Appendix I

PREDICTED WATER QUALITY IN THE SOUTHERN IMPOUNDMENTS

Michael Anderson
UCR

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I conducted a couple of quick water quality simulations for the –240’ and –245’ southern impoundments with the BATHTUB model (Walker, 1996). I used the data presented in the Table in the Pacific Institute’s proposal for the volumes and areas for the impoundments created by placing of dikes at –245’ to Bombay Beach and –240’, along with mean nutrient concentrations presented in Setmire *et al.* (2001) (Table 1). Total annual flow was assumed at 1 maf, consistent with Weghorst (2001).

Table 1. Flow and influent water quality to southern impoundment.

Source	Flow (maf)	TP (mg/L)	SRP (mg/L)	TN (mg/L)	IN (mg/L)
Alamo R.	0.554	0.719	0.408	9.20	7.68
New R.	0.488	1.110	0.697	8.20	7.27

An annual evaporation rate was put at 1.5 m/yr and rainfall was assumed to be about 0.15 m/yr. The BATHTUB model uses a series of empirical sub-models to predict the annual nutrient budgets and productivity levels in the water body; there is some latitude here in terms of which model is used. For the following calculations, the 2^{nd}-order, available N and P sedimentation models were used, while the P-N-light-T model for chlorophyll was used.

Results for the two proposed impoundment scenarios (without treatment wetlands) are shown in Table 2.

Table 2. BATHTUB-predicted mean annual water quality in the two proposed impoundment configurations (without wetlands pretreatment).

Property	Units	South –245’ (no wetlands)	South –240’ (no wetlands)
TP	mg/L	0.292	0.430
TN	mg/L	4.030	5.836
Chl a	μg/L	74.8	92.8
Secchi Depth	m	0.4	0.4
Retention Time	yrs	0.192	0.047
% P Retained	-	81.1	70.2
% N Retained	-	67.7	49.7

As one can see, very high total P, total N and chlorophyll levels are expected for both impoundment scenarios. For comparison, the TP and TN concentrations in the Salton Sea average approximately 0.07 and 4.0 mg/L (Holdren, 1999).The larger, deeper impoundment formed by placing the dike on the –245’ contour (mean depth 2.1 m) had better water quality than the shallower –240’ impoundment (mean depth of 1.36 m), even though this impoundment had a much shorter hydraulic residence time (0.192 vs. 0.047 yrs, respectively). P removal within both impoundments is predicted to be quite effective, with 81.1% of the influent P removed in the –245’ impoundment and 70.2% in the –240’ impoundment (Table 2).

Similar calculations could be performed for the above impoundments with wetlands at the front end with some specific assumptions about the extent of nutrient removal within the wetlands. Although I did not do the simulations, with P removal rates around 10% in the wetlands as discussed, it seems that water quality will not be substantively improved. An additional use of model would be to solve the inverse problem, that is, estimate what level of nutrient removal within the New and Alamo Rivers (e.g., via alum addition, wetlands, etc.) is required to achieve an “acceptable” water quality condition in the impoundment(s). Anyway, while a more careful analysis is probably warranted, these preliminary calculations suggest water quality consistent with our expectations of hypereutrophic conditions in these shallow, highly nutrient-loaded systems