Appendix D

Responses to Comments
(Showing Changes to Supporting Staff
Report Since February 2008)

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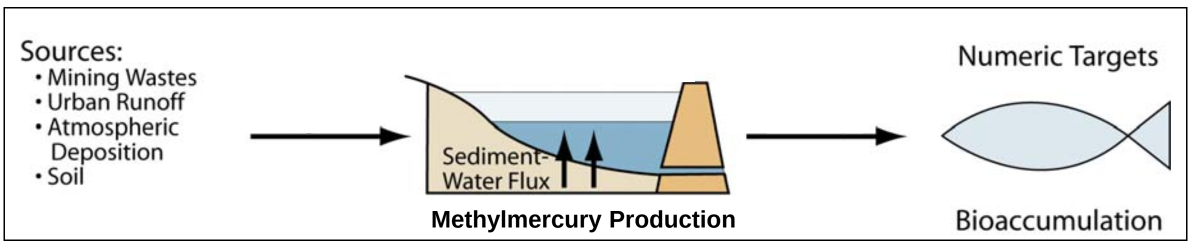
Guadalupe River Watershed

Mercury

Total Maximum Daily Loads (TMDLs) Project

Staff Responses to Comments



California Regional Water Quality Control Board
San Francisco Bay Region

September 2008

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Introduction

This document provides Water Board staff's responses to oral and written comments on a proposed Basin Plan amendment and supporting Staff Report for a Total Maximum Daily Load (TMDL) and Implementation Plan for mercury in the Guadalupe River watershed.

We include responses to comments made during the May 14, 2008 Board hearing (Part 1) and written comments on the February 2008 version of the proposed Basin Plan amendment and supporting Staff Report (Part 2). Additionally, we include responses to Peer Review comments on the August 2007 version of the proposed Basin Plan amendment and supporting Staff Report (Part 3). Staff-initiated changes since February 2008 are described in Part 4.

We received fifteen comment letters on the February 2008 version of the proposed Basin Plan amendment and supporting Staff Report. We responded to these comments in several ways. Some comments prompted us to reevaluate our presentation of elements of the TMDL, and led us to clarify parts of the Basin Plan amendment or Staff Report. In some cases, we made more substantive revisions to the documents. We disagreed with some comments, and for those comments we provided detailed rationale in our responses. Importantly, none of these comments resulted in substantial changes to the implementation actions.

The key changes to the proposed Basin Plan amendment are as follows:

- **Allocations to Mercury Mining Waste**
- **Impaired Waters and TMDLs**
- **Clarified Strategy for Alamitos Creek**

A number of important issues were raised in the comment letters, some of them by multiple stakeholders. We review these major overarching issues in this overview. The issues are as follows:

- **What is expected of creekside property owners downstream of mines?**
- **Daily means daily**
- **The allocations to mercury mining waste do not account for dilution by cleaner sediments nor reflect mineralized areas**
- **Lexington Reservoir is not an appropriate reference site because it is not located in mineralized geology**
- **The October 15, 2008 date for submission of a coordinated watershed monitoring plan is impracticable.**

Allocations to Mercury Mining Waste

In the February 2008 version we proposed two allocations to mercury mining waste of 0.1 and 0.2 mg mercury per kg erodible soil fines (dry wt., median). We received comments on the meaning of "erodible soil fines" and the derivation of these allocations. We eliminated the 0.1 mg/kg allocations, assigned the allocation more clearly to mercury mining waste (rather than soil), and defined erodible (see Table RTC-1).

TABLE RTC-1: CHANGES IN NUMERIC Load and Wasteload Allocations

Source	February 2008 Load Allocation	September 2008 Load Allocation
Total Mercury Sources:		
Mercury mining waste discharged…	0.1 & 0.2 mg mercury per kg erodable soil fines (dry wt., median)[a]	0.2 mg mercury per kg mercury mining waste (dry wt., median)[a, b, c]
Mercury-laden sediment discharged from depositional areas …	0.1 & 0.2 mg mercury per kg erodable soil fines (dry wt., median)[a]	0.2 mg mercury per kg erodible sediment (dry wt., median)[a, b]

February 2008 footnote:

a Soil fines (i.e., particulates, suspended sediment) are less than 63 microns in diameter. Erodable soil is the portion of bulk material that is potentially available for transport by storm runoff or already deposited in the stream. The erodable soil fines allocations are equal to the mercury suspended sediment TMDLs in Table 7-A.

September 2008 footnotes:

a Allocations to mercury mining waste and mercury-laden sediment are not cleanup standards. These allocations are equal to the mercury suspended sediment TMDLs in Table 7-A.

b "Erodible" means material readily available for transport by stormwater runoff to surface waters.

c The mercury mining waste allocation shall be measured in fines less than 63 microns in diameter.

We eliminated the 0.1 mg/kg allocation to mercury mining waste and mercury-laden sediment discharged from depositional areas downstream of mercury mines. We now propose a single allocation to mercury mining waste of 0.2 mg mercury per kg mercury mining waste (dry wt., median); and a single allocation to mercury-laden sediment of 0.2 mg mercury per kg erodible sediment (dry wt., median). Erodible means material readily available for transport by stormwater runoff to surface waters. This allocation applies to industrial process waste; it does not apply to soils that are not mercury mining waste.

We clarified that we are not establishing mercury cleanup standards for mine sites or depositional areas. Instead of establishing numeric goals, we propose to rely upon "best management practices" for erosion control, and rely primarily upon visual assessment of the effectiveness of these measures. The 0.2 mg/kg allocation is based on the sediment target in the San Francisco Bay mercury TMDL. The allocation of 0.1 mg/kg is based on the reference reservoir for this TMDL project, and now only applies to nonurban stormwater discharges (i.e., non-mineralized, background areas), not to mercury mining wastes.

Impaired Waters and TMDLs

In the February 2008 version we proposed three TMDLs (0.1 mg/kg, 0.2 mg/kg, and 1.5 ng/l) to address waters of the Guadalupe River watershed except Los Gatos Creek and its tributaries upstream of Vasona Dam. U.S. EPA requested clarification of which waters are impaired. In response, we clarified that these TMDLs address seven impaired waters, and we eliminated the 0.1 mg/kg TMDL. These changes are shown in Table RTC-2. In contrast to the two TMDLs that address seven specific waters, the six allocations address source of mercury discharged to all waters of the Guadalupe River watershed.

Table RTC-2 appears on the next page.

Clarified Strategy for Alamitos Creek, as follows:

The Water Board's strategy for Alamitos Creek, which is highly polluted with mercury mining waste, is to encourage a cooperative effort among the District, local agencies, and creekside property owners to undertake a comprehensive creek bank stability and habitat restoration project. The Water Board encourages the District to be the technical lead for this project, and to seek funding for it. The Water Board will identify mercury cleanup as a grant funding priority for the San Francisco Bay region. Where necessary, the Water Board will invoke its cleanup authority to compel upstream dischargers who initially discharged mercury mining waste into depositional areas, to cleanup and abate mercury mining waste. Creekside property owners are responsible to provide reasonable access to the creek for project studies, construction, and monitoring, and to not take actions on their property that worsen the discharge of mercury mining waste into the creek.

