SJR DWSC DO WQO Violations and DWSC Flow during the Summer 2005

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DO WQO Violations in SJR DWSC

In August 2005 I reported (Lee, 2005) that during June 2005 the flow of the San Joaquin River (SJR) Deep Water Ship Channel (DWSC) was at least 2,100 cfs and, as expected based on previous studies, there were no DO water quality objective (WQO) violations in the SJR at the DWR RRI DWSC monitoring station. I recently obtained from the USGS (Cathy Ruhl) the July and August 2005 SJR DWSC flows. During those two months the flows in the DWSC were typically over 1,200 cfs. However, there were several periods of time during which the SJR DWSC flow was in the range of 800 to 1,000 cfs. Examination of the DWR RRI DO monitoring station data shows that those periods were associated with the presence of DO in concentrations less than the WQO of 5 mg/L. The lowest DO was about 4 mg/L. These results demonstrate that SJR DWSC flows of less than about 1,200 cfs can lead to DO WQO violations in the DWSC during the summer.

The SJR DWSC RRI DO concentration measurements made thus far during September 2005 show extensive DO WQO violations. Since the first of September DO concentrations have been above 7 mg/L every afternoon; at times values were as high as 9 mg/L. However, in the early morning the DO has been below the WQO of 6 mg/L, with some values as low as about 4 mg/L. This situation points to the need to change the DO WQO to 5 mg/L, and to determine WQO violations by using the daily average WQO, instead of the current method of using the lowest value during the day. As I have discussed (Lee and Jones-Lee, 2005), this approach will be protective of aquatic life in the DWSC and will fully support Chinook salmon migration to their homestream waters.

DWR D-1641 Cruise Data

During August 2005 DWR made several monitoring cruises of the SJR DWSC in support of State Water Resources Control Board Water Rights Decision D-1641. As in the past, when SJR flows exceed about 1,000 cfs, the DWR RRI monitoring station does not record the minimum DO found in the DWSC. During mid- and late August, the DWR cruises found that the minimum DOs were located near Turner Cut. Further, as Lee and Jones-Lee (2003, 2004) have reported, the DWR D-1641-measured surface DO values between the Port of Stockton and Turner Cut do not represent the minimum DO values that occur during the day since those measurements were made during late-morning to mid-day.

The DWR D-1641 cruises continued to show that at many sampling stations, the DO concentration near the bottom was a few tenths of a mg/L lower than the near-surface value. Again, using an average DO over the water column would be a more appropriate approach to determining WQO violations in the DWSC.

SJR Vernalis Flows

Examination of the USGS SJR Vernalis flows during the summer of 2005 shows that the flows were always at least 2,000 cfs. During late August the SJR Vernalis flow was at or just above 2,000 cfs. Earlier in the summer it had been somewhat higher. Thus, during late summer, about half of the SJR flow at Vernalis was diverted into the South Delta at the Head of Old River, where it was used for South Delta agriculture and exported at the Tracy and Banks pumps. If at least 400 cfs of the SJR Vernalis water that was sucked into the South Delta had been allowed to pass through the SJR DWSC before being export by the state and federal export projects, it is likely that there would have been few and possibly no DWSC DO WQO violations during the summer of 2005. Allowing such additional SJR Vernalis water to pass through the DWSC during that time would eliminate DWSC DO WQO violations while apparently allowing sufficient SJR Vernalis water to pass into the South Delta to maintain water levels needed for irrigated agriculture.

Sources of Oxygen Demand

There are two primary sources of oxygen demand for the DWSC: city of Stockton domestic wastewater ammonia, and algae that develop upstream of the SJR Vernalis. As we discussed in the Synthesis Report (Lee and Jones-Lee, 2003), at times associated with low SJR DWSC flow and elevated ammonia concentrations in the effluent, the wastewater ammonia can represent up to about 90% of the total oxygen-demand load to the DSWC. However, when the SJR DWSC flows are elevated and there are low ammonia concentrations in the wastewater effluent, the city's ammonia represents less than about 20% of the oxygen-demand load for the DWSC. The remainder of the oxygen-demand load is algae derived from the SJR watershed. During June 2005, the city of Stockton's effluent ammonia concentrations averaged 6.5 mg/L. While the July and August wastewater ammonia data are not yet available, based on the trend of decreasing concentrations that was established during the spring and early summer 2005 and previous years' data, the city's ammonia is not likely to be a major source of oxygen demand for the DWSC during July and August 2005.

Overall

Overall, the summer 2005 data on DO and SJR DWSC flows show that SJR DWSC flows on the order of 900 to 1,000 cfs lead to DO WQO violations in the DWSC, especially near Turner Cut. It appears that when the city of Stockton maintains an average monthly effluent ammonia concentration of 2 mg/L or less, in accord with its current NPDES permit, SJR flows in excess of about 1,000 cfs will be needed to eliminate DO WQO violations during the summer.

References

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