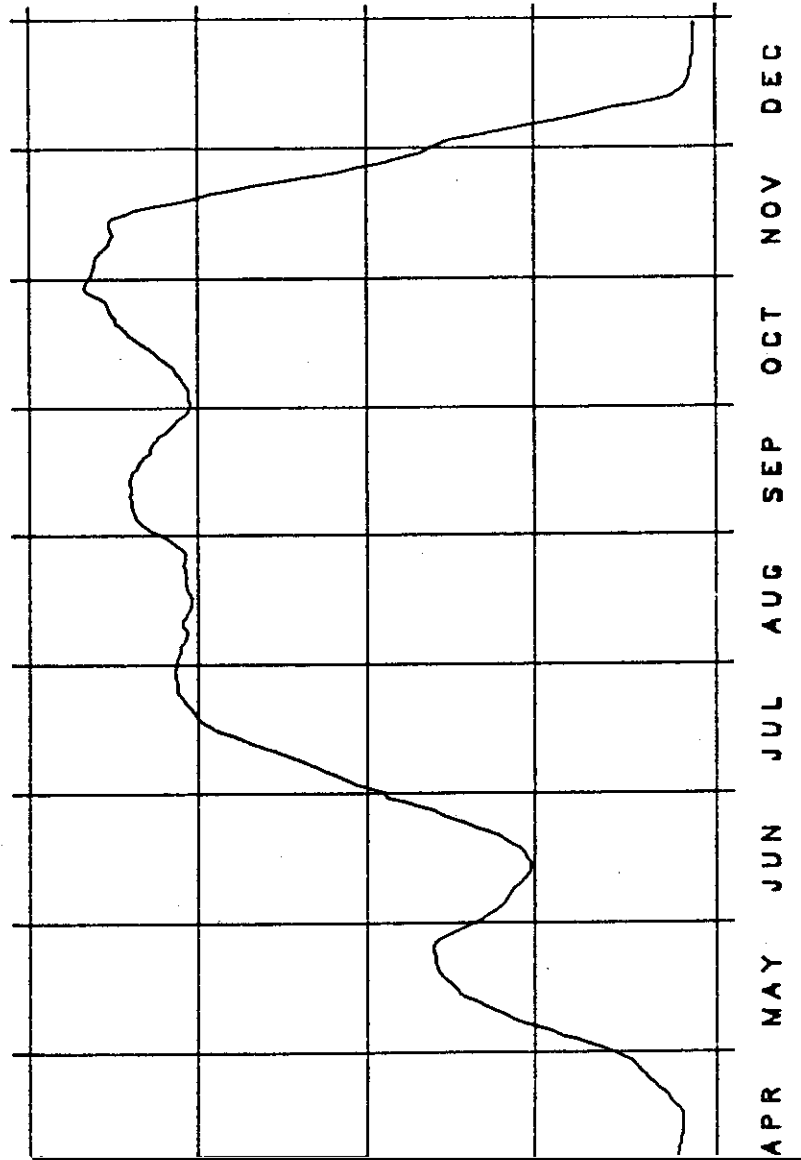
Figure 9 also shows that other minimum Delta outflows required from April 1 through April 14 and from May 6 through July 31 (for protection of striped bass spawning and survival) were surpassed. In addition, Figure 11 shows that during the critical striped bass spawning period of April 15 through May 5 average salinities in the San Joaquin River at Antioch were well below the standard of 1500 micromhos.

During the period of May through June, the Delta standards require that Central Valley Project exports into the Delta-Mendota canal and State Water Project exports into the California Aqueduct each be limited to maximum mean monthly values of 3000 cubic feet per second. During July, the mean monthly export limit is 4,600 cubic feet per second and only applies to the State Water Project since the maximum capacity of Delta-Mendota Canal is already limited at that level. These export limitations are designed to reduce the physical effects of the export pumping on the Delta fishery. On May 20, 1981 flow of SWP water in the California Aqueduct was halted because of a slippage in the aqueduct lining and canal embankment. The Department of Water Resources requested a temporary permit to divert SWP water from the CVP's Tracy Pumping Plant to make up for the loss of SWP operating capability while the necessary repairs were

Figure 10

CHIPPERS ISLAND
RIVER AT
DAILY EC (MICROMHOS)*
RUNNING AVERAGE OF

MAXIMUM OF 12500 MICROMHOS
ROUGH MAY AND OCTOBER THROUGH DECEMBER



1981
collected at Mallard Slough

SAN JOAQUIN RIVER AT ANTIOCH MEAN DAILY ELECTRICAL CONDUCTIVITY (MICROMHOS)

