

Theo A. Dillaha, III, Ph.D., P.E.

Agro-Environmental Engineer

345 Woods Lane

Newport, VA 24128-4022

Phone: 540-231-6813 (office); 540-544-4444 (home)

E-mail: dillaha@vt.edu

April 8, 2006

Sam Unger, Unit Chief, TMDL Unit #2
California Regional Water Quality Control Board
320 W. 4th Street, Suite 200
Los Angeles, CA 90013

Subject: Peer Review of the Calleguas Creek Watershed Metals and Selenium TMDL

Dear Mr. Unger:

At your request, I conducted a scientific review the Draft Creek Watershed Metals and Selenium TMDL. My review is based on my reading of the following documents:

1. Draft Amendment to the Water Quality Control Plan for the Los Angeles region to Incorporate a Total Maximum Daily Load for Metals and Selenium for the Calleguas Creek, its Tributaries, and Mugu Lagoon (resolution No. R4-2006-XXX)
2. Calleguas Creek Watershed Metals and Selenium TMDL Final Draft Technical Report (Feb. 22, 2006)
3. Technical Memorandum dated March 1, 2006 on the Calibration Results of the CCWM for Metals and Selenium
4. Metals and Selenium Linkage Analysis for the Calleguas Creek Watershed: Interim Draft, Attachment A to the Calleguas Creek Watershed Metals and Selenium TMDL (November 2005)

In the review, I considered the following questions:

1. Are the numeric targets for zinc, copper, and nickel valid?
2. Are the key parameters for the partition coefficient in the Water Quality Model valid?
3. Are the numeric targets for mercury valid?
4. Is the scientific portion of the proposed rule based on sound scientific knowledge, methods, and practices?

In general, I found the TMDL to be scientifically reasonable. As in many TMDLs, there was inadequate historical flow and water quality monitoring data available for rigorous model parameter development, calibration, and validation. Consequently, there is a high degree of uncertainty in the model predictions and the resulting numeric targets developed for the Calleguas Creek TMDLs. The TMDL developers adequately compensated for the lack of data by selecting very conservative model parameters that generally resulted in overestimates of contaminate concentrations and loads. In my opinion, the conservative model parameters and model calibration probably resulted in an implicit margin of safety on the order of 20 to 40%. I believe that this margin of safety is reasonable and desirable given the lack of available data for model calibration and validation. Based on my analysis of the Calleguas Creek TMDL

documents that I reviewed, it is my best professional judgment that the achievement of the proposed numeric targets, WLAs, and LAs will bring the waters of Calleguas Creek Watershed into compliance with applicable California water quality criteria. Because of the conservative assumptions used in the development of the TMDL, I believe that many of the water quality criteria will be achieved before the specified WLAs and LAs are achieved.

Responses to specific review questions:

1. Are the numeric targets for zinc, copper, and nickel valid?
Yes. The numeric targets are based on reasonable scientific assumptions and their achievement should result in attainment of applicable water quality standards. The numeric targets are also based on conservative assumptions concerning the bioavailable forms of the contaminants.
2. Are the key parameters for the partition coefficient in the Water Quality Model valid?
Yes. The partition coefficients were developed using site-specific observations of dissolved and adsorbed concentrations of specific pollutants in the Calleguas Creek Watershed. The developed partition coefficients are reasonable given the water quality data that was available for their development.
3. Are the numeric targets for mercury valid?
The assumptions concerning bioaccumulation seemed reasonable and conservative. I am not an expert in this particular area though.
4. Is the scientific portion of the proposed rule based on sound scientific knowledge, methods, and practices?
Yes. The authors seem to be fully aware of the uncertainty associated with the model and the assumptions they made. The most significant limitation in the development of the proposed rule was the lack of measured water quality data that was needed for the development of partition coefficients, potency factors, and other model input parameters, and for model calibration and validation. The proposed rules are based on conservative assumptions that account for the uncertainty in the data utilized and in the representation of contaminate transport processes and fate.

