Section: Section Title

Reviewer A. Keller, GSWI TAP – UCSB

Subsection		**Page(s)**		**Comment Date**	2/25/2008
Comment	The Draft Report for Task 2B-1 provides a very useful documentation of the modeling effort related to the Upper Santa Clara River Chloride TMDL Collaborative Process, providing in quite a bit of detail the information needed to understand the basis for implementing the model, the assumptions and decisions made during the implementation, the calibration process, the selection and construction of scenarios addressing future conditions, and the results of scenario simulations. The document is an accurate representation of the process as it developed and was discussed with the Technical Advisory Panel throughout the past 18 months. The implementation of the model was of high quality, with a lot of thought given to each decision along the entire process. The model selected is one of the best available for addressing surface/groundwater interactions, and modeling the fate and transport of chloride within this complex system. The overall scope of the project was well defined, and this was translated into reasonable boundary and initial conditions, as well as in the construction of the future scenarios. The modelers made use of a large amount of existing local data, including information on parameter values (e.g. geology, hydrogeologic parameters, vegetation cover, land use and land use practices, meteorology, point source releases, etc.) as well as observed hydrology and water quality. It was a major undertaking to collect all this information and process into useable model files. They also used this information to its full extent in the calibration process, adequately fine tuning the model to best match the observed data. In general, sound practices were used for the calibration process. The construction of the future scenarios was done in collaboration with the stakeholders and thus represents the best estimates that can be done considering the uncertainties about the future. The results of the scenarios seem quite reasonable and should provide useful information for the stakeholders in addressing the concerns about Chloride concentrations in the Santa Clara River. In addition to a well-written text, the authors should be commended for the high quality of the graphics throughout the report. The following comments are meant to provide a valuable external perspective on the various aspects of the modeling effort and the documentation of this activity. It should be noted that in my opinion, the current documentation is of very high quality and would be considered more than adequate. However, as with any process, there are different perspectives and room for improvement.				
Response	Comment noted. No detailed response required.				

Subsection	1.0	**Page(s)**		**Comment Date**	2/25/2008
Comment	This section provides a very good overview of the background, objectives and conceptual model considered before selecting a numerical model. The tables and graphics are of very high quality and serve to clearly explain the study area.				
Response	Comment noted. No detailed response required.				

Subsection	2.0	**Page(s)**		**Comment Date**	2/25/2008
Comment	This section provides an overview of the numerical model, including a description of its origins and some of the peer-reviewed studies that have been used to test the model against analytical solutions. Although this is a fairly technical section, it is written clearly and provides a general description of the conceptual model. The section is not intended to be a "User's Guide" for the model, which in my opinion is the correct approach. An interested reader is provided information on where to look for additional details on the MODHMS code.				
Response	Comment noted. No detailed response required.				

Subsection	2.2	**Page(s)**	2-3	**Comment Date**	2/25/2008
Comment	One comment is that in Section 2.2 there is actually no explanation of the solution techniques. It provides a defense of the techniques used in MODHMS, but the reader is referred to the MODHMS manual for more details. It would be useful to briefly describe them here.				
Response	The title of this subsection was changed from "Solution Techniques" to "Scientific Bases". For the purposes of the GSWI Study and the intended audience, no additional text describing the solution techniques of MODHMS was provided. The MODHMS User's Manual (HGL, 2006) should be relied upon for such a description.				

Subsection	2.4	**Page(s)**	2-3	**Comment Date**	2/25/2008
Comment	In addition, Section 2.4 discusses very generally the limitations. It would be useful to refer the reader to the latter Section 4.2.5 which discusses in more detail the potential sources of error.				
Response	Additional text was added as suggested.				

Section: Section Title

Reviewer A. Keller, GSWI TAP – UCSB

Subsection	3.0	Page(s)		Comment Date	2/25/2008
Comment	This section provides detailed information on overall boundaries, grid generation, land surface parameters, interception storage and evapotranspiration parameters, subsurface hydraulic parameters, transport parameters, time discretization, and initial and boundary conditions. It provides detailed information on the decisions, assumptions and revisions to the assumptions (e.g. adjustment of subsurface layer thickness) made in constructing the model. It also provides useful documentation of the datasets that were used and of those subsets of data (e.g. precipitation from certain rain gages) which were questioned based on preliminary results. In some cases the authors provide a short and useful description of a parameter (e.g. rill height, streambank elevation), but this is not consistently done (e.g. obstruction height, canopy interception storage). It would be useful to do it throughout, particularly since some of these parameters are not commonly used in other models.				
Response	Additional text was added, where appropriate, to better define parameters.				

Subsection	3.0	Page(s)		Comment Date	2/25/2008
Comment	When the authors comment about work that will be explained in later sections (e.g. initial flow conditions using a "charge-up" simulation, described in Section 4), it is best to provide a reference to the section where such work will be discussed in detail.				
Response	Additional reference information was added as suggested, where appropriate.				

