U.S. EPA Malibu Creek and Lagoon Draft Total Maximum Daily Load (TMDL) for Sedimentation and Nutrients to Address Benthic Community Impairments

TECHNICAL COMMENTS

A. General Technical Comments

1. We recommend that all calculations be made using the SC-IBI with the new bioassessment scoring tool developed for the state: the California Stream Condition Index (CSCI).

2. We recommend that bioassessment reference sites be changed from the coastal reference sites to two Malibu Creek headwaters sites under the influence of the Monterey Formation. Other Santa Monica mountain coastal streams are not representative of Malibu Creek's native ionic strength, nor of its major tributaries other than Cold Creek.

3. We recommend that National Park Service and Calabasas Landfill water quality monitoring data be included in a revised calculation of natural background water quality (see attached data).

4. We recommend that EPA conduct a full CADDIS level causal assessment with stakeholder participation that includes the CADDIS ionic strength module. Watershed stakeholders have more detailed knowledge of potential stressors affecting streams, and ionic strength is one stressor that was not considered in the draft TMDL. This should be added in the recommendations section.

5. TMDL analysis should limit its finding to benthic macroinvertebrate bioassessment sites with year-round flow, per the assumptions of the So Cal IBI. Sites MC1 and MC12 do not have year-round flow.

6. TMDL analysis should limit algal percent cover and nutrient water quality assessment to periods of time with flow.

7. The TMDL should use benthic macroinvertebrate impairment thresholds specific to the conditions in Malibu Creek watershed, including the influences on water quality from the Monterey/Modelo Formation and other local geologic terrain. This is the approach being used by the state biological objectives benthic macroinvertebrate science team.

8. The TMDL should develop algal impairment thresholds specific to the conditions in Malibu Creek watershed, including the influences on water quality from the Monterey/Modelo Formation and other local geologic terrain and very low flow conditions during summer.

9. The TMDL should assess algal biomass using ash free dry weight and not by using chlorophyll-a. There are multiple problems with chlorophyll a assessments: chlorophyll can degrade prior to analysis, results are highly variable by method and by laboratory.

10. EPA cites the Heal the Bay report Sikich et al. (2012)[1] 22 times in the text of the TMDL, but the report is not available for review by watershed stakeholders because it has not been published. It is expected to be published in 2013. EPA's reliance on this report dictates that it should be available for the affected stakeholders to review.

[1] Sikich, S. K., Pease, K., Diringer, M., Abramson, M., Gold, M., Luce, S. 2012. *State of the Malibu Creek Watershed Report: Trends in Watershed Health*. Heal the Bay, Santa Monica, CA.

B. Detailed Technical Comments

Note: Page numbers refer to specific pages in the draft TMDL. Comments are also numbered sequentially to assist the EPA in responding to specific comments.

Section 1 – Introduction

Page 1-2

Comment (1): In summarizing their own work, the draft TMDL authors assert that, "This TMDL completed a detailed stressor identification or causal assessment to comprehensively evaluate the critical stressors causing the impairment." We disagree. Our detailed comments below provide substantial evidence that the draft TMDL did NOT comprehensively identify or evaluate critical stressors of the benthic macroinvertebrate community in Malibu Creek. Critical stressors were either not identified at all or were dismissed despite a larger weight of evidence for their importance than the stressors that EPA identified as critical with respect to low IBI scores.

For example, the on-going use of toxic aquatic insect larvacides in Malibu Creek for vector control was not identified as even a potential stressor. Likewise, while the EPA's linkage analysis includes the potential effects of nitrogen and phosphorus on algal growth in Malibu Creek, it overlooked the effect of elevated calcium – which is unusually high in Malibu Creek - on algae growth, documented in EPA's own stressor identification guidance. The TMDL authors also appear unaware of the fact that Malibu Creek is a non-perennial stream over 25% of its length every summer, and use aquatic insect assessment methods that assume permanent flow. This error in turn stems from EPA's reliance on stream flow data from the county gage, which does not register zero flows above the gage because it lies immediately below a major tributary (Cold Creek), and does not register zero flows in the creek below the gage where a major drying zone develops virtually every summer (see photos) in the absence of deliberate, releases of recycled water from Tapia WRF required by the US National Marine Fisheries Service to sustain aquatic habitat for endangered steelhead trout. This basic error in hydrology – overestimating instream flows –violates both the assumption of perennial flow in EPA's macroinvertebrate assessment method and overestimates sediment transport in its sedimentation assessment. More information is provided below in the relevant sections.

Comment (2): In the paragraph at the top of the page, the TMDL states that a TMDL is required to account for seasonal variation. But seasonal analyses were not done or presented in sections 6, 7 or 9. Data should be separated between discharge (November 16 – April 14) and non-discharge periods (April 15 – November 15). Had that been done, the data would indicate that nutrient levels are significantly lower during the seven-month, non-discharge period, which coincides with peak spring and summer algal growth in Malibu Creek. Conversely, algal growth declines in winter due to cooler weather, lower sun angles, and shorter days despite higher nutrient levels, as shown in the figures on pages 45-47 of our analysis of the Malibu Creek monitoring data (LVMWD Report #2475.00) which was previously submitted.

Page 1-2

Comment (3): Data should be presented seasonally. In the paragraph at the top of the page, the TMDL states that a TMDL is required to account for seasonal variation, but seasonal analyses weren't presented in sections 6, 7 or 9. Not separating nutrient data, especially, into the discharge season (November 17 – April 14) and non-discharge season, gives the erroneous impression that nutrient concentrations can vary greatly at any time of year. By showing the results seasonally, those reviewing the TMDL will see that Tapia Water Reclamation Facility (WRF) increases nutrients only during the discharge season, and that concentrations are significantly lower during the non-discharge season. Without seasonal analysis, the TMDL presents a biased image.

Section 2 – Problem Statement

Page 2-4

Comment (4a): The sentence at the bottom of this page should add that ammonia objectives are not exceeded in Malibu Creek.

Page 2-8

Comment (4b): In their conclusion on impairments, the EPA states that "nutrient concentrations exceed targets established in Malibu Creek Nutrient TMDL (USEPA, 2003)[2] at MC-1, especially for nitrate-N and orthophosphate-P (Table 7-7) during both winter and summer periods (Section 7.5)." This is incorrect. Our review of Heal the Bay's nitrate data (NO_3-NO_2) shows that since Tapia WRF's 2005 permit, MC-1 has only exceeded the 1.0 mg/L summer limit once (5/28/2005), and the 8.0 mg/L winter limit once (3/1/2009). The phosphorus limit is exceeded more frequently, but we believe there is a geologic source of elevated phosphorus in the watershed (see comments on this given for Section 5).

Page 2-9

Comment (5): The statement that "overall, stations with low median IBI scores are also those stations that are downstream of significant amounts of urban development" is incorrect. Heal the Bay's reference site LV-9 has a median SC-IBI of just 41, and half the scores fail. This site is in the undeveloped headwaters of Las Virgenes Creek within the Monterey / Modelo Formation. The Cheeseboro Creek site Ch-6 has a median score of 54, but had a failing score in one of the seven assessments. This site is also in undeveloped Monterey / Modelo Formation headwaters. Site LV1 from the Malibu Creek Watershed Monitoring Project is immediately upstream of development in the undeveloped headwaters of Las Virgenes Creek and has a median score of 24, but is not a pristine site. However, in terms of water quality, it should be considered reference, as it is just at the outlet of an undisturbed watershed. Los Angeles County site 16 is also in the undeveloped headwaters of Las Virgenes Creek, and has a median score of 19 with two Poor and one Very Poor score. While Heal the Bay has 6 reference sites with IBI data, the EPA omitted the three from within Malibu Creek watershed, two of which are within the Modelo Formation, despite the influence that formation has on water quality. Those formations are not present upstream of the two coastal reference sites the EPA selected. Sites selected to represent natural

[2] http://www.epa.gov/region9/water/tmdl/final.html, scroll down to Malibu Creek Nutrient TMDL, 2003.

conditions should include the full range of the watershed's natural conditions. We request that the EPA base reference condition on the range of SC-IBI scores from all Heal the Bay reference sites, and limit sites to those within Malibu Creek watershed. Natural background water quality condition within the watershed should be based on data from all Heal the Bay, National Park Service and Malibu Creek Watershed Management Program (MCWMP) reference sites in the watershed, not just a subset of the single collection of data provided by Heal the Bay.

Section 3 – Numeric Targets

Page 3-1

Comment (6): The TMDL states that "Heal the Bay has collected algal coverage data for 2005-2010." The TMDL should note that algal cover data provided by Heal the Bay is based on single visual observation, and not as reliable as new algal bioassessment percent cover methods developed for SWAMP that rely on objective sampling techniques on 21 transects in a 150m reach with five sampling intervals per transect. Furthermore, Heal the Bay combines benthic filamentous algae with benthic periphyton for their AlgaeMT percents, and combines all floating algae, not just filamentous, in their AlgaeFlt percents (see detailed comments on this for Page 8-3). Benthic cover, in particular, is very difficult to assess visually.

Page 3-2

Comment (7): TMDL numeric targets applied in and resulting from the EPA analyses are listed, but several of those used are problematic for the following reasons:

A. The Southern California IBI has been shown to be an inaccurate tool, and should not be used in this TMDL.
    - It is an inappropriate metric for use in pools and non-perennial sites in the watershed. The SC-IBI was developed for perennial, wadeable streams. Mazor et al. (2012)[3] found that while the IBI accurately assessed the condition of some nonperennial streams, IBI scores declined with increasing stress other than nonperennial flow. We contend that natural water quality conditions constitute that additional stress, so we expect nonperennial flow to further depress scores.
        - Sites MC-1, MC-12 and many other sites in the watershed are not perennial
        - Parts of site MC-12, and sites R-1 and other sites form deep pools that must be sampled along the edges
    - The SC-IBI has not been validated on low gradient stream reaches, as there were an insufficient number of low gradient reference sites in the south coast xeric region.
    - Use of the SC-IBI was found by the technical team developing methodology for the State's Biological Objectives policy effort, to nearly double the state's miles of impaired streams relative to their O/E. The explanation given to the Stakeholder Advisory Group meeting by the technical team on April 18, 2012, was "this makes sense because unless you're modeling, you're continually confounding natural variation with impairment."

[3] Final Report on Bioassessment in non-perennial streams – report to the State Water Resources Control Board. 2012. Mazor, R., Schiff, K., Ode, P. Stein, E. D. Technical Report 695. Southern California Coastal Water Research Project, Costa Mesa, CA.

This is exceptionally so for Malibu Creek, which lies along an extreme in the natural gradients for conductivity, sulfate, chloride and potentially metals and other substances that could affect macroinvertebrate communities. The problem posed by Malibu Creek watershed was reported by the technical team in their report to the Scientific Advisory Group on April 18, 2012, as follows and according to our notes: "California is diverse. To give the scientific advisory group some background, the Monterey Formation is a world renowned oil-bearing formation high in natural conductivity. Thus, the biology at a site may be unfairly judged as impaired. Although we tried to capture sites like that in the reference pool, there will always be some settings that aren't captured and scoring tools will fail. The Assessment Framework can't model all sites. I think this is a case where that would apply." The point we are making is not that Malibu Creek is so exceptional that it cannot be assessed. Instead, the point we are making is that the Malibu Creek is exceptional enough that it is very difficult to assess. The Technical Team has been adding reference sites and revising the model, and these updates are expected to be applicable in Malibu Creek watershed. We expect the state's tools to work well in this watershed.

B. The SC-O/E was not modeled with appropriate predictor variables and reference sites are unknown but unlikely to have similar conductivity and ionic composition.
    - The EPA used a predictive model developed by a team led by respected stream ecologist, Dr. Chuck Hawkins. Access to models is available upon request through the Western Center for Monitoring and Assessment of Freshwater Ecosystems website. Because of the limited time available to respond with comments to the TMDL, we are not able to fully assess the EPA's use of the model. However, we have been able to identify some potential problems. The website[4] includes a primer, which says "a potential problem in the use of empirical models is to apply models to inappropriate situations." An example is given of using the model to assess a large stream when only small streams were used to build the model. In that case, they say it "would be dangerous to extrapolate beyond the experience of the model." The model does have a test to determine whether the predictor variables used fall within the experience of the model, and flags the results when they do not. The EPA used this flagging system to determine that the predictor variable values for "all of the sites from Malibu Creek watershed and adjoining sites … were within the experience of the model" (page 8-14). The problem is that we do not know whether reference sites used to build the model capture the natural variation exhibited in the Malibu Creek watershed. The EPA selected only physical habitat predictor variables (page 8-13) to assess this watershed and to test model fit. They neglected to include conductivity as a predictor variable, although conductivity and ion concentrations are the predictor variables the state is considering. It may be that the model is "extrapolating beyond the experience of the model" in terms of conductivity. The EPA includes a geologic component, percent sedimentary geology, but this is insufficient in this watershed. We have shown in our report summarizing 35 years of data in the Malibu Creek watershed (LVMWD 2011)[5], that conductivity and ion concentrations draining the Monterey Formation exceed Los Angeles Regional Board

[4] http://www.cnr.usu.edu/wmc/htm/predictive-models/predictive-models-primer

[5] LVMWD. 2011. *Water Quality in the Malibu Creek Watershed, 1971-2010*, Submitted by the Joint Powers Authority of the Las Virgenes Municipal Water District and the Triunfo Sanitation District to the Los Angeles Regional Water Quality Control Board in compliance with Order No. R4-2010-0165.

standards for conductivity, TDS, selenium, sulfate, phosphate and chloride, while drainage from other sedimentary formations do not. Given comments made by the state technical team about the watershed, and given that their original set of reference sites did not have conductivity as high as in Malibu Creek, we suspect the reference set in the O/E model may also not have had reference sites with high conductivity.

C. Benthic algal coverage and biomass metrics may not be appropriate in this watershed.
   - The TMDL states that algal cover targets are derived from Biggs (2000), despite the multiple warnings given by Biggs (2000) that these limits may not be achievable in watersheds where there are even modest amounts of Tertiary marine sedimentary formations because of the natural nutrient enrichment derived from those rocks. LVMWD staff met with EPA at their southern California office in December 2010 to share the report on watershed water quality (LVMWD 2011) which reports these warnings by Biggs (2000). Quoting Biggs: "Indeed only small amounts of these rock types in a catchment can cause proliferations during low flows." The EPA ignored these statements by Biggs (2000) and continues to apply the 30% and 60% cover thresholds.
   - Nutrient spiraling studies support the idea that as nutrient spiraling lengths decrease with low flows, nutrient retention may increase (Powers et al. 2012[6], Dent et al. 2007[7]).
   - The EPA ignores EPA funded research by the Southern California Coastal Water Research Project (SCCWRP) indicating higher percent algal cover and larger natural algal biomass occurring in southern California reference streams (Stein and Yoon 2007)[8]. Table 8 in Stein and Yoon (2007) shows that dry weather percent algal cover ranged from 0 to 100% for benthic algae in southern California reference streams. They distinguished between attached and free-floating macroalgal cover, but when these percent cover values are combined to compare with the EPA's floating/filamentous values, the naturally occurring percentages in the range from 9.0 to 75.6%. The EPA ignored the findings of Stein and Yoon (2007) that algal cover is naturally elevated in southern California reference streams, and instead continues to apply the 30% and 60% cover thresholds. When the EPA find on page 8-36 that "an examination of all of the Heal the Bay mat algal coverage data shows that there is almost no correlation between algal coverage and either inorganic N or inorganic P concentrations" (page 8-36), they ignore similar findings from a study they supported. Stein and Yoon (2007) also found that "Neither chlorophyll-a concentration nor algal percent cover was significantly correlated with any nutrient concentrations."
   - The TMDL applies the 150 mg/m^2 limit derived from the CA NNE framework. This again ignores the findings of Stein and Yoon (2007), which gives average, dry season chlorophyll-a concentration in southern California reference streams as 439.2 mg/m^2 for benthic algae. We used their raw data to produce the following graph of average

[6] Powers, S. M., Johnson, R. A., Stanley, E. H. 2012. Nutrient retention and the problem of hydrologic disconnection in streams and wetlands, *Ecosystems*, 15(3): 435-450.

[7] Dent, C. L., Grimm, N. B., Marti, E., Edmonds, J. W., Henry, J. C., Welter, J. R. 2007. Variability in surface-subsurface hydrologic interactions and implications for nutrient retention in an arid-land stream, *Journal of Geophysical Research*, 112: G04004(1-13).

[8] Stein, E. and V. K. Yoon. 2007. Assessment of Water Quality Concentrations and Loads From Natural Landscapes. Southern California Coastal Water Research Project Report 500. Available at www.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/500_natural_loading.pdf.

concentrations by stream. The graph below (Figure 1) shows that average algal biomass at more than half the southern California reference streams assessed exceed the 150 mg/m^2 threshold. The threshold is clearly inappropriate for Malibu Creek as a southern California stream. This also ignores the finding of the EPA in Section 10, TMDLs and Allocations, that "The information on natural background concentrations suggests that attaining the NNE target of 150 mg/m^2 chlorophyll-a is likely not feasible in this watershed." (page 10-10). If 150 mg/m^2 is unfeasible, why maintain it as a target?

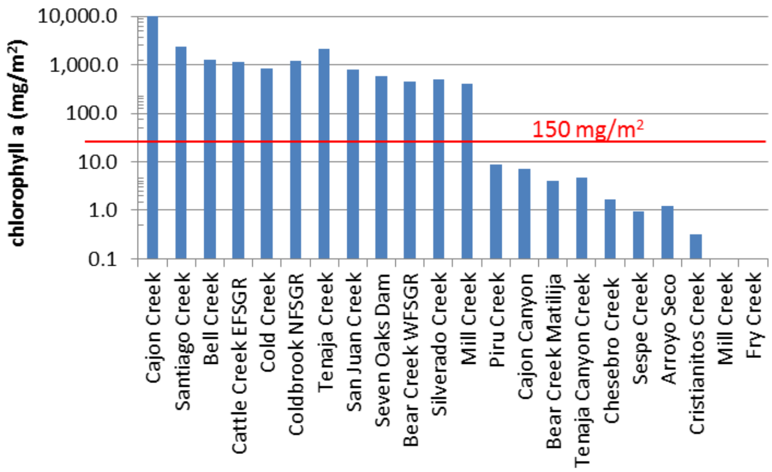

Figure 1. Average chlorophyll-a concentration from southern California reference streams, SCCWRP data (Stein and Yoon 2007).

d. Dissolved oxygen limits are appropriate, but should be applied with caution to avoid very low flow and stagnant, drying pools.
e. Nutrient Concentrations (page 3-3): We believe nutrient limits proposed in this TMDL are unreasonably low, and were derived with inappropriate data and faulty analysis. More detailed comments are provided in the remainder of this document.
    - We believe there is a typo. The first instance of "Lagoon" should say "Creek."

Section 4 – Geographic Information and Analysis

Page 4-4

Comment (8): The TMDL's finding that "Geology in the basin in the Santa Monica Mountains is mostly non-marine in nature, but does include some areas of Eocene and Cretaceous marine sediments." is incorrect. Malibu Creek watershed's geology is 38% Miocene marine sedimentary rock, 36% Miocene volcanic rock, and 6.7% Cretaceous and 1.2% Miocene non-marine sedimentary rock, with the remaining 16.7% consisting of Quaternary sediments derived from these source rocks.

Pages 4-4 and 4-5

Comment (9): The TMDL's finding that "Significant exposures of Triassic age marine sediments are found in the area immediately north of the 101 Freeway where the Monterey formation (known locally as the Modelo formation; Figure 4-4) is present at the surface." is incorrect. The Triassic period precedes the presence of terrestrial land masses in this region.

Comment (10): Throughout the document: Capitalize the F in "formation" when part of a proper noun. Both words in "Monterey Formation" should be capitalized, as they are in both parts of the name "Malibu Creek."

Page 4-5

Comment (11): The TMDL's finding that "Soils in the watershed generally reflect the underlying glacial geology derived from sandstone, shale, or metavolcanic parent material." is incorrect. What is EPA's evidence for glaciers in the watershed? To our knowledge, indeed to almost all geologists familiar with southern California, this area has never experienced glaciers and there is no glacial geology present. Likewise, there are volcanics, but no known metamorphosed volcanics (e.g. metavolcanics). Good resources for investigating the watershed's geology can be found in LVMWD Report No. 2475.00 (2011), previously submitted.

Section 5 – Source Assessment

Pages 5-4 to 5-6: Section 5.2.

Comment (12): The TMDL's listing of non-point sources should include a subsection on natural sources. LVMWD (2011) includes a lengthy analysis of the evidence of natural source contributions to water quality from local geology, which we include here by reference. Constituents elevated above Basin Plan standards in the undeveloped northern headwaters include TDS (as converted to conductivity), sulfates, selenium, chloride and phosphate. The northern headwaters are dominated by a depositionally distinct (not materially distinct) subset of the Monterey Formation known as the Modelo Formation. Much is known about the Monterey Formation, because it is California's primary petroleum source rock. The USGS is aware of the potential risks posed by the Monterey Formation to water quality and aquatic life, and has posted a website to alert the public to the potential hazards.[9] The site shows that the Monterey Formation is similar in composition to the Moreno Formation, infamous for its roll in contributing toxic selenium at Kesterson Reservoir. A source of water quality impairment of this renown should not be overlooked by the EPA, which focused almost entirely on the Monterey Formation's impacts on nutrient levels in Malibu Creek. To make it clear that the Modelo Formation locally should be expected to have the same effects on water quality as the Monterey Formation generally, we refer to the Modelo Formation throughout this document as the Monterey/Modelo Formation, or simply the Monterey Formation following the recommendations of geologists who have evaluated both formations in relation to their elemental, mineral and organic composition. The TMDL's use of the term "Modelo Formation" is incorrect and discourages dissemination of the TMDL's findings with respect to the water quality impacts associated with the Monterey Formation, California's most economically important petroleum

[9] U.S. Geological Survey, 2002. Hazardous trace elements in petroleum source rock: The Monterey Formation. Website: http://geomaps.wr.usgs.gov/env/monterey.html. Last accessed 12/19/2012.

source rock. The water quality impacts we have documented from the Monterey Formation in Malibu Creek are the same water quality impacts associated with the Monterey Formation elsewhere in the state, and the EPA should work to highlight this finding, not obscure it unintentionally by referring to the Monterey Formation in Malibu Creek by its earlier name.

Section 6 – Flow Data and Analysis

Comment (13): On multiple pages throughout the document beginning on page 6-1, the TMDL erroneously suggests irrigation runoff is a primary source of increased low flows, propagating the outdated and incorrect findings in the NRCS report of 1995. Landscape irrigation runoff is less than 10% of summer base flow, based on isotopic analysis of stream water downstream of urban sections of Las Virgenes Creek during the summer of 2007 and 2008 (Hibbs 2012)[10]. All water supplied by LVMWD is imported from northern California and is delivered via the State Water Project, so it is isotopically distinct from local rain or groundwater. A USGS study conducted in Malibu Lagoon also included an isotopic analysis of Malibu Creek water sampled just upstream of development in the summer of 2010 and found that site to have a very low fraction of imported water (Izbicki, personal communication). Among statements that require correction are the following:

- Page 6-1: "Much of this [imported water] is used for landscape irrigation, which subsequently enters the waterways through shallow groundwater flows or runoff into storm drains."
- Page 6-1: "About 3,000 acre-feet of the increased flow is associated with runoff from lawn and home use, and about 500 acre-feet with septic tank seepage (NRCS, 1995)." (page 6-1)
- Page 6-1: "However, as a result of irrigation with imported and reclaimed water, most of the larger tributaries and all of the main reaches from Westlake Lake to Malibu Lagoon generally have flows all year long (NRCS, 1995)."
- Page 6-1: "Extensive use of imported water in the basin has extended flows into the dry season, which, in conjunction with reduced storage in the Lagoon, tends to result in overtopping of the beach during the summer."
- Page 6-4: "… imported water has also contributed to the base flow increase."
- Page 6-10: Extensive use of imported water in the basin has extended flows into the dry season, which, in conjunction with reduced storage in the Lagoon, tends to result in overtopping of the beach during the summer.

