#	Comment Provider	Comment	Response
1	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	*Question 1: In your assessment, do the modeling results adequately estimate the relatively contribution from vehicle brake pad wear debris to copper levels in the San Francisco Bay? What improvements, if any, do you recommend for the presentation of results?* It appears to me that the total amount of copper generated from the brake pad wear debris can be estimated from the total number of cars and trucks registered in local governments that are associated with each watershed and the average wearing rate. Of course, some of the debris may never come to the San Francisco Bay, but in general, the majority of the debris will come to the bay sooner or later. With this information, the relatively contribution from brake pad wear debris can be further confirmed. For example, if URS found that 90% of the debris generated comes to the bay, then the relative contribution would be more convincing. This information should be relatively easy to obtain and very useful.	Comment noted. The work described by the commentor is a watershed modeling issue and not within URS's scope of work. This comment should be addressed in the watershed model study.

#	Comment Provider	Comment	Response
2	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	*Question 2: In your assessment, do the modeled results adequately present the level of uncertainty involved in the amount of copper from vehicle brake pad wear debris that is present in the bay? Do the modeled results adequately represent the uncertainty in the relative contribution of copper in the bay from brake pad wear debris and from non-brake pad copper sources?* The exchange of sediment (and thus, absorbed copper) between those in the water column and those in the sediment bed has not clearly described. Unlike other processes, how these sediment transport parameters were selected has not been spell out in the draft report neither. This leads to a big uncertainty on the modeling effort regarding the amount of copper released from buried sediment during erosion events and the amount deposit on the sea floor and later buried (during calm weather conditions). This reviewer has suggested at an early review that these sediment parameters should be acquired via in-situ measurements to provide a reasonable range for uses, at least for two of the three important parameters (erosion rate, critical bed shear stress for erosion and settling velocity). It appears that these parameters are still selected arbitrary. Even the sensitivity study to demonstrate the relatively importance of each sediment parameter is not performed.	The Bay model was principally calibrated for dissolved copper, not sediment. However, the sediment parametners were not selected arbitrarily. A previous Bay model study (URS 2003) did calibrate for SSC by adjusing settling velocity, critical velocity, and resuspension rate. These resulting sediment parameters, which also agreed with published values, were used in the BPP Bay model. The sediment parameters were not selected arbitrarily. It was determined during development of the work plan for this study that in-situ measurements of sediment parameters were not possible for the budget and schedule of this study. Although the BPP Bay model was not re-calibrated for SSC, we will add a figure to the final report showing time series plots of measured suspended sediment concentration (SSC) and predicted SSC during 1997. This year is selected because measured and predicted time series data are most readily available for this year. The following text will be added to Section 2.1.2 to describe in more detail the processes modeled by ECO Lab that affect copper: "Adsorption/desorption is the essential link between metals in the aqueous and solid phases. Adsorption is the process by which dissolved metal ions or complexes attach themselves to the surface of particulate matter. Desorption is the detachment of the metal from the particulate surface and its return to the dissolved state. In the ECO Lab Heavy Metal module, adsorption also includes the processes of absorption (incorporation of the metal into the solid phase) and surface precipitation. The second important process is resuspension and sedimentation of particulate matter within the Bay. When metals are sorbed onto the solid phase, their concentration in the water column is partly controlled by the turbulent shear stresses induced by wind, tidal, or fluvial advection. These stresses cause sediments to become resuspended, thereby increasing water-column metals concentrations. Conversely, as turbulence is reduced, the particles and associated metals are again able to settle to the Bay floor as depicted on Figure 14. The third process illustrated in Figure 14 is diffusion of metal-enriched water between the ambient Bay and porewater, depending on the concentration gradient. Diffusion rates are dependent on the chemical environment in the pore spaces of the sediment, which may be significantly different than the overlying water. Adsorption and desorption rate constants are used to represent chemical transformation in the porewater. The final process incorporated into the ECO Lab Heavy Metal module is advection and dispersion of dissolved and adsorbed metals. Both dissolved and adsorbed metals are modeled simultaneously in ECO Lab, and parameters calculated in the simultaneous runs of MIKE 21 HD and ECO Lab govern this process." We did not have enough time to perform a sensitivity analysis on all sediment parameters, though if we were allowed more time, we would have looked at the sensitivity of dissolved and benthic copper to critical velocity and resuspension rate. Section 4.1 describes previous sensitivity analyses (Bessinger et al. 2006), which showed that the dissolved copper concentration was not sensitive to sediment settling velocity.
3	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	Other specific comments: p.2-4., line 3. The flows were scaled down appropriate. What is "appropriate?"	We will revise the text to reflect this clarification by replacing the sentence "The flows were scaled down as appropriate." with "To derive the flows for each of these catchments not included in the subwatersheds, the flows from the nearby subwatersheds were scaled by multiplying them with the ratio of the corresponding catchment area to the subwatershed area."

#	Comment Provider	Comment	Response
4	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	p.2-4. It said that point sources are input with a flow and a concentration. But then a default 0.1 m/s was applied: for marina input, for publicly owned treatment work and industrial point sources, for tributaries. What is this default 0.1 m/s coming from? Why it has a unit of m/s?	We will replace the existing sentence "A default velocity of 0.1 meter per second (m/s) was applied to all flows." with the following text: "Point source inputs to ECO Lab consist of flow, concentration, and velocity data. The flow and concentration are used to determine the copper load, while the velocity is used to provide the flow with initial momentum. A flow velocity of 0.1 meter per second (m/s) was estimated as a reasonably small value compared to the current speeds of the Bay. Because the model grid size is 330 meters or larger, and because the model is not a near-field model, discharge from the source would be quickly mixed." The velocity associated with the point source has units of m/s because these are the units required for input into ECO Lab to give the flow some initial momentum.
5	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	P.2-10. What is the meaning of "Suspended matter can be produced in the water column by primary production." Are we talking about biological production? or how sediment can be produced in the water column? It is hard to under this paragraph.	We will revise the text by adding the word "biological" in front of "primary production".
6	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	p.2-10. It has been shown (e.g., Maa and Kim, 2002) that the sediment erosion rate can be 10 to 50 times different if there is a storm event. For this reason, it is not clear why only the dry season values were applied? At least an average value, weighted by the duration for wet and dry period, should be used.	We will add text to Section 2.1.2.1 (under Sediment Characteristics and Parameters) to clarify why dry season values were applied. The existing text "Dry season values are generally greater than wet season values. The resuspension rates were determined during calibration of a previous model (URS 2003). For this study, dry season values were applied throughout the entire simulation period." will be replaced with the following: "Because the Bay is dominated by high winds and fetch during the dry season, dry season resuspension rates are generally greater than wet season resuspension rates. The resuspension rates were determined during calibration of a previous model (URS 2003). For this study, dry season values were applied throughout the entire simulation period because they provided a better fit to the measured dissolved copper concentrations than the wet season values." We didn't think it was necessary to determine a weighted average based on the duration of wet and dry periods because the dry season values produced good results.

#	COMMENT PROVIDER	COMMENT	RESPONSE
7	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	p. 2-11. There is no settling or density difference to cause vertical gradient for dissolved copper concentration. In general, even with density difference for salty water, the salinity would be rather uniform for shallow water area. For this reason, the argument presented in the paragraph before Sec. 2.2 is not convincing. What is the water depth for those measurement stations?	There may not be any settling or density differences to cause a vertical gradient for dissolved copper, but dissolved copper may still vary throughout the water column due to the differences in suspended sediment concentrations and desorption and adsorption. We will add text to explain why predicted and measured data don't match exactly: "Also, the model output represents concentrations within grid cells that are hundreds of meters on each side, whereas the measured data represents one point in space. Other reasons for the differences between measured and predicted values include the inaccuracy of the model and the lab variability." The depths at which the RMP water quality samples were taken are not specified in the RMP data, but according to the RMP field sampling manual, samples are extracted from approximately 1 to 2 feet into the water column. We will revise the text to describe RMP's procedures regarding sampling depth. "Water samples were collected just below the water surface by the RMP at varying tide levels and at depths varying between approximately 1 to 2 feet, adding to the difficulty of predicting actual conditions (AMS 2001)." Applied Marine Sciences (AMS). 2001. Field Sampling Manual for the Regional Monitoring Program for Trace Substances. February.
8	Jerome Maa, Virginia Institute of Marine Science (October 20, 2007)	p. 4-3. It is not clear why the sensitivity runs for temperature and salinity are necessary. Is it because the ECO lab results showing a significant dependence? This appears conflicted with the statements given in "Forcing" (in P. 2-10).	The sensitivity runs for temperature and salinity demonstrated that the model is not highly sensitive to temperature and salinity, thus it was not necessary to include temperature and salinity forcings in the model for this study. The statements given in Section 2.1.2.1 regarding forcing inputs and those given in Section 4.4 regarding the sensitivity runs do not conflict. Both sections agree that the while forcings may have a strong effect on the ECO Lab results for other metals, the ECO Lab results do not show a significant dependence for dissolved copper in the San Francisco Bay.
1	Brent Topping, U.S. Geological Survey (November 6, 2007)	My general impression is that this is a useful exercise, but it is very hard to know how effectively it can estimate the BPWD contribution to Cu levels in the Bay. First of all, I'm not a modeler, so I can't comment knowledgeably on whether the models are well constructed. However, I'm concerned that the report doesn't effectively disclose what is really being modelled, relative to BPWD. In other words, it seems to me that the driving force between the estimates of "Mid" and "Mid-No-BP" is simply the Aqua Terra 2007 tributary input estimates. I think this should be emphasized more. Or, if I'm wrong, and the authors believe that the hydrodynamics of the South Bay are the determining factor, please ask them to discuss this further.	We agree that both the tributary loads and the hydrodynamics of the South Bay drive copper concentrations. However, the effects of BPWD on copper in the Bay are primarily a function of the tributary loads since the hydrodynamics for the Mid and Mid-No-BP scenarios are unaffected. We will add text to Sections 3.2.1 and 3.2.2 to emphasize this finding. At the end of the second paragraph of Section 3.2.1 and at the end of the second paragraph of Section 3.2.2, we will add the following sentence: "The difference in concentration between the Mid and Mid-No-BP scenarios are primarily attributed to the different tributary loads."

