Public Comment
2009 Periodic Review
Deadline: 6/15/09 by 12 noon

SOUTH DELTA WATER AGENCY

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Via E-mail commentletters@waterboards.ca.gov

Ms. Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
P. O. Box 100
Sacramento, CA 95812-2000

Re: Draft Staff Report on Periodic Review of the 2006 Bay-Delta WQCP

Dear Board Members:

The following are the South Delta Water Agency's comments to the draft staff report for the Periodic Review of the 2006 Bay-Delta Water Quality Control Plan.

1. Southern Delta Salinity and San Joaquin River Flows. The Report makes no recommendations regarding southern Delta salinity objectives (or standards) or San Joaquin River flows in light of the fact that the Board has already decided to review those issues. The Report does set forth some history and facts regarding those issues.

On page 13 the Report lists those factors affecting salinity concentrations or loads in the southern Delta, and includes "fertilizers" and "soil amendments." It is common to hear at both Regional Board and State Board hearings and workshops that fertilizers and soil amendments contribute salt to the River. However, inquires as to the basis of such statements reveal no studies supporting the claim. If the SWRCB staff has some citation to support their conclusion that these contribute to Delta salts in any significant way, they should reference that support.

The Report also fails to mention a number of very significant regulatory actions or inactions that affect Delta salinity. There is no mention of the Regional Board's failure to set upstream salinity standards on the San Joaquin. There is also no mention of the Boards' failure to address municipal discharges which have in the past allowed significant amounts of discharges of water in excess of the standards into areas of little or no net flow.

Finally with regard to southern Delta salinity, the Report should make the distinction between processes that add salt to the system and those which concentrate salts through use of River water. The former should never preclude or hinder the latter.

With regard to San Joaquin River flows, the Report should reference the recent testimony of DFG regarding its continued belief that higher flows are associated with higher survivability. This is especially important because the current standards have never been fully implemented and the period of VAMP has corresponded to a sharp decrease in San Joaquin River salmon populations.

2. Outflow. The Report correctly identifies outflow as a significant factor in the health of the estuary, but should be much more forceful in its recommendation to make changes. There is little dispute that the system is currently operated to maximize exports at the expense of the ecosystem. The insufficiency of water for the estuary (and the corresponding excessive export pumping) has been known for many years (see attached paper by L. Leopold which was part of previous SWRCB Bay-Delta efforts).

The Report wrongly cites to the PPIC report regarding its conclusions about the need for variable salinity and diverse habitat in the Delta. PPIC conclusions were based on its finding that the Delta is now kept "fresher" than it was historically. CCWD corrected this error and showed that PPIC had it backwards; the Delta is now saltier that it was. Hence the idea that we should periodically "salt up" the Delta to improve fisheries should have been discarded some time ago. Allowing ocean salts to intrude higher into the estuary does not create "more diverse habitats," rather it decreases both the mixing zone habitat which prevailed well downstream and the fresh water habitat that prevailed in the Delta. If there is one thing that is clear, it is that the inflow and outflow of the Delta have been radically decreased over time, especially during hydrologic years classified as below normal, dry and critical.

The Report should emphasize that the recent BO for smelt also recommends increased outflow as necessary to protect the estuary.

3. Exports. The Report is weak in its recommendation to review export restrictions. After the POD Synthesis Report, the Wanger Decision, the Smelt BO and the Salmon BO, there can be no uncertainty. Every process which included opposing views has concluded that fishery protections require decreased export levels. In light of the crash of various species, the Report should be much more forceful. A clear example of the Report lacking the necessary recommendations is its treatment of the spring export limits. The 2006 Plan's (as well as the 1995 Plan's) limits on exports do not even match the limitations in the BO's recently thrown out or replaced much less the new Opinions. The Report should specifically recommend new restrictions and the deletion of the "no-net loss" to exports footnote.

The Report references the PPIC report again, for the proposition that southern Delta exports should be moved to a new location. The many factual errors of the PPIC can be addressed in other forums. However, if the Report is going to reference PPIC as supporting the idea that the projects should divert from some other location, it should also reference Water Code Section 12205 and the Delta Corridors Proposal which provide both legal guidance for such changes and alternatives thereto.

