Comment/Response Table - Management Zone Archetype Analysis: Alta Irrigation District, Extreme No-Ag Scenario Addendum

Comment No.	Section No.	Original Section Title	Original Page Number	Commenter	Comment	Response
1	ES	Executive Summary	ES-1	Thomas Harter	Regarding third bullet: what is native vegetation and what is the ET from that? Is ET only from precipitation or also from groundwater?	Now specifies, "Rain-fed, non-phreatophytic, native vegetation"
2	ES	Executive Summary	ES-1	Debbie Webster	Regarding first sentence after bullets: This sentence a little clunky; suggest rephrasing.	Comment incorporated
3	ES	Executive Summary	ES-3	Thomas Harter	Regarding paragraph on page: please add an summary explanation for the simulated observations. Why are nitrate concentrations not decreasing more rapidly, especially at the water table? Why are salinity concentrations increasing in the upper zone and at the water table? Also provide key discussion points on how these results may be sensitive to specific model assumptions, e.g., plant water uptake from the water table (if that is the case), vadose zone travel time, legacy movement of nitrate and salts to groundwater from the vadose zone etc. Also provide key discussion points on how these results may be sensitive to specific model assumptions, e.g., plant water uptake from the water table (if that is the case), vadose zone travel time, legacy movement of nitrate and salts to groundwater from the vadose zone etc.	Explanatory text added: "Note that, as with the analysis of other scenarios for AID, loading from root zones was transmitted directly to groundwater as load in the same year. This is the best way to assess the long-term impact of surface management regimes on aquifers. The analysis is not designed to capture legacy loads or their effect on groundwater quality. Other model hydrologic assumptions, such as a) that water no longer used for irrigation remains stream channels and is not spread on land, and b) that native vegetation is mainly upland and non-phreatophytic, affect rates and quality of recharge. As no new water-spreading facilities or programs were suggested by stakeholders for this analysis, the first assumption is reasonable. Without such facilities, the second assumption is probably also reasonable for the large majority of the land area."
4	ES	Executive Summary	ES-4+D24	Debbie Webster	Regarding time series maps: The outlining feels like the scenarios have a different weight and are less defined. If it is not a lot of work, being consistent between both scenarios would be useful.	This report emphasizes the extreme scenario. The baseline images are included for comparison. The outlines and gray background of the AID MZ Model area are inconsequential
5	--	Introduction	1	Thomas Harter	Regarding third bullet: What is native vegetation and what is the ET from that? Is ET only from precipitation or also from groundwater? (I assume this relates to L 870?)	Now specifies, "Rain-fed, non-phreatophytic, native vegetation"
6	--	Introduction	1	Debbie Webster	Regarding last bullet: This wasn't in the Executive Summary; probably should be. That said, this likely to generate additional questions such as if all that happened was a limited ag pump and fertilize with high nitrate water, what would happen?	Text modified to match the Executive Summary. Additional scenarios are being contemplated to incorporate NIMS management actions.
7	1	Extreme Management Scenario - GW Flow & Transport Model ("Model")	4	CWC	General: As part of the introduction add a comment on whether this analysis addresses existing nitrate in the vadose zone.	Legacy loading, or residual N or salts in the vadose zone, are not accounted for in the AID modeling. However, the model conservatively handles N or salt mass moving past the root zone (i.e., output from SWAT model) by treating it as an instantaneous input to groundwater at the uppermost saturated layer of the groundwater flow model.

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8	1	Model	4	Thomas Harter	General: Since the SWAT model feeds the groundwater model, I suggest that Sections 1 and 2 are reported in reverse (SWAT first, then the groundwater analysis)	We discussed this and decided to keep the section in the same order.
