Salmon Smolt Survival

San Joaquin

Draft 7/28/94 SEH

Alter-native	Delta Cross Channel	Max Total CVP/SWP Exports in cfs	Barrier Upper Old River	Vernalis Flow	Fall Run SSSI
A	Closed 4/1 to 6/30 All Year Types	4/1 to 5/31 1500 6/1 to 6/30 4000	None in Spring	4/1 to 5/31 Average CFS W 12310 AN 7940 BN 5650 D 3871 C 2855	Sac SJ W .30 AN .20 BN .15 D .12 C .10 Avg= Avg=.19
B	Closed 4/1 to 6/30 All Year Types	Average exports similar to below, however varying in each year based on sliding scale	4/15 to 5/15 All Year Types	CFS Average cfs in each water year type similar to below, and as an overall average slightly higher	Sac SJ* W .49 AN .35 BN .28 D .24 C .20 Avg= Avg=.34
C	Closed 4/1 to 6/30 All Year Types	4/15 to 5/15 1500 4/1 to 4/15 & ~~6/1~~ 5/16 to 6/30 W 6000 AN 5000 BN 4000 D 3000 C 2000	4/15 to 5/15 All Year Types	4/15 to 5/15 Minimum CFS W 10000 AN 8000 BN 6000 D 4000 C 4000 Other flows from 4/1 to 5/31 same as DWRSIM run used by USFWS for D-1630	Sac SJ W .49 AN .35 BN .28 D .22 C .22 Avg= Avg=.33
D USFWS Stockton (Note that barrier is 2 months)	Closed 4/1 to 6/30 All Year Types	4/15 to 5/15 W 6000 AN 5000 BN 4000 D 3000 C 2000	4/1 to 5/31 All Year Types	4/15 to 5/15 Minimum CFS W 10000 AN 8000 BN 6000 D 4000 C 2000 Other flows from 4/1 to 5/31 same as DWRSIM run used by USFWS for D-1630	Sac SJ W .49 AN .41 BN .40 D .35 C .32 Avg= Avg=.41

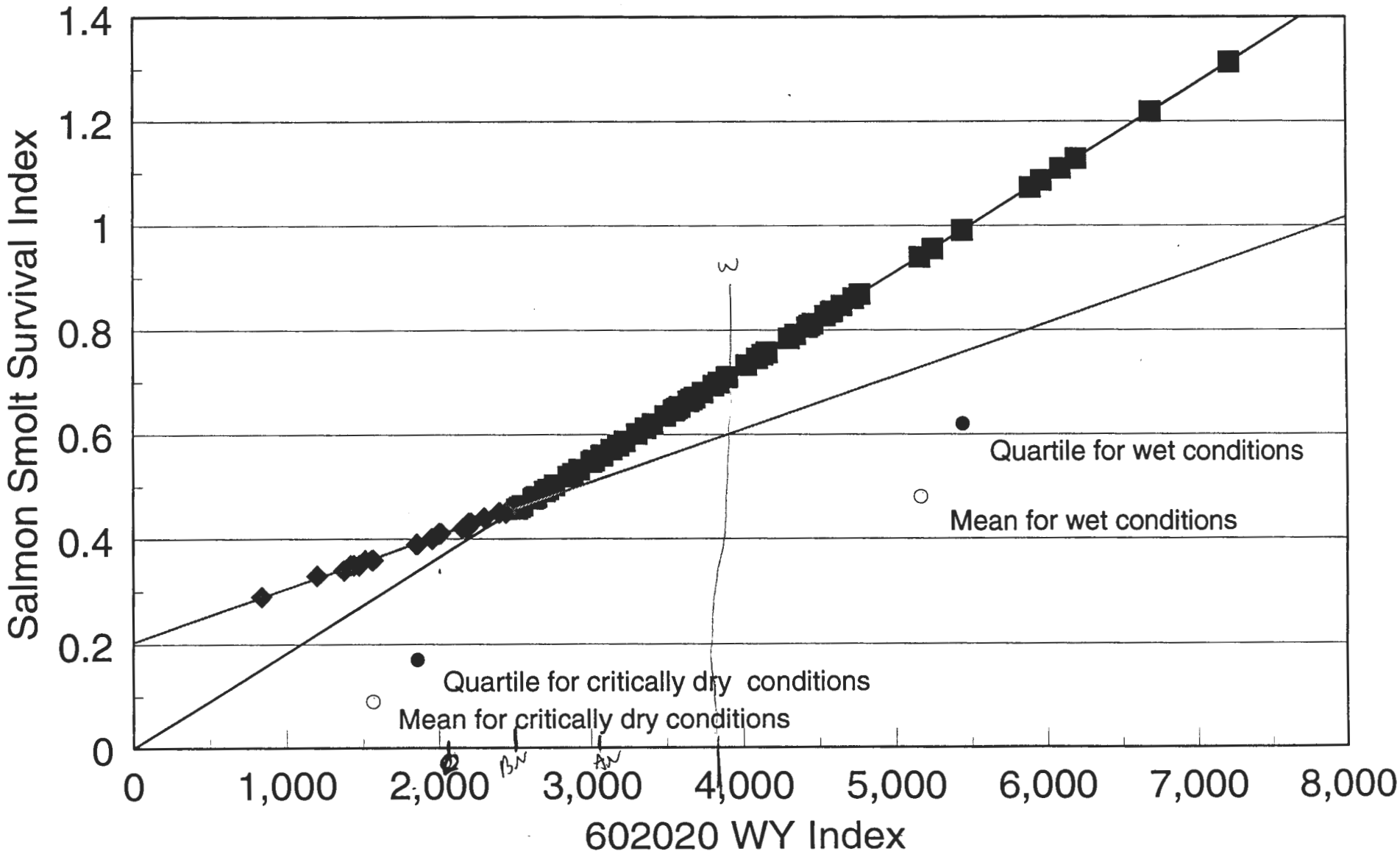
- "B" is "C", with transformation into sliding scales for both CFS + Exports. And preferred
- Concern on Water Cost for export controls. In proposed Rule, we had a flat 4000 export in the control period. Now we're scaling it, in "C", and this restriction will have additional water costs

Tim Notes

Salmon Smolt Survival Goals

Goal for W, AN, BN years: SSSI = .000182*SJWYIndx

Goal for D,C years: SSSI = 0.20615 + .0001*SJWYIndx



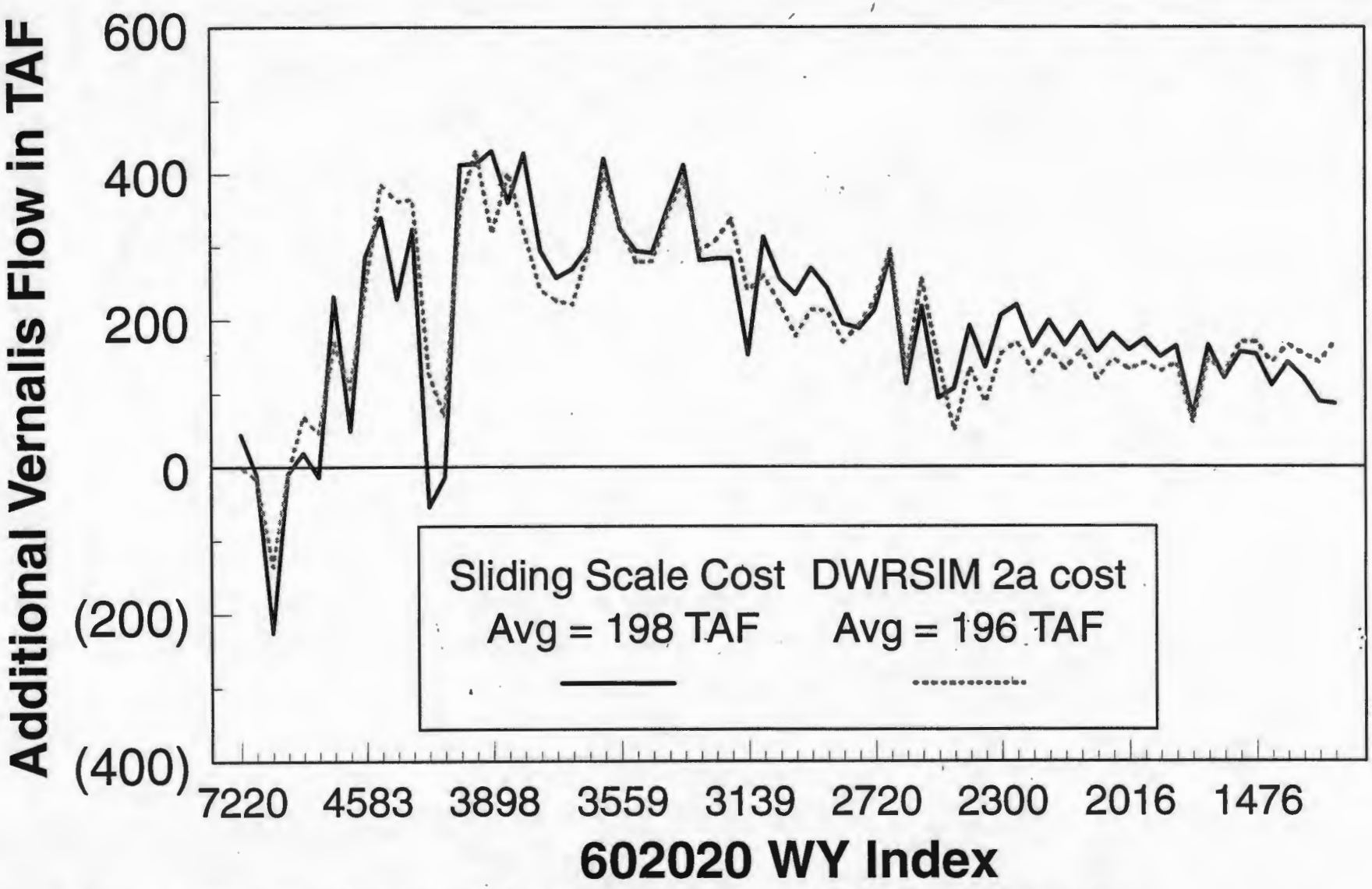
THE GOAL AS OF 7/28/94 ***DO NOT CHANGE***

Class	Year	WyIndex	SSSI Goal Index	Goal/1.8	WYClass Average	WYClass Avg/1.8
W	1983	7220	1.31	0.73		
W	1906	6695	1.22	0.68		
W	1907	6198	1.13	0.63		
W	1969	6095	1.11	0.62		
W	1911	5968	1.09	0.60		
W	1938	5895	1.07	0.60		
W	1982	5446	0.99	0.55		
W	1967	5252	0.96	0.53		
W	1952	5165	0.94	0.52		
W	1958	4773	0.87	0.48		
W	1980	4730	0.86	0.48		
W	1916	4653	0.85	0.47		
W	1909	4593	0.84	0.46		
W	1978	4583	0.83	0.46		
W	1922	4544	0.83	0.46		
W	1956	4463	0.81	0.45		
W	1942	4441	0.81	0.45		
W	1941	4426	0.81	0.45		
W	1914	4348	0.79	0.44		
W	1986	4306	0.78	0.44		
W	1993	4161	0.76	0.42		
W	1917	4134	0.75	0.42		
W	1915	4098	0.75	0.41		
W	1943	4028	0.73	0.41		
W	1974	3903	0.71	0.39		
W	1937	3898	0.71	0.39		
W	1975	3846	0.70	0.39		
W	1965	3812	0.69	0.39	0.881881	0.489934
AN	1936	3740	0.68	0.38		
AN	1984	3689	0.67	0.37		
AN	1979	3669	0.67	0.37		
AN	1910	3647	0.66	0.37		
AN	1945	3590	0.65	0.36		
AN	1963	3573	0.65	0.36		
AN	1927	3559	0.65	0.36		
AN	1935	3557	0.65	0.36		
AN	1923	3550	0.65	0.36		
AN	1973	3495	0.64	0.35		
AN	1932	3410	0.62	0.34		
AN	1940	3364	0.61	0.34		
AN	1946	3305	0.60	0.33		
AN	1921	3226	0.59	0.33		
AN	1970	3183	0.58	0.32		