Table RTC-2: Total Maximum Daily Loads

February 2008 Waters	February 2008 TMDLs	September 2008 Waters	September 2008 TMDLs
Waters upstream of reservoirs and lakes: • Guadalupe Creek upstream of Guadalupe Reservoir • Alamitos Creek • Percolation ponds along these creeks • Tributaries to these waters	0.1 mg mercury per kg suspended sediment (dry wt., annual median)	Creeks and river: • Guadalupe Creek • Alamitos Creek • Guadalupe River	0.2 mg mercury per kg suspended sediment (dry wt., annual median)
Reservoirs and lakes: • Guadalupe Reservoir • Almaden Reservoir • Calero Reservoir • Lake Almaden	1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)	Reservoirs and lakes: • Guadalupe Reservoir • Almaden Reservoir • Calero Reservoir • Lake Almaden	1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)
Waters downstream of reservoirs and lakes: • Guadalupe Creek downstream of Guadalupe Reservoir • Los Gatos Creek downstream of Vasona Dam • Canoas Creek • Ross Creek • Guadalupe River • Percolation ponds along these creeks and the Guadalupe River • Tributaries to these waters	0.2 mg mercury per kg suspended sediment (dry wt., annual median)		

Clarified Strategy for Alamitos Creek, as follows:

The Water Board’s strategy for Alamitos Creek, which is highly polluted with mercury mining waste, is to encourage a cooperative effort among the District, local agencies, and creekside property owners to undertake a comprehensive creek bank stability and habitat restoration project. The Water Board encourages the District to be the technical lead for this project, and to seek funding for it. The Water Board will identify mercury cleanup as a grant funding priority for the San Francisco Bay region. Where necessary, the Water Board will invoke its cleanup authority to compel upstream dischargers who initially discharged mercury mining waste into depositional areas, to cleanup and abate mercury mining waste. Creekside property owners are responsible to provide reasonable access to the creek for project studies, construction, and monitoring, and to not take actions on their property that worsen the discharge of mercury mining waste into the creek.

Do not adopt the TMDLs until creekside property owners downstream of mercury mines have been informed about them.

Water Board staff conducted a public meeting in September 2008 for residential property owners along and nearby upper Alamitos Creek, in response to this and similar requests made at the May hearing and in written comments. The goal of the public workshop was to explain the TMDL project to residential property owners and communicate what their roles and responsibilities will be under the TMDL. Staff answered verbal questions at the meeting, and in Appendix A we provide responses to questions from the meeting.

Daily means daily

We used a concentration-based approach for TMDLs, rather than a daily mass load, which several parties commented on. In response to their comments, we revised Section 8 to provide a daily load expression in grams per day (g/d).

The allocations to mercury mining waste do not account for dilution by cleaner sediments; it is not reasonable to set the same sediment mercury standards for mineralized (deposits containing naturally occurring sediment mercury) and non-mineralized areas

It is not our intent to assign numeric mercury limits to suspended sediment discharge, but rather to implement erosion control for the significant sources and to demonstrate effectiveness through proper installation and maintenance. This is why, despite changes to the TMDLs and allocations, the implementation plan did not change significantly since February 2008.

We explained the technical basis for the allocations in the supporting Staff Report. Currently, there is insufficient information to support revising the allocation to mercury mining waste to account for dilution by cleaner sediments, despite the fact that we are relying on these cleaner sediments to cover mercury mining waste in the bottom of reservoirs. Similarly, there is insufficient information on pre-mining conditions in the mineralized zone. However, with future scientific information, we may be able to propose a revised and substantially higher allocation to mercury mining waste, in accordance with adaptive implementation.

Lexington Reservoir is not an appropriate reference site because it is not located in mineralized geology

We explained that both a Technical Review Committee, composed of recognized mercury experts, and the Peer Reviewers, selected by an independent third party, support the use of Lexington Reservoir as a reference reservoir for this TMDL project.

The October 15, 2008 date for submission of a coordinated watershed monitoring plan is impracticable.

We extended the due date to October 15, 2009, because monitoring of loads to San Francisco Bay should resume as early as possible—for the 2009-2010 wet season. Section 9.9 of the supporting Staff Report provides extensive details on required monitoring. This, together with previous sampling plans for mercury in the watershed, should make for a minimal amount of work to develop the sampling plan. In Appendix C, we provide an example California Water Code § 13267 Technical Report Requirement for Coordinated Watershed Monitoring. This, together with previous memoranda of understanding (MOUs) between some of the parties for monitoring and other projects (i.e., San Francisco Bay Regional Monitoring Program), should make for a minimal amount of work to develop the MOU. These parties have known since at least the release of the January 2006 TMDL Staff Report they would be expected to either participate in coordinated watershed monitoring or to conduct monitoring individually, if not before.

Part 1

PUBLIC COMMENTS:

Michael Boulland (resident, Town of New Almaden)

Michael Cox (New Almaden expert and resident, Town of New Almaden)

Roberta Lamons (resident, Town of New Almaden)

Steve Ritchie (South Bay Salt Ponds Restoration Project)

Beau Goldie (Santa Clara Valley Water District)

Kirk Lennington (Midpeninsula Regional Open Space District)

Andrew Kenefick (Guadalupe Rubbish Disposal Co.)

Lisa Killough (Santa Clara County Parks)

Andria Ventura (Clean Water Action)

Baykeeper (Sara Aminzadeh)

BOARD MEMBER COMMENTS:

Rameshwar Singh

Shalom Eliahu

Steven M. Moore

James McGrath

Rameshwar Singh

Terry F. Young, Vice Chair

James McGrath

William E. Peacock

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

This section addresses comments received from the public at the May 8, 2008 Water Board testimony hearing on the Guadalupe River watershed mercury TMDL project. The full text of these statements is included in Appendix F (to the staff summary report for the October 8, 2008 Board agenda item no. 7). Revisions made to the draft proposed Basin Plan amendment and supporting Staff Report are indicated in underline/strikeout in Appendices D & E herein.

Responses to public comments:

Michael Boulland (resident, Town of New Almaden) requested that adoption of the TMDL be delayed until after residential property owners know about the TMDL.

Water Board staff conducted a public meeting in September 2008 for residential property owners along and nearby upper Alamitos Creek, in response to this and similar requests made at the May hearing and in written comments. The goal of the public workshop was to explain the TMDL project to residential property owners and communicate what their roles and responsibilities will be under the TMDL. Staff answered questions at the meeting, and in Appendix A we provide responses to questions from the meeting.

Mr. Boulland also suggested that the proposed Basin Plan amendment be re-written, and cited our Walker Creek mercury TMDL as an example to follow for its clear implementation methods.

Mr. Boulland subsequently clarified he was citing our reliance on "best management practices" in the Walker Creek mercury TMDL. "Best management practices" are the standard for erosion control, both in the Walker Creek and Guadalupe River watershed mercury TMDL projects.

Erosion controls were completed at the Gambonini mercury mine in Walker Creek prior to the first draft of that TMDL. We modeled the Guadalupe mercury mine implementation actions after the methods used at Gambonini (and at Almaden Quicksilver County Park). For example, in Section 9.1, *Mercury Source Control Actions for Mining Waste*, we describe the goal for mercury mine sites as the following, "… the goal is to prevent further erosion of mercury mining waste by stabilizing and vegetating slopes".

Similarly, we modeled the Walker reservoir actions on the steps the Santa Clara Valley Water District (District) has taken for their Guadalupe reservoirs. Only a few water and fish samples have been collected from Soulajule Reservoir along Walker Creek, whereas the District's reservoir actions are well advanced.

However, there is less similarity in the implementation actions required for downstream depositional areas. Both these TMDLs seek to minimize erosion or resuspension of mercury-laden sediment.