9	1	Model	4	Thomas Harter	Regarding first bullet on the page: How were 39 land-use classes converted to 2, in other words which of the 39 became RNG and which became FEUR?	Comment incorporated
10	1	Model	4	Thomas Harter	Regarding paragraph following bullets: I cannot recall (or quickly find) information on the AID MZ groundwater model and whether it was steady-state or transient. Please include a short statement to recall whether the flow model is steady-state or transient, and if it is transient and also for the transient transport experiment, state the time-frame considered. Switching to these new recharge values would drastically change the water budget, possibly water levels and flow direction in the region, especially under steady-state conditions. These changes should be described so that the transport simulations outcomes can be better understood. Some of this may go into the Results section, but here, please address how this (drastic) changes are handled such that the model is still conceptually viable. For example, if the model is steady-state flow, then how does the net effect of almost no pumping and almost no recharge (net reduction in outflow or inflow across the basin?) balanced by reduction/increase in flows across other boundaries? (e.g., as part of L 184 - 188)	Footnote added
11	1	Model	5	Thomas Harter	Regarding last two sentences in main paragraph on page: Move this to the Results section.	Comment noted
12	1	Model	5	Glenn Meeks	Regarding first sentence in last paragraph on page: What component is the major recharge component into the system? Precipitation or stream leakage?	The major recharge component for the extreme scenario is precipitation.

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13	1	Model	6	CWC	Regarding Section 1.1 -there are two types of analysis in this paper – the first is the mass balance approach where you look at the aid area as a whole and describe what is happening. The second (section 1.3) uses a different transport simulation model that looks at concentration by cells within aid allowing for showing how concentration in different areas of aid change over time. Have these two models been reconciled? – does the total of all areas in the transport model equal the results in the mass balance model? Also the mass balance approach first looks at a snapshot in time, presumably current situation, but later figures in section 1.2.3 looks at changes over time. What is missing in this paper is an explanation of what causes horizontal flux and gw pumping mass changes over time.	Yes – these two approaches have been reconciled. These two approaches offer two different methods of understanding what happens with salt and nitrate, with the second approach allowing for the view into the future up to 100 years later using the same recharge conditions while still allowing for the spatial discretization that illustrates spatially where concentrations are reduced or increased
14	1	Model	6	CWC	Regarding Section 1.2 - There is a volume deficit under the three non-extreme scenarios – is this made up from a combination of gw flow from adjacent areas and overdraft? How does application of surface water in aid factor in to this mass balance?	Because this AID MZ Model is a steady-state model, there is no change in overall storage for the entire model area. Within the AID MZ, however, there is a deficit representing the study period (WY 1991-2000), which results in groundwater flowing into the AID MZ from other areas. Surface water is not applied in the extreme scenario because there is no applied water in the extreme scenario.
15	1	Model	6	Thomas Harter	All mass balance / flux tables in Section 1.2: these are averaged over which (transient) simulation time period? (this comment does not apply to steady-state flow simulations, if that is what was done).	Steady state flow model
16	1	Model	6	Thomas Harter	Regarding Tables 2-4: Excellent Tables to show! Relative to Scenario 3, net groundwater recharge (recharge minus pumping) from the ag landscape changes from about -85,000 af/y (net use) to about +8,000 af/y (net recharge). Relative to Scenario 3, this change in net recharge would result in significant downward and outward movement of groundwater from AID, despite the fact that actual recharge decreases by about 50% (from Scenario 3 to no-ag), or does it go somewhere else?	Yes, as seen in the following tables with horizontal and vertical flow components

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17	1	Model	7	Glenn Meeks	Regarding Table 3, Recharge NO_3-N value in Extreme No-Ag column: Is this naturally occurring nitrate?	Further clarification added: In the RNGE class, sources of nitrate and TDS include the following: • TDS: Salt-free water is extremely corrosive and rare in nature. Precipitation is actually a weak carbonic acid solution. Terrestrial and soil water pick up solutes from dissolution of minerals, organic matter decomposition, atmospheric and soil carbon dioxide, animal waste, and the like. • Nitrate: Nitrogen-free root zones are also rare in nature, and if nitrogen is present, some will cycle to the nitrate form, and can be leached during naturally wet periods. Nitrogen sources include atmospheric deposition, nitrogen fixation (e.g., by legumes or free-living microbes), animal waste, and organic nitrogen mineralization.