STANDARD: MAXIMUM AVERAGE FOR PERIOD APRIL 1
THROUGH MAY 5 OF 1500 MICROMHOS

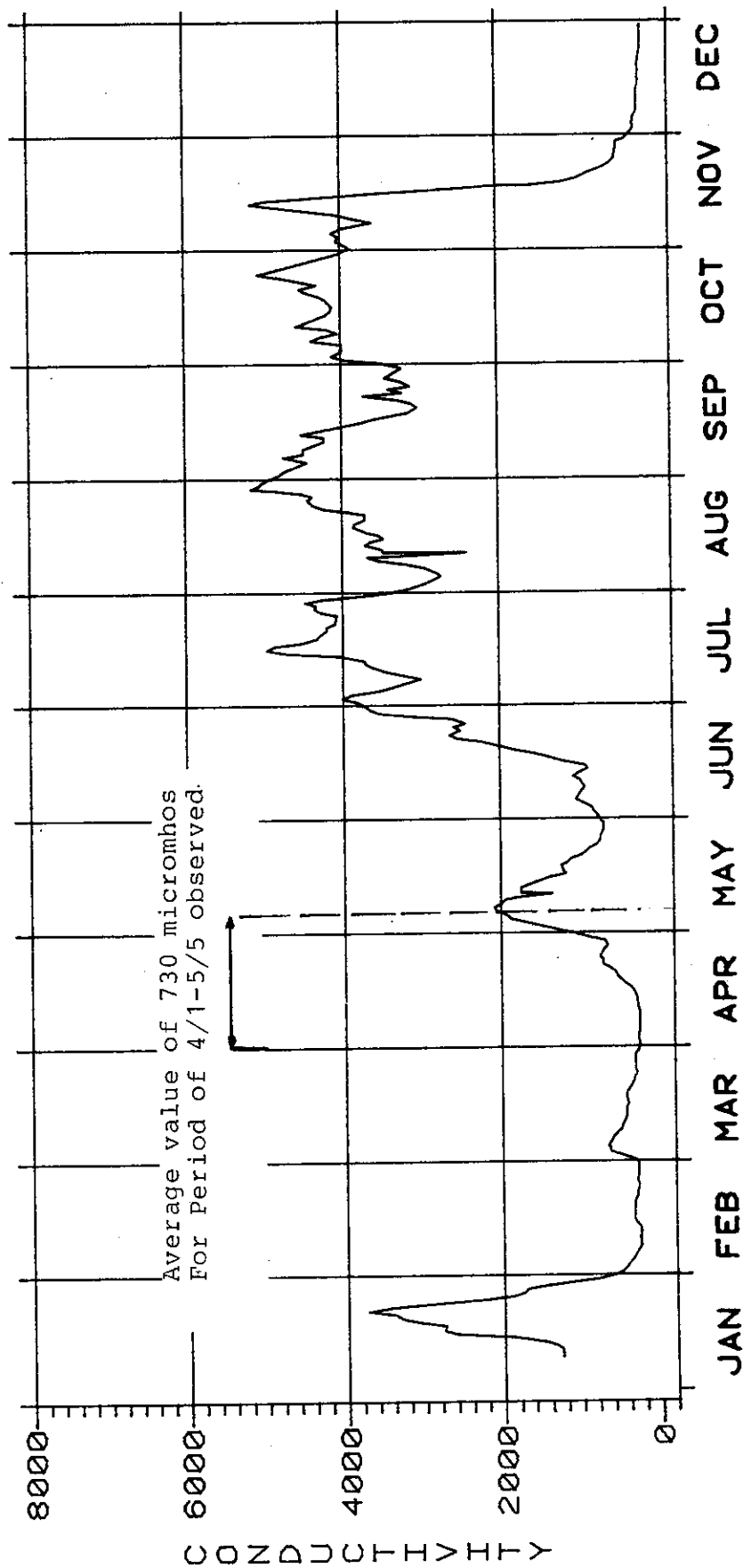


Figure 11

1981

being made. The State Board issued a temporary permit on May 22, 1982 allowing the SWP to divert up to 1,600 cfs using excess CVP capacity at the Tracy Pumping Plant from May 22, 1981 to July 22, 1981. Repairs were completed and full SWP operations were resumed on July 14, 1981.