Specifically, the Walker Staff Report, on p. 56, describes that "…site-specific management measures to prevent, to the maximum extent practicable, erosion or resuspension of mercury-laden sediment … [a]pplicants seeking coverage under [waste discharge requirements] or [conditional waivers of waste discharge requirements] to control pathogens, nutrients or sediments in the Walker Creek watershed must also incorporate Best Management Practices (BMPs) to limit unnecessary increases in total, methyl or particulate mercury production or discharges." (SFBRWQCB 2007). Site-specific actions are appropriate for Walker's geomorphology (long stretches of incising creek channel), the far smaller amount of mercury mining waste discharged from Gambonini compared to New Almaden, and Walker's mostly single land use (grazing).

The land use in Walker Creek is primarily grazing, which is quite different from the mix of land uses in Guadalupe. The Water Board recently issued a conditional waiver of waste discharge requirements for grazing lands in Walker and surrounding watersheds. For example, simply fencing the cattle out of the creek (an option under this waiver) will greatly reduce mercury discharges in Walker. In contrast, a conditional waiver of waste discharge requirements is impractical for Guadalupe, given the widely varying land uses along these waters.

Additionally, nearly all the ore from the New Almaden Mining District for about the first century of operations was processed at the Hacienda Furnace Yard, making it the largest mercury processing facility in California. Consequently, a comprehensive mercury cleanup and creek restoration project is needed in Alamitos Creek downstream of Hacienda, rather than site-specific actions as called for in Walker Creek.

Mr. Boulland included comments in his April 2008 comment letter regarding outreach to local residents. We respond to his request for outreach above, and his other written comments in Part 2 of this document.

Michael Cox (New Almaden expert and resident, Town of New Almaden)

Mr. Cox described his involvement with New Almaden, which dates from 1974 when he was hired by the County to close mine shafts. Mr. Cox is a recognized expert on mercury mines, particularly New Almaden. Mr. Cox led the County's effort to characterize the most toxic sites in Almaden Quicksilver County Park—an extensive sampling program—in the late 1980's. Similar to Mr. Boulland, Mr. Cox requested that adoption of the TMDL be delayed until local residents know about the TMDL project. As described in response to Mr. Boulland, staff conducted a public workshop in September 2008.

Mr. Cox also requested that the TMDL be delayed to incorporate the findings from recent research.

We believe that delay is not justified at this time because of our adaptive implementation process. We provide specific questions to be addressed in the adaptive implementation portion of the implementation plan. The first questions are, "Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should this TMDL project be modified?"

Mr. Cox questioned the TMDL and allocation for the mine site, "I am having a lot of trouble with the sediment quality goal. …We have 0.2 mg/kg at the Bay, but we have 0.1 mg/kg at the mine."

We revised the proposed Basin Plan amendment (*Tables 7-A & 7-B*, and *Implementation Plan*) and Section 8.1 (*Mining Waste Total Mercury Allocation*), in response to Mr. Cox and others' comments. We revised the mining waste allocation to 0.2 mg/kg, as described in detail in our response to Parks comment no. A.5 (in Part 2 of this document). We revised the proposed Basin Plan amendment (*footnote a in Table 7-B*) and corresponding Section 9 of the Staff Report to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas.

In his written comments, Mr. Cox succinctly captured the TMDL requirements: it is not our intent to assign numeric effluent limits to suspended sediment discharge, but rather to implement erosion control for the significant sources and to demonstrate effectiveness through proper installation and maintenance (see Cox comment no. 7 in Part 2).

The allocation of 0.2 mg/kg at the Bay is based on the sediment target for the San Francisco Bay mercury TMDL. The allocation of 0.1 mg/kg is based on the reference reservoir for this TMDL project, and now only applies to nonurban stormwater discharges (i.e., non-mineralized, background areas), not to mercury mining wastes.

Mr. Cox questioned why the pre-mining concentration gradient from the mines to the Bay was not fully characterized. He also noted that from about 1845 to 1916, "something on the order of 200,000 kg of mercury and one billion kg of waste was discharged in Alamitos Creek and flushed downstream".

One approach to TMDLs is to characterize the pre-industrial conditions, and use them as the basis of targets and allocations. There is no one approach for any TMDL. The large volume of mining waste in the watershed makes it difficult to establish pre-mining conditions, which is one reason we chose a different approach.

Mr. Cox stated, "… it appears to me that 80 percent of the money is going to more studies instead of mass removal. We certainly as a community, and I myself personally agree, that mass removal is very important here. …"

We disagree; monitoring and studies are less than 1% of the implementation costs (see Table 10.3, Summary of Estimated Costs for [TMDL] Implementation.) Our detailed response can be found in Part 2, in response to District comment no. 2.1.

Mr. Cox again requested that the TMDL be delayed to work out "… some of the issues with the TMDL … You have not talked about the permits, you have not talked about what exactly is being done to ratchet down, say, for example, the park storm water permit."

Our approach for mercury mine sites, described in the February 2008 proposed Basin Plan amendment, is to "implement the load allocations through Water Code §§ 13267 and 13304 orders to compel investigation, cleanup and monitoring, as well as through Basin Plan Section 4.21.4 to the extent applicable".

Lastly, Mr. Cox noted, "…there is no daily load in the TMDL. …"

We used a concentration-based approach for TMDLs, rather than a daily mass load, which several parties commented on. In response to their comments, we revised Section 8 to provide a daily load expression in grams per day (g/d). Our detailed response can be found in Part 2, in response to GRDC comment no. 1.

Several times during his comments Mr. Cox offered to work with Water Board staff and others to resolve these issues. We worked with him, Mr. Boulland, and the District in planning for the September 2008 public workshop on the TMDL.

Mr. Cox included some of the above comments in his April 2008 comment letter. We respond to his other written comments in Part 2.

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

Roberta Lamons (resident, Town of New Almaden)

Dr. Lamons expressed concern that, "[t]he detailed scientific studies mentioned in the report did not include predictions or plans for chemically testing the sediments before and after and during remediation, which [is essential to remediation].

We agree that chemical testing is appropriate for typical hazardous waste site cleanups, which commonly include excavation and offsite disposal of contaminated materials. We discuss the applicability of this approach for mercury mine sites in Section 9.10 of the supporting Staff Report. However, we think that such testing will not be needed for many sites, such as those for which revegetation will contain the mining waste on the landscape, and prevent erosion into surface water.

Additionally, Dr. Lamons expressed concerns relating to mercury cleanup projects at mine sites. "We do not want to deposit more mercury in the air, even though the calcines in Jacques Gulch [an area of Almaden Quicksilver County Park planned for mercury cleanup and creek restoration] do not have a lot, and not a lot would be deposited in the air."

We disagree that these earth-moving projects, which are designed to reduce contamination in runoff, will emit significant amounts of mercury-contaminated dust. The permits for these projects, issued by the Water Board and other agencies, will require implementation of best management practices to minimize and control dust and monitoring to evaluate the effectiveness of dust control. The District and Parks are undertaking these projects. Their staff and contractors are experienced in properly deploying the appropriate control measures.

Dr. Lamons repeated other comments from her April 2008 letter. She disputes the scientific basis of these TMDLs. We respond to her written comments in Part 2.

Steve Ritchie (South Bay Salt Ponds Restoration Project)
Mr. Ritchie is the Executive Project Manager of the Coastal Conservancy's South Bay Salt Ponds Restoration Project. Previously, he was Executive Officer of the Water Board. He acknowledged how difficult this mercury problem is in the Guadalupe and Bay, and voiced his support for implementation actions which keep mercury on the landscape and out of the water. "…I would urge moving forward as rapidly as possible with the TMDL to make sure we eliminate [continued discharge of mercury mining waste] because we will be spending in the billion dollars plus downstream, trying to make the Bay as good as we can make it. And one way to do that is to eliminate the source of mercury from the Guadalupe."