18	1	Model	7	Glenn Meeks	Regarding Table 4, Recharge TDS value in Extreme No-Ag column: Is recharge only precipitation or does it include horizontal flux. And if so, is the TDS associated with dissolution of salinity from the vadose zone? Or is recharge predominantly from horizontal groundwater flux from outside the area (from the east and north)? The report should discuss the sources assumed.	Recharge is the deep percolation that originates from the SWAT model output.
19	1	Model	7	Thomas Harter	Regarding "recharge volume" in first sentence of last paragraph on page: Good discussion. Also note: nitrate-N loading changes from a net of about 5,000 tons/yr (Scenario 3) to 300 ton/yr (almost 20 fold reduction). Net salt flux from 45,000 tons/yr (Scenario 3) to 8,000 tons/yr (5-fold reduction). Given that total recharge is reduced by 2-fold (Scenario 3 to no-ag), average recharge concentrations of nitrate decreases 10-fold and of salt about 2.5 fold. This may important to note to also explain future groundwater concentrations. Also see comment above about validating these concentrations against measured values in existing undisturbed natural lands.	That is a good way of looking at it, text added to highlight this in a new footnote.
20	1	Model	7	Glenn Meeks	Regarding second sentence of last paragraph on page: Also includes a significant reduction in groundwater pumping, leaving a net inflow of water into the upper groundwater system.	See paragraph below about the role of reduced groundwater pumping.

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21	1	Model	8	Thomas Harter	Regarding last paragraph before Section 1.2.1: This may be misleading: as stated, I read this to mean that TDS and nitrate are now "stuck" in the AID groundwater, since much less pumping occurs. Yet, assuming a steady-state flow situation, the (smaller) recharge with the lower nitrate and salt concentration still leaves the AID groundwater at its lateral boundaries.	The whole model is steady state, not AID itself
22	1	Model	8	Glenn Meeks	Regarding sentence, "The reduction in groundwater pumping means that less nitrate and TDS mass leaves the system." in last paragraph before Section 1.2.1: But isn't more groundwater volume accumulating thereby reducing the overall average concentration?	The gw pumping allows for the removal of existing nitrate and TDS mass that is already present in the aquifer system.
23	1	Model	8	CWC	Regarding Section 1.2.1: Add a quick explanation of why flux from the north is not included.	The shape of the AID Management Zone is triangular, so there are really only three sides to develop fluxes (east, west, and south)
24	1	Model	8	Thomas Harter	Regarding Table 5: There appears to be about 55,000 afy net lateral inflow under no-ag instead of about 45,000 under Scenario 3. Given that net recharge under no-ag is almost 100,00 af/y larger than in Scenario 3, how can there also be more lateral inflow into the AID groundwater zone? I would have expected net horizontal flows to increase outwardly (total is more negative). Between Table 2 and Table 5, the total water balance under no-ag is a net accumulation of water within AID relative to scenario 3. Why is that? Please add an explanation after Line 283.	The whole model is steady state, not AID itself
25	1	Model	8	Debbie Webster	Regarding Table 5: Recommend moving column after scenario 3 in all the charts	This report is for the Extreme Scenario – the additional columns are provided for comparison's sake
26	1	Model	10	CWC	Regarding the following sentence in main paragraph on page: "The extreme no-agriculture scenario results in slightly more flow entering AID from the east, likely due to a reduction in agricultural pumping allowing more groundwater to be available to enter AID". How does less pumping result in more import of gw?	A reduction in groundwater pumping outside of AID means that more groundwater is available (not being removed) and able to flow to the west into AID
27	1	Model	10	CWC	Regarding the following sentence in main paragraph on page: "The extreme no-agriculture scenario results in slightly more flow entering AID from the west, and slightly more groundwater flow leaving AID to the south compared to baseline conditions, but not as much as is seen in Scenarios 1 and 3". Explain why.	There is a different flow regime for the extreme scenario compared to Scenarios 1 and 3 – the groundwater pumping and the groundwater recharge are both significantly reduced in the extreme scenario.