Figure 12 shows mean daily exports into the Delta-Mendota Canal.^{1/} Figure 13 shows mean daily inflow to Clifton Court Forebay which approximates exports into the California Aqueduct. Table 4 shows that CVP and SWP exports met the D-1485 pumping restrictions during the May-July period as modified by the State Board's temporary permit. Table 3 (p. 5) shows that standards for minimum flows in the Sacramento River at Rio Vista to provide for salmon migration were met easily in 1981 primarily due to uncontrolled winter flows and downstream water quality requirements. The standards for closure of the Delta cross channel gates (operated by the Bureau) to minimize cross-Delta movement of salmon between January 1 and April were also met.

^{1/} Includes SWP exports from the Tracy Pumping Plant

MEAN DAILY CVP EXPORT (CFS) INTO DELTA-MENDOTA CANAL

STANDARD: MAXIMUM MEAN MONTHLY VALUE OF 3000 CFS
FOR MAY AND JUNE

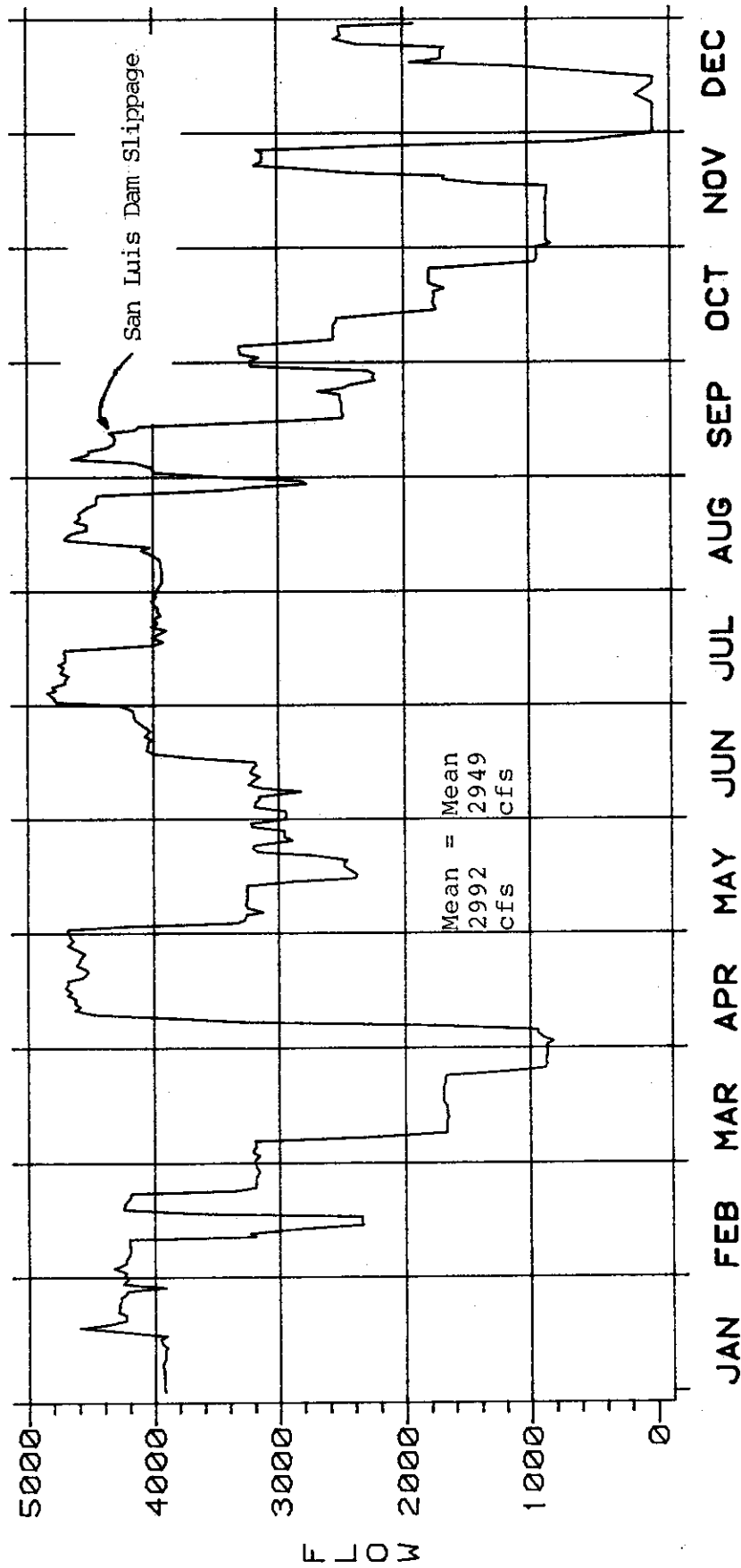


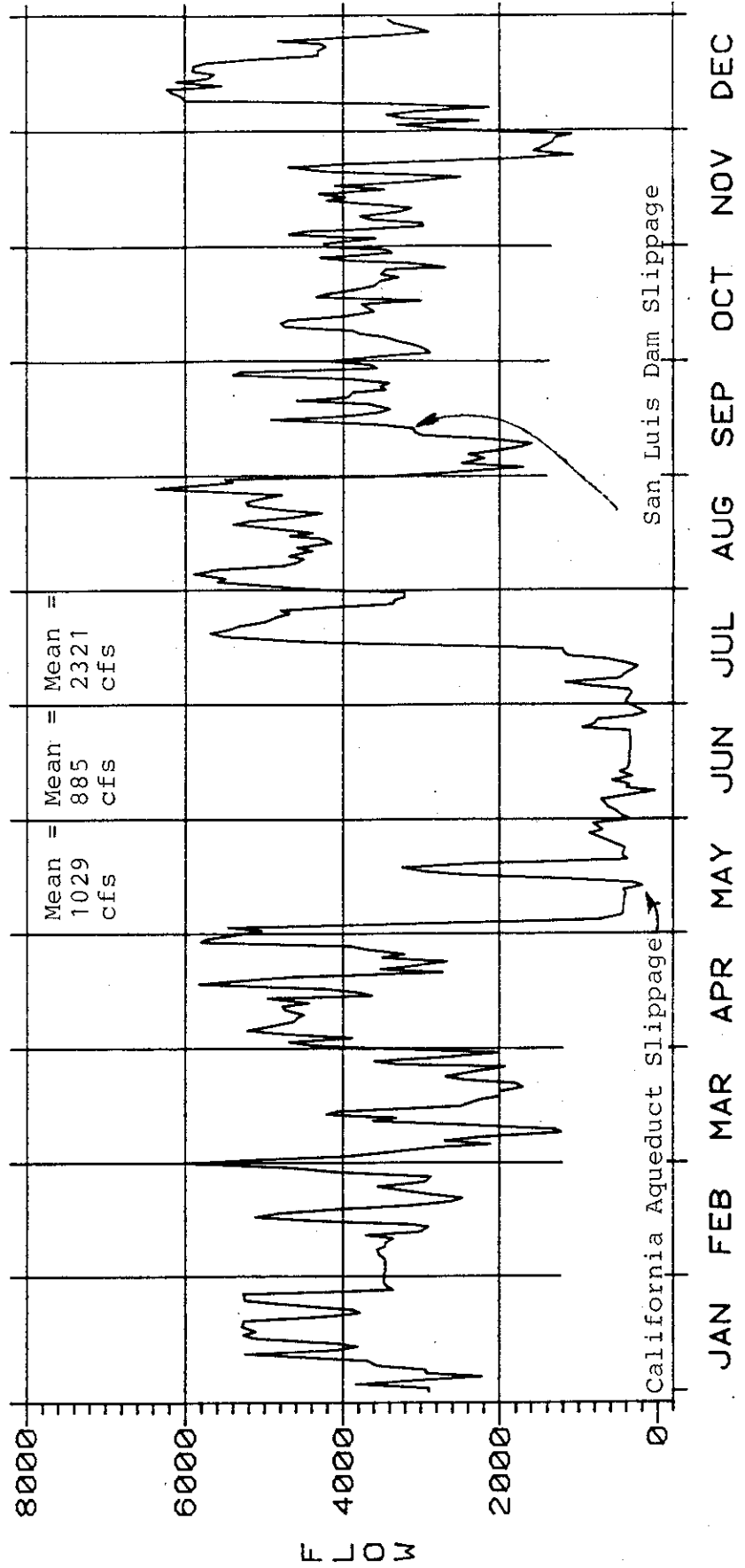
Figure 12

1981

Figure 13

MEAN DAILY SWP EXPORT (CFS) INTO CALIFORNIA AQUEDUCT

STANDARD: MAXIMUM MEAN MONTHLY VALUE OF 3000 CFS
FOR MAY AND JUNE AND 4600 CFS FOR JULY.