4 Suisun Marsh. The Report should discuss how current operations have decreased the historic mixing zone habitats in and around the Marsh.

5. Old River/Middle River flows. It is appropriate for the Report to reference the recent restrictions on these parameters under the Wanger Decision and the recent smelt BO. However, the topic requires an analysis of the recent CCWD information which suggests that net flows are irrelevant, rather the existence of ebb flow is the key. Per CCWD, outmigrating salmon use the ebb flow to travel downstream regardless of the net flow. It is only when the ebb flow reaches zero, that the fish necessarily end up at the export pumps.

The Report should also note that the recent smelt BO notes that although other factors affect fish populations, those other factors are important only due to the alteration of the hydrodynamics of the system by the projects.

6. Screens. The Report contains a fair review of fish screen issues, excepting as to the screening of the export pumps. Without any citation whatsoever, the Report concludes that concerns about sea level rise and levee stability argue against requiring new screens at the export facilities. Proposals for new diversions place them in a similar circumstance for both sea level rise and levee problems. Further, there is little doubt that the current screening at the CVP and SWP facilities results in significant mortality of many species. All the evidence (including the CalFed ROD referenced in the Report) points to the need for new, better screens for the projects.

7. Biological Indicators. This portion of the Report mentions the narrative salmon doubling standard. In light of the crash of the fisheries (including salmon) and in light of the CVPIA's requirement that numerous species (including salmon) be doubled, the Report should include a recommendation regarding a specific new standard and how it should be implemented.

SDWA also joins in the comments of the Central Delta Water Agency. Please feel free to contact me if you have any questions.

Very truly yours,

JOHN HERRICK

Enclosure

SACRAMENTO DELTA WATER SUPPLY AND REVIEW OF THE TIBURON REPORT

Luna B. Leopold
Consulting Engineer

California must take heed of well documented experience in the Soviet Union where diversion of fresh water from the natural supply to an estuary has resulted in immense economic loss and the near destruction of an important estuary. Regulation of the Don River has resulted in an increase of salinity of the Azov Sea by a mere 7 percent and the result was to reduce total fish production from about 15 to 3 thousand tonnes annually. This has been documented in detail by Volovik (1986) and reviewed in the Tiburon report here being discussed.

The Tiburon report as it will here be called is a detailed study of the water situation in the Sacramento Delta. The reference is:

Rozengurt, M., Herz, M.J., and Feld, S.,1987, Analysis of the influence of water withdrawals on runoff to the Delta-SanFrancisco Bay ecosystem (1921-1983): Paul F. Romberg Tiburon Center for Environmental Studies, Tech. Rept. No 87-7.

This voluminous study cannot be either read or taken lightly for it is statistical, detailed, and in many places less than clear. Nevertheless the more one studies it the more impressive is the informational content. The present review deals only with the discussion and data dealing with annual flow data whereas the Tiburon report analyses both annual and monthly data.

The present discussion is an attempt to bring out those points that seem most significant and to present some reanalysis to clarify and emphasize some of the important conclusions.

The data base is reviewed in some detail. It appears that during the planning and construction stages of water development and diversion in the Sacramento system, two somewhat shortcut data compilations were used. The "Four River Index" is a data base that includes runoff from only 75 % of the total drainage area. A "modified method" had previously been employed also relating less than the full runoff. Finally a compilation was made that estimated the runoff not only from the major rivers but included runoff from the foothill areas and is thought to represent a good approximation of the full runoff volume of 100% of the basin area. The Tiburon report shows that the planning done in the early years based on these less than full runoff volumes have given an over-optimistic picture of the water available for diversion from the Delta system.

Tiburon Center for
Environmental Studies
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Then using the most uptodate data base that most realistically decribes what water is really available, the report introduces a statistical analysis of this water supply. Generally this analysis is couched in the form of deviations above and below the mean or average value of the runoff series, and expressed among other ways as probability of occurrence. When values of deviation from the mean are plotted as the probability of being equalled or exceeded, the differences in actual runoff quantities among different data sets can be eliminated so that the particular length of the record becomes unimportant.

The method of analysis will be demonstrated below to help explain and support the major conclusions in the report. First, however, it would be desireable to summarize the major findings of the study.