We request that the EPA amend this section to remove implications that urban runoff from the upper watershed is not implicated. See Table 4, Figures 1-4 and associated comments, this document, for evidence that the stream dries each summer at MC-1 flows cease.

- Page 8-24: "Malibu Creek, which flows into the Malibu Lagoon, now receives year-round flow due to irrigation water, treated wastewater inputs and other urban related runoff
    - This sentence should be amended to avoid the misinterpretation that flow is reaching Malibu Lagoon year-round. This is incorrect as the USGS gage and our photo monitoring show. See Table 4, Figures 1-4 and associated comments, this document.

[10] Hibbs, B. J., W. Hu., and R. Ridgeway. 2012. Origin of source flows in a watershed at the wildlands-urban interface, Santa Monica Mountains, *Environmental and Engineering Geoscience*, 27(4): pp.

- Page 8-25: "Upstream runoff from residential areas and irrigation is estimated at a rate of 2,500--3,500 acre-ft annually."
- Page 9-6: "… irrigation (which increases base flow levels)…"
- Page 9-19: "Now, as a result of irrigation with imported and reclaimed water, most of the larger tributaries and all of the main reaches from Westlake Lake to Malibu Lagoon generally have flows all year long (NRCS, 1995)."
- Page 9-20: "Moreover, Malibu Lagoon now receives year-round flow due to irrigation water and other urban-related runoff."
    - This sentence should be deleted. This is incorrect as the USGS gage and our photo monitoring show. See Table 4, Figures 1-4 and associated comments, this document.

Page 6-2

Comment (14): The draft TMDL overlooks obvious differences between the L. A. County flow gage at LVMWD station RSW-13 (same location as the MS4 mass emission monitoring site) and the USGC gage located just above Malibu Lagoon that explain differences in low flows. Specifically, the TMDL says: "Flows at the two gages match fairly well in the winter; however, during the summer period flow at the upstream F-130 gage remains around 1 cfs, while flow at the downstream USGS gage drops to near zero. The difference is presumably due to evaporation and uptake by riparian vegetation, such as the non-native giant reed, *Arundo donax*." Besides overlooking this invasive species impact on benthic macroinvertebrates, the more likely cause of low flows in the lower creek is loss of surface flows to groundwater based on the following evidence:

- At the upstream gage water flows over a concrete apron with underlying bedrock, forcing water to the surface. The downstream USGS site has an obvious sediment bed of indeterminate depth, but where upstream flows do not reach the surface in dry summer months.
- The Tapia WRF NPDES discharge permit prohibits discharge from April 15 through November 15 with exceptions for operational emergencies, storm events, or low stream flow conditions that require flow augmentation to sustain endangered species. The requirement to augment flow for endangered steelhead has been in effect since 1997 and is triggered when flow drops below 2.5 cfs for a specified series of days (NPDES Permit No. CA0056014 CI# 4760). This ensures that flows will not drop far below 2.5 cfs for any extended periods of time. The release is also operated such that surface water is just evident north of the Cross Creek Road bridge so as not to breach the berm.

Page 6-4

Comment (15): The EPA concludes that "Observed flow data from the long-term gage portrays a significant increase in base flow between the pre-1966 monitoring period and the post-1992 period." This finding is incorrect. Low flows as measured at the Los Angeles County gage are not representative of flow from developed portions of the watershed because of the requirement that Tapia WRF augment certain low flows, as described above. Because of this required discharge, the lowest base flows are not representative of flow in the upper half of Malibu Creek's main stem or upper watershed tributaries. The TMDL's findings in its low flow analysis should be revised to account for required discharge to the lower half of Malibu Creek and the sentences following this statement should be stricken or revised. Average daily flows that were categorized as low flows may be re-categorized as extreme low flows. The

Pre-Post Impact Flow Duration Curves may need to be recalculated with the Tapia WRF discharge, as well as any other minimum flow requirement contributions, removed in order to get a more accurate representation of low flow hydrologic change. Additional potential causes of increased low flows that should be considered by the EPA are:

a. Hibbs (2012) suggests that the likely causes of increased base flows in Las Virgenes Creek are loss of riparian uptake with the removal of riparian vegetation and the deepening of channels below the summer groundwater table.
b. Concrete revetment of streams likely began about 1964, a year before Tapia WRF came online, based on the build dates for parcels immediately adjacent to concrete channels. Channel armoring requires removal of riparian vegetation, resulting in loss of riparian uptake and increase in base flows. Channels may also have been deepened, and may have intersected groundwater tables during this process. These factors were not considered in the TMDL or analysis of flow.
c. Westlake Lake withdraws groundwater and purchases imported water to maintain minimum flow over the dam as required by regulations. This this is also the case for other lakes in the watershed. This factor was not considered in the TMDL or analysis of flow.
d. An exploratory oil well drilled just north of the county Line in upper Las Virgenes Creek produced artesian flow of water and was never capped (LVMWD 1916.3759). This factor was not considered in the TMDL or analysis of flow.

Among statements that need correction are the following:

a. Page 6-4: “Observed flow data from the long-term gage portrays a significant increase in base flow between the pre-1966 monitoring period and the post-1992 period. In part this may be due to agricultural diversions in the earlier period, but imported water has also contributed to the base flow increase.”
b. Page 6-4: “Predevelopment measurements show that the historical base flow during summer was on the order of 0.18 cfs (NRCS, 1995), but by the 1990s the summer base flow had reached about 4 cfs. The NRCS (1995) study estimated that summer runoff from watering lawns and washing driveways in the upper watershed accounted for about 2.4 cfs of the base flows. About 7.4 cfs of runoff is generated, but about two-thirds of that is lost through evapotranspiration (NRCS, 1995).”
c. Page 6-6: “Not only do the median peak flows significantly increase during the post-impact period as expected from the increased development and imperviousness in the watershed, but the median low-flows also increase (+2,310 percent for the 30-day rolling median) as a result of wastewater discharges, use of imported water, and likely reductions in stream diversions.”
d. Page 6-7, Figure 6-6, Table 6-4 “The EFC median low flows by month are shown in Figure 6-6 and reveal a dramatic change associated with use of imported water in the basin.”

Page 6-4, continued.

Comment (16): The TMDL explains the increase in base flow by saying “In part this may be due to agricultural diversions in the earlier period, but imported water has also contributed to the base flow increase.” While Tapia discharge may have contributed to the increase in flows when it began operation in 1965, sales of recycled water began to decrease the proportion of water discharged since 1972, and regulations have prohibited discharge to the creek for seven months of the year, with limited exception, since 1997.

Comment (17): Table 6-2 is entirely misleading and should be deleted. It compares 1931-2010 flows at the LA County gage to the 2007-2010 flows at the USGS gage at Cross Creek. These flows are incomparable because the LA County gage mixes the eras while the USGS gage was only recently installed, and because the two gages have entirely different hyporheic flow: the LA County gage has none since it is all base rock and concrete, and the USGS site at Cross Creek Road has an obvious sediment bed with indeterminate depth, but where upstream flows do not reach the surface in dry summer months. To give a fair comparison, flow at the upstream station should be given in two separate columns – one for the pre-2007 period, and one for the 2007-2010 period for the purpose of comparing flow at the gages.

Page 6-4 to 6-9

Comment (18): The IHA Change Analysis ignores all the additional contributions to increased base flow listed above.

Page 6-6

Comment (19): Table 6-3 should include footnotes to include recognition of the sources of increased minimum flow, number of zero flow days, and number of low pulses as listed above.

Page 6-7

Comment (20): The extreme low threshold used in the TMDL's IHA analysis is incorrect. Specifically, the TMDL sets the threshold for extreme low flows at 0 cfs on the grounds that "There is a dramatic change in extreme low flow frequency: In the pre-impact period the median number of days with zero flow was four per year, whereas none occur in the post-impact period. This change may decrease the ability of the system to purge invasive species." (Page 6-8). To accurately assess the change in low flow, two changes should be made: flows should be recalculated with minimum flows required to protect endangered fishes removed, and the threshold should be increased to something more representative of actual low flow, such as the second standard deviation below the mean. Secondly, there are many, lengthy reaches in Malibu Creek which dry up nearly every summer, and these dry stretches have not halted the spread of invasive species. A revised analysis may show that without required minimum flow requirements, there may be a median of 4 days per year with no flow.

Page 6-10

Comment (21): The TMDL says that "Extensive use of imported water in the basin has extended flows into the dry season, which, in conjunction with reduced storage in the Lagoon, tends to result in overtopping of the beach during the summer. To prevent flooding, mechanical breaching of the beach during summer has been used." LVMWD staff have analyzed the relationship between flow and berm status (open or closed) and found that the berm does not close until flow drops below about 10 cfs. Los Angeles County stopped breaching the berm mechanically over a decade ago. The EPA is encouraged to look into illicit breaching of the berm, unrelated to imported water use in the watershed.

Section 7 – Water Quality Data and Analysis

Pages 7-1 through 7-24

Comment (22): We object that while conductivity is included, the TMDL omits data and analysis of data for Ionic Strength. We have communicated to the EPA on numerous occasions, both in person and by email that we believe a primary stressor affecting macroinvertebrate communities in the Malibu Creek watershed is high concentrations of ions. This TMDL is inadequate without that analysis. See our comments for TMDL pages 9-16 through 9-18.

7.1 Sources of Data

Page 7-1

Comment (23): Reference sites selected by the EPA are inadequate. The TMDL includes this explanation for reference site selection:

> *"Consistent with the discussion in Luce (2003), site SC-14 on Solstice Creek and LCH-18 on Lachusa Creek were selected as the most appropriate reference sites for the Malibu main stem. These sites are at similar elevation (but slightly lower stream order), but have few or no impacts due to development. Luce also treated the Arroyo Sequit station (AS-19) as a potential reference site; however, this site is subject to some development impacts including roads, equestrian uses, and at least one septic system upstream of the sampling station. Therefore, it is not treated as a primary reference site in this assessment."*

The EPA selected two Heal the Bay bioassessment reference sites from nearby coastal watersheds and ignored three of Heal the Bay's bioassessment reference sites within the watershed. These are sites 3 (Upper Cold Creek), 6 (Cheeseboro Creek) and 9 (Las Virgenes Creek). Heal the Bay collects or has collected monthly water quality samples at these sites, as well as their reference sites 8 (Palo Comado), and 10 (Carlisle Creek), all of which should be referred to for natural background water quality. Sites 6 and 9 are in the Monterey/Modelo Formation headwaters, which drain to Malibu Creek and should both be included in all analyses and figures. All of these were used as reference by Luce (2003). The omission of Monterey Formation sites is especially negligent, because we have discussed with the EPA the likely stress to macroinvertebrate populations posed by water quality draining the Monterey Formation.

The table below (Table 1) shows all of Luce's (2003) reference sites, by creek, dominant upstream geology, median sulfate concentration (at the nearest site, which is named in parentheses), and maximum orthophosphate phosphorus concentration. For comparison, the two reference sites selected by the EPA are in **bold**. The EPA selection excludes two reference sites within the Modelo/Monterey Formation, despite our early requests to take Modelo/Monterey Formation influences into account. The EPA also excludes reference sites within Malibu Creek watershed with sulfate concentrations similar to those in Malibu Creek (median 591 mg/L, but with a maximum of 2,050 mg/L). Heal the Bay's maximum orthophosphate concentrations (mg/L) are also shown below, converted from their PO4-HPO4 values to PO4-P using atomic weights. Note that EPA selected two sites with among the lowest natural background phosphate levels (final column). The table shows that the EPA reference sites do not include Monterey Formation exposures, nor do they have comparable sulfate or phosphate concentrations to Malibu Creek's.

Table 1. Reference sites used by Luce (2003) and EPA (bold) with both Luce's and EPA's site names are shown with geologic and chemical values for comparison. Malibu Creek has Monterey Formation drainage, a sulfate median of 591 mg/L, and a median summertime PO4-P concentration since 1999 of 0.17mg/L and a maximum of 1.0.

Site	Creek	Geology	Median IBI	Sulfate median	Max PO4-P
R3=CC3	Upper Cold Creek	Mixed	78	90 (J_UColdCrk)	0.16
R6=Ch6	Cheeseboro	M Fm	54	1,550 (Ches)	0.26
R9=LV9	Upper Las Virgenes	M Fm	41	1,238 (S-ULasVir)	0.32
R14=SC14	Solstice	Mixed	67	312 (S-SolsCrk)	0.11
R18=Lc18	Lachusa	Mixed	56	No data	0.15
R19=As19	Arroyo Sequit	Mixed	70	162.3 (J-ArrSeq)	0.09

Comment (24): The EPA's selection of reference sites also omits with no justification those submitted from other agencies. Los Angeles County and the MCWMP also collected benthic macroinvertebrate data from reference sites within the watershed. The Malibu Creek Watershed Monitoring Project site LV-1 in upper Las Virgenes Creek is minimally developed and could have been used as a reference site, as could site 16 of the Los Angeles County MS4 tributary monitoring program. Data for these sites were submitted to the EPA in September 2011 and should have been used to provide an accurate and complete picture of reference conditions in the Malibu Creek watershed. Additional monitoring sites that could have been included as reference sites for benthic macroinvertebrates include the following table (Table 2).

Table 2. Possible additional reference sites.

Site	**Creek**	**Geology**	**Median IBI**	**Sulfate median**	**Max PO4-P**
MCWMP LV1	Las Virgenes	M Fm	24	1,238 (S_ULasVir)	0.14 (S_ULasVir)
LA Co 16	Las Virgenes	M Fm	19	1,238 (S_ULasVir)	0.14 (S_ULasVir)

Page 7-2

Comment (25): Other National Park Service (NPS) water quality data were available to the EPA, but were not included in TMDL analyses. These data were prominent in LVMWD's report on Malibu Creek water quality (2011), which used the data to assess natural background concentrations, along with data from Cheseboro Creek collected by the Calabasas Landfill (being sent with this submission). The NPS data are particularly informative because of the many sites in undeveloped headwaters. While this data set does not include IBI scores, it is particularly well suited to determining natural background water quality for nutrients and conductivity, and also has useful data on sulfate, chloride, fluoride and selenium results. We have the NPS data from their first 10 monitoring sets, which were used in the analyses for LVMWD (2011), and which we are submitting with these comments. We encourage the EPA to contact the NPS Santa Monica Mountains National Recreation Area to acquire the more recent data.

Pages 7-2 through 7-7

Comment (26): The TMDL's analysis and findings on dissolved oxygen have several major errors. Of the 117 samples at MC-1, Table 7-1 shows that the average was 10.90 mg/L dissolved oxygen, but the minimum was 2.81 mg/L. Our data from our NPDES monitoring results show that MC-1 dries up completely each summer, and it appears that Heal the Bay continues to sample it as long as there is water. We expect that stagnant pools of water will have low dissolved oxygen. Our analysis of Heal the Bay's data for this site showed that flow was not measured on the 14 dates with DO less than 7.0 mg/L: August and September 1999, August through October 2000, August and October 2004, September and October 2008, and June through September 2009. The USGS gage at that site shows there was no flow for 120 days in 2008 (7/16-11/5/2008 & 11/15-21/2008), and 134 days without flow in 2009 (6/28-11/21/2009 & 10/22-11/18/2009). The gage was only in operation from late 2007 though this year, so there is no data for the earlier dissolved oxygen excursions. However, we do have photos for some of those time periods (Figures 2-5). The photo from July 8, 2004 shows water ponded behind the Arizona crossing, before it was replaced by a bridge. The photo from July 26, 2007 shows the very small stagnant puddle at the site. Heal the Bay's DO measurement at this site on July 12, 2009 was 5.5 mg/L dissolved oxygen, and on August 2 2009 was 3.8 mg/L. Low DO should be expected in these small pools as the creek dries at this site. Also note the white surface of the dry creek bed, due to precipitation of Malibu Creek's unusually salty water. This is significant for aquatic life as the creek dries, because drying in these sections raises the ionic strength above the already high levels occurring during continuous flow. Furthermore, dissolved oxygen values from non-perennial sites as they become isolated, stagnant pools as they dry up should not be used for the purposes of assessing stream conditions for regulatory purposes and should be removed from the TMDL analysis. The analysis should be redone by removing dissolved oxygen data from drying pools, which experience low DO as the creek's aquatic life crowds into low flow refugia and consumes available oxygen. The density of invasive crayfish – yet another invasive species overlooked in the TMDL – can reach over a dozen individuals per square meter in these refugia, virtually blanketing the bottom of some pools. The creek's freshwater clams also experience high mortality during these periods of prolonged drying.

Figure 2. MC-1, July 8, 2004

Figure 4. MC-1, July 26, 2007

Figure 3. MC-1, October 20, 2008

Figure 5. MC-1, July 24, 2009

Page 7-2

Comment (28): The TMDL states that "samples from Malibu Creek main stem generally meet [dissolved oxygen] criteria, but not all the time." The EPA's 2003 Nutrient TMDL for Malibu Creek analyzed Tapia WRF monitoring stations and showed (EPA 2003, Table 5) not only the minimum, but the count of measurements below the 5 mg/l threshold. That table found no excursions below the threshold, except for at site R9, where water stands in stagnant pools in the summer before drying up. That TMDL concluded "There is no demonstration that algae in these reaches is affecting dissolved oxygen concentration." The data presented in this 2012 draft TMDL do not convincingly show that dissolved oxygen targets are not being met.

Page 7-3

Comment (29): Table 7-1 shows that the minimum dissolved oxygen concentration at MC-12 is 2.6 mg/L. No other agency samples at that site, a popular swimming hole in Malibu Creek State Park that reduces to very low flows in the summer and dries up at the downstream end. The upstream end is inaccessible so it is unknown whether there is continuous year-round flow into the pool. Our analysis of Heal the Bay data from that location shows that of 66 measurements, eight dropped below the 7.0 mg/L threshold. Of these, four include comments in the "flow type" field indicating low flows ("Intermittent" and "trickle" where "intermittent" is between "none" and "trickle" on the field sheet continuum from "none" to "heavy"). Again, we expect that stagnant pools of water will have low dissolved oxygen. One excursion also occurred two days after a rain event, so may have experienced low dissolved oxygen with higher turbidity (6/7/2009). If these are removed, only 3 excursions below the 7.0 mg/L threshold remain, with the lowest dissolved oxygen concentration of 4.2 mg/L.

Comment (30): Table 7-1 also shows that the minimum dissolved oxygen concentration at MC-15, at the Los Angeles County gage site, is 2.8 mg/L. LVMWD monitors site RSW-MC013D at this same location. Of the 192 measurements taken at this site by LVMWD beginning in 2000, the minimum concentration was 5.0 mg/L with only five other samples at less than 7.0 mg/L, ranging from 6.2-6.7 mg/L. Heal the Bay has only sampled at site MC-15 since 2008, so have much less data and few excursions below the 7.0 mg/L threshold. Because LVMWD data are collected for regulatory purposes, exceptionally reliable instruments are used, and we assume these data are more reliable. The graph below (Figure 6) compares LVMWD data with Heal the Bay's. We suggest using a larger set of data than are available from only Heal the Bay at this site.

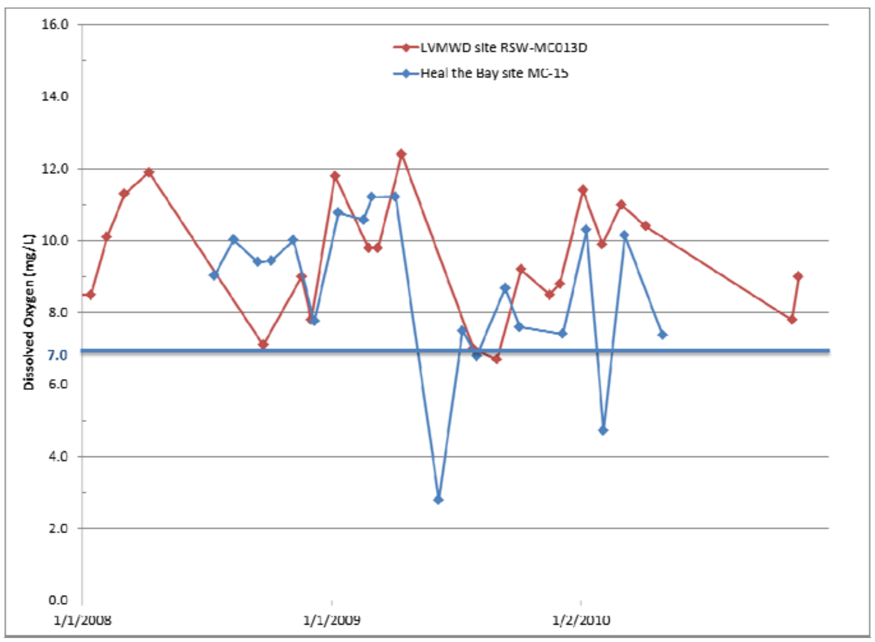

Figure 6. Comparison of dissolved oxygen data at site MC-15 by two agencies.

Comment (31). Table 7-1 also omits dissolved oxygen data from other potential reference sites. The TMDL states only that "The SPWN criterion of 7 mg/L and the COLD criterion of 6 mg/L or better are met in the reference sites, but not always in the main stem." Table 3, below, corrects this finding, showing that dissolved oxygen criteria are not well met at the *__majority__* of potential reference sites. Thirteen of the nineteen potential water quality reference sites in the watershed, together with Heal the Bay's coastal sites, have a minimum dissolved oxygen concentration below the 7.0 mg/L threshold. The TMDL's Table 7-2 shows that dissolved oxygen concentrations at LV-9, which is in an undeveloped headwater and should be included as a reference site, drop below the 7.0 mg/L threshold 80% of the time. The 7.0 mg/L standard applies to cold water fish, which cannot reach that site, but even the 5 mg/L warm water threshold is not met 38% of the time.

Table 3. Dissolved oxygen concentrations at potential reference sites.

Creek	Agency	Site	Min (mg/L)	Avg (mg/L)	Max (mg/L)	Count
Arroyo Sequit	HtB	19	5.4	9.5	15.1	68
Arroyo Sequit	NPS	J_ARRSEQ	5.5	9.1	10.8	10
Big Sycamore	NPS	S_BIGSYC	4.7	7.5	10.8	9
Cheeseboro	NPS	J_CHEESEBRO	12.9	12.9	12.9	1
Cold	HtB	3	5.0	9.1	12.5	110
Cold	MCWMP	CC	4.4	7.4	9.4	27
Cold	NPS	J_UCOLDCRK	8.0	9.1	10.6	7
Lachusa	HtB	18	7.1	9.9	13.3	110
Las Virgenes	HtB	9	2.9	5.4	9.1	30
Las Virgenes	NPS	J_EFLASVIR	0.2	3.9	6.5	7
Las Virgenes	MCWMP	LV1	4.8	8.8	16.5	31
Las Virgenes	Ventura	MCW_8b	3.4	6.6	13.8	51
Las Virgenes	NPS	S_ULASVIR	1.9	6.9	9.7	7
Palo Comado	HtB	8	4.0	7.3	8.7	10
Ramirez	NPS	R1_RAMICYN	7.7	9.2	10.2	7
Solstice	HtB	14	7.1	9.3	16.2	132
Solstice	NPS	R1_SOLSCRK	8.4	9.7	11.0	7
Solstice	NPS	S_SOLSCRK	6.7	8.1	9.4	10
Trancas	NPS	R1_WFTRANCAS	5.6	8.4	11.0	7

Comment (32): The dissolved oxygen analysis also ignores the non-perennial nature of many sites along Malibu Creek. Lake (2003)[11] states that "As streams dry and the surface water shrinks to unshaded pools, the build-up of nutrients, high temperatures and solar radiation can precipitate blooms of algae," which may then result in large diurnal dissolved oxygen concentrations. Malibu Creek becomes a string of isolated pools in the summer, or pools with trickles of water flowing between them. This hydrologic characteristic naturally shortens nutrient spiraling lengths, allowing for increasing nutrient concentrations and increasing biomass in pools. This factor is independent of both native and non-native nutrient inputs.