If you have any additional questions concerning my review of the Calleguas Creek TMDL, please do not hesitate to contact me. Additional editorial and other comments and observations concerning the Calleguas Creek TMDL documents are attached to this letter.

Sincerely,



Theo A. Dillaha, Ph.D., P.E.

General Editorial Comments and Observations Concerning the Calleguas Creek TMDL:

1. Attachment A to Resolution No. R4-2006-XXX

- a. Page 6, 2nd and 3rd tables: units (lbs/day?) are missing for dry and wet weather WLAs in water column and for daily storm volume Q (ft³?)
- b. Page 8, 3rd table: units missing daily storm volume Q (ft³?)

2. Calleguas Creek Watershed Metals and Selenium TMDL Final Draft Technical Report (Feb. 22, 2006)

- a. Land use in the watershed is poorly described. Makes it more difficult to provide context for pollutant sources.
- b. “Percent” used throughout report when percentage is grammatically required.
- c. Page 75-76. Modeling of sediment erosion using RUSLE and a simplified version of a sediment delivery model (SEDMOD) is described and used to develop Table 42. Not sure what the purpose of this analysis is and there is so much uncertainty in the presented loads that I am not sure they are useful for anything. The description of the methods involved is so vague that it is difficult to evaluate the science involved. Without more detail, it appears that the USLE model rather than RUSLE was actually implemented in the GIS. Lack of information on how the LS factor was implemented in the GIS is a cause for concern since the USLE (and RUSLE for that matter) is extremely sensitive to slope-length (L). Similar concerns exist with the simplifications made to the SEDMOD sediment delivery model. Reducing its terms just to simplify implementation in the GIS is not adequately justified. Consequently, the background natural load numbers in Table 42 are fairly meaningless. A more scientifically defensible estimate of natural loadings could have been obtained by using the calibrated HSPF model with the anthropogenic sources turned off to estimate the natural background loadings. The models and resulting numbers in Table 42 are not used in the TMDL, so this does not impact the proposed TMDLs for metals and selenium.
- d. Page 142, Figure 56: Units missing from y-axis. X-axis would be understood by more readers if expressed as % exceedance.
- e. Page 142, Table 63 and following sentence: The sentence “As shown in ...” is not true. For both Revolon and Calleguas, the critical condition for nickel is in the average flow range. Rewrite sentence.
- f. Page 145, Table 65: Units of daily storm volume, Q, not specified
- g. Page 145 and 146, Tables 67 and 68: Are headings of columns 4 mislabeled? Shouldn't they be “... Total Loading Capacity Equation (lb/day)”? Also, why not multiply the equations out to simplify?
- h. Page 146, Tables 69 and 70: Missing units under Target (µg/L).
- i. Page 147, 1st paragraph: Where does the “46%” reduction for copper come from? Is there a table(s) or figure(s) to support the statement? If so, specify.
- j. Page 148 and 149, Tables 72 and 73: Include “Dry Weather” in captions
- k. Page 149, next to last paragraph: Modify to: “... resulting equation by the fraction of the load attributable to the source and 1.0 plus the margin of safety expressed as a fraction.”
- l. Pages 150 and 151, Tables 74 and 75: Why are the WLAs for Hill Canyon and Camarillo the same? Daily discharges are very different, 10.2 and 6.75 MGD, respectively.
- m. Page 153, Table 78: Are final LAs and WLAs really the same for both agricultural and urban sources? Is the coincidence or typos?
- n. Page 153, Table 79: Units missing from Table caption. Are Interim Dry Daily and Monthly LAs really the same for agriculture and then for urban sources in both watersheds? Is the coincidence or typos?

