Sept. 12, 2019 *transmitted via e-mail*

TO: Mark Norton, SAWPA & Johnson Yeh, Geosciences

CC: Lauren Wicks, Geosciences & Tess Dunham, Somach, Simmons & Dunn

FROM: Tim Moore, Risk Sciences

RE: Comments on Draft Waste Load Allocation Report dated July 19, 2019

These comments are focused on Chapter 5, 6 & 9 of Geosciences' draft Final Report as comments were previously submitted on earlier draft of Chapters 1-4 and Chapters 7-8. However, before offering any comments and suggestions I would like to commend Geosciences for the extraordinary effort they obviously devoted to producing this excellent document. Nothing in the following review is intended to suggest otherwise.

1) Pg. 72, Section 5.1, last paragraph; the report states that: "…the 67-year period used for the model simulation is not representative of conditions 67 years into the future." This wording may cause some to conclude that the WLAM is seriously flawed because it is not "representative." I recommend re-wording this to say: "When running the simulation model, it is assumed that the range of meteorological conditions expected to occur should fall within the same range of conditions that have been observed over the previous six decades. This is not meant to imply that the actual pattern of rainfall over the next 67 years will look exactly like the last 67 years."

2) Would it be possible to prepare some sort of Cumulative Frequency Distribution graph, using daily flows at Prado Dam, to illustrate the very wide range of conditions evaluated by the simulation model?

3) Pg. 73, Section 5.3.1.1: Need to make clear that the USACE discharge occurred in Reach 2 of the SAR (below Prado Dam). On page 74, the text states that this discharge was temporary. Please identify the start and end dates for that project. The draft report acknowledges that USACE's dewatering discharge was assumed to occur for the entire duration of Scenario A, but it should also state that it was not included in any of the other Scenarios (B thru F).

4) Pg. 76, Section 5.3.1.2.3: Text states that Corona WWTP #3 is due to be decommissioned in 2020. So, while it was included in the calibration (because it was operating in that period) it was not included in any of the Scenarios, right?

5) Pg. 76, Section 5.3.1.2.4: delete the word "contractually" from the second sentence.

6) Pg. 76, Section 5.3.1.2.4: add the word "only" after "0.5 MGD" and before "during extreme wet weather."

7) Pg. 77, Section 5.3.1.3: First paragraph states that OC-59 water transfers were not included in any of the Predictive Scenario runs. However, I think they were included in the Retrospective run discussed in Section 8, right?

8) Pg. 77, Section 5.3.1.3: Second paragraph indicates that a diversion capacity of 500 cfs was assumed for the various scenario runs. Is this appropriate for the 2020 condition? The current capacity is only about 200 cfs. When will the increased diversion capacity actually become available?

9) Pg. 78, Section 5.3.2: I do not understand the text that explains how the diversion capacity was increased from 200 cfs to 500 cfs starting in January of 2002. Why wouldn't we just use 200 cfs for all the 2020 scenarios and 500 cfs for all the 2040 scenarios? This discussion appears to be more related to the issue of calibration than to results from the predictive scenario runs.

10) Pg. 79, Section 5.3.5: Text states that the volume of rising water at Riverside Narrows and in the vicinity of Prado Dam were assumed to be the same as the average monthly rising water from the calibration period. Please provide the numeric value that was used based on that assumption.

11) Pg. 79, Section 5.4.1.1: What numeric TIN & TDS values were used to represent the USACE dewatering discharge in Scenario A?

12) Pg. 80, Section 5.4.1.2.2: Since there is no existing permit and no historical record to characterize SNRC's dischargers, what numeric TIN &TDS values were used in the predictive simulations? I know this information is presented in a table much later in the document but, in some of the atypical cases (like USACE & SNRC) it is a good idea to repeat the information in the narrative text.

13) Pg. 81, Section 5.4.1.2.5: Last sentence of first paragraph states that the BPA is expected by the end of FY2018 or early 2019. Since we are now at the end of 2019, I think this should be revised to say "sometime in 2020."

14) Pg. 82, Section 5.4.3: text states that the City of Riverside has presented data to support a higher N-loss coefficient. It is more accurate to state that: "The Regional Board has approved a higher nitrogen loss coefficient for the lower portion of Reach 3 overlying the Chino South GMZ based on site-specific scientific studies prepared and submitted by the City of Riverside."

15) Pg. 83, Section 6.0: The rolling 10-year average is intended to identify periods of prolonged drought and to provide a surrogate indication of what might be expected to occur in response to projected climate change in the region.

16) Pg. 83, Section 6.0, second paragraph: change "…. and designate a use of assimilative capacity" to "…and identify conditions where a potential use of assimilative capacity may occur."

