Review comments on the 2010 Reclamation MAA Documents

RT Brown, ICF International

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TMML Implementation Issues

The USBR 2010 MAA documents illustrate several fundamental issues with the existing Phase I implementation of the Salt and Boron TMDL for the lower SJR (at Vernalis). Reclamation is following the salt load allocation and assimilative capacity equations in the Basin Plan amendment (more fully described in Appendix 1 "Technical TMDL Report" attached to the Dec 2004 Staff Report for the Basin Plan Amendment). In reviewing the MAA documents I have identified some TMDL implementation issues that could be better resolved by RWQCB staff for the MAA and for the future TMDL implementation procedures.

Implementation Report. *I am suggesting that the salt load calculations proposed in the Technical TMDL Report be revised and described in a new document (TMDL Implementation Report) to clarify the basic approach and calculations for the future TMML implementation.* One source of possible confusion in the Technical TMDL Report is the dual description of the "fixed" TMML load allocation based on worst case monthly flows (for each year type) and the "flexible" monthly load allocation that would be based on the actual flows and salinity measured at Vernalis each month. The suggested implementation approach would introduce the fixed load allocation as an example of the salt budget terms, but would emphasize the flexible monthly calculations that would depend on monthly water deliveries and Vernalis flows.

Loads Flows and Concentration. *Loads alone are not useful for management purposes and should always be referenced with the corresponding flow and concentration.* To help clarify these monthly load and allocation descriptions in the implementation report (and the MAA documents), monthly loads should always be shown with the assumed flows and concentrations. Tables should always have these three columns together. Only loads that are associated with high concentrations require management actions.

Limited TMDL Implementation. *When the measured Maze EC is below the Vernalis EC objectives, salt load allocations and assimilative capacity credit calculations are not necessary.* This is another source of confusion in the Technical TMDL Report because it is implied (assumed) that the San Joaquin River at Vernalis is always "under a TMDL" (i.e., EC objectives are exceeded) and that salinity discharges of all types must be regulated or reduced at all times. But there have been very few monthly EC values above the 1995 WQCP Vernalis objectives (i.e., 700 µS/cm from April to August and 1,000 µS/cm from September to March) since these EC objectives were adopted (1995). The data analysis period used in the Technical TMDL report included WY 1986-1998, but most of these years had a constant 500 mg/l (about 775-800 µS/cm) requirement at Vernalis (D-1422, SWRCB 1973).

This confusion could be resolved with a Board implementation policy statement that might state:

"Because the maximum allowable loads of salt (and boron) that will meet the Vernalis objectives are dependent on the actual SJR hydrology, reservoir releases, and Delta exports (DMC deliveries), the Phase I Salt and Boron TMDL (at Vernalis) will be implemented by calculating the actual monthly loads based on measured water flows and salinity (concentrations). Only when the EC at Maze (upstream of the Stanislaus River) is approaching the established Vernalis EC objectives will salt discharge regulatory actions or real-time water management actions be required."

Flow Management. *Flow management opportunities for resolving the Salt and Boron TMDL should be more clearly identified and evaluated as an implementation strategy, even if the Regional Board cannot itself these flow and export changes*. Another source of confusion in the Technical TMDL Report is the statement that because flow management cannot be implemented by the Regional Board, potential flow management actions will not be considered or evaluated in the TMDL. However, New Melones Reservoir releases by USBR are introduced as the major source for assimilative capacity credits that are assumed to offset the DMC salt load imported by Reclamation (which is the major source of salt load to the LSJR). This direct connection between flow management opportunities and TMDL implementation alternatives should be more clearly described in the TMDL Implementation Report. Upstream "restoration" flows, increased tributary flows, DMC recirculation (including new opportunities using the Intertie capacity) and possible separation of the SJR flow and salinity from the DMC exports (i.e., BDCP or Delta Corridors) should be included under flow management implementation options.