Comment (33): USGS data indicates that, while there may be water at the site MC-1, there are long periods without flow. The USGS has operated a gage at that site since December 2007 (Table 4). The gage shows that flow stops and the site becomes an isolated pool in the summer. Intermittent photo monitoring from 2004 through 2010 shows that the site becomes an isolated pool without surface inflow or outflow every summer during the gage period of record, and that it went nearly dry in 2004, 2008, 2010, and completely dry in 2007 (<8/20 – rain 9/21) and 2009 (7/24-10/14 rain event). Google Earth historical imagery shows it completely dry 12/24/2004, 8/22/2002, 9/6/1990, and 7/17/1989.

[11] Lake, P. S. 2003. Ecological effects of perturbation by drought in flowing waters, *Freshwater Ecology*, 48(7): 1161-1172. http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2427.2003.01086.x/full

Table 4. USGS gage records of zero flow conditions.

Year	Zero flow	Days without flow
2008	7/16-11/5/2008 & 11/15-21/2008	120
2009	6/28-11/21/2009 & 10/22-11/18/2009	134
2010	7/15-10/5/2010 & 10/12-19/2010	91
2011	8/25-10/4/2011, 10/14-21/2011 & 10/24-11/4/2011	62

Page 7-6

Comment (34): The TMDL refers to continuous dissolved oxygen measured in pools by the Resource Conservation District. LVMWD collaborated with the RCD on this effort by installing a probe in Tunnel Pool in 2010. Tunnel Pool dropped below 7.0 mg/L dissolved oxygen only 4.5% of the time; average concentration was 8.3 mg/L. Tunnel Pool received constant flow all summer. Minimum daily dissolved oxygen concentrations of 6.2-6.94 were observed 7/15-7/20/2010, and minimum concentrations of 3.34-6.79 mg/L were observed 8/1-8/12/2010. Four other nights in August dipped below 7.0 to between 6.09 and 6.90.

Pages 7-6 to 7-7

Comment (35): The Resource Conservation District's 24-hour dissolved oxygen sampling of steelhead trout pools in 2010 needs to be interpreted with caution. LVMWD staff worked with RCD staff on sonde deployment and calibration in 2010. Besides Start, Lunch and Tunnel Pools, Mott Rd Pool is the fourth of the four Malibu Creek pools that measured continuously that summer. Mott Rd Pool is upstream of Tapia WRF within Malibu Creek State Park. Lunch, Tunnel and Mott Rd pools have continuous surface flow in and out all summer, while Start Pool dries up at the downstream end, and may become isolated pool in summer. Lunch and Tunnel Pools showed similar dissolved oxygen patterns where a minority of readings in a 24-hour period fell below 7.0 mg/L and many days stayed above 7.0 mg/L. Mott Rd Pool had periods where dissolved oxygen concentrations remained below 7.0 for full 24-hour periods. Start Pool may be an exception because as it becomes an isolated pool without fresh flows during the summer. The Steelhead TAC, which LVMWD participates in, has not been able to figure it out the many complex issues at that pool. The Start Pool low DO is exceptional even among Malibu Creek pools and may result from a large number of site specific, localized conditions.

7.3 Conductivity and Dissolved Solids Analyses (Page 7-7 to 7-8)

Page 7-8

Comment (36): The EPA uses a "rule of thumb" conversion factor of 0.67 to convert TDS (mg/L) to conductivity (µS/cm) resulting in a 2,985µS/cm standard, rather than the empirical relationship developed for this watershed and communicated in our report *Water Quality in Malibu Creek 1971-2010* (LVMWD 2011). Our conversion based on local empirical data sets that threshold at 2,489 to 2,560 µS/cm. The relationship we found for 241 TDS-SC data pairs throughout the watershed is that TDS=0.91*(SC) – 308, or TDS=0.79 (SC) when the y-intercept is set at zero. We have recently recalculated this relationship using only data pairs from Malibu Creek proper. Linear regression results on those 197 data pairs resulted in the equation TDS=0.88 (SC) – 280, or TDS=0.75 (SC) if forced through the origin.

Our more accurate site-specific conversions result in a Basin Plan criteria of 2,489 or 2,528 µS/cm for the watershed and 2,558 or 2,560 µS/cm for Malibu Creek, depending on whether the y-intercept is dictated by the trend in the data or is forced through the origin. All of these conversions result in a lower conductivity threshold for impairment according to the Basin Plan TDS standard that the EPA's conversion. This is an important point, because using the EPA's conversion Malibu Creek does not generally exceed the standard, while using the more accurate watershed-specific conversion, Malibu Creek does not generally meet the standard. Malibu Creek watershed has exceptional, geologically-derived water quality, and deserves watershed-based standards and not "rule of thumb" approaches.

Page 7-7

Comment (37): Table 7-3 includes some very obvious outliers among the minima and maxima shown. We encountered very few of these when we analyzed Heal the Bay's data, and we contacted the Stream Team lead about them and were given corrections where field sheet entries contradicted the database entries. Before including outliers in its analysis, the EPA should verify that it reviewed the field sheets for these outliers for data entry errors. If it did, it should say so, including listing those found in error.

7.5 Nutrients Data Analyses (pages 7-13 to 7-24)

Comment (38): The TMDL did not make use of all available data in its nutrient analyses, omitting without justification data from both Tapia WRF receiving water monitoring and from the National Park Service.

Comment (39): The TMDL's nutrient analysis underestimates the native nutrient loads because its nutrient data are based on methods that do not measure inorganic nitrogen from geologic sources. This is a significant oversight because the Monterey Formation's nitrogen content consists primarily of organic forms, which in turn is due to its extremely high biogenic fraction. This is shown in Fig. 2 on page 76 in our compilation of data on local Monterey Formation rock samples in LVMWD report No. 2475.00 by comparing TKN values with those for nitrate N from the same samples. We previously submitted this report, but it appears that the TMDL authors overlooked this finding, which is not apparent in the analyses presented in the TMDL that rely solely on nitrate data.

Comment (40): The TMDL also completely neglects the enrichment of Malibu Creek of calcium, which is a major cation in the creek due to drainage from the Monterey Formation, as demonstrated in Fig. 10 on p. 81 of LVMWD report No. 2475.00, previously submitted. In omitting this information, the TMDL neglects to mention EPA guidance on assessing the impacts of high ionic strength that specifically notes that the growth of *Cladophora glomerata,* the species responsible for most surface algal matting in Malibu Creek, is enhanced in waters with high calcium levels, and also that high ionic strength enhances the growth of halophilic diatoms, which grow as benthic algal mats. Over 25% of the creek's diatom species are halophilic based on diatom surveys required under our NPDES permit monitoring, but which apparently were not analyzed by the TMDL despite their importance in assessing the role of ionic strength and major ion composition as known causes of excessive diatom and macroalgae growth according to EPA's own guidance on assessing ionic strength. Our surveys also show that Malibu Creek's diatom community includes species capable of fixing atmospheric nitrogen via symbiotic association with nitrogen-fixing bacteria. This natural nitrogen source was also overlooked in the TMDL.

Comment (41): Nutrient data analyses should have been analyzed and presented seasonally. The TMDL states that benthic macroinvertebrate communities are impaired because of excessive algae in response to nutrient impairment. A seasonal analysis is especially important for sites downstream of Tapia WRF which has a discharge prohibition from November 15 through April 15, resulting in very different concentrations by season. Seasonal analysis reveals that Tapia WRF increases nutrients during the discharge season, with significantly lower concentrations during the non-discharge season.

Pages 7-13 to 7-14

Comment (42): Table 7-6: Statistics displayed in Table 7-6 show annual values for each site. Table 5, below, shows what the NOx-N portion of Table 7-6 (page 7-13 to 7-14) would show if divided by Tapia WRF's discharge and non-discharge seasons. Summary values in this table using include Heal the Bay data and data from other agencies that monitor those same locations. Data are from 1/1/2000 through 2010. This table shows that concentrations are much lower in the dry season when algae cover increases.

Table 5. NOx-N at Heal the Bay stations, by season, beginning 2000. NO3-N included from coincident monitoring sites.

	MC1 (dry)	MC1 (wet)	MC12 (dry)	MC12 (wet)	MC15 (dry)	MC15 (wet)
Count	92	99	41	29	69	74
Average	0.33	3.88	.04	0.14	0.93	4.53
Median	0.20	3.56	.03	0.03	0.50	4.6
Min	0.005	0.20	.005	0.005	0.04	.3
Max	3.7	13.1	.31	0.86	7.9	8.6

Comment (43): Because there are natural sources of nutrients which confound efforts to determine the degree of impairment, an analysis of natural sources should have been done. An analysis of natural background water quality from all potential reference sites mentioned should have been conducted for consideration of all the potential causes of low benthic macroinvertebrate community scores. The following evidence needs to be included in EPA's analysis:

a. Water quality at sites LV1 and LA County 16 should have been included in that assessment; although the habitat may be slightly altered there, the upstream area is protected open space and water flowing from the area is representative of the natural upstream contributions to water quality.
b. Stein and Yoon (2007) found that in southern California reference streams "concentrations of several nutrients were higher than USEPA-proposed nutrient guidelines (i.e., US Environmental Protection Agency guidelines for Ecoregion III, 6). This finding indicates that background nutrient levels in southern California may be higher than in other portions of the country."
c. LVMWD (2012) reports median concentrations of phosphate-P at undeveloped sites in the northern, Monterey Formation headwaters ranges from 0.01 mg/L (J_Cheeseboro) to 0.99 mg/L (J_EFLasVir). The median for all undeveloped northern headwaters sites is 0.13 mg/L, meaning that more than half the samples taken from those sites exceeds the 2003 and proposed TMDL limits for Malibu Creek. The median NO3-N concentration is 0.20 mg/L and the maximum is 3.5 mg/L.

Pages 7-14 to 7-21, Tables 7-6, 7-7, Figures 7-16, 7-17 and text

Comment (44): The EPA incorrectly reports Heal the Bay's phosphate data as orthophosphate-P (PO4-P), but Heal the Bay phosphate methods result in phosphate as orthophosphate (PO4-HPO4). Heal the Bay phosphorus results are derived from readings taken with a LaMotte Smart Colorimeter with a cadmium and zinc reduction. The process does not include digestion, which would be necessary to measure PO4-P. To verify the magnitude of this error, we evaluated data we received from Heal the Bay and calculated the following annual values for PO4-HPO4 (Table 6, below). Compare these with the values in TMDL Table 7-6. The TMDL overestimated phosphorus concentrations due to this error, and will need to revise graphs and re-do other calculations throughout the Water Quality Data and Analysis Section and other TMDL findings dependent on these data.

Table 6. LVMWD calculation of HtB PO4-HPO4 statistics.

Site Species	1 PO4-HPO4	12 PO4-HPO4	15 PO4-HPO4
Count	114	70	24
Average	1.82	0.27	1.51
Median	1.42	0.27	0.65
Min	0.33	0.03	0.17
Max	5.46	0.51	5.12

Comment (45): The TMDL also neglects native phosphorus inputs from Monterey Formation sediments carried downstream. Fig. 2 on page 76 of LVMWD report No. 2475.00 shows that the total phosphorus concentration of local Monterey Formation rock is two orders of magnitude larger than its phosphate fraction. This less-soluble fraction is carried into the creek via sediment runoff from the Monterey Formation, and is invisible to load assessments based solely on dissolved phosphate data as it is in this TMDL.

Page 7-14, Table 7-6

Comment (46): We have also compared all the values given in table 7-6 with the data we received from Heal the Bay converted using molecular weights to PO4-P (which may be an underestimate), shown below by season (Table 7).

Table 7. Statistics for PO4-P calculated using mol. wts.

Site Species season	1 PO4-HPO4 Dry	1 PO4-P Dry	1 PO4-HPO4 Wet	1 PO4-P Wet	12 PO4-HPO4 Dry	12 PO4-P Dry	12 PO4-HPO4 Wet	12 PO4- Wet	15 PO4-HPO4 Dry	15 PO4-P Dry	15 PO4-HPO4 Wet	15 PO4-P Wet
Count	66	66	48	48	41	41	29	29	14	14	10	10
Average	1.19	0.38	2.70	0.87	0.29	0.09	0.25	0.08	0.59	0.19	2.79	0.90
Median	1.21	0.39	2.79	0.90	0.28	0.09	0.27	0.09	0.45	0.14	3.28	1.06
Min	0.33	0.11	0.61	0.20	0.03	0.01	0.08	0.03	0.18	0.06	0.17	0.05
Max	3.16	1.02	5.46	1.76	0.51	0.16	0.50	0.16	2.31	0.75	5.12	1.65
Excursions (>0.1)	--	66 (100%)	--	48 (100%)	--	15 (31%)	--	5 (14%)	--	10 (71%)	--	9 (90%)

Page 7-15

Comment (47): Comments made to dismiss evidence of naturally elevated nutrients at site LV1 are unsupportable. The EPA notes that the MCWMP data is the most useful for the spatial distribution of TN. (We remind the EPA that the National Park Service data also has a very useful spatial distribution and includes both developed and undeveloped sites.) The TMDL notes that TN in summer and winter at LV1 is upstream of most anthropogenic influences, and has high concentrations of TN ranging from 1.22 to 1.73 mg/L. Yet these high values are essentially dismissed because a Heal the Bay report has noted the presence of unstable stream banks and illegal dump sites above this station. We have observed discarded construction materials at the site, but nothing organic that would contribute to elevated nitrogen concentrations. Furthermore, the National Park Service data from more pristine sites farther upstream support the validity of the LV1 data as representative of natural conditions. Those values are given in the table below (Table 8), and also illustrate the heterogeneous nature of water quality from streams draining the Monterey/Modelo Formation. Note also that the MCWMP reporting limit for TKN was 0.5 mg/L which may not have been sensitive enough for this analysis.

Table 8. NPS nutrient data upstream of LV1.

	NO3-N (summer range)	NO3-N (winter range)	PO4-P (summer range)	PO4-P (winter range)
J_EFLASVIR	0.05 – 0.90	0.01 – 0.80	0.61 - 1.62	0.60 – 0.95
S_ULASVIR	0.01 – 0.50	0.02 – 0.10	0.04 – 0.19	0.01 – 0.16

Page 7-17

Comment (48): The EPA's assessment of data from Busse et al. (2003) results in a conclusion that "the reference sites, as well as several of the other sites, show inorganic N as a small fraction of total N." This is repeated on page 9-11 where the TMDL says "Available information on total N and total P concentrations suggest that the totals (which include organic forms) are much higher than the inorganic nutrient concentrations." A comparison of TN and NO3-N concentrations from the Los Angeles County gage site (R-13) shows that on average NO3-N is 98% of TN, but there is a standard variation of 26%. The average ratio of NO3-N to TN at site R-1 was 89%, with a standard deviation of 22%. Thus, on average, TN is not much higher than NO3-N at this site. A comparison of PO4-P and TP shows that on average TP is 22% higher than PO4-P at R-13, and at R1 is 52% higher. Naturally elevated phosphorus levels resulting from geologic sources will make it unlikely that phosphorus will ever be limiting. The EPA's conclusion that lower nutrient levels will reduce algal growth rests on findings that substantially underestimate both N and P from native geological sources by failing to consider this evidence and evidence presented in other comments above also overlooked in the TMDL analysis. .

7.5.1 Nitrate plus nitrite N Trends (page 7-17 to 7-19)

Comment (49): In its earlier sections, the TMDL states that a TMDL is required to account for seasonal variation, but there is very little attention to seasonal variation in the analyses of the data. Besides including data from Malibu Creek sites from organizations other than Heal the Bay, and besides including a fuller set of reference site data, Figure 17-12 should display box plots to show wet and dry season data separately. The existing 2003 nutrient TMDL targets and analysis derived from its adherence to EPA's TMDL guidance to account for seasonal variation, in contrast to the limited seasonal analysis conducted for this draft TMDL's revision of these previously established EPA targets

Page 7-18

Comment (50): The EPA incorrectly interpreted conclusions from LVMWD (2011) by saying "LVMWD (2011) suggest that nitrate concentrations in the watershed are naturally elevated due to the Modelo formation." A thorough review of the report will not reveal such a statement. Surface water monitoring does not indicate elevated nitrate levels in streams draining the Monterey/Modelo Formation. What the report does include are suggestions that the Monterey/Modelo Formation is capable of yielding elevated concentrations of nitrogen compounds. In the text on page 78 we report the high nitrate concentrations found in a benchtop reactor test of crushed rock from Malibu Creek's Modelo Formation headwaters in deionized water (CSDLAC 1996)[12], showing that the rock is capable of producing water consistent with the nutrients and metals detected in surface waters, whereas direct measurements of urban runoff show this source has lower levels of these compounds than those running directly off of both weathered and freshly exposed areas of Monterey Formation rock. Nutrient loads along with other compounds from sites classified as urban development do not reflect actual loads from urban development because these sites are also located within and downstream of Monterey Formation rock. This oversight is clearly shown by results from lower Cold Creek, which is also downstream of significant urban development but not Monterey Formation rock. Academic literature on the Monterey Formation supports the CSDLAC finding (Piper and Isaacs 2001)[13].

Comment (51): Absent either urban development or significant exposures of Monterey Formation rock, the only thing that the TMDL's coastal "reference" streams are useful for is to identify expected nutrient and benthic macroinvertebrate scores from Malibu Creek tributaries lacking both urban development and Monterey Formation rock, such as upper Cold Creek. So Cal IBI scores from that location are virtually identical to those from the TMDL's coastal reference stream sites. They cannot serve as reference sites for assessing urban loads in areas tributary to Malibu Creek located in urban development built on or downstream of the Monterey Formation, as is done in the draft TMDL, because those sites do not represent water quality impacts solely from urban develop, but rather impacts from both urban development and the Monterey Formation.

7.5.4 Nutrient Reference Conditions in the Malibu Creek Watershed (Pages 7-22 to 7-24)

Page 7-23

Comment (52): The paragraph on geologic influences on nutrient concentrations needs to be revised. The EPA states "Malibu Creek watershed has unique geology, with many areas of marine sediments with the Modelo formation. For nitrate-N, median concentrations at potential reference sites without significant anthropogenic disturbance appear to be less than 0.03 mg/L and mostly less than 0.01 mg/L for many sites both in and outside the Modelo formation, although there appear to be higher

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[12] County Sanitation Districts of Los Angeles County (CSDLAC), 1996, *Mineral Leaching Study Calabasas Landfill*, Whittier, CA

[13] Piper, D. Z. and C. M. Isaacs. 2001. The Monterey Formation: Bottom-water redox conditions and photic-zone primary productivity. In *The Monterey Formation: From Rocks to Molecules*. C. M. Isaacs and J. Rullkötter, (eds.), Columbia University Press, New York. 2001.

concentrations at the MCWMP LV1 station (median 0.30 and 0.35 mg/L in summer and winter, respectively, perhaps increased by the presence of illegal dump sites and unstable stream banks in this reach) (Table 7-11)." This ignores the National Park Service data given above (Table 8), which shows that NO3-N in the Modelo Formation reaches as high as 0.90 mg/L.

7.6 Pesticide Data Analysis

Page 7-24
Comment (53): It should be added that Los Angeles County West Vector Control District regularly treats all of Malibu Creek, including those portions within the State Parks, with the larvaecide BTi to control black flies.

Section 8 – Biological and Habitat Data and Analysis

Pages 8-1 through 8-44

Comment (54): To reiterate, a major objection we have to this TMDL is that while conductivity is included, the TMDL omits data and analysis of data for ionic strength and analysis of any effect conductivity and ion concentrations might have on macroinvertebrate community composition. This TMDL is inadequate without that analysis. For example, chloride concentrations exceed aquatic life standards in several locations in the Modelo/Monterey Formation headwaters, including undeveloped headwaters (Figure 7). The TMDL subsumes conductivity, major ion, and selenium stressors on the benthic macroinvertebrate community under its general analysis of toxicity, dismissing them as causes of low IBI scores based on the results of toxicity tests. This is problematic for several reasons. First, the no-toxicity results include test methods using marine organisms, which can be expected to tolerate high ionic strength water. Second, these results do not include direct toxicity testing of the benthic macroinvertebrate species used to determine IBI scores. Third, as noted in the TMDL, toxicity was reported by Brown and Bay (2005) and was interpreted by them as likely due to sulfate and other dissolved salts in both their Malibu Creek site (HTB-01) and Las Virgenes Creek.

