# Water Board Responses to California Public Comments

November 2, 2010

## 2. California Department of Transportation

**DEPARTMENT OF TRANSPORTATION**
DISTRICT 3
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September 10, 2010

Mr. Douglas F. Smith
California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Dear Mr. Smith:

Re: Comments on the Lake Tahoe Watershed Sediment and Nutrient TMDL and Basin Plan Amendment

The California Department of Transportation (Caltrans) appreciates the opportunity to comment on the Proposed Amendments to the Water Quality Control Plan for the Lahontan Region, including the draft Lake Tahoe Lake Clarity Total Maximum Daily Load (TMDL) for Sediment and Nutrients. Caltrans supports the Lahontan Regional Water Quality Control Board's (Water Board's) efforts to improve the water quality in Lake Tahoe and has taken steps to reduce its impact in the Lake Tahoe watershed. Over the past several years, Caltrans has actively coordinated with other stakeholders in the development of the TMDL and supports the adaptive implementation approach of the TMDL.

The Lake Tahoe TMDL requires substantial outlay of resources in order to comply with the load reduction and crediting requirements. In addition, objective assessment of TMDL compliance is a concern for several reasons. First, Caltrans has significant concerns with the accuracy of the crediting tools being developed by the Water Board. These may require significant adjustments to accurately simulate watershed conditions and estimate loading to the lake. Second, Caltrans is included with "Urban Upland" and has not been assigned a specific waste load allocation. Caltrans will need to prioritize stormwater mitigation needs and work with the State Board, Regional Board, and other stakeholders to explore alternative compliance strategies to supplement capital construction (treatment retrofit) so that compliance with the NPDES Permit and TMDLs can be achieved. The adaptive implementation approach of the TMDL must be integrated in a way to allow the stakeholders to explore these different strategies while staying compliant with the TMDL requirements.

The proposed changes to the existing basin plan language include removal of the discussion of effluent limitations, including numerical standards, from pages 5.6-1 to 5.6-2. We expect the effluent limitation requirements that will be removed from the basin plan will also be removed from the

# Comment

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

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# Response

**Caltrans-1:** The implementation cost analysis is described in the Pollutant Reduction Opportunity Report and the Integrated Water Quality Management Strategy Report. The analyses contained in these two reports indicate the implementation timeframe is achievable. If pollutant load reductions are not achieved due to lack of funding, the Water Board has the discretion to amend the implementation schedule.

**Caltrans-2:** As described in the proposed Basin Plan amendment (see Table 5-18.8 in the urban uplands implementation section), the Water Board will provide clear guidance and requirements for calculating jurisdiction-specific baseline pollutant load estimates. The Pollutant Load Reduction Model was developed with the input of stormwater managers to provide a continuous simulation tool to evaluate pollutant load and load reduction opportunities in the Lake Tahoe basin. Municipal jurisdictions in the Lake Tahoe area have already used this tool to conduct jurisdiction-scale baseline load analysis, and we anticipate others will similarly use this tool or an equivalent method. The proposed Basin Plan amendment has been changed to state that the Water Board may accept alternative load estimation tools provided such tools "demonstrably produce similar results" to the Pollutant Load Reduction Model or other continuous hydraulic simulation methods.

There are several additional tools being developed to support load estimates. These tools, the BMP and Road Rapid Assessment Methods, are anticipated to be used in the Lake Clarity Crediting Program (LCCP) along with the Pollutant Load Reduction Model. However, the LCCP and associated tools are not proposed as part of the Lake Tahoe TMDL but are anticipated to be used as part of the Municipal Stormwater NPDES Permit program. The LCCP is intended to provide municipal jurisdictions and state highway departments a flexible framework to account for the various pollutant reductions that each jurisdiction chooses to perform. As long as the proposed action can demonstrably reduce the average annual load of the pollutants of concern, such action will be acknowledged as a viable means of compliance.

**Caltrans-3:** For state highway departments, wasteload allocations (average annual load reductions) will be the compliance metric rather than the numeric effluent limits. The proposed Basin Plan amendment describes how each urban runoff discharger will be required to prepare baseline load estimates for its jurisdiction. Load reduction requirements contained in the load allocation tables will then be applied to the baseline loads to establish five-year load reduction requirements.

pending Caltrans Statewide NPDES permit. Caltrans anticipates receiving a second-term statewide NPDES permit renewal, and the current statewide permit (Order 99-06-DWQ) does not include requirements for compliance with the TMDL. Caltrans requests the Water Board ensure consistency between the TMDL requirements and the Caltrans permit.

For the past ten years, Caltrans has dedicated resources and participated on the Lake Tahoe Capital (Environmental) Improvement Program (CIP or EIP). Caltrans has implemented many structural and non-structural BMPs since the baseline period of 2002 to 2004. Caltrans also performs maintenance and has modified other practices since this baseline period to reduce the potential for pollutants to be discharged from its facilities. We have reduced the amount of traction sand applied to roadways and increased the amount of sand recovered though improved sweeping, and have worked to improve the quality of traction sand to lessen potential discharge of particles and constituents that impact lake clarity to date. Caltrans has installed five (5) detention basins, 50 infiltration devices, and 136 traction sand traps in the Lake Tahoe watershed since the baseline period. We have also assessed our roadway system to determine areas where roadway runoff does not reach receiving waters by virtue of the sheet flow condition. Collectively, these actions constitute compliance with the requirements of our NPDES permit. It is critical that the crediting tools developed by the Water Board allow the flexibility to account for the load reductions from these activities. The Caltrans NPDES Permit Order No. 99-06-DWQ, Provision L.4 states:

> All Caltrans facilities within the Lake Tahoe Hydrologic Unit must be retrofitted to comply with this requirement by the year 2008. If site conditions do not allow for adequate on site disposal, all site runoff must be treated to meet applicable Effluent Limits and/or Receiving Water Limitations specified in the Basin Plan.
>
> Caltrans shall continue to participate in the Capital Improvement Program (CIP), as described in Volume IV of the CWA Section 208 Water Quality Management Plan (208 Plan). The purpose of the CIP is to identify projects, develop an implementation program, and develop a funding mechanism for storm water runoff and erosion control projects in the Lake Tahoe Hydrologic Unit.