Assimilative Capacity Credits. *An alternative calculation of the assimilative capacity credit is suggested that would identify the actual reservoir releases that were made by USBR to meet the Vernalis EC objectives.* Another source of confusion is the calculation of the USBR assimilative capacity credit from New Melones releases. The equation introduced in the Technical TMDL Report (and Basin Plan amendment) that was used in the 2010 MAA documents allows most of the release to count towards the credit, and allows the full assimilative capacity (tons of salt that could be transported while meeting the EC objective) to be credited (i.e., [release flow-base flow] x [EC objective- release EC]). But if the Maze EC is less than the EC objective, this assimilative capacity credit is not actually needed to transport salt out of the basin. While the release (additional assimilative capacity) does reduce the salinity at Vernalis (i.e., dilution), this is not an actual load reduction and should not be treated as equivalent to reducing the excess salt load from the DMC that is delivered to the basin. Only the increased transport of salt from the river (while meeting the EC objective) that was provided by the releases should be credited against the DMC load.

The appropriate assimilative capacity credit should be calculated as the release flow needed to reduce the measured Maze EC to the Vernalis EC objectives. This flow would be providing more of a direct offset to the excess salt load that was leaving the basin, by transporting this salt from the basin while meeting the EC objective. This would usually be a fraction of the actual New Melones releases, but this credit would correspond to the measured salinity reductions observed at Vernalis compared to the EC at Maze. There would be no credits when the EC at Maze is below the Vernalis EC objective (i.e., during high flow periods). The next section provides an example of this approach to estimating the USBR assimilative capacity credits, using the historical monthly flow and EC data for WY 1976-1991.

Calculating New Melones Reservoir Release Dilution Credits

The actual TMDL benefits achieved from Stanislaus flow dilution of SJR salt can be easily demonstrated with the historical flow and EC data from the Maze monitoring station and from the Vernalis monitoring station. The major difference between the Maze and Vernalis stations is the addition of the Stanislaus River flow and the corresponding dilution of the Maze EC. If the Maze EC is higher than the Vernalis EC objective, the Stanislaus flow will provide a TMDL dilution benefit and allow the Vernalis EC objective to be met. If the Maze EC is below the Vernalis EC objective, there is no dilution required to meet the EC objective and no TMDL load credit should be given to USBR. A reduced Vernalis EC is perhaps a benefit of some kind, but this normally occurs when there is already a high flow in the river, and additional flow from the Stanislaus is not actually needed.

Figure 1 shows the monthly Maze and Vernalis flows and EC data for WY 1976-1991, which is the standard period of DSM2 simulations often used to describe the range of Delta EC conditions in planning studies (e.g., South Delta Improvements Program and the OCAP BA alternatives). The flow at Vernalis (dark blue line) is always higher than the flow at Maze (light blue line) because the Stanislaus River enters the San Joaquin River between these two stations. The Vernalis EC (red diamonds) is always lower than the EC at Maze (green triangles) because the Stanislaus River EC is about 100 uS/cm and always provides a dilution effect at Vernalis. During 1976 and 1977 there was low SJR flow at Maze (less than 1,000 cfs) and almost no increase at Vernalis. But during the 1988-1991 period when SJR flow at Maze was less than 1,000 cfs, there was (beginning in March) about 250-500 cfs added by New Melones Reservoir releases to dilute the SJR EC to the required EC objective of about 750 uS/cm (500 mg/l TDS required in D-1422). The 1995 WQCP Vernalis EC objectives (purple line) are shown for reference in Figure 1, although this was not the Vernalis EC objective during this 1976-1991 period. During months with higher Maze flows (more than 2,000 cfs), the Maze EC was already less than the Vernalis EC objectives and there was no need for dilution flows to meet the EC objectives.

Figure 2 shows the estimated Stanislaus River dilution flow needed to meet the Vernalis EC objectives for the historical Maze flow (cfs) and Maze EC (uS/cm) for water years 1976-1991. When the Maze EC is less than the Vernalis EC objective, there is no dilution flow needed. When the Maze EC is higher than the Vernalis EC objective, the necessary dilution flow is calculated as:

Needed Stanislaus Flow (cfs) = Maze Flow x (Maze EC – EC Objective) / (EC objective – Stanislaus EC)

The Stanislaus EC was assumed to be 100 uS/cm. More dilution flow is needed when the Maze flow is high, but only when the Maze EC is higher than the EC objective. The calculated dilution flow (purple line) was often 500-1,000 cfs in the low flow months when the EC objective is 700 uS/cm. The historical Stanislaus River flows (green line) were generally higher than the required dilutions flows. During wet years (when New Melones Reservoir is filled), the Stanislaus river flows were often higher than necessary for salt dilution. The assimilative capacity credit should be calculated only for the dilution flow required to meet the Vernalis EC objectives:

Assimilative Capacity Credit (tons) = Stanislaus Flow (cfs) x (EC objective – Stanislaus EC) x conversion

To determine how much of the DMC load that this dilution credit may offset, the DMC load is calculated in the MAA and the TMDL Report based on the deliveries to areas that are assumed to drain back to the lower SJR. The excess DMC salt load (above the baseline SJR salt load that would have been applied for irrigation of this same area) is calculated from the DMC flow and EC:

DMC Excess Load (tons) = DMC Delivery Flow (cfs) x (DMC EC – baseline EC) x conversion

The baseline EC is assumed to be about 75 uS/cm and the DMC EC values range from 400 to 600 uS/cm. Because the difference between the Vernalis EC objective and the Stanislaus EC is usually greater than the difference between the DMC EC and the baseline EC, the Stanislaus releases will usually offset about twice as much DMC delivery flow. Nevertheless, there is much more DMC delivery flows than Stanislaus releases (needed for salt TMDL dilution), so Reclamation cannot offset much of the excess DMC salt load with this assimilative capacity credit, if properly calculated.

Figure 3 shows the calculated monthly Vernalis salt load (tons) and the corresponding Stanislaus release credit (tons) for the historical flow and salinity measured at Maze for 1976-1991. The monthly Vernalis salt loads were about 50,000 to 100,000 tons during the summer irrigation season in most years. The monthly salt loads were less than 50,000 tons in 1977 and in 1990 and 1991 because of low deliveries and low seepage sources. The calculated assimilative capacity credits were about 20,000 to 30,000 tons in months when calculated Stanislaus TMDL releases were 500 to 1,000 cfs. These Stanislaus TMDL assimilative capacity credits are a great benefit for implementing the TMDL to match the existing salt loads in the San Joaquin River with sufficient flows to meet the Vernalis EC objectives. But calculating an assimilative capacity credit for every month of releases from New Melones Reservoir is not appropriate.

Figure 4 shows the historical Vernalis flow, EC and calculated salt load for WY 1976-1991. This figure illustrates the difficulty of TMDL management without always identifying the source of the loads. Only high concentrations of salt (or other contaminants) cause an impact to beneficial uses. Loads that may be high because of high flows do not need to be managed or regulated. This figure also summarizes the important role of flow management for reducing the salinity (or contaminant concentration) to the water quality objectives. Reducing the salt load from other beneficial activities, such as irrigation for agriculture or wastewater from urban areas, will not likely prove successful. When the SJR salinity is relatively high, the most practical management action will likely be flow management.

Figure 4 illustrates the TMDL implementation options and the purpose of the MAA. The overall goal of the TMDL is to meet the Vernalis EC objectives. The purpose of the monthly accounting of individual flows and salt loads that contribute to the Vernalis salt load is to identify excess slat loads that can be reduced or shifted in time. However, it is difficult to accurately account for the many sources of salt within the lower SJR basin. This is the motivation for the SJR WARMF watershed model that is being used to guide the CV-SALTS program. The MAA represents Reclamation’s share of the flow and salt accounting within the lower SJR. A TMDL implementation report should be prepared by RWQCB staff to clarify these accounting and management issues for Reclamation and all stakeholders.

