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CV DWP Working Group

California Urban Water Agency

455 Capitol Mall, Ste. 705

Sacramento, CA 95814

Subject:

Drinking Water Treatment Evaluation Final Report

WATER

Date:

April 26, 2011

Dear Working Group Members:

Contact:

Zaid K. Chowdhury

Please find attached a copy of the final report for our evaluation of water treatment under future regulatory and water quality conditions. We have incorporated all findings of this project in this report including the information provided to you earlier in the form of a Technical Memorandum. Your comments on the draft report were addressed and incorporated in this final report (please see the attached table for comment resolution descriptions).

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Please let us know if you have any question or comment.

Our ref:

3054008/3054009

Sincerely,

ARCADIS U.S., Inc

Zaid K. Chowdhury, PhD, PE, BCEE

Senior Vice President

Imagine the result

Comments on Drinking Water Treatment Evaluation Draft Project Report

Submitted by CUWA, SRCSD, Larry Walker Associates

 = Comment addressed/resolved in Final Report

 = Comment addressed in Comment Response Table

ID	Topic	Page	Item	Comment	Submitted by	Resolution
1	Executive Summary		General Comment	As much as possible in the executive summary, the document should quantify rather than using adjectives and descriptions.	Lisa Voight, SRCSD	The executive summary was written to summarize the analysis performed as part of the project and to summarize the results. Results were quantified as much as possible.
2	Stakeholders	1-1	Last paragraph	It is not clear if this is supposed to be a complete list of stakeholders or just the stakeholders involved in the initial work plan at the start of the project. If it is the later, a date should be referenced for the work plan so as not to be confused with the work plan we are currently developing. If it is the former the sixth bullet on page 1-2 should be "Sacramento City and County Stormwater Programs" or "Sacramento Stormwater Quality Partnership".	Brian Laurenson, Larry Walker Associates	The list of stakeholders was updated to represent the current group involved based on discussions with Sue McConnell and Elaine Archibald.
3	Stakeholders	1-2		Add California Rice Commission	CUWA	Added. The entire list of stakeholders was updated to represent the current group involved based on discussions with Sue McConnell and Elaine Archibald.
4	Stakeholders	1-1		several stakeholders are missing including members from Agriculture community such as Rice Commission, etc.	Lisa Voight, SRCSD	The list of stakeholders was updated to represent the current group involved based on discussions with Sue McConnell and Elaine Archibald.
5	Future Regulatory Scenarios	9-2	Section 9.3, first bullet	First bullet point. It should be noted that the plausible regulatory assumption of a single sample DBP not to exceed the MCL is the driver behind bromide and TOC controlling future compliance. The workgroup has discussed this point extensively, but it is the primary cost driver identified in this report and should be clearly stated.	Brian Laurenson, Larry Walker Associates	Added text to clarify.
6	Future Regulatory Scenarios	ES-2		A bullet item states "in an effort to reduce the cancer risk to or 5 ug/L (plausible), or lower (outer boundary)." Clarify what lower means. Is this less than 5ug/L or approaching zero?	Lisa Voight, SRCSD	Clarified statement to say lower (1 to 4 µg/L).
7	Future Treatment Upgrades	6-3	Table 6-2	Specify what upgrades are represented in the table itself (i.e., what the UW-1 A upgrade includes, etc.). The upgrade scenario naming was not introduced.	Brian Laurenson, Larry Walker Associates	Added a footnote to the table to direct the reader to the discussion and summary of VWTP upgrades.
8	Future WQ Scenarios	3-6	Top of page	I disagree with the logic that the historic observed and modeled current concentrations should match. In fact I would not be surprised if the use of CALSIM over the modeled period is enough to explain much of the difference. However, since the modeled results (normalized to historic or not) are not even used in this analysis, this is not a major issue. I suggest changing the last two sentences of this paragraph to, "As shown in Table 3-4, model results based on CALSIM were shifted to align with the historical observed values. This assumption is not entirely necessary, except to demonstrate that the source control measures, even in the most aggressive control scenarios, does not result in TOC or bromide water quality improvements large enough to be discernable by the drinking water treatment model (i.e., the changes are smaller than the overall accuracy of the drinking water treatment model)."	Brian Laurenson, Larry Walker Associates	Added text to clarify.
9	Future WQ Scenarios	3-7		The author concludes that slight decreases in TOC concentrations under the most aggressive control strategies are not significant enough to use in the drinking water treatment model. This allows the author to use drinking water treatment model results from the historical case. We do not disagree with this simplification, but suggest adding a sentence stating that "The resulting water quality improvements for even the most aggressive source control approaches does not result in meaningful changes to DBP modeling, and this incremental benefit is not included in the drinking water treatment facility planning and cost estimate analysis that follows."	Brian Laurenson, Larry Walker Associates	Added text to clarify.