17) Pg. 83, Section 6.1: text states that streambed recharge in Reach 4 of San Timoteo Creek was only evaluated for the segment of the stream below the City of Beaumont's outfall. There is no technical justification for this approach and it produces a biased and inaccurate picture of the probable impact on the underlying aquifer. All streambed recharge from Reach 4 of STC to the Beaumont GMZ should be included in the calculation.

18) Pg. 87, Section 6.1.2: Table 6.2 improperly compares the recharge quality to the Original Antidegradation Objectives in the Basin Plan and, as a result, shows all of the TIN values in boldface type. As noted in the text, water quality in the lower reaches of San Timoteo Creek is largely driven by the discharges from YVWD and the City of Beaumont. These discharges must comply with effluent limits designed to meet the Maximum Benefit objectives approved by the Regional Board. Therefore, the text should indicate that the increased TIN concentration in the recharge is an "authorized degradation" provided that it continues to comply with the 5.0 mg/L objective in the Basin Plan.

19) Pg. 88, Section 6.1.3: Revise text to say: "Since there are not POTW outfalls ~~discharges~~ in San Timoteo Creek Reach 1…" In addition, there is mention of SNRC forthcoming discharges to City Creek which also overlies the Bunker Hill-B GMZ. Please correct this omission.

20) Pg. 90, Section 6.1.4: Since there are not POTW outfalls anywhere near SAR-Reach 4, it is difficult to understand what is driving the higher TIN concentrations shown in Scenario A. In addition, there is only a 560 acre-foot difference between Scenario A (max discharge) and Scenario B (expected discharge). With so little change in flow, what is causing the disproportionately higher TIN in the streambed recharge? Since effluent from Beaumont & YVWD recharges in STC before the confluence with SAR-Reach 5, I assume what we may be seeing here is the effect of SNRC's proposed discharge, right?

21) Pg. 91, Section 6.1.5: I believe the Task Force previously directed Geosciences to prepare separate analyses for SAR-Reach 3 and SAR-Reach 4 where they overlie the Riverside-A GMZ. Nearly all of the recharge shown in Table 6-5 occurs in Reach 4 above the influence of rising groundwater (with higher TDS) that occurs in Reach 3.

22) Pg. 93, Section 6.1.6: While it is true that streambed recharge complies with both the water quality objectives, and poses no risk of degradation, it is important to note somewhere in the text that this recharge is actually significantly improving water quality in the Chino-South GMZ because the average TIN & TDS is so much lower than both the ambient receiving water and the associated basin plan objectives.

24) Pg. 94, Section 6.1.7: the elevated (boldface) TIN values shown for the maximum discharge scenarios (A & D) are most likely being driven by the extremely conservative (high flow) discharge assumptions applied to both EVMWD & EMWD. The conservative nature of these assumptions was called-out earlier but should be repeated here. It may be appropriate to ask these two agencies to pull together some real-world historical data that more accurately describes their actual discharges to Temescal Creek over the last 15-20 years so that we can put the worst-case assumption of Scenario A in proper perspective.

25) Pg. 95, Section 6.1.8: revise text to say that: "…no significant percolation ~~is thought to~~ occurs in …" If this is true, then why does Table 6-8 show there is more than 14,600 acre-feet of recharge occurring in the PBMZ for all six scenarios?

26) Pg. 97, Table 6-8: shows water quality objective at Prado as TIN. Footnote in Basin Plan states that compliance with this objective is evaluated using Total Nitrogen measured in a filtered sample. Add footnote to table describing the objective more accurately.

27) Pg. 98, Section 6.1.9: need to be very clear that the USACE dewatering discharge occurs in Reach 2 below Prado Dam. This is one of several reasons why the results in Table 6-8, 6-9 and 6-10 appear so inconsistent with one another. See discussion below.

28) Pg. 99, Table 6-9: While the TDS values in this table are generally within 10% of those shown in Table 6-8, the TIN values are nowhere close to one another. The TIN values in Table 6-8 are nearly double those shown in Table 6-9. What accounts for the huge difference? Additional stormwater flowing in to Reach 2? The additional 25% N-loss that occurs as water percolates from Reach 2 to the OC-GMZ? Nitrogen removed by OC's Prado wetlands? The text must acknowledge and explain the discrepancy before we can have confidence in and rely on the WLAM results.

29) Pg. 101, Table 6-10: The five-year running averages for TDS in this table are 100-200 mg/L lower than the values shown on the 5-year line of both Table 6-8 and Table 6-9. Table 6-10 seems to indicate that the highest 5-year average in Reach 2(below Prado) easily complies with both the surface water objective (650 mg/L) and the TDS objective for the underlying OC-GMZ (580 mg/L), but Table 6-9 shows the highest 5-year average for TDS exceeds both these values in all but Scenario D. In addition, Table 6-10 shows Scenario A & D have higher TDS than the other four scenarios but Table 6-9 reports the opposite is true. These discrepancies must be resolved before we can rely on the WLAM.