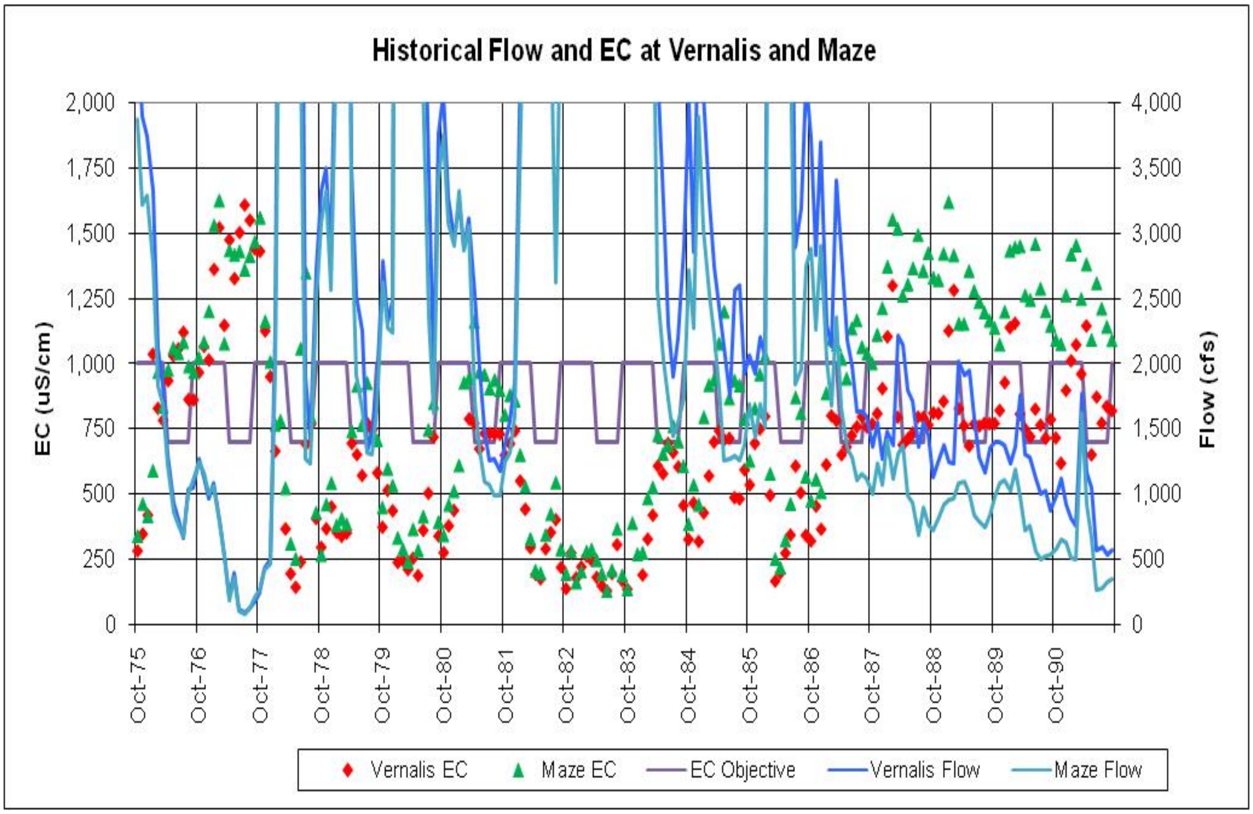

Figure 1. Monthly Historical Flow (cfs) and EC (µS/cm) at Maze and at Vernalis for 1976-1991.