Subsection	3.0	Page(s)		Comment Date	2/25/2008
Comment	The authors provide a very complete documentation of the model parameters in more than 35 tables. However, it would be useful for the reader to know whether the parameter values provided are the original ones (i.e. from the various sources) or the final calibration values. Also, in a few cases, the source of the data is not indicated in the table footnotes (e.g. evapotranspiration parameter values, dry and wet deposition of chloride).				
Response	Additional text was added to the report which states that the parameterization, as described in Section 3.0 of the Task 2B-1 report, is in reference to the calibrated parameters in GSWIM. The Task 2A report describes the parameterization that was initially used for model development.				

Subsection	3.0	Page(s)	3-5	Comment Date	2/25/2008
Comment	Typo: Page 3-5, 2nd paragraph: "...beneath Piru Creek its location outside..."				
Response	The referenced sentence was revised as suggested.				

Subsection	4.0	Page(s)		Comment Date	2/25/2008
Comment	Section 4 presents the process undertaken to calibrate the model in detail, and then presents an evaluation of the results of the calibration. First a steady-state calibration was conducted, which is reasonable, to evaluate the initial conditions and determine whether the resulting gradients are in the right direction and magnitude. Then a transient calibration was performed, first for flow and then for chloride concentrations, which is the correct order. Calibration targets were very well defined for surface and groundwater flow, including a number of criteria for determining the "goodness of fit". There were no specific "goodness of fit" criteria for chloride concentrations. The modelers provide an adequate description of the preliminary calibration approach, which used monthly time steps to evaluate whether the general trends were in line with the observed values. This is a reasonable approach, given the complexity of the model and the relatively long simulation runs. Then a sensitivity analysis was performed, by varying parameter values over the entire domain to determine which parameters were more likely to influence the outcome of a simulation. The sensitivity was focused on evapotranspiration, since this was perceived as the major uncertainty in the modeling effort. The modelers then proceeded to perform a flow calibration of the model by subareas, which is reasonable, given that the model is quite complex. Finally the modelers calibrated chloride concentrations throughout the model. It would be useful for the authors to indicate that the preliminary calibration was done only for the hydrologic system and not for chloride concentrations.				
Response	Additional text was added to Section 4.1.2.2 (Preliminary Calibration Approach) to explain that the initial calibration focused on flow only.				

Section: Section Title

Reviewer A. Keller, GSWI TAP – UCSB

Subsection	4.0	Page(s)		Comment Date	2/25/2008
Comment	The sensitivity analysis was useful. However, rather than systematically changing parameter values by a known factor (e.g. increase/decrease by 2x or 10x), the modelers selected arbitrary increases or decreases in parameter values. Although this does provide an overall sense of the response of the outcome to a given parameter value, it makes it difficult to compare the sensitivity of one parameter relative to another. Also, a global sensitivity analysis would entail sampling the entire possible distribution of parameter values using a Monte Carlo approach; since that would require more than 10,000 simulations for a model of this level of complexity, it seems that the current approach is adequate in terms of providing a general sense of the parameter sensitivity. A Monte Carlo approach would give a better sense of the co-variances. Table 4-1 provides a good idea of the process used to conduct the sensitivity analysis.				
Response	Comment noted. No detailed response required.				

Subsection	4.0	Page(s)		Comment Date	2/25/2008
Comment	In a number of instances, the authors indicate that a parameter value was changed to improve the goodness of fit. However, the original and final calibration values are seldom provided. Thus, the interested reader has no idea how much change was needed (a few percent, 100%, a factor of 1000?) to achieve the outcome and it is also not possible to determine whether the final value is reasonable. One assumes it is, but the information is not available. A table with the original and final calibration values for each parameter varied within a subarea would be very useful, along with some brief notes for each major change.				
Response	We started with parameter values presented in the Task 2A report and ended with parameter values presented in the Task 2B-1 report. Additional text was also added to the Task 2B-1 report which states that the calibrated parameter values are within reasonable ranges of values.				

Subsection	4.1.2.2	Page(s)	4-6 through 4-8	Comment Date	2/25/2008
Comment	At the end of the description of the calibration of Hopper and Pole Creek, it is mentioned that a subsurface layer was included to help generate base flow. It is unclear whether this was additional to the layers described in Section 3. In addition, it is mentioned that "parameter assumptions ... were then implemented in the GSWIM". It is unclear whether this means that this additional layer was implemented elsewhere, or just some of the other parameter value changes discussed in the section.				
Response	Additional text was added to the report which states that the parameterization, as described in Section 3.0 of the Task 2B-1 report, is in reference to the calibrated parameters in GSWIM. The Task 2A report describes the parameterization that was initially used for model development. Thus, the subsurface layer that was included to help generate baseflow in Hopper Creek is already accounted for in Section 3.0 (see Figure 3-16).				