First, the role of fresh water runoff is of highest importance in controlling salinity and the functioning of the "nutrient trap", that zone of an estuary where fresh water with its load of sediment and nutrients interacts with the saline water from the ocean. This is the area richest in plankton production where many fish species thrive as juveniles (see pp. I.3, I.6, and Fig. I.2). In the Delta area, this is between Chipps Island and Benicia. Reduction of fresh water reaching the Bay has made the saline zone move upstream and is the cause of the historic increase in salinity. The loss of fish populations, a well documented fact, is related to these complex changes. Salinity in the Delta has increased in the present century from an original value of .01-2.0 grams per liter to a present value of 1.0-14. The increase in salinity experinced in the Sea of Azov of the Soviet Union was less than two-fold whereas the increase in the Delta has been ten-fold. Even with the modest increase in the Saz of Azov the result has demonstably been disasterous in that country.

Second, the Tiburon report shows that use of an unsatisfactory data set to describe the available water has in the planning and construction stages of water development seriously underestimated the probability of critically dry conditions in the estuary. Further, the use of frequency curve analysis is necessary to evaluate properly the effect of the already operative water diversions that deplete the fresh water supply so essential to the continued functioning of the ecosystem.

Third, the report shows what should be an obvious fact, that continued diversion of the same magnitude of fresh water in dry years as well as wet years makes a much larger percentage change in available water in a dry period than in a wet one. Yet there is no attempt to adjust the amount of diversion in response to the available supply.

Fourth, the amount of water diverted has continued to increase with time despite the data on biologic populations and salinity that have given ample warning that even the present amount of diversion is impacting the ecosystem.

Both to check quantitatively the results presented on annual flows in the Tiburon report, and to explain in new words its findings, I have reanalysed some of the data. My results are in qualitative agreement with those in the report though my numbers are not as exact. One reason for this is that I have generally rounded the data to three significant figures, for my work was done by hand whereas the Tibruron computations were made on a computer.

Four sets of data were used in my analysis. They are a) the list of annual flows representing natural, unimpaired inflows to the delta; b) the regulated annual inflow to the Delta; c) the natural or unimpaired outflows from the Delta, and d) the regulated or altered outflow annual values. These tabulations of basic data are included as printed tables in this study. The annual natural inflow data are those representing the flow from all or 100% of the drainage area as previously stated as being necessary for a correct analysis.

The method of analysis is similar to that used in the Tiburon report. The data array was retabulated in order of magnitude of the values. For each the recurrence interval was calculated as n+1/m where n is the number of years of record, and m is the rank order of the value or runoff quantity. The reciprocal of recurrence interval is the probability of occurrence, that is m/n+1 is the probability. For example, the value of probability of 0.10, that is 10 chances out of 100, means that in 100 years, it is probable that 10 years will experience a flow less than the quantity specified.

To make this more specific consider Figure 1 of the present study. Four graphs are plotted. They show the probability that any value of annual flow will be equalled or exceeded. The four graphs describe the annual natural inflow to the Delta, the regulated inflow, the natural outflow, and the regulated outflow.

Consider first, the graph of natural inflow, plotted as the symbol x. There is a 50 percent probability that the annual natural inflow will be equal to or less than 25,000,000 acre feet. This is the median value of the array, that is half the annual values are larger and half smaller. The arithmetic mean is somewhat larger, about 28.1 million. Now look at the value 25% on the bottom scale. At a probability of 25% the annual runoff value is about 37 million acre feet. This says that there is a 25% chance, one in four, that the annual value of natural inflow will be equal to or larger than 37 million. By the same token, the upper scale says that there is a 75% chance, 3 out of 4, that the annual value will be equal to or less than 37 million. In other words it is less than likely that any given year will have as large a flow as 37 million.

Now look at the lower part of the curve which is the significant part from the standpoint of the estuarine ecosystem. Where the lower scale reads 90, the graph reads 13 million acre feet. Thus 9 years out of 10 or 90 years out of 100 it is probable that the natural inflow would equal or exceed 13 million. Or from the upper scale, 10 years out of 100 can be expected to have a natural inflow less than 13 million.