AN	1951	3139	0.57	0.32	0.633542	0.351968
BN	1918	3080	0.56	0.31		
BN	1962	3073	0.56	0.31		
BN	1953	3025	0.55	0.31		
BN	1957	3008	0.55	0.30		
BN	1925	2929	0.53	0.30		
BN	1971	2886	0.53	0.29		
BN	1950	2854	0.52	0.29		
BN	1944	2763	0.50	0.28		
BN	1954	2720	0.50	0.28		
BN	1948	2698	0.49	0.27		
BN	1920	2642	0.48	0.27		
BN	1928	2632	0.48	0.27		
BN	1919	2620	0.48	0.26		
BN	1912	2549	0.46	0.26		
BN	1949	2533	0.46	0.26		
BN	1966	2514	0.46	0.25	0.506483	0.28138
D	1981	2442	0.45	0.25		
D	1933	2441	0.45	0.25		
D	1985	2404	0.45	0.25		
D	1908	2396	0.45	0.25		
D	1926	2300	0.44	0.24		
D	1955	2300	0.44	0.24		
D	1968	2215	0.43	0.24		
D	1959	2209	0.43	0.24		
D	1939	2199	0.43	0.24		
D	1964	2187	0.42	0.24		
D	1947	2183	0.42	0.24		
D	1972	2159	0.42	0.23	0.434773	0.241541
C	1930	2016	0.41	0.23		
C	1929	2005	0.41	0.23		
C	1913	2002	0.41	0.23		
C	1989	1964	0.40	0.22		
C	1991	1955	0.40	0.22		
C	1987	1861	0.39	0.22		
C	1960	1854	0.39	0.22		
C	1976	1568	0.36	0.20		
C	1992	1558	0.36	0.20		
C	1990	1514	0.36	0.20		
C	1988	1476	0.35	0.20		
C	1934	1440	0.35	0.19		
C	1924	1420	0.35	0.19		
C	1961	1375	0.34	0.19		
C	1931	1201	0.33	0.18		
C	1977	839	0.29	0.16	0.368948	0.204971
			Overall Average		0.614245	0.341247
			Average dry & critical		0.397159	0.220644

1982 goal divided by quartile (1982 data) for wet year conditions (.99/.62)	1.6
Average of wet year goals divided by average for experimental wet conditions (.88/.48)	1.8
1987 goal divided by quartile (1987 data) for critically dry year conditions (.39/.17)	2.3
Average of critically dry year goals divided by average for experimental low flow conditions (.37/.09)	4.1

Approximate water costs (total Vernalis flow) by year, sliding scale vs DWRSIM study 2a



Sliding Scale cost estimated by using difference between USFWS SSSI and sliding scale SSSI, assuming the additional survival would be made up by additional flows during the time the barrier is in.

SEH 7/28/94
DRYGOAL regression

DEP VAR: SSSI N: 28 MULTIPLE R: 1.000 SQUARED MULTIPLE R: 1.000
ADJUSTED SQUARED MULTIPLE R: 1.000 STANDARD ERROR OF ESTIMATE: .516605E-09

VARIABLE	COEFFICIENT	STD ERROR	STD COEF	TOLERANCE	T	P(2 TAIL)
CONSTANT	0.206148000	.458546E-09	0.000000000	.	.45E+09	.10E-14
WYINDX	0.000100000	.234559E-12	1.000000000	.100E+01	.43E+09	.10E-14

ááá

Salmon

①

Bay / Delta Staff — Notes — 08/02/94

~~(1) Schedules: Aug 10~~

~~NOAA~~

~~(2) Blended~~

(3) Salmon

Items that need work:

(a) State error of attainment, both average over x years, plus max error in any particular year

(b) Need to address export limits in "C". In proposal for rule, we had assumed 4000 export; now we're limiting it. We need to get new DWR modeling data.

(c) Note that our criteria is simply the SSSI values for the implementation measures ~~values~~ ~~How they~~. The implementation measures came from USFWS Stockton adjusted for not putting in barriers 2 months (but only 1)

XZ RULE

B Herbold
2 Aug 94

Incorporation of conclusions from comments

In the proposed standards for the Bay/Delta estuary, EPA used an approach to protect estuarine habitat by identifying how much of such habitat had existed historically in each of five types of water years. Comments were particularly requested on how such standards might be more effectively specified in terms of a "sliding scale" that would more accurately reflect the diverse hydrological patterns that occur in California. A sliding scale would allow standards to reflect a linear relationship between a measure of water availability as an independent variable and a level of protection as the dependent variable. Extensive comments on this topic were received formally, informally, and at a series of workshops that were attended by a diverse array of interested parties. In commenting on a 'sliding scale,' commentors referred to the measurements that comprise the independent variable, difficulties in forecasting the independent variable, how to model the relationship between the independent and dependent variables at earlier historical periods, how to increase the historical salinity data by the use of models that predict salinity from patterns of flow, the appropriate format for standards like those proposed by EPA, and how compliance should be measured once the standards are in place.

Conclusions from comments that are reflected in these revised standards are:

The requirements to protect estuarine habitat ought to be stated solely, or largely, in reference to the patterns of precipitation that could directly affect estuarine habitat; i.e. for standards that protect conditions in the February-June period only the unimpaired flows of February-June, or January-June, should be used. Thus, it appears that precipitation in other months or the amount of carryover storage in reservoirs from previous years would lead to less reliable water project operations or to decreased environmental protection.

Standards should reflect the total amount of unimpaired flow in the Central Valley rather than just the Sacramento River and its tributaries.

Basing requirements on February forecasts of year type are apt to require frequent and inefficient revision because February and March are typically the months of greatest and most variable precipitation. The standards should rely on a conservative estimate of the amount of water available.

A new salinity model developed by Contra Costa Water District is a more accurate model than the Kimmerer-Monismith model used by EPA.

The 'number-of-days' criteria are best modeled using a logistic equation.

Standards intended to reflect a historical 'level of development' should model development rather than use corresponding historical periods because of the confounding of conditions that are attributable to year type with conditions that are due to increasing levels of development. Calendar year appears to be a reasonable surrogate for level of development, at least up to the time of the late 1970s when development slowed down and regulation by the State Water Resources Control Board began to control the

operations of water projects.

To allow maximum flexibility to water users in meeting these standards compliance should be allowed through daily salinity, 14-day average salinity, or equivalent measures of outflow. Such compliance measures requires that the standards be set in relation to the historic conditions of both salinity and flow.

Proposed criteria

The intent of these criteria is to reflect the minimum amounts of estuarine habitat that would have resulted given the level of development experienced in 1968. To calculate this condition over the full range of hydrologies experienced in California, EPA and others developed regression equations that explained the variability in amount of estuarine habitat as a function of two variables: calendar year as a surrogate for the level of development and unimpaired flow as a measure of precipitation. This procedure allows us to separate the effects of year to year variability in precipitation from the effects of increased levels of upstream storage and diversion. At a given level of development, then, one can predict how much estuarine habitat would have resulted form a given pattern of precipitation. EPA has chosen the 1968 level of development because of a widespread perception that at that time there was adequate estuarine habitat to sustain most aquatic populations in the bay and delta.

EPA's proposed criteria are described as a number of days when the electrical conductivity is less than 2694 when corrected to a temperature of 25 C at each of three locations in the estuary. Hereinafter this conductivity is referred to as a salinity of 2 ppt and the number of days when the criteria pertain to a given location are referred to as 2ppt-days. The three locations are (1) the confluence of the Sacramento and San Joaquin rivers, (2) the upstream limit of Suisun Bay at Chipps Island and (3) Roe Island near the middle of Suisun Bay. Appropriate monitoring stations already exist near each of these locations at Collinsville, Mallard Slough and Port Chicago, respectively.

The 2ppt-days required is a function of the unimpaired flow received by the Sacramento and San Joaquin valleys. The total unimpaired flow of the two valleys is calculated from the sum of the unimpaired flows of the four major rivers within each valley: the Sacramento, Feather, Yuba, American, Stanislaus, Tuolumne, Merced and San Joaquin rivers.

Because the total unimpaired runoff is not known until late in the period of concern we have used monthly totals of unimpaired runoff to establish monthly requirements. Thus, the precipitation of January is used to set the number of 2ppt-days to be required at the Chipps and Roe island locations in February and the precipitation of February is used to set the next month's requirement. Because the monthly calculation of the previous month's index is not available until the 10th day of the following month, satisfaction of the requirements can extend forward 10 days in March, April and May. For example, if 28 2ppt-days are required at Chipps Island in February this number may be satisfied in any of the 38 days from February 1 to March 10. In all years the 14-day average conductivity at Collinsville must remain below 2694 from February 1 through June 30.

The specific requirements are a set of equations of the form:

$$\text{days required} = \text{Number of days in month}*(1-1/(1+e^{K})$$

where

$$K = A + B*\text{natural logarithm of the previous month's 8-river index}$$

The appropriate monthly values of A and B vary with month and with target location as presented in Table 1. The requirements resulting from these equations across a range of previous monthly 8-river index (PMI) values are presented in Table 2.

	Chipps Island		Roe Island	
	A	B	A	B
Feb	-	-	-14.36	+2.068
Mar	-105.16	+15.943	-20.79	+2.741
Apr	-47.17	+6.441	-28.73	+3.783
May	-94.93	+13.662	-54.22	+6.571
June	-81	+9.961	-	-

Table 1. Constants appropriate to each of the monthly equations to determine monthly requirements described.

	Chipps Island					Roe Island (if triggered)			
PMI	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May
250	0	0	0	0	0	1	0	0	0
500	28	0	0	0	0	5	1	0	0
750		18	0	0	0	9	2	1	0
1000		31	2	0	0	13	4	2	0
1250			7	0	0	17	7	4	0
1500			15	0	0	19	10	8	0
1750			21	0	0	21	13	11	0
2000			26	1	0	22	16	15	0
2500			29	16	1	24	20	21	2
3000			29	29	7	25	24	25	5
4000			30	31	25	26	27	28	18
5000					29	27	29	29	26
6000					30	28	30	30	29

Table 2. Requirements across a range of values of the 8-river index for each month at Chipps and Roe islands.

Example: If the 8-river indices for January, February, March, April, and May were 1000, 3000, 4000, 1500, 1500 respectively then the required number of 2ppt-days would be 28 or 29 at Chipps and 13 at Roe in February, 31 days at Chipps and 24 at Roe in March, 30 days at Chipps and 28 at Roe in April, and requirements only at the confluence in May and June. The requirements at Roe Island would be subject to the trigger described below.

Adjusting the Roe Island standard to reflect intra-year variability in storm timing and magnitude. The proposed criteria at Roe Island, unadjusted, would fully protect low salinity habitat, but would not accurately reflect the historical variability in runoff and precipitation. The distribution of storm systems within the October to April wet season varies greatly from year to year. In some years storms are concentrated in winter, in other years in spring, in some years most precipitation falls as rain and causes rivers to rise early in the year, and in others the precipitation falls as snow and river runoff is delayed until later in the year. This historical variability is reflected in the proposed salinity criteria.

Under the proposal the number of days at Roe Island would not apply unless and until the 14-day average salinity at Roe Island falls below 2 ppt for the last 14 days of the preceding month. Following this triggering event the number of 2ppt-days specified for the subsequent month must be satisfied. If at the end of the month the salinities at Roe Island remains below 2-ppt then the number of days specified for the subsequent month are triggered.
Example: If the required number of days at Roe Island for February, March, April, May, and June are 18, 31, 18, 18, 18, respectively and the last two weeks of January trigger the standard for February, satisfaction of the requirement might proceed as follows: in February outflow conditions are regulated to satisfy the required 18 2-ppt days but midway through the month a large storm results in salinities less than 2 ppt for the entire month, This condition triggers compliance for all 31 days of March. Because the last 14 days of March must be less than 2 ppt, 18 days of April must also comply. If no further storm events occur than the required days in May and June do not apply.