Subsection	4.2	Page(s)		Comment Date	2/25/2008
Comment	It is unclear why no "goodness of fit" measures were used for the chloride concentrations. Calibration should not be just visual. It is tricky to match very few observations visually. At the very least, some of the criteria considered for flow (residual error, ME, RMSE, RMSE/range, r2) should be calculated and reported for those regions where observed data is available. The description of flow calibration is very detailed, whereas the description of the chloride concentration calibration is short (targets, criteria, approach?).				
Response	Mean Error (ME), Root Mean Squared Error (RMSE), Coefficient of Determination (R^2), and Number of Observations (n) were added to the time-series chloride calibration plots (i.e., Figures 4-16 through 4-24).				

Subsection	4.2	Page(s)		Comment Date	2/25/2008
Comment	In terms of the calibration results (Section 4.2), the authors provide very detailed graphical information, allowing the reader to compare the simulation results against groundwater elevations, stream flows or chloride concentrations. The text provided in this section serves to guide the reader through all this information. It would be useful to reference the figures related to each section, so that the reader can follow them easily. However, in several instances the comparisons described in the text are very qualitative (e.g. "simulated heads matched the range of measured heads fairly well"), even though there are clear quantitative targets. Whenever possible, it would be best to use a specific goodness of fit measure to evaluate whether the simulation matches the observed data adequately. Although Figure 4-13 provides the general goodness of fit evaluation, it is best to use this information throughout this section. In addition, there are instances where the match is not as good (e.g. SCWD N-Oaks East and West) yet this is not mentioned in the text. It would be useful to provide a possible explanation for such instances. For example, is the consistent underestimate of the groundwater elevations in VWC-1 a datum issue?				
Response	Additional text was added in an attempt to better quantify the calibration results and more clearly associate appropriate figure numbers with the calibration results.				

Section: Section Title

Reviewer A. Keller, GSWI TAP – UCSB

Subsection	4.2	Page(s)		Comment Date	2/25/2008
Comment	There seemed to be a consistent under-prediction of chloride concentrations in NCWD-Pinetree 1 and SCWD-N Oaks West. There should be an evaluation of the cause of this consistent bias. Similarly, wells VWC-K2, VWC-N and VWC-S6 consistently show increasing chloride concentrations (observed), which are not simulated adequately. Some analysis should be provided. Could there be missing sources?				
Response	Section 4.2.3.1 states that GSWIM had difficulty replicating groundwater chloride concentrations at NCWD-Pinetree 1 and SCWD-N.Oaks West. We stated that errors resulting from the lack of available streamflow and chloride data at Lang during the calibration period could be the reason GSWIM had difficulty matching some of the chloride trends in Soledad Canyon. Additional text was added to Section 4.2.3.1 which indicates the possibility that additional sources of chloride existed that were not simulated in GSWIM upstream of the referenced locations.				
Subsection	Figure 4-13	Page(s)		Comment Date	2/25/2008
Comment	The overall goodness of fit shown in Figure 4-13 is quite interesting. It serves to understand the trend in calibration from upstream to downstream. It appears there is an anomaly at around 1,280 ft, which should be commented on.				
Response	The anomalously low simulated heads within the measured head range of approximately 1,270 and 1,290 ft msl on Figure 4-13, occur at NCWD-9 between June 1975 and June 1977. Figure 4-6 shows that measured groundwater levels increased during this drought period. However, the monthly pumping rate at NCWD-9, according to data provided by the responsible agency for NCWD-9, increased during this drought period by approximately 40 percent per year. GSWIM simulated decreasing groundwater levels because of increased pumping during a drought period. So, either the measured groundwater levels or pumping rates are questionable at NCWD-9 between June 1975 and June 1977. Regardless, as shown on Figure 4-1b, NCWD-9 is located distant from the Santa Clara River near the headwaters of Newhall Creek and not in the main areas of interest with respect to the chloride TMDL study. Additional text, similar to that provided in this response, was incorporated into the report.				
Subsection	Figures 4-23 and 4-24	Page(s)		Comment Date	2/25/2008
Comment	Figures 4-23 and 4-24 present a comparison between observed and simulated chloride concentrations in the Santa Clara River. These are quite useful, and it shows that the model does a very nice job of simulating chloride concentrations in the river. However, the black line used for simulation results is quite thick, and this obscures the observed data, which is in light colors. It would be best to make it easier to see both observed and simulated data by selecting a thinner line for the simulation results and a darker color for the observed data. Observed data should be in the foreground.				
Response	The time-series calibration plots were revised in an attempt to improve clarity.				
Subsection	4.2.5	Page(s)	4-24 through 4-25	Comment Date	2/25/2008
Comment	The analysis of the potential sources of error is useful and provides a valuable analysis. There are a few additional potential sources of error: • Input data (e.g. info from point sources) may have errors • Input data is generally at a different time scale (e.g. monthly loading rate averages) than the simulation time step • The conceptual model, although overall very accurate, may not adequately describe all the processes in particular regions • The assumptions for the initial and boundary conditions may not hold everywhere where they are applied				
Response	Additional text was added to Section 4.2.5 (Sources of Error) to make this section more complete, as suggested.				
Subsection	4.3	Page(s)	4-26	Comment Date	2/25/2008
Comment	In the second to last bullet point in the Calibration Outcome, the authors indicate that the numerical solution is "highly" constrained. It would be better to simply state "adequately" constrained. With so many grid points, parameters and parameter values, there are so many degrees of freedom that it would be difficult to state it is highly constrained.				
Response	The term "highly" was replaced with "adequately" as suggested.				
Subsection	4.1.2.1	Page(s)	4-2	Comment Date	2/25/2008
Comment	Typos in page 4-2, last paragraph: "describe aspects of groundwater and ...", "variety of hydrologic and water use conditions".				
Response	The referenced sentence was revised as suggested.				