Staff concurs.

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

Beau Goldie (Santa Clara Valley Water District)

Mr. Goldie urged us to continue our partnership, and to focus on implementation actions.

Water Board staff are committed to our partnership with the District. In July 2008, Water Board and District staff met to discuss the District's comments and on the Staff Report and proposed Basin Plan amendment. The meeting was extremely productive and consensus was reached on the timing and scope of the implementation actions the District will be responsible for under this TMDL. The District was instrumental in helping Water Board staff plan and conduct public outreach for the September 2008 public workshop for private property owners along Alamitos Creek. We are committed to working closely and productively with the District into the future.

We think that the TMDL is focused on implementation; monitoring and studies are less than 1% of the implementation costs (see Table 10.3, Summary of Estimated Costs for [TMDL] Implementation.) Our detailed response can be found in Part 2, in response to District comment no. 2.1.

The District submitted a lengthy comment letter, which we respond to in detail in Part 2.

Kirk Lennington (Midpeninsula Regional Open Space District)
Mr. Lennington is a Senior Planner of the Midpeninsula Regional Open Space District. His agency supports the TMDL, although they are concerned about coordinating monitoring with so many disparate interests.

Staff understands that coordinating amongst many disparate interests is challenging, but we think we have provided sufficient financial incentive to overcome these challenges. Additionally, we initiated discussions with the District on best ways to achieve a coordinated and cost-effective approach to monitoring.

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

Andrew Kenefick (Guadalupe Rubbish Disposal Company)

Mr. Kenefick is Senior Legal Counsel of Waste Management's Western Group Legal Department. Waste Management owns Guadalupe Rubbish Disposal Company (GRDC) and submitted a lengthy comment letter. Mr. Kenefick repeated several comments from GRDC's letter.

Mr. Kenefick re-stated GRDC's written comment no. 1: The TMDL does not satisfy the Clean Water Act's requirement that TMDLs must be based on a daily limit.

We used a concentration-based approach for TMDLs, rather than a daily mass load, which several parties commented on. In response to their comments, we revised Section 8 to provide a daily load expression in grams per day (g/d). Our detailed response can be found in Part 2, in response to GRDC comment no. 1.

Mr. Kenefick discussed GRDC's concerns with an "erodible soil" standard, as expressed in GRDC's written comment nos. 2 & 4, as follows.

GRDC asserts that a TMDL cannot be based on mercury concentration in "erodible soil." … The loading capacity reflects the maximum amount of a pollutant that may be delivered to the waterbody and still achieve water quality standards." EPA Region 9, *Guidance for Developing TMDLs in California* at 4 (Jan. 7, 2000) …

The "maximum amount" must be determined based on how much mercury is discharged to the system, and cannot be based on the concentration of mercury in the soil, *i.e.*, one cubic yard of heavily contaminated erodible soil may result in a lower total discharge of mercury than a millions of cubic yards of lightly contaminated soil. … Even if a TMDL based on mercury concentrations in erodible soils were lawful, the standard is unworkable as a practical matter. How does one determine which soils are "erodible?" Aren't all soils erodible to some degree?

Mr. Kenefick continued this line of questions, and asked, "[A]s a landowner, … what does it mean? … If you go out there and you test your soil and you find that [mercury concentrations exceed the allocation of either 0.1 or 0.2 mg/kg], what do you do? Do you have to excavate it out? Do you have to vegetate it? What if it is on a hillside? What if it is not on a hillside? Is it now potentially subject to erosion? … I was pleased to [learn from the staff presentation] … that it is not intended to be a cleanup standard. …"

No, <u>soil</u> mercury concentrations above the allocations do not trigger any requirements under this TMDL. This TMDL project distinguishes between surface soil undisturbed by mining and "mining waste". Implementation actions are only required at mine sites to abate discharges of mercury from <u>mining waste</u> to surface waters. No actions are required for surface soil undisturbed by mining.

Mr. Kenefick stated that GRDC does support the sequence of actions as proposed, to address upstream sources of mercury mining waste before addressing downstream sources. "It does not make any sense to focus all of your cleanup efforts downstream, only to have the recontamination occur from the upstream sources. We know it is a challenge, we also know that the time needed to accomplish the cleanup could be substantial. The mercury has been there for a long and it may take some time to solve the problem."

We appreciate GRDC's support of the proposed implementation phasing.

GRDC included these and many other comments in their April 2008 comment letter. We respond to their numerous written comments in Part 2.

Lisa Killough (Santa Clara County Parks)

Ms. Killough is the Director of the Santa Clara County Parks and Recreation Department (Parks), which owns the vast majority of the New Almaden Mining District. Upon purchasing the land in the 1970's, the Parks assumed liability for New Almaden's mercury legacy.

Ms. Killough described Parks' considerable efforts to cleanup calcines, roasted mercury ore, in Almaden Quicksilver County Park.

Chairman Muller acknowledged Parks' cleanup actions, and the scope of this legacy mercury problem. For a detailed description of the Parks' cleanup actions, see Staff Report Section 3.5, *Cleanup of Almaden Quicksilver County Park, Remaining Cleanup Challenges in Almaden Quicksilver County Park,* and *Natural Resources Damage(s) Assessment*.

Calcines are one form of mercury mining waste, but this TMDL requires erosion control for all forms of mining waste that are eroding into surface waters (see definition of mining wastes in Section 8.1).

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

Ms. Killough expressed Parks' concerns about how the mining waste allocation will be applied, the extent of additional cleanup Parks will be required to undertake and fund, potential adverse effects on habitat, and requested greater flexibility in implementation.

We revised the Staff Report and proposed Basin Plan amendment (*Implementation Plan*), in response to comments regarding allocations to mining waste and potential habitat destruction, as described herein.

We described in response to Mr. Cox that the mining waste allocation is not a cleanup standard, and in response to Mr. Kenefick, described that this allocation applies to mercury mining waste. In other words, we are regulating the discharge of industrial process waste from mining; we are not regulating the natural erosion of soil. We revised the Staff Report and the proposed Basin Plan amendment (*footnote a in Table 7-B*) to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas. This revision should help to clarify the extent of additional cleanup Parks will be required to undertake. (The extent is limited to areas where mercury mining waste is eroding into surface waters. However, the full extent will not be known until Parks completes the first task in the implementation plan, a site investigation to evaluate the erosion potential of mercury mining waste by December 31, 2009.)

We revised the Staff Report in response to Parks' comments regarding potential habitat destruction. Although the previously described revision should clarify that no actions are required for areas of natural serpentine soils, which ensures this habitat will be protected, we also revisited our regulatory analysis. We revised Sections 10.3–10.5 (from the February 2008 version) pertaining to analysis required by the California Environmental Quality Act (CEQA), to more completely describe how impacts to habitat and special status species will be minimized.

Specifically, we have revised the Environmental Checklist and explanations sections pertaining to air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, and mandatory findings of significance. We added a new section to describe the regulatory framework , revising the descriptions of the environmental protections afforded by the California Water Code, Clean Water Act Section 401 certification process, County of Santa Clara's comprehensive grading ordinance, and permit requirements and project oversight provided by state and federal environmental protection agencies.

In response to Parks' comments requesting flexibility in implementation, we provide flexibility in several ways, such as by *not* specifying the means of compliance, and through our adaptive implementation process.

Parks included these comments in their lengthy April 2008 comment letter. We respond to their other written comments in Part 2.

