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Santa Ana Regional Water Quality Control Board
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VIA EMAIL: wcross@waterboards.ca.gov

Dear Ms Cross:

This letter includes my review comments on the Technical Basis of Proposed Basin Plan Amendment for Organochlorine Compounds TMDLs for San Diego Creek and Newport Bay. My expertise includes contaminant partitioning, hydrologic transport processes, sediment dynamics in stream and estuarine systems, source identification from sediment records, and simple fate and transport modeling. My background has relevance to the following categories in Attachment 2: Proposed San Diego Creek/Newport Bay Organochlorine Compounds TMDLs, Scientific Issues:

2. Numeric target derivation
3. Source identification
4. Linkage analysis/loading capability
6. Margin of safety/seasonal variation and critical conditions
7. Implementation and monitoring

Arriving at Total Maximum Daily Loads within evolving watersheds is a complex task that requires considerable judgment and integration across a wide range of scientific disciplines. What is immediately apparent for this proposed action is that the environmental regulatory framework adopted in the United States over the last 40 years is having an effect. California and the United States have recognized that DDT, PCBs, Chlorodane, and Toxaphene were environmentally persistent and toxic to the environment. Their removal from production and use has resulted in declining concentrations in biota, but the time required for improvements are unfortunately measured in tens of years. Given the presence of these compounds and mixtures in the San Diego Creek/Newport Bay watershed at levels anticipated to cause impairment, watershed planning is needed to guide further improvements.

The basin plan amendment wisely recognizes the critical importance of sediments in the partitioning of these organochlorine compounds and in determining the fate of these compounds within the watershed. The very high hydrophobicity of these compounds as quantified by the

octanol water partition coefficient, K_{ow}, predicts that the concentrations dissolved in water will be very small and difficult to measure. Models are therefore needed to address partitioning and bioavailability. Given the importance of compound sorption to sediments, sediment control in the uplands portion of the watershed is needed to minimize sediment erosion and deposition in sensitive downstream habitats. There are also concerns with the release of the sediments through erosion during extreme hydrologic events and eventual deposition within the creek channels, Newport Bay, and perhaps in the coastal waters. I will separate my review into two categories of Critical Concerns followed by Additional Concerns.

Critical Concerns

1. On page 37, the Plan Amendment states that because of the large number of assumptions required to apply Equilibrium Partitioning, a different approach was followed to arrive at numeric targets. Concepts of equilibrium partitioning appear throughout the Plan Amendments with some unanticipated consequences. It thus appears odd to say that equilibrium partition has not been applied.
2. On page 45, Table 4-1 utilizes equilibrium partitioning to relate organochlorine partition coefficients to octanol water partition coefficients. First, in footnote (a) the relationship has an error and should probably be written as $LogK_{oc} = 0.00028 + 0.983 LogK_{ow}$ and the contribution of the term 0.00028 is minimal and could be dropped. The ratio of Bioconcentration Factor to the octanol water partition coefficient, BCF/K_{ow}, should be a measure of the lipid fraction in the organism assuming equilibrium partitioning. In calculating that ratio for the organochlorine compounds in Table 4.1, the values range from 0.018 for Chlordane to 0.16 for Toxaphene which suggests data from difference sources and for different organisms are being combined (footnote (k)). For consistency, the same reference organism should be used. The bioconcentration factor from Table 4-1 is critical in the subsequent analysis.
3. The model for calculating existing loads appears in equation (5) on page 62. This model appears simple but has within it many assumptions that might be in conflict. A measured tissue concentration (TC) divided by a literature value of the bioconcentration factor is an estimate of the equilibrium organochlorine concentration dissolved in water. The total suspended concentration is then obtained by dividing by the fraction that is dissolved and this comes from an equilibrium sorption model appearing in equations (9) and (10). Hydrologic variability is then incorporated by picking three different flow tiers and summing up the contributions, although the summation sign is missing from equation (5). As is demonstrated in Figures 2-6 through 2-8, there are substantial differences in tissue concentrations in winter and summer, suggesting either fish migration or rapid exchange of these organochlorine compounds between these organisms and the environment. It is my understanding that compounds with octanol water partition coefficients in the range of these organochlorine compounds are not readily purged from organisms over the seasonal time scale. This appears to be a case where an equilibrium partitioning model is being adopted continuously over the seasons when the system is not at equilibrium. Bioconcentration factors appear in Table 4-1 and are used in Table 4-7 for this estimate of loading, but those numbers were variable due to different organisms. This is inconsistent with the intent of arriving at an annual loading. The model needs greater development, justification and description.
4. The sediment transport modeling greatly benefited from earlier work that utilized the 22

years of US Geological Survey records available on the San Diego Creek. While it is computationally convenient to utilize three flow tiers (low, medium and high) and pick the mean values for those flows, there is no documentation that this analysis preserves sediment loading. Since sediment transport via equation (11) is nearly proportional to flow rate squared, extremely high flow events completely dominate in terms of sediment contribution. Since the actual data are available, how does this three tier model compare to the annual sediment loss calculated from measure daily data?