In addition, Tables 5.18-2 through 5.18-4 of the proposed new Basin Plan subsection (Subsection 5.18: Lake Tahoe TMDL for Sediment and Nutrients) establish the schedules of reductions that are required to meet the TMDL. The reductions are based on the estimated loads from the Lake Tahoe Watershed Water Quality Model. Caltrans submitted a comment letter on the water quality model to the Regional Water Board on May 3, 2010 that expressed various concerns with the model load estimates. Major concerns include:

1. The accuracy of the assumptions used in the watershed model for the particle size distribution, event mean, and runoff concentrations;
2. The accuracy of the sediment-particle converter equations used to convert fine sediment mass to particle numbers;
3. The linkage of runoff to streams that assumes that all Caltrans runoff discharges directly into Lake Tahoe; and
4. The estimates of Caltrans drainage area and the portion that is composed of impervious land.

## Comment

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September 10, 2010
Page 2

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## Response

**Caltrans-4:** Water Board staff will work with the State Water Board to incorporate Lake Tahoe TMDL wasteload allocations in the Statewide NPDES permit following USEPA approval of the Lake Tahoe TMDL.

**Caltrans-5:** See Response Caltrans -2 with this addition: The baseline period includes all projects that have been implemented since 2004, so Caltrans will be able to account for load reductions from actions taken and continued since 2004.

**Caltrans-6:** On August 13, 2010, Water Board staff sent a response to Caltrans on all concerns expressed in Caltrans letter of May 3, 2010. The complete copy of responses, which addressed the four major concerns listed here by Caltrans, is attached to the end of these responses as Attachment 1 (Caltrans letter of September 10, 2010).

The Water Board should schedule reassessment milestones in the implementation plan to allow for readjustment of these load reduction requirements as the understanding of the actual loads discharged from different jurisdictions and sources improves.

We hope our comments are helpful. If you have any questions, please call me at (530) 741-4233, or the Chief Environmental Engineer, Scott McGowen at (916) 653-4446.

Sincerely,

Jody Jones

JODY JONES
District 3 Director

G. SCOTT MCGOWEN, P.E.
Chief Environmental Engineer
Division of Environmental Analysis

## Comment

Mr. Douglas Smith
September 10, 2010
Page 3

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*"Caltrans improves mobility across California"*

## Response

**Caltrans-7:** As stated on page 17 of the proposed Basin Plan amendment, the Regional Board is committed to operating a TMDL Management System (Chapter 12 in the Lake Tahoe TMDL Report details the components of the Management System). Based on Management System findings, the Regional Board may consider reopening the TMDL to adjust load reduction milestones and/or the TMDL implementation approach if needed. Following the first fifteen year implementation period of this TMDL, the Regional Board will evaluate the status and trend of the lake's deep water transparency relative to the load reductions achieved. The Regional Board, in partnership with implementation, funding, and regulatory stakeholders, anticipates conducting this adaptive management process as needed to ensure the deep water transparency standard will be met by year 65.

**Attachment 1:** Lahontan Water Board Staff response to California Department of Transportation letter of May 3, 2010

*Note: If printing Attachment 1, please print double-sided for ease of viewing.

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May 3, 2010

Mr. Harold J. Singer, P.E.
Executive Officer
California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, California 96150

Dear Mr. Singer:

The California Department of Transportation (Caltrans) appreciates the opportunity to comment on the watershed model developed for the Lake Tahoe Clarity Total Maximum Daily Load (TMDL). Caltrans supports the Lahontan Regional Water Quality Control Board's efforts to improve the water quality in Lake Tahoe. While the TMDL is under development, we would like to ask for clarification of some issues and provide constructive suggestions to enhance the watershed model and its application in the TMDL. Please also clarify the schedule and procedure that will be followed for revisions to the watershed model.

Our comments are contained in the attachment. We hope they are helpful. If you have any questions, please call me at my office at (530) 741-4233, or Scott McGowen at (916) 653-4446.

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## Response

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# ATTACHMENT

## Model Input

The event mean concentrations (EMCs) in the model input do not correspond to the numbers presented in Appendix B (page 83) in the *Watershed Hydrologic Modeling and Sediment and Nutrient Loading Estimation for the Lake Tahoe Total Maximum Daily Load* (Tetra Tech, Inc., February 2007). Please clarify whether the numbers used to create the calibration plots in the document were generated with the current input files or from other values. If these plots were created from other information, please provide the values and information on the source. The runoff concentrations of sediment in the current model input files for primary and unpaved roads are higher than those listed within the Tetra Tech report (note – the distribution of fines matches between the Tetra Tech report and the input files). The June 2009 Lake Tahoe TMDL Technical Report mentions initial EMC estimates were increased by a factor of 20% to include a margin of safety (Page 4-58). It is unclear whether the initial estimates were used and then the model was calibrated, or if the increased EMC values including the margin of safety were used and then the model was calibrated.