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28	1	Model	10	CWC	Regarding main paragraph on page: Since the extreme scenario only applies to aid, the movement of water, nitrate and tds from outside of aid does not change much. What does change is that the reduced pumping in aid from the extreme scenario does impact the flow in and out of aid in some way that needs to be explained.	No, the extreme scenario applies to the entire Model Area.
29	1	Model	10	Glenn Meeks	Regarding Section 1.2.2: Are these all annual values?	The units in the tables are provide as AFY.
30	1	Model	10	Glenn Meeks	Regarding "the upper three vertical units constitute the 'production zone'" at the top of the page: This doesn't seem consistent with the higher resolution work. Isn't the production zone the volume-weighted average of the entire Lower and the Upper zones?	For this transport modeling analysis, the production zone is defined by particular model layers as described in the footnote and is consistent with the previous AID Report.
31	1	Model	12	Thomas Harter	Regarding paragraph after Table 10: If there is more water flowing downward, then where does it go? Also, can you account for the differences by comparing the change in downward fluxes between Scenario 3 and no-ag to the fluxes through groundwater pumping in Scenario 3 (they should be about the same, if the increase in downward fluxes is in fact due to the removal of pumping in the no-ag scenario)? Comparing Table 3 and Table 9: Between Scenario 3 and No-Ag, there is decrease of N in recharge of about 4,500 tons N/yr. Yet there is an increase of 400 tons N/yr flowing from Layer 1 to Layer 2. Similarly, for TDS mass flux (Table 4 and 10), the recharge reduction is about 40,000 tons/yr, but flux from Layer 1 to Layer 2 increase by 15,000 ton/yr. Why is that? Seems inconsistent.	The entire flow model's hydrology has changed between the two models so it is difficult to make these comparisons on the subset of cells that comprise the AID MZ. Attempts in the text were made to compare what is going on within AID alone, as that was the focus of the analysis, but AID remains influenced by neighboring flows and mass fluxes.
32	1	Model	12-13	Thomas Harter	Regarding paragraph before Figure 2 (page 13): Figure 2 indicates that No Ag leads to 150,000 tons/100yrs less N stored under AID, or about 1,500 less N/yr when compared to Scenario 3. Yet, the No-Ag has 4,500 tons N/yr less coming in by recharge alone (compared to Scenario 3). This seems odd from a mass balance perspective. Similarly, the increase in salt storage seems odd. Please explain. The root of this is related to the previous question, where the water goes and why.	The time series mass flux (Section 1.2.3) is based on transport results over 100 years using the flow vectors from the steady-state model. Therefore, the flow of water in and out of AID remains the same over the 100 years, but the salt and nitrate mass fluxes in and out of AID change due to changes in concentration of all the model cells (except for the general head boundaries, which have fixed ambient concentrations) over the 100 years.
33	1	Model	14	CWC	Section 1.2.3 - Regarding sentence, "The amount of mass associated with lateral flow and pumping wells changes over time as the ambient groundwater concentration in the subsurface changes over time" in main paragraph on page: This needs more explanation. Mass associated with well pumping changes with the ambient gw concentration, but why does lateral flow mass change with aid ambient conditions?	For the spatial time-series mass flux transport analysis in Section 1.2.3, lateral mass in and out of AID is influenced by the ambient groundwater concentration locally near the border.