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10	Future WQ Scenarios	3-3	Section 3.3	I recommend that the future water quality scenarios be explained in this section so that the reader doesn't wonder how they were developed. We will provide some standard language that has been developed that describes the scenarios.	CUWA	Added language provided by CUWA: <i>Three scenarios for future conditions (2030) were compiled: the Planned scenario reflects changes required in existing waste discharge permits for wastewater treatment plants and urban runoff discharges, and a hypothetical 2 percent reduction in loading from agricultural land. Plausible represents more aggressive treatment of wastewater and urban runoff and a hypothetical 6 percent reduction in loading from agricultural land. The Outer Boundary scenario demonstrates the limits of what can be achieved with current technology for wastewater discharges, aggressive treatment of urban runoff, and a hypothetical 10 percent reduction in loading from agricultural land. These scenarios were modeled in the WARMF model for the Sacramento and San Joaquin basins. It should be noted, that within the Delta it was not possible to incorporate the urban runoff and agricultural load reductions due to budget and schedule constraints so only the wastewater future scenarios were modeled.</i>
11	Future WQ Scenarios	ES-1		"It was found that the TOC, bromide, and temperature did not differ significantly from historical data to result in meaningful changes to disinfection by-product modeling results." This statement should be clarified and strengthened. What historical data (dates and from what sources? The sentence state that you are comparing historical TOC, bromide and temperature to modeled disinfection byproduct results, which is not a direct one to one comparison. State what exactly was compared to what? What were the changes that were being evaluated? And is it just the disinfection by products that were evaluated with respect to the changing TOC, bromide and temperature or were other things important too with respect to changes to DW quality?	Lisa Voight, SRCSD	Added text to clarify that historical data and modeled predicted future water quality data did not match. Based on the relative differences in predicted future water quality scenarios, it was determined that a slight improvement with respect to TOC could be observed in the more aggressive future scenario. Despite the slight improvement in TOC, meaningful reductions in DBP modeling results were not observed.
12	Future WQ Scenarios		General Comment	During the presentation, it was stated that future water quality did not degrade significantly beyond "noise" and so drinking water treatment costs were based on regulatory changes. This should be stated more clearly in the executive summary.	Lisa Voight, SRCSD	Added text to state this point more clearly.
13	Future WQ Scenarios	3-3	Section 3.3	List the specific model(s) including the run (date or version) that produced the water quality data that was used for this report. (For WARMF and DSM2. These models might be modified in the future so knowing which runs were used is important.)	Lisa Voight, SRCSD	Added text provided by CUWA to describe the modeling and the future water quality scenarios.
14	Sensitivity Analysis	7-5	12. Tables 7-1 through 7-4	The provided footnote annotations are not included in the table. It is unclear if the 99th percentile temperature was used.	Brian Laurensen, Larry Walker Associates	This footnote actually belonged to Table 7-5 and was a typographical error. The typo was removed to clarify that 90th percentile water quality was used.
15	Sensitivity Analysis	7-1	Section 7.1	We appreciate the paired TOC-temperature analysis, but would have suggested an alternate approach to the analysis using the drinking water treatment model paired outputs to calculate a continuous record of DBPs or developing a monte carlo simulation. However, we realize there is insufficient time for this additional analysis. Given the overall analysis, the level of analysis is adequate.	Brian Laurensen, Larry Walker Associates	This suggestion is appreciated, though time and budget constraints did not allow for such an analysis to be performed.