## Model Calibration

The Tahoe watershed model uses a default value of 951.6 mg/L for the concentration of all runoff coming from Caltrans roadways. The TMDL model report states that a value of 793 mg/L was obtained from the *Caltrans Tahoe Highway Runoff Characterization and Sand Trap Effectiveness Studies Report* (CTSW-RT-03-054.36.02) and a report from the Nevada Department of Transportation (NDOT) and the Desert Research Institute (DRI) (Publication No. 41209). The load was then increased to 951.6 mg/L during the calibration process, without additional clarification. As presented in Figure 1 below, primary road Total Suspended Solids (TSS) concentrations below 1,000 mg/L do not appreciably change the total watershed load of TSS. Because changes to primary road TSS concentrations below 1,000 mg/L do not result in watershed TSS responses, it would be possible to select any TSS concentration value for primary roads without affecting the sediment calibration of the model. Please explain how this value was estimated and update the model, if necessary.

Secondary roads were originally assumed to have similar runoff concentrations to the primary roads and were assigned EMC of 793 mg/L. However, through the calibration process, secondary roads were reduced to the same level as multifamily residential, a TSS concentration of 150 mg/L (Page 4-59 of the TMDL Technical Report, June 2009). In the pollutant load reduction model (PLRM), the secondary road TSS concentrations for moderate road risk vary between 170 and 344 mg/L, depending on road condition. It is difficult to understand why a TSS concentration of 150 mg/L would be selected to represent secondary roads when commercial areas (parking lots) are assigned 296 mg/L.

# Response

Attachment
Harold Singer
Caltrans Tahoe Model Concerns
May 3, 2010

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**DOT-1d:** The initial EMC estimates, as presented in Appendix B in Tetra Tech's Feb 2007 Watershed Modeling Report, were increased by a factor of 20 percent to include a margin of safety and these final estimates are shown on Table 4-23 in the Technical Report. The final estimates depicted in Table 4-23 were then input to the Lake Tahoe Watershed Model then the model was calibrated before estimating the upland source loads.

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**DOT-2d:** The 793 mg/l EMC was increased by a factor of 20 percent for a margin of safety [793 mg/L + .20(793 mg/L)] = 951.6 mg/L.

**DOT-3d:** The EMC value used for primary roads was informed by water quality monitoring data from the TMDL Stormwater Monitoring Study (Heyvaert et al. 2007, Heyvaert et al. unpublished, Gunter 2005) among other sources referred to in the paragraph. The source analysis conducted for this TMDL focuses on number of fine sediment particles, not on TSS as depicted in Figure 1. This TMDL did not directly translate or correlate between TSS for all land-uses with number of fine sediment particles for primary roads. Rather, Chapter 5 in the Technical Report describes several steps that were taken to estimate and convert the subwatershed mass loading values to number of fine sediment particles (based on land-use type).

Secondary roads were originally assumed to have similar runoff concentrations to the primary roads and were assigned EMC of 793 mg/L. However, through the calibration process, secondary roads were reduced to the same level as multifamily residential, a TSS concentration of 150 mg/L (Page 4-59 of the TMDL Technical Report, June 2009). In the pollutant load reduction model (PLRM), the secondary road TSS concentrations for moderate road risk vary between 170 and 344 mg/L, depending on road condition. It is difficult to understand why a TSS concentration of 150 mg/L would be selected to represent secondary roads when commercial areas (parking lots) are assigned 296 mg/L.

**DOT-4d:** As stated in the Technical Report page 4-60, no direct data was available for secondary roads. EMCs from the secondary roads land-use are assumed to be the same as those developed/estimated for the multiple family residential land-use since the secondary roads were considered to be a large part of the multi-family residential land-use category. The EMC estimates in the TMDL for secondary roads should not be compared to the estimates derived from the Pollutant Load Reduction Model (PLRM). The PLRM was developed exclusively for use in the implementation phase for implementers to estimate load reductions and the PLRM was not used in the TMDL basin-wide source loading estimates.