Andria Ventura (Clean Water Action)

Ms. Ventura is the Program Manager of Clean Water Action and Clean Water Fund, and also spoke on behalf of Environmental Justice Coalition for Water.

Ms. Ventura expressed Clean Water Action's concerns that the TMDLs and proposed water quality objectives are not set at levels that protect subsistence fishers (142.4 g/d), that no exposure reduction activities are required, and that we do not have or plan to collect actual fish consumption rates for this watershed.

We revised Section 9.7, Adaptive Implementation, in response to this comment, by expanding on the focusing questions to be developed for the adaptive implementation review.

Ms. Ventura referred to the U.S. EPA's default subsistence fisher consumption rate of 142.4 g/d. Our proposed water quality objectives are set at levels that protect consumers up to four meals per month (32 g/d). This consumption rate is greater than or equal to what 95% of all Bay Area anglers reported consuming in a very comprehensive consumption survey of fishers in San Francisco Bay (CDHS & SFEI 2000, 2001).

This study showed that the majority of people who eat fish from the Bay do so safely, without exceeding the health advisory recommendations. However, about one in ten eats more than the recommended amount. Among ethnic groups, Asian anglers stand out as a group of concern due to their large numbers, consumption rates, and methods of preparation and consumption. Anglers' likelihood of eating over the advisory limit varied with ethnicity, with Asians and African Americans more likely than other ethnic groups to eat above the limit. The authors of the study expected to find a correlation between high consumption of Bay fish and a low level of income and/or education, but they did not.

We think this Bay study is a reasonable estimate of consumption from the watershed. Although fish species and seasonal abundance differ between the Bay, Guadalupe River, Lexington Reservoir, and Vasona Lake, access for fishing these waters is similar and relatively easy. In contrast, access to fishing in the other upper watershed reservoirs (Guadalupe, Almaden, and Calero) is more difficult because they are located greater distances from freeways, and of these three, fishing is only allowed at Calero, but restricted to catch and release due to elevated mercury. Using the same consumption rate is one key aspect of integration between the Delta, Bay, and Guadalupe mercury TMDLs; integration of these TMDLs is required by the State Water Board.

Ms. Ventura commented on lack of exposure reduction activities. Currently, exposure reduction activities consist of signs warning to not consume fish from waters downstream of New Almaden Mining District. These signs are essential to reduce human exposure, given the high mercury levels in fish. Consequently, signs are even posted at Guadalupe and Almaden reservoirs, which are not open for fishing. But, people fish anyway, and people also vandalize the signs. However, based on our discussions with Clean Water Action for the San Francisco Bay mercury TMDL, we believe their concept of "exposure reduction" relies on actions outside the authority of the Water Boards, such as providing alternate sources of fish and/or medical care.

We are further concerned that exposure reduction activities may be interpreted incorrectly, and that the public may be led to believe that watershed fish are safe to eat, even if only occasionally. It is critical that people know these fish are not safe to consume in any amount; they are some of the most mercury-contaminated fish found anywhere in California. In any case, we are willing to reconsider exposure reduction—within the limits of Water Board authority—at the end of Phase 1 of implementation, in accordance with the adaptive implementation process, and we revised Section 9.7 accordingly (as described in the first paragraph of this response).

Regarding plans to conduct local consumption surveys, we plan to rely on the State Water Board. The State Board is currently working on new mercury water quality objectives, and will have to consider local consumption rates, and how they may vary across California. We keep in close contact with the State Board on this project, and know they are giving careful consideration to using the same consumption rate as in the Delta, Bay, and Guadalupe mercury TMDLs (32 g/d, and a level of 0.2 mg/kg in fish that humans consume). If they adopt a higher consumption rate, hence lower fish mercury concentration, we will need to revise the Bay, Guadalupe, and Walker mercury TMDLs and water quality objectives.

Clean Water Action included these comments in their April 2008 comment letter. We respond to their other written comments in Part 2.

Baykeeper (Sara Aminzadeh)

Ms. Aminzadeh, a legal fellow at Baykeeper, could not attend this hearing. Ms. Ventura complied with Chairman Muller's request that she read Ms. Aminzadeh's comments into the record.

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

Baykeeper feels it is particularly important to consider aerial sources in the Guadalupe River Watershed TMDL because as legacy mining mercury is addressed over time, ongoing local aerial sources will become a larger piece of the puzzle.

We revised Section 9.7, Adaptive Implementation, in response to this comment, by expanding on the focusing questions to be developed for the adaptive implementation review.

New Almaden was the fifth-largest mercury mine in the world, and much of the waste was disposed of in creeks. This level of pollution makes it impossible to distinguish additional effects from local aerial sources. It will take the full twenty years planned for implementation to cleanup the mercury-laden sediment in creeks downstream of New Almaden. Nonetheless, we are willing to reconsider the importance of mercury from sources other than mining at the end of Phase 1 of implementation, or later, in accordance with the adaptive implementation process; we revised Section 9.7 accordingly (as described in the first paragraph of this response).

Baykeeper noted that in the San Francisco Bay TMDL the Board has stated that the Bay Area Air Quality Management District "should conduct a local mercury emissions inventory and investigate the significance of local mercury air emissions." … Staff has informed us that this provision in the San Francisco Bay TMDL is intended to cover the Guadalupe River Watershed. However, in our opinion, the phrase "local" does not clearly define the scope of that mandate to include the Guadalupe Watershed.

"Local" in the Bay mercury TMDL includes the entire Bay watershed and airshed. The Guadalupe River watershed is located within the Bay watershed and airshed. Therefore, the mercury emission inventory and investigation component of the Bay mercury TMDL implementation plan applies to, and is inclusive of, the Guadalupe River watershed and airshed.

Baykeeper requested, given that this TMDL is designed specifically to address the Guadalupe Watershed, we request that similar language be added to the Guadalupe TMDL, specifying the Guadalupe Watershed as a local area particularly in need of inventory and investigation. At a minimum, the TMDL should cross reference the atmospheric deposition section in the SF Bay TMDL, to clarify that it is intended to cover the Guadalupe Watershed.

We disagree that the Guadalupe River watershed and airshed are particularly in need of inventory and investigation of local mercury air emissions, due to the amount of mercury mining waste already in the waters (see our response to Baykeeper's first comment). The proposed Basin Plan amendment already cross references the Bay mercury TMDL, in the Implementation Plan, *Mercury Source Control Actions*, "the implementation plan for … atmospheric deposition … is contained in the San Francisco Bay mercury TMDL."

Baykeeper echoed Clean Water Action's comments regarding subsistence fishing and agreed that a target that only allows people to eat fish out of the watershed one meal per week may not be appropriate. The Board does have a responsibility to investigate fishing practices in the Guadalupe watershed and implement exposure reduction strategies as needed.

We described in response to Clean Water Action's comments that one meal per week is the same consumption rate as in the Bay and Delta (and Walker Creek) mercury TMDLs; that we relied on an excellent and detailed fish consumption survey for San Francisco Bay; and that we are willing to reconsider exposure reduction strategies, about ten years hence, through the adaptive implementation process.

Part 1: Staff responses to verbal comments at the May 14, 2008 public hearing

Responses to comments from Board Members:

This section addresses concerns raised by Board Members at the May 8, 2008 Water Board testimony hearing on the Guadalupe River watershed mercury TMDL project. Dr. Thomas Mumley, Assistant Executive Officer, and Ms. Carrie Austin, Project Manager and Water Resources Control Engineer, answered some questions during the meeting. Those questions and staff responses are recorded in the hearing transcript and are included in Appendix F (to the staff summary report for the October 8, 2008 Board agenda item no. 7). Staff responses to the other concerns expressed by the Board are provided in this section. Revisions made to the draft proposed Basin Plan amendment and supporting Staff Report are indicated in underline/strikeout in Appendices D & E herein.