30) Pg. 118, Section 9.0, first bullet: the text seems to imply that most of the difference observed between model predictions and stream gage values occurs at the lower end of the flow range ("near the limit of detection"). If so, then the text should note that errors at this end of the range are almost irrelevant because they have so little real-world effect on the actual recharges that occur.

31) Pg. 118, Section 9.0, second bullet: the sweeping claim made in the last sentence is extremely unsettling. More explanation and more detail are needed. Which gages, which years, which flows (high or low) are not within 15% of the true value? Is there a systematic bias to the low or high side? What effect does this have on the WLAM predictive analysis? At a minimum, it may be necessary to show how accurate or inaccurate the flow data is at the two most critical gages used in the WLAM: MWD crossing and Prado Dam.

32) Pg. 118, Section 9.0, third bullet: the text states that "…these deviations are not accounted for in the modeling…" It is more accurate to say that there is no way for the model to account for such deviations because they represent departures for the Standard Operating Procedures and, by definition, follow no predictable rule-based procedure.

33) Page 118, Section 9.0, fourth bullet: If the WLAM is unable to predict when the sand dike will be washed out or when it will be rebuilt, the text should indicate that the WLAM assumes this diversion structure remains in-place throughout all simulation conditions. This assumption does not alter the amount of flow estimated to flow through Prado Dam. And, it has only a slight effect on water quality. TDS will be overestimated because, without the dike, there is less evaporative loss in the Prado wetlands. TIN will be underestimated because, without the dike diverting flows, the N-loss that normally occurs in those wetlands will not happen. Neither is a big deal because the washouts happen in the winter and the dike is repaired long before we get to the August-September baseflow monitoring period that poses the biggest challenge for regulatory compliance.

34) Page 119, Section 9.0, fourth bullet: I believe Geosciences had daily discharge data for the POTWs, but I don't think we had daily measurements for TIN & TDS for each of these wastewaters. I assume we just used the monthly average, as reported on the DMRs, to represent each day in that month. If so, this is also a source of potential error that should be discussed in this paragraph.

35) Pg. 120, Section 9.0, last bullet: the 25% nitrogen loss assumption is used as a default value throughout the entire watershed (with limited exceptions in lower Reach 3 of the SAR and near some of EMWD's recharge basins). It was deliberately designed to be conservative and is not intended to be an accurate estimate of the site-specific nitrogen losses that actually occur in the various streambeds. Consequently, using this conservative assumption also creates something of a safety factor for the estimated TIN concentrations associated with streambed recharge.

36) Tables 6-1 thru 6-10: the long-term (67-year) average should be shown on these tables. In addition, a footnote should be added to each table directing the reader to where the related data and graphs can be found in the appendices.

37) All of Section 6: somewhere early on the document needs to state that every reference to "current" groundwater quality is based on the volume-weighted average of well samples collected in the 20-year period between 1996 and 2015. D.B. Stephens' final report should be cited and added to the Reference Section (it is presently missing). The Regional Board resolution which accepted these estimates (R8-2018-0027; March 23, 2018) should also be added to the Reference Section. Finally, it should be noted that these estimates are revised triennially and the next update will be published in early 2020.

38) All graphs in Appendix G: it would help to adjust the left Y-axis to allow the graphics to spread out more and make it easier to discern the changes in the lines representing different averaging periods. This probably creates an issue with where to put the legend. So, at a minimum, the change suggested above is most critical for the CDF graphs. It would also help to add vertical grid lines to the CDF graphs.

39) Appendix G: As noted earlier, the Task Force previously requested separate analyses for Reach 3 and Reach 4 of the Santa Ana River where these segments overlie the Riverside-A GMZ. Please prepare separate tables and graphs, splitting Reach 3 from Reach 4, to replace the unified tables and graphs presently shown in Appendix G for the Riverside-A GMZ.

40) At present, the appendices are organized by Scenario. I found this rather unwieldy as I flipped from the discussion in Section 6 to the supporting tables and graphs in the appendices. It may be helpful to reorganize them so that the six scenarios for each GMZ are grouped together; this would match the way the tables and discussion are presented in Section 6 and would make the cross-referencing easier to manage. Alternatively, perhaps Geosciences can leave the appendices just as they are but add hyperlinks to the PDF file so that the reader merely had to click the link to see the related temporal and CDF graphs for each scenario in each GMZ.

41) Tables 6-1 thru 6-10: the column entitled "Compliance Period" should be relabeled as: "Averaging Period." Otherwise some may mistakenly conclude that bold or red fonts imply an actual violation occurred based on some sort of non-compliance.