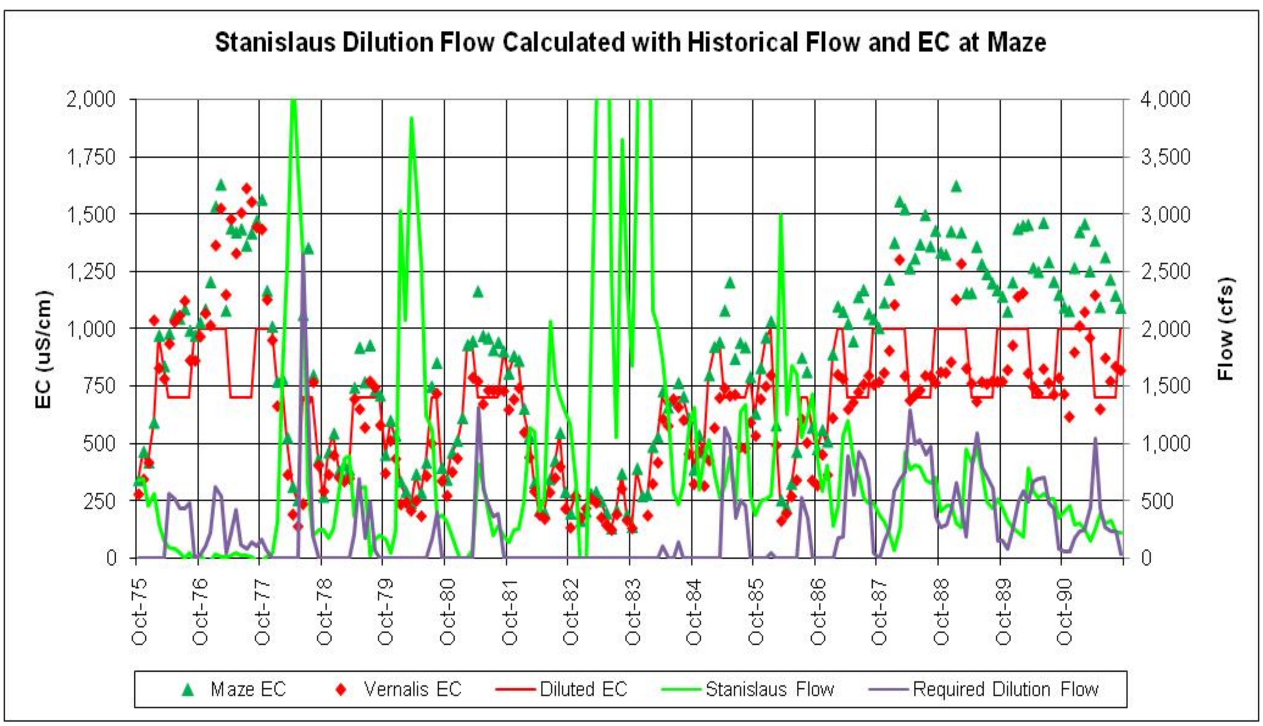

Figure 2. Estimated Stanislaus River Flow needed to meet Vernalis EC objectives for 1976-1991.