#	Comment Provider	Comment	Response
2	Brent Topping, U.S. Geological Survey (November 6, 2007)	Again, I'm not an expert on the modelling process, but this report seems to focus only on the uncertainty of the model in terms of its sensitivity to certain inputs. I would suggest a lengthy paragraph discussing the uncertainty in determining the effect of BPWD on Cu levels in the Bay. Again, I'd also suggest that the authors acknowledge that much of the uncertainty is likely carried over from the uncertainty in the Aqua Terra 2007 report. I think Figures 24c and 24d dramatically show how much influence these tributary inputs have on the model. I don't believe that the authors adequately expressed their awareness of this in the explanation (Section 4.2, 2nd paragraph).	Please note that Section 4.2 will be revised to reflect the results of the revised sensitivity run, which was modified to remove copper loads from the Delta and to run from WY 1991 to WY 1992. See response to comment #14 from Kelly Moran. We will add a summary paragraph to the end of Section 4 to address factors that may affect the estimated sensitivity of copper levels in the Bay to BPWD. In Section 4.2, paragraph 2, we will revise the existing text to note the influence of the tributary loads on the Bay model. The existing sentence "In the South Bay (Figures 24b through 24d), the results of the two runs are fairly similar. The largest differences between the two models occur during the wet season." will be replaced with "In the South Bay (Figures 24b through 24d), the results clearly show that the change in copper loads has an effect on the dissolved copper concentrations in the South Bay, especially during the wet season when runoff carries most of the BPWD to the Bay." We will add the following paragraph to the end of Section 4.2 to acknowledge that uncertainty from the watershed model is carried over the the Bay model, even though it was not quantified: "The low- and high-level scenarios briefly described in Section 2.2 were modeled as part of the watershed modeling study. The results of these modeled scenarios provided reasonable lower and upper limits of the uncertainty in the tributary loads (AQUA TERRA 2007). This uncertainty, as well as any others inherent in the watershed model, is carried over to the Bay model results. Because these low- and high-level scenarios were not modeled for this Bay modeling study, the uncertainty in dissolved copper concentrations due to the uncertainty in the tributary loads is not quantified. Similarly, uncertainty in atmospheric copper loads estimated by the air deposition model (Atmospheric and Environmental Research 2007) will affect the Bay model results, as well."
3	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 2-6, first full paragraph: The model may not have the capability to incorporate it, but the presence of benthic biota (worms, clams, etc.) can increase the transport of dissolved metals beyond what would be expected through diffusion alone. Please see: http://toxics.usgs.gov/pubs/wri99-4018/Volume2/sectionA/2214_Kuwabara/pdf/2214_Kuwabara.pdf and look at Figure 4 showing the difference between assumptions of diffusion-only versus directly measured flux (with live macroinvertebrates in the sediment).	The Kuwabara reference was provided to URS during development of the Bay model work plan. Transport of dissolved metals due to benthic biota is not explicitly defined in ECO Lab, but it is indirectly included in the overall diffusive flux term.

#	COMMENT PROVIDER	COMMENT	RESPONSE
4	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 2-7, just before the second full paragraph: I don't understand using such as indirect method for determining the copper concentrations is the ocean boundary. If you're citing the SFEI already, why not use their dissolved copper concentrations at site BC20 (well beyond the Golden Gate). The resulting difference is massive (less than 1 µg/L (RMP) vs. 44 µg/L (Table 2). Using assumptions like this are always better than nothing, but when major differences between the calculated value and the observed value appear, changes need to be made. The model does seem to be able to overpower this input: all modelled values for BC20 are at or below 1 µg/L (see Figure 16m). Still, it should be addressed to justify the accuracy of the starting parameters.	The dissolved copper concentration of 44 ug/l and adsorbed copper concentration of 32 ug/l shown in Table 2 were typos. They will be corrected as 0.044 ug/l and 0.032 ug/l, respectively. The correct dissolved copper concentration is consistent with the "less than 1 ug/l" range noted by the commentor. We didn't use the copper concentrations measured at RMP site BC20 because we were trying to represent open oceanic conditions and the Golden Gate station at BC20 could be affected by the Bay. It should be noted that both the values for BC20 and the corrected input values are low.
5	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 2-10, 5th paragraph: This is a reasonable assumption for copper, and the argument could be strengthened by noting that another dissolved metal not studied here (Cd) exhibits considerable dependence on salinity values.	We appreciate the suggestion on how to strengthen the assumption for copper, but will refrain from adding a description of a metal not related to this study to avoid confusing readers.
6	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 2-11, first paragraph in section 2.2, right after "AQUA TERRA 2007:" I would suggest a more specific reference here. Is the Powerpoint presentation I found online really the only published source of this information? If so, could that table of data be copied within this report. It seems like important information to delineate since it likely drives much of the difference between Mid and Mid-No-BP, especially the site-specific differences - assuming the air deposition component is relatively uniform over the whole Bay.	To view the tributary inputs resulting from the watershed model, readers will need to refer to the watershed model report, which is cited here as AQUA TERRA 2007, or contact AQUA TERRA. It is outside URS's scope to provide the watershed model results as part of the Bay model report.
7	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 3-3, third paragraph in section 3.2.2: Table 6 indicates that the Lower South Bay benthic Cu concentration will drop 50% inside of 10 years before stabilizing. Why don't the report authors comment on this dramatic shift?	We didn't report on this dramatic shift because we had didn't have much time to analyze the results shown in Table 6 before submitting the draft to the steering committee. In response to comment #12 from Kelly Moran, we will be expanding the presentation of Table 6 and the related discussion of results. In this expanded discussion, we will note the dramatic shift in the benthic copper concentration of the Lower South Bay, as the commentor has pointed out.
8	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 4-2, second full sentence: "fairly similar" is not a quantitative term, and does not describe what I see. Also, why casually dismiss the "wet season" differences when it is the wet season runoff which would likely bring more BPWD into the Bay.	See response to comment #2 from Brent Topping.
9	Brent Topping, U.S. Geological Survey (November 6, 2007)	page 4-3, after section 4.4: Why not include a plot here to prove the point that Temp/Salinity forcings are not important in determining Cu values?	We didn't include plots because we thought it was enough to describe that the difference between the results with forcings and the results without forcings were small. We will include plots in the final report and include call-outs to the new figure in Sections 2.1.2.1 (under the Forcings sections) and 4.4. [new figure not available yet]
10	Brent Topping, U.S. Geological Survey (November 6, 2007)	Table 2, row for Pacific Ocean Boundary Conditions: See note for page 2-7 for further remarks. Unnecessary assumptions are being made to derive the dissolved value. At the least, use a range of values, as was done for the delta boundary below.	The correct dissolved copper concentration of 0.044 ug/l is consistent with the "less than 1 ug/l" range noted by the commentor. The Pacific Ocean boundary conditions do not have to be revised.

#	COMMENT PROVIDER	COMMENT	RESPONSE
1	Kelly Moran, TDC Environmental (November 9, 2007)	Overview The way the Bay modeling was implemented appears to provide a reasonable estimate of the contribution of copper in vehicle brake pads to copper levels in San Francisco Bay. While we have a few questions about specific elements of the modeling, overall, we believe that the modeling of San Francisco Bay completed by URS is suitable to serve the needs of the BPP.	Comment noted.
2	Kelly Moran, TDC Environmental (November 9, 2007)	Watershed entry points. BASMAA appreciates the BPP's and URS's early response to our query about the selection of the watershed entry point for the Upper Alameda Creek Modeled Watershed. We understand that the typo in Table 3 will be corrected and that the text will be amended to identify the mis-placement of this watershed entry point and to note that the impact of this minor error is believed to be insignificant.	See response to comment #3 from Kirsten for revisions to Table 3. The following paragraph will be added to Section 2.1.1.1 (under Tributary Sources): "During peer review of the draft of this report, a misplacement of Upper Alameda's downstream reach was noted. In the Bay model, the Upper Alameda sub-watershed connects to the Bay via the A11 river entry point. The correct connection point should have been at A12, which is the Alameda Creek Federal Flood Channel mouth. However, the effects of this error would only cover a small area because A11 and A12 are adjacent to each other (separated by 12 330-meter resolution grid cells), and discharges from the entry points are quickly mixed in the Bay."
3	Kelly Moran, TDC Environmental (November 9, 2007)	Lower South Bay watershed entry points. The selections of the locations of the four watershed entry points in the lower South San Francisco Bay is not intuitive and has caused much discussion among BASMAA reviewers. It would be helpful for the report to clarify why the locations of SC1 and SC2 are appropriate and why the other two entry points (SC 3 and SC4) appear to be in the middle of the Bay, rather than on the shoreline.	Figure 3 will be revised represent where the entry points are placed in the model. SC3 and SC4 were moved from their actual locations along the shoreline to a grid cell that is permanently wet. SC1 and SC2 should also have been shown farther away from the shoreline. We will revise Figure 3 so that SC1 and SC2 are shown in the modeled locations. [revised figure not availablet yet] The text in Section 2.1.1.1 (under Tributary Sources), after the existing sentence "Figure 3 shows the locations of the catchment entry points and the various watershed delineations." This sentence will be added: "Some of the entry points were moved from their geographically true locations to prevent placement in a grid cell that was periodically dry."
4	Kelly Moran, TDC Environmental (November 9, 2007)	Mass balance. The mass balance for the lower South Bay (Section 3.2.3) estimates that 99.96 percent of the total copper in the system is in the sediments. What are the implications of this relative to the brake pad copper modeling results?	We will include a discussion of the implications in the final draft of the report.
5	Kelly Moran, TDC Environmental (November 9, 2007)	Modeled benthic copper concentrations. The 10- and 20-year data for lower South Bay in Table 6 and the accompanying discussion in Section 3.2.2 do not appear to match the results in Figure 19. The table shows lower South Bay concentrations decreasing from the initial model concentration, while the figures appear to show increases.	The South Bay results shown in the table and plots conflict because the table represents area-averaged results (many grid cells), while the plots represents results from one grid cell. In the South Bay, some grid cells increase in bethic copper, while others decrease. It appears that benthic copper tends to increase at channel sites and decrease at mudflat sites. We will add a Coyote Creek mudflat site as another site of interest and present the dissolved and benthic copper results for this site to show that benthic copper is increasing and decreasing in this area. Also, instead of relying on the results of just one grid cell, more area-averaged results will be shown for various subsections of the Bay to provide a more holistic picture. See response to comment #12 from Kelly Moran.