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16	Sensitivity analysis box plots	7-3 to 7-4	Figures 7-4 and 7-5	Please provide n values for each month in the box plots. Single values in small monthly datasets could control cumulative probability calculations.	Brian Laurenson, Larry Walker Associates	Added. Though some parameters (TOC for example) were only available monthly, at least 10 years of data were available and one single point did not control the dataset. For example, there were two out of eleven years that recorded TOC of greater than 8 mg/L in the month of January.
17	Sensitivity analysis percentile plots	7-2	11. Figures 7-2, 7-4, and 7-6	Recommend labeling cumulative probability axis.	Brian Laurenson, Larry Walker Associates	Added.
18	VWTP development	4-2	First paragraph	First paragraph, second sentence. Refers to future Delta water quality “degradation” – this conclusion was not supported by the modeling work. We suggest changing sentence to “As drinking water standards become more stringent, these facilities could potentially incorporate blending as a treatment option.”	Brian Laurenson, Larry Walker Associates	Added text to clarify.
19	VWTP development	ES-1		“in general, three common treatment trains emerged”. Clarify this statement. Did these treatment trains represent 90% of the existing treatment plants currently in use? Are these the only ones planned or currently in use?	Lisa Voight, SRCSD	Virtual Water Treatment Plants do not represent any single existing plant, but represent the central tendencies of treatment practices in a source water area. It is not possible to define a percentage of plants that a VWTP treatment train represents. Doing so would be inconsistent with the five-step process used to develop VWTPs.
20	VWTP development	4-2, 4-3	Tables 4-1 and 4-2	Make sure there is a description of the treatments such as Pre-pH Adjustment...GAC, PAC so that the reader understands what these are. Some are not intuitive. For example in general what chemicals or processes are used? OR reference where this is described (figure 6-2, etc?)	Lisa Voight, SRCSD	Added table to define treatment processes.
21	Treatment triggers	5-20	Table 5-16	It is not clear how the values in this table are taken from the corresponding tables. For example for UW-1, Table 5-2 shows that no treatment triggers are exceeded, but this table indicates that targets are met under certain conditions for THM4 and HAA5. Does this refer to conditions other than the 90th percentile water quality? This applies to the other regions as well. Please confirm the values in this table or provide a more detailed notation of the design conditions that do not meet the target.	Brian Laurenson, Larry Walker Associates	Refined summary table to focus on 90th percentile water quality conditions instead of a range or matrix of possible water quality conditions.
22	Treatment triggers, targets, and regulations		Sections 5 and 6 and cost tables	Sections 5 and 6 use the terms triggers, targets and regulations. There should be an explanation of the difference and what is used for which scenarios. Need a discussion on the difference between treatment triggers, targets and violations. What were the costs based on? Does changing the evaluation to include costs for avoiding violations versus target exceedances change the costs at all? If so, by how much? At this late stage, if applicable, this could be estimated as a percentage or a range versus completely changing the estimates. Added note: Comments should be made on the tables and diagrams that are based on targets or triggers rather than violations.	Lisa Voight, SRCSD	The report defined treatment triggers as 80% of the MCL. This is a common practice in water treatment engineering both with respect to design and operation of water treatment facilities. As such we feel strongly that we continue with this approach, but provide clarification about the method so that the reader can fully understand the basis of compliance. Moreover, it is not possible to do analysis with both approaches (violation vs. treatment target) simultaneously. One can choose one or the other (possibly both can be done sequentially and compared side by side), which involves a lot of additional work and cannot be accomplished within the project time frame and budget.
23	Costs	ES-6, 8-9, 9-5	Table ES-1., Table 8-10, Table 9-2	It is not clear how the values are added for the total. For example, the total lower end plausible cost should be \$10M + \$682M + \$2,699M = \$3,391M; sum is listed as \$3,735M. Likewise, plausible upper end cost sums to \$7,265M not \$8,004M.	Brian Laurenson, Larry Walker Associates	Calculations were reviewed and resolved to correct rounding and other minor errors.