Measures of compliance

Compliance with these standards is assumed to be achieved when either the daily conductivity values or 14-day average conductivity values are below the specified level. The conductivities are to be measured at the Mallard Slough station for Chipps Island and at Port Chicago for the Roe Island requirement. The Chipps Island and Roe Island requirements can also be satisfied by net delta outflow equal to or greater than 11,400 cfs and 29,200 cfs respectively. The requirements are based on the number of days in the historical period when either salinities were less than 2 ppt or flows were greater than specified. EPA believes that, in almost all years, less water will be required to satisfy the specified conductivity than the alternative flow requirements.

Because of the expectation that compliance with the standards would be measured by either flow or salinity, the computed relationships between unimpaired flows and the required number of were based on either historical patterns of days of either salinity or flow. Thus, if compliance were to be measured only through salinity or only through flow a different relationship and a different requirement would be appropriate.

Comments:

(1) DFG may have an issue on the Marsh.
We need to identify it.
☆ Jerry will give us the State list
Jerry says they will limit it to the Bay / Not do much upstream issues.
Ray say

(2) Jerry is concerned about the implementation measures

☆ (3) Give Bruce's DWR sim runs to Gary S. (DONE!)

☆ (4) Take the issue back to BOR on "Interim Standards" and what this means to ESA Consultations. (Jerry Issue)

(5) Late spawn - USFWS issue

(6) Wayne raises issue of need for a "take shot" for the State, and maybe an HCP.
When: Certainly by implementation,

(a) Close of Comment Period
(b) Before: To

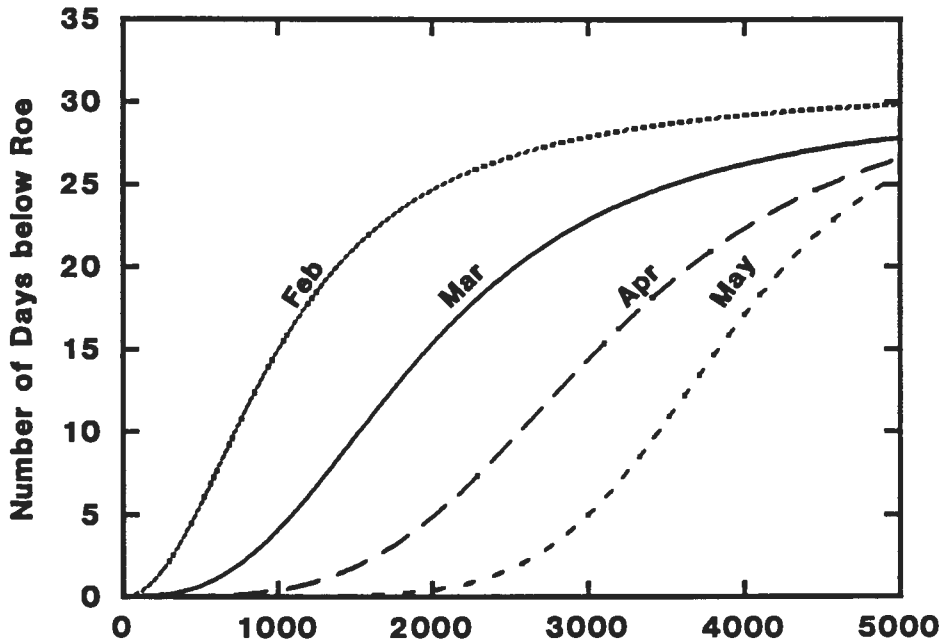
☆ (1) DFG - Suisun Marsh (EPA → Board
☆ (2) Cay Wants a "Project Descript" from EPA
☆ (3) Species List

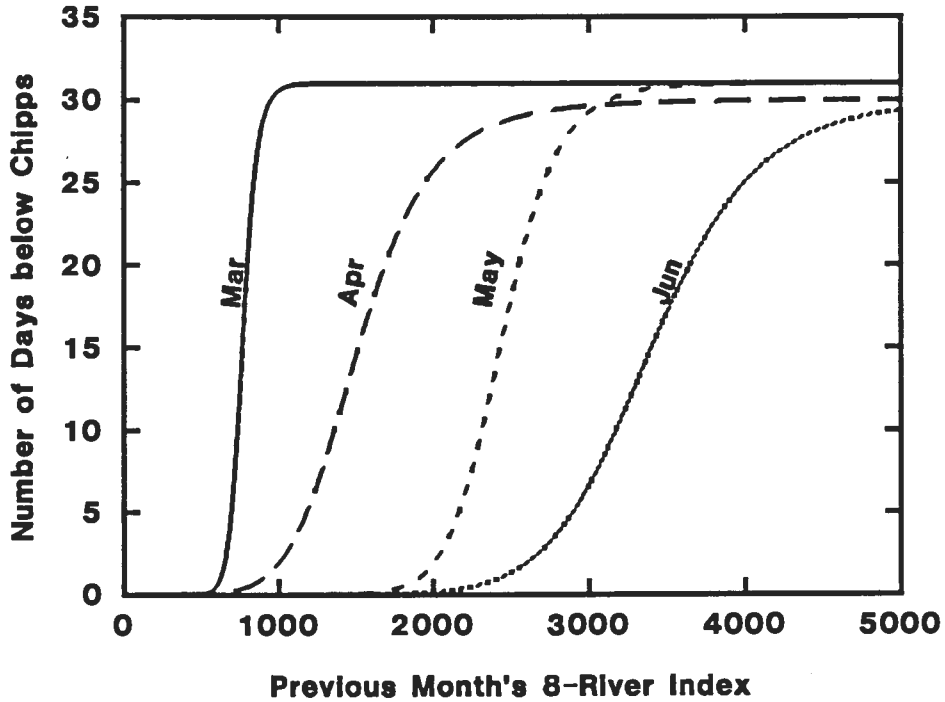
Sept 6th - 10:00 Cottage Way

(1) Informal feedback
(2) State Comments on SSSI
(3) FWS / NMFS comments on whittled down list of species
(4) Discuss

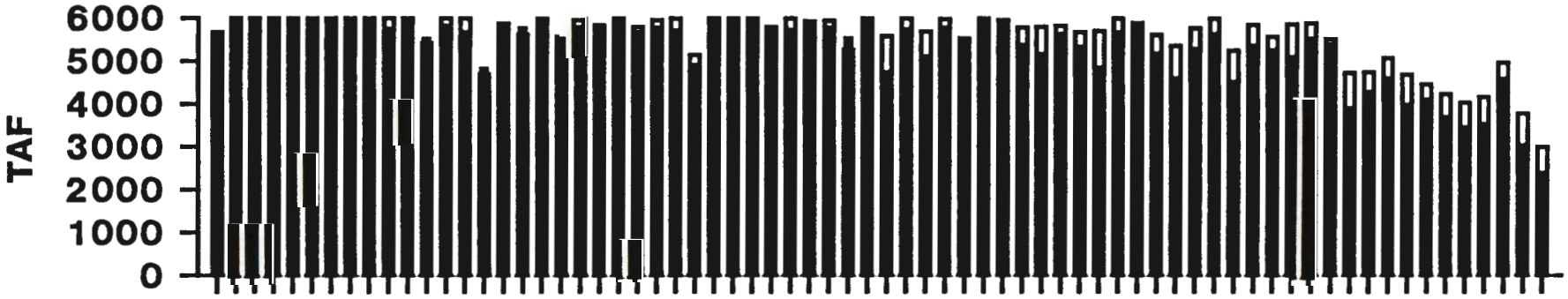
How, in Month A, to determine the # of days ~~of~~ compliance in month A+1.

From B. Herbold
08/02/94
(potentially for Rule)



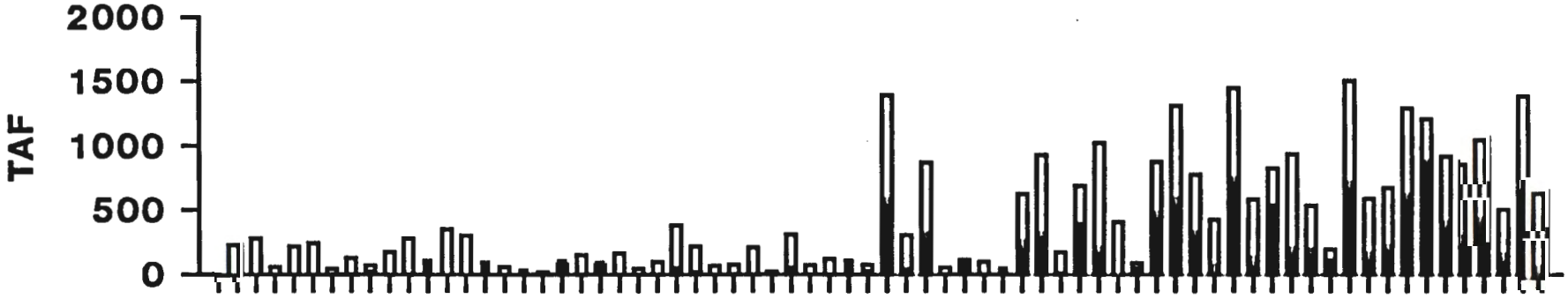


Impacts of NMFS and EPA



white is reduction in exports
because of EPA alone

Allowable exports vs dryness of year



Black are NMFS
White are add-on of
EPA proposed (zppt + salmon)

Reductions in exports vs dryness of year

BH
08/02/94

6/30/94

TABLE 1

SUMMARY OF COMPARATIVE WATER SUPPLY IMPACTS RELATIVE TO D-1485
(1000'S AF/Year)

STUDY	Critical Dry Period Average (May 1928 - October 1934)	71-Year Average (1922 - 1992)	Average Annual Carryover Storage Sacramento Basin	Average Annual Carryover Storage New Melones
NMFS	-618 [1,4]	-148 [4]	-238	0
EPA 1955 LOD	-1269 [1,2,4]	-491 [3,4]	-550	-42
EPA 1968 LOD	-1104 [1,2,4]	-459 [3,4]	-491	-42
EPA 1968 LOD With Alt. Salmon	-1108 [1,2,4]	-448 [3,4]	-503	-59
EPA 1968 LOD +NMFS	-1295 [1,2,4]	-595 [3,4]	-514	-42
EPA 1968 LOD Without Roe Standards	-1049 [1,2,4]	-443 [3,4]	-467	-42
EPA 1968 LOD Without Salmon Measures	-946 [1,4]	-159 [4]	-222	0
EPA 1975 LOD	-967 [1,2,4]	-442 [3,4]	-431	-42
EPA 1975 LOD Without Roe Standards	-964 [1,2,4]	-427 [3,4]	-421	-42
EPA Salmon protection Measures	-417 [1,2,4]	-309 [3,4]	-384	-42

1.Includes adjustments due to upstream net Storage used.
2.Includes adjustments due to upstream net Storage used and additional flows from Tuolumne and Merced River system to meet Vernalis pulse flows.
3.Includes adjustments due to additional flows from Tuolumne and Merced River system to meet Vernalis pulse flows.
4.Does not include potential water supply impact for "Take Limits."

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY

MEMORANDUM

TO:	Palma Risler, USEPA	(415) 744-1078	FAX
	Sushil Arora, DWR	(916) 653-6077	FAX
	Mike Jackson, USBR	(916) 978-4854	FAX
	Chet Bowling, USBR	(916) 978-5284	FAX
	Harold Meyer, WRMI	(916) 920-1812	FAX

From: Lance Johnson and Tom Boardman, 8/3/94

Re: RIA, CVP South of Delta Modeling Results

Introduction

This transmits the results of our modeling studies completed to date. This includes the 71 year Level 1 (annual time step analyses) and a portion of the proposed Level 2 (monthly time step analyses) for the 1928 through 1934 critical period. Because of time constraints, the full 71 years of Level 2 analyses was not completed. This memorandum lists the numerical and operational assumptions that went into the impact studies and discusses the validity of some of the more questionable assumptions.