#	COMMENT PROVIDER	COMMENT	RESPONSE
6	Kelly Moran, TDC Environmental (November 9, 2007)	We believe that the following changes would improve the usefulness and clarity of the report: Add description to enhance credibility of BPP-conducted studies. In Section One, it would be helpful to provide a short explanation of the framework of the BPP studies (i.e., the boxes in Figure 1) that identifies the studies that were specifically prepared to provide input data for this Bay modeling report. We believe that is important to explain that the BPP studies were completed with the cooperative oversight of the BPP Steering Committee and were peer reviewed by the BPP Scientific Advisory Team. The cooperative approach to preparation of these input data distinguishes the BPP-supplied studies from other information sources that happen to have relevance to this work. The cooperative approach and the peer review lend credibility to the BPP-supplied inputs. When BPP-funded studies are mentioned for the first time in the body of the report, it would be helpful to identify them as BPP studies.	The following text will be added to Section 1: "The air deposition and watershed modeling studies were specifically prepared to provide input data for the Bay modeling. The air deposition modeling study estimated the amount of copper from BPWD and other air releases of copper that are deposited in the watershed. The watershed modeling study estimated the relative amount of copper from BPWD that is discharged from the watershed in runoff to the Bay." "The BPP studies were completed with the cooperative oversight of the BPP Steering Committee and were peer reviewed by the BPP Scientific Advisory Team." In Section 2.1.1.1 (under Precipitation), first sentence, the words "BPP study's" will be inserted in front of "watershed model". In Section 2.1.2.1 (under Air Deposition), first sentence, the wrods "BPP study's" will be inserted in front of "air deposition model".
7	Kelly Moran, TDC Environmental (November 9, 2007)	Add description to enhance credibility of previous related Bay modeling. This modeling relies heavily on previous modeling completed by URS. The previous modeling was subject to extensive peer review. In Section One, it would be very helpful to briefly summarize the context and review process for the previous modeling, which will enhance its credibility among readers who are not familiar with that work.	The following paragraph will be added to the end of Section 1. "The Bay model for this BPP study is largely built upon a previous Bay model that was developed by URS for the Proposed San Francisco International Airport (SFO) Runway Configuration Project (URS 2003). The calibration and verification of this previous model were subject to extensive peer review (NOAA 2003). The BPP Steering Committee elected to use this model with the understanding that it would be modified as necessary for the BPP study." Commentors should be aware that CDs of the SFO Runway Configuration Project Technical Report are available from URS upon request.
8	Kelly Moran, TDC Environmental (November 9, 2007)	Note that wastewater discharge copper form assumption is conservative (page 2-8). We suggest substituting "conservatively assumed" for "assumed" in the last sentence in the first full paragraph on page 2-8. This would clarify that copper in wastewater discharges is usually somewhat less than 100% dissolved.	We will revise the text as suggested by the commentor.
9	Kelly Moran, TDC Environmental (November 9, 2007)	Explain why dry season calibration parameters were used (page 2-11, first paragraph). The report would be improved if it included a more detailed explanation of the rationale for using 1997 dry season calibration parameters (rather than wet season parameters or averages). Would this selection affect instances of poorer fit noted in the next paragraph (which seem to mostly be wet season)?	See response to comment #6 from Jerome Maa. There aren't enough measured concentrations to support analysis of seasonal trends in the calibration (four wet season vs. two dry season observations).
10	Kelly Moran, TDC Environmental (November 9, 2007)	Clarify transect placement (page 3-1). Please clarify if all transects are west to east shore, or is Golden Gate transect from Marin to San Francisco?	The following sentence in Section 3.1 "Each of these transects extends linearly from one shoreline to the opposite shoreline and represents a site of interest." will be replace with "Most of the transects extends linearly from the western shoreline to the eastern shoreline, but the Golden Gate and San Pablo Bay transect extends from the northern shoreline to the southern shoreline. A grid cell along each transect represents a site of interest."

#	Comment Provider	Comment	Response
11	Kelly Moran, TDC Environmental (November 9, 2007)	<u>Data presentation</u>. In addition to the figures presenting modeling results, a few tables with numbers are needed to assist the reader in evaluating and interpreting the relative significance of the brake pad copper to different segments of the Bay. Such numeric summaries will make the information in this report more accessible for future users. We recommend three types of new summary tables below. If the specific formats we suggest are costly, we would appreciate the team's consideration of less costly methods of presenting quantitative results that address these needs. 1. *Relative contribution of brake pads to water column copper concentrations*. Prepare a table analogous to BPP watershed modeling report Table 3.4. For each of the 11 stations in Figure 18, the table should present: a) the relative range of wet weather dissolved copper contribution from brake pads b) the percent that the brake pad copper increment represents of the ambient concentration range at each station These ranges would of course have to be somewhat qualitative and may require "best professional judgment" in selection. However, some summary like this is needed to help inform data interpretation and assist with more extensive station-by-station, and/or Bay segment-by-segment discussion of the results in Section 3. Without this level of information, it is challenging to evaluate the technical robustness of qualitative statements in the report (i.e., statements like that in the second paragraph of Section 3.2.1, which provides an the analysis of the relative importance of brake pad copper, but relies on information not currently available to the reader).	We will try to provide the requested information in a table similar to the one shown at the end of this document. [revised table not available yet]

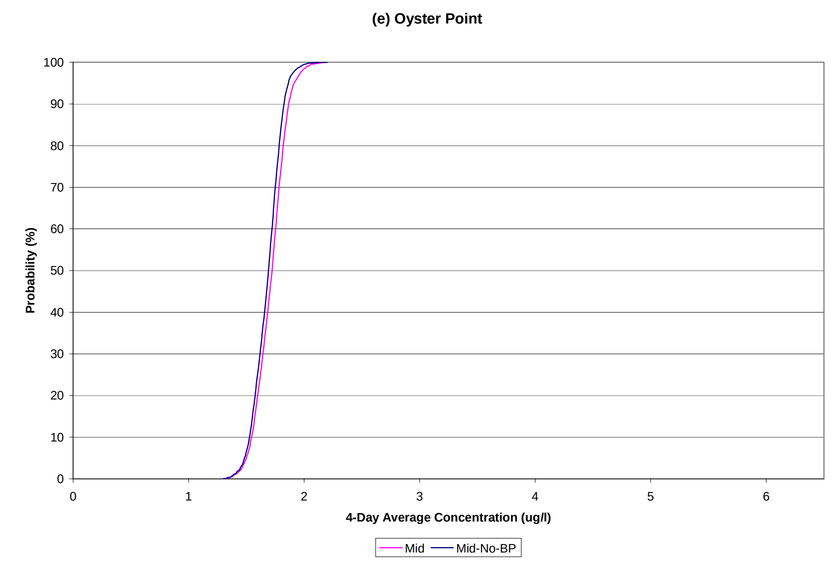
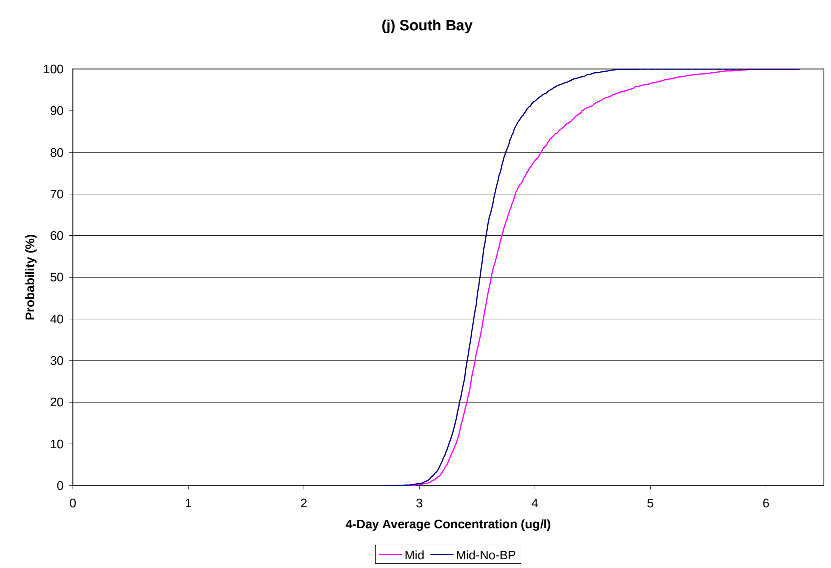
#	Comment Provider	Comment	Response
12	Kelly Moran, TDC Environmental (November 9, 2007)	2. *Benthic copper data summary*. Modify Table 6 to include results from all 11 stations in Figure 19 for the initial, 10-year, and *20*-year benthic copper results. It would also be helpful to include combined data for three hydrologically similar *Bay* subsections: (1) North and Central Bays, (2) South Bay above Dumbarton Bridge, and (3) Lower South Bay. In the case of the North and Central Bays, we recognize that for purposes of this model's original development, URS defined Central Bay as ending north of Bay Bridge (as indicated in Figure 2 and in the text at the top of page 4-2). However, if possible, it would be helpful if interpretive discussion could use the new regional standard definition of the Central Bay, which, based on extensive review of Bay data, is now understood to extend hydrologically from Richmond Bridge to San Bruno Shoal. (This newer definition is used by the San Francisco Bay Regional Monitoring Program and by the San Francisco Estuary Institute's multi-box model of the Bay). Alternatively, if this is not easy to do, we suggest simply inserting a note mentioning this evolving definition of Bay segmentation as clarification for local readers.	We will either expand upon Table 6 or create new, similar tables to incorporate the information requested by the commentor. We will include the URS-defined and newly defined boundaries of the Central Bay. The tables shown below are abbreviated, but will include all sites and sub-sections for the final report.