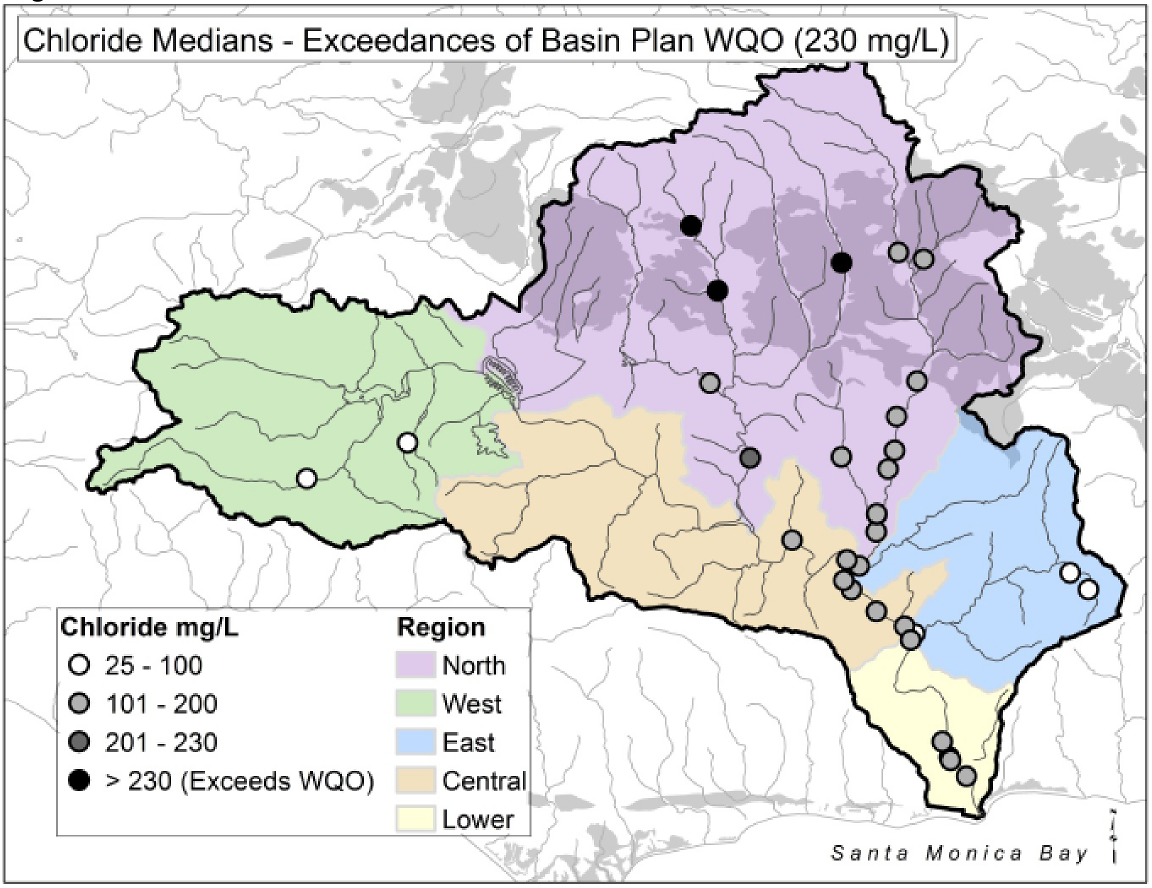


Figure 7. Chloride median concentrations exceed aquatic life standards, even in undeveloped headwaters (northeast portion of the watershed)

We have communicated to the EPA on numerous occasions, both in person and by email, that we believe a primary stressor affecting macroinvertebrate communities in the Malibu Creek watershed is due to high concentrations of ions. One of the documents we sent to the EPA is copied below:

The EPA conducted a study of West Virginia coal mining region streams to "examine the severity of aquatic life use impairment in waters downstream of [mountain top removal] valley fills using genus level data," and compare the efficacy of family and genus level BMI identification in determining impairment (Pond et al. 2008)[14]. Among the results:

- *"Most biological metrics and the MMIs had substantially stronger correlations with specific conductance and individual ions than with the mining-related metals or individual habitat variables."*
- *"Water quality structured benthic communities more than habitat quality. Our study and others (Chambers and Messinger 2001, Howard et al. 2001, Fulk et al. 2003, Pond 2004, Hartman et al. 2001, Merricks et al. 2007) suggest that specific conductance is the best predictor of the gradient*

[14] Pond, G. J., M. E. Passmore, F. A. Borsuk, L. Reynolds and C. J. Rose. 2008. Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. *Journal of the North American Benthological Society*, 27(3): 717-737.

of conditions found downstream of alkaline mine drainage and valley fill sites in the Central Appalachians."

- *"Elevated conductivity can be toxic through effects on osmoregulation (Wichard et al. 1973, McCulloch et al. 1973, Ziegler et al. 2007)." Details on biological function relative to ionic strength follow this sentence on page 726.*
- *Pond et al. (2008) cite Mount et al. (1997) and Tietge et al. (1997) in giving the relative toxicity of major ions as K>HCO_3 ≈ Mg>Cl>SO_4.*

The following table below compares water quality results for the major ions found to produce toxicity from Pond et al. (2008) to water quality in Malibu Creek (MC) watershed.

Mean (range) Number samples	Pond et al. Mined	Pond et al. Unmined	Malibu Creek watershed	MC northern tributaries	MC Central section	MC Lower Creek
Specific Conductance (µS/cm)	1023 (159-2540) 27	62 (34-133) 10	2362 (66-9240) 2,397	3046 (71-9240) 1,203	2007 (690-8120) 548	1916 (750-3690) 285
Potassium (mg/L)	9.9 (3-19) 13	1.6 (1.3-2) 7	Only collected in North	9.4 (2.0-23.8) 97	No Data	No Data
Bicarbonate (mg/L)	183 (10.7-501.8) 13	20.9 (6.1-3.5) 7	Only collected in North	277[15] (152-610) 95	No Data	No Data
Magnesium (mg/L)	122.4 (28-248) 13	4.3 (2.3-7) 7	Only collected in North	184[16] (104-297) 95	No Data	No Data
Chloride (mg/L)	4.6 (<2.5-11) 13	2.8 (<2.5-4) 7	159 (20-325) 395	188 (92-325) 149	154 (64-270) 109	146 (78-196) 114
Sulfate (mg/L)	695.5 (155-1520) 13	16 (11-21.6) 7	949 (16-2300) 358	1524 (901-2300) 124	718 (201-1440) 117	609 (264-2050) 108

These data show that water in Malibu Creek watershed has higher concentrations responsible for macroinvertebrate toxicity and lowered BMI MMI scores than Appalachian valley fill sites. However, in the case of Malibu Creek, these concentrations are natural. Monitoring sites in open space headwaters in the Monterey Formation have the highest values and are diluted downstream.

Comment (55): Turning to ionic impacts on the algal diatom community, the TMDL did not evaluate ionic impacts on the diatom community despite well-known documentation of effects in the scientific literature. Potapova and Charles (2003)[17] for example showed that diatom assemblages respond not only to conductivity, but to gradients in major ion concentration. We contacted the senior author of this work, Marina Potapova, who reviewed mounted slides from LVMWD's 2011 algal bioassessment

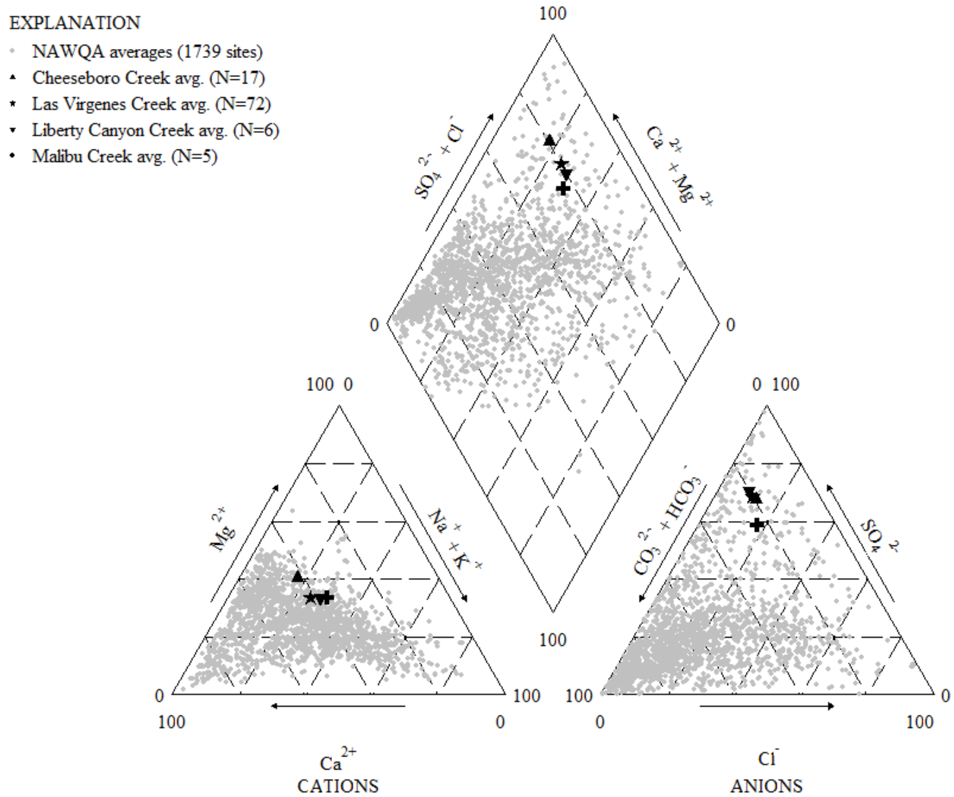
[15] Including values derived from conversion of bicarbonate alkalinity from LVMWD and landfill sites.
[16] Including values derived from conversion of magnesium hardness from the Calabasas Landfill Cheeseboro Creek site.
[17] Potapova, M., Charles, D. F. 2003. Distribution of benthic diatoms in U.S. rivers in relation to conductivity and ionic composition, *Freshwater Biology*, 48(8): 1311-1328.

and found that “the diatoms clearly indicate a high ionic content,” adding that one diatom species found in abundance on the slides “may be new to science and potentially endemic.” [18] The table below provides additional detail on the halophilic diatoms most common in Malibu Creek identified in her review.

Taxon Name	Autoecology
Navicula gregaria	Brackish water ecotype (Bahls et al., 1984)
Nitzschia communis	Brackish water ecotype (Bahls et al., 1984); Cloudy water (TSS< 25 mg/L) ecc
Cocconeis placentula	Common in high Ca streams (Kovics et al., 2006)
Navicula tripunctata	Common in high Ca streams (Kovics et al., 2006)
Amphora pediculus	Common in high Ca streams (Kovics et al., 2006)
Cyclotella meneghiniana	Brackish water ecotype (Bahls et al., 1984);
Tabularia fasciculata	Prefers brackish waters with elevated Na and SO4 (Western Diatom database,
Navicula salinarum	Prefers brackish waters with elevated Na and SO4 (Western Diatom database,
Ctenophora pulchella	Prefers brackish waters with elevated Na and SO4 (Western Diatom database,
Nitzschia microcephala	Prefers brackish waters with elevated Na and SO4 (Western Diatom database,
Entomoneis paludosa	Prefers brackish waters with elevated Na and SO4 (Western Diatom database,

Given the ionic character of Malibu Creek’s water quality, we do not think that regional, southern California metrics for biological indicators are appropriate in this watershed because they would always result in low scores and indicate impairment even in undeveloped subwatersheds draining the Monterey Formation. At the very least, bioassessment guidance documents should exclude the application of standard IBI metrics to outlier watersheds like Malibu Creek, or, at the very least, include the kinds of warnings that are given so frequently in the New Zealand Periphyton Guidelines. Malibu Creek’s water quality is an outlier regionally and even nationally, as shown below where local data are compared to national data from the USGS NAWQA database.

[18] Personal communication with Dr. Randal Orton, December 7 and 8, 2011.



Piper diagram of major ions in the Malibu Creek watershed compared with national NAWQA data.

8.1.1 Inventory of Biological and Habitat Data (Page 8-1 to 8-44)

Page 8-1 to 8-2

Comment (56): TMDL Table 8-1 shows that the EPA has slope data, but these data were not included in analyses of macroinvertebrate community metrics. Slope is a known, important variable in benthic macroinvertebrate IBI scores and should be analyzed. The EPA attends the State's Biological Objectives Regulatory Advisory Group meetings, where the problems associated with slope have been discussed. Not only were SC-IBI scores depressed in low slope areas, but there was an insufficient number of reference sites in many parts of the state, and especially in the south coast xeric region to validate use of the SC-IBI in low gradient streams. Note also that the reference sites selected by the EPA both have greater slope than the state's threshold for low gradient streams (1.0%). SC14 and LC18 both have a relatively high gradient of 3.7%. MC-1 has a slope of 0.5%. MC-15, at the County gage is given with a slope of 3.5%, but we question this value. Annual bioassessment is conducted at that site for Tapia WRF, but the gradient recorded for that site, R-13, is 1.15%. There is a concrete apron covering what would have been a small cascade of base rock for use as the Los Angeles County gage at this site. The concrete and rock section is steep and separates a shallow upstream pool from a deeper downstream pool. However, the steeper concrete and rock section of the creek is only about 15 meters, so most of either assessment would be conducted in the shallower upstream reach. Perhaps Heal the Bay also samples from that steep 15 meter section for a total slope of 3.5%. However, 85% of their reach would be shallower. Site MC-12 separates Rock Pool from the Visitor Center Pool in Malibu Creek. The channel length between the pools is steep and boulder, but the distance between them is less than 150 m, so they also sample the pools, using pool edges when necessary. Those sections will be low gradient. County Sanitation Districts of Los Angeles County staff provided us with an analysis of slope and SC-IBI using data from this TMDL, and found a significant positive correlation between them (Figure 8).

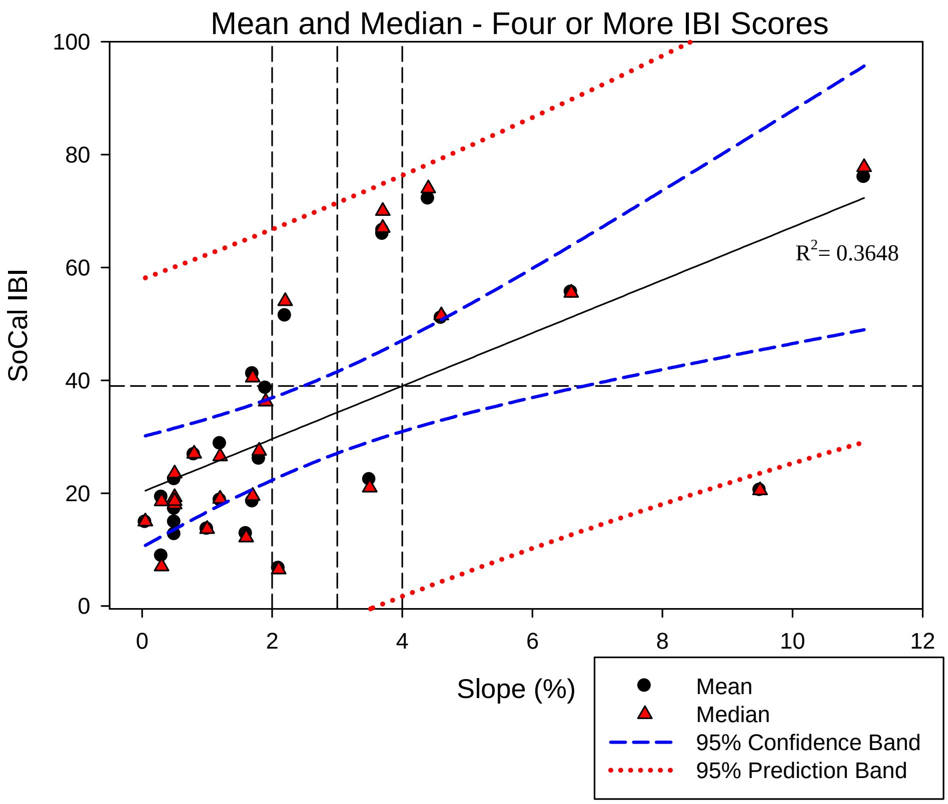


Figure 8. Slope explains 36% of the variation in SC-IBI scores presented in this TMDL (CSDLAC).

8.1.3 SC-IBI Scores (Pages 8-4 through 8-12)

Page 8-4

Comment (57): The southern California IBI (SC-IBI) is inappropriate for regulatory use in this creek.

a. The SC-IBI was developed for perennial wadeable streams, while Malibu Creek is non-perennial or non-wadeable along most reaches. Based on our observations, during the summer most of Malibu Creek dries entirely or forms isolated deep pools so is neither perennial, nor wadeable.
    - Heal the Bay site 1 dries up entirely or forms a shallow, stagnant pool most summers.
    - Heal the Bay site 12 dries up in the downstream half most summers, and the upper portion is in a deep pool.
    - Other monitoring sites along Malibu Creek also dry up in the summer (LVMWD RSW_MC009U, LVMWD RSW_MC004D) or form deep pools that require alteration of the monitoring protocol to be able to sample (LVMWD RSW_MC003D).
b. The SC-IBI was rejected for use in California's Biological Objectives program because it does not reflect the range in natural gradients within the southern California region.
    - Instead, the state is using a hybrid metric composed of an observed versus expected model of expected taxa for sites with similar temperatures, precipitation, watershed

area and elevation, and a predictive multimetric index of biological community structure where metric expectation is based on seven natural site specific gradients, and including six gradients for expected ionic constituents as influenced by geology.

Abundant literature can be found on the effects of seasonal drought and non-perennial flow on macroinvertebrates. An unpublished review of the literature on macroinvertebrate communities and stream flow by the Xerxes Society[19], includes reference to numerous peer reviewed journal articles that investigate non-perennial streams and macroinvertebrate communities in them. Numerous causes of species composition differences from and similarities to perennial streams are discussed. We copy several statements from that white paper here.

a. A positive relationship has been noted between the proportion and/or abundance of EPT taxa and increasing flow permanence (Feminella, 1996; Smith *et al*. 2003; Wood *et al*., 2005). This is not surprising, as these orders are known in general to require cold, well-oxygenated, fast-flowing water (Merritt *et al*., 2007; Wiggins, 1996; Stewart & Stark, 2002).
b. Chadwick & Huryn (2007) noted that channel drying typically excludes large-bodied aquatic taxa whose long generation times and high biomass requires perennial flow to complete their life cycle, specifically freshwater mussels (Margaritiferidae, Unionidae), some odonates (Aeshnidae, Corduligasteridae, Gomphidae), and some families of stonefly (Pteronarcyidae, Perlidae).
c. Isolated pools that formed a few meters apart in one intermittent stream reach differed substantially in nutrient concentrations and dissolved oxygen levels as drying progressed, and supported different macroinvertebrate communities (Stanley *et al*., 1997).
d. Flooding and drying is accompanied by changes in pH, dissolved oxygen, conductivity, siltation level, and concentrations of ions, toxins, or pollutants (Williams, 1987; Stanley *et al*., 1994: Lake, 2000)… These changes in turn affect the taxonomic composition and biotic interactions of the macroinvertebrate community.
e. Adult invertebrates with strong flight capability and high dispersal capacity, especially beetles (Coleoptera) and true bugs (Hemiptera), are often more abundant and diverse in intermittent streams (Williams, 1996; Boulton, 2003; Bogan & Lytle, 2007; Bonada *et al*., 2007).
f. Seasonal changes in community composition are larger and more significant in intermittent streams, with rheophilic (requiring water for their entire life cycle) wet-season species gradually being replaced during the dry season by winged air-breathing species of true bugs and beetles (Williams, 1987).

Page 8-4

Comment (58): If the SC-IBI is to be applied, reference condition should be based on local reference sites. On page 7-1 of the TMDL the EPA relates that the two reference sites selected are SC-14 (coastal Solstice Creek) and AS-18 (Coastal Arroyo Sequit). The TMDL describes how the SC-IBI is calculated on page 8-4 by saying “Ode et al. (2005) used a statistical criterion of two standard deviations below the mean score from unimpacted reference sites to establish a value of SC-IBI as an impairment threshold.” If the mean of each potential reference site in the area were used (i.e. Heal the Bay sites/mean IBIs 1/76, 6/51, 8/32, 9/41, 14/67, 18/56, 19/66 and MCWMP site/mean IBI LV1/24 an LA County 16/20.) the mean from these sites is 48.1 and the standard deviation is 20. So using the SC-IBI threshold selection

[19] http://www.xerces.org/wp-content/uploads/2009/03/xerces_macroinvertebrates_indicators_stream_duration.pdf

method of 2 standard deviations below mean, an impairment threshold could be set at 8. By limiting reference sites to only the six Heal the Bay reference sites, the mean is 55.5 and the standard deviation is 15.4, so a threshold of 25 could be used. Or another impairment threshold could be considered. In any case, local reference scores indicate that the threshold selected for the SC-IBI (40) is inappropriate in this area.

Page 8-5

Comment (59): Table 8-2, Heal the Bay SC-IBI Bioscores, appears to include scores that are different from those supplied to us by Heal the Bay. Instead, this table shows sites and scores presented by Alison Lipman to the California Aquatic Bioassessment Workgroup in 2009.[20] Alison Lipman was Heal the Bay's Stream Team manager, but two people have held the position since she left in 2010. We have asked Heal the Bay where the 18 PowerPoint slide sites are, for those that have non-standard Heal the Bay site IDs. We do not have that information at this time. We have still not been able to determine the location of the following sites with non-standard Heal the Bay site IDs, and therefore cannot respond with comments: MC1B, MC12A, MC13, MC8, MC8B, MC20 andMC21. The following comments result from a comparison of scores in Table 8-2 with scores for standard Heal the Bay sites provided to us by Heal the Bay.

a. MC-1: The PowerPoint table shows no score for the spring sampling in 2001, 2006, 2008, and 2009, but the data we received has scores for these dates. Heal the Bay indicated that this is the same location as their water quality monitoring site 1.
b. MC1B: This appears to be where the score for MC-1 was recorded for spring 2001, but it does not include the other missing scores for MC-1. We have not been able to determine where this site is.
c. MC-12: This is the reach downstream from Heal the Bay water quality monitoring site 12 at Rock Pool.
d. MC-12A: We have not been able to determine where this site is.
e. MC-13: Heal the Bay has no site MC-13, but has a site 13 on Las Virgenes Creek. Heal the Bay has informed us that this is at a location we know in Malibu Creek State Park where a trail (once a dirt road) crosses Malibu Creek. This site dries up for months most summers.
f. MC15: The table shows no scores for 2000 and 2001, yet the data we received from Heal the Bay has scores for these years at this site.
g. MC-8: Heal the Bay has no water quality monitoring site 8 on Malibu Creek, but they do have a site 8 on Palo Comado. Heal the Bay has reported to us that this site is just upstream of Tapia WRF discharge 001.
h. MC-8B: Heal the Bay tells us this site is just downstream of Tapia WRF discharge 001.
i. MC-9: These are the scores for MC-15. Heal the Bay confirms that site MC-9 is at their water quality monitoring site 15.
j. MC-20: Heal the Bay has no site MC-20. Heal the Bay has no site 20 at all. We have not been able to determine where this site is.
k. MC-21: Heal the Bay has no site MC-21. They do have a site 21 on Medea Creek, but the data they sent us does not show any IBI scores for that site. We have not been able to determine where this site is.

[20] http://www.waterboards.ca.gov/water_issues/programs/swamp/reports.shtml#bmp_assess

Page 8-15

Comment (60): The TMDL says "For O/E there does not appear to be a significant difference between the Malibu main stem MC-1, MC-9, and MC-15 stations and the reference sites." Is this a typo that should say MC-12? Does the EPA have taxa data for these non-conventional Heal the Bay sites in order to compute O/E?

Page 8-7

Comment (61): Table 8-4 with Los Angeles County SC-IBI Bioscores appears to have many errors. The sites and dates sampled all appear to be correct, but all the scores listed here are incorrect. Furthermore, LA County provided the EPA with all their Bioassessment reports in September 2011, including reports for 2009, 2010 and 2011 in September 2011, but scores for those dates are not included here.

Page 8-8

Comment (62): Table 8-6 with SC-IBI Scores from LVMWD appears to have many errors. Sampling dates and locations appear to be correct, but several scores have been entered incorrectly.