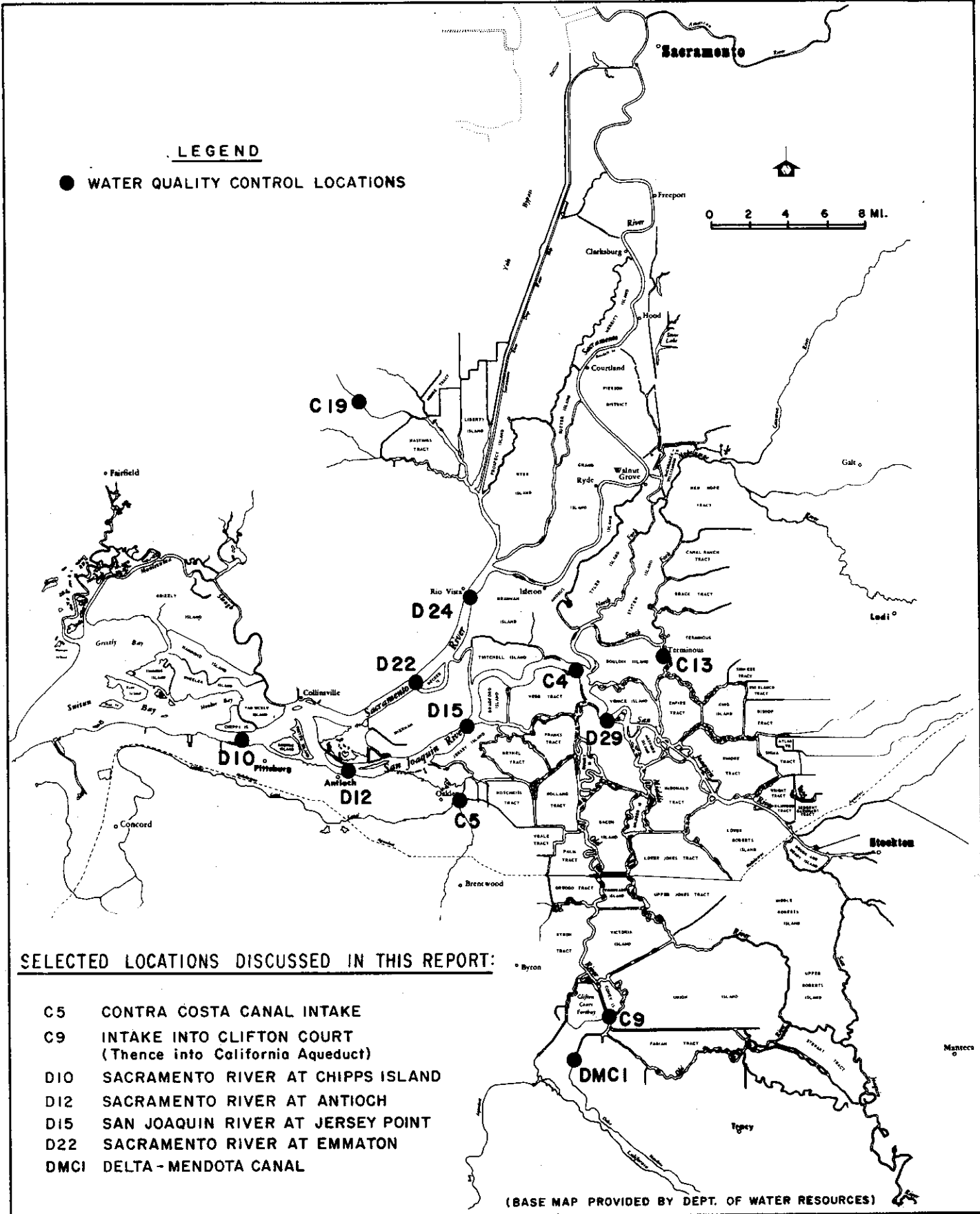
1981

Table 4
Mean Monthly Project Exports (cfs)

		<u>Tracy Pumping Plant (Federal)</u>	<u>Delta Pumping Plant (State)</u>	<u>Monthly^{1/} Total</u>
May	CVP	2992	41	3033
	SWP	144 ^{2/}	885	1029
June	CVP	2949	0	2949
	SWP	603 ^{2/}	265	868
July	CVP	4351	24	4375
	SWP	0	2321	2321

1/ The D-1485 May-July pumping restrictions apply to each export facility.

2/ The temporary emergency permit issued by the State Board allowed the SWP to utilize excess Tracy capacity from May 22 to July 22.



**DECISION 1485
WATER QUALITY CONTROL LOCATIONS**