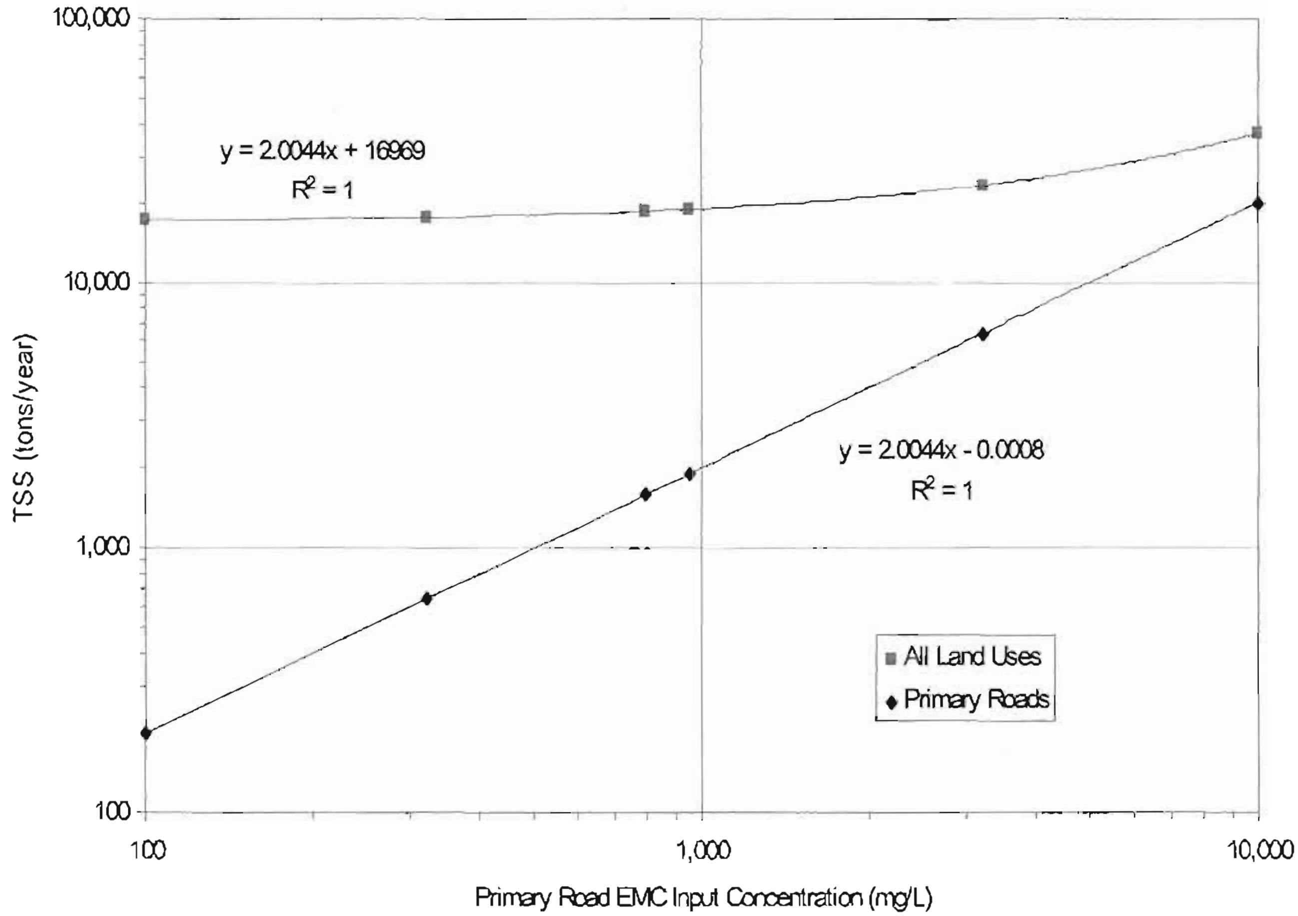


**Figure 1: Modeled Total Suspended Sediment Load Response to Changes in Primary Road EMC**

**Particle Size Distributions**

The Tahoe TMDL model estimates that 63.1% of the total TSS mass from Caltrans facilities is comprised of ultra-fine particles (<20 μm). The text accompanying Table 4-8 (Page 62) of the watershed modeling report states that the distributions were derived from *Particle Size Distribution in Stormwater Runoff Samples at Tahoe* (Heyvaert, A., J. Reuter, G. Schladow, 2007). None of the sites evaluated in the study receive exclusively runoff from State Highway facilities. In addition, the standard deviation of samples collected from urban land uses is highly variable with standard deviations much larger than the average values. It is also important to note that the intercept listed in Figure 5.2 of the report for a sample in Blackwood exceeds the corresponding maximum intercept listed in Table 5.1. Please explain how the distribution values were chosen from the Heyvaert study and why they are appropriate for Caltrans facilities.

The particle size distributions for commercial, industrial, primary road, and secondary road land uses are identical in the model. However, the residential land uses as shown in Table 4-8 (Page 62) of the

Attachment
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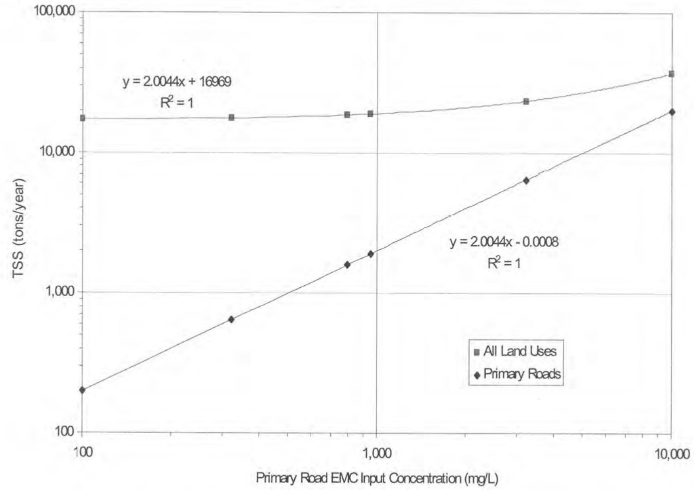
Caltrans Tahoe Model Concerns
May 3, 2010