Section:	Section Title				
Reviewer	A. Keller, GSWI TAP – UCSB				
Subsection	4.1.2.2	Page(s)	4-9	Comment Date	2/25/2008
Comment	For clarity, in page 4-9, second paragraph, change to "Unlike the previous subarea models, the Bouquet Canyon…"				
Response	The referenced sentence was revised as suggested.				
Subsection	4.2.2.1	Page(s)	4-18	Comment Date	2/25/2008
Comment	Typo in page 4-18, second paragraph: "GSWIM replicated streamflow well…"				
Response	The referenced sentence was revised as suggested.				
Subsection	4.2.3.3	Page(s)	4-22	Comment Date	2/25/2008
Comment	Typo in page 4-22, fourth paragraph: "GSWIM replicated the range…"				
Response	The referenced sentence was revised as suggested.				

Section: Section Title

Reviewer D. Williams, GSWI TAP – GEOSCIENCE.

Subsection		Page(s)	Comment Date 2/22/2008

Comment

In my professional opinion, the Task 2B-1 Draft Report meets the standards and criteria generally accepted in the ground water industry for development and analysis of geohydrological/geochemical problems through use of ground water modeling. In other words, there are no fatal flaws and the work is consistent with generally accepted principles used in ground water hydrology. The report is well organized, professionally written and includes a good understanding and approach which is consistent with the general goals of the study. Throughout the process, the project management was excellent in keeping the TAP members informed regarding technical issues related to the work. Interactive web-based presentations on a timely basis were very helpful in this process. What was particularly useful was the fact that all of the team expertise, as well as stakeholders, were readily available during these Web-based calls so that any questions by TAP members could be answered immediately (or at least discussed).

Response

Comment noted. No detailed response required.

Subsection		Page(s)	Comment Date 2/22/2008

Comment

Most of my detailed comments regarding specific figures, graphics, clarification in the text and other editorial and presentation issues have been addressed (or discussed) and conveyed to the project team. For completeness, the issues considered important to the overall project goals are listed below and include:

It is my understanding that the project goal for chloride concentrations in the Santa Clara River is now 100 mg/L. As such, and based on modeling scenarios to date, some mitigation may be needed to ensure this threshold -- even with low reuse and chloride output limited to 100 mg/L in the Valencia and Saugus WRPs discharge.

It is also my understanding that the most likely operational scenarios which would achieve the project objectives are currently being addressed. Specifically, it is my understanding that potential compliance options may include:

a. Advanced treatment and brine disposal
b. Advanced treatment and secondary effluent pipeline and outfall
c. Alternative WRP discharge locations
d. Alternative water resources management using dilution water
e. Hybrid mix of several alternatives

Response

Comment noted. No detailed response required.

Section: Section Title

Reviewer B. Steets/D. Parkinson on behalf of NLF, GSWI TWG and Stakeholders – GeoSyntec Consultants