	Time from Beginning of Simulation	Initial Condition	At Year 10	At Year 20	At Year 30	At Year 40
Site	Scenario	Benthic Copper Concentration (mg/kg)				
San Pablo Bay	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					
Golden Gate	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					
Bay Bridge	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					
Alameda	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					

	Time from Beginning of Simulation	Initial Condition	At Year 10	At Year 20	At Year 30	At Year 40
Sub-section of Bay	Scenario	Benthic Copper Concentration (mg/kg) Grid-Averaged by Sub-section				
From Carquinez Strait to Bay Bridge	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					
From Carquinez Strait to San Bruno Shoal	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					
From Bay Bridge to Dumbarton Bridge	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					
From San Bruno Shoal to Dumbarton Bridge	Mid					
	Mid-No-BP					
	Concentration Difference					
	Percent Difference					

<table>
<tr><th>#</th><th>COMMENT PROVIDER</th><th>COMMENT</th><th>RESPONSE</th></tr>
<tr><td>13</td><td>Kelly Moran, TDC Environmental (November 9, 2007)</td><td>3. *Table summarizing cumulative probability plots*. A summary table of the Figure 20 results would be useful in improving the understanding of the significance of the brake pad copper contribution. It is suggested that the table include the dissolved copper concentrations representing the 50^{th} and 90^{th} percent probabilities for each of the two scenarios for each station.</td><td>A new table will be inserted to accompany Figure 20. The content and general appearance of the table are shown below.
<table>
<tr><th rowspan="2">Site</th><th rowspan="2">Modeled Scenario</th><th colspan="4">4-Day Average Dissolved Copper Concentration (ug/l)</th></tr>
<tr><th>0 Percent (Minimum)</th><th>50 Percent (Median)</th><th>90 Percent</th><th>100 Percent (Maximum)</th></tr>
<tr><td rowspan="2">San Pablo Bay</td><td>Mid</td><td>0.80</td><td>1.29</td><td>1.56</td><td>2.16</td></tr>
<tr><td>Mid-No-BP</td><td>0.80</td><td>1.29</td><td>1.56</td><td>2.16</td></tr>
<tr><td rowspan="2">Golden Gate</td><td>Mid</td><td>0.53</td><td>0.93</td><td>1.00</td><td>1.13</td></tr>
<tr><td>Mid-No-BP</td><td>0.53</td><td>0.93</td><td>1.00</td><td>1.12</td></tr>
<tr><td rowspan="2">Bay Bridge</td><td>Mid</td><td>0.96</td><td>1.02</td><td>1.04</td><td>1.24</td></tr>
<tr><td>Mid-No-BP</td><td>0.95</td><td>1.02</td><td>1.04</td><td>1.24</td></tr>
<tr><td rowspan="2">Alameda</td><td>Mid</td><td>1.04</td><td>1.10</td><td>1.17</td><td>1.61</td></tr>
<tr><td>Mid-No-BP</td><td>1.04</td><td>1.10</td><td>1.17</td><td>1.59</td></tr>
<tr><td rowspan="2">Oyster Point</td><td>Mid</td><td>1.31</td><td>1.72</td><td>1.87</td><td>2.20</td></tr>
<tr><td>Mid-No-BP</td><td>1.31</td><td>1.69</td><td>1.83</td><td>2.12</td></tr>
<tr><td rowspan="2">San Bruno Shoal (In Channel)</td><td>Mid</td><td>1.31</td><td>1.87</td><td>1.99</td><td>2.35</td></tr>
<tr><td>Mid-No-BP</td><td>1.31</td><td>1.83</td><td>1.93</td><td>2.23</td></tr>
<tr><td rowspan="2">San Bruno Shoal (In Eastern Mudflats)</td><td>Mid</td><td>1.18</td><td>1.81</td><td>2.12</td><td>2.86</td></tr>
<tr><td>Mid-No-BP</td><td>1.18</td><td>1.74</td><td>1.97</td><td>2.40</td></tr>
<tr><td rowspan="2">Redwood Creek</td><td>Mid</td><td>1.47</td><td>1.85</td><td>2.04</td><td>2.45</td></tr>
<tr><td>Mid-No-BP</td><td>1.47</td><td>1.80</td><td>1.91</td><td>2.35</td></tr>
<tr><td rowspan="2">Dumbarton Bridge</td><td>Mid</td><td>2.06</td><td>2.56</td><td>3.20</td><td>4.72</td></tr>
<tr><td>Mid-No-BP</td><td>2.02</td><td>2.49</td><td>2.84</td><td>3.63</td></tr>
<tr><td rowspan="2">South Bay</td><td>Mid</td><td>2.73</td><td>3.62</td><td>4.41</td><td>6.28</td></tr>
<tr><td>Mid-No-BP</td><td>2.71</td><td>3.52</td><td>3.92</td><td>4.91</td></tr>
<tr><td rowspan="2">Coyote Creek (In Channel)</td><td>Mid</td><td>3.29</td><td>3.99</td><td>4.79</td><td>6.46</td></tr>
<tr><td>Mid-No-BP</td><td>3.26</td><td>3.88</td><td>4.33</td><td>5.51</td></tr>
<tr><td rowspan="2">Coyote Creek (In Western Mudflats)</td><td>Mid</td><td>2.32</td><td>3.26</td><td>4.62</td><td>6.29</td></tr>
<tr><td>Mid-No-BP</td><td>2.29</td><td>3.13</td><td>4.25</td><td>5.87</td></tr>
</table>
In addition, text will be added to refer the reader to this table in addition to Figure 20. After the existing sentence:
“The cumulative probability plots on Figure 20 present the model results without time dependence.”
the following sentence will be added:
“An accompanying table, Table 6, summarizes minimum and maximum 4-day average dissolved copper concentrations as well as the concentrations representing the 50 and 90 percent probabilities for both modeled scenarios at each site.”</td></tr>
</table>

#	Comment Provider	Comment	Response
14	Kelly Moran, TDC Environmental (November 9, 2007)	Explain San Pablo Bay's lack of sensitivity to local copper loads (pages 4-1 to 4-2). It appears that the sensitivity analysis did not zero out copper loads from the Central Valley. If so, the discussion should note that copper loads from the Central Valley are very large compared to local sources into the North Bay, which explains outcome of this sensitivity analysis for the North Bay.	The sensitivity run intended to remove all copper loads, including those from the Delta, but upon checking the input files for this sensitivity run, we found that the copper loads were still present. After re-running the model with the corrected Delta input file (and running through WY 1992 instead of just for WY 1991), the results were nearly the same. Thus, we cannot agree with the commentor's suggested explanation. However, Section 4.2 and Figure 24 will be updated to reflect the revised sensitivity run. The existing sentence "The simulation period for this sensitivity run was only for WY 1991, as it was considered a sufficient length of time for the analysis." will be revised to read "The simulation period for this sensitivity run was from WY 1991 through WY 1992, as this was considered a sufficient length of time for the analysis."
15	Kelly Moran, TDC Environmental (November 9, 2007)	Additional discussion of results. We suggest that the discussion section be expanded to include more comparisons of results organized by the three more hydrologically similar areas: North/Central Bays, South Bay above Dumbarton Bridge, and lower South Bay. (Ideally this expanded discussion would be able to reference the recommended summary tables). Given that the copper contribution from brake pads appears highest in the lower South Bay, more discussion of lower South Bay results is particularly warranted. This regional information will be useful in the future to help identify and prioritize overall copper management actions bay-wide.	As stated in the response to comment #12 from Kelly Moran, we will try to present the additional information as requested. Subsequently, we will expand upon the existing discussion in Section 3.2.2 with a focus on the Lower South Bay. [revised text not available yet]
16	Kelly Moran, TDC Environmental (November 9, 2007)	Clarify the source of marina copper concentrations in Table 5. Please add "estimated" or "calculated" (or similar wording) to the header of the column listing copper concentrations. This will clarify that the concentrations were estimated by URS based on data from Process Profiles; these are not measured concentrations.	Changed from "Mean Daily Dissolved Copper Concentration (mg/L)" to "Calculated Mean Daily Dissolved Copper Concentration for Model Input (mg/L)."
17	Kelly Moran, TDC Environmental (November 9, 2007)	Add "Sources of Runoff Loads" box to Figure 22. In Figure 22 (lower South Bay mass balance) add a text box showing the sources of runoff loads breakdown of brake pad and non-brake pad copper as was done for Figure 23 (overall Bay mass balance).	We will revise Figure 22 as requested by the commentor. [revised figure not available yet]
18	Kelly Moran, TDC Environmental (November 9, 2007)	ATTACHMENT The following minor editorial items were identified during our review: • P. 2-9, line 1. Correct spelling of "desporption." • Page 3-2, second paragraph, second sentence. Replace "suggesting and increasing influence of BPWD…." with "suggesting an increasing influence of BPWD…." • Page 4-2, first paragraph. This paragraph contains a sentence fragment. • Figure 19 (j2). Caption contains a typo—it should match (j1).	Typos on pages 2-9 and 3-2 were fixed. Page 4-2 was changed as follows: These differences increase moving from the North Bay towards the Lower South Bay.~~,~~ This may be ~~possibly~~ due to the transport of large amounts of copper down waterways and through POTW and tributary discharges to the Bay during storm events. Figure 19 (j2) will be changed to "South Bay."