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## Response

**DOT-5d:** During the period when field data was being collected in support of the TMDL modeling efforts (primarily 2002-04), Caltrans was engaged in a significant monitoring effort of highway sites for runoff characterization. Based on that effort, which included particle size analysis for the California highways, specifically, it was deemed most appropriate that the limited funding for particle size characterization for urban runoff would be dedicated for monitoring non-primary road sites. Caltrans primary road monitoring data was used for other constituents.
The number of fine sediment particles is much more important than sediment mass in this TMDL. However, while some particle size data based on particle number was collected by Caltrans and presented in their 2003 report that summarized their 2000-03 monitoring efforts, the particle number data needed for the modeling was inadequate and could not be used.
When considering urban runoff it has been found that at Lake Tahoe, the standard deviation over the course of an entire year is often greater than the mean. This is a reflection of a high degree of both seasonal variation and the fact that absolute concentrations measured during a single storm event are highly influenced by a number of factors such as rain versus snow, rain intensity, first-flush type of events, etc.
Since particle data entering the lake from Blackwood Creek and other channelized, permanent streams was based on direct field monitoring of particles in the inflow, the observation regarding slope value for Blackwood Creek is not considered significant.
The potential importance of fine particles to Lake Tahoe's clarity was first published in 1999. UC Davis researchers immediately began to study and confirm this hypothesis. This work was greatly enhanced by the TMDL process so that models and other data used in support of the TMDL were as accurate and as up-to-date as possible. Between 2002-2004 fine sediment particles in stream flow and urban runoff were measured for the first time. This work was on the leading edge of stormwater investigations nationally, in the sense that the literature on this topic was negligible. Assumptions used in the estimations were based on the new and unique database and best professional judgment.

**DOT-6d:** The 63.1% value used for fine sediment particle composition from primary and secondary roads were assumed to be the same as that actually measured for the CICU land-use category. The TMDL Stormwater Monitoring Study (Heyvaert et al. 2007, Heyvaert et al. unpublished, Gunter 2005) (conducted in support of the TMDL and the most extensive ever done at Lake Tahoe), did not have the ability to support a program where each specific land-use in the basin was individually evaluated. Besides a limited budget to support such an approach, stormwater flow is such that it was typically not possible to isolate land-uses to such a fine resolution.
Consequently, the single family and multiple family residential, along with CICU were measured directly. Secondary roads were considered to be a significant part of the residential runoff. Other specific land-uses such as turf, forest roads, and ski slopes were informed by available monitoring data taken from other – past – focused studies. Again, the TMDL used the reported Caltrans and NDOT concentration values for other constituents, except the particle count data was not used.

watershed modeling report are assigned distributions with substantially fewer ultra-fines. Please explain why different values were used for these land uses in the model.

Additionally, the runoff fines distributions for residential land uses [both Single-Family Pervious (SFP) and Multi-Family Pervious (MFP)] appear inconsistent depending on the method calculated. For example, in Table 4-33 on page 4-76 of the 2009 Lake Tahoe TMDL Technical Report, Residential SFP has an upland TSS load of 269 metric tons per year. If this number is multiplied by corresponding runoff fines distributions for that land use type (Table 4-24 of the 2009 report), Residential SFP then has an upland fine TSS load (<63 μm) of 205 metric tons (same as in Table 4-33), and an upland ultra-fine TSS load (<20 μm) of 96 metric tons (not shown in the report). If the fine upland TSS load for Residential SFP land use type (205 metric tons) is used in conjunction with the urban particle converter, the upland ultra-fine TSS load (<20 μm) is then calculated out to be 146 metric tons, which is greater than the 96 metric tons calculated using Table 4-24 in the report. Please explain these inconsistencies regarding residential SFP and MFP fine sediment load.

**Fine Sediment Load to Fine Sediment Particle Number**

Urban and non urban fine sediment mass (<63 μm) are converted to particle numbers using two sediment-particle converters. The proportion field of each converter appears to have been rounded, and this is appears to be affecting model verification calculations. The proportion field should be updated in both the urban and non urban particle conversion tables with consistent significant figures which reflect the level of accuracy needed to replicate the results in the report.

Table 4-24 in the 2009 Lake Tahoe TMDL Technical Report lists runoff fines distributions for three sediment sizes. The percent fines less than 63 μm, together with the urban and non urban particle converters are used to estimate total number of fine particles generated by each land use or sub-basin. Alternatively, the total number of ultra-fine particles (< 20 μm) generated by land use or sub-basin can also be estimated by these methods. When total suspended sediment, ultra-fines, and corresponding number of ultra-fine particles are compared by land-use type plotted against area contribution (Figure 2), the model output appears incorrect. It seems highly unlikely that if 90 percent of the Lake Tahoe basin area is vegetated and produces at least 60 percent of total suspended sediment, that ultimately it would produce 20 percent of the ultra-fine sediment load and 10 percent of the ultra-fine particles. The ratio of urban and non urban influence on fine sediment load should be substantiated.

# Response

Attachment
Harold Singer
Caltrans Tahoe Model Concerns
May 3, 2010

watershed modeling report are assigned distributions with substantially fewer ultra-fines. Please explain why different values were used for these land uses in the model.

Additionally, the runoff fines distributions for residential land uses [both Single-Family Pervious (SFP) and Multi-Family Pervious (MFP)] appear inconsistent depending on the method calculated. For example, in Table 4-33 on page 4-76 of the 2009 Lake Tahoe TMDL Technical Report, Residential SFP has an upland TSS load of 269 metric tons per year. If this number is multiplied by corresponding runoff fines distributions for that land use type (Table 4-24 of the 2009 report), Residential SFP then has an upland fine TSS load (<63 µm) of 205 metric tons (same as in Table 4-33), and an upland ultra-fine TSS load (<20 µm) of 96 metric tons (not shown in the report). If the fine upland TSS load for Residential SFP land use type (205 metric tons) is used in conjunction with the urban particle converter, the upland ultra-fine TSS load (<20 µm) is then calculated out to be 146 metric tons, which is greater than the 96 metric tons calculated using Table 4-24 in the report. Please explain these inconsistencies regarding residential SFP and MFP fine sediment load.