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34	1	Model	18	Glenn Meeks	Regarding Figure 7: What is the main source of the in the recharge component?	Further clarification added: In the RNGE class, sources of nitrate and TDS include the following: • TDS: Salt-free water is extremely corrosive and rare in nature. Precipitation is actually a weak carbonic acid solution. Terrestrial and soil water pick up solutes from dissolution of minerals, organic matter decomposition, atmospheric and soil carbon dioxide, animal waste, and the like. • Nitrate: Nitrogen-free root zones are also rare in nature, and if nitrogen is present, some will cycle to the nitrate form, and can be leached during naturally wet periods. Nitrogen sources include atmospheric deposition, nitrogen fixation (e.g., by legumes or free-living microbes), animal waste, and organic nitrogen mineralization.
35	1	Model	19	CWC	Section 1.2.4, Horizontal Movement bullet - Regarding, "The extreme no-agriculture scenario produces higher horizontal water fluxes in all directions compared to baseline, and less horizontal water fluxes from the west and to the south compared to Scenarios 1 and 3. The extreme no-agriculture scenario has more nitrate flux compared to baseline and Scenario 2 for movement from the west and to the south, but less than Scenarios 1 and 3." Explain what the reason is for this.	The hydrology and mass loadings have changed from Baseline Conditions/Scenario 2 and Scenarios 1/3. The hydrology and mass loadings have undergone further changes for the Extreme Scenario, resulting in the statements above. So the flux through different boundaries is governed by: 1) existing ambient groundwater quality along the borders and inside of AID, and 2) the hydraulic gradients controlling flow directions and amounts along the border of AID (which is inherently a result of the spatial distribution and amount of recharge and pumping).
36	1	Model	20	Glenn Meeks	Regarding last sentence in Horizontal Movement bullet: Why? Need to explain in the other movement bullet items.	This has to do with the hydrology of the extreme scenario's flow regime. More flow occurs from the east that allows for existing TDS mass from the east to enter into AID.
37	1	Model	20	Thomas Harter	Regarding Figure 8: The pie charts (like the previous tables and figures) are an excellent idea! When these graphs and tables are not representing time lines, it would be useful to identify, in the figure/table caption, which time period is represented by the graph.	These pie charts represent the mass and water fluxes at the initial time of each scenario – text added to captions.
38	1	Model	20-21	Thomas Harter	Regarding Figures 8 and 9: The water flux under baseline indicates a net overdraft situation. Under No-Ag a net surplus of water (so these simulations must not be steady-state). Under No-Ag, there appears to be an infilling of a cone of depression under AID from West, East, and Recharge (net inflow). Salt and nitrate inflow from the East appears the key reason why the aquifer system is not cleaning out.	Noted

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39	1	Model	23	Thomas Harter	Regarding Figure 10: It is not clear to me, why nitrate at first encountered groundwater does not decrease more, given the much lower nitrate concentration in recharge (there is still 30-50 years worth of baseline or Scenario 3 recharge in the 100 years of No-Ag). In the Upper Zone, why is there not more of a dilution effect? Assuming downward piston flow, at 0.1 ft/yr of recharge over 100 years and an effective porosity of 10% - 20%, the upper 50 ft to 100 ft of No-Ag scenario groundwater would represent the new post-ag, natural recharge nitrate concentrations. Why are nitrate concentrations not changing more in the Upper Zone? Same could be asked for the salt concentrations.	This is due to relatively slow velocity vectors in the subsurface.
40	1	Model	23-24	Tim Moore	The multi-cell tabular pictograms shown in Figure 10 and Figure 11 are interesting and informative. We should definitely keep them. But, I am also looking for way to express the same concepts in a numeric graph. Attached is a one-page PDF file with my suggestion. We can use cumulative distribution function graphs to characterize the range of nitrate (or TDS) concentrations in a given volume of groundwater. Different colored lines can represent different sub-sections of the same sub-basin (e.g. upper, lower & production zone) as shown in the upper graph. Or, different colored lines can be used to show how different management strategies are expected to alter groundwater quality in the same MZ over time. Obviously, we can mix and match: sub-zones, management strategies, and time elements in these graphs. They have the advantage of being quickly able to see subtle changes ("bending the curve") that are difficult to discern in the pictograms. And, they also help capture the concept of "volume-weighted" concentrations. The AID management zone is already carved up into one-quarter mile cells. And, I'm sure Vicki has already calculated the volume associated with upper, lower and production zones for each cell. If the cells were rank-ordered based on the average nitrate concentration in the production zone, then it would be easy to derive the X-axis values as a proportion of the total water volume in the MZ....This approach may also help us create sub-zones (areas within a management zone) that might serve as salt sinks in order to better protect the other adjacent areas in the same management zone.	We constructed cumulative distribution function graphs based on zone, constituent, and time and provided them to Tim Moore in a memorandum. This memorandum is attached to the final report as Appendix F.