Page 8-8

Comment (63): USEPA 2010-2011 Benthic sampling site locations are not given with adequate specificity for proper review. Site locations are given on page 8-8 for the 5 EPA benthic macroinvertebrate sampling locations, but are given as narrative that is very imprecise. MC EPA-1 is described as being between two points that are about 500 meters apart. The description is much less revealing as to the location of EPA-2, EPA-3 and EPA-4. Based on the description, EPA-2 could be anywhere along a 5 km section of the creek, most of which dries up in the summer, and some of which is pooled behind Century Dam. EPA-3 could be anywhere along a 2.5 km section of Malibu Creek, some of which dries up and some of which forms deep pools. EPA-4 could be somewhere along a 5 km section of Las Virgenes Creek. The location of EPA-5 is omitted completely. The EPA's lack of greater specificity on the site locations prevents an assessment of the sites' appropriateness for this TMDL and prevents us from being able to comment more adequately. Examples follow, below:

a. "For the two sites in Malibu Creek State Park, a single dominant taxon was accounted for over 80% of the individuals collected whereas the other three sites outside of the park had approximately a fifth of the individuals as a single dominant taxon."(Page 8-9)
    - Most of Malibu Creek upstream of the confluence with Las Virgenes Creek dries up entirely in the summer, with the exception of Century Lake, Rock Pool and the inaccessible pools between them. The lake and pools are not wadeable, so we assume EPA-2 and possibly EPA-3 were sampled at non-perennial sites.
b. "The percentage of the highest tolerant species was observed in the State Park at MC-EPA2." (Page 8-9)
    - Again, we suspect this sample was taken along a stretch that we know is unshaded and becomes entirely dry most summers.

c. "The other site further upstream in Malibu State Park had the lowest percentage of tolerant species (3%); this site also had the highest percentage of collectors (96%)." (Page 8-9)
   - We suspect this site is between Malibou Lake Dam and Century Lake, a stretch that becomes dry or damp most summers and is forested with a deciduous tree canopy.

d. "These results indicate that the benthic community along the Malibu Creek main stem were all of poor condition and the sites located in the State Park did not fare better, likely due to the strong impact of the upstream development. This matches well with our analyses of the upstream development and impervious surface discussion."
   - The hypothesized cause may also result from any number of causes, including inappropriate site selection.

e. "Water quality taken at the time of the benthic macroinvertebrate sample collection showed that specific conductivity measurements were over 1.800 mS/mho at all sites." (page 8-10)
   - We suspect the high conductivity and the ionic species present in high concentrations that contribute to that conductivity, contribute significantly, along with the non-perennial flow, to the low scores relative to the SC-IBI thresholds. Given that we know specific conductivity is higher along Las Virgenes Creek, we would expect the EPA site there to have the highest conductivity among their sites. It is not surprising then that the SC-IBI was the lowest.

Page 8-10

Comment (64): EPA's conclusion on SC-IBI scores is misleading. Conclusions are justified with various median scores, ignoring the fact that the ranges are large. The median value from Heal the Bay's 8 samples taken at reference site 9, for example, is 41, with scores ranging from 26 to 59. It is misleading to say that if median passes, the the site passes. This Modelo Formation situated reference site fails half the time. Similarly, Heal the Bay site 15 has a median score of 24 but a range of scores from 6 to 43. Even Heal the Bay site 3 in the pristine Cold Creek headwaters (with no Monterey Formation) has a 31 point spread in scores. The California State Biological Objectives technical team is developing a scoring tool that incorporates a calculation of uncertainty due to the variation in scores from sample to sample. It is clear from the variation of scores in this region that there is a large degree of uncertainty, yet the EPA does not account for that and instead uses an absolute threshold that has been rejected by the state.

Page 8-11 and 8-12

Comment (65): EPA incorrectly justifies their reference site selection with respect to differences in geologic terrain by citing scores at HtB Ch-6. Heal the Bay has two reference sites in the Modelo Formation-dominated, undeveloped headwaters of Malibu Creek, but selectively discusses just site 6 in Cheseboro Creek, which has only one failing score out of seven assessments scores ranging from 34 to 64. EPA omits mention of the other reference site, site 9, in the Las Virgenes Creek headwaters. Site 9 was sampled 8 times with scores ranging from 26 to 59 and with 50% of scores failing. Heal the Bay characterizes both sites as "minimally disturbed" but site Ch-6 has more canopy cover and is probably steeper. Test sites have even lower canopy cover, so it would be more appropriate to have included both sites 6 and 9 as reference sites.

Comment (66): EPA is ignoring EPA policy on natural sources of impairment. EPA says "perhaps in this Watershed and with the unique geology, this site [site Ch-6] is appropriate to use as basis for comparison with impacted sites; furthermore, this station does achieve acceptable SC-IBI scores." It appears that the EPA maintains the assumption that if a site attains passing scores, it is reference, and if it does not, it is not reference. This is in contradiction to EPA policy established through the EPA memorandum "Establishing Site Specific Aquatic Life Criteria Equal to Natural Background"[21], which states "For aquatic life uses, where natural background concentration for a specific parameter is documented, by definition that concentration is sufficient to support the level of aquatic life expected to occur naturally at the site, absent any interference by humans." We interpret this to mean that at a natural site (LV-9), the range of scores is by definition, the range of scores that are representative of the natural condition. Whatever stressor or stressors are present and depressing SC-IBI scores at HtB site LV-9 can be considered as the "natural background concentration of specific parameters." Site LV-9's IBI scores are "the level of aquatic life expected to occur naturally at the site." Thus, SC-IBI scores in the range of 26 to 59 are the natural expectation for that reference site, not just the scores over 39. This contradicts the selection of 40 as the threshold for discerning impairment.

Comment (67): Scattergrams of SC-IBI scores at all potential reference sites (Figure 9) shows the large variation in scores by site and shows that reference sites do attain failing scores. Sites selected by the EPA as reference are sites 14 and 18 – the coastal sites with the highest maximum scores. Figure 8 shows that Heal the Bay's two reference sites in the undeveloped Monterey Formation headwaters attain a similar range of scores, each with passing and failing scores. A non-parametric Mann-Whitney difference of means test on scores from sites Ch-6 and LV-9 shows that there is no significant difference between the two sites' scores. Both sites should be included as reference. We argue that Malibu Creek will receive the water quality effects from the Monterey/Modelo Formation and will experience the same depression of scores as those reference sites that lie within the Monterey/Modelo Formation.

[21] http://water.epa.gov/scitech/swguidance/standards/upload/2009_01_29_criteria_naturalback.pdf

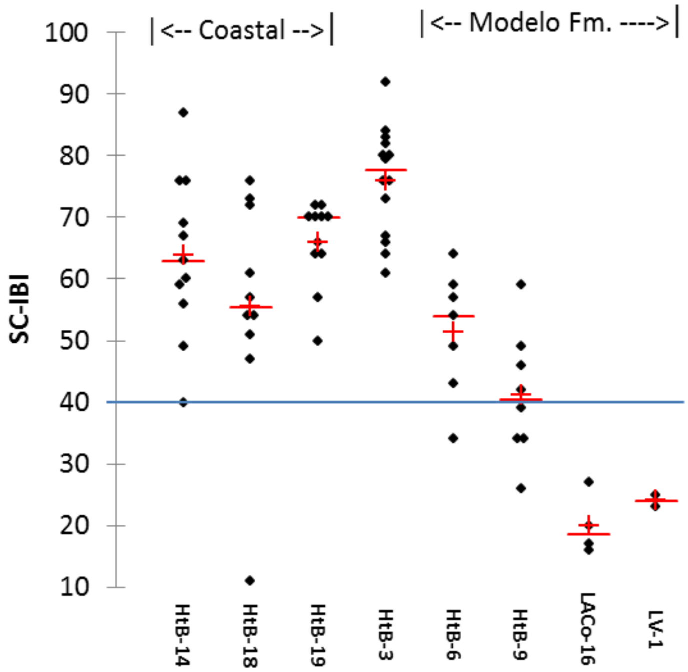


Figure 9. Scattergram of SC-IBI scores at all Heal the Bay sites and sites LACo-16 and LV-1 immediately upstream of development in the undeveloped headwaters of Las Virgenes Creek. Medians are shown as bars and means as crosses. A line is drawn at the EPA threshold of 40.

Page 8-13

Comment (68): EPA states that they used raw taxa data where available, from Heal the Bay, LVMWD, and USEPA. It should be noted that raw taxa data from the Malibu Creek Watershed Monitoring Program and the Stormwater Monitoring Coalition also were supplied to the EPA in fall 2011 and from Los Angeles County in Fall 2012, but none of these data appear to be used.

Page 8-15 to 8-16

Comment (69): Figure 8-5, the EPA O/E Analysis of Benthic Macroinvertebrate Data showed there was not a significant difference between the test sites MC-1, MC-9, and MC-15 and reference sites LC-18 and SC-14. We do not think this O/E was adequately modeled, but this is one indication that the test sites may not vary significantly from reference. Instead of being dismissed, it should have been pursued further by adding predictor variables, including conductivity and ionic concentrations. Note also that sites MC-1 and MC-9 are non-perennial and should not have been included. See also our comments on the O/E entered for TMDL page 3-2 and for Appendix D.

Page 8-16

Comment (70): The EPA found that EPT taxa "may be sensitive to the high conductivity associated with the marine sedimentary geologic formations in the watershed." Ephemeroptera are known for their sensitivity to salinity (Hart et al. 1991[22], Hassell et al. 2006[23] Echols et al. 2009[24]) and to low flow (Echols et al. 2009). Given this finding, the potential effects of high conductivity water draining the Monterey/Modelo Formation should not be so readily dismissed. The USGS maintains a web page with warnings on the water quality hazards to animal life posed by the Monterey Formation[25] (Hazardous Trace Elements in Petroleum Source Rocks: the Monterey Formation). If average specific conductivity were plotted on Figures 8-6 and 8-7, which shows EPT taxa ranges for two reference sites and three test sites, the effects of conductivity would be made more clear. The averages for the reference sites Lachusa 18 and Solstice 14 are 1,531 and 1,185 µS/cm, respectively. The average for MC-1 and LVMWD R-4 is 1,876 µS/cm, while MC-12 averages 2,090 and MC-15 averages 2,151. These coastal streams are unreliable references for expected IBI scores, being substantially lower in ionic strength than Malibu Creek.

Page 8-19

Comment (71): Figure 8-9, the EPA's discussion of Figure 8-9 concludes that conductivity is not so influential on SC-IBI scores as development, but its analysis is flawed. The EPA tests the strength of the relationship between conductivity and IBI scores by regressing median SC-IBI on median specific conductivity for all Heal the Bay sites. When the strength of the association was found to be weak (R^2=0.30), the EPA concluded that there is only a weak correlation between the two. We believe this weak correlation is due to the inclusion of all Heal the Bay sites, including all those where there are multiple stressors present confounding the analysis, which the EPA admits: "the apparent correlation of IBI and Modelo formation drainage may be confounded because the outcrops of this formation are located just north of the 101 freeway corridor where most of the high density development occurs." Yet the EPA concludes without analysis that "results appear to correlate better with the presence of upstream high density development" instead and refers to a map of the developed areas. We avoided the confounding effects resulting from an inclusion of all Heal the Bay's sites by regressing median SC-IBI on median conductivity for just Heal the Bay's six reference sites (3, 6, 9, 14, 18 and 19; figure 10, below). The result shows that 76% of the variation in SC-IBI is due to conductivity. The result for a regression of median O/E on median SC-IBI is 77% (Figure 11, below). Because these are open space reference sites, conductivity will result primarily from geology. By limiting a regression to reference sites, the influence of conductivity alone is more clearly revealed, and the influence is strong.

[22] Hart, B. T., Bailey, P., Edwards, R., Hortle, K., James, K., McMahon, A., Meredith, C., Swadling, K. 1991. A review of salt sensitivity of the Australian freshwater biota, *Hyrdobiologia*, 210: 105-144.
[23] Hassell, K. L. Kefford, B. J., Nugedoda, D. 2006. Sub-lethal and chronic salinity tolerances of three freshwater insects: *Cloen* sp. and *Centroptilum* sp. (Ephemeroptera: Baetidae) and *Chironomus* sp. (Diptera: Chironomidae), *Journal of Experimental Biology*, 209: 4024-4032.
[24] Echols, B. S., Currie, R. J, Cherry, D. S. 2009. Preliminary results of laboratory toxicity tests with the mayfly, *Isonychia bicolor* (Ephemeroptera: Isonychiidae) for development as a standard test organism for evaluating streams in the Appalachian coalfields of Virginia and West Virginia, *Environmental Monitoring and Assessment,* 169: 487-500.
[25] http://energy.cr.usgs.gov/TraceElements/monterey.html

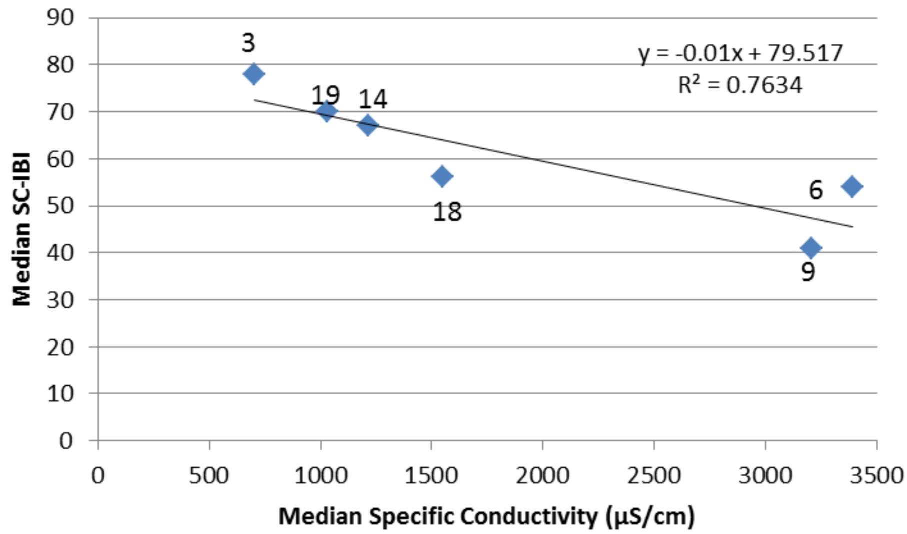


Figure 10. Correlation of Median IBI scores with median conductivity for Heal the Bay reference sites alone.

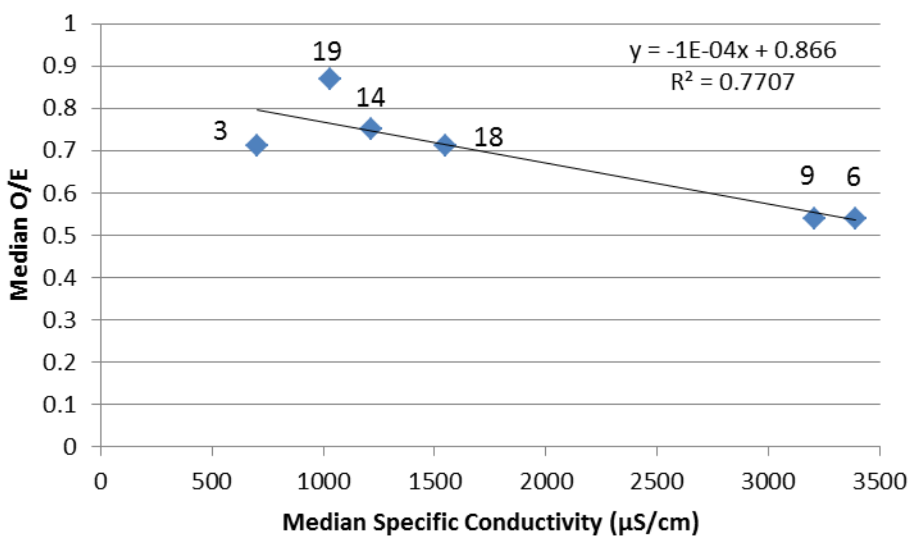


Figure 11. Correlation of median O/E scores with median conductivity for Heal the Bay reference sites alone.

The results above are further indication that the standard threshold for passing and failing SC-IBI scores is not appropriate in this watershed. Natural stressors are at least in part depressing scores, as can be seen by the low median scores of Monterey/Modelo Formation reference sites. Even the coastal site medians attain scores ranked “good,” but not “very good.”

Page 8-20

Comment (72): Figure 8-10. The EPA’s argument that development, rather than conductivity, is the cause of failing SC-IBI scores is facile and misleading. By using only medians, EPA is able to obscure the very large interannual variation in scores at most sites and thereby create what appears to be a reasonable diagram showing that sites in the “high density development” box are the only sites to have median scores of less than 30. This is misleading in several ways.

a. First, sites are boxed in Figure 8-10 to show that all the sites with scores less than 30 are downstream of high density development. But it should also be mentioned that all these sites are also downstream of the Modelo/Monterey Formation with water quality draining that formation. The box does nothing to reduce the spatially confounding influences of the Monterey/Modelo Formation and urban development. Everything within and downstream of the Monterey/Modelo Formation attains failing IBI scores at some times, even Ch-6, which is shaded, has slope >1 and may have other advantages we don't know of because we have not been able to see the physical habitat measures. LV-9 is a reference site in the Monterey/Modelo Formation, but fails half the time. The substrate there is dominated by fines and the slope appears to be shallow.
b. Sites MC1, MC15 and MC12 are included in the "high density development" box, when they are very far downstream of any high density development by about 13, 7 and 6 km each. The watershed area upstream of MC1 is about 80% open space. These sites can hardly be classified as "high density development."
c. Scores at these sites have very large interannual variation; a plot of median SC-IBI scores is simplistic and ignores the complexity of the biology in Malibu Creek watershed where there are significant natural source stressors.
d. Finally, the EPA dismisses the influence of the Modelo Formation by comparison of a Modelo Formation site with a site that should never be assessed as a perennial wadeable stream using the SC-IBI. The EPA says on page 8-20: "IBI scores are relatively high (median 56) at CH-6, within the Modelo formation, and low (median 19) at TR-17, with only a small fraction of its drainage in the Modelo formation." Here they compare the median score from a forested reference site in an undeveloped headwater with a channel slope of 2.2% (CH-6) with the median score from a site with 0.5% slope that is along a stretch of creek that forms isolated pools or becomes entirely in the summer (TR-17). Google Earth shows this site within a reach that is dry for more than a kilometer upstream (August 2012 imagery). Heal the Bay monthly water quality monitoring includes a qualitative record of flow ranging from none, to intermittent, to trickle, to steady and then heavy. Of the five summers assessed, flow dropped to "none" three years and to "intermittent" one. Heal the Bay continued macroinvertebrate monitoring at Ch-6 after they stopped monthly water quality monitoring, but for the two years where we have both flow records and SC-IBI, one was "steady" flow (SC-IBI=57 & 59) and one summer had "none" (spring IBI=49).

A better analysis would have been to plot the individual SC-IBI scores with the conductivity measurements made on that date. Because these were not provided, we evaluated the individual SC-IBI scores as scattergrams with sites given in order of increasing median conductivity (Figure 12, below). This plot demonstrates the folly of EPA figure 8-10. Three of Heal the Bay's six reference sites have SC-IBI scores which always fall above the selected threshold of 40. Site SC22 is a special study done on Solstice Creek. Yet, three of Heal the Bay's reference sites have failing (Poor and Very Poor) scores.

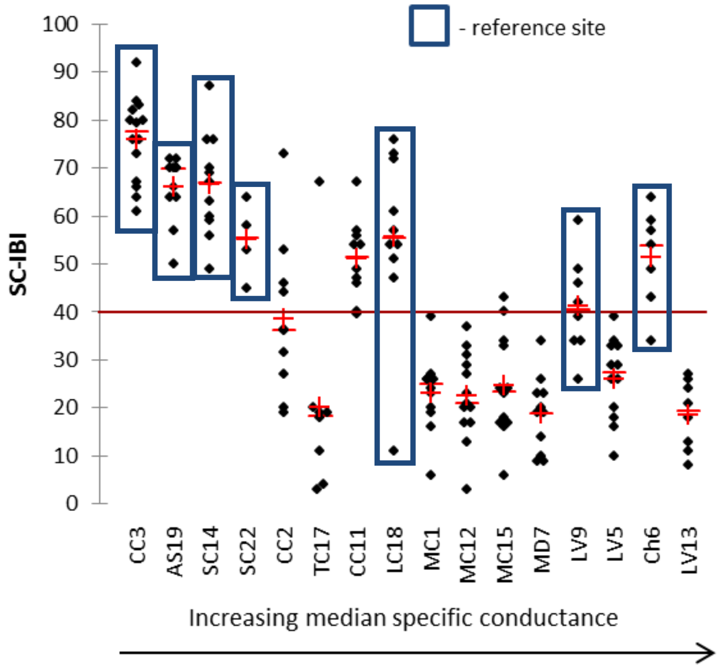


Figure 12. Heal the Bay SC-IBI scores plotted in order of increasing median conductivity by site. Reference site scores are boxed.

Page 8-21

Comment (73): Figure 8-11 is used to show that the only sites with SC-IBI>30 also had average nitrate values less than 1.0 mg/L. Yet there are also failing sites with low nitrate averages. Since nitrate concentrations vary with time, this analysis is better done by sample, rather than by site. Note also that Heal the Bay does not measure nitrate-N, but measures NO3-NO2-N.

Page 8-21

Comment (74): EPA cites a finding by Luce (2003) that conductivity may have a geologic source, and then ignores that statement to conclude that conductivity is due to stormwater input. At the time Luce did her dissertation work (2003), Yerkes and Campbell's geologic map of Los Angeles County (2005)[26] had not been published, and the USGS (2002) had only recently posted their website warning of the potential water quality hazards posed by the Monterey Formation. With limited information, Luce (2003) made her best guesses about the source of high conductivity and guessed correctly when she said that the source may be geologic. The EPA uses this information to say "it appears most likely that IBI scores are responding primarily to urbanization and only to a lesser degree, if at all, to conductivity itself. It thus appears that conductivity enters these regressions primarily as a surrogate for urban stormwater input." We have no explanation for why the TMDL authors fail to mention the obvious counter-argument that if they are correct that urban runoff is brackish, then we should expect to see similar conductivity in stormwater through the Los Angeles metropolitan area, which is not the case; there is no reason to believe that runoff purely from urban development in this watershed is so different

[26] Yerkes, R. F. & R. H. Campbell. 2005. Preliminary Geological Map of the Los Angeles 30' x 60' quadrangle, Southern California. U. S. Geological Survey Open File Report 2005-1019. http://pubs.usgs.gov/of/2005/1019/.

from urban development elsewhere in the region with respect to ionic strength. Given more time, we could generate the fraction of area upstream from each site that is within the Monterey/Modelo Formation and plot that against conductivity. Lacking that time, we have plotted the fractions for each of 3 tributary regions and for the whole watershed along with conductivity medians for each site in each tributary region or downstream watershed (Figure 13).

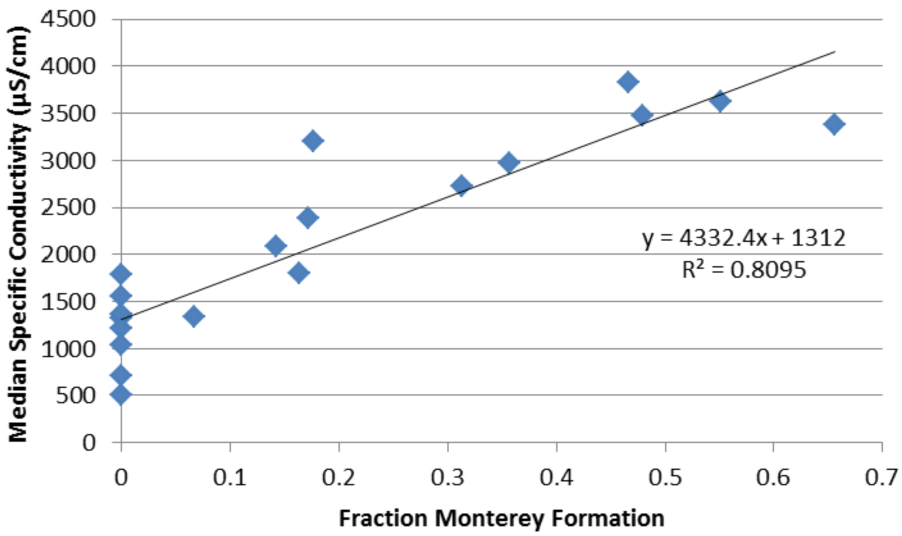


Figure 13. 81% of the variation in median specific conductivity is explained by the fraction of upstream watershed Monterey Formation exposure for Heal the Bay sites.