- o. Page 156, TMDL equation: Need parentheses around 1-PR. Conversion factor, f, should be 1.97E-06 according to my calculations. If I am correct, is this a typo or is the wrong conversion factor used developing the mercury TMDL?
- p. Page 157, line 19: Change to "... current load * (1 – percentage reduction/100)
- q. Page 157, last paragraph: First sentence has grammatical problems. Reasoning in paragraph is questionable. Better logic is that bedload is not considered because it is composed of coarser sediment particles (sand and gravel) that mercury does not adsorb to. Suspended sediment contains the particle sizes that are responsible for mercury transport.
- r. Page 159, Figure 57: Eliminate bad figure caption at the top of the figure box.
- s. Page 159, Figure 58: Eliminate bad figure caption at the top of the figure box. Include low and medium annual flow lines in figure for clarity.
- t. Page 160, Section 10.4, first sentence: Should be changed to "... the total load of mercury is proportional ~~approximately equivalent~~ to the suspended sediment load."
- u. Page 160, next to last paragraph: Anthropogenic mercury also comes from undeveloped open space due to atmospheric deposition. Was this mercury considered?
- v. Page 160, last paragraph: GIS analysis did not utilize flow data. Delete "and flow data". I do not see the benefit of using the GIS generated mercury load. Not scientifically reasonable to arbitrarily assume that sediment loss is simply proportional to area (fraction of undeveloped land). Sediment loss is greater when the land is disturbed. Undeveloped land would be expected to have lower sediment yield due to less disturbance (natural cover and armoring). Eliminate the reference to data from Table 42 on page 76. It is not needed.
- w. Page 162, Table 84: Puzzling that mercury loads in agricultural and urban runoff are so similar. I would expect much higher sediment losses from the agricultural areas. Unless the mercury concentrations in the urban soils are proportionally higher, this is puzzling. Need to check soil losses and mercury concentrations in soils of agricultural and urban areas to see if this makes sense.
- x. Page 162, Tables 84 and 85: Why are the interim LAs in Table 85 higher than the current LAs in Table 84?
- y. Page 162, Table 86: How Table 86 is used in determining interim limits needs to be explained. Column headings need to be clarified "Mercury in Suspended Sediment"
- z. Page 164, 4th bullet: Not clear that this statement is correct. Some of the mercury losses from the open space land are due to anthropogenic atmospheric deposition, not natural soil concentrations. The two should be separated and defined before making this statement. That said, the reality of the situation is that it may not be socially or economically feasible to achieve 80% reductions in mercury losses from anthropogenic and/or natural sources.
- aa. Page 165, Table 88:
 - Relative difference in what values? Are these comparisons between individual concentration values? If so, it would be useful to indicate how many samples the relative differences are based on. Need more explanation of data in table.
 - Fairly consistent and systematic over prediction for copper and mercury. Since most of the estimated mercury loading comes from the largest storms, and the table suggests that the model may overestimate loadings by 100%, required mercury reductions may be much less than the estimated 80%.

3. Technical Memorandum dated March 1, 2006 on the Calibration Results of the CCWM for Metals and Selenium

- a. No information or data is presented on the hydrology calibration results for the CCWM. Lack of information on the hydrology calibration results makes it somewhat difficult to evaluate the TSS, metals and selenium calibrations.
- b. Page 26: Reference for Chang (2004) is missing from references
- c. Pages 27-29: Figures indicate that the calibrated the CCM model is overestimating measured sediment concentrations by a factor of 2.1 to 3.3. This is justified based on similarities to alternative estimates of annual sediment yields by Chang (2004) and an unspecified NRCS/SCS study(s); however no information on the scientific basis of either estimate is presented on which to judge their scientific validity. More background is needed on these estimates.
- d. Pages 31-37: CCWM seems to consistently grossly over predict total copper concentrations. Possible consequence of over prediction of TSS or potency factor. Dissolved copper concentrations are generally predicted well.
- e. Pages 39-45: CCWM seems to generally over predict total nickel concentrations. Possible consequence of over prediction of TSS or potency factor. Dissolved nickel concentrations are generally predicted well.
- f. Pages 47-50: CCWM seems to consistently over predict total mercury concentrations. Possible consequence of over prediction of TSS or potency factor. Dissolved nickel concentrations are generally predicted well.
- g. Pages 52-55: CCWM seems to predict total selenium concentrations well.