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Modeling Assumptions

The following assumptions were utilized in our studies:

-Base Case; DWRSIM Base Study 2, D1485+NMFS, 6.0 MAF Delta Export Demand, run number 1995c6b-NMFS-276

-Impact Case; DWRSIM EPA Study 2b, EPA 1968 LOD + NMFS, 6.0 MAF Delta Export Demand, run number 1995C6B-NM+EPA-280

-CVP south of delta supplies include CVP Tracy Pumping and SWP Wheeling for CVP from the above model results plus San Joaquin and James Bypass inflows (accretions) to Mendota Pool derived from PROSIM Folsom Reoperation Study, 4001c, 400 Folsom F. C., 1995 Demands, February 25, 1994, with maximum monthly usable deliveries of 95,000 AF and

no minimum demands,

-San Luis Reservoir CVP storage parameters are 966.8 TAF normal maximum, 971 TAF absolute maximum, 50 TAF September 1 minimum and no carryover storage target,

-CVP South of Delta water obligations were obtained from PEIS draft data, dated 6/27/94, with corrections to eliminate double counting of obligations with the corrected obligations listed below:

	CVP Delta Export Obligation & Amount (TAF)				
Service Area	Wtr. Rights	Ag Cont.	M&I Cont.	Refuge	Loss
Delta Mendota Canal	216.0	407.2	10.2	below	120
Cross Valley Canal	--0--	128.0	--0--	below	-0-
San Luis Unit	6.0	1,236.5	17.1	below	60
Mendota Pool Unit	666.1	108.6	--0--	below	80
San Felipe Unit	--0--	68.1	127.7	below	-0-
Wildlife Refuges (CVPIA Level 2)				211.7	incl.
SUBTOTALS	888.1	1,948.4	155.0	211.7	260

TOTAL CVP South of Delta Obligations= 3,463,200 AF excluding Contra Costa Water District @ 118,000 AF (grand total CVP delta export obligations 3,581,200 AF)

-CVP deficiency criteria and hierarchy as follows:

Priority 1

-Water Rights per Shasta inflow criteria, 75% minimum

-M&I and refuges per CVPIA, 75% minimum or equal to ag contracts if above 75%, and

Priority 2

-Ag contracts, no minimum

-Agricultural contract water allocated in increments of 5% for Level 2 analysis,

-Delivery of unstorable flood flows (CVP 215 water) is not considered,

-Carryover of contract water and groundwater is not considered

Summary and Discussion of Results

Level 1 Analysis: The Level 1 analysis consists of taking the sum of estimated annual supplies (CVP export + Mendota Pool inflows) and applying CVP obligations

with the appropriate hierarchy and deficiency criteria. The impacts to agricultural contract supplies are smaller than those produced in the Level 2 analysis and they are the most optimistic for several reasons. First, contract water years span a period of March through the following February, while the modeled water years span a period of October through the following September . This causes an overlapping of years and an over estimate of available supply in certain sequences of year types.

Second, the Level 1 analysis does not consider any operational constraints such as demand scheduling, reservoir minimum and maximum storage limitations and conveyance facility limitations. These two factors in combination lead to estimated levels of supply that vary by 5 to 10+% in a given year when compared to those identified in the Level 2 studies.

A third factor applies to the DWRSIM studies which affects the post processor results of both the Level 1 and 2 analyses. The DWRSIM studies operate the projects with perfect foresight, that is, the model is based upon historic hydrology which is known. Following this methodology, project modelers know in advance what the hydrology will be later in the year. They are therefore able to make informed decisions enabling optimization of operations, rather than having to take a more conservative approach due to unknown future conditions, as is the case in the "real world". The impact of this situation will not be consistent from year to year and cannot be accurately estimated. It is, however, probable that actual available supplies would be less in most years. This indicates the modeled results are somewhat optimistic.

Results of the Level 1 analysis indicate the following agricultural contract supplies would be available:

Level 1 Study Results (Annual Analysis)

	Agricultural Contract Supply (% of Contract Obligation)			
Study Case	71 year Avg.	1928-34 Avg.	Maximum	Minimum
Base 2, D1485+NMFS	71.2	56.9	92.6	17.6
EPA 2B, EPA1968 LOD+NMFS	61.8	38.5	79.5	0.0

Copies of the complete Level 1 analyses are attached.

Level 2 Analysis: As previously noted, the Level 2 analysis is incomplete at this time. The studies completed to date include only the 1928 through 1934 critical period. Data from this period is, however, useful as it identifies the differential in the results

between the Level 1 and 2 studies. It also identifies errors or problems associated with the DWRSIM modeling results to be discussed below.

The Level 2 analysis was conducted taking into account maximum and minimum allowable storage conditions in the CVP share of San Luis Reservoir and water demand patterns that vary with the type of obligation (water rights, ag contract, M&I and refuges) and with the available supply. These demand pattern estimates are based upon the water use in a particular month being a percentage of the total available supply expressed in acre feet. Available agricultural contract demand patterns are based upon increments of 25%. Water rights, M&I and refuge demand patterns are at two levels, 75% or 100% supply. The initial 1928 condition was taken from the DWRSIM outputs as the estimated CVP San Luis reservoir storage of 865 TAF as of 3/1/28. The model was then conducted as a continuous series with the end of year reservoir storage condition being the input for the following years initial condition.

All modeling is based upon meeting water rights, M&I and refuge obligations as the first priority with appropriate loss factors being applied. Remaining water supplies were allocated to meet agricultural contract obligations. These were first estimated from the Level 1 analysis. These allocations were then adjusted up or down in 5% increments to achieve no less then 50,000 AF minimum September 1 storage in the CVP share of San Luis Reservoir. If an estimated allocation fell between available demand patterns (as example, estimated allocation of 35%, falling between 25% and 50%) both the higher and lower patterns are tested to meet, but not exceed, reservoir operational parameters as closely as possible.

The Level 2 analyses identified a problem with the DWRSIM outputs. During the 7 year period of study there were two instances when the upper limits of CVP reservoir storage would have been exceeded given the beginning storage condition and the modeled rate of export vs. water demands during the period. In other words, estimated supply exceeded demand causing a theoretical overfilling of the reservoir. This condition would overestimate the available supply in the Level 1 analysis. These instances are noted and quantified at the bottom line item titled "San Luis Reservoir CVP Exceedence". When these conditions occurred, the following month's initial storage condition was adjusted downward to the maximum allowed and the analysis reinitiated from that point. Given the occurrence of this condition twice during the

critical period, it might be expected that this situation would occur more frequently during "normal years".

Results of the Level 2 analyses for the 1928 through 1934 critical period are as follows:

	Level 2 Study Results 1928 to 1934	
	Agricultural Contract Allocation (%) vs. Study Case	
Water Contract Year	Base Study 2	EPA Study 2b
3/1/28 to 2/28/29	85%	65%
3/1/29 to 2/28/30	50%	45%
3/1/30 to 2/28/31	70%	55%
3/1/31 to 2/28/32	45%	10%
3/1/32 to 2/28/33	55%	30%
3/1/33 to 2/28/34	60%	35%
2/1/34 to 2/28/35	45%	30%
Average	58.6%	38.6%

Copies of the summary sheets for each year are attached.

Discussion of DWRSIM Modeling and EPA Assumptions

The CVPXO model used to generate the results herein is a post processor model that uses as inputs the outputs of some other model. Thus, the results of our modeling are no better then the outputs from the source modeling, which in this case is DWRSIM. Many of the assumptions used in the DWRSIM modeling were stipulated by USEPA. Other assumptions and default values regarding CVP operational conditions and limitations have been provided to DWR by USBR. There are, in our opinion, serious errors and flaws in several of the stipulated modeling assumptions and default values used in the DWRSIM modeling. These are discussed below.

EPA Standards as Modeled: This analysis is a part of the Regulatory Impact Analysis (RIA) for the proposed Bay/Delta standards. At the time the DWRSIM studies were conducted the standards had not been finalized. The principal uncompleted portion of the standards involves determination of the possible use of a sliding scale and, if used, what the sliding scale function will be. The use and function of a sliding scale for delta outflow requirements can have a very large impact, either positive or negative,

on the availability of delta export water supplies. Therefore, modeling studies conducted, on preliminary rather than final standards will produce data and an RIA that do not accurately represent the actual impacts of the proposed standards.

Level of Demand (LOD): The stipulated LOD used in the studies was 6.0 Million Acre Feet (MAF). This is supposed to represent the combined CVP + State Water Project (SWP) delta export demand. This has been broken down as 2.9 MAF SWP demand and 3.1 MAF CVP demand including Contra Costa Water District and system losses. These figures are also being used in the CVPIA PEIS process for consistency between the EPA and PEIS processes.

It has been previously suggested that the appropriate LOD is 7.1 MAF rather than 6.0 MAF used in the DWRSIM studies. This debate has apparently focused on the variable SWP demands associated with Metropolitan Water District and the availability of water from other sources. Our concern and disagreement with the modeled LOD relates to CVP obligations. Specifically, as listed above, CVP delta export obligations including CVPIA Level 2 refuge supplies and CCWD are 3,321,200 +/- acre feet plus losses. Various estimates and studies identify CVP south of delta losses as ranging from 180 TAF to 260 TAF, producing a total CVP delta export obligation of 3,501,200 AF to 3,581,200 AF. In either case, CVP export demand is 400,000 to 500,000 AF in excess of the 3.1 MAF used in the DWRSIM studies.

Prior studies at the 7.1 LOD show higher levels of base study supply when compared to those at the 6.0 LOD because the models operate the projects to attempt to meet whatever demand level is set. While it is understandable that there may be some debate regarding the SWP LOD, it is clear that the 6.0 LOD with CVP obligations set at 3.1 MAF is incorrect. The use of the 6.0 LOD causes underestimation of supplies primarily in the base case. This in turn leads to an inaccurate portrayal of the differential (base study vs. impact study) impacts being less then they actually are.

It is our opinion that the level of demand should be be based upon CVP obligations at about 3,550,000 AF. SWP demands should be based upon consideration of the variable MWD demands.

CVP Tracy Export Capabilities: The DWRSIM outputs for Tracy export lists maximum pumping rates in some months that are in excess of the physical capabilities of the

facility. These excedences are as much as 11,000 AF per month and total 55,000 to 60,000 AF in several years. The use of these incorrect data leads to an overestimation of CVP supply in many years and, therefore, a false reduction of impacts. We are enclosing a copy of an analysis evaluating historic data for the facility and listing the practical maximum export capabilities of Tracy Pumping Plant.

CVP San Luis Reservoir Storage Capacity: The DWRSIM modeling studies use a CVP San Luis Reservoir storage capacity of 971,000 AF. Data published by both DWR and USBR list the normal maximum capacity as 966,000 AF. The 971,000 AF figure requires encroachment of reservoir freeboard and is not a normal operating condition. Use of the 971 TAF figure leads to a small over estimation of supply.

In summary, we believe our analysis is reasonably accurate given the assumptions and inputs used in our model. However, we make no claim that these results are objectively accurate, due to what we believe are significant errors and flaws in the underlying assumptions and inputs. We strongly urge the parties to this process to correct these erroneous assumptions; otherwise, we believe that the end product, the RIA, will be flawed and subject to both technical and legal challenges as to its adequacy.