#	COMMENT PROVIDER	COMMENT	RESPONSE
19	Kelly Moran, TDC Environmental (November 9, 2007)	Figure 20. It would be easier to follow this series of figures if the same X-axis scale were used throughout.	We will revise Figure 20 as requested by the commentor. Examples of the revised plots are shown below. The minimum and maximum concentations that were shown on the existing plots will be moved to the new table created in response to comment #13 from Kelly Moran.  

#	COMMENT PROVIDER	COMMENT	RESPONSE
1	John J Oram, San Francisco Estuary Institute (November 9, 2007)	1. *Are the general objectives of the workplan are still met, or if not what are biggest concerns for BPP?* It seems that the objectives of the modeling workplan are met. The main objectives were to develop a Bay model (or models) to estimate the short- and long-term effects of brake pad wear debris (BPWD) on Bay copper concentrations. I certainly feel these objectives were met. The original workplan did mention the development of two Bay models; one for short-term predictions and another (potentially the SFEI/USGS multibox model) for long-term predictions. The work performed strayed from this plan, though it seems there was steering committee approval. Being the developer of the multibox model I would have liked to see its use, but it is my professional opinion that the model used here is appropriate for assessing both short- and long-term effects.	Comment noted.
2	John J Oram, San Francisco Estuary Institute (November 9, 2007)	2. *Are there general concerns with model construction or inputs as reported in section 2.1? I don't expect you to be familiar with all of them but you'll be way ahead of me. I did note one potential issue in watershed inputs (see below) but don't know how much discrepancy it might produce in terms of overall model prediction.* I do have some concerns about the use of a two-dimensional hydrodynamics model for San Francisco Bay. Such models are appropriate where water column stratification is negligible. It has been shown, however, that San Francisco Bay is not uniform in the vertical (i.e., it is stratified) and that the Bay exhibits highly complex flow patterns, especially near the Delta and Golden Gate. Furthermore, considerable freshwater inputs to the Bay increase stratification and drive gravitational circulation patterns that are not well parameterized by a two-dimensional model. A three-dimensional model is more appropriate to resolve these complex flows. The grid nesting approach is reasonable, and a good trade off in exchange for ability to run long-term model runs.	It is true that a three-dimensional (3-D) model will more accurately resolve density-driven currents during periods of stratification. However, the use of a 3-D model is computationally expensive and would have been prohibitively time-consuming for long-term modelling. As noted in our SFO report (URS 2003), salinity simulations of the dry season of a dry year (1994) and the wet season of a wet year (1997-98) were performed using the 2-D MIKE 21 model and the 3-D TRIM model. The MIKE 21 model was able to adequately model the salinity during the dry season. The 3-D model was able to reproduce salinities during the 1997-98 wet season when conditions were stratified in the main channel throughout most of the Bay. The 2-D model did not perform as well, which indicates that 3-D processes are important during periods of high freshwater flows and stratification (URS 2003). The ability to accurately model salinity is a good indication of the ability to model dissolved substances that are conserved. Based on the previous modeling of salinity, the MIKE 21 model should perform well during the dry season and probably for most of the wet season as well for portions of the Bay that are not very stratified (such as the South Bay).

#	COMMENT PROVIDER	COMMENT	RESPONSE
3	John J Oram, San Francisco Estuary Institute (November 9, 2007)	I have considered you concerns regarding the spatial distribution of inputs (both freshwater and copper) from local watersheds. While it is certainly best to get their distribution as close as possible to reality, I don't think there placement in the existing model poses much of a problem. The uncertainty in estimating the inputs from these watersheds (as assessed by the watershed model) are likely larger than the potential effects of there geographical misplacement, given the misplacement is small. In addition, the depth-integrated model, and comparison to observations at particular depths, is likely a larger contributor to the discrepancies you note in current velocities. On the other hand, the differences you note do not raise any real alarms with me. Predictions are generally comparable to observations and time trending (e.g., seasonal patterns) is captured.	We agree. See response to Comment #2 from Kelly Moran.
4	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• How were the various bathymetry data sources interpolated to create the model grids? Some sort of objective mapping?	The following paragraph will be added to the Bathymetry section of 2.1.1.1: "The data sources were generally used separately for each specific region where they were applied. The 25-m USGS grid of the Lower South Bay (Smith and Cheng 1994) was used in preference to other data sources because it incorporated aerial photos to provide more accurate bathymetry in the shallow areas. The 30-m NOAA (1993) grid was the primary source from the Dumbarton Bridge through the Central Bay to Carquinez Strait. The 100-m USGS bathymetric grid (Cheng and Smith 1998) was used to specify the model bathymetry in Suisun Bay and in the Pacific Ocean outside of the Golden Gate. NOAA soundings were used to extend the bathymetry further west in the Pacific Ocean. Once the coverage for the entire Bay was obtained, the grids were all interpolated to a 30-m resolution before merging them together using the hierarchy specified above. The 30-m grid was then resampled to create the 330-m and 990-m grids used in the Bay modeling for this study."
5	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Would like to see the ranges of Manning's n.	We will provide the range for Manning's n instead of Manning's number (1/n) in Table 1. Manning's number is the actual input to the model. The range for Manning's n is 1/67 to 1/29, or 0.015 to 0.034.
6	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Why was 0.1 m/s used as velocity for all inputs from tributaries, POTWs, and marinas? Seems that these inputs should have unique velocities. Effects may be small but would affect the momentum transfer in the near-field.	The following is part of the response to Comment 4 from Jerome Maa: We will replace the existing sentence "A default velocity of 0.1 meter per second (m/s) was applied to all flows." with the following text: "Point source inputs to ECO Lab consist of flow, concentration, and velocity data. The flow and concentration are used to determine the copper load, while the velocity is used to provide the flow with initial momentum. A flow velocity of 0.1 meter per second (m/s) was estimated as a reasonably small value compared to the current speeds of the Bay. Because the model grid size is 330 meters or larger, and because the model is not a near-field model, discharge from the source would be quickly mixed." It is true that the inputs would have varying velocities depending on the volume of flow. However, any velocity given as input is overshadowed by the assumption in the model that point sources are completely mixed within a grid cell. It is doubtful that any of the point sources should be transferring momentum beyond the boundaries of one grid cell (330 m by 330 m or 990 m by 990 m).

#	COMMENT PROVIDER	COMMENT	RESPONSE
7	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Typo- page 2-8 second to last paragraph : As a result, …'wet' should be 'dry'	Fixed text.
8	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• I would like to see some discussion and validation of the sediment model. It seems that there is no real sediment transport model, but rather an accounting of the processes in terms of how they affect copper fate. I may be mistaken. Some discussion is certainly warranted. What are predicted suspended sediment concentrations? What are predicted sedimentation rates?	We will add a section to the final report to discuss the validation of the sediment model. Please see the response to Comment #2 from Jerome Maa.
9	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Using particle settling, resuspension rates, and critical velocity as calibration parameters concerns me. Too many degrees of freedom here. As one technical reviewer noted (Jerome Maa), this opens the possibility that the right results are reached for the wrong reasons.	See response to Comment 2 from Jerome Maa. The settling velocities used in the model range from 0 to 5 m/d, which agree with results from settling column tests performed by Kinnetic Laboratories using San Francisco Bay sediments that yielded settling velocities on the order of 1.0 m/d (URS 2003). They are also in general agreement with a report entitled *Suspended Sediment Transport in an Estuarine Tidal Channel within San Francisco Bay, California* published in *Marine Geology* by Sternberg et al. in 1986.
10	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Ignoring effects of temperature, salinity, pH, etc. on copper partitioning seems reasonable. Partitioning coefficients in this case seem to capture the seasonal variability that these parameters would introduce.	We agree.
11	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Results of sensitivity analysis to external loads are conceptually reasonable. Would have been more powerful to do these sensitivity tests over more than one water year.	We agree. However, we modeled the longest period we could fit in within the time and budget available to us. Continuing the sensitivity analysis to external loads by modeling for an extended time period would be worthwhile for future modeling work.