Page 8-22 to 8-24 and Figures 8-14 and 8-15

Comment (75): The EPA was amiss in assessing the effects of geology on macroinvertebrate measures by limiting analysis to "sedimentary formations" in general and not analyzing the effects of the Monterey Formation sedimentary rock specifically, which has an inordinate influence on water quality. Our analysis shows that a significant source of the variation in SC-IBI scores is the fraction of Monterey Formation in the upstream watershed. The EPA compared median SC-IBI and O/E scores with the fraction of sedimentary geology in the watershed area upstream of those sites and found them "essentially uncorrelated" with R^2 values of 0.01 and 0.02, respectively. It is unfortunate that the EPA ignored the results from the report presented to them with our findings on the Monterey Formation's influence on water quality (LVMWD 2011) and assessed instead the influence of the more general geologic classification of sedimentary rock. We replicated the analysis, but replaced percent sedimentary rock with percent Monterey/Modelo Formation and obtained an R^2 value of 0.22. So while sedimentary rock explains only 1-2% of the variation in SC-IBI scores, the Monterey Formation explains 22% of that variation (Figure 14.) We strongly suspect that the inclusion of other Miocene marine sedimentary formations would improve the strength of the correlation; the Miocene was a period of intensified upwelling of nutrient rich waters in this region, which entered the geologic cycle primarily through the sedimentation and burial of marine diatoms (see our report No. 2475.00, section 3 for references to the Monterey Formation's depositional history and biogenic fraction. It should not surprise anyone that upon exposure in brackish streams, this geological biogenic rock is an effective diatom and algal fertilizer.

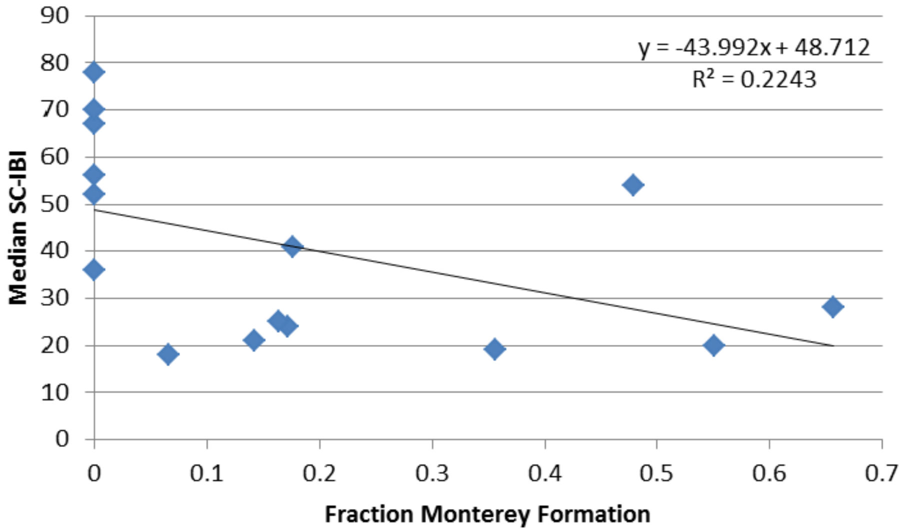


Figure 14. 22% of the variation in median specific conductivity is explained by the fraction of upstream exposures of the Monterey Formation at Heal the Bay sites.

Page 8-22 to 8-24

Comment (76): EPA's findings on the influence of upstream imperviousness on macroinvertebrate scores are flawed, because they do not address the confounding influence of upstream Monterey Formation. Higher density development and Monterey/Modelo Formation exposures co-occur in the northern headwaters of Malibu Creek. The EPA acknowledges that this spatial co-occurrence could confound analysis on page 8-19, but then ignores it. Again, the best way to isolate urban runoff impacts on water quality and IBI scores is to compare results from sites with urban development but no Monterey Formation rock either upstream or geographically coincident with urban development.

8.3 Stream and Benthic Algal Data (Pages 8-33 through 8-38)

Page 8-33

Comment (77): The EPA's algal percent cover thresholds are inappropriate for these sites in this watershed. The EPA states that "the nutrient impairment listing for the Malibu Creek watershed is based primarily on algal coverage. The TMDL (USEPA, 2003) establishes thresholds of 30 percent coverage for floating algae and 60 percent coverage for mat algae." (Page 8-33) The EPA (2003) uses floating and benthic algal percent cover thresholds recommended by Biggs (2000), while ignoring this source's cautions on applying those thresholds as indicators of human impairment in watersheds with exactly the kind of marine tertiary sedimentary rock as the Monterey Formation. We argued in the report *Water Quality in the Malibu Creek Watershed, 1971-2010*, that Biggs (2000) specifically stated that these thresholds would not be met in catchments with significant amounts of Tertiary marine sediments, which can cause proliferations during low flows. We met with EPA staff working on this TMDL and presented them with this report in 2011, so this should have been investigated and considered when developing this section. The EPA ignored the warnings in Biggs (2000) that natural proliferations will occur in watersheds with Tertiary marine sedimentary formations like the Monterey/Modelo Formation, and instead continues to apply the 30% and 60% cover thresholds without giving any justification for dismissing Biggs (2000) caveats on geological sources such as this.

Page 8-33

Comment (78): The EPA erroneously cites Luce (2003) by saying "Malibu Creek has a generally intact riparian canopy." In fact, limited canopy cover should have been one of the stressors listed and investigated by the EPA, were they to have conducted a thorough assessment of stressors in accordance with CADDIS procedures. A box plot of canopy cover (Figure 15) copied from Luce (2003, Figure 5) shows that all Heal the Bay reference sites (the numbers preceded by an "R" in the figure below) are well shaded with canopy, while the sites used in this EPA TMDL (I1, I12 and I15 in the figure below) are among the four least shaded sites when minimum and median values are considered. Luce (2003, page 61) ends her discussion of stressor effects on macroinvertebrate community metrics by saying "maintaining canopy cover appears to be very important to protecting the BMI community in this system … protecting the riparian buffer zone from development and thereby providing canopy cover for the stream will help maintain a healthy BMI community in the stream." The TMDL gives no justification for ignoring Luce's findings on canopy cover.

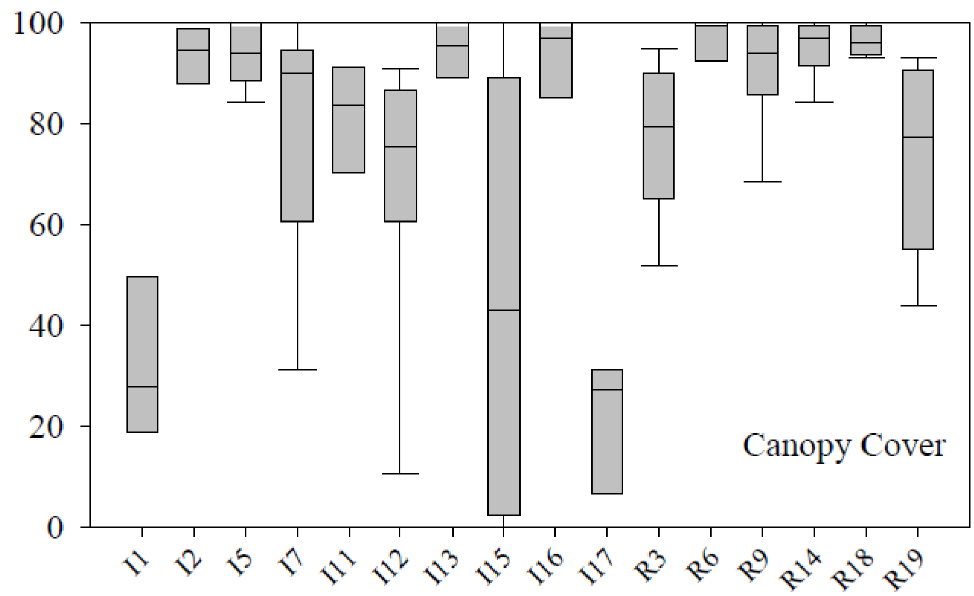


Figure 15. Canopy cover (%) at Heal the Bay reference (R) and impacted (I) sites (Luce 2003, Figure 5).

Page 8-33

Comment (79): The TMDL includes a finding from Busse et al. (2003) which says "At most sites, algal biomass was not limited by nutrients, but rather by light availability and water current," which is supported by the figure shown above (Figure 15). We have already shown that flow at Heal the Bay sites 1 and 12 are low or nonexistent most summers, and now we can see that canopy cover is minimal as well. The TMDL analysis of nutrient-algal linkages throughout fails to address other factors that are shown to affect algal growth in Malibu Creek by virtually every study on the subject cited in the TMDL.

Page 8-33

Comment (80): We previously commented on the statement "Total nitrogen, total phosphorus, and total chlorophyll concentrations were all positively correlated with the proportion of upstream land covered by impervious surfaces (Busse et al., 2006)." We pointed out the confounding effects of impervious surfaces, development and the Monterey/Modelo Formation, which are spatially coincident in the northern headwaters. Busse et al. (2006) may have confounded the effects from impervious areas with the effects from the Monterey/Modelo Formation.

Page 8-34

Comment (81): This page includes the sentence "Given these studies, it is not clear if the existing nutrient TMDL targets – even if fully implemented – would be sufficient to significantly reduce algal coverage in Malibu Creek." First, these same studies also acknowledge other factors unrelated to nutrient levels that encourage algal growth in Malibu Creek (see our comments, above). Second, we provide substantial additional evidence that both algal growth and algal species composition is impacted by Malibu Creek's ionic strength and composition. Third, we would like to point out that the 2003 EPA has <u>not</u> been fully implemented, so it is not known whether those nutrient targets would have made differences in algal cover. The MS4 permittees have only had the nutrient TMDL incorporated in their permits as of December 2012 and have not had an opportunity to try to reduce nutrients from MS4s. LVMWD (2011) showed that annual median nitrate-N exceeds the 1 mg/L total N limit at 18 watershed monitoring sites and phosphate-P exceeds the summer limits at 40 sites in both developed and undeveloped areas.

Comment (82): LVMWD (2011) shows that while sites on Malibu Creek meet summer nitrogen targets, NO3-N concentrations on 11 of 32 sites on tributary streams do not meet the summer target. Malibu Creek median concentrations from 13 of 18 monitoring sites are not meeting the summertime phosphorus limit set by the 2003 TMDL. The report also showed that 22 of 33 sites in the northern tributaries were not meeting the phosphorus target, including three open space sites. The 2003 TMDLs have so far only been applied to one permit – that for Tapia WRF. Tapia has been incompliance with permits based on this TMDL. However, the Los Angeles County MS4 permit was just adopted. Nutrient limits should not be revised until MS4 permittees have a chance to meet those targets. The EPA conducted an intensive analysis for the 2003 TMDL, less than a decade ago, which concluded that the allocations presented would correct the problems. The EPA should allow the MS4 permittees the opportunity to meet these targets to see if by doing so, impairments are corrected.

Page 8-34

Comment (83): EPA relies on algal cover data from Heal the Bay and Busse (2003), but does not disclose significant differences in methods used by the two. Heal the Bay's algal percent cover measures are based on visual inspection with no objective measurement. Heal the Bay combines subsurface filamentous and diatom mats in their benthic "mat" estimate. Their floating algae estimate includes all algae present at the water-air interface. Visual estimates are notoriously unreliable, especially when depth, shading and surface water reflections make benthic cover or the lack of benthic cover more difficult to see. Since Heal the Bay also relies on volunteers for monitoring, inter-rater variability is also a factor affecting the reliability of data that may give erroneous impressions of temporal trend. In contrast, Busse's (2003) method of algal percent cover estimation followed the EPA Rapid Bioassessment Protocol using objectively defined transects and gridded buckets. We recommend that in the future EPA limit algal cover estimates to objective measures, such as those in the EPA RPB or the SWAMP Algae SOP[27].

Page 8-34

Comment (84): Table 8-13 has an error. Site 12 is listed as "Malibu Creek below Cold Creek," but site 12 is between the Malibu Creek State Park bridge by the visitor center and Rock Pool.

Page 8-36

Comment (85): The EPA finds "An examination of all of the Heal the Bay data shows that there is almost no correlation between algal coverage and either inorganic N or inorganic P concentrations (Figure 8-21)." Without further analysis, the EPA decides that "instead total nutrient concentrations may be better at providing an indication of primary production." The EPA adds that, "Notably, 100 percent cover can occur at the lowest inorganic nutrient concentrations, while low cover is often found at high inorganic nutrient concentrations. In part, this may reflect control by light limitations and other factors; however, it also suggests that inorganic nutrient measurements may not provide a good indication of algal growth potential; instead total nutrient concentrations may be better at providing an indication of primary production." Further analysis using total N and total P collected simultaneously with reliable algal biomass and percent cover measurements should be undertaken to verify the unsupported EPA decision that the cause must then be some form of nutrients not measured. Because this finding is equally true of the TMDL's conclusions regarding nutrient runoff from natural sources, and if those sources are sufficiently high than nutrient levels in the creek will exceed those necessary to sustain maximum algal growth regardless of controls on human sources. Those limits are already exceeded in Malibu Creek for floating mat algal species such as *Cladophora glomerata* on the basis of known nutrient levels alone.

Comment (86): By suggesting that there must be species of N and P not analyzed that are responsible for alga cover when no relationship is found between algal cover and inorganic species ignore findings from EPA funded research. In a study of southern California reference stream condition, (Stein and Yoon 2007, page 23) found that "Neither chlorophyll-a nor algal percent cover was significantly correlated with any nutrient concentrations." Nutrient species included in their study included NH3, TKN, N03-NO2-N, TP, PO4-P, TOC and DOC. They did not find that algal biomass or percent cover were related to TN. Research by Stein and Yoon (2007) also indicated higher percent algal cover and larger natural algal biomass occur in southern California reference streams. (See additional comments made for TMDL page 3-2).

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[27] Fetscher, A. E., Busse, L., Ode, P. R. 2009. Standard Operating Procedures for Collecting Stream Algae Samples and Associated Physical Habitat and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 002. (updated May 2010)

Pages 8-37 to 8-38

Comment (87): The EPA reports algal biomass as chlorophyll-a (mg/m^2) from the 2002 survey by Busse et al. (2003) and conclude that "Based on these analyses, the algae-related impairment in the Malibu Creek main stem has yet to be mitigated." 2003 was the year the EPA established the TMDL, so data collected for a report published in 2003 will have preceded the implementation of the TMDL and cannot be informative of conditions with an established TMDL. More recent data would have been more relevant. Though they do not say so in this section, we assume they compare results with the 150 mg/m^2 chlorophyll-a threshold based on BURCII/III and the CA NNE.

8.4 – Invasive Species (Pages 8-38 to 8-39)

Comment (88): The EPA considers only invasive species that may be niche competitors for benthic macroinvertebrates, but omits reference to the many invasive species that may limit macroinvertebrate abundance through predation, which would have been included had the EPA conducted a CADDIS assessment that included full stakeholder participation, as is described in the EPA CADDIS website.

8.5 – Toxicity Data (Page 8-39 to 8-40)

Comment (89): The EPA cites work by Brown and Bay (2005)[28] who determined toxicity in Malibu Creek was most likely due to sulfate and other dissolved salts. Given this finding, it seems unreasonable that the EPA concluded that it is "most likely that IBI scores are responding primarily to urbanization and only to a lesser degree, if at all, to conductivity itself." The only way EPA can make this argument is to ignore the LVMWD report (2011) which shows that sulfate is the ion contributing the most to high conductivity in Malibu Creek watershed and that those concentrations are highest in the Monterey Formation headwaters, including in undeveloped sites.

Comment (90): The EPA also reports that LACDPW attributes occasional toxicity to volatile chemicals, but the EPA does not say how infrequently the mass emissions site detects any volatile organic chemicals. The Malibu Creek mass emissions site has exceedingly low detection rates for volatile and semi-volatile organic compounds – and has found no exceedances to more than couple a year out of hundreds of tests.

8.6 – Physical Habitat Information (Pages 8-40 to 8-43)

Comment (91): The EPA concludes that "biota in the main stem do not appear to be strongly limited by physical habitat condition alone. The EPA cites Isham (2005) who says "there was virtually no relationship between macroinvertebrate community quality and physical habitat quality in the presence of urban runoff." We contend that groundwater flow from the Monterey / Modelo Formation presents a similar stress to macroinvertebrates that urban runoff may in other areas. In this watershed, base flow from the Monterey/Modelo Formation has much higher specific conductivity and concentrations of sulfate and metals than does local urban runoff (LVMWD 2011).

[28] Brown, J. S., Bay, S. M. 2005. Organophosphorus pesticides in the Malibu Creek watershed. *SCCWRP Annual Report*, 2003-04: 94-102.

Section 9 - Linkage Analysis (Pages 9-1 to 9-38)

Page 9-1

Comment (92): The EPA concludes that "benthic macroinvertebrate communities in Malibu Creek and Estuary have been adversely affected, as shown by low bioscores," but we find this conclusion is not based on sound science. As stated earlier, assessment methods are inappropriate, reference site selection was inadequate and two of the three primary test sites used do not have perennial flow.

9.2 List Candidate Causes (Page 9-3 to 9-6)

Comment (93): The EPA omitted many candidate stressors that local stakeholders would have known about if a full CADDIS process, which includes stakeholder participation, had been conducted. A short list of potential stressors we might have been able to contribute would have included the following: low flow, summer drying, summer pools, conductivity, concentrations of the major ions contributing to high conductivity (SO_4, Mg, Ca, K, etc.), predation by invasive species, use of vector control chemicals throughout the length of Malibu Creek, altered flow (higher storm peaks, perhaps changes in summer low flow), etc. A larger stakeholder group would likely be able to generate a much longer list.

Page 9-4

Comment (94): The EPA selects algae as a major stressor, saying "excess algal growth associated with nutrient enrichment has long been observed in Malibu Creek watershed," despite their own analysis finding no correlation between algal coverage and nutrient concentration, and despite the studies they cite that also found no correlation. Luce (2003) found no significant correlation in benthic macroinvertebrate metrics with microalgal cover for six metrics (taxa richness, percent dominant species, EPT richness, Sensitive EPT index, percent intolerant species, and percent shredders) and found positive but weak correlation with EPT index and percent filterers. Rather, "conductivity, embeddedness and canopy cover were the factors most commonly related to BMI metrics." Another study with this conclusion is the SCCWRP study of natural loadings in southern California reference streams (Stein and Yoon 2007), which found "Neither chlorophyll-a concentration nor algal percent cover was significantly correlated with any nutrient concentrations."

Comment (95): In the same paragraph on page 9-4, the EPA says "the proliferation of algae can result in loss of invertebrate taxa through habitat alteration." Yet the EPA provided no evidence that habitat alteration resulting from algal growth has resulted in loss of invertebrate taxa. In fact, the TMDL states in a number of locations that algal measures did not correlate with benthic macroinvertebrate measures. Nor does the TMDL anywhere consider the potential benefits of instream algal cover for benthic macroinvertebrates, or the thermal insulation provided by floating algal mats. This thermal benefit is important in the lower creek, where temperatures often approach the thermal maximums of endangered steelhead trout. The TMDL does not address this issue.

Page 9-5

Comment (96): Figure 9-1 should be revised to include arrows from Natural Geology to Organic Toxics, Elevated Nutrients, and to elevated TSS and Turbidity. Ionic Strength, Non-Perennial Flow and Pesticide Treatments should be added additional Proximate Stressors. Petroleum source rocks could be contributing natural petroleum compounds (R. Churchill, CA Geological Survey, personal communication). The Monterey Formation does contribute elevated concentrations of phosphorus, and experiments have shown that the rock can leach substantial concentrations of nitrogen compounds (LACSD 1996)[29]. Marine shales decompose to silts and landslides are common in steep Modelo Formation terrain in Malibu Creek's northern headwaters. The figure should be amended to include the entire list of potential stressors we recommended. For example Natural Geology (and precipitation) can result in a hydrologic pattern of seasonal drought, which can cause eutrophication in drying reaches and pools, resulting in algal growth, low dissolved oxygen, and concentration of ion toxicity through evaporative loss.

Page 9-6

Comment (97): A.3 Reduced DO from Excess Algal Growth of Oxygen-demanding Wastes: While the EPA states that "Algal mats may result in eutrophic conditions where dissolve oxygen concentration is low." The 2003 EPA TMDL concludes "There is no demonstration that algae in these reaches is affecting dissolved oxygen concentration." This TMDL concludes "The excess algal growth does not appear to affect DO concentrations in the creek." So while "algal mats may result in eutrophic conditions," the EPA concludes on page 9-15 that "impaired sites in Malibu Creek show average dissolved oxygen concentrations that are similar to reference sites." We remind the EPA that differences in canopy cover between reference and test sites will result in differences in DO, as will the loss of flow during summer months at two of the EPA's three test sites.

Comment (98): A.4 Toxicity from metals or Organic Toxics: Local data and studies suggest that if there is toxicity, the source is most likely natural. When EPA reports the results of Brown and Bay (2005) in this section, they should repeat the conclusion that the toxicity was probably caused by elevated ionic concentrations such as sulfate, which occurs naturally from geologic sources. The EPA states that "stormwater in Malibu Creek often has toxicity," yet later say "occasionally" (page 9-16). Those toxicity hits reported by the EPA in this TMDL were either from ionic concentrations or pesticides in the most densely developed northern tributary (Brown and Bay 2005) or at the mass emissions station testing due to undetermined causes. Toxicity very well may result from sulfate concentrations, which exceed Basin Plan standards in those parts of the watershed draining the Monterey/Modelo Formation, as shown in Figure 16, below (from LVMWD 2011).

Comment (99): In addition to an analysis of the potential for toxicity effects on macroinvertebrate communities, the TMDL would be greatly improved if the EPA would apply the Ionic Strength module from CADDIS to their analysis of potential stressors. (See comments for pages 9-8 to 9-9 and 9-16 to 9-18.)

[29] County Sanitation Districts of Los Angeles County (CSDLAC), 1996, *Mineral Leaching Study Calabasas Landfill*, Whittier, CA

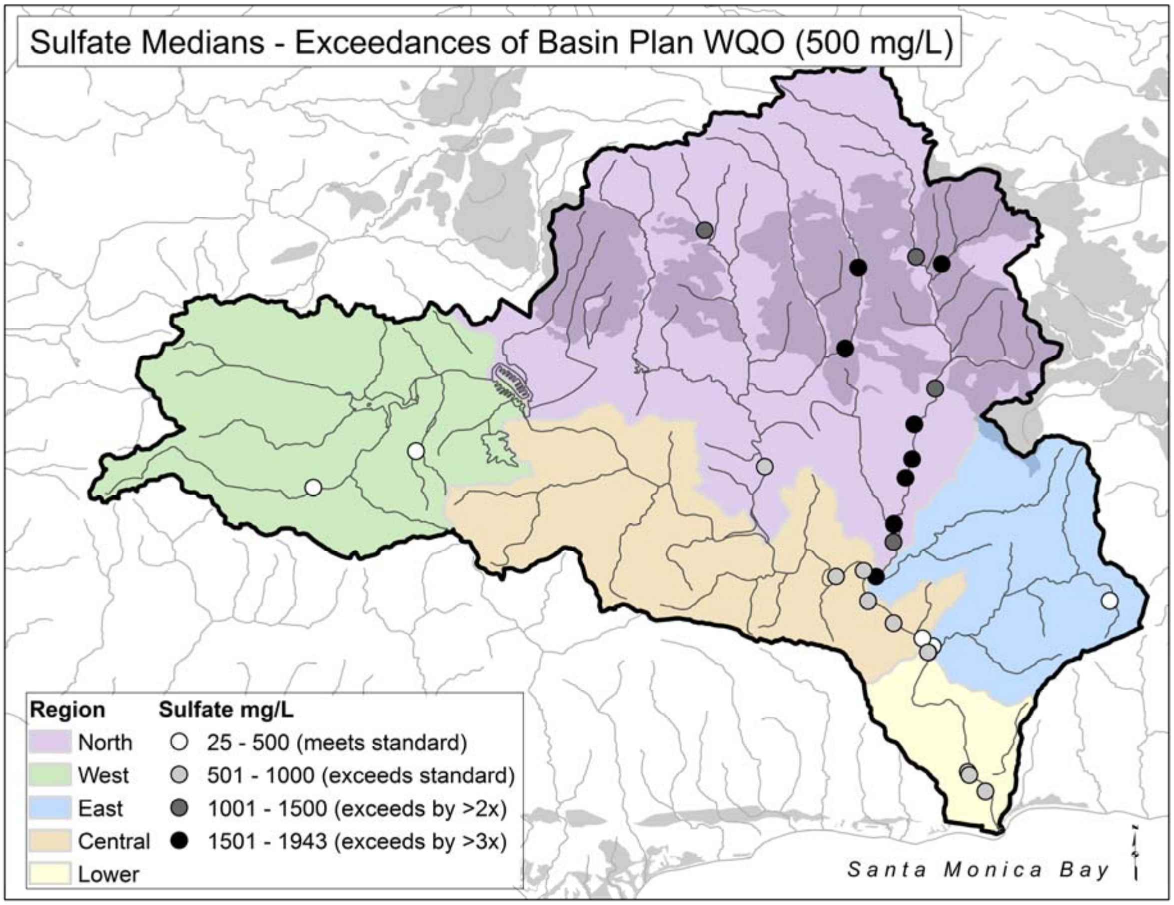

Figure 16. Median sulfate concentration by site. Note that the three sites farthest NE are in undeveloped headwaters.