The average natural inflow to the delta is about 28.1 million acre feet. It should be obvious that this average value has but little significance. Of interest is the year of short supply and the frequency with which it might be expected. This is the reason both the Tiburon report and the present analysis concentrate on frequency curves.

Consider now the comparison of the curves for the natural inflow and the natural outflow to the Delta. In Fig. 1 the former is the crosses x, and the latter is the solid circle. The two curves are nearly identical. To the extent they are the same the data show that under natural conditions water coming into the Delta was nearly the same as that amount leaving the Delta.
At the scale of this graph the amount of loss by seepage or evapotranspiration cannot be seen.

But now consider the comparison of natural inflow to the regulated inflow shown on the graph by open circles. Regulated inflow is the water allowed to flow into the Delta after diversion and after the construction of upstream dams. Diversions to southern California are the primary cause of depletion. The average regulated or man-influenced inflow is about 22.8 million acre feet. This is an average reduction of 28.1-22.8 or 5.3 million or 19 percent of the natural. Again this average reduction is not very informative. Compare the curves on the lower scale at 75 percent probability. The natural inflow expected to be equalled or exceeded 75 percent of the time or 75 years out of 100 is about 18 million acre feet. But the regulated flow will only produce 13 million, a depletion of 5 million out of the naturally expected 18 million, a reduction of nearly 30 percent.

Now consider that low flow expected 10 percent of the years or once every ten years. At this frequency the natural inflow was 12 million acre feet. The expected regulated outflow once in ten years is only 7.5 million. At this frequency the depletion of the flow into the Bay is nearly 40 percent.

The above comparisons deal with the probability of experiencing any given quantity and do not mean to apply to any particular year. However, when one looks at the probability of one in ten, it means that next year or any given year in the future has a one in ten chance of experiencing an outflow to the Bay of less than 7.5 million acre feet. Like tossing a coin, each toss has the same chance of coming up heads.

Note also that the regulated outflow to the Bay is considerably less than the regulated inflow to the Delta. This means that after regulation the losses or depletions within the Delta have increased. Before regulation the losses within the Delta were negligible as previously stated.

The Tiburon report wisely makes an important issue of the number of dry and critical years under natural as compared with regulated conditions. To check and extend those findings I have prepared Figure 2. I have used the same definitions of wet, abnormal, subnormal, dry, critically dry, and drought as used by the Dept. of Resources Bulletins 23-62 and 130-70s (see Tiburon report Table I-9 p I.45). I have added a category of very dry so that all years may be described. The definitions are given in Figure 2.

In my tables with the annual flows arranged in order of magnitude it is easy to count the number of years in each category. As Figure 2 shows, regulation and diversion of water have increased the number of years in the dry categories and reduced the number of years in the wet categories. The Figure refers to annual values of inflow to the Delta.

Years in which the inflow is considered wet have decreased from natural conditions from 17 to 9, or from 30 percent of all years to 15 percent of years.

Subnormal years have changed from 11 to 7 or from 19 percent of all years to 12 percent.

The important change is in the number of critically dry years, an increase from 8 to 23 in the period of record or from 14 percent of all years to 39 percent. Thus the amount of diversion and depletion under present conditions has doubled the number of years considered critically dry.

Further, the increase in depletion has been continuous over time. A measure of depletion is the difference between natural and regulated values of outflow from the Delta. The depletion by periods of time is shown below.

Natural outflow less Regulated Outflow
average values in millions of acre feet

Time Period	Depletion
1921-1929	3.77
1930-1939	3.79
1940-1949	4.73
1950-1959	6.64
1960-1969	8.74
1970- 1979	10.94
1980-1982	12.70

In conclusion, my studies confirm the general conclusions in the Tiburon report. The depletions have been massive and continue to increase. They have greatly increased the percentage of years of critical drought in the Delta and the Bay.

It is my professional opinion that no set of standards of water quality can be written that can have the practical effect of protecting the ecosystem from further degradation if diversions increase over the present level. Because forecasts of runoff are imperfect the effect of diversions in a year that turns out to be dry will already have taken its toll on the ecosystem before water quality measurements can compare the condition with the standards.

The logical and in my opinion the imperative step is to preclude henceforth any additional diversions of water from the Delta system.