#	COMMENT PROVIDER	COMMENT	RESPONSE
12	John J Oram, San Francisco Estuary Institute (November 9, 2007)	• Discussion of sensitivity to initial benthic copper concentrations seems to overstate the BPWD contributions during wet/dry conditions (bottom of page 4-2). Related, I am not surprised the sensitivity to BPWD, and loads in general, is greater when the model is initialized with equilibrium benthic copper concentrations. Under such conditions, the sediment represents less of a 'sponge' and its buffering capacity is reduced (i.e., sediment response times to loads are shorter).	We agree. We will focus the discussion on the overall observation that the scenario differences from the sensitivity run are generally higher than those of the production run, with the exception of wet season instances in Coyote Creek. We agree with the commentor's insight regarding the buffering capacity of the sediment. In the second paragraph of Section 4.3, we will expand the existing sentence. "It appears that by setting the initial benthic copper conditions to at or near equilibrium values, the model generally predicts a greater contribution of BPWD to dissolved copper in the Bay." to read: "It appears that by setting the initial benthic copper conditions to at or near equilibrium values, the model generally predicts a greater contribution of BPWD to dissolved copper in the Bay except for instances in the wet season at Coyote Creek (Figure 26f). The hightened sensitivity of dissolved copper to BPWD might be a result of the benthic sediment losing its buffering capacity, or ability to sequester copper loads from the water column, when benthic copper is at equilibrium." The following text in Section 4.3 will be removed: "However, in the Lower South Bay, where the sensitivity and production runs differ most, the scenario differences from the production run are significantly greater than those of the sensitivity run during instantaneous moments in wet seasons (Figures 26e and 26f). This pattern suggests that by initializing benthic copper to equilibrium values, which generally equates to higher benthic copper concentrations in the Lower South Bay, the model would predict a greater contribution of BPWD to dissolved copper in the Bay during the dry season, and less of a contribution during the wet season in the Lower South Bay." The final draft of the report will show results for an additional 20 years of modeling. The benthic copper concentrations will have had more time to get closer to equilibrium, and consequently, the increase in the contribution of BPWD to dissolved copper concentrations will be included.
1	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-2. second paragraph - spelling error - "suggesting an~~d~~ increasing" should read "suggesting **an** increasing influence of BPWD."	Fixed text as suggested.
2	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-2 second paragraph - sometimes Brake Pad Wear Debris is abbreviated with BPWD and in other areas it is abbreviated with BPDW.	Fixed in two places on p. 3-2.
3	Bob Peters, Akebono Brake Corporation (November 12, 2007)	There are numerous other typos (i.e., page 2-9 1st paragraph "desporption", page 2-10 "verification is describe in the following….")	Fixed text.
4	Bob Peters, Akebono Brake Corporation (November 12, 2007)	I would prefer page numbers for the figures and tables listed in the table of contents.	We will try to list page numbers for figures and tables if we have time.
5	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-2 second paragraph "could be an effect of the hydrologic conditions …" Could this be spelled out – what hydrologic conditions – I assume that means dry vs. wet years?	The commenter is correct that we were referring to dry vs. wet year. The text was clarified as follows: However, this upward trend is very slight and could be an effect of ~~hydrologic conditions~~ variations in annual runoff amounts rather than the behavior of BPWD-related copper in the Bay.

#	COMMENT PROVIDER	COMMENT	RESPONSE
6	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-2 third paragraph. The last sentence states "From a temporal perspective, copper contribution from BPDW is highest during the wet season." Are you saying it's highest over the wet season because the first big storm event has a high build up of copper or that copper concentration is less per storm event but is still greater over the entire (wet) season. Could this be clarified?	The copper contribution is highest over the wet season because of the higher concentrations and differences in dissolved copper observed during the multiple storm events ocurring during the wet season. It is not just the first storm, but all storms. The following was added to the end of the third paragraph on p. 3-2: "The dissolved copper concentrations peak during storm events. These periods also show the largest differences between the Mid and Mid-No-BP scenarios, which implies that the contribution from BPWD is highest during storm events."
7	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-3 last paragraph of section 3.2.2. Given the uncertainties in the model inputs and source terms, is 1.5% significant?	We believe that a difference of 1.5% is significant because even though the exact values of the benthic concentrations may not be accurate, the differences between the Mid and Mid-No-BP scenarios are indicative of the overall effect of removing copper from BPWD. There is more accuracy in the differences between the two scenarios than the absolute magnitude for either scenario.
8	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-3 section 3.2.3. 1500kg of copper is the stated amount of total runoff and air deposition for the lower south bay area. Is that correct, it seems rather low? Is it specific to 1997? If so – how was it measured? Does it match loadings predicted by the watershed model? How about footnoting the source of that loading information?	The 1500 kg of copper should have been 1800 kg since the adsorbed copper in the runoff was accidentally excluded from the inventory, and the concentrations of the wastewater discharges were slightly different than what had been input to the model. The 1800 kg includes: • The total copper in the runoff for the four catchments draining to the Lower South Bay (from the watershed model for Feb to Sep 1997); • The total copper from three wastewater discharges (from average flows/concentrations based on 1996 and 1997 NPDES monitoring reports); • The total copper from marinas (South Bay Yacht Club and algaecide releases from Santa Clara County from 2003 estimate of non-brake sources);and • Air deposition (based on annual average from air deposition model and area of Lower South Bay). The tributary loads are specific to the Feb-Sep period of 1997. These are the only loads that change based on the changing hydrology and volume of runoff predicted in the watershed model. The sources of the loading information will be added to the figure.
9	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Page 3-3 section 3.2.3 The mass balance indicates a difference in predicted copper inventories relative to the measured amounts in the lower south bay for part of 1997. The model predicts a net gain and the measurements indicate a net loss – this needs more explanation. There is a hypothesis presented but if the difference really is correct it seems to me this has a cumulative effect that can put the inventory trend way off. This either needs more investigation or the explanation needs to go further in defining why the simulation and the measured data don't correspond.	You would expect to see a net export of copper during the dry season due to the decrease in input loads. In the final report we will include additional discussion and additional mass balances for a range of hydrologic conditions with varying copper loads in annual runoff.
10	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Table 6. I would like to see uncertainty addressed in table 6. Also, I assume that the column labeled "10 years" is at the 10 year mark and not the average of the first 10 years – same for the next column. Could this be clarified?	To address uncertainty, we would have needed to model the brakes-high and brakes-low scenarios to obtain the range of contributions to benthic copper concentrations from BPWD. Clarification will be added to the table to indiate that the results are at the 10-year or 20-year mark and are not the average of the first 10 or 20 years. Please see response to comment #12 from Kelly Moran.
11	Bob Peters, Akebono Brake Corporation (November 12, 2007)	The degree of resolution implied by 52.4 is probably way greater than uncertainties would dictate.	We agree that showing the absolute concentrations to the tenth of a mg/kg is probably a higher resolution than dictated by the uncertainty. However, we were more concerned with showing the differences between the scenarios, which should also have less uncertainty.
12	Bob Peters, Akebono Brake Corporation (November 12, 2007)	Figures 22 & 23 I assume the loads quoted are from Kirsten's loading inventory and/or the watershed model based on the "methodology" section but the graphs would stand on their own better if the figures had this info noted explicitly.	The figures will be annotated to show the sources of the loads shown.

#	Comment Provider	Comment	Response
1	Kirsten Rosselot, Process Profiles (November 14, 2007)	General comments: URS has done a good job of painting a picture from data that are difficult to convey. The variations in copper concentrations for water years, from location to location, from one season to the next, and during the course of the modeling are difficult to grasp.	Comment noted.
2	Kirsten Rosselot, Process Profiles (November 14, 2007)	Specific comments: Sub-watersheds: Partnership convention for the technical studies has been to refer to the 22 study watersheds as sub-watersheds of the San Francisco Bay watershed. These 22 study watersheds are referred to as superwatersheds in the draft bay modeling report, which in a way makes sense because they are groups of watersheds that URS conducted bay modeling for previously. However, the bay modeling report needs to be consistent with the rest of the Partnership's technical studies documents and refer to the 22 modeled watersheds as sub-watersheds. Perhaps the watersheds modeling in URS' previous work could be referred to as catchments, just to distinguish them from the Partnership's subwatersheds.	The text has been revised accordingly. The larger “superwatersheds” were changed to “sub-watersheds” and the smaller “watersheds/subwatersheds” were changed to “catchments.”

<table>
<tr><th>#</th><th>COMMENT PROVIDER</th><th>COMMENT</th><th>RESPONSE</th></tr>
<tr>
<td>3</td>
<td>Kirsten Rosselot, Process Profiles (November 14, 2007)</td>
<td>Table 3 is referred to in the text before Table 2.

As I understand it, the scaling factors in Table 3 are applied to runoff from the various subwatersheds in order to assign runoff from the Partnership's subwatersheds to the previous bay modeling subwatersheds, so the scaling factors for each sub-watershed should add up to 1. The scaling factors in Table 3 for the Peninsula subwatershed add up to 1.32. I understand that the Colma subwatershed runoff is included in the Peninsula subwatershed at SM4, but the scaling factor for that location for the Peninsula subwatershed is 0.05. I think it would help make this clear if the location for Colma was listed in the table with Colma as the subwatershed. The other four Partnership subwatersheds with upstream subwatersheds assigned to them have scaling factors that add up to 1 or close to 1. The scaling factors for Solano West add up to 3.1, and this subwatershed does not include runoff from upstream subwatersheds. The scaling factors for Contra Costa Central add up to 1.06.

It might be a good idea to note that the North Napa and North Sonoma sub-watersheds are not included in this table because their runoff is included in the Napa and Sonoma sub-watersheds, because the text mentions 22 sub-watersheds and Table 3 only mentions 20 because the bay only sees 20.</td>
<td>The tables will be re-ordered and re-numbered correctly.