9.2.2 Major Stressor Sources (Pages 9-6 to 9.8)

Pages 9-6 to 9-7

Comment (100): B1. Altered Hydrology - Please incorporate comments on flow given for Section 6.

Page 9-7

Comment (101): B2. Channel Alteration - The description given in this section misses the most substantial channel alteration in the Malibu Creek main stem – the 120-foot Rindge Dam. There is also a smaller dam within Malibu Creek State Park at Century Lake, which was built for recreational purposes early in the last century. A third dam is Malibou Lake Dam which marks the upstream end of Malibu Creek. These are significant alterations, but Rindge Dam is full, so does not trap sediment, while Malibou and Century Lake dams do continue to trap sediment. Heal the Bay Stream Walk data for Malibu Creek main stem indicate additional alteration is limited along Malibu Creek proper.

Page 9-7

Comment (102): B3. Fire Impacts - The EPA incorrectly states "Although fire is a natural phenomenon in chaparral landscapes, human intervention to suppress fire events and magnitudes can lead to less frequent, but more intense and damaging fires." This accurately describes western states fire management generally, but general fire management does not apply here. In the Santa Monica Mountains, the natural fire regime is patchy fires of low frequency. The Santa Monica Mountains National Recreation Area Fire Management Plan[30] states "Significantly, research indicates that in many areas, including the Santa Monica Mountains, fire return intervals have shortened in association with increasing settlement and human activity … Thus, management actions based on the assumption of the age-mosaic model that fire has been excluded from shrublands may be counter to the goal of maintaining long-term biodiversity in chaparral and coastal sage scrub ecosystems." It is incorrect to assume that fire has been excluded. What changed with increasing populations are accidental and intentional fires started by humans during Santa Ana wind conditions that cause catastrophic fires. The frequency of these fires has even decreased the population of plant species that require fire by re-burning areas before they have rooted deeply enough.

9.3 Analyze Evidence and Characterize Causes (Pages 9-8 to 9-30)

Pages 9-8 to 9-9

Comment (103): The EPA lists causal pathways for their selective set of potential stressors. The EPA should add the following to the following from their list of four causal pathways, and should add the fifth potential causal pathway:

a. Reduced habitat quality from excess algal growth can also occur by natural water quality derived from geologic sources, as was demonstrated by Stein and Yoon (2007).
b. Reduced dissolved oxygen can also result from low flow and no-flow conditions (stagnation) or from natural excesses in algal growth due to a combination of geologically enriched water quality and stages of stagnation and drying.
c. Toxicity can also derive directly from conductivity (affecting osmotic regulation) and more particularly from particular ions. Mount et al. (1997)[31] found the relative toxicity of natural ions to be K>HCO_3 ≈ Mg>Cl>SO_4. Each of these is elevated in Malibu Creek watershed to levels as high or higher than those found to be toxic to macroinvertebrates downstream of mountain top coal mining in West Virginia (Pond et al. 2008)[32].
d. "Some soil types and geologic formations are natural sources of salts, and certain anthropogenic activities may mobilize and transport those salts to freshwater streams and rivers. Natural geologic variability among neighboring watersheds may result in profound—yet natural—differences in ionic strength of associated streams, especially in arid regions, such as the southwestern U.S. Causal assessors should characterize soil type and geology if ionic strength is

[30] http://home.nps.gov/samo/parkmgmt/upload/Final_FMP_07update.pdf
[31] Mount, D. R., Gulley, D. D., Hockett, J. R., Garrison, T. D., Evans, J. M. 1997. Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia, Daphna magna, and Pimephales promelas* (fathead minnows), *Environmental Toxicology and Chemistry*, 16(10): 2009-2019.
[32] Pond, G. J., M. E. Passmore, F. A. Borsuk, L. Reynolds and C. J. Rose. 2008. Downstream effects of mountaintop coal mining: comparing biological conditions using family- and genus-level macroinvertebrate bioassessment tools. *Journal of the North American Benthological Society*, 27(3): 717-737.

> being considered as a stressor, particularly if dryland salinity, mining, oil drilling, or irrigation occur in the watershed."[33]

Pages 9-9 to 9-37

Comment (104): We question the EPA's decisions on temporality. Temporality is one of the tests for the strength of the evidence. It is tested by checking whether the purported cause preceded the effect (impairment). In general, throughout this section, temporality is considered validated based on assumptions that pre-development levels met regulatory limits, which may not have been the case. The EPA provides no data to support those assumptions, so EPA decisions on temporality are questionable. For example, the evidence for temporality of reduced DO in Malibu Creek is considered consistent "because of the area's history of urban growth" (pages 9-26 and 9-27). But "urban growth" is not evidence that the "cause preceded the effect." There is no evidence that the effect (low DO) had a temporal component, because dissolved oxygen values from the pre-development era are not provided. Given the fact that many sections of Malibu Creek are non-perennial now, and given that the EPA says summer flows are higher during the pre-development than post development era, and given the increased likelihood of low dissolved oxygen in drying streams, we believe it is likely that Malibu Creek experienced low DO in places even in the pre-development era. This argument applies not only to dissolved oxygen, but to the degree of pre-development sedimentation, and to all potential stressors considered in relation to the Modelo Formation. The EPA does not have sufficient pre-development data or any pre-Monterey/Modelo Formation data to support many of the temporality claims made.

Page 9-9 to 9-10: A1. Reduced Habitat Quality from Excess Sedimentation, Malibu Creek

Page 9-9

Comment (105): The EPA incorrectly uses the historic filling of the pool behind Rindge dam as evidence of "excess sedimentation." "Excess sedimentation also has been demonstrated by sedimentation in the Lagoon and the filling of the pool behind Rindge Dam such that it was 85 percent filled by 1949 (Ambrose and Orme, 2000)." Given that there was very little development in the watershed prior to the 1970s and 1980s, sedimentation rates between Rindge dam's construction in 1929 and filling by 1949 would not be attributable to development. The rate of sedimentation filling Rindge Dam may not have been in "excess" of that which is natural to the watershed. It may instead be indicative of the natural rate of sedimentation.

Comment (106): The EPA incorrectly uses Heal the Bay's Stream Walk data to justify a decision to support a sedimentation impairment in Malibu Creek. The EPA states "Furthermore, Heal the Bay's Stream Walk program reported that 21.29 miles of 68 surveyed stream miles were impaired by excess fine sediments." Heal the Bay's Stream Walk GIS data shows no fine sediment alteration in the entire length of the Malibu Creek main stem. They do show a large amount of "fill" in the upper tributaries. GIS data for Malibu Creek lists features with lengths that would constitute 16% of the length of the creek, but 12 of the 27 listed alterations are "loose boulder", 4 are "natural vegetation," 1 is "fencing," 6 are "concrete wall" or "concrete pier" (at bridges), one is a concrete boulder and one is asphalt. We do not see evidence in this data to support a designation as impaired for sedimentation.

[33] http://www.epa.gov/caddis/ssr_ion_wtl.html

Comment (107): The EPA cites only one bioassessment report (Aquatic Bioassay) for the sediment information included in the physical habitat assessment, while six years of LVMWD bioassessment reports (including physical habitat data in Excel format) and five years of Los Angeles County bioassessment reports were provided to the EPA for the development of this TMDL. The TMDL provides no justification for not including these data in its analysis.

Page 9-10

Comment (108): The EPA has provided insufficient local data to support the conclusion that "sedimentation co-occurs spatially with impairment." Heal the Bay Stream Walk data is inappropriate for the task. One of the nine goals for the program[34] was to "identify areas that are contributing to sediment loading in the watershed," but they were not assessing in-stream habitat. Other goals were to look for illicit discharges, barriers to fish passage and stream bank alteration. The Stream Walk data is inconclusive. The only other evidence that "sedimentation co-occurs spatially with impairment" provided by the EPA is an unfounded claim that it is a "well documented fact that sedimentation has long been present in the watershed, providing evidence for temporality." If it is well documented, then the studies and data should be cited, rather than relying solely Heal the Bay's Stream Walk data. Not only is there insufficient data to support the conclusion that there is a sediment impairment and that sedimentation is limiting bioassessment scores, but the EPA admits "the biological gradient evidence is weak, because the physical habitat scores are generally acceptable and do not appear to correlate with the SC-IBI scores."

Pages 9-11 to 9-14: A2. Reduced Habitat Quality from Excess Algal Growth

Page 9-11

Comment (109): The first paragraph in this section has PO4-P, which is incorrect. It should be PO4-HPO4, which is what Heal the Bay Stream Team measures. (See comments for pages 7-14 to 7-21.)

Comment (110): The EPA suggests that "available information on total N and total P concentrations suggest that the totals (which include organic forms) are much higher than the inorganic nutrient concentrations," but they provide no data to support this conclusion. We have compared TN and NO3-N concentrations from our data at site R-13 (HtB site 15) and found that NO3-N concentrations are, on average, 98% of TN concentrations. This result does not rule-out instream conversion of organic N to inorganic forms, but it does show that nitrate is the predominant form of nitrogen at this location. A comparison of phosphorus data shows that TP concentrations average about 18% higher than PO4-P. But phosphorus is abundant from geologic sources, both in soluble form and in native sediments derived from native, phosphatic parent rock, as demonstrated in our report (LVMWD, 2011, previously cited). The establishment of phosphorus targets in the draft TMDL seems arbitrary, both in the target level selected (which is based on general guidance as opposed to actual native background P levels, and also in light of the TMDL's conclusion that nitrogen is the limiting nutrient of algal growth in Malibu Creek.

Comment (111): The EPA states that "NOx-N concentrations are clearly elevated at the downstream station, MC-1, downstream of the Tapia WRF, while concentrations upstream of Tapia at MC-12 are not

[34] Malibu Creek Watershed Stream Team Pilot Project: Shattering the Myths of Volunteer Monitoring, undated, Heal the Bay.

much different from reference sites." First, the data should be presented seasonally because of Tapia WRF's seasonal discharge prohibition, but are not. Had that been done, the data would clearly show that nitrate levels below Tapia WRF in the summer are substantially less than in winter. Secondly, the TMDL fails to consider that these differences may be the result of different nutrient spiraling lengths, and thus the degree of nutrient retention at the two sites being compared. Recall that site MC-1 dries up most summers, so Heal the Bay data from that site will naturally have nutrient retention as the stranded pool stagnates. (See related comments for Page 7-2 through 7-7). While some of the bioassessment reach at MC-12 dries or becomes isolated pools each summer, water quality assessment site MC-12 tends to have year round flow.

Comment (112): In addition to our comment above, the biological gradient for NOx-N effects on algal growth is reverse of that which would be needed to support a decision that algae increases with increasing NOx-N. The EPA notes that "NOx-N concentrations are clearly elevated at the downstream station, MC-1, downstream of the Tapia WRF, while concentrations upstream of Tapia at MC-12 are not much different from reference sites." But the TMDL fails to disclose evidence contrary to its proposed nutrient-algae linkage from these two sites, specifically that the average monthly benthic algal percent cover exceeds the 60% standard ten months out of the year at station MC-12, but exceeds it only five months out of twelve at site MC-1 (Figure 17, below.) So while MC-1 may have higher nutrient concentrations than MC-12, it has lower percent cover for benthic algae. Nor does the TMDL disclose other evidence contrary to its findings on nutrient-algal linkages provided in Stein and Yoon (2007), who concluded that "neither chlorophyll-a concentration nor algal percent cover was significantly correlated with any nutrient concentrations." Beyond contradicting the TMDL's linkage conclusions, this study helps to explain the EPA's finding on page 9-12 "despite lower NOx-N concentrations upstream of Tapia, SC-IBI scores upstream of Tapia are not significantly different from scores downstream in three separate data collection efforts (Table 9-2). In fact, scores at the Heal the Bay downstream site MC-1 have been higher than those at the upstream MC- 12 site since 2005." In short, the weight of the evidence does not support at all the TMDL's assertion that "strong evidence" links excess nutrients, excess algal growth and reduced habitat quality for benthic macroinvertebrates in Malibu Creek, since algal growth does not correlate with nutrient concentration and SC-IBI scores do not decrease with increases in algal cover.

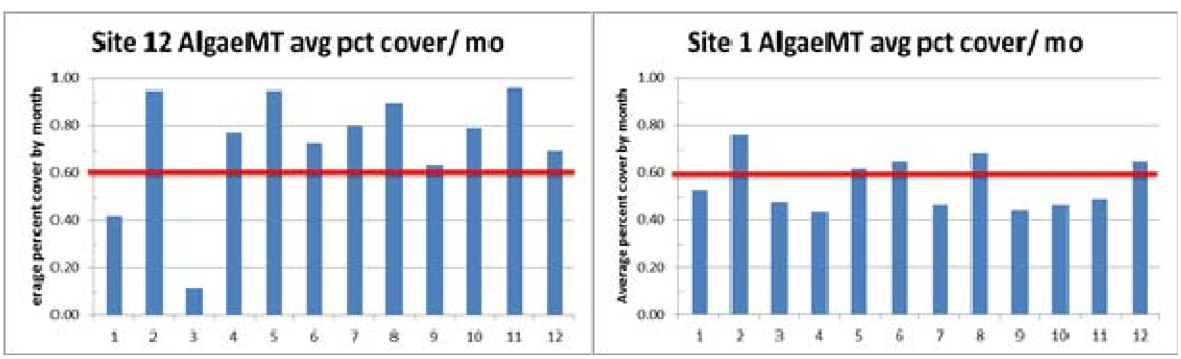

Figure 17. Average monthly percent benthic algal cover, sites MC-12 and MC-1, where MC-1 has higher nutrient concentrations.

Comment (113): The analysis of nutrient concentrations conducted by the EPA inappropriately applied annual mean concentrations, when seasonal means would have been more appropriate. Nutrient concentrations are elevated during the winter period when Tapia is discharging, but the TMDL fails to acknowledge that lower levels of insolation and higher flows reduce algal growth regardless of nutrient levels, and that most nutrients are swept to sea, with limited contact time in comparison with summertime conditions of low flow and lagoon closure. An analysis of nutrient levels limited to the discharge prohibition period (April 15 to November 15) would have given a clearer picture of the nutrient condition affecting algal growth. But the EPA did not include any seasonal analyses in the TMDL.

Page 9-12

Comment (114): The EPA erroneously states "Although the nutrient limits proposed in the TMDL appear to have been achieved the algal density targets have not." We assume the EPA means that Tapia WRF has been meeting TMDL nutrient limits, but it is not correct to say that the TMDL nutrient limits have been achieved in the watershed. LVMWD (2011) found 11 stations upstream of discharge with annual median NO3-N concentrations not meeting the limit. MS4 permittees have only just received a new permit that incorporates the 2003 Nutrient TMDL. (See also comments on pages 8-34 and 8-37 to 8-38.)

Comment (115): The EPA states that "sites exhibiting excess algal growth also exhibit SC-IBI scores lower than reference sites." We remind the EPA of its own caution, found in the draft TMDL, that spatial correlation does not demonstrate causation. This is why the JPA, in finding spatial correlations between the Monterey Formation and phosphorus and other water quality parameters, took the additional steps of directly testing both the rock itself from local exposures, and testing actual runoff from these exposures during and immediately following rain, and comparing these results with direct testing of urban runoff using data collected during the same rain event (LVMWD Report No. 2475.00). In this way we were able to show evidence directly linking these parameters in surface water quality to their geologic source. In contrast, the draft TMD's analysis purporting to link IBI scores to nutrient levels is based on correlative evidence alone, correlations that ignore the many differences between reference and test site locations: canopy cover, proximity to the more temperate coast, stream temperature, flow permanence, slope, upstream percentages of the Monterey Formation, etc.

Page 9-13

Comment (116): The EPA refutes the LVMWD (2011) claim that pH and DO generally fall within regulatory limits using weak arguments. The EPA claims that "high gas exchange rates are expected in shallow streams…" But Malibu Creek is not generally a shallow stream in summer, so high gas exchange rates would not be expected. It is more often a string of deep pools separated by dry reaches or very low flow, when present. Stagnant pools and puddles in dry stream beds will not have high gas exchange rates. And, the EPA admits on the next page that "excess algal growth in Malibu Creek does not appear to strongly affect DO concentrations in the creek." The low DO measurements at Start Pool are another matter, and an apparent exception among pools which deserves further investigation. Low DO measurements were not found in another pool of similar size found upstream of this site and monitored simultaneously as Start Pool, suggesting that some other, site-specific factor is responsible for either the low DO values in Start Pool or the higher DO values in the upstream pool.

Comment (117): The EPA argues that "median IBI scores greater than 30 only occur at sites with average nitrate-N concentrations less than 1 mg/L, suggesting that nutrient impacts may be depressing benthic biotic health in the watershed." They refer to their argument based on TMDL Figure 8-10, page 8-20, which we found confounded upstream urban development with upstream Monterey/Modelo

Formation. Nor does the TMDL's argument account for the fact that there are also sites with lower average nitrate concentrations that have median SC-IBI scores less than 30.

Comment (118): The TMDL provides no evidence that nitrate itself impairs macroinvertebrates at the levels found in Malibu Creek, nor are we aware of any evidence in the scientific literature of impacts at these levels. The literature does provide examples where nitrate can increase algal cover, but site-specific studies in Malibu Creek have found no correlation between nutrients and algal cover (Stein and Yoon 2007) in natural streams, let alone any non-correlative evidence of a direct linkage. The Malibu Creek main stem is primarily natural, despite 20% development and 6.95% impervious area in the upstream watershed. (See our comments to Page 8-20, Figure 8-10.)

Comment (119): The EPA states in an argument that there is a macroinvertebrate biological gradient related to nutrient concentrations, but that "the biological gradient with respect to the Tapia WRF discharge is less clear." LVMWD (2011) analyzed a long term data set of visual observations of percent algal cover at stations upstream and downstream of Tapia discharge and found no obvious increase in algal cover in the downstream direction. On the contrary, in later years, algal cover appeared to be slightly less in the downstream direction relative to the upstream direction. This is further evidence that algal cover does not correlate well with nutrients. The EPA makes a statement showing agreement with our findings, but suggests that the "long-term Tapia discharge since 1965 undoubtedly caused … nutrient increases in the system, which would directly impact the benthic community over time." It is unlikely nutrients would build up continuously over that time frame in a stream such as Malibu Creek, which transitions from summertime flows of less than 1 cfs to flows in excess of 100 cfs during rain events, every winter, every year, as shown by county streamgage records.

Comment (120): The EPA states "Although the biological gradient and the Tapia discharge is tenuous, this does not include the evaluation of the long term impact of Tapia WRF's discharge in the watershed. The long-term Tapia discharge since 1965 undoubtedly caused to [sic] nutrient increases in the system, which would directly impact the benthic community over time." The suggestion that Tapia WRF's discharge has caused long-term nutrient retention in the creek is unsubstantiated and unsupported by any evidence in the TMDL. The EPA's own time series evaluation (TMDL page 7-16, figure 7-11) showed no summer season increases over time, nor does LVMWD (2011).

Comment (121): We are at a loss to explain the TMDL's certainty that nutrient levels are linked to algal cover in Malibu Creek, when none of the studies it cites found any conclusive evidence for it. No significant correlation was found between nutrient concentrations and algal cover by Stein and Yoon (2007). No significant correlation has been found between macroalgal cover and macroinvertebrate metrics by Luce (2003). Thus, we should expect no significant correlation between nutrient concentrations and macroinvertebrate metrics. The suggestion nutrients are related to macroinvertebrate impairment based on a reading from Figure 8-11 (Page 8-21) that there are no passing scores when nitrate-N concentrations are greater than 1.0 is a tenuous argument because of the confounding factors not taken into account (see our earlier comments), and because many sites with less than 1.0 mg/L nitrate-N also had low IBI scores.

Pages 9-16 to 9-18

Comment (122): A4. Toxicity from Metals or Organic Toxics, should have been "Ionic Strength." This is a substantial oversight in light of the following.

a. EPA CADDIS contains modules on thirteen candidate causes of impairment, including one titled "Ionic Strength." We think the EPA pursued the Toxicity from Metals and Organic Toxics in order to address our alternative explanation – supported by substantial evidence LVMWD (2011) and this review - that naturally elevated high conductivity water and the high concentrations of ions in that water are the likely causes of benthic macroinvertebrate impairment in Malibu Creek watershed.
b. Toxicity was an inappropriate candidate stressor to consider in the evaluation of elevated ion concentrations and conductivity. We argue that ionic concentrations from the Monterey/Modelo Formation does cause lethal or reproductive toxicity in the sense of response to time-limited laboratory testing, but that over time, the high ionic concentrations draining the Monterey/Modelo Formation headwaters will extirpate species that have not adapted to these conditions.
c. Kefford et al. (2007)[35] investigated the salinity tolerances of early life stages of native South African macroinvertebrates, and found that eggs and hatchlings had salinity tolerances ranging from 4% to 88% of their older life stages.
d. Hassell et al (2006)[36] investigated sublethal effects of increased electrical conductivity on two *Ephemeroptera* and one *Diptera* species, and found that growth rates were reduced and time to emergence was delayed by 15 to 88% with increased salinity, and that these delays could influence those populations.
e. In a study of macroinvertebrates along a salinity gradient in canal habitat in the Netherlands, Peeters et al. (2009)[37] found that sub-toxic trace metals concentrations explained 8.6% of the variation in macroinvertebrate community structure.
f. Acute and chronic thresholds have been developed for some ions for test organisms, such as Ceriodaphnia, but we found no studies of toxicity or sub-toxic effects on macroinvertebrates native to southern California. Studies of macroinvertebrate communities from Kentucky, Virginia, West Virginia, and Pennsylvania have shown that conductivity explains the most variance in commonly used benthic assessment metrics (Pond et al. 2006). Anticipating the counterargument that macroinvertebrates in the Appalachian region have evolved and are adapted to very low conductivity streams, the same can be said of macroinvertebrate communities adapted to the lower conductivity streams in the So Cal IBI reference streams. There is no reason to expect that these species would fare as well in the very brackish waters of Malibu Creek, and there remains a strong correlation between ionic strength and IBI scores in

[35] Ben J. Kefford, Dayanthi Nugegoda, Liliana Zalizniak, Elizabeth J. Fields and Kathryn L. Hassell. 2007. The salinity tolerance of freshwater macroinvertebrate eggs and hatchlings in comparison to their older life-stages: a diversity of responses, *Aquatic Ecology,* 41(2): 335-348.
[36] Hassell, K. L., Kefford, B. J., Nugegoda, D. 2009. Sub-lethal and chronic salinity tolerances of three freshwater insects: *Cloeon* sp. and *Centroptilum* sp. (Ephemeroptera: Baetidae) and *Chironomus* sp. (Diptera: Chironomidae), *the Journal of Experimental Biology*, 209: 4024-4032.
[37] Peeters, E.T.H.M., Gardeniers, JJP, Koelmans, AA. 2000. Contribution of trace metals in structuring in situ macroinvertebrate community composition along a salinity gradient, *Toxicology and Chemistry,* 19(4): 1002-1010.

the watershed even with anomalous sites included that the TMDL focuses on to argue against this linkage with ionic strength.