Enclosures

cc Dan Nelson
Jason Peltier
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from Base 2

CVP South Delta Water Supply Impacts
EPA Base Study 2
[D1485 + NMFS Salmon]

Year	Shasta Inflow	Year Type	San Joaquin Flow to Pool	CVP Exports	Annual CVP Water Supply	Exchange Contractor Allocation	M&I, Refuges, Losses	Available For Ag Contractors	Ag Contractor Allocation (%)
	A	B	C	D	E	F	G	H	I

Units are thousands of arce feet

1922	4548	2	190	2716	2906	888.1	600.7	1417.3	74.6
1923	3635	3	0	2926	2926	888.1	603.2	1434.7	75.6
1924	2439	6	0	2554	2554	666.1	600.7	1287.3	67.8
1925	5035	2	0	2751	2751	888.1	600.7	1262.3	66.5
1926	3711	5	0	2917	2917	888.1	601.4	1427.5	75.2
1927	6917	1	124	2836	2960	888.1	609.7	1462.2	77.0
1928	5105	2	0	2972	2972	888.1	612.0	1471.9	77.5
1929	3176	6	0	2477	2477	666.1	600.7	1210.3	63.7
1930	4147	3	0	2686	2686	888.1	600.7	1197.3	63.0
1931	2536	6	0	2017	2017	666.1	600.7	750.3	39.5
1932	3624	3	125	2312	2437	666.1	600.7	1170.6	61.6
1933	3452	5	0	2161	2161	666.1	600.7	894.3	47.1
1934	3318	5	0	2141	2141	666.1	600.7	874.3	46.0
1935	4840	2	90	2715	2805	888.1	600.7	1316.3	69.3
1936	4605	2	98	2874	2972	888.1	612.0	1471.9	77.5
1937	4117	3	190	2786	2976	888.1	612.8	1475.1	77.7
1938	9511	1	376	2857	3233	888.1	662.3	1682.2	88.6
1939	3470	6	0	2688	2688	888.1	600.7	1199.3	63.2
1940	6998	1	57	2934	2991	888.1	615.7	1487.2	78.3
1941	8701	1	280	2757	3037	888.1	624.6	1524.6	80.3
1942	7603	1	164	2786	2950	888.1	607.8	1454.1	76.6
1943	5873	1	136	2827	2963	888.1	610.3	1464.6	77.1
1944	3670	5	0	2951	2951	888.1	608.0	1454.9	76.6
1945	4837	3	179	2972	3151	888.1	646.6	1616.3	85.1
1946	5893	2	4	2766	2770	888.1	600.7	1281.3	67.5
1947	3904	5	0	2868	2868	888.1	600.7	1379.3	72.6
1948	5403	3	0	2789	2789	888.1	600.7	1300.3	68.5
1949	4324	5	0	2927	2927	888.1	603.4	1435.5	75.6
1950	4126	3	0	2955	2955	888.1	608.8	1458.1	76.8
1951	6314	1	45	2933	2978	888.1	613.2	1476.9	77.8
1952	7779	1	334	2932	3266	888.1	668.8	1709.1	90.0
1953	6544	1	0	2594	2594	888.1	600.7	1105.3	58.2
1954	6558	2	0	2953	2953	888.1	608.4	1456.5	76.7
1955	4111	5	0	2762	2762	888.1	600.7	1273.3	67.0
1956	8821	1	264	2741	3005	888.1	618.3	1498.1	78.9
1957	5371	3	0	2908	2908	888.1	600.7	1419.3	74.7
1958	9696	1	241	3019	3260	888.1	667.6	1704.3	89.7
1959	5098	5	0	2685	2685	888.1	600.7	1196.3	63.0
1960	4728	3	0	2878	2878	888.1	600.7	1389.3	73.2
1961	5070	5	0	2777	2777	888.1	600.7	1288.3	67.8
1962	5255	3	95	2836	2931	888.1	604.1	1438.8	75.8
1963	7003	1	86	2908	2994	888.1	616.3	1489.6	78.4
1964	3903	5	0	2693	2693	888.1	600.7	1204.3	63.4
1965	6976	1	156	2772	2928	888.1	603.6	1436.5	75.6
1966	5319	3	4	2872	2876	888.1	600.7	1387.3	73.1
1967	7385	1	375	2928	3303	888.1	675.9	1739.1	91.6

2870 - 888 - 600 = 1382 TAK

CVP South Delta Water Supply Impacts
EPA Base Study 2
[D1485 + NMFS Salmon]

Year	Shasta Inflow	Year Type	San Joaquin Flow to Pool	CVP Exports	Annual CVP Water Supply	Exchange Contractor Allocation	M&I, Refuges, Losses	Available For Ag Contractors	Ag Contractor Allocation (%)
1968	4776	3	0	2543	2543	888.1	600.7	1054.3	55.5
1969	7666	1	383	2914	3297	888.1	674.8	1734.5	91.3
1970	7904	1	8	2554	2562	888.1	600.7	1073.1	56.5
1971	7316	1	0	2991	2991	888.1	615.7	1487.2	78.3
1972	5076	3	0	2950	2950	888.1	607.8	1454.1	76.6
1973	6162	2	175	2846	3021	888.1	621.5	1511.4	79.6
1974	10782	1	202	3026	3228	888.1	661.4	1678.3	88.4
1975	6391	2	24	2710	2734	888.1	600.7	1245.3	65.6
1976	3597	6	0	2545	2545	888.1	600.7	1056.3	55.6
1977	2625	6	0	1600	1600	666.1	600.7	333.3	17.6
1978	7827	1	367	2322	2689	888.1	600.7	1200.2	63.2
1979	4025	5	58	2853	2911	888.1	600.7	1422.3	74.9
1980	6418	1	414	2603	3017	888.1	620.7	1507.9	79.4
1981	4098	6	1	2950	2951	888.1	608.0	1454.9	76.6
1982	9011	1	321	3005	3326	888.1	680.4	1757.5	92.6
1983	10796	1	713	2577	3290	888.1	673.4	1728.4	91.0
1984	6687	1	184	2363	2547	888.1	600.7	1058.7	55.7
1985	3972	5	0	2941	2941	888.1	606.1	1446.8	76.2
1986	7547	1	372	2644	3016	888.1	620.5	1507.2	79.4
1987	3947	6	2	3037	3039	888.1	625.0	1525.9	80.4
1988	3930	6	0	2592	2592	888.1	600.7	1103.3	58.1
1989	4755	3	0	2859	2859	888.1	600.7	1370.3	72.2
1990	3619	6	0	2739	2739	888.1	600.7	1250.3	65.8
1991	3051	6	0	2221	2221	666.1	600.7	954.3	50.3
1992	3621	6	0	2276	2276	666.1	600.7	1009.3	53.1

71 Year Average (%)	81.4	98.6	82.7	71.2
1928-34 Average (%)	71.4	80.6	79.8	56.9

Assumptions:

Exports: CVP exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand
Includes wheeled D-1485 water pumped through Banks.

Exchange Contract 888.1 KAF full supply and 666.1 KAF (75% supply) when Shasta Inflow Criteria is not met.

Refuges and M&I: Receives not less than 75% of Level 2 supplies under CVPIA. (247.4 KAF refuge full supply with 37 KAF for Kesterson Mitigation. M&I never receives less than 75% of 155.1 KAF)

Losses: 260 KAF regardless of delivered quantites (Includes losses in DMC and Mendota Pool).

Ag Contractors 1899.0 KAF full supply .

San Luis Unit	1236.5 KAF
DMC (Ag Only)	407.2 KAF
San Felipe	68.7 KAF
Mendota Pool	58.6 KAF
Cross Valley	128 KAF

CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	859.0	Group 2 Allocation (%)	85
As of:	03/01/28	Exchange Contractors (%)	100
		Demand Pattern (% year)	75

Water Year 1928-29

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	859.0	971.0	947.6	791.2	441.0	144.6	51.2	195.8	262.8	413.9	583.7	642.9
Est. CVP Tracy Export (KAF)	275.0	213.0	184.0	179.0	283.0	242.0	258.0	199.0	254.0	262.0	260.0	161.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	19.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	7.0	25.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	19.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	7.0	25.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	1153.0	1184.0	1131.6	970.2	728.0	386.6	309.2	394.8	523.8	700.9	843.7	803.9
Upper DMC Demands (KAF)	19.2	29.0	42.1	54.8	63.4	35.4	21.0	33.7	17.8	10.8	19.9	17.5
Lower DMC Demands (KAF)	14.0	22.5	31.6	35.1	42.0	23.3	21.0	37.2	17.6	7.7	16.0	13.4
Estimated Upper/Lower DMC Deliveries	33.2	51.5	73.7	89.9	105.4	58.7	42.0	70.9	35.4	18.5	35.9	30.9
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	28.4	70.2	88.8	162.5	170.5	100.4	18.7	14.2	22.2	36.4	82.6	93.3
Estimated Pool Deliveries	9.7	11.8	15.2	18.2	19.1	13.5	10.6	15.0	10.1	7.9	9.7	9.6
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	62.1	84.0	129.8	213.6	239.9	133.6	27.0	18.9	24.9	35.9	55.7	52.7
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.8	5.1	12.9	15.9	17.0	9.9	7.5	7.3	11.5	11.9	8.2	6.5
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	6.3	8.5	13.2	21.8	24.5	13.6	2.6	1.6	2.4	3.6	5.5	5.2
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	149.9	236.4	340.4	529.2	583.4	335.4	113.4	132.0	109.9	117.2	200.8	201.4
Estimated EOM San Luis CVP Res. Storage	1003.1	947.6	791.2	441.0	144.6	51.2	195.8	262.8	413.9	583.7	642.9	602.5
Adjusted Maximum EOM Storage (KAF)	971.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance	32.1											

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	602.5	Group 2 Allocation (%)	50
As of:	03/01/29	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1929-30

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	602.5	600.1	500.2	383.3	183.4	50.7	161.4	259.8	304.0	468.5	661.9	800.5
Est. CVP Tracy Export (KAF)	123.0	80.0	136.0	179.0	283.0	291.0	183.0	160.0	246.0	262.0	260.0	165.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	34.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	34.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	725.5	680.1	636.2	562.3	466.4	375.7	344.4	419.8	550.0	730.5	921.9	965.5
Upper DMC Demands (KAF)	16.7	23.5	32.9	39.3	45.8	21.8	17.6	31.9	14.6	5.3	11.6	11.0
Lower DMC Demands (KAF)	12.7	19.5	26.7	26.8	32.5	16.0	19.2	36.3	15.9	4.7	11.6	9.9
Estimated Upper/Lower DMC Deliveries	29.5	43.0	59.5	66.1	78.2	37.8	36.8	68.1	30.5	9.9	23.2	21.0
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	9.1	10.6	13.1	14.7	15.2	10.5	9.9	14.6	9.4	6.7	7.9	8.1
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	50.6	58.3	86.7	141.3	157.4	70.3	11.0	10.6	9.8	9.9	17.0	22.7
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.4	4.2	11.4	13.4	14.1	7.7	6.9	7.0	11.0	11.0	6.8	5.4
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	5.1	5.8	8.7	14.3	15.9	7.0	1.0	0.8	0.8	0.9	1.5	2.1
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	125.4	179.9	252.9	378.9	415.7	214.3	84.5	115.8	81.5	68.7	121.4	132.6
Estimated EOM San Luis CVP Res. Storage	600.1	500.2	383.3	183.4	50.7	161.4	259.8	304.0	468.5	661.9	800.5	832.9
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

Revised: 08/03/94 06:55:51

CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	832.9	Group 2 Allocation (%)	70
As of:	03/01/30	Exchange Contractors (%)	100
		Demand Pattern (% year)	50

Water Year 1930-31

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	832.9	911.4	796.9	654.8	330.7	62.1	122.5	275.6	342.7	504.8	759.8	868.8
Est. CVP Tracy Export (KAF)	241.0	117.0	184.0	179.0	283.0	291.0	248.0	191.0	254.0	262.0	260.0	145.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	76.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	76.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	1073.9	1028.4	980.9	833.8	613.7	403.1	370.5	466.6	596.7	842.8	1019.8	1013.8
Upper DMC Demands (KAF)	21.0	28.3	40.1	51.1	58.9	27.7	18.4	32.5	15.3	6.0	12.9	12.8
Lower DMC Demands (KAF)	15.0	22.1	30.5	33.1	39.5	19.1	19.6	36.6	16.2	5.1	12.2	10.9
Estimated Upper/Lower DMC Deliveries	36.0	50.4	70.6	84.3	98.5	46.8	38.0	69.1	31.5	11.1	25.1	23.6
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	28.4	70.2	88.8	162.5	170.5	100.4	18.7	14.2	22.2	36.4	82.6	93.3
Estimated Pool Deliveries	10.0	11.6	14.7	17.3	18.1	11.8	10.1	14.7	9.6	6.9	8.1	8.5
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	70.4	80.8	120.3	196.4	218.9	97.5	14.7	13.5	13.0	13.3	22.9	30.8
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	6.1	5.0	12.5	15.3	16.3	8.6	7.1	7.1	11.1	11.1	7.0	5.7
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	7.2	8.2	12.2	20.0	22.3	9.9	1.3	1.1	1.2	1.3	2.2	3.0
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	162.5	231.5	326.1	503.1	551.6	280.6	94.8	123.9	91.9	83.0	151.1	168.2
Estimated EOM San Luis CVP Res. Storage	911.4	796.9	654.8	330.7	62.1	122.5	275.6	342.7	504.8	759.8	868.8	845.5
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	845.5	Group 2 Allocation (%)	45
As of:	03/01/31	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1931-32