5. Sediment and organochlorine loading to Newport Bay is dependent upon an accurate representation of organochlorine concentrations on sediments (C_s) and the sediment loading (D_s) as is used in equation (12). The organochlorine concentrations are taken from Bay et al. (2004) according to the Amended Plan, but there is no indication of how many measurements were utilized to arrive at this value. Given the variability of sediment concentration with flow rate and the variability of organochlorine concentration with sediment levels (Figure 5-3), there must be considerable uncertainty in this estimate of existing load. The sediment loading on an annual basis is estimated in Table 4-8, but there may be a discrepancy with the July 1998 US Army Corps of Engineers Feasibility Report. Table 4-8 reports an annual sediment deposition of 31474.17 m^3/y for Unit I Basin but in the 1998 USACE report the computed sediment load for the 22 years of record was 354,000 cubic yards for the same Unit I Basin, and this becomes an average annual loading of 12,000 m^3, which is considerably different from the value found in Table 4-8.
6. On page 65 of the Amended Plan there is the statement that the average annual sediment load was over 100,000 tons per year and the allowable sediment load for Newport Bay is 62,500 tons. There is no discussion of the uncertainty in either of these numbers and they are each likely to be large. The margin of safety of 10% adopted for TMDLs by the USEPA appears to be low. This TMDL process should reflect the uncertainty in the models and resulting estimates should have some range of values specified to clarify the uncertainty.
7. Hydrologic variability is recognized on page 79, but Figures 7-1 through 7-3 are not reflected in the TMDL analysis. Given the high variability in flow, the high variability in sediment loading, the high variability in organochlorine loading, and the seasonal variability in fish tissue concentrations, the overall analysis does not recognize this or carry along an uncertainty in the estimates. Significant data uncertainties are mentioned on page 81, and there are many ongoing projects that will assist in some of these efforts as summarized in Section 8.2 (page 82), but the level of detail in the summary is not sufficient to indicate if the details of hydrologic variability will be fully represented.
8. As the watershed transitions from range land to agriculture to a mix of commercial, residential and open space, there will be a corresponding change in water quality impacts on the environment. While organochlorine compounds are no longer used or released to the environment, there are many other products available to consumers and landscape professionals that are applied intentionally or non-intentionally on the land surface in commercial and residential areas that may be impacting receiving waters. It would be helpful if the monitoring programs put in place for implementing this Plan Amendment included some anticipatory monitoring. For example I would expect that sediment loads temporarily increase during the transition to commercial and residential land use, and decline following the establishment of more mature vegetated surfaces. Additional loading from crankcase oil, pesticides, fertilizers, animal wastes, and trash might be anticipated and perhaps prevented through a more holistic look at water quality non-

degradation rather than waiting for contaminants to emerge with observable environmental impacts.

Additional Concerns:

1. The Amended Plan could be improved if there was more attention to including only significant digits in numerical values. For example in item #5 above, it was reported that sediment load was 31474.17 m^3/y when it would have been just as accurate to write 32,000 m^3/yr.
2. On page 51, there is concern expressed that groundwater might be a significant pathway for organochlorine transport based on a January 2006 monitoring report. It is highly unlikely that groundwater will be a significant transport pathway for highly hydrophobic organochlorine compounds, and Table 4.4 indicates there were no organochlorine compound detections. In an era of limited financial resources, it is important to devote those resources to important issues and not get side-tracked with other matters of lesser importance.

Arriving at appropriate TMDLs for complex watersheds is a challenge that can be met through exhaustive data analysis, modeling, and measurements as has been undertaken for the San Diego Creek/Newport Bay. The Amended Plan has made a good start at developing the necessary modeling approaches and data analysis for predicting future conditions and anticipating actions required to meet water quality objects. The appropriate combination of modeling, monitoring, and analysis is a logical means of protecting the water quality for the future. I hope these comments have been helpful in refining that plan.

Sincerely,

James R. Hunt
Lawrence E. Peirano Professor of Environmental Engineering