42) All tables and graphs in Appendix G: there is no 5-year average calculated for the first 4 years in the 67-year simulation period, no 10-year average calculated for the first 9 years in the 67-year simulation period, and no 20-year average calculated for the first 19 years in the simulation period. This is not consistent with the Task Force's past practice (see excerpt below from WEI's 2015 Final Report for Scenario 8). In previous WLAM projects, individual annual values from the end of the 67-year monitoring period were "rolled-over" to allow long-term averages to be computed for all 67-years. It is not important that the hydrology which occurred in the latter years does not accurately represent that which occurred in the years prior to 1949 because the goal here is to characterize a range of possible meteorological conditions not to forecast the specific sequence that may occur. It is important that all 67-years receive equal weight when calculating the long-term averages. By not calculating long-term averages for some years in the tables, the cumulative distribution function graphs that follow no longer provide accurate estimates of the probability of exceedance. This is particularly true for the 20-year average where the CDF graph omits 28% of the potential data-points.

Table 8a-RA
TDS and TIN of Streambed Recharge to the Riverside-A Management Zone
Scenario 8a - Low Discharge for 2015

Water Year	Volume-Weighted Running Average *(mg/L)*					
	TDS			TIN		
	1 Year	10 Year	63 Year	1 Year	10 Year	63 Year
1950	451	434	411	6.09	5.76	5.42
1951	512	434	411	7.00	5.76	5.42
1952	355	450	411	4.65	6.05	5.42
1953	488	452	411	6.63	6.08	5.42
1954	407	440	411	5.40	5.90	5.42
1955	463	440	411	6.26	5.90	5.42
1956	460	437	411	6.26	5.86	5.42
1957	483	445	411	6.56	5.98	5.42
1958	348	438	411	4.43	5.88	5.42
1959	504	437	411	6.90	5.86	5.42
1960	502	441	411	6.84	5.92	5.42
1961	522	442	411	7.18	5.93	5.42
1962	417	451	411	5.57	6.07	5.42
1963	469	449	411	6.36	6.05	5.42
1964	483	457	411	6.57	6.17	5.42
1965	447	456	411	6.00	6.15	5.42
1966	378	446	411	4.92	5.98	5.42
1967	360	432	411	4.67	5.77	5.42
1968	452	445	411	6.10	5.99	5.42
1969	250	403	411	2.75	5.28	5.42
1970	456	400	411	6.16	5.24	5.42
1971	453	396	411	6.10	5.18	5.42
1972	475	400	411	6.44	5.25	5.42
1973	416	396	411	5.50	5.18	5.42
1974	439	393	411	5.91	5.14	5.42
1975	480	395	411	6.51	5.17	5.42
1976	444	401	411	5.97	5.27	5.42
1977	482	413	411	6.55	5.44	5.42
1978	280	389	411	3.27	5.04	5.42
1979	389	417	411	5.06	5.51	5.42
1980	254	384	411	2.82	4.96	5.42
1981	500	386	411	6.82	5.00	5.42
1982	385	379	411	5.08	4.89	5.42
1983	286	364	411	3.38	4.64	5.42
1984	455	365	411	6.12	4.65	5.42
1985	467	364	411	6.32	4.64	5.42
1986	447	364	411	5.99	4.64	5.42
1987	510	365	411	6.97	4.66	5.42
1988	470	387	411	6.36	5.02	5.42
1989	480	394	411	6.52	5.13	5.42
1990	482	433	411	6.56	5.76	5.42
1991	408	424	411	5.43	5.64	5.42
1992	392	425	411	5.18	5.65	5.42
1993	254	410	411	2.80	5.39	5.42
1994	476	411	411	6.44	5.41	5.42
1995	309	393	411	3.74	5.10	5.42
1996	453	393	411	6.08	5.11	5.42
1997	409	387	411	5.39	5.01	5.42
1998	321	373	411	3.94	4.78	5.42
1999	519	375	411	7.11	4.81	5.42
2000	489	375	411	6.65	4.82	5.42
2001	502	381	411	6.85	4.90	5.42
2002	528	389	411	7.28	5.03	5.42
2003	415	423	411	5.54	5.59	5.42
2004	514	425	411	7.04	5.63	5.42
2005	288	420	411	3.40	5.54	5.42
2006	471	421	411	6.33	5.56	5.42
2007	531	431	411	7.32	5.72	5.42
2008	465	451	411	6.25	6.04	5.42
2009	494	450	411	6.75	6.02	5.42
2010	410	442	411	5.41	5.89	5.42
2011	387	431	411	4.99	5.72	5.42
2012	521	430	411	7.16	5.71	5.42
Maximum	**531**	**457**		**7.32**	**6.17**	

R_Alt8a_metrics.xlsx -- Table2
10/20/2014

WEI