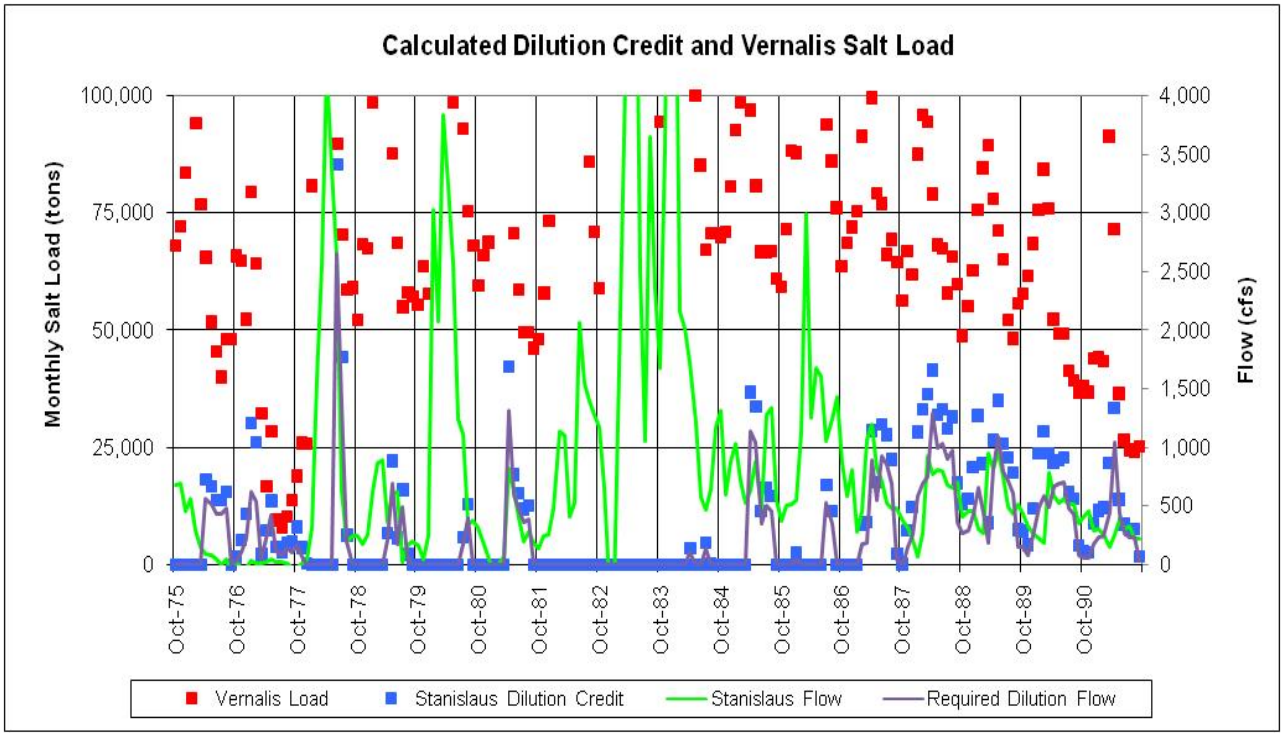

Figure 3. Calculated Assimilative Capacity TMDL Credit (tons) for Stanislaus Releases Required to meet the Vernalis EC Objectives.

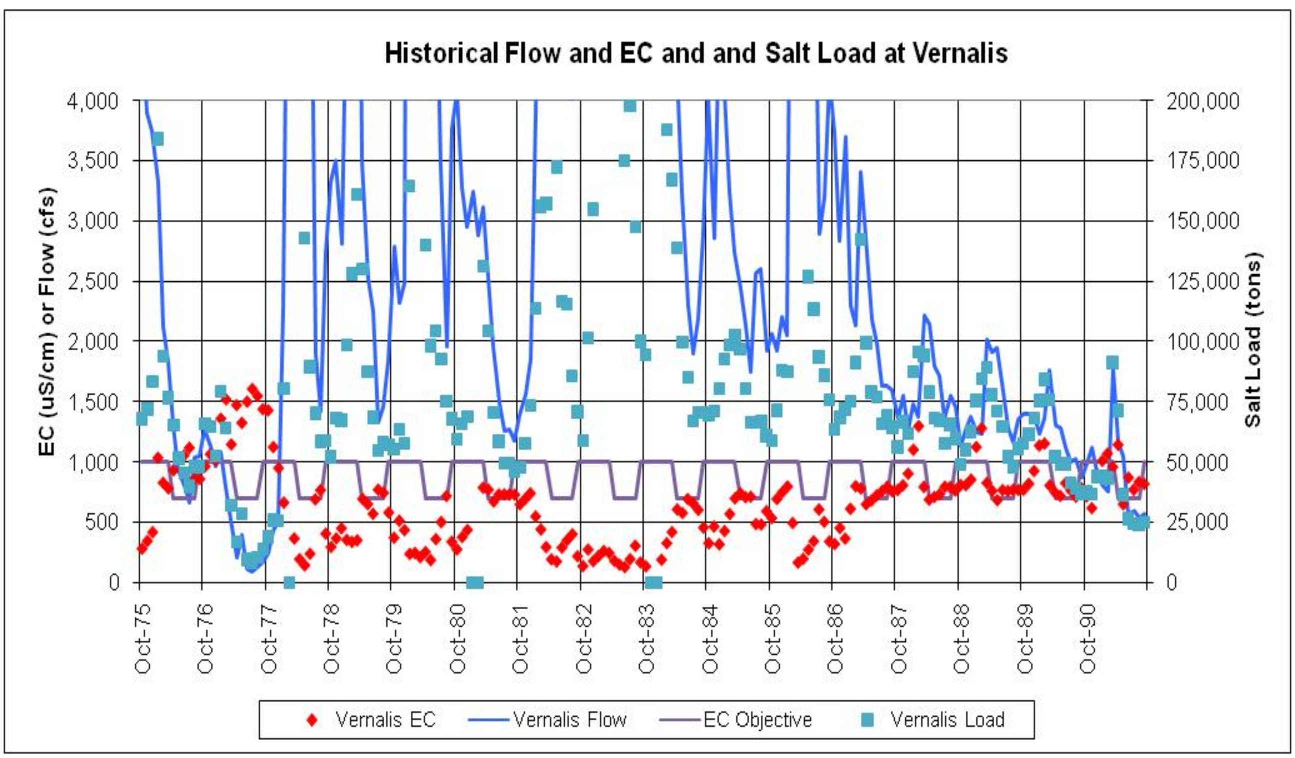

Figure 4. Historical Flow (cfs) and EC (uS/cm) and Calculated Salt Load (tons) at Vernalis for 1976-1991.