The flow scaling factors shown in the existing table are correct. The footnotes explain which catchments do not aggregate into a sub-watershed (which would cause totals greater than 1). The flow scaling factor table will be re-arranged to show which catchment is included in which sub-watershed, and to show the scaling factors for all the catchments in each sub-watershed add up to 1 or close to 1. A selection of content and the general appearance of the revised table are shown below (note that the scaling factors in the Solano West sub-watersheds do not add up to 1.00 due to different catchment delineations used by URS and AQUA TERRA) :
<table>
<tr><th>Sub-Watershed</th><th>Catchment (Entry Point) Within Sub-Watershed</th><th>Scaling Factor</th><th>Sum of Scaling Factors</th></tr>
<tr><td rowspan="7">Contra Costa Central</td><td>CC9</td><td>0.01</td><td rowspan="7">1.00</td></tr>
<tr><td>CC10</td><td>0.02</td></tr>
<tr><td>CC11</td><td>0.07</td></tr>
<tr><td>CC12</td><td>0.02</td></tr>
<tr><td>CC13</td><td>0.68</td></tr>
<tr><td>CC14</td><td>0.06</td></tr>
<tr><td>CC15</td><td>0.15</td></tr>
<tr><td>Santa Clara Valley West</td><td>SC3[5]</td><td>1.00</td><td>1.00</td></tr>
<tr><td rowspan="3">Solano West (Green Valley Creek)</td><td>FF1</td><td>0.09</td><td rowspan="3">1.01</td></tr>
<tr><td>FF2</td><td>0.20</td></tr>
<tr><td>FF3</td><td>0.72</td></tr>
<tr><td rowspan="2">Solano West (Montezuma Slough)</td><td>FF5</td><td>0.57</td><td rowspan="2">1.03</td></tr>
<tr><td>FF6</td><td>0.46</td></tr>
<tr><td>Sonoma</td><td>SN1[6]</td><td>1.00</td><td>1.00</td></tr>
<tr><td colspan="4">Catchments not included in the sub-watersheds
Flow and concentration data from the sub-watershed closest to this catchment were used to derive flow and concentration data for this catchment. The sub-watershed from which data were derived are listed in the left-hand column.</td></tr>
<tr><td>Contra Costa Central</td><td>AX1</td><td>0.05</td><td>Not applicable</td></tr>
<tr><td>Solano West (Montezuma Slough)</td><td>AX2</td><td>0.08</td><td>Not applicable</td></tr>
<tr><td>Peninsula</td><td>SF1</td><td>0.10</td><td>Not applicable</td></tr>
<tr><td>Peninsula</td><td>SM1</td><td>0.22</td><td>Not applicable</td></tr>
</table>

Notes:
1. This catchment entry point includes flow and concentration from the Upper Alameda sub-watershed. As noted in the text, the placement of the Upper Alameda outflow at A11 was an error and should have been placed at A12.
2. This catchment entry point includes flow and concentration from the Upper Corte Madera sub-watershed.
3. This catchment includes Upper Napa.
4. This catchment entry point includes flow and concentration from the Upper Colma sub-watershed.
5. This catchment entry point includes flow and concentration from the Upper San Francisquito sub-watershed.
6. This catchment includes Upper Sonoma.</td>
</tr>
</table>

#	Comment Provider	Comment	Response
4	Kirsten Rosselot, Process Profiles (November 14, 2007)	inputs direct to bay waters p. 2-4, maybe this should clarify that it includes copper from pressure-treated wood used in marine construction and copper released from antifouling coatings used on boats.	Clarification was added to Table 5 and the report section on Marina Inputs was clarified as follows: The locations and copper release rates of ~~95~~ 90 marinas included in the Bay model were provided by Rosselot (2006). The copper released from marinas includes copper from pressure-treated wood used in marine construction and copper released from antifouling coatings used on boats (Rosselot 2006). Copper loads from algaecides released to shoreline surface waters were also included in the model for the five counties with reported usage (Rosselot 2006). These loads were treated as point sources located near the center of each county's shoreline. Even though the loads should be more distributed, this assumption should not unduly influence the results because the copper loads from algaecides are relatively small compared other copper releases to the Bay. The marinas and counties are listed in Table 5 and locations are shown on Figure 4.
5	Kirsten Rosselot, Process Profiles (November 14, 2007)	I don't think you mentioned copper in algaecides released to shoreline surface waters and while this source may not be important, that loop needs to be closed.	See response to comment 4 above.
6	Kirsten Rosselot, Process Profiles (November 14, 2007)	p 2-11, at the bottom, there's a sentence that reads "The results of the watershed model showed that the total copper loads to the Bay did not vary significantly between each level of contributions…" Part of the reason for this is that some of the parameters were adjusted differently for each of the three pairs of watershed modeling runs. There's quite a bit of variation in the location of the copper in runoff even though the total copper in runoff is close to the same for all three runs. I think it would be better to say that conducting bay modeling for the mid-brakes case with brakes and for the mid-brakes case without brakes will show whether the results of the bay modeling are sensitive enough to variations in runoff for the three pairs of watershed modeling runs to make running high-brakes and low-brakes cases worthwhile.	The text was changed as follows: The results of the watershed model showed that even though there is some spatial variability in copper loads between scenarios, the total copper loads to the Bay did not vary significantly between each level of contributions (AQUA TERRA 2007). Modeling the Mid and Mid-No-BP scenarios shows how sensitive the Bay model is to changes in copper loads. ~~For this reason, in addition~~ Due to computer processing time constraints, Bay model runs of the low- and high-level scenarios were not included in this study. As differences were apparent between the Mid and Mid-No-BP scenarios, the BPP may choose to run the low- and high-level scenarios in future studies.
7	Kirsten Rosselot, Process Profiles (November 14, 2007)	Figure 17's caption is messed up.	Agreed. This will be fixed for the final report by saving the document at a higher resolution PDF. Likewise, the title of Figure 13 will be fixed. The shapefiles bleeding over the edges of Figures 4 and 15 will also be fixed.

#	Comment Provider	Comment	Response
8	Kirsten Rosselot, Process Profiles (November 14, 2007)	Figure 18: The locations described by Figure 18 need to be on a map where they can be identified. I found Bay Bridge as station 4317 in one place and elsewhere identified as Bay Bridge/Yerba Buena Island (different locations). I couldn't find in the writeup how to correlate the locations for the Figure 18 descriptions to a physical place in the bay. I think you should point out in the text that the scales of parts 2 of those graphs is not the same as the scale for the parts 1 of those graphs, or change them to % difference rather than absolute difference. The absolute different increases as the concentration in the bay goes up but the fraction of concentration due to brake pads seems to be about 10-20% everywhere, and if that's so, it's interesting. Figure 19 is the same -- is the fraction of copper in benthic sediments due to brake pads 3-4% at every location?	The locations described by Figure 18 and in Section 3.1 are shown in Figure 15. The following text will be added to the second paragraph of Section 3.1: "These sites are approximately the same as the deep channel RMP water quality stations shown in Figure 15. The sites that are outside the channel in mudflats are also depicted in Figure 15. These sites of interest were selected to provide a basis for comparison against RMP measured data, as well as to show differences between in-channel and mudflat results." Figure 15 will also be revised to include the San Bruno Shoals (In Eastern Mudflats) and Coyote Creek (In Western Mudflats) sites. These sites do not approximate the locations of any of the RMP water quality stations. [revised figure not available yet] The following text will be added to Section 3.2.1, the end of the first paragraph, to point out the different y-axis scales: "The resulting concentrations shown in the upper half of each page are plotted on a different scale than the scenario differences shown in the lower half of each page. Different scales were used so that the variation in differences would be more apparent." See response to Comment #11 from Kelly Moran.

<table>
<tr><th>#</th><th>COMMENT PROVIDER</th><th>COMMENT</th><th>RESPONSE</th></tr>
<tr><td>9</td><td>Kirsten Rosselot, Process Profiles (November 14, 2007)</td><td>Figure 23: The description of Figure 23 needs to explain why the copper in runoff in 1999 was only 29,000 kg when the average runoff from the watershed modeling is around 55,000 kg/y. A table that showed total copper in runoff for all the modeled years would help make this more understandable.</td><td>We will include the following table and revise Figure 23 to include the adsorbed fraction of the total copper in the runoff, which was accidentally left out of the copper inventory.

We will add some discussion to text about the variability of the annual tributary loads. Using the output from the watershed model, we calculated an average load of approximately 84,000 kg/yr vs. the 56,000 kg/yr reported in the AQUA TERRA (2007) report. In 1999, the total calculated tributary load was approximately 66,000 kg. The annual tributary loads ranged from about 33,000 kg to 174,000 kg.