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	845.5	809.6	664.2	495.1	285.0	99.7	67.7	107.5	161.8	307.6	502.2	643.0
Est. CVP Tracy Export (KAF)	82.0	26.0	71.0	148.0	207.0	172.0	123.0	169.0	226.0	262.0	280.0	240.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	927.5	835.6	735.2	643.1	492.0	271.7	190.7	276.5	387.8	569.6	762.2	883.0
Upper DMC Demands (KAF)	15.7	22.3	31.1	36.4	42.5	20.4	17.4	31.7	14.4	5.1	11.3	10.6
Lower DMC Demands (KAF)	12.2	18.9	25.7	25.2	30.7	15.2	19.1	36.2	15.8	4.6	11.4	9.7
Estimated Upper/Lower DMC Deliveries	27.8	41.2	56.8	61.6	73.2	35.6	36.5	67.9	30.2	9.7	22.7	20.3
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	3.9	10.3	12.7	14.1	14.4	10.2	9.8	14.5	9.4	6.7	7.8	8.1
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	45.7	52.7	78.3	127.5	142.0	63.5	10.1	9.8	9.0	9.0	15.5	20.6
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.3	4.0	11.1	12.9	13.6	7.5	6.9	6.9	11.0	11.0	6.8	5.3
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	4.6	5.2	7.6	12.8	14.3	6.3	0.9	0.7	0.7	0.8	1.4	1.9
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	117.9	171.4	240.2	358.0	392.4	204.0	83.1	114.7	80.3	67.3	119.2	129.5
Estimated EOM San Luis CVP Res. Storage	809.6	664.2	495.1	285.0	99.7	67.7	107.5	161.8	307.6	502.2	643.0	753.6
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 8.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	753.6	Group 2 Allocation (%)	55
As of:	03/01/32	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1932-33

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	753.6	697.7	620.3	617.9	443.1	89.1	135.5	297.6	355.6	473.9	700.9	837.3
Est. CVP Tracy Export (KAF)	77.0	111.0	184.0	179.0	85.0	271.0	248.0	175.0	201.0	252.0	260.0	136.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	79.3	46.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	830.6	808.7	883.6	842.9	528.1	360.1	383.5	472.6	556.6	770.9	960.9	973.3
Upper DMC Demands (KAF)	17.8	24.7	34.7	42.3	49.1	23.3	17.8	32.0	14.8	5.4	11.9	11.5
Lower DMC Demands (KAF)	13.3	20.2	27.6	28.4	34.2	16.8	19.3	36.3	15.9	4.8	11.7	10.2
Estimated Upper/Lower DMC Deliveries	31.1	44.9	62.3	70.7	83.3	40.1	37.1	68.4	30.7	10.2	23.7	21.6
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	9.3	10.8	13.5	15.4	15.9	10.8	9.9	14.6	9.5	6.8	7.9	8.2
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	56.6	63.9	95.1	155.1	172.8	77.1	11.9	11.3	10.6	10.7	18.5	24.7
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.6	4.4	11.7	13.8	14.7	7.9	7.0	7.0	11.0	11.0	6.9	5.5
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	5.6	6.4	9.6	15.7	17.5	7.7	1.1	0.8	0.9	1.0	1.7	2.3
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	132.9	188.4	265.6	399.8	439.0	224.6	86.0	117.0	82.7	70.0	123.7	135.6
Estimated EOM San Luis CVP Res. Storage	697.7	620.3	617.9	443.1	89.1	135.5	297.6	355.6	473.9	700.9	837.3	837.6
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	837.6	Group 2 Allocation (%)	60
As of:	03/01/33	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1933-34

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	837.6	755.2	648.3	458.9	217.2	75.8	67.9	108.6	191.5	338.6	529.3	663.4
Est. CVP Tracy Export (KAF)	58.0	90.0	89.0	179.0	283.0	227.0	128.0	201.0	231.0	262.0	260.0	190.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	895.6	845.2	737.3	637.9	538.2	302.8	195.9	309.6	422.5	600.6	789.3	853.4
Upper DMC Demands (KAF)	18.8	25.9	36.5	45.2	52.4	24.7	18.0	32.2	14.9	5.6	12.3	11.9
Lower DMC Demands (KAF)	13.9	20.8	28.6	30.0	36.0	17.5	19.4	36.4	16.0	4.9	11.9	10.4
Estimated Upper/Lower DMC Deliveries	32.7	46.7	65.1	75.2	88.4	42.3	37.4	68.6	31.0	10.5	24.1	22.3
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	9.6	11.1	13.9	16.0	16.6	11.2	10.0	14.6	9.5	6.8	8.0	8.3
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	60.5	69.6	103.5	168.8	188.2	83.9	12.9	12.0	11.4	11.6	20.0	26.8
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.8	4.8	11.9	14.3	15.2	8.2	7.0	7.0	11.0	11.1	6.9	5.6
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	6.1	7.0	10.4	17.1	19.1	8.4	1.2	0.9	1.0	1.1	1.8	2.5
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	140.4	197.0	278.4	420.7	462.4	234.9	87.4	118.1	83.9	71.3	125.9	138.7
Estimated EOM San Luis CVP Res. Storage	755.2	648.3	458.9	217.2	75.8	67.9	108.6	191.5	338.6	529.3	663.4	714.6
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA BASE STUDY 2

San Luis CVP Storage (KAF):	714.6	Group 2 Allocation (%)	45
As of:	03/01/34	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1934-35

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	714.6	704.7	548.3	427.2	218.1	78.8	86.8	144.6	207.9	354.7	625.3	766.1
Est. CVP Tracy Export (KAF)	108.0	15.0	119.0	149.0	253.0	212.0	141.0	178.0	227.0	262.0	260.0	151.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	822.6	719.7	667.3	576.2	471.1	290.8	227.8	322.6	434.9	692.7	885.3	917.1
Upper DMC Demands (KAF)	15.7	22.3	31.1	36.4	42.5	20.4	17.4	31.7	14.4	5.1	11.3	10.6
Lower DMC Demands (KAF)	12.2	18.9	25.7	25.2	30.7	15.2	19.1	36.2	15.8	4.6	11.4	9.7
Estimated Upper/Lower DMC Deliveries	27.8	41.2	56.8	61.6	73.2	35.6	36.5	67.9	30.2	9.7	22.7	20.3
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	8.9	10.3	12.7	14.1	14.4	10.2	9.8	14.5	9.4	6.7	7.8	8.1
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	45.7	52.7	78.3	127.5	142.0	63.5	10.1	9.8	9.0	9.0	15.5	20.6
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.3	4.0	11.1	12.9	13.6	7.5	6.9	6.9	11.0	11.0	6.8	5.3
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	4.6	5.2	7.8	12.8	14.3	6.3	0.9	0.7	0.7	0.8	1.4	1.9
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	117.9	171.4	240.2	358.0	392.4	204.0	83.1	114.7	80.3	67.3	119.2	129.5
Estimated EOM San Luis CVP Res. Storage	704.7	548.3	427.2	218.1	78.8	86.8	144.6	207.9	354.7	625.3	766.1	787.7
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

Revised: 08/03/94 10:55:28

CVP South Delta Water Supply Impacts
EPA Study 2B
[Base + NMFS Salmon + EPA 1968 LOD]

Units are thousands of arce feet

Year	Shasta Inflow	Year Type	San Joaquin Flow to Pool	CVP Exports	Annual CVP Water Supply	Exchange Contractor Allocation	M&I, Refuges, Losses	Available For Ag Contractors	Ag Contractor Allocation (%)
1922	4548	2	190	2631	2821	888.1	600.7	1332.3	70.2
1923	3635	3	0	2661	2661	888.1	600.7	1172.3	61.7
1924	2439	6	0	2436	2436	666.1	600.7	1169.3	61.6
1925	5035	2	0	2360	2360	888.1	600.7	871.2	45.9
1926	3711	5	0	2549	2549	888.1	600.7	1060.3	55.8
1927	6917	1	124	2715	2839	888.1	600.7	1350.3	71.1
1928	5105	2	0	2768	2768	888.1	600.7	1279.3	67.4
1929	3176	6	0	2405	2405	666.1	600.7	1138.3	59.9
1930	4147	3	0	2335	2335	888.1	600.7	846.2	44.6
1931	2536	6	0	1486	1486	666.1	600.7	219.3	11.5
1932	3624	3	125	1749	1874	666.1	600.7	607.6	32.0
1933	3452	5	0	1786	1786	666.1	600.7	519.3	27.3
1934	3318	5	0	1769	1769	666.1	600.7	502.3	26.4
1935	4840	2	90	2455	2545	888.1	600.7	1056.3	55.6
1936	4605	2	98	2712	2810	888.1	600.7	1321.3	69.6
1937	4117	3	190	2746	2936	888.1	605.1	1442.8	76.0
1938	9511	1	376	2588	2964	888.1	610.4	1465.1	77.2
1939	3470	6	0	2633	2633	888.1	600.7	1144.3	60.3
1940	6998	1	57	2649	2706	888.1	600.7	1217.3	64.1
1941	8701	1	280	2678	2958	888.1	609.4	1460.8	76.9
1942	7603	1	164	2809	2973	888.1	612.2	1472.7	77.5
1943	5873	1	136	2834	2970	888.1	611.7	1470.2	77.4
1944	3670	5	0	2667	2667	888.1	600.7	1178.3	62.0
1945	4837	3	179	2781	2960	888.1	609.7	1462.2	77.0
1946	5893	2	4	2705	2709	888.1	600.7	1220.3	64.3
1947	3904	5	0	2629	2629	888.1	600.7	1140.3	60.0
1948	5403	3	0	2530	2530	888.1	600.7	1041.3	54.8
1949	4324	5	0	2600	2600	888.1	600.7	1111.3	58.5
1950	4126	3	0	2657	2657	888.1	600.7	1168.3	61.5
1951	6314	1	45	2763	2808	888.1	600.7	1319.5	69.5
1952	7779	1	334	2662	2996	888.1	616.7	1491.2	78.5
1953	6544	1	0	2686	2686	888.1	600.7	1197.3	63.0
1954	6558	2	0	2781	2781	888.1	600.7	1292.3	68.0
1955	4111	5	0	2455	2455	888.1	600.7	966.2	50.9
1956	8821	1	264	2619	2883	888.1	600.7	1393.8	73.4
1957	5371	3	0	2838	2838	888.1	600.7	1349.3	71.1
1958	9696	1	241	2727	2968	888.1	611.3	1468.6	77.3
1959	5098	5	0	2656	2656	888.1	600.7	1167.3	61.5
1960	4728	3	0	2597	2597	888.1	600.7	1108.3	58.4
1961	5070	5	0	2527	2527	888.1	600.7	1038.3	54.7
1962	5255	3	95	2617	2712	888.1	600.7	1223.3	64.4
1963	7003	1	86	2788	2874	888.1	600.7	1385.3	72.9
1964	3903	5	0	2405	2405	888.1	600.7	916.2	48.2
1965	6976	1	156	2564	2720	888.1	600.7	1231.5	64.8
1966	5319	3	4	2687	2691	888.1	600.7	1202.3	63.3
1967	7385	1	375	2631	3006	888.1	618.6	1499.4	79.0

CVP South Delta Water Supply Impacts
EPA Study 2B
[Base + NMFS Salmon + EPA 1968 LOD]