**DOT-7d:** The particle converter was not used at this stage to change the percent of the TSS load < 16 µm in size to number of fine sediment particles. Rather, the 76.3 percent upland fines (< 63 µm) of the Single-Family Pervious land-use were applied to the TSS EMC value and the resulting value was then input to the Lake Tahoe Watershed Model to determine the loading by subwatershed and intervening zone. After estimating the basin-wide upland loading for urban and non-urban land-uses, then the particle converter was used to estimate the number of fine sediment particles < 16 micrometers in size.

### Fine Sediment Load to Fine Sediment Particle Number

Urban and non urban fine sediment mass (<63 µm) are converted to particle numbers using two sediment-particle converters. The proportion field of each converter appears to have been rounded, and this is appears to be affecting model verification calculations. The proportion field should be updated in both the urban and non urban particle conversion tables with consistent significant figures which reflect the level of accuracy needed to replicate the results in the report.

**DOT-8d:** Section 5.2.1 in the Technical Report describes how the fine sediment particle numbers and associated mass were developed from model output. The proportion field is a reflection of the derived individual mass divided by the total mass. The total mass for each particle size range was input from the summed values (after converting back to mass) in Table 5-13 in the Technical Report.

Table 4-24 in the 2009 Lake Tahoe TMDL Technical Report lists runoff fines distributions for three sediment sizes. The percent fines less than 63 µm, together with the urban and non urban particle converters are used to estimate total number of fine particles generated by each land use or sub-basin. Alternatively, the total number of ultra-fine particles (< 20 µm) generated by land use or sub-basin can also be estimated by these methods. When total suspended sediment, ultra-fines, and corresponding number of ultra-fine particles are compared by land-use type plotted against area contribution (Figure 2), the model output appears incorrect. It seems highly unlikely that if 90 percent of the Lake Tahoe basin area is vegetated and produces at least 60 percent of total suspended sediment, that ultimately it would produce 20 percent of the ultra-fine sediment load and 10 percent of the ultra-fine particles. The ratio of urban and non urban influence on fine sediment load should be substantiated.

**DOT-9d:** While the total number of fine sediment particles (< 16 µm) could be estimated by applying the percent of fines (< 20 µm) to each land-use, we did not take that approach. Rather, we used the total fines (< 63 µm) percent and applied it to the TSS value to obtain the total fines load as input to the Lake Clarity Model. The particle converter was used to simply convert the TSS value to total number of fine sediment particles < 16 µm for the basin-wide value of urban and non-urban land-uses.

**DOT-10d:** Given the much higher concentration of fine sediment particles in urban runoff, this was found to be one of the most revealing aspects of the TMDL scientific study. The nutrient and sediment summary budget (Table 4-66 of the Technical Report) shows that suspended sediment input from the forested uplands exceeds the urban runoff, but as particle size declines the importance of the urban contribution increases. The TMDL conclusion on this topic is supported by actual field data collected in support of this document. Given that the decline in deep water transparency has been seen since urbanization, it is not surprising that urban inputs would be the most important.

