Attachment I

SWRCB DRAFT WATER QUALITY CONTROL PLAN OF DECEMBER 15, 1994

PLANNING SIMULATION MODEL (DWRSIM) ASSUMPTIONS
(STUDY 1995C6B-SWRCB-407)

I. SWRCB Objectives for M&I purposes (Report Table 1, page 14) are modeled at the Contra Costa Canal Intake, as follows:

Year Type (40-30-30 Index)	Number of days at 130 mg/l Chlorides
Wet	240 days (Jan.1 - Aug.28)
Ab Norm	190 days (Jan.1 - Jul.09)
Bl Norm	175 days (Feb.1 - Jul.25)
Dry	165 days (Feb.1 - Jul.15)
Crit.	155 days (Feb.1 - Jul.05)

The remaining days of all years maintain a standard of 225 mg/l Chlorides.

The actual daily standards are specified as 150 mg/l and 250 mg/l. However for use in a monthly model, a "buffer" was added to insure that the standard would be maintained on a daily basis. Thus, DWRSIM uses a value of 130 mg/l for the 150 mg/l standard, and a value of 225 mg/l for the 250 mg/l standard.

II. SWRCB Objectives for Agricultural purposes (Report Table 2, page 15) are modeled as follows:

1. EC standards at Emmaton (April 1 through August 15) are maintained as specified in the Draft standards.
2. EC standards at Jersey Point (April 1 through August 15) are maintained as specified in the Draft standards.
3. EC standards on the San Joaquin River at Vernalis (Apr-Aug 0.7 EC; Sep-Mar 1.0 EC) are maintained. In this study a 70 TAF/year limit (cap) on additional upstream releases from New Melones Reservoir is assumed.

Other Agricultural standards from SWRCB Table 2 that are not modeled in DWRSIM are as follows:

Interior Delta EC for Mokelumne River at Terminous, and for San Joaquin River at San Andreas Landing.

1.0 EC standard at Clifton Court Forebay and at Tracy Pumping plant.

III. SWRCB Objectives for Fish and Wildlife purposes (Report Table 3, pages 16-17) are modeled as follows:

1. Criteria for salmon protection are maintained per the NMFS biological opinion for Winter-run salmon as follows:

   o Maintain the end-of-September storage in Shasta Reservoir at greater than 1.9 in all normal water years. However, in some Critical water years, Shasta Reservoir end-of-September storage is allowed to fall below 1.9 MAF.

   o Maintain a minimum fishery flow in the Sacramento River below Keswick Reservoir of 3,250 cfs from October 1 through March 31 of all years.

2. For San Joaquin River salinity control, a 0.44 EC is maintained at Jersey Point in April and May of all years. Per Footnote 4, this criteria is dropped in May if the Sacramento River Index is projected to be less than 8.1 MAF. The 0.44 EC requirement at Prisoners Point is not modeled in DWRSIM.

3. For Suisun Marsh salinity control the following EC standards are maintained, modeled only at Chipps Island:

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
EC - Normal Yrs.	19.0	15.5	15.5	12.5	8.0	8.0	11.0	11.0
EC - Deficiency Yrs	19.0	16.5	15.6	15.6	15.6	15.6	14.0	12.5

   In deficiency years (as defined by Footnote 6), the relaxation of EC standards is assumed to start in Jan. and continues for a 12-month period through the following Dec.

   The corresponding EC standards for other locations in Suisun Marsh are not modeled in DWRSIM.

4. Minimum required Delta outflows are maintained as follows, using the Sacramento River 40-30-30 Index.

Year Type (40-30-30 Index)	Required Outflow (cfs) Oct	Nov	Dec	Jan	Feb-Jun	Jul	Aug	Sep
Wet	4000	4500	4500	*	**	8000	4000	3000
Ab Norm	4000	4500	4500	*	**	8000	4000	3000
Bl Norm	4000	4500	4500	*	**	6500	4000	3000
Dry	4000	4500	4500	*	**	5000	3500	3000
Crit.	3000	3500	3500	*	**	4000	3000	3000

   * Jan: For all Year types either 4,500 cfs minimum or 6,000 cfs if the Dec. monthly 8-River Index was greater than 800 TAF (per Footnote 10).

   ** Feb-Jun: 2.64 EC standards (X2) are maintained, as described in Item 5 below.

5. For February through June, outflow requirements are maintained using the 2.64 EC criteria (previously known as X2 salinity), using the required number of days at Chipps Island (74 km) and Port Chicago (64 km, aka Roe Island) per "Footnote 11 for Table 3" on page 23 of the SWRCB Draft Standards.

   At the Confluence (81 km), the full 150 days (Feb 1 - Jun 30) of 2.64 EC is maintained in all years, up to a maximum required flow of 7,100 cfs. This Confluence EC requirement is dropped in May and June of any year for which the projected Sacramento River Index will be less than 8.1 MAF. In those years where the May/June EC criteria is dropped, a minimum outflow of 4,000 cfs is still maintained in May and June.

   In the DWRSIM model, the following monthly equation is used to calculate the outflow needed (in CFS units) to maintain the EC standard (average monthly position in Kilometers). In this equation the EC position is given, and the equation is solved for Delta outflow.