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41	1	Model	25	Thomas Harter	Regarding paragraph at top of page: Further explain why nitrate concentrations do not decrease more rapidly and why salt concentrations increase. See previous comment/questions	This is due to relatively slow velocity vectors in the subsurface
42	1	Model	25	CWC	Regarding following sentence in paragraph at top of the page: “Although the simulated volume-weighted average nitrate concentration in the first encountered groundwater zone is still above the MCL of 10 mg/L as N, the huge reduction in nitrate mass does result in overall improvement in all groundwater zones in the long-term.” Explain why this is the case.	It is because high nitrate concentrations already exist in the subsurface and it takes decades to see improvement.
43	1	Model	25	Glenn Meeks	Regarding Table 11: Why does Nitrate start going up after 40 years of no ag? Is it just a modeling uncertainty and these values are essentially the same concentration?	These values are very similar, the model is attempting to approach equilibrium via flow through the system and the boundaries (the steady-state model boundaries that do not change in flow or concentration)
44	1	Model	25	Debbie Webster	Regarding "baseline (10 yr) loading) in Table 11: I am not sure what this is again. Tried to search for it in the text above, but couldn’t find. Does it make sense to include this in a separate table or for each of the scenarios?	Good comment – footnote added to describe the 10-year loading scenarios
45	1	Model	26	Debbie Webster	Regarding Figure 13: I am understanding how the graph from day 0 could work for all but extreme ag scenario. I have been wondering throughout the report on this proportionately large drop in the first 5 years for the and this graph really brought home my questions. Probably would be a good thing to explain to the exec committee	The graph doesn’t start at day zero. The upper zone is effected more by the reduction in the nitrate mass loading in the extreme scenario compared to other scenarios
46	1	Model	30	Glenn Meeks	Regarding Table 14: Over a much longer time, wouldn’t this reach a quasi equilibrium at the average concentration of the flu into the system?	Yes
47	1	Model	35	Debbie Webster	Regarding Section 1.4: I am finding this section really interesting, but definitely have some questions to further explain the graphs. This can happen in the exec meeting or, if you want a head’s up, let me know and I can try for Friday or early next week.	The variability seen in the different municipal wells has a lot to do with the spatial variability of ambient concentrations PLUS changes in mass loadings in the vicinity. We can discuss this further at the next agreed-upon opportunity.
48	1	Model	36	CWC	Regarding Section 1.4.1: The figures for Cutler and Orosi have a different pattern that the other three communities. Please explain why there is a leveling off at a constant rate compared to the other three that are more variable.	This is due to their spatial location – there are areas within AID where groundwater quality changes throughout the entire 100 years simulation, and other places where equilibrium is reached much earlier. This is a result of the hydrology and mass fluxes spatially.

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49	1	Model	36	Glenn Meeks	Regarding Figure 22: Why does well CDPH 1000728 continue to increase in nitrate concentration when the Ag source of nitrate goes away? Wouldn't this ultimately reduce as the higher nitrate groundwater zone continues to move west and south?	A reduction in nitrate is not noticed in this well on this time scale, due to existing ambient nitrate in the aquifer system. Over time as the cleaner no-ag water flushes down through the strata, we would expect to see this well's nitrate concentration decrease.