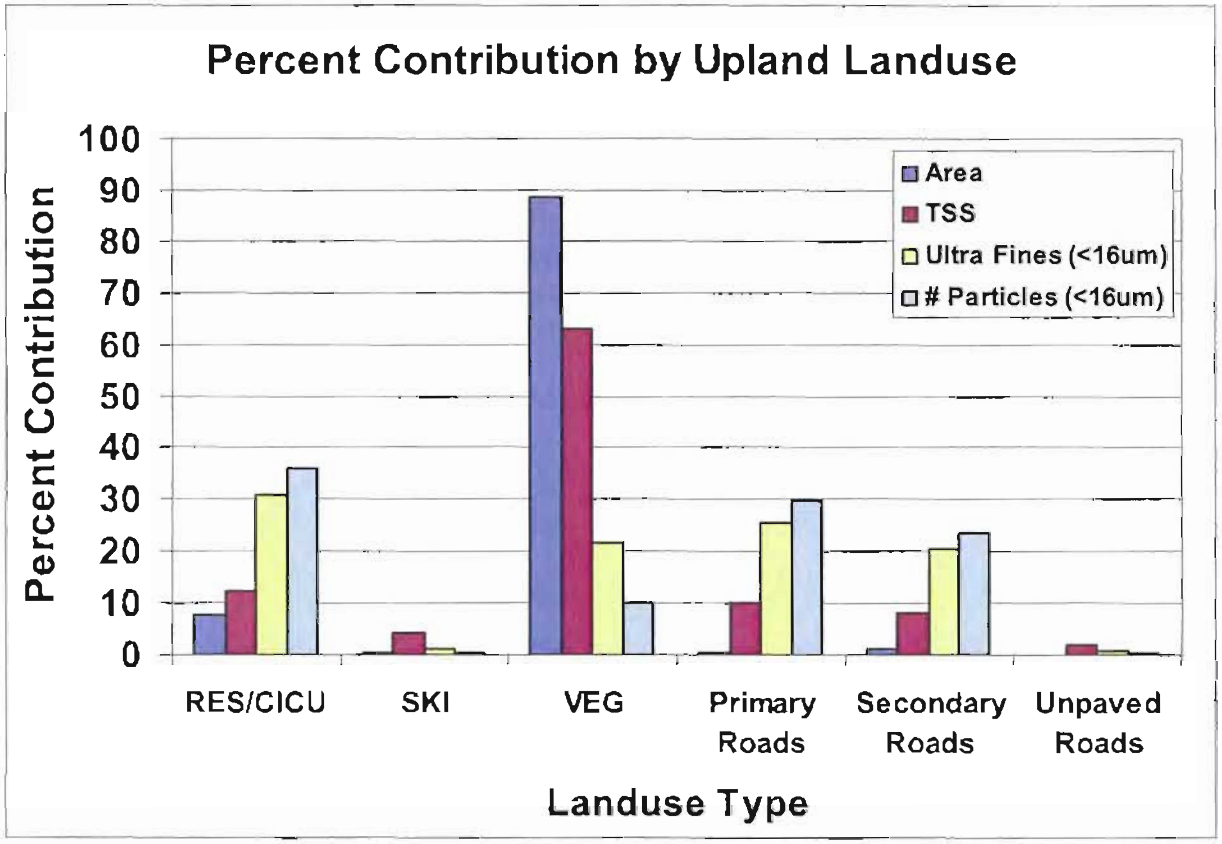


**Figure 2: Modeled Total Suspended Sediment Load, Ultra-fine Sediment Load, and Number of Particles Compared to Percent Area of Entire Watershed**

## Reported Fine Sediment Loads

Summarized model information is often presented in tables corresponding to the 64 streams, rather than all 184 subwatersheds (e.g., Table 4-32 in the June 2009 Lake Tahoe TMDL Technical Report). Please clarify whether the column listed "tributary" is presenting data which reflect model output only associated with that stream (e.g. is Third Creek only associated with subbasin 1030), or if presented results are aggregated in some way (e.g. Third Creek corresponds to 1030, 1031, 1032, 1033, 1034, and 1035). If they are aggregated, please provide the methodology used to accomplish this. It is assumed that Table 4-29, 4-34, and 4-35 are generated in a similar fashion, as well as values in Appendix C in the Tetra Tech, 2007 document. Please confirm these assumptions or provide clarification.

Table 5-4 in the June 2009 Lake Tahoe TMDL Technical Report lists 64 Sub-Basins and their corresponding Group Name, which in turn describes particle loading estimates based on 10 LTIMP streams. In the table, sub-basins 7000, 7010, 7020, 7030, 7040, and 7050 are all listed under the group Blackwood Creek. The model input structure does not reflect these groupings listed in the table, however. By reading the input file to the model, it is confirmed that only sub-basin 7010 is designated as within the Blackwood Creek region. The other sub-basins (7000, 7020, 7030, 7040, and 7050) are designated as part of the General Creek group. Each group corresponds to a different runoff fines distribution, which is described in Table 4-24 of the June 2009 Lake Tahoe TMDL Technical Report.

## Response

Attachment
Harold Singer
Caltrans Tahoe Model Concerns
May 3, 2010

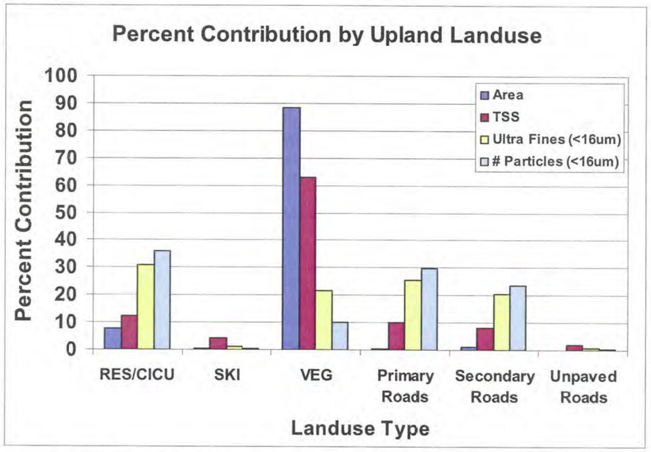


**Figure 2: Modeled Total Suspended Sediment Load, Ultra-fine Sediment Load, and Number of Particles Compared to Percent Area of Entire Watershed**

**Reported Fine Sediment Loads**

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**DOT-11d:** Each tributary value is expressed as an aggregate of the entire watershed. The concern is centered on what drains into the lake. Pollutant generation from each subwatershed is calculated and this is transported downstream, combined with the pollutant generation for the next subwatershed and further routed downstream in this fashion.

Table 5-4 in the June 2009 Lake Tahoe TMDL Technical Report lists 64 Sub-Basins and their corresponding Group Name, which in turn describes particle loading estimates based on 10 LTIMP streams. In the table, sub-basins 7000, 7010, 7020, 7030, 7040, and 7050 are all listed under the group Blackwood Creek. The model input structure does not reflect these groupings listed in the table, however. By reading the input file to the model, it is confirmed that only sub-basin 7010 is designated as within the Blackwood Creek region. The other sub-basins (7000, 7020, 7030, 7040, and 7050) are designated as part of the General Creek group. Each group corresponds to a different runoff fines distribution, which is described in Table 4-24 of the June 2009 Lake Tahoe TMDL Technical Report.

Blackwood Creek and General Creek runoff are estimated to consist of approximately 45% and 29% fines (<63 μm), respectively. Because the Blackwood Creek region experiences some of the highest amounts of precipitation and unit-area water yield, the number of basins within the Blackwood Creek region can significantly influence the total fine sediment load. If sub-basins 7000-7050 are categorized within the Blackwood Creek region, these six sub-basins contribute to approximately 28% and 25.5% of the total sediment and total fine sediment load to Lake Tahoe. If sub-basin 7010 represents Blackwood Creek as the only sub-basin in that region, the fine sediment load contribution from the six sub-basins (7000-7010, where 7010 corresponds to Blackwood Creek and 7000 and 7020-7050 correspond to General Creek) decreases to approximately (21%). Please clarify which sub-basins are grouped within the Blackwood Creek region and why they are categorized as such.