   EC position = 122.2 + [0.3278 * (Last Months EC position in km)] - [17.65 * log10(Delta outflow for current month)]

   Additional details are modeled in DWRSIM as follows:

   - Trigger to activate Roe Island standard is set at 66.3 km in DWRSIM, as an average monthly value.
   - Maximum required monthly outflows to meet the 2.64 EC standard are capped at the following limits:

     29,200 cfs for Roe Island criteria
     11,400 cfs for Chipps Island criteria
      7,100 cfs for the Confluence

   - Relaxation criteria in February for the Chipps Island standard is as follows:

     If the 8-River Index for the preceeding month of January is:

     a) less than 800 TAF, then Feb. EC days at Chipps Island is zero.
     b) greater than 1,000 TAF, then meet full 28 days at Chipps Island.
     c) between 800 and 1,000 TAF, interpolate days required at Chipps Island from 0 to 28 days in proportion to the Jan. 8-River Index flow.

6. Flow requirements at the Rio Vista on the Sacramento River are maintained as follows:

Year Type (40-30-30 Index)	Minimum Flow (cfs) Sep	Oct	Nov	Dec
Wet	3000	4000	4500	4500
Ab Norm	3000	4000	4500	4500
Bl Norm	3000	4000	4500	4500
Dry	3000	4000	4500	4500
Crit.	3000	3000	3500	3500

7. Minimum flow requirements on the San Joaquin River at Vernalis are maintained as follows:

   o From February 1 through June 30, maintain flows per the table below. For each period, the higher flow is required at Vernalis whenever the Delta outflow requirement (2.64 EC per Item 5 above) is located west of Chipps Island (kilometer 74.0). If the 2.64 EC Delta outflow position is east (upstream) of Chipps Island, then the lower flow requirement is used at Vernalis. The 60-20-20 San Joaquin River Index is used to determine year types at Vernalis.

Year Type (60-20-20 Index)	Minimum Flows at Vernalis (cfs) Feb.1- Apr 14 AND May 16-Jun 30 (Low or High)	Apr.15-May 15 (Low or High)
Wet	2130 or 3420	7330 or 8620
Ab Norm	2130 or 3420	5730 or 7020
Bl Norm	1420 or 2280	4620 or 5480
Dry	1420 or 2280	4020 or 4880
Crit.	710 or 1140	3110 or 3540

   o For the month of October, the minimum flow requirement at Vernalis is 1,000 cfs in all years, plus a 28 TAF pulse flow. The 28 TAF pulse (equivalent to 455 cfs monthly) is to be added on top of the actual Vernalis flow, up to a maximum of 2,000 cfs. In the DWRSIM monthly model, these two components are combined as an average monthly requirement as follows:

Oct. base flow at Vernalis	Combined Required Flow for October
less than 1000 cfs	1455 cfs
1000 to 1545 cfs	Base flow + 455 cfs
more than 1545 cfs	2000 cfs

   o The above flow requirements at Vernalis are primarily maintained by releasing additional water from New Melones Reservoir. In years when New Melones Reservoir storage drops below 300 TAF, additional water from unspecified sources in the upper San Joaquin River system is added to fully meet the Vernalis flow requirements.

8. Limits on Delta Exports are simulated as follows:

   A. Ratios for maximum allowable Delta Exports are specified as a percentage of Total Delta inflow as follows:

Month:	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Export Limit (% of Inflow)	65	65	65	65	45/35	35	35	35	35	65	65	65

   For February the export ratio is determined as a function of the January 8-River Index, as follows:

   If the Jan. 8-River Index is greater than 1.25 MAF, ratio = 35%

   If the Jan. 8-River Index is less than 1.25 MAF, ratio = 45%

   For this ratio criteria, Total Delta Exports are defined as the sum of pumping at the SWP Banks and CVP Tracy Pumping Plants. In the DWRSIM model, Total Delta Inflow is calculated as the sum of river flows from the Sacramento River, Yolo Bypass, total from the Eastside stream group, and San Joaquin River inflow. Delta area precipitation and consumptive uses are not used in this ratio.

   B. April 15 - May 15 Delta Export (Banks plus Tracy) limitations are modeled as follows:

   Maximum combined export limit - 2,000 cfs, OR 100% of the San Joaquin River flow at Vernalis, whichever is greater.

   Export limits for Apr.1-14 and May 16-31 are controlled by either the export/inflow ratio (35 %) or pumping plant capacity, whichever is smaller.

9. Delta Cross-Channel closures are modeled as follows:

   A. Closed 15 days/month for Nov., Dec. and Jan. (total closure of 45 days).

   B. Fully closed from Feb 1 through May 20 of all years.

10. The Water Year Classification Indexes used in this study to determine year types and Delta standards are as follows:

   A. The Sacramento River 40-30-30 Index (as defined in the SWRCB Draft standards, page 20) is used to determine year types for Delta outflow criteria and Sacramento River system requirements.

   B. The San Joaquin River 60-20-20 Index (as defined in the SWRCB Draft standards, page 21) is used to determine year types for flow requirements at Vernalis.

   C. The Eight River Index (as defined in Footnote 10, page 18) is only used where specified, in relation to variations of specific Delta standards.