Year	Shasta Inflow	Year Type	San Joaquin Flow to Pool	CVP Exports	Annual CVP Water Supply	Exchange Contractor Allocation	M&I, Refuges, Losses	Available For Ag Contractors	Ag Contractor Allocation (%)
1968	4776	3	0	2674	2674	888.1	600.7	1185.3	62.4
1969	7666	1	383	2635	3018	888.1	621.0	1509.3	79.5
1970	7904	1	8	2682	2690	888.1	600.7	1201.1	63.2
1971	7316	1	0	2835	2835	888.1	600.7	1346.3	70.9
1972	5076	3	0	2723	2723	888.1	600.7	1234.3	65.0
1973	6162	2	175	2753	2928	888.1	603.5	1436.4	75.6
1974	10782	1	202	2769	2971	888.1	611.8	1470.9	77.5
1975	6391	2	24	2706	2730	888.1	600.7	1241.3	65.4
1976	3597	6	0	2513	2513	888.1	600.7	1024.3	53.9
1977	2625	6	0	1084	1084	666.1	417.9	0.0	0.0
1978	7827	1	367	2205	2572	888.1	600.7	1083.2	57.0
1979	4025	5	58	2844	2902	888.1	600.7	1413.3	74.4
1980	6418	1	414	2599	3013	888.1	619.9	1504.7	79.2
1981	4098	6	1	2838	2839	888.1	600.7	1350.3	71.1
1982	9011	1	321	2740	3061	888.1	629.2	1543.7	81.3
1983	10796	1	713	2569	3282	888.1	671.9	1721.9	90.7
1984	6667	1	184	2484	2668	888.1	600.7	1179.7	62.1
1985	3972	5	0	2720	2720	888.1	600.7	1231.3	64.8
1986	7547	1	372	2588	2960	888.1	609.7	1462.0	77.0
1987	3947	6	2	2863	2865	888.1	600.7	1376.3	72.5
1988	3930	6	0	2312	2312	888.1	600.7	823.2	43.4
1989	4755	3	0	2643	2643	888.1	600.7	1154.3	60.8
1990	3619	6	0	2297	2297	888.1	600.7	808.2	42.6
1991	3051	6	0	1840	1840	666.1	600.7	573.3	30.2
1992	3621	6	0	1981	1981	666.1	600.7	714.3	37.6

71 Year Average (%)	75.7	98.6	80.0	61.8
1928-34 Average (%)	60.9	80.6	79.8	38.5

Assumptions:

Exports: CVP exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand
Includes wheeled D-1485 water pumped through Banks.

Exchange Contract 888.1 KAF full supply and 666.1 KAF (75% supply) when Shasta Inflow Criteria is not met.

Refuges and M&I: Receives not less than 75% of Level 2 supplies under CVPIA. (247.4 KAF refuge full supply with 37 KAF for Kesterson Mitigation. M&I never receives less than 75% of 155.1 KAF)

Losses: 260 KAF regardless of delivered quantites (Includes losses in DMC and Mendota Pool).

Ag Contractors 1899.0 KAF full supply .

San Luis Unit	1236.5 KAF
DMC (Ag Only)	407.2 KAF
San Felipe	68.7 KAF
Mendota Pool	58.6 KAF
Cross Valley	128 KAF

CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	865.0	Group 2 Allocation (%)	65
As of:	03/01/28	Exchange Contractors (%)	100
		Demand Pattern (% year)	75

Water Year 1928-29

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	865.0	971.0	837.8	617.8	268.5	52.5	105.9	244.5	366.1	518.4	699.6	777.9
Est. CVP Tracy Export (KAF)	275.0	74.0	75.0	105.0	283.0	291.0	243.0	248.0	252.0	262.0	260.0	161.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	51.0	0.0	0.0	0.0	26.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	51.0	0.0	0.0	0.0	26.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	1140.0	1045.0	912.8	722.8	551.5	394.5	348.9	492.5	618.1	804.4	959.6	938.9
Upper DMC Demands (KAF)	16.1	24.8	35.7	44.2	51.5	28.8	19.7	32.9	16.7	9.1	17.2	14.9
Lower DMC Demands (KAF)	12.4	20.3	28.2	29.4	35.5	19.7	20.3	36.8	17.0	6.8	14.5	12.0
Estimated Upper/Lower DMC Deliveries	28.5	45.1	63.9	73.6	87.1	48.5	40.1	69.7	33.6	15.8	31.8	26.9
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	28.4	70.2	88.8	162.5	170.5	100.4	18.7	14.2	22.2	36.4	82.6	93.3
Estimated Pool Deliveries	9.0	10.9	13.7	15.8	16.5	12.1	10.4	14.8	9.9	7.8	9.1	9.0
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	47.8	64.7	99.9	164.1	184.3	102.7	21.0	15.2	19.5	27.7	43.1	40.9
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.3	4.4	11.8	14.2	15.1	8.8	7.3	7.1	11.3	11.6	7.7	6.1
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	4.8	6.5	10.1	16.6	18.7	10.4	2.0	1.2	1.8	2.7	4.2	4.0
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	128.2	207.2	295.1	454.2	499.1	288.6	104.4	126.4	101.7	104.8	181.7	183.4
Estimated EOM San Luis CVP Res. Storage	1011.8	837.8	617.8	268.5	52.5	105.9	244.5	366.1	518.4	699.6	777.9	755.5
Adjusted Maximum EOM Storage (KAF)	971.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance	40.8											

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	755.5	Group 2 Allocation (%)	45
As of:	03/01/29	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1929-30

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	755.5	734.6	634.2	468.1	217.0	121.7	298.7	384.5	433.8	595.6	790.2	931.0
Est. CVP Tracy Export (KAF)	97.0	71.0	74.0	107.0	283.0	291.0	169.0	164.0	242.0	262.0	260.0	160.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	14.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	14.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	852.5	805.6	708.2	575.1	514.0	502.7	467.7	548.5	675.8	857.6	1050.2	1091.0
Upper DMC Demands (KAF)	15.7	22.3	31.1	36.4	42.5	20.4	17.4	31.7	14.4	5.1	11.3	10.6
Lower DMC Demands (KAF)	12.2	18.9	26.7	25.2	30.7	15.2	19.1	36.2	15.8	4.6	11.4	9.7
Estimated Upper/Lower DMC Deliveries	27.8	41.2	58.8	61.6	73.2	35.8	36.5	67.9	30.2	9.7	22.7	20.3
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	68.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	8.9	10.3	12.7	14.1	14.4	10.2	9.8	14.5	9.4	6.7	7.8	8.1
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	45.7	52.7	78.3	127.5	142.0	63.5	10.1	9.8	9.0	9.0	15.5	20.6
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.3	4.0	11.1	12.9	13.6	7.5	6.9	6.9	11.0	11.0	6.8	5.3
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	4.6	5.2	7.8	12.8	14.3	6.3	0.9	0.7	0.7	0.8	1.4	1.9
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	117.9	171.4	240.2	358.0	392.4	204.0	83.1	114.7	80.3	67.3	119.2	129.5
Estimated EOM San Luis CVP Res. Storage	734.6	634.2	468.1	217.0	121.7	298.7	384.5	433.8	595.6	790.2	931.0	861.5
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	961.6	Group 2 Allocation (%)	55
As of:	03/01/30	Exchange Contractors (%)	100
		Demand Pattern (% year)	50

Water Year 1930-31

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	961.6	971.0	839.0	626.2	290.7	92.1	109.4	220.8	241.3	389.0	616.9	732.6
Est. CVP Tracy Export (KAF)	241.0	74.0	75.0	105.0	283.0	267.0	202.0	141.0	236.0	262.0	260.0	86.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	1202.6	1045.0	914.0	731.2	573.7	359.1	311.4	361.8	477.3	696.0	876.9	818.6
Upper DMC Demands (KAF)	17.8	24.7	34.7	42.3	49.1	23.3	17.8	32.0	14.8	5.4	11.9	11.5
Lower DMC Demands (KAF)	13.3	20.2	27.6	28.4	34.2	16.8	19.3	36.3	15.9	4.8	11.7	10.2
Estimated Upper/Lower DMC Deliveries	31.1	44.9	62.3	70.7	83.3	40.1	37.1	68.4	30.7	10.2	23.7	21.6
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	28.4	70.2	88.8	162.5	170.5	100.4	18.7	14.2	22.2	36.4	82.6	93.3
Estimated Pool Deliveries	9.3	10.8	13.5	15.4	15.9	10.8	9.9	14.6	9.5	6.8	7.9	8.2
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	55.6	63.9	95.1	155.1	172.8	77.1	11.9	11.3	10.6	10.7	18.5	24.7
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	5.6	4.4	11.7	13.8	14.7	7.9	7.0	7.0	11.0	11.0	6.9	5.5
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	5.6	6.4	9.6	15.7	17.5	7.7	1.1	0.8	0.9	1.0	1.7	2.3
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	140.0	208.0	297.8	440.4	481.7	249.7	90.6	120.5	88.3	79.1	144.3	159.0
Estimated EOM San Luis CVP Res. Storage	1062.6	839.0	626.2	290.7	92.1	109.4	220.8	241.3	389.0	616.9	732.6	659.7
Adjusted Maximum EOM Storage (KAF)	971.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance	91.6											

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

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CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	659.7	Group 2 Allocation (%)	10
As of:	03/01/31	Exchange Contractors (%)	75
		Demand Pattern (% year)	25

Water Year 1931-32

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	659.7	640.7	551.4	405.0	264.1	143.4	93.6	141.2	145.7	277.3	481.3	639.4
Est. CVP Tracy Export (KAF)	38.0	14.0	0.0	78.0	114.0	89.0	123.0	114.0	205.0	262.0	260.0	214.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	697.7	654.7	551.4	483.0	378.1	232.4	216.6	255.2	350.7	539.3	741.3	853.4
Upper DMC Demands (KAF)	7.1	12.6	17.8	16.7	20.2	11.2	16.3	31.0	13.5	3.7	8.9	7.1
Lower DMC Demands (KAF)	7.5	13.7	18.6	14.6	18.7	10.2	18.5	35.8	15.2	3.9	10.1	7.8
Estimated Upper/Lower DMC Deliveries	14.6	26.4	36.4	31.3	38.9	21.4	34.8	66.7	28.7	7.6	18.9	14.9
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	7.0	8.2	9.8	9.7	9.5	8.2	9.6	14.4	9.2	6.4	7.3	7.3
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	5.5	7.7	16.5	35.7	37.9	20.4	5.0	6.3	4.5	2.8	4.1	4.4
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	3.9	2.4	8.9	9.6	9.9	5.9	6.7	6.8	10.8	10.8	6.4	4.8
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	0.4	0.6	1.4	3.3	3.6	1.9	0.3	0.3	0.3	0.2	0.2	0.2
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	57.0	103.3	146.5	218.9	234.7	138.8	75.4	109.5	73.4	58.0	101.9	104.8
Estimated EOM San Luis CVP Res. Storage	640.7	551.4	405.0	264.1	143.4	93.6	141.2	145.7	277.3	481.3	639.4	748.6
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

Revised: 08/02/94 13:14:44

CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	748.6	Group 2 Allocation (%)	30
As of:	03/01/32	Exchange Contractors (%)	75
		Demand Pattern (% year)	25