Subsection	Figure 5-20	Page(s)		Comment Date	2/22/2008
Comment	For the Newhall Ranch water & chloride routing schematic, the "imported water" box should be removed and the word "blended" should be removed from the water droplet supply symbol. These changes should be made to reflect the fact that Newhall Ranch relies on groundwater for its potable water supply. Other locations in the text, if they exist, should similarly be revised to reflect this fact.				
Response	For modeling purposes, it was assumed that seven existing and future VWC wells (i.e., VWC-E14/E15/E16/E17 and VWC-G1/G3/G4) will supply up to 7,038 acre-feet of groundwater per year to Newhall Ranch. Using a total potable demand of 8,645 acre-feet per year at build-out (according to the Draft Additional Analysis [Impact Sciences, 2002]), the imported water needed to supply the remaining demand at build-out equals 1,607 acre-feet per year (8,645 minus 7,038). These assumptions indicate that imported water would make up less than 20 percent of the potable supply at build-out. Thus, Figure 5-20 correctly illustrates the water and chloride routing assumptions that were built into GSWIM for the scenarios of future conditions. If other water supply assumptions for Newhall Ranch are of interest, then additional scenarios can be simulated at the request of the GSWI TWG.				
Subsection	4.0	Page(s)		Comment Date	2/22/2008
Comment	Chloride calibration summary statistics need to be summarized – including average relative & absolute error (or residuals) for specific output locations for surface water and groundwater chloride concentrations. Chloride concentration prediction uncertainty needs to be addressed in order to have a meaningful discussion of the differences within and between future scenarios, as well as for considering a margin of safety in the final recommendation for WRP effluent limits.				
Response	Mean Error (ME), Root Mean Squared Error (RMSE), Coefficient of Determination (R^2), and Number of Observations (n) were added to the time-series chloride calibration plots (i.e., Figures 4-16 through 4-24). A more thorough evaluation of scenario results in relation to the appropriate WQO and the upper and lower range of the avocado chloride threshold from CH2M HILL (2005) was also provided in a new section (5.3.4).				
Subsection	5.2.5	Page(s)		Comment Date	2/22/2008
Comment	Basis for Water Demand/Supply Assumptions – Water supply and demand data and sources are provided for all but Newhall Ranch development. This impacts assumptions for influent and effluent chloride concentrations for Newhall Ranch WRP reuse water supply. Please provide a table of water supply flow assumptions for the Newhall Ranch development, as well as the data or source for chloride concentration assumptions.				
Response	Table 5-6 summarizes the projected annual effluent flows from the future Newhall Ranch WRP, which indicate that the annual effluent at build-out will be 7.72 million gallons per day (i.e., 8,645 acre-feet per year, as described in the Draft Additional Analysis [Impact Sciences, 2002]). Consistent with the scenario assumptions, the simulated chloride concentrations in the Newhall Ranch WRP discharge to the Santa Clara River were set at 100 mg/L (assumed to be run through reverse osmosis). The portion of the Newhall Ranch WRP effluent that will be reused within Newhall Ranch was assumed to have a constant chloride concentration of 150 mg/L, at your request. This information is described in Sections 5.2.9.2 and 5.2.10 in the Task 2B-1 report.				
Subsection	5.2.11	Page(s)	5-11	Comment Date	2/22/2008
Comment	Boundary conditions for chloride – Has two bullet items, but first sentence after bullets says "First two items straightforward…..Last item required modification to MODHMS…" What are first two? And what is last item?				
Response	There is a typo in that particular sentence that was corrected to indicate that "Implementation of the first item was straightforward".				
Subsection	5.3.1 through 5.3.3	Page(s)		Comment Date	2/22/2008
Comment	Please be specific at the very beginning, if not in the title of the section, which scenarios are being discussed (i.e. Section 5.3.1 = Scenarios 1 vs. 3; Section 5.3.2 = Scenarios a vs b, etc.).				
Response	Additional text was included to more clearly state which scenarios are being discussed in each section.				
Subsection	5.0	Page(s)		Comment Date	2/22/2008
Comment	Section 5 maps don't show GSWI-MW-01, GSWI-MW-02, GSWI-MW-03. Yet these wells are discussed in the text of future scenarios, and plots of groundwater elevations and chloride concentrations are provided. Please locate these wells on the maps for Section 5.				
Response	Locations for GSWI-MW01, GSWI-MW02, and GSWI-MW03 were added to Figure 4-1 to be consistent with the notes on Figures 5-21 and 5-22.				

Section: Section Title

Reviewer B. Steets/D. Parkinson on behalf of NLF, GSWI TWG and Stakeholders – GeoSyntec Consultants

Subsection	5.3.1.2	**Page(s)**	5-13 and 5-14	**Comment Date**	2/22/2008

Comment Bullet number 3 states, "GSWI-MW-02 exceeded the groundwater chloride WQO of 150 mg/L..." This is a misleading statement. The water quality for this well is extremely poor (existing chloride measurements range from 140-160 mg/L) and so the fact that it remains poor under future modeling scenarios is of little practical use. Suggest deleting, or rewording to include a statement that existing water quality for well is extremely poor. This applies to Figure 5-26 as well – please show existing water quality data for this well from 2002-2006 time frame, or remove the plot. In fact, any discussion of chloride concentrations at Bluecut should note the fact that existing groundwater data in the immediate area (MW-02, MW-03) indicates consistently elevated chloride concentrations.

Response The text describing results at GSWI-MW02 was removed.

Subsection	Figure 5-25	**Page(s)**		**Comment Date**	2/22/2008

Comment Add predicted future flows for Potrero and Salt Creeks. This information is required in order to assess the impacts of the chloride concentrations for these two tributaries shown in Figure 5-31.

Response Figure 5-25 was revised to show streamflow results for all locations shown on Figure 5-31 for consistency.

Subsection		**Page(s)**		**Comment Date**	2/22/2008

Comment Please provide an additional figure, as previously requested by C.P. Lai, of a profile along the Santa Clara River of surface water and alluvial groundwater chloride concentrations under both "average" and drought conditions. These should include a couple time slices at a minimum, so change over time can be represented.