50	1	Model	43	Glenn Meeks	Regarding Figure 25: Why the increase in well CDPH 1001601 for the Extreme No Ag Scenario from 2016 on? Is it due to location? Ultimately wouldn't this well decrease in nitrate concentrations?	Same comment as above re spatial variability
51	1	Model	44	Glenn Meeks	Regarding Figure 26: Why do some wells increase than decrease then flatten out at different concentrations? Is it based on location? Wouldn't there be an average concentration that would ultimately reach equilibrium for the system?	Same response as above
52	1	Model	48	Thomas Harter	Regarding Figures 30-34: The same questions that apply to the time series maps Figures 10, 11 (see above) apply to the assimilative capacity maps in Section 1.5 (Line 783 and following).	This is due to relatively slow velocity vectors in the subsurface.
53	1	Model	48	Glenn Meeks	Regarding following sentence, "Simulated assimilative capacity for TDS decreases in the center of AID in the long-term for the upper zone and a small area of the production groundwater zone." in paragraph below Figure 30: Is this because of less recharge from agriculture and less pumping?	Yes
54	1	Model	54	Glenn Meeks	Regarding following finding in last sentence in top paragraph, "however, the lower zone shows greater rates of degradation over time compared to baseline conditions and the three other management Scenarios": Need to explain why. Because of less pumping and more flow downward into the Lower Zone from the Upper Zone.	Comment incorporated
55	2	Development of Surface Loading Rates for the Extreme Scenario ("SW Loading Rates")	55	Thomas Harter	Regarding Section 2.1: How were 39 land-use classes converted to 2, in other words which of the 39 became RNG and which became FEUR?	Similar response as above. Text revised.

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56	2	SW Loading Rates	55	Debbie Webster	Regarding reference to Figure 37: For the very large portion of land mass abutting the foothills that shows in blue in the (a) portion of the figure, what is being grown here now? I just can't tell from the color chart and didn't think that there was a big change in practices there. If it is the same (range) I recommend using the same color. Otherwise, does the model change the loading of those two in any way?	This area is RNGE in both runs, as indicated in the legends. There is no change in management.
57	2	SW Loading Rates	59	Glenn Meeks	Regarding, "The salt load becomes tiny, and is primarily delivered in precipitation": TDS from the atmosphere or dissolution of salts in the vadose zone.	Further clarification added: In the RNGE class, sources of nitrate and TDS include the following: TDS: Salt-free water is extremely corrosive and rare in nature. Precipitation is actually a weak carbonic acid solution. Terrestrial and soil water pick up solutes from dissolution of minerals, organic matter decomposition, atmospheric and soil carbon dioxide, animal waste, and the like. Nitrate: Nitrogen-free root zones are also rare in nature, and if nitrogen is present, some will cycle to the nitrate form, and can be leached during naturally wet periods. Nitrogen sources include atmospheric deposition, nitrogen fixation (e.g., by legumes or free-living microbes), animal waste, and organic nitrogen mineralization.
58	2	SW Loading Rates	59	Glenn Meeks	Regarding, "Therefore, a different post process calculation was employed (TDS post-process run 2, or Run 2).": Does this introduce errors due to things being calculated a different way than in the other Scenarios?	The effect of the change is discussed on the following page.
59	2	SW Loading Rates	59	Thomas Harter	Regarding the equation: Why does IRR still occur in the equation - there is neither IRR nor GWTDS under the extreme scenario?	The equation is general and accommodated irrigation. Where irrigation is absent, the IRR term is zero.
60	2	SW Loading Rates	60	Thomas Harter	Regarding Section 2.3, first sentence: Figure 38 shows the case of managed crop (Run 1?). Can a second graph be added that shows the fluxes for RNG (Run 2?)?	Figure 38 is for Run 2. As noted previously, for non-irrigated areas, some of the terms are zero.