Board Member Eliahu voiced his support for the proposed Basin Plan amendment and urged action (i.e., Board adoption).

Board Member McGrath noted that total mercury is not the metric that we are going to use for all time as we begin to understand the process of mercury. He suggested we need to begin to move away from total mercury towards methylmercury and perhaps to reactive mercury. The problem with using total mercury is, once there is enough to initiate bioaccumulation, the landscape and factors like grain size, the precise geochemistry, particularly carbon, organic carbon, sulphur and iron, all matter more than concentrations of total, as well as the food chain and the nature of the food chain. So we need as we move forward to begin to reflect the adaptive management process into picking these things up and beginning to use them as metrics.

Staff proposes to establish both total mercury and methylmercury allocations and TMDLs for the Guadalupe River watershed. At this time, it is impractical to identify, or implement actions to address, reactive mercury separate from other mercury species. Board Member McGrath lists factors important to mercury methylation and bioaccumulation, which we included in Section 9.7 of the Staff Report.

Board Member McGrath re-stated an issue that came up in testimony regarding the background mercury concentration. He asked, “Are we trying to clean this stream up below background?”

We established the background mercury concentration in non-mineralized zones of 0.1 mg/kg in the TMDL data collection effort. However, we did not establish the pre-mining mercury concentration in mineralized zones. We anticipated the need for cleanup levels, and provide various calculation methods in Section 9.10 of the Staff Report, *Calculating the Mining Waste Cleanup Goal*.

We are not proposing to cleanup to below background. We described in response to Mr. Cox and Mr. Kenefick that the mining waste allocation is not a cleanup standard, and that it only applies to industrial process waste associated with mine operations. We revised the Staff Report and proposed Basin Plan amendment (*Implementation Plan*), in response to these comments, to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas.

Board Member McGrath stated that there is a responsibility associated with construction and operation of reservoirs related to controlling mercury.

Staff concurs.

Board Member Singh asked whether the benefits from the previous cleanup actions in Almaden Quicksilver County Park have been measured.

We estimate that erosion control actions required by this TMDL project will achieve greater than 70 percent load reduction. This estimate is based on our measurements at the Gambonini mine in Walker Creek, not from Almaden Quicksilver County Park. As explained in response to Mr. Boulland (above), we modeled the Guadalupe mercury mine implementation actions after the methods used at Gambonini.

In the 1990's, Parks addressed the five worst mercury-contaminated sites in Almaden Quicksilver County Park under a remedial action order issued by CalEPA's Department of Toxic Substances Control (DTSC; see Section 3.5 of the Staff Report). However, the effectiveness of this cleanup action in reducing mercury loads has not been measured.

These sites were cleaned up to visual standards and no confirmation soil mercury samples were collected. Some water data are available from two sets of stormwater samples collected each year to comply with the General Industrial NPDES stormwater permit. The sampling points were not intended to, nor do they, target stormwater only from remediated areas. The sampling points collect stormwater from a much larger area. Consequently, these data illustrate the high mercury concentrations remaining in stormwater post-cleanup, up to 110,000 ng/l, and the need for additional cleanup actions.

In contrast, efforts have been made to precisely quantify the load reduction from the cleanup of the Gambonini mercury mine in the Walker Creek watershed, which drains to Tomales Bay. A preliminary data evaluation indicates about a 70 percent load reduction—from the same types of mercury mining waste erosion control and cleanup actions we anticipate for Guadalupe. We hope to publish these findings in the peer-reviewed literature within the next year.

Board Vice Chair Young urged staff to clarify the mining waste allocation.

We revised the Staff Report and proposed Basin Plan amendment (*Implementation Plan*), in response to several comments, to clarify that allocations are not cleanup goals. We described in response to Mr. Cox that we revised the proposed Basin Plan amendment (*footnote a in Table 7-B*) to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas. In response to Mr. Kenefick, we described that this allocation applies to mercury mining waste. In other words, we are regulating the discharge of industrial process waste from mining; we are not regulating the natural erosion of soil.

Board Vice Chair Young indicated she is on the same page as Steve Ritchie, who urged "moving forward as rapidly as possible with the TMDL to make sure we eliminate [continued discharge of mercury mining waste] because we will be spending in the billion dollars plus downstream, trying to make the Bay as good as we can make it. And one way to do that is to eliminate the source of mercury from the Guadalupe."

Staff concurs.

Board Vice Chair Young expressed her concern that perhaps we are not giving full or appropriate credit for early implementation and cooperation. She requested that staff clarify how we are giving credit, to provide continued incentive for implementation.

We revised Section 9.7 (annual TMDL progress report to the Board), and Section 9.3 and the proposed Basin Plan amendment (*Implementation Actions for Mercury Mines*; previous cleanup sites at Almaden Quicksilver County Park exempted from cleanup), in response to this comment, as described in the following paragraphs. (See also responses to Cox in Part 1, and responses to GRDC comment no. A1, and Cox comment no. 3 in Part 2.)

Staff is always willing to acknowledge and give appropriate credit to actions by parties that improve water quality. While we cannot modify concentration-based allocations based on past actions, we can provide credit in some of the following ways. We will consider whether past actions were undertaken voluntarily, monitored for effectiveness, and/or whether they were properly maintained, when reviewing TMDL implementation proposals. If so, we will adjust and provide flexibility in such requirements as level of monitoring, reporting, and time schedules. Where multiple parties are involved in an implementation action, staff will consider past actions of the parties in determining who has to do what. If, in the future, we revise the allocations to be mass load reductions, we will account for past remedial efforts in assigning these reductions.

Credit can also be in the form of cost savings opportunities, which generally consist of "double credit" for actions that decrease mercury loads both within the watershed, and to the Bay. We identify double credit opportunities in the proposed Basin Plan amendment, as follows (underlined text indicates a revision in response to this comment, to ensure that creekbank stabilization and similar projects also qualify for double credit).

> Implementation actions that reduce loads of mercury from mining waste <u>and/or mercury-laden sediment</u> to the waters of the Guadalupe River watershed downstream of dams will also count towards achieving the San Francisco Bay mercury TMDL allocation to legacy mercury sources in the Guadalupe River watershed. … Urban stormwater runoff implementation actions that reduce loads of mercury to San Francisco Bay will also count towards achieving the Guadalupe TMDL allocation to the urban stormwater runoff source.

In response to this comment, we revised Section 9.7 to describe the accounting of implementation actions and credit earned we will include in our periodic TMDL progress report to the Board. Also in response to this comment, we revised Section 9.3 and the proposed Basin Plan amendment to exclude completed and on-going mercury cleanup projects in Almaden Quicksilver County Park (see responses to GRDC comment no. A1 and Cox comment no. 3, in Part 2). However, continued maintenance of these erosion control measures is required.

We have provided credit, both in the proposed Basin Plan amendment and in the Bay mercury TMDL, in many forms to both Santa Clara County Parks (Parks) and the Santa Clara Valley Water District. In the following paragraphs we describe some of these forms of credit.

<u>Almaden Quicksilver County Park</u>

We credit Parks for their cleanup actions in Almaden Quicksilver County Park, undertaken prior to adoption of this TMDL project. In the 1990's, Parks addressed the five worst mercury-contaminated sites in Almaden Quicksilver County Park. These cleanup actions helped to restore habitat value in highly disturbed areas that otherwise were unvegetated and actively eroding industrial dumps.