**Linkage of Runoff to Streams**

The model assumes that all Caltrans runoff discharges directly into Lake Tahoe or a tributary to the lake. The model does not simulate the discharge of runoff into the storm drain system or onto pervious areas adjacent to the roadway. The discharge of runoff onto pervious areas would reduce the flow and pollutant loading into the lake through infiltration. In addition, other constituents, including nutrients and TSS, are reduced through infiltration. The areas of the watershed designated as Natural Environment as Treatment (NEAT) in the *NEAT Report* submitted to the Lahontan Regional Board are not reflected in the model. Additionally, there are non-linkage areas directly connected to the Lake and treatment is not needed in these areas. In the letter that Caltrans received from Harold J. Singer dated January 19, 2010, he noted that "the NEAT Report helps to identify areas where few or no improvements are needed for TMDL purposes based on the multiple factors evaluated". The exclusion of these factors causes the contribution from Caltrans to be overestimated by the model.

**Caltrans Drainage Area**

The model assumes primary roads are impervious surfaces, which are modeled using Hydrologic Simulation Program-Fortran (HSPF) algorithms. The HSPF manual recommends that land-uses which are categorized as impervious should be segmented so that the area is represented by an "effective impervious area." The effective impervious area is defined as the portion of the total impervious area that is directly connected to the drainage system, because impervious runoff that drains first to pervious areas can infiltrate and should not be included in the impervious simulation. In other words, only directly connected impervious roadway should be characterized as impervious. There should be pervious land use types corresponding to roads accounting for runoff that is not directly connected. Please comment on whether effective impervious areas were incorporated for impervious land-uses, and if so, what the estimates are and how they were made.

The TMDL goal is based on achieving the level of clarity present in 1968. Caltrans area has not changed substantially since this time. The major changes in the watershed are due to development and this is likely a major cause of the reduction in clarity in the lake. The model is likely under-predicting the load discharged from developed portions of the watershed.

## Response

Attachment
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Caltrans Tahoe Model Concerns
May 3, 2010

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**DOT-12d:** As discussed in Chapter 5 of the Technical Report, fine particle loading from stream channels is estimated using LSPC flow and the regression equations from Rabidoux (2005), which are based on two years of actual field monitoring data. For sub-basins 7000-7052, the particle loading estimates are based on the concentrations from Blackwood Creek and not General Creek.

**Linkage of Runoff to Streams**

The model assumes that all Caltrans runoff discharges directly into Lake Tahoe or a tributary to the lake. The model does not simulate the discharge of runoff into the storm drain system or onto pervious areas adjacent to the roadway. The discharge of runoff onto pervious areas would reduce the flow and pollutant loading into the lake through infiltration. In addition, other constituents, including nutrients and TSS, are reduced through infiltration. The areas of the watershed designated as Natural Environment as Treatment (NEAT) in the *NEAT Report* submitted to the Lahontan Regional Board are not reflected in the model. Additionally, there are non-linkage areas directly connected to the Lake and treatment is not needed in these areas. In the letter that Caltrans received from Harold J. Singer dated January 19, 2010, he noted that "the NEAT Report helps to identify areas where few or no improvements are needed for TMDL purposes based on the multiple factors evaluated". The exclusion of these factors causes the contribution from Caltrans to be overestimated by the model.

**DOT-13d:** Though previous drafts may have included an estimate of baseline loading from urban jurisdictions, the June 2010 Final TMDL does not include jurisdiction-specific baseline loadings for any municipal jurisdiction. Information from the NEAT Report should help Caltrans in determining its baseline load.

**Caltrans Drainage Area**

The model assumes primary roads are impervious surfaces, which are modeled using Hydrologic Simulation Program-Fortran (HSPF) algorithms. The HSPF manual recommends that land-uses which are categorized as impervious should be segmented so that the area is represented by an "effective impervious area." The effective impervious area is defined as the portion of the total impervious area that is directly connected to the drainage system, because impervious runoff that drains first to pervious areas can infiltrate and should not be included in the impervious simulation. In other words, only directly connected impervious roadway should be characterized as impervious. There should be pervious land use types corresponding to roads accounting for runoff that is not directly connected. Please comment on whether effective impervious areas were incorporated for impervious land-uses, and if so, what the estimates are and how they were made.

**DOT-14d:** For input to the Lake Tahoe Watershed Model, the Water Board assumed all impervious surfaces were directly connected to tributaries or the lake. The connection is valid in areas with low to non-existent infiltration, such as high groundwater, frozen soils, and rock. Since many pervious areas infiltrate surface water, urban jurisdictions should use that information to maximize infiltration potential when designing stormwater treatment facilities. Abundant pervious areas can help each jurisdiction to define its baseline loads and to place projects for maximum benefit.

The TMDL goal is based on achieving the level of clarity present in 1968. Caltrans area has not changed substantially since this time. The major changes in the watershed are due to development and this is likely a major cause of the reduction in clarity in the lake. The model is likely under-predicting the load discharged from developed portions of the watershed.

**DOT-15d:** Though the Caltrans roadway system may not have changed substantially since 1968, the maintenance, use, and presence of stormwater control facilities has likely not remained constant. The application and recovery of traction abrasives, in particular, has varied considerably. Caltrans has also installed numerous stormwater facilities along its roadways in the 1980s and 1990s but many of those facilities were not designed specifically to capture fine sediment particles < 16 μm in size. The draft TMDL load allocations have been assigned to all urban areas together, basin-wide, and there were no load allocations assignments that separated roads from other developed uplands.