Water Year 1932-33

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	748.6	678.5	632.0	597.8	397.1	91.9	94.0	253.9	387.7	553.0	705.2	857.2
Est. CVP Tracy Export (KAF)	0.0	74.0	75.0	70.0	34.0	196.0	245.0	253.0	247.0	215.0	260.0	118.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	79.3	46.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	748.6	752.5	786.3	713.8	431.1	287.9	339.0	506.9	634.7	768.0	965.2	975.2
Upper DMC Demands (KAF)	8.9	15.1	23.8	30.5	35.0	19.0	17.6	32.4	14.6	4.4	9.7	8.0
Lower DMC Demands (KAF)	8.5	15.0	21.8	22.1	26.6	14.4	19.2	36.5	15.9	4.3	10.5	8.3
Estimated Upper/Lower DMC Deliveries	17.4	30.1	45.5	52.6	61.6	33.4	36.9	68.9	30.5	8.7	20.2	16.3
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	7.4	8.7	11.1	12.8	12.8	9.9	9.9	14.7	9.4	6.5	7.4	7.5
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	14.2	19.1	44.2	100.2	106.9	56.8	11.4	12.8	10.0	6.0	8.1	8.6
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	4.2	2.8	9.9	11.9	12.3	7.2	6.9	7.0	11.0	10.9	6.5	4.9
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	1.3	1.6	4.3	10.0	10.7	5.6	1.0	1.0	0.8	0.5	0.6	0.7
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	70.1	120.5	186.4	316.7	339.3	193.9	85.1	119.2	81.7	62.6	107.9	111.2
Estimated EOM San Luis CVP Res. Storage	678.5	632.0	597.8	397.1	91.9	94.0	253.9	387.7	553.0	705.2	857.2	864.0
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

Revised: 08/03/94 11:16:48

CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	864.0	Group 2 Allocation (%)	35
As of:	03/01/33	Exchange Contractors (%)	75
		Demand Pattern (% year)	50

Water Year 1933-34

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	864.0	780.1	625.8	485.1	210.9	76.1	67.8	159.4	169.0	308.1	505.4	650.7
Est. CVP Tracy Export (KAF)	19.0	0.0	74.0	42.0	211.0	175.0	172.0	122.0	217.0	262.0	260.0	166.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	883.0	780.1	699.8	527.1	421.9	251.1	239.8	281.4	386.0	570.1	765.4	816.7
Upper DMC Demands (KAF)	13.6	19.9	27.5	30.5	35.9	17.5	17.0	31.4	14.1	4.7	10.7	9.7
Lower DMC Demands (KAF)	11.0	17.6	23.8	22.0	27.1	13.6	18.9	36.0	15.6	4.4	11.0	9.2
Estimated Upper/Lower DMC Deliveries	24.6	37.5	51.2	52.5	63.0	31.1	35.8	67.4	29.7	9.1	21.7	18.9
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	8.4	9.8	11.9	12.8	13.0	9.5	9.8	14.5	9.3	6.8	7.7	7.9
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	35.8	41.4	61.5	99.9	111.2	49.9	8.2	8.3	7.4	7.3	12.5	16.5
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	4.9	3.6	10.5	11.9	12.5	7.0	6.8	6.9	10.9	10.9	6.7	5.2
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	3.6	4.1	6.1	10.0	11.2	4.9	0.7	0.5	0.6	0.6	1.1	1.5
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	102.9	154.3	214.7	316.2	345.7	183.4	80.3	112.5	77.8	64.7	114.7	123.3
Estimated EOM San Luis CVP Res. Storage	780.1	625.8	485.1	210.9	76.1	67.8	159.4	169.0	308.1	505.4	650.7	693.5
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with CWRSIM based on a 6.0 MAF CVP & SWP demand

Revised: 08/03/94 11:29:34

CVP SOUTH DELTA WATER SUPPLY - DETAILED IMPACTS

EPA STUDY 2B

San Luis CVP Storage (KAF):	693.5	Group 2 Allocation (%)	30
As of:	03/01/34	Exchange Contractors (%)	75
		Demand Pattern (% year)	25

Water Year 1934-35

	March	April	May	June	July	August	September	October	November	December	January	February
CVP San Luis Storage (KAF)	693.5	665.4	544.9	430.4	235.7	95.5	65.6	121.5	148.3	280.6	479.8	631.8
Est. CVP Tracy Export (KAF)	42.0	0.0	74.0	107.0	199.0	164.0	141.0	146.0	214.0	262.0	260.0	151.0
Actual CVP Tracy Export (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Est. SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Actual SWP/CVP Banks Export (KAF)	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Joaquin River Flows to Mendota Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gross Available CVP Supply (KAF)	735.5	665.4	618.9	552.4	434.7	259.5	206.6	267.5	362.3	542.6	739.8	782.8
Upper DMC Demands (KAF)	8.9	15.1	23.8	30.5	35.0	19.0	17.6	32.4	14.6	4.4	9.7	8.0
Lower DMC Demands (KAF)	8.5	15.0	21.8	22.1	26.6	14.4	19.2	36.5	15.9	4.3	10.5	8.3
Estimated Upper/Lower DMC Deliveries	17.4	30.1	45.5	52.6	61.6	33.4	36.9	68.9	30.5	8.7	20.2	16.3
Actual Upper/Lower DMC Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Rights Contract Demands (KAF)	21.3	52.6	66.6	121.9	127.9	75.3	14.0	10.7	16.7	27.3	61.9	69.9
Estimated Pool Deliveries	7.4	8.7	11.1	12.8	12.8	9.9	9.9	14.7	9.4	6.5	7.4	7.5
Actual Pool Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated SLU Deliveries	14.2	19.1	44.2	100.2	106.9	56.8	11.4	12.8	10.0	6.0	8.1	8.6
Actual SLU Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated San Felipe Div. Deliveries	4.2	2.8	9.9	11.9	12.3	7.2	6.9	7.0	11.0	10.9	6.5	4.9
Actual San Felipe Div. Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estimated Southern CVP Deliveries	1.3	1.8	4.3	10.0	10.7	5.6	1.0	1.0	0.8	0.5	0.6	0.7
Actual Southern CVP Deliveries	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Deliveries South of Delta	70.1	120.5	168.4	316.7	339.3	193.9	85.1	119.2	81.7	62.8	107.9	111.2
Estimated EOM San Luis CVP Res. Storage	665.4	544.9	430.4	235.7	95.5	65.6	121.5	148.3	280.6	479.8	631.8	671.6
Adjusted Maximum EOM Storage (KAF)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
San Luis CVP Exceedance												

Exports generated with DWRSIM based on a 6.0 MAF CVP & SWP demand

Revised: 06/03/94 11:32:24

Run Date 2-25- 94
Pool Gains Used to meet Demand
Base: Folsom Reoperation Study, 4001c, 400 Folsom-F.C. Pool, 1995 Demands
Equation is +pdel 54+pdel 55+pdel 48-flow 53
Report is in ascending order by year

Units are in TAF

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1922	0.0	0.0	0.0	0.0	0.0	0.0	0.0	106.1	118.9	0.0	0.0	0.0	225.0
1923	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1924	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1925	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1926	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1927	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.0	47.0	0.0	0.0	0.0	124.0
1928	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1929	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1930	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1931	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1932	0.0	0.0	0.0	0.0	0.0	0.0	0.0	79.3	46.0	0.0	0.0	0.0	125.3
1933	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1934	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1935	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	0.0	90.0
1936	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	72.0	0.0	0.0	0.0	98.0
1937	0.0	0.0	0.0	0.0	0.0	0.0	0.0	107.4	120.0	0.0	0.0	0.0	227.4
1938	0.0	0.0	0.0	0.0	31.3	63.3	91.0	107.4	120.3	0.0	0.0	0.0	413.2
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.0	0.0	0.0	0.0	0.0	57.0
1941	0.0	0.0	0.0	0.0	31.3	19.0	40.0	107.4	120.3	0.0	0.0	0.0	318.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.0	120.3	0.0	0.0	0.0	189.3
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.0	95.0	0.0	0.0	0.0	136.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	4.0	7.4	30.5	0.0	0.0	84.0	101.0	0.0	0.0	0.0	226.9
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	4.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	6.8	7.6	30.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.2
1952	0.0	0.0	0.0	0.0	0.0	60.0	84.0	107.4	120.3	0.0	0.0	0.0	371.7
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	6.6	7.4	30.5	0.0	29.0	107.4	120.3	0.0	0.0	0.0	301.1
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	16.0	35.0	107.4	120.3	0.0	0.0	0.0	278.7
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	120.3	0.0	0.0	0.0	120.3
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	66.0	0.0	0.0	0.0	86.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	7.2	30.0	0.0	0.0	61.0	58.0	0.0	0.0	0.0	156.2
1966	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
1967	0.0	0.0	0.0	0.0	30.8	63.3	91.0	107.4	120.3	0.0	0.0	0.0	412.8
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.0	0.0	7.8	31.3	63.3	91.0	107.4	120.3	0.0	0.0	0.0	421.0
1970	0.0	0.0	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	18.0	0.0	0.0	107.4	62.0	0.0	0.0	0.0	187.4
1974	0.0	0.0	0.0	7.8	4.0	0.0	0.0	107.4	116.0	0.0	0.0	0.0	235.2
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	24.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	22.6	63.3	91.0	107.4	120.3	0.0	0.0	0.0	404.6
1979	0.0	0.0	0.0	3.0	18.0	12.0	10.0	14.0	1.0	0.0	0.0	0.0	58.0
1980	0.0	0.0	0.0	7.6	30.8	63.3	91.0	107.4	25.0	82.0	11.0	8.0	426.1
1981	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
1982	0.0	0.0	0.0	0.0	0.0	6.0	91.0	107.4	120.3	34.0	0.0	0.0	358.7
1983	0.0	42.2	7.1	7.8	31.3	63.3	91.0	107.4	120.3	128.5	113.0	90.2	802.0
1984	109.0	42.2	7.1	7.8	31.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	198.4
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	30.5	63.3	91.0	107.4	91.0	1.0	0.0	0.0	384.1
1987	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Avg.	1.6	1.2	0.5	1.2	6.2	8.0	13.2	32.1	36.8	3.5	1.8	1.4	107.4

Table 3-2

CENTRAL VALLEY PROJECT DELTA EXPORT CAPABILITIES

Theoretical Maximum Export, Pumping, Conveyance Capacity, and D-1485 May, June Limitations Only.

Month	Days/ Month	Tracy Avg. CFS	Multiplier CFS to Ac.-Ft.	Maximum Tracy AF	SWP/CVP Banks AF[4]	Absolute Historic Maximum[5] AF	YR
Jan.	31	4,150[1]	1.9835	255,177	0	254,400	1990
Feb.	28	4,200[1]	"	233,260	0	235,700	1988
Mar.	31	4,250[1]	"	261,326	0	263,370	1984
Apr.	30	4,300[1]	"	255,872	0	258,200	1987
May	31	3,000[2]	"	184,466	0	184,300	1986
June	30	3,000[2]	"	178,515	0	178,500	1985
July	31	4,600[3]	"	282,847	65,000[4]	282,900	1989
Aug.	31	4,600[3]	"	282,847	65,000[4]	282,900	1989
Sept.	30	4,500[1]	"	267,773	65,000[4]	273,300	1988
Oct.	31	4,200[1]	"	258,252	0	259,300	1989
Nov.	30	4,150[1]	"	246,946	0	247,800	1989
Dec.	31	4,150[1]	"	255,177	0	256,100	1988
				2,962,458[6] +195,000	195,000	2,976,770[6] +195,000	
				3,157,458		3,171,770	

Total CVP Tracy Export Obligations: 3,353,736 (Table 1).
Total Over Obligation: 196,278 AF or 10.9 percent of Group II obligation.

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[1]Tracy export limited by conveyance capacity of the Delta-Mendota Canal (DMC) which decreases from 4,600± cfs at Tracy Pumping Plant to 4,150 cfs at O'Neill Pumping Plant (upper DMC reach). Does not reflect water quality limitations or impacts from scheduled or unscheduled outages, incidental take restrictions under ESA, or pulse flow export restrictions.

[2]Tracy export limited to 3,000 cfs pursuant to D-1485 for the protection of striped bass.

[3]Maximum permitted export rate under U.S. Army Corps of Engineers diversion permit.

[4]Pumpage of Central Valley Project (CVP) water, totalling 195,000 acre-feet (AF), by State Water Project (SWP) to makeup for May-June D-1485 export curtailments by CVP. Does not include pumping for Cross Valley Canal contracts.

[5]Based upon period of record 1953-1992.

[6]Absolute maximum annual water year export was 2,895,351 AF for the period of October 1987 through September 1988. Adding 195,000 AF SWP/CVP equals 3,090,351.