Parks' cleanup efforts are the only cleanup actions to date for mercury mine sites. Guadalupe Rubbish Disposal Co., Inc. (owners of Guadalupe mine) and Midpeninsula Regional Open Space District have yet to undertake cleanup actions. We credit Parks for their cleanup actions by informing them of grant opportunities—although they have not yet received funding from grant opportunities we identified.

In 2004, the Board adopted the San Francisco Bay mercury TMDL, which potentially provides the Parks (and others) credit for actions towards attaining the legacy mercury allocation, as follows, "1. Quantify the annual average mercury load reduced by implementing … (b) source and treatment controls …. The Water Board will recognize loads reduced resulting from activities implemented after 1996 (or earlier if actions taken are not reflected in the 2001 load estimate) to estimate load reductions."

We are available to work with Parks staff, upon their request, to estimate mercury loads avoided from their prior cleanup actions. Many of these cleanup actions took place in areas that drain to below dams, and so are potentially eligible for "double credit" (if they were not reflected in the 2001 load estimate to the Bay).

Santa Clara Valley Water District

We credit the Santa Clara Valley Water District (District) for permanently removing nearly 1,000 kilograms of mercury to date from the watershed—and hence from San Francisco Bay. Under their Stream Maintenance Program and for flood control purposes, the District will continue to permanently remove mercury, and we will report on it annually.

We have provided the District many forms of credit, for their excellent watershed stewardship, studies that supported TMDL development, and early implementation actions. In recognition of the District's excellent stewardship, we do not plan to compel the District to undertake any specific Stream Maintenance Program-related sediment removal actions (i.e., implementation actions in depositional areas). In fact, we have allowed for the District, and only the District, to comply voluntarily with methylmercury studies and implementation actions in depositional areas. Further, we designed the phasing and scheduling of implementation actions to align with the District's project and funding schedules.

We greatly appreciate the following from the District's comment cover letter, "much of the … monitoring of fish and water quality, may be integrated into existing District projects and programs." In fact, we are counting on the District to lead the coordinated watershed monitoring effort, and to take the technical lead to address Alamitos Creek, one of the world's most mercury-polluted waterways.

In closing, we propose to provide credit in many ways. We look forward to comments from responsible parties with specific suggested methods for accounting for credit. We will respond to these suggestions, and report annually to our Board progress on implementing the TMDL project and accrued credit.

Board Vice Chair Young noted that at least one potential permittee felt that it was going to be placed in a position where it would have to negotiate between what the Water Board, Endangered Species Act, and Fish and Game might require. Dr. Young asked staff to resolve this issue, and not place permittees in such positions.

We have no intention of placing anyone in an untenable situation, including in a situation in which they have to negotiate between competing agency interests. We do not agree that the proposed Basin Plan amendment places anyone in this situation. The TMDL addresses the challenge of mercury-contaminated fish, which is not in opposition to the goals of other agencies.

Similarly, Board Vice Chair Young requested that staff clarify that we do not intend to "clean up areas that have rare serpentine habitats".

We described in response to Mr. Cox and Mr. Kenefick that the mining waste allocation is not a cleanup standard, and that it only applies to industrial process waste, it does not apply to soils that are not mercury mining waste. We revised the Staff Report and proposed Basin Plan amendment (*Implementation Plan*), in response to these comments. This revision should clarify that no actions are required for areas of natural serpentine soils, so this important habitat will be protected.

In closing, Board Vice Chair Young requested that, particularly for creeks projects, we do not set up unintended consequences that create a disincentive for restoration.

The toxic legacy and scale of mercury mining does bring challenges to restoration projects in this watershed. The mercury mining waste itself is a disincentive for restoration, principally due to the high costs of complying with hazardous waste regulations.

This TMDL encourages restoration projects that stabilize creek banks, to prevent erosion of mercury mining waste. However, we cannot prescribe the manner of compliance. Nonetheless, many erosion control methods enhance habitat, because they rely on deeply rooted vegetation to keep soil in place.

We have called out Alamitos Creek in particular for restoration. Long stretches of Alamitos Creek downstream of Hacienda Furnace Yard are lined with calcines (roasted ore), a very poor matrix for plants. Consequently, these stretches have poor habitat value. We state in the proposed Basin Plan amendment, "Particularly in Alamitos Creek which is highly polluted with mercury mining waste, the Water Board encourages the District and creekside property owners to undertake a comprehensive creek bank stability and habitat restoration project."

Early in the project, we considered and rejected two other options. We rejected the option to require excavation and off-site disposal of all mining waste, partly because of its widespread, albeit short-term, destruction of habitat. We selected the erosion control option because it better preserves habitat and is effective, based on our work at the Gambonini mercury mine (described above in response to Board Member Singh). We also rejected the option to require import of fill material to be spread over the mining waste and hold it in place, such as clean top soil or gunnite (spray-on concrete). This option would eliminate habitat for many decades, and it is not durable, so that it would require extensive maintenance to prevent erosion of mining waste.

We considered unintended consequences, and designed this TMDL project to avoid unintended consequences that create a disincentive for restoration. If, during implementation, we realize that this TMDL project has created unintended disincentives, we will propose modifications, in accordance with the adaptive implementation plan.

Board Member McGrath urged that the monitoring program include grain size, because mercury on fines is more bioavailable than mercury on larger soil particles (sands and larger).

We agree that grain size is important. Consequently, we propose a revised allocation to mercury mining waste that is to be measured in fines less than 63 microns in diameter. We also propose TMDLs, allocations, and load measurements on suspended sediments (i.e., soil fines).

Lastly, Board Member McGrath suggested that we consider physical barriers to sediment transport, e.g., covering reservoir bottoms with clean sediment or armoring channels, and not preclude innovative actions that might prevent methylation.

We considered covering reservoir bottoms with clean sediment or other materials. However, this method will not be effective until the mining waste stops eroding off the mine sites. This is one reason mercury mining waste control actions are phased—so that mercury discharges from upstream will be eliminated or significantly reduced before downstream projects are undertaken.

Board Member Peacock stated that it is appropriate to try to quantify the number of people who actually do subsistence fishing.

While we do not know the number of people subsistence fishing, our approach in this TMDL project is to set a safe level such that people can consume the fish. Since 1987, signs have been posted along waters downstream of New Almaden Mining District to warn people to not eat fish.

Our target rate of consumption is one meal per week, the same consumption rate as in the Bay and Delta (and Walker Creek) mercury TMDLs (see response to Clean Water Action and Baykeeper's comments in Parts 1 & 2). Using the same rate is one key aspect of integration between the Delta, Bay, and Guadalupe mercury TMDLs—integration required by the State Water Board. We relied on an excellent and detailed fish consumption survey for San Francisco Bay to develop this consumption rate. We think this Bay study is a reasonable estimate of consumption from the watershed.

Regarding plans to conduct local consumption surveys, we plan to rely on the State Water Board. The State Board is currently working on new mercury water quality objectives, and will have to consider local consumption rates, and how they may vary across California. If they adopt a higher consumption rate, hence lower fish mercury concentration, we will need to revise the Bay, Guadalupe, and Walker mercury TMDLs and water quality objectives.

Part 2

APPROVING AGENCY:

1. **U.S. EPA (Peter Kozelka)**

COUNTY DISTRICTS, AGENCIES & MINE OWNERS:

2. **Santa Clara Valley Water District (Beau Goldie)**
3. **County of Santa Clara, Environmental Resources Agency, Parks and Recreation Department (Lisa Killough)**
4. **Guadalupe Rubbish Disposal Company (Todd Maiden of Reed Smith LLP)**
5. **Hillsdale Mine (Robert Bettencourt)**
6. **Hillsdale Mine (Thomas McCloskey of Strategic Engineering & Science, Inc.)**

URBAN RUNOFF AGENCIES:

7. **City of San Jose (John Stufflebean)**
8. **Santa Clara Valley Urban Runoff Pollution Prevention Program (Adam Olivieri)**
9. **California Department of Transportation (Joyce Brenner)**

RESIDENTS:

10. **New Almaden Quicksilver County Park Association (Michael Cox)**
11. **Friends of Los Alamitos Watershed (Roberta Lamons)**
12. **Friends of Los Alamitos Watershed (Mike Boulland)**
13. **Residents (Amanda & Frederick Dill)**

ENVIRONMENTAL JUSTICE ADVOCATES

14. **Clean Water Action (Andria Ventura)**
15. **Baykeeper (Sara Aminzadeh)**

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from the U.S. Environmental Protection Agency

We gratefully acknowledge the U.S. EPA's supportive comment, "We support adoption of the package." We respond to their specific comments below.

U.S. EPA comment no. 1. … the proposed Basin Plan amendment needs to reference the TMDL Staff Report, …

We will ensure that the resolution that the Water Board adopts (for which the proposed Basin Plan amendment is "Attachment A") references the supporting Staff Report.

U.S. EPA comment no. 2. The proposed Basin Plan amendment lists the waters to which the revised water quality objectives and TMDLs apply. The proposed Basin Plan amendment list includes waters that are currently listed as impaired on California's CWA Section 303(d) list, and some waterbodies that are not currently included on the list. … Please ensure that the Staff Report includes a specific record supporting the conclusion that the additional waters are water quality limited, and why it is important to adopt TMDLs for these segments at this time. Also, please clarify in the proposed Basin Plan amendment which of the waters are currently listed and which are not listed but are currently being identified as impaired. …

We revised Sections 2.4 and 8 in response to this comment. In revising Section 2.4, we clarified that this TMDL project addresses waters "impaired" by mercury, and waters that drain mercury mines, and other waters that convey mercury from other sources to impaired waters—all waters eventually drain to the Guadalupe River, an impaired waterbody. Therefore, this TMDL project assigns allocations to all waters in the watershed. "Impaired" means waters already on the 303(d) list or that will be proposed for listing on 2009 303(d) list.

Section 2.4 now provides an extensive description of the listing status, and a specific record to support listing of additional waters. Also, we clarified the 303(d) listing status in the first paragraphs of Chapter 7 in the proposed Basin Plan amendment. Section 8 now clarifies that TMDLs apply to impaired waters, but allocations apply to all waters.

U.S. EPA comment no. 3. The proposed Basin Plan amendment does not list the permit numbers to which the waste load allocations apply. Please include the permit numbers, or …

We revised Table 7-B: Load and Wasteload Allocations in the proposed Basin Plan amendment, and Section 8.3 (*Urban Stormwater Runoff Total Mercury*

Allocation) of the Staff Report, to include the permit number for the Santa Clara Valley Urban Runoff Pollution Prevention Program. This is the only NPDES permit affected by this TMDL project.

U.S. EPA comment no. 4. If any of the permits to which the implementation schedule applies are permits that must comply with Clean Water Act 301(b)(1)(C), we recommend the Water Board ensure that the schedule is consistent with the provisions of the statewide Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits …

We do not anticipate issuing or revising any NPDES permits that are covered by the compliance schedule policy, due to this TMDL project.

U.S. EPA comment no. 5. The proposed Basin Plan amendment does not include a summary of the quantification of mercury and methylmercury sources, nor a summary of the linkage analyses … The proposed Basin Plan amendment needs to contain a summary … or … reference the TMDL Staff Report …

This comment is similar to U.S. EPA comment no. 2, and we have the same response. We will ensure that the resolution that the Water Board adopts references the supporting Staff Report.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from the Santa Clara Valley Water District

The Santa Clara Valley Water District's (District's) comment letter consists of a cover letter with general comments (numbered 1, 2.1, 2.2a-d, and 2.3) and an attachment with detailed comments (numbered A.1–A.11). The District and the Water Board have a long history of effective partnership. This TMDL is an example of our effective partnership. In 2003, the District and the Water Board entered into a Memorandum of Understanding regarding the District's funding. The District funded the studies that culminated in the Conceptual Model of Mercury Behavior in the Guadalupe River Watershed, which provides the scientific basis for these TMDLs (see Section 3.1). Although the District's comment letter expresses support for continuing our partnership, the letter also expresses many concerns with the TMDL.

District comment no. 1: District/Water Board Partnership Produced Results

… the District has demonstrated its intent and commitment to addressing the mercury issue by voluntary early implementation of control measures that have removed nearly one thousand (1,000) kilograms of mercury from the watershed, reduced methylmercury production by over ninety percent (90%) in Almaden Lake in 2006 and 2007, and in mid-2007 expanded the successful Almaden Lake pilot project to the Almaden and Guadalupe reservoirs. … We believe that successful implementation of the TMDL will require a continuation of the collaborative partnership between our agencies.

We commend the District for permanently removing nearly 1,000 kilograms of mercury from the watershed—and hence from San Francisco Bay. We are optimistic the District will have continued success in reducing methylmercury production. We note and credit the District for undertaking these actions in advance of adoption of the TMDL (see also response to Board Vice Chair Young in Part 1).

Water Board staff are committed to continuing our successful partnership with the Water District. We had face-to-face and teleconference meetings with District staff in the months before and after receiving their written comments. We plan continued communications and close collaboration with District staff.

District comment no. 2: District's Concern with Implementation

The District expressed several concerns with implementation. In the following paragraphs we respond to their specific concerns, which we numbered 2.1, 2.2a–d, and 2.3.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

District comment no. 2.1: 80% Studies, Only 20% Abatement Action

The District analysis of the TMDL Report and Basin Plan amendment identified that over eighty percent (i.e., $19.2M) of the $24 million estimated total cost to the District will be directed toward monitoring, reporting, and "special studies" with only twenty percent (i.e., $4.8M) directed toward actual abatement of mercury contamination. The District believes that the limited resources should be applied to the abatement first rather than conducting studies.

We estimate that monitoring and studies are less than 1% of the implementation costs, and they range from $600,000 up to $10 million total for all parties, which is less than half the District's estimate of $19.2 million (see Table 10.3, Summary of Estimated Costs for [TMDL] Implementation.) The District's implementation responsibilities are closer to 90% action and 10% studies and include:

a) their "stream maintenance program" particularly for the maintenance of engineered channels that drain New Almaden (Randol, Greystone, Golf, McAbee, and Alamitos creeks, and Guadalupe River),

b) seeking funding for and serving as technical lead for a $135 to $270 million project for Alamitos Creek downstream of Hacienda Furnace Yard (comprehensive creek bank stability, habitat restoration, and cleanup of mercury mining waste),

c) the invention, testing and deployment of methylmercury controls in reservoirs and lakes, and

d) leadership for coordinated watershed monitoring.

The District's concerns with monitoring costs are not specific to the TMDL; rather, these are wide-ranging concerns for all of their activities subject to Water Board permits. We agreed in the 2003 MOU for these TMDLs that monitoring or special studies undertaken for TMDL purposes may be an appropriate substitute for project-specific monitoring requirements. The main consequence of this MOU clause to these TMDLs is that these TMDLs reflect a coordinated approach for mercury monitoring. In fact, we are counting on the District to lead the coordinated watershed monitoring effort. We greatly appreciate