Response As indicated in a previous response to Regional Board comments on the Draft Task 2B-1 report, the output control of GSWIM was not programmed to save results for every surface and subsurface computational grid point in longitudinal profile along the Santa Clara River, because of file management limitations. Inclusion of additional output locations would be required and the simulations would need to be rerun to create such profiles. Furthermore, available analytical data and modeling output indicate that chloride concentrations between Blue Cut and the Eastern Piru Subbasin fluctuate significantly in response to hydrology and upstream land use and water use/reuse. Thus, profiles of chloride concentrations could look substantially different depending on the selected periods. The chloride concentration animations that were provided to stakeholders during the development and application of GSWIM are useful in illustrating the variability in chloride concentrations in the groundwater and surface-water system. The GSWI Modeling Team will contact the Regional Board and GeoSyntec Consultants directly to discuss options for addressing their data request outside of the Task 2B-1 reporting task.

Subsection	5.3.1.3	**Page(s)**	5-14	**Comment Date**	2/22/2008

Comment The second bullet reads, "The differences in simulated surface-water chloride concentrations ... between both water reuse scenarios were as much as approximately 50 mg/L (see differences between Scenarios 1a and 3f during dry periods)." This is a misleading statement. This 50 mg/L difference cannot be considered a cause of high reuse vs low reuse. It is very clearly caused by variations in influent water supply chloride concentrations (see Geomatrix supplemental report Figure 2 vs Figure 5). Suggest rewording this statement comparing 1a to 3a or 1f with 3f, but not 1a to 3f.

Response Additional text was included to clarify the statement, as suggested.

Subsection	5.4	**Page(s)**	5-23	**Comment Date**	2/22/2008

Comment The second to last bullet reads, "The RO scenarios [a and b] occasionally simulated unrealistically high chloride concentrations in Saugus and Valencia WRP effluent...". This not only created high concentrations, but also created an actual increase in total load to the system. The affect of this "occasionally simulated unrealistically high chloride concentrations" on the long term chloride concentrations downstream is impossible to gage. Scenarios a and b would have been much better, and more easily comparable to other scenarios, if the effluent concentrations were allowed to be no higher than 100 or 120 mg/L, but also allow this effluent to be lower, based on the same calculation of effluent concentration used for Scenarios f and g. Suggest not comparing a and b scenario results directly with f and g scenario results unless qualifying the difference as such. Scenarios a through g cannot be directly compared due to differing simplifying assumptions.

Response We agree that care must be taken when evaluating the scenario results. However, because the future cannot be predicted with any certainty, the ranges of assumptions that were agreed upon by the GSWI TWG and included in the simulations were compared to describe the ranges in results. Results from the RO scenarios, as simulated with a constant chloride concentration in the WRP discharges, do provide valuable insights regarding chloride loading downstream of the WRPs.

Where appropriate, additional text was added to remind the reader that the RO scenarios are not as physically meaningful as some of the other scenarios because of the additional chloride loading that is simulated to the system.

Section: Section Title

Reviewer S. Unger/C. Lai, GSWI TWG and Stakeholders – LARWQCB

Subsection		**Page(s)**	**Comment Date** 2/21/2007

Comment Chloride concentration gradient along the river – The purpose of this study is to provide the chloride concentration gradient (i.e. dilution factor) between two Wastewater Reclamation Plants (WRPs), and downstream receiving water stations. However, the Task 2B-1 report provided only the time series of relative chloride concentration at several stations between the Valencia WRP and downstream stations, which can not clearly indicate the profile of the chloride concentration gradient along the upper Santa Clara River. It will be very helpful for the Regional Board staff if the relative chloride concentrations in surface water and groundwater are presented at every computational grid point in longitudinal profile along the river at least for 1977, 1991 and 2003 (three drought periods) for calibration simulation periods and for 2009 and 2023 for future scenario simulation periods.

Response The output control of GSWIM was not programmed to save results for every surface and subsurface computational grid point in longitudinal profile along the Santa Clara River, because of file management limitations. Rather, results for a subset of locations, including at key receiving water stations, were output and included in the Task 2B-1 report (see relative chloride concentration [C/Co] values, which are also dilution factors, presented on Figures 4-25, 4-26, and 4-27 [historical dilution factors] and Figures 5-32, 5-33, and 5-34 [model-derived future dilution factors]). The GSWIM output files for a single simulation already consume approximately 20 GBs of hard drive space with the current subset of output locations. Inclusion of additional output locations as suggested would be prohibitive, given that the simulations would need to be rerun and the amount of hard drive space would be enormous.

The GSWI Modeling Team can provide the Regional Board the data files used to create the C/Co figures in the Task 2B-1 report, so that interested parties could zoom in on periods of interest. The GSWI Modeling Team will contact the Regional Board directly to discuss options for addressing their data request outside of the Task 2B-1 reporting task.

Subsection	Figure 4-23	**Page(s)**	**Comment Date** 2/21/2008

Comment Dilution factor between the Valencia WRP and SCR-RD station – In Figure 4-23, the results of chloride concentration indicate the dilution factor is about 0.85 (180/210 and 170/200) at SCR-RD during the drought periods at 1991 and 2003. As shown in Figure 4-1b, the distance between SCR-RD station and the discharge point of the Valencia WRP is very close and no other loading is entering the river. It needs to be explained why the dilution of the discharge from the Valencia WRP changes so quickly (from 1.0 to 0.85) in a short distance under no other external dilution effects. In addition, it can be seen that no similar dilution factor occurs at SCR-RD for the future scenario simulations when compared with Figure 5-30. It is recommended that you explain why these two inconsistent situations occur.