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61	2	SW Loading Rates	60	Thomas Harter	Regarding bullets: It is no clear to me why Run 1 and Run 2 are applied to all Scenarios. I thought, based on the previous page, that the first equation (Run 1) was applied to the irrigated scenarios, but the second equation (Run 2) would only be applied to the extreme, no-ag and no-irrigation scenario? I don't understand what this part is saying or what it means?	Explanatory text added: "The two methods (Run 1 and Run 2) are simply two different ways of estimating salt load. Run 1 worked well for scenarios in which most of the salt came from irrigation, but was unsuitable to analyze a landscape dominated by non-irrigated land use. This obliged development of a more complex post process to handle this situation. Although the Run 2 method handles non-irrigated lands, it can also be applied to irrigated scenarios. We applied to all four scenarios (and present results here) because 1) in this appendix, we are comparing results of Extreme and other scenarios, and therefore need to use consistent methods for this comparison, and 2) the comparison illustrates that while results of Run 1 and Run 2 methods are not the same, they are quite similar. This ties the Extreme Scenario analysis back to the main AID analyses in terms of general consistency."
62	2	SW Loading Rates	61	Glenn Meeks	Regarding Table 17: Why the variability in TDS values?	Explanatory text added: "Variability in the output is due to variations in land management, as well as soil, topographic, and climatic conditions, as would be expected from a model that considers all of these factors."
63	2	SW Loading Rates	61	Thomas Harter	Regarding Table 17: What is the explanation for the maximum value of nitrate and TDS loading (MAX) in Table 17, last row, "Extreme"? Also in Figures 49, 50.	See response to previous comment
64	2	SW Loading Rates	62	Thomas Harter	Regarding first bullet at top of the page: Should this be "< 0.15 f/y" instead of "> 0.15 f/y"? If this is correct as written, why so high?	Good catch, comment incorporated
65	2	SW Loading Rates	62	Glenn Meeks	Regarding second bullet at top of page: We might want to talk about the source of this minor nitrate amount. Naturally occurring? From POTWs, From Smog? Also shouldn't this be a less than sign?	Good catch. Comment incorporated. Also, while no irrigation water or fertilizer is applied in the RNGE class, it is in the FEUR class. So, the Extreme scenario is not without fertilizer or irrigation.
66	2	SW Loading Rates	62	Harter & Webster	Regarding second bullet at top of page: Same here: "< 25 lb/a-y"? If this is correct as written, where does the N come from?	Yes and thanks
67	2	SW Loading Rates	62	Glenn Meeks	Regarding third bullet at top of page: Same comment as above. Should discuss source of the TDS. River water salt load? Naturally occurring marine sediments and rock material? Urban runoff? Also shouldn't this be a less than sign?	Yes and thanks

Comment No.	Section No.	Original Section Title	Original Page Number	Commenter	Comment	Response
68	2	SW Loading Rates	62	Thomas Harter	Regarding second paragraph: can you validate this distribution of percolation, N, and salt fluxes under non-irrigated landscapes (extreme scenario) with any literature from research in non-irrigated native vegetation regions in this	SWAT is highly validated. We were not scoped to validate individual class results with observations from the literature, but rather to provide reasonable loading estimates for this groundwater modeling effort. However, this is a very reasonable suggestion, and merits follow-up by parties scoped to do such work.
69	2	SW Loading Rates	62	Thomas Harter	Regarding end of Section: Please provide more detailed explanation for why some of the loadings are relatively higher (see comment above). And also explain what that means for concentration of nitrate and salt in recharge to groundwater and whether these data are comparable to leaching of nitrate and salts found in today's natural rangelands of the San Joaquin Valley (without cattle farming on them). Such validation in some form seems important to provide model confidence.	See response above to comments on this page.
70	2	SW Loading Rates	64	Debbie Webster	Regarding Figure 41: Is there a crop type for the orange box at the top of the legend?	Figure 41 refers to grid cell loads. Loads onto grid cells are the summation of all sources, regardless of land cover class (i.e., crop type). So, no, there is not crop type specified.