The content and general appearance of the table are shown below.
<table>
<tr><th></th><th colspan="3">Copper Load (kg/year)</th></tr>
<tr><th>Water Year</th><th>Dissolved</th><th>Adsorbed</th><th>Total</th></tr>
<tr><td>1981</td><td>12,883</td><td>20,309</td><td>33,193</td></tr>
<tr><td>1982</td><td>39,166</td><td>127,192</td><td>166,358</td></tr>
<tr><td>1983</td><td>48,460</td><td>125,998</td><td>174,458</td></tr>
<tr><td>1984</td><td>20,769</td><td>34,164</td><td>54,933</td></tr>
<tr><td>1985</td><td>18,710</td><td>42,718</td><td>61,427</td></tr>
<tr><td>1986</td><td>37,172</td><td>106,864</td><td>144,036</td></tr>
<tr><td>1987</td><td>14,825</td><td>24,866</td><td>39,691</td></tr>
<tr><td>1988</td><td>17,720</td><td>25,224</td><td>42,944</td></tr>
<tr><td>1989</td><td>18,326</td><td>25,455</td><td>43,781</td></tr>
<tr><td>1990</td><td>15,922</td><td>19,443</td><td>35,365</td></tr>
<tr><td>1991</td><td>18,867</td><td>22,962</td><td>41,828</td></tr>
<tr><td>1992</td><td>26,163</td><td>37,405</td><td>63,568</td></tr>
<tr><td>1993</td><td>42,301</td><td>85,076</td><td>127,377</td></tr>
<tr><td>1994</td><td>19,453</td><td>16,910</td><td>36,363</td></tr>
<tr><td>1995</td><td>50,951</td><td>102,249</td><td>153,200</td></tr>
<tr><td>1996</td><td>37,998</td><td>86,878</td><td>124,875</td></tr>
<tr><td>1997</td><td>32,797</td><td>76,631</td><td>109,428</td></tr>
<tr><td>1998</td><td>52,865</td><td>110,636</td><td>163,501</td></tr>
<tr><td>1999</td><td>25,939</td><td>40,072</td><td>66,011</td></tr>
<tr><td>2000</td><td>27,423</td><td>46,096</td><td>73,518</td></tr>
<tr><td>2001</td><td>19,229</td><td>18,250</td><td>37,478</td></tr>
<tr><td>2002</td><td>26,118</td><td>41,907</td><td>68,024</td></tr>
<tr><td>2003</td><td>29,172</td><td>63,726</td><td>92,899</td></tr>
<tr><td>2004</td><td>23,797</td><td>46,234</td><td>70,031</td></tr>
<tr><td>2005</td><td>34,300</td><td>52,441</td><td>86,742</td></tr>
<tr><td>Minimum</td><td>12,883</td><td>16,910</td><td>33,193</td></tr>
<tr><td>Mean</td><td>28,453</td><td>55,988</td><td>84,441</td></tr>
<tr><td>Maximum</td><td>52,865</td><td>127,192</td><td>174,458</td></tr>
</table>
Source: AQUA TERRA 2007.</td></tr>
</table>

<table>
<tr><th>#</th><th>COMMENT PROVIDER</th><th>COMMENT</th><th>RESPONSE</th></tr>
<tr><td>10</td><td>Kirsten Rosselot, Process Profiles (November 14, 2007)</td><td>Did the results of the sensitivity to copper loads in Section 4.2 indicate that modeling of the high brakes and low brakes cases with and without brakes would not provide further illumination into the impact of copper from brake pads on copper concentrations in the bay? Is there any way you could bracket the differences you would expect to see in the bay from the three pairs of scenarios?</td><td>Due to the geographic variation in the copper loading in the high-brakes and low-brakes cases compared to the mid-brakes case, it is not possible to provide a good estimate of the range of differences without performing additional modeling.</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Stephen Monismith, Stanford University (November 29, 2007)</td><td>Overall - given the need to use a 2D model to simulate long time-scales, the modeling looks to be quite good. I.e. tidal motions seem to be accurately represented by the 2D model, a not unexpected result given earlier results reported by Ed Gross in a series of papers he published in the late nineties. However, as Ed also showed, the residence time for stuff south of the Dumbarton was much less when computed using a 3D model than when computed with a 2D model. This means that the model will be inaccurate in that the effects of reducing Cu inputs may ~~not~~ be ~~as~~ more effective than~~as~~ what the model shows since less of the reduction will be apparent in the model. It might be worth doing short 3D simulations to check this.</td><td> (The comment was marked up to reflect our understanding of the intent.)
The results reported by Ed Gross were cited in our SFO report (URS 2003). These studies showed that the residence time south of Dumbarton estimated using a 2-D model was approximately 63 to 67 days, and the residence time using a 3-D model was approximately 19 to 23 days. Other studies gave ranges of approximately 2 weeks to 10 weeks for the residence times of the South Bay and south of the Dumbarton (URS 2003). The SFO report also compared the MIKE 21 2-D model with the TRIM2D and TRIM3D models to calculate estimates of the residence time south of the Dumbarton. The residence times calculated with the 3-D model were comparable, as shown in Table 5.2.6-2 from the SFO report (URS 2003) and reproduced below.
Comparison of Residence Time Estimates Between Different Models for Existing Conditions
<table>
<tr><th rowspan="2">Injection Point</th><th rowspan="2">Basin</th><th colspan="3">1997-1998</th><th colspan="3">1993</th></tr>
<tr><th>MIKE 21</th><th>TRIM2D</th><th>TRIM3D</th><th>MIKE 21</th><th>TRIM2D</th><th>TRIM3D</th></tr>
<tr><td rowspan="2">Coyote Creek</td><td>Far South Bay</td><td>9-20</td><td>10-20</td><td>8-15</td><td>10-20</td><td>15-20</td><td>10-15</td></tr>
<tr><td>South Bay</td><td>50-80</td><td>>40</td><td>>35</td><td>50-80</td><td>70-80</td><td>50-60</td></tr>
<tr><td rowspan="2">North of SFO</td><td>Near SFO</td><td>3-5</td><td>5-15</td><td>3-6</td><td>3-5</td><td>5-15</td><td>5-10</td></tr>
<tr><td>South Bay</td><td>30-45</td><td>>15</td><td>>15</td><td>30-45</td><td>30-70</td><td>20-40</td></tr>
<tr><td rowspan="2">South of SFO</td><td>Near SFO</td><td>5-7</td><td>4-10</td><td>3-7</td><td>3-8</td><td>5-15</td><td>5-9</td></tr>
<tr><td>South Bay</td><td>35-55</td><td>>20</td><td>>15</td><td>30-55</td><td>40-70</td><td>30-45</td></tr>
</table>
Since we do not already have a 3-D copper model of the Bay, the effort required to run 3-D simulations would be significantly more than our schedule and budget allowed. </td></tr>
<tr><td>2</td><td>Stephen Monismith, Stanford University (November 29, 2007)</td><td>The model does not appear to include windwaves - this is a major shortcoming in that much of the sediment re-suspension, and hence the sorption/de-sorption dynamics can be very very different. Satoshi Inagaki did a masters thesis here at Stanford ca. 2000 (motivated by the runways problem) and showed pretty convincingly that even a crude model of windwave effects improved things dramatically. I am pretty sure the URS guys are aware of this thesis. I can certainly provide a copy if they don't have one. Before doing further modeling, it might be worthwhile to think through what this omission might mean for the results.</td><td>We agree that that sediment re-suspension is significantly affected by wind waves. This process is extremely important for compounds that strongly adsorb to sediment. Copper does not adsorb to sediment as strongly as other compounds such as PAHs, PCBs and mercury. Also, the water quality objectives for copper in the Bay are expressed as dissolved concentrations, so it is important to be able to calculate the concentration in the dissolved phase. Therefore, it was presumed that it was more important to utilize a model with kinetically based sorption/desorption processes such as the heavy metal template of ECO Lab even though it does not have the cabability of modeling wind wave re-suspension. Incorporating the necessary equations into the ECO Lab model would have required significantly more effort than our schedule and budget allowed, although it would certainly be something to look into for future modeling work.</td></tr>
</table>

#	COMMENT PROVIDER	COMMENT	RESPONSE
3	Stephen Monismith, Stanford University (November 29, 2007)	It would be good if the authors provided some references to peer-reviewed work (i.e. not just other technical reports or user manuals) where ECOLAB has been used. It would also be useful to know what algorithms it actually includes. Does it have the same structure as the modeling they (URS) published recently in the SF Bay online journal? Most importantly, I would be concerned that it would be inappropriate to use a model that has not been subject to peer review for environmental assessment.	The heavy metal template of Eco Lab was based on the same algorithms used in MIKE 21 ME, which is the model used previously for the SFO report (URS 2003) and published in the SF Bay online journal [Bessinger, Brad, et. al. 2006. *A Kinetic Model of Copper Cycling in San Francisco Bay*. San Francisco Estuary and Watershed Science. Vol. 4, Issue 1. February]. The version 2003 heavy metal template for ECO Lab may be obtained by emailing DHI at: software_us@dhi.us

Response to comment #11 from Kelly Moran, continued:

Site	Wet Season[1]						Water Year[2]					
	Dissolved Copper Concentration from BPWD (ug/l)[3]			Percentage of Dissolved Copper Concentration from BPWD (%)[4]			Dissolved Copper Concentration from BPWD (ug/l)[3]			Percentage of Dissolved Copper Concentration from BPWD (%)[4]		
	25th Percentile	50th Percentile (Median)	75th Percentile	25th Percentile	50th Percentile (Median)	75th Percentile	25th Percentile	50th Percentile (Median)	75th Percentile	25th Percentile	50th Percentile (Median)	75th Percentile
San Pablo Bay (example data shown)	0.011	0.021	0.031	0.11	0.21	0.31	0.009	0.018	0.023	0.08	0.19	0.29
Golden Gate												
Bay Bridge												
Alameda												
Oyster Point												
San Bruno Shoal (In Channel)												
San Bruno Shoal (In Eastern Mudflats)												
Redwood Creek												
Dumbarton Bridge												
South Bay												
Coyote Creek (In Channel)												
Coyote Creek (In Western Mudflats)												

Notes:
Data shown in this table represents 4-day average dissolved copper concentrations from the last 10 years of the simulation (WYs 2010 through 2020). The last 10 years of the simulation were selected to capture long-term trends. This avoids the initial spin-up period of the model.
1. Wet season is from October 1 to March 30.
2. Water year is from October 1 to September 30.
3. Dissolved copper concentration from BPWD is the difference between the Mid and Mid-No-BP concentrations. The 25th percentile represents the concentration below which 25 percent of the modeled 4-day average concentrations are found. Similarly, the 50th and 75th percentiles represent the concentrations below which 50 and 75 percent of the concentrations are found, respectively.
4. Percentage of dissolved copper from BPWD is calculated by dividing the dissolved copper concentration from BPWD by the mean dissolved copper concentration for the corresponding percentile.