Response Historical chloride concentration data for the Valencia WRP effluent and Santa Clara River at SCR-RD were provided by SCVSD. These measured data are independent of GSWIM results and indicate that the Valencia WRP effluent was diluted by 10 to 20 mg/L in 2003 by the time it reached SCR-RD (no measured chloride concentration data were available prior to 1995 at SCR-RD).

The SCR-RD receiving water station is located in a groundwater discharge reach of the Santa Clara River. Chloride concentrations at SCR-RD are less than those in the Valencia WRP effluent because of mixing with the more dilute baseflow prior to SCR-RD.

The inconsistency between resulting dilution factors between the Valencia WRP and SCR-RD, when comparing the historical and future simulation periods, is because of the differing land use and water use/reuse assumptions between the historical and future simulation periods.

Section: Section Title

Reviewer S. Unger/C. Lai, GSWI TWG and Stakeholders – LARWQCB

Subsection	Page(s)	Comment Date	2/21/2008

Comment Simulated chloride concentrations at Blue Cut – When compared with the Figures 5-30 and Figure 5-31, the simulated chloride concentrations at Blue Cut increased significantly for future scenario simulations during the drought periods of 2020 through 2025. However, the simulated chloride concentrations at Blue Cut and SCR-RE do not show a similar trend as the results shown in Figures 4-23 and Figure 4-24 for calibration simulation during drought periods of 1988 though 1993. It implies that there is additional loading entering the river between SCR-RE and Blue Cut during future scenario simulations. The contributions of the additional loading to simulated chloride concentrations at Blue Cut are 15%-20% for 1A & 1B series and 7% for 1F and 1G series, respectively, and there is no additional contribution downstream of Blue Cut. What are the sources of additional loading entering the river between SCR-RE and Blue Cut? And why does the additional loading only affect the Blue Cut station and does not affect upstream and downstream of Blue Cut during the drought periods of 2020 through 2025?

Response The sources of additional chloride loading to the Santa Clara River between SCR-RE and Blue Cut include tributary inflow (e.g., Castaic Creek and smaller downstream tributaries) and groundwater discharge (includes underflow from upstream areas and return flow of locally applied water). The evapoconcentration of chloride in the shallow groundwater system between SCR-RE and Blue Cut also increases chloride concentrations in the Santa Clara River with increasing downstream river distance.

Chloride concentrations during drought periods of the future simulation period are higher than those during the historical simulation period because of the assumed increase in water reuse and imported water over this future period, coupled with assumed changes in land use (i.e., urbanization in the East Subbasin).

A short distance downstream of Blue Cut, the Santa Clara River begins to leak water to the subsurface. Thus, the groundwater discharge component of flow and chloride loading is not present in the losing reaches of the Santa Clara River.

Subsection	Page(s)	Comment Date	2/21/2008

Comment Chloride concentrations between Blue Cut/SCR-RF and East Piru Basin/V0013 – The profiles of chloride concentrations between Blue Cut/SCR-RF and East Piru Basin/V0013 are not clearly indicated and presented in the report. The real profile of chloride concentration change in surface water and groundwater between Blue Cut and East Piru Basin would be helpful to identify the fate and transport of chloride due to changes in water quality with respect to the variability associated with groundwater and surface water interaction. It is recommended that the profile of chloride concentrations between Blue Cut/SCR-RF and East Piru Basin/V0013 be provided in the report. The extent of dry gap between surface water and groundwater should be identified through the model simulation results and be presented in the report as well.

Response As indicated in a previous response to Regional Board comments on the Draft Task 2B-1 report, the output control of GSWIM was not programmed to save results for every surface and subsurface computational grid point in longitudinal profile along the Santa Clara River, because of file management limitations. Inclusion of additional output locations would be required and the simulations would need to be rerun to create such profiles. Furthermore, available analytical data and modeling output indicate that chloride concentrations between Blue Cut and the Eastern Piru Subbasin fluctuate significantly in response to hydrology and upstream land use and water use/reuse. Thus, profiles of chloride concentrations could look substantially different depending on the selected periods. The chloride concentration animations that were provided to stakeholders during the development and application of GSWIM are useful in illustrating the variability in chloride concentrations in the groundwater and surface-water system as well as the transient extent of the Dry Gap in the Piru Subbasin. The GSWI Modeling Team will contact the Regional Board directly to discuss options for addressing their data request outside of the Task 2B-1 reporting task.