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24	Costs	9-4	Section 9.5	These are based on current treatment capacity so 2030 costs are likely to be higher.	CUWA	Added text to clarify.
25	Costs	8-8	Section 8.6	Add a few sentences in this section that explains that these costs are based on current treatment capacity. Future treatment capacity is likely to increase with increasing population, but we were not able to query each agency about plans for future treatment plant upgrades within the scope of this project.	CUWA	Added text to clarify.
26	Costs	ES-6, 8-9, 9-5	Table ES-1., Table 8-10, Table 9-2	Remember to add a note that the capacities are based on today's capacities and have not been increased for future population increases or decreased based on water conservation.	Lisa Voight, SRCSD	Added text to clarify.
27	Costs		Table 8-10 and Appendix G	Doesn't take into account the recent increase in fuel costs. According to the US Dept of Labor Bureau of Labor Statistics Friday, April 15, 2011 http://www.bls.gov/news.release/cpi.nr0.htm "The all items index rose 2.7 percent in the last 12 months, the largest increase since December 2009. The energy index has now risen 15.5 percent over the last 12 months, with the gasoline index up 27.5 percent." Several cost references taken into account appear dated.	Lisa Voight, SRCSD	We have used the traditionally accepted mark-up factors (EPA uses these as well for their technology and cost evaluations) that are used in water treatment facility costing and feel strongly to keep those as they are in the draft report. Also, changing the power cost seems to create a confusing issue with respect to adjusting the costs by ENR indices. Truly speaking, we should be using the power costs as they were assumed to be for the year of the cost estimate and use the ENR indices to adjust the overall costs rather than using a different power cost.
28	Costs		General Comment	This is related to the presentation from Malcolm Pirnie last week, but I didn't see this in their report related to the Drinking Water Treatment costs. During their presentation they referenced and extrapolated costs from the wastewater treatment plant report. I didn't feel that this was appropriate as each of the TMs produced by the consultants were developed independently (except for the modeling). If there is a reference in their report to the wastewater costs it should be removed - my comment would be as follows: Remove references to other draft technical memos and other work group products, especially the ones that extrapolate cost data (such as the cost data that was used for wastewater treatment plant cost comparison in the Malcolm Pirnie presentation done on 4/14/11). The tech memos are still being commented on and are in draft form. Other consultant information should not be used and interpolated or expanded upon in this report.	Lisa Voight, SRCSD	No comparison to wastewater treatment costs were included in this report. Comparisons were only brought up as a part of the discussion with the Work Group during the meeting to put things in context.
29	Constituents that couldn't be modeled	6-11	Section 6.4.4 Microcystin	Do existing VWTTPs all have the ability to deal with microcystin? Microcystin blooms have been occurring in the Delta in recent years.	CUWA	Yes, the current VWTTPs have sufficient free chlorine and/or ozone contact time to oxidize microcystin. Text was modified to include the current scenario (along with the plausible and outer boundary) in the discussion in Section 6.4.4.
30	Constituents that couldn't be modeled	6-11	Section 6.4.5 Pathogens	Add a sentence that says pathogen levels were not provided for the future scenarios. All plants are currently in Bin 1. What effect would increasing levels of pathogens have on the existing, plausible, and outer boundary VWTTPs?	CUWA	Added text to explain that increased levels of pathogens in the source waters would result in an increased treatment cost that was not captured in this evaluation.
31	Constituents that couldn't be modeled	6-11	Section 6.4.6 Taste and Odor	Add a sentence that says no information on nutrient levels or the potential for taste and odor problems was provided for the future scenarios. Taste and odor problems are a major issue with existing plants. Perhaps use some of the language from Tech Memo 1 (page 3-11) to better set the stage for this issue. In the plausible scenario, what happens with the plants that don't have pre-ozonation?	CUWA	Added.
32	Constituents that couldn't be modeled	6-11		Need discussion of ability of existing, plausible, and future VWTTPs to remove CECs - pharmaceuticals, personal care products, and endocrine disruptors.	CUWA	Added.

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33	Constituents that couldn't be modeled	6-11		Need discussion of multiple barrier concept and how source water protection is the first step in protecting public health.	CUWA	Added.
34	Nutrients	6-10		Need to add a sentence that says that nutrient concentrations for the future scenarios were not provided.	CUWA	Added.
35	Pathogens	ES-4, 2-8	Table 2-3	"The CCL3 is evaluating several emerging pathogens;...": Define CCL3 in acronyms section. Also, note here that future treatment of CECs could result in significant additional future costs. Could add footnote that future treatment of CECs could result in significant additional future costs.	Lisa Voight, SRCSD	Added CCL3 to list of acronyms. Included discussion of CECs in Section 6.4.
36	Taste and Odor	6-11	Section 6.4.6 first sentence	It has not been determined that the taste and odor issues would require costly upgrades. Suggest editing sentence to "Taste and odor compounds can be removed through many of the proposed future facilities, but are not specifically assessed in this analysis."	Brian Laureson, Larry Walker Associates	Added text to clarify.
37	Future WQ Scenarios	ES-1		Need to state that inputs from the model project an improvement in water quality.	Debbie Webster, CVCWA	Added text to clarify.
38	Treatment Triggers	ES-3		Please clearly include within the executive summary that it is not water quality changes that are driving these types of treatment improvements, but rather the projected changes in regulatory requirements on the VTPs.	Debbie Webster, CVCWA	Added text to clarify.
39	Treatment Triggers	ES-4		Based on discussion at workgroup, this is not suppose to be about CUWA.	Debbie Webster, CVCWA	Modified text.
40	Treatment Triggers	ES-4		Before getting into the "met current regulations," you need to set forth the conditions at the VTP, i.e. triggers were set at 80% of the MCL.	Debbie Webster, CVCWA	Modified text.
41	Treatment Triggers	ES-4	VWTP Compliance	Define	Debbie Webster, CVCWA	Modified text.
42	Treatment Triggers	ES-4		Need to differentiate between actual compliance with the MCL and triggering the 80% value. ...to meet treatment goals of current...	Debbie Webster, CVCWA	Modified text.
43	Future WQ Scenarios	3-7		Any changes expected at the VTPs are due to changing regulations rather than driven by changes in water quality.	Debbie Webster, CVCWA	Added text to clarify.
44	Treatment Triggers	5-2		It was discussed that it may be valuable to indicate whether the actual WQ parameter was exceed, not only the target. Please do this.	Debbie Webster, CVCWA	The report defined treatment triggers as 80% of the MCL. This is a common practice in water treatment engineering both with respect to design and operation of water treatment facilities. As such we feel strongly that we continue with this approach, but provide clarification about the method so that the reader can fully understand the basis of compliance. Moreover, it is not possible to do analysis with both approaches (violation vs. treatment target) simultaneously. One can choose one or the other (possibly both can be done sequentially and compared side by side), which involves a lot of additional work and cannot be accomplished within the project time frame and budget.

Malcolm Pirnie Response to

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45	Sensitivity Analysis	7-3		An explanation of the very high Jan TOC percentile within the report would help.	Debbie Webster, CVCWA	Though TOC data were only available monthly, at least 10 years of data were available. One single point did not control the dataset. For example, there were two out of eleven years that recorded TOC of greater than 8 mg/L in the month of January (2005, 2002). Time and budget constraints did not allow for the investigation into why these years produced increased TOC.
46	Sensitivity Analysis	7-4		Again, an explanation of the outlier for bromide would be helpful both in Jan and Feb.	Debbie Webster, CVCWA	One single data point did not control the dataset. For example, bromide was highest in January and February of 1990, 1991, 2001, 2007, and 2008. Time and budget constraints did not allow for the investigation into why these years had higher bromide concentrations.
47	Costs	8-2		How are these comparing to what was done for the WWTPs. It seems like a very different approach. Also, per my comment in Appendix G, both the VTP and WWTP evaluations were to use the same power cost. This was not done.	Debbie Webster, CVCWA	We have used the traditionally accepted mark-up factors (EPA uses these as well for their technology and cost evaluations) that are used in water treatment facility costing and feel strongly to keep those as they are in the draft report. Also, changing the power cost seems to create a confusing issue with respect to adjusting the costs by ENR indices. Truly speaking, we should be using the power costs as they were assumed to be for the year of the cost estimate and use the ENR indices to adjust the overall costs rather than using a different power cost.
48	Costs	G-3		We had asked that you use the same value for the WWTPs, which, I believe is \$0.12. Per our discussions, the same power costs should be used.	Debbie Webster, CVCWA	