Comment (123): The EPA's own CADDIS guidance for the Ionic Strength module acknowledges that increased ionic concentrations will often result in "shifts in community composition, rather than mortality" as the following passage from the CADDIS website indicates: "There is debate among scientists as to the exact mechanisms responsible for toxicity associated with ionic strength. Toxicity due to ionic strength could result from disruption of organisms' osmotic regulation processes, decreases in bioavailability of essential elements, increases in availability of heavy metal ions, increases in particularly harmful ions, changes in ionic composition, absence of chemical constituents that offset impacts of harmful ions, a combination of the above, or other as yet unknown mechanisms. In some instances (perhaps the majority), increased ionic strength causes shifts in community composition rather than mortality; thus, specific conductivity, salinity, and TDS levels may be associated with biological impairment and yet be below mortality thresholds."[38] In short, the draft TMDL author's reliance on toxicity test results in discounting impacts from high ionic strength ignores strong counterarguments found in EPA's own guidance documents.

Page 9-17

Comment (124): The EPA acknowledges that "conductivity measurements appear higher in impaired sites than in reference sites," and then cites Luce's (2003) hypothesis that high conductivity may be related to elevated phosphate. It may be related, but it is a minor contributor of ionic strength in Malibu Creek and it is not the reason for Malibu Creek's high conductivity. Specifically, LVMWD (2011) analyzed major ions draining the Monterey/Modelo Formation and found that the major anions were sulfate, bicarbonate and chloride and the major cations were calcium and magnesium. We are unaware of any study or evidence that urban runoff can account for sulfate levels in excess of 500 mg/L in Malibu Creek's main stem, let alone levels of 1,500 mg/L in its northern headwaters. There is no plausible mechanism or evidence of an urban source of sulfate at these concentrations nor of any of Malibu Creek's major ion levels.

Comment (125): As mentioned in the general comments for TMDL Section 8, Mount et al. (1997) gave the relative toxicity of major ions as $K > HCO_3 \approx Mg > Cl > SO_4$. While the Basin Plan has no water quality objectives for potassium, bicarbonate or magnesium, the Basin Plan does have aquatic life standard for chloride (230 mg/L four day average continuous) and a standard for sulfate (500 mg/L), both of which are exceeded in Malibu Creek watershed. Of the five major ions studied in Mount et al. (1997) that can impact benthic macroinvertebrates, four of them are found at elevated concentrations in Malibu Creek.

Comment (126): In basing its finding of benthic macroinvertebrate community impairment on comparisons of IBI scores in Malibu Creek with those found in waters of lower ionic strength, the TMDL should acknowledge that the state has not yet been able to find reference sites with high enough conductivity to model expectation for or adequately define impairment threshold in streams with conductivity as high as are found in Malibu Creek. This is a significant oversight in the draft TMDL, affecting virtually all of its findings on both the evidence for impairment and its conclusions on probable major stressors. To demonstrate this, the box plot below is from the October 17, 2012, presentation by

[38] http://www.epa.gov/caddis/ssr_ion_wtl.html

the Biological Objectives Technical Team to their Scientific Advisory Group, shows the range of conductivity from sites in the reference pool as box and whiskers, as well as conductivity from a site on the Santa Clara River.[39] The slide on page 29 of the PDF PowerPoint (Figure 18) shows that the set of reference sites for this region includes conductivity values only as high as about 1,300 µS/cm (box, whiskers and white box for outlier), while the conductivity for the test site on the Santa Clara River is about 2,300 µS/cm (the red dot). According to the CADDIS method, the test site is scored with a + to indicate that it is a plausible candidate cause since its conductivity is above the 95th percentile of conductivity at reference sites. The same CADDIS test applied in Malibu Creek would also show that conductivity is a potential stressor no less plausible (and in our view likely) candidate cause than nutrients or algal growth.

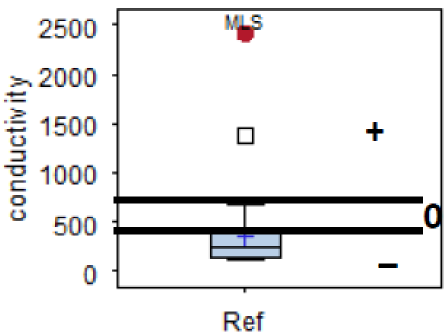

Figure 18. Conductivity at Santa Clara River test site (red dot) relative to reference site conductivity, showing 75th and 95th percentile lines and CADDIS scoring values for intervals relative to those lines. The plus sign (+) indicates that conductivity is a plausible stressor.

Comment (127): The EPA cites an exception to the general trend of lower SC-IBI scores with increasing conductivity with the single site, Ch-6, in the Monterey/Modelo Formation headwaters. We have several arguments against this. First, Ch-6 has advantages that other sites do not, such as riparian cover, slope>1%, and possibly year-round flow. Secondly, LVMWD (2011) found that while Monterey/Modelo Formation tributary streams had generally similar specific conductivity, ion concentrations varied by stream. We found, for example, that chloride concentrations increased in streams to the west. Phosphate ion concentration increases in streams to the east, and selenium concentrations may do the same. It is unknown why the Ch-6 median SC-IBI score is passing (>40), but the scores are significantly lower than at other reference sites and do sometimes fail. LV-9 fails about half the time, has high conductivity, but lower slope and less canopy cover, yet it is also a reference site in the Monterey/Modelo Formation. This site should be included as reference indicative of what scores Malibu Creek might attain.

Page 9-18

Comment (128): A5. Invasive Species - We concur with the EPA in their evaluation of the limitations of the SC-IBI. Specifically, EPA notes that essentially the same score was attained by a site when the New Zealand mudsnail constituted 3% of the sample as at another time when the invasive snail constituted 81% of the sample. We suggest that it is very likely that the SC-IBI is also limited in its ability to assess

39 http://www.waterboards.ca.gov/plans_policies/docs/biological_objective/101712_meeting/seven_caddis_san_diego.pdf

benthic macroinvertebrate composition in Malibu Creek, which is at an extreme end of the natural conductivity gradient.

Pages 9-19 to 9-20: B1. Altered Hydrology

Page 9-19

Comment (129): The EPA claims that irrigation with imported water is the reason tributary streams that were once non-perennial are now perennial. Please see our comments in Section 6 in addition to those below.

Comment (130): The EPA claims that "all the main reaches from Malibou Lake to Malibu Lagoon generally have flows all year long." This is false. In the summer, the stretch from Malibu Lake to the upper end of Century Lake becomes dry for long stretches with small isolated pools becoming larger and more frequent until Century Lake. The segment between Century Lake Dam and Rock Pool (MC-12), is inaccessible because of steep rock walls. Most of the stream from Rock Pool to Mott Road Pool is dry in summer. From Mott Road Pool, past the Salvation Army Camp, past Tapia and past the Los Angeles County gage to Tunnel Pool there is surface flow in most places. The stretch between Tunnel Pool and Rindge dam is not easily accessed and is not sampled. Below Rindge Dam to MC-1 there are stretches that dry entirely, isolated pools, and pools connected by shallow surface flow.

Comment (131): Regarding Heal the Bay Stream Walk data, please see our comments for TMDL page 9-9.

Comment (132): EPA states that "reference sites are likely not impacted by the sedimentation," but the northern headwaters are primarily shale, which erodes primarily to silts. Since we have not been able to obtain Heal the Bay physical habitat data we are unable to respond specifically, but we suggest that percent fines may be elevated within and downstream of the Monterey / Modelo Formation. Large fractions of this rock consist of silt- and mudstone, and it is both friable and highly fractured in the watershed due to tectonic folding and attendant seismicity.

Pages 9-20 to 9-22: B2. Channel Alteration

Comment (133): EPA states that "the evidence from the case clearly supports spatial co-occurrence of channel alteration and increased sedimentation in Malibu Creek." We are at a disadvantage in that EPA has received the Heal the Bay report (Sikich 2012) with this data and information, but we cannot obtain a copy of the report until after it is published later this year in 2013, 2012 not then being the year of publication, but the year that EPA obtained an advance copy. In any case, we were able to obtain the Stream Walk data some years ago, and see nothing in that data set to show that sedimentation was observed in Malibu Creek itself, and that there was very little channel alteration mapped, either. The EPA has not shown that "the case clearly supports" anything, because the EPA has only quoted unpublished work and shown no data. It is only because we have the GIS data that we know most of the alterations are in the northern tributaries.

Pages 9-23 to 9-24: B4. Point Source Discharges

Page 9-23

Comment (134): The EPA misstates conclusions from LVMWD (2011) by saying "LVMWD (2011) suggest that nitrate concentrations in the watershed are naturally elevated due to the Modelo formation." A thorough review of the report will not reveal such a statement. Surface water monitoring does not indicate elevated nutrients in streams draining the Monterey/Modelo Formation. What the report does include are observations that the Monterey/Modelo Formation is capable of yielding elevated concentrations of nitrogen compounds. In the text on page 78 we report the high nitrate concentrations found in a benchtop reactor test of crushed rock from Malibu Creek's Modelo Formation headwaters in deionized water (CSDLAC 1996)[40], showing that the rock is capable of contributing the nutrients and metals detected to surface waters. Academic literature on the Monterey Formation strongly supports the CSDLAC finding (Piper and Isaacs 2001)[41]. The CSDLAC (1996) report found very high nitrogen concentrations in some of its benchtop reactor tests, consistent with elevated nitrate concentrations at National Park Service headwaters sites (Table 8, this letter).

Page 9-24

Comment (135): The EPA says that PO4-P is "significantly higher [in Malibu Creek] than concentrations at reference sites," and acknowledges that "the Modelo formation [sic] does appear to lead to elevated background concentrations of phosphorus." We have tested the significance of reference sites 14 and 18 against Malibu Creek test sites 1, 15 and 12, and find that there is a significant difference, both when tested by season and annually. However, we find no significant difference in PO4-P concentration ($p<0.05$) when Malibu Creek sites 1, 12 and 15 are compared with Heal the Bay and National Park Service reference sites in the northern Monterey/Modelo Formation headwaters.

Page 9-25

Comment (136): The EPA seems to rebut the claim in the LVMWD (2011) report that PO4-P is elevated in the Monterey/Modelo Formation headwaters by noting that Ch-6 has "lower inorganic phosphorus than any other sites in the Modelo Formation." There is indeed variation in water quality parameters shown to be impacted by the Monterey/Modelo Formation across sites, as would be expected for any geologic source. The TMDL fails to acknowledge that this variation (in PO4-P or other water quality parameters may explain why site Ch-6 has higher SC-IBI scores than other sites in the Monterey/Modelo Formation headwaters and in drainages downstream of it. As mentioned in comments for TMDL pages 9-16 to 9-18, we see differences in ion concentrations by tributary streams draining the Monterey/Modelo Formation.

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[40] County Sanitation Districts of Los Angeles County (CSDLAC), 1996, *Mineral Leaching Study Calabasas Landfill*, Whittier, CA

[41] Piper, D. Z. and C. M. Isaacs. 2001. The Monterey Formation: Bottom-water redox conditions and photic-zone primary productivity. In *The Monterey Formation: From Rocks to Molecules*. C. M. Isaacs and J. Rullkötter, (eds.), Columbia University Press, New York. 2001.

Pages 9-29 – 9-30: B7. Natural Geology

Comment (137): The primary problem with this section is that natural geologic impacts are only assessed relative to their ability to produce toxicity and sediments. It is not assessed relative to its ability to produce water of high ionic strength. This is a significant oversight given the weight of the evidence provided throughout our comments that high concentrations of ions is one of the primary reasons, along with non-perennial flow, that benthic macroinvertebrate communities are depauperate relative to California reference locations. Natural geology was assessed relative to toxicity, when toxicity is not the relevant issue, as described previously.

Page 9-32, Table 9-3: Strength of Evidence Analysis, section A2. Reduced Habitat from Excess Algal Growth

Comment (138): We have evaluated scoring for Malibu Creek in this section and disagree with several scores.

a. The EPA scores temporality as weakly supportive (+), and justifies the score with the statement "elevated nutrients appear associated with development, beginning in the 1960s." Yet the EPA says on page 8-26 "An examination of all the Heal the Bay mat algae coverage data shows that there is almost no correlation between algae coverage and either inorganic N or inorganic P concentrations (Figure 8-21). Notably, 100 percent cover can occur at the lowest inorganic nutrient concentrations, while low cover is often found at high inorganic nutrient concentrations. We have also argued that the EPA does not have pre-development algae data or data on macroinvertebrate habitat availability, so the EPA must score this with a "0" – "it is uncertain whether the purported cause preceded the effect (impairment)." It is uncertain what degree of algae growth or habitat availability there was in the pre-development era.
b. The EPA scores Biological Gradient with reduced habitat from excess algae growth as "strongly supportive" of the candidate cause. The explanation given is that algae growth is higher at the 3 test sites on Malibu Creek than at the two reference sites used for comparison. We have previously noted that both the test sites and the reference sites are inappropriate. Reference sites are small coastal streams with a high degree of canopy cover and no upstream Monterey/Modelo Formation. Two test sites are non-perennial. Furthermore, Luce (2003) found that "canopy cover was significantly related to all BMI metrics except percent filterers," and her findings on microalgal cover was "positively but not strongly related to EPT index, percent intolerant species, and percent filterers at some sites." This evidence is not "strongly supportive" of the candidate cause.
c. The EPA scores complete exposure pathway as moderately supportive of algal growth limiting habitat, despite no evidence showing that algal cover or biomass has any correlation with macroinvertebrate measures.
d. The EPA scores consistency of the lines of evidence as "strongly supportive" of algal growth reducing habitat and impairing macroinvertebrate communities. The logical thread the EPA provides is that IBI scores at three selected reference sites (omitting those from LV-9, which fails half the time) are higher than at sites on Malibu Creek (Figure 8-3). They then show correlations between median IBI scores and average nitrate, despite findings by Luce hat they selected are higher than at the One line of evidence is that lower scores are found where there are higher nutrient concentrations. This was shown with Figures 8-11 and 8-13. Then it was shown on Figure 8-20 that the reference sites had higher mat algal cover percentages than at the test

sites. But on page 8-36 the EPA reports no correlation between inorganic nutrient concentration and benthic algal cover. The EPA ignores their own finding and that of EPA funded research (Stein and Yoon 2007) which found average, dry season chlorophyll a concentration in southern California reference streams as 439.2 mg/m2 for benthic algae – much higher than the 150 mg/m2 limit. Then nowhere does the EPA make the connection between algal cover and benthic macroinvertebrate impairment, other than by citing literature.

Section 10 – TMDLs and Allocations (Pages 10-1 to 10-14)

Page 10-1

Comment (139): A sentence in the second to the last paragraph reads "Excess nutrient loading causes overgrowth of algae including the development of macroalgal mats, which also directly impair the habitat available for benthic macroinvertebrates, while indirectly contribute to exceedances of DO and pH criteria." We suspect the EPA meant "microalgal" rather than "macroalgal" mats. Heal the Bay's data show more frequent exceedance of the 60% benthic algal target (combined filamentous and diatom data) than the 30% macroalgal target (their floating algal data).

Page 10-2: 10.1 Biological Response Targets for the Watershed

Page 10-2

Comment (140): The EPA proposes several biological response targets all of which are, or will soon be, out-dated due to California state policy development. Accordingly we ask that the final TMDL recommend that, if implemented, these outdated or soon to be outdated biological response targets should be adopted only on an interim basis until the state of California adopts newer and more robust metrics and thresholds which can be used in their place.

Comment (141), The SC-IBI has already been rejected for use by the state of California, which is expected to have Biological Objectives Policy in place by April 2014. Rather than setting the TMDL biological response target solely to this outdated metric, the EPA should recommend application of newer metrics and thresholds being developed by the state, once the state has approved them. The metric most likely to be approved at the time of this response will be a single composite score derived from a predictive multimetric index and an O/E (not the O/E referenced in the TMDL).

Comment (142): As for Comment 140, the SC-O/E, as defined and applied in this TMDL, should be considered interim until the State Biological objectives policy has been adopted. The state will be developing and applying a combination metric that includes a multimetric index (like the IBI, but with a predictive component) and an O/E. We ask that the EPA recommend that its O/E results, if implemented as biological objectives, be adopted as interim targets pending completion of the state policy and methods development

Comment (143): Likewise, the TMDL should also recommend that Benthic Algal Coverage targets should also be set as interim targets if implemented until the algal index of biotic integrity (IBI) is developed and ready for use by the state of California. This TMDL applies algal cover percent targets based on Biggs (2000), which were developed for New Zealand streams. California's algal IBI will be based on surveys throughout the state of California. As such, we expect they will find, similarly to Biggs, and account for algal proliferations in catchments with even modest amounts of Tertiary marine sediments. The state methods may include different algal cover percentages and measures of biomass.

Pages 10-8 to 10-13: 10.3 Nutrient Endpoints

Page 10-8

Comment (144): The TMDL states that "this TMDL, applying the same reference approach, considered nine reference sites…" This does not appear to be accurate. Analyses presented in Section 8 – Biological Habitat and Data Analysis – used mostly only sites SC-14 and LC-18 as reference sites.

Comment (145): In response to the sentence, "The nutrient TMDL was based on achieving a threshold of 30 percent cover for filamentous (floating) algae greater than 2 cm in length and bottom algae greater than 0.3 cm thick." We refer the EPA to our comments for page 3-2 (with Biggs (2000) warnings about proliferations in catchments with Tertiary marine sediments).

Page 10-10

Comment (146): The EPA states that "The information on natural background concentrations suggests that attaining the NNE target of 150 mg/m^2 chlorophyll a is likely not feasible in this watershed." If 150 m/m^2 is unfeasible, then a feasible biological response target should be established.

Page 10-11

Comment (147): The EPA retains the 2003 TMDL summertime phosphorus limit "because the observed data still consistently show that the 2003 numeric target is not met." Although LVMWD (2011) shows that seasonal medians meet the numeric targets, it also shows that the 75th percentile of NO3-N concentrations at sites RSW-MC001U (R-1), RSW-MC-MC002D (R-2) and RSW-MS-013D all exceed the summer target during the non-discharge period. Because these exceedances occur both upstream and downstream of Tapia WRF when Tapia is not discharging, they may be due to upstream sources of nutrients. 2003 TMDL nutrient limits have been applied to the 2012 MS4 permit. 2003 nitrogen limits should be retained for the same reason as phosphorus limits, "because the observed data still consistently show that the 2003 numeric target is not met."

Pages 10-11 to 10-12

Comment (148): Invitation to Comment on Alternative Option. We approve of the development of a phosphorus limit that reflects natural background concentrations from geologic sources. Dry season median PO4-P concentrations for reference sites in the Monterey / Modelo Formation range from 0.01 mg/L at Heal the Bay site 8 on Palo Comado to 1.24 mg/L at J_EFLASVIR. We expect downstream dilution. However, we also expect that Las Virgenes Creek may naturally exceed the proposed 0.4 mg/L maximum depending on flow contributions from the high concentration East Fork (dry season median 1.24 mg/L) and the lower concentrations from the undeveloped main stem (reference site dry season medians 0.06-0.19 mg/L). Although we approve of phosphorus limit development based on geologic sources in the watershed, we wonder how limits can be developed and still attain the required algal response targets, especially when the EPA has concluded that "attaining the NNE target of 150 mg/m^2 chlorophyll a is likely not feasible in this watershed." (Page 10-10)

Comment (149): Unfortunately, we do not have the resources or time to provide the data and information the EPA is requesting by the March 25, 2013 submission deadline, so recommend that the Alternative Option be added to the Recommendations section. We are submitting the National Park Service water quality data we have, but recommend that the EPA also contact the NPS Santa Monica Mountains National Recreation Area directly to obtain more recent data that we do not have. This can be used for this option, but can also be used to more accurately assess natural source contributions of nutrients and other parameters. We do not have time to generate data or information "to illustrate that TP concentrations at or below 0.4 mg/L are also correlated to limited algal coverage data," nor "delineation of and verification that sub areas in the Watershed can be appropriately distinguished between those areas draining the Modelo Formation and those sub areas draining from Non-Modelo Formation."

Page 10-12

Comment (150): Table 10-5: Wasteload allocations for Tapia WWTP are given as in-stream limits. The 2003 TMDL in-stream limits were applied directly to Tapia's permit as discharge limits. These 2013 TMDL limits, if applied as end of pipe limits would be an extreme financial burden to ratepayers. We recommend that the EPA clarify that this is not an end-of-pipe requirement.

Section 11 – Recommendations (Pages 11-1 to 11-2)

Comment (151): Add a recommendation for the alternative option described on pages 10-11 and 10-12.

Comment (152): Add a recommendation that the TMDL be reopened once the state has adopted Biological Objectives polices and assessment methods and thresholds, and results from those methods, including a full, stakeholder-inclusive CADDIS assessment, for Malibu Creek watershed become available.

Comment (153): Add a recommendation that the TMDL be reopened again once the state has adopted algal bioassessment policy with methods and thresholds, and results from those methods for Malibu Creek watershed become available.

Comment (154): Add a recommendation that data used to ascertain compliance be conducted in accordance with bioassessment methods currently under development. Visual estimates of percent algal cover are not sufficient.

Comment (155): Appendix D – O/E Models - See also our comments to page 3-2. The physical predictor variable for geologic influence is inadequate. The EPA selected mean annual precipitation, percent sedimentary geology and longitude as predictor variables. (Page D-3) The EPA's O/E includes percent sedimentary geology, while the State has rejected this criterion and developed more precise predictors of geologic influence. A year ago the state considered a "predicted conductivity" measure, which was composed of 22 geologic and meteorological parameters. More recently they have replaced this with six geologic element measures including those for magnesium oxide, calcium oxide, sulfur, two phosphorus metrics, and mean nitrogen. But not all sedimentary geologic formations contribute similar concentrations in base flow. Base flow from the Monterey Formation headwaters of Malibu Creek watershed is exceptionally brackish with median annual specific conductivity of 3,060 µS/cm. In contrast, the only other site with a different dominant marine sedimentary formation, Stokes Creek, which is dominated by the Calabasas Formation, has a mean annual conductivity of 1,607 µS/cm. And, we have found that ion dominance and concentrations vary by tributary. This results in high conductivity in Malibu Creek (avg = 2,015 µS/cm, median=1915, N=526) where the major ion is sulfate (avg = 666 mg/L, N=225, median=596).