Subsection	Page(s)	Comment Date	2/21/2008

Comment Lower flow rate in the river – The simulated chloride concentrations are significantly affected by the lower flow in the river during drought periods. The calibration results indicated that the model under-predicted lower stream flows in intermittent streams, which over-predicted chloride concentrations in intermittent streams during drought periods. The lower flow rate in the river during drought periods should be indicated in the report. Thus, it is recommended that the daily mean stream flow shown in Figure 4-14 and Figure 4-15 should be enlarged so that the lower flow rate can be clearly seen in the figures as the lower flows are shown in Figure 5-25.

Response The y-axes on the middle row of daily streamflow plots on Figures 4-14 and 4-15 were changed from linear to log scale as suggested, so the difference between measured and simulated streamflow results can be more easily discerned over the full range of flow conditions.

5-2102

Section: Section Title

Reviewer S. Unger/C. Lai, GSWI TWG and Stakeholders – LARWQCB

Subsection	Figure 3-6	Page(s)	Comment Date	2/21/2008

Comment In Figure 3-6, please mark the dimensional scale of schematic cross sections along AA' and BB'.

Response Figure 3-6 is not to scale and is intended to provide a schematic representation of GSWIM in profile view along two transects. Figure 3-1 highlights the locations of the cross section lines along Row 69 and Column 187 of GSWIM's grid. A note was added to Figure 3-6 indicating that the images are not to scale and that the vertical to horizontal scale is exaggerated.

Subsection	Figure 4-20 and Figure 5-27	Page(s)	Comment Date	2/21/2008

Comment The results of chloride concentrations at V-0031 shown in Figure 4-20 and Figure 5-27 need to be tuned to match the measured data. Alternatively, explain why the model parameters can not be adjusted to match the measured data.

Response Figure 5-27 shows results from simulations of future conditions; thus, no measured chloride concentration data are available.

We agree that improvements could be made to calibration at some locations; however, such improvements cannot be made under the current project schedule limitations. The calibration results at V-0031 shown on Figure 4-20 were discussed at the GSWI Modeling Subcommittee and TWG meetings held on February 19, 2008. The results shown are from the FWL5 (fracture well) package, which resembled results from Model Layer 5 at V-0031. However, the chloride concentrations that were simulated in Model Layer 4 at V-0031 more closely resemble the measured chloride concentrations. Thus, some of the difference (i.e., residual) between the simulated and measured chloride concentrations shown on Figure 4-20 for V-0031 could be a result of discretization inaccuracies. If the linkage between the FWL5 well element of V-0031 and Model Layer 4 was improved, then the residual might be lowered at this location.

Subsection	Figure 4-25 and Figure 5-32	Page(s)	Comment Date	2/21/2008

Comment In Figure 4-25 and Figure 5-32, please show the time series of relative chloride concentrations for SCR-RB, SCR-RD and NLF-NR1stations as well.

Response Relative chloride concentrations for SCR-RB, SCR-RD, and NLF-NR1 were included on Figures 4-25 and 5-32, as requested.

Subsection		Page(s)	Comment Date	2/21/2008

Comment The results of chloride concentrations for groundwater shown in Figure 4-16 through Figure 4-22 and Figure 5-26 through Figure 5-29 should indicate whether it is for the average of total layers or for a specific layer.

Response Additional text was added to Section 4.0 and 5.0 figures which indicates whether results were from the FWL5 (fracture well) package or individual model layers.

Subsection	Figure 4-24	Page(s)	Comment Date	2/21/2008

Comment The chloride concentrations near Fillmore Fish Hatchery increase significantly during 2025-2030 as compared the results shown in Figure 4-24; please explain why.

Response When comparing calibration (i.e., historical) results to results from the scenarios of future conditions, it is important to remember that only the diversion flows, groundwater pumping in the Piru Subbasin, hydrology (i.e., precipitation and ET), and chloride concentrations in Bouquet Reservoir, Castaic Lake, and Lake Piru are repeated from 1975 through 1998 for 2007 through 2030. It was assumed that urbanization in the East Subbasin will increase the demand for recycled water and imported water during the future simulation period. Modeling results suggest that these future water use/reuse changes coupled with changing land use patterns in the East Subbasin could lead to occasional increases in chloride concentrations at some downstream locations, as compared to chloride concentrations observed during the historical simulation period.

Subsection	Figure 5-36	Page(s)	Comment Date	2/21/2008

Comment The estimate of chloride concentrations in the Saugus and Valencia effluents for RO scenarios as shown in Figure 5-36 need explanation as to how it was estimated.

Response The end-of-pipe chloride concentrations in GSWIM under the RO scenarios were fixed at the desired concentrations of 100 and 120 mg/L for the a- and b-series scenarios, respectively.

Subsection	Figure 5-37	Page(s)	Comment Date	2/21/2008

Comment The figure title as shown in Figure 5-37 for SCR-RD and SCR-RE should read as "downstream of ..."instead of "upstream of ...."

Response The text was modified for SCR-RD to read "downstream of" instead of "upstream of". However, according to our mapping (see Figure 4-1b), SCR-RE is located upstream of the Castaic Creek confluence as stated.

This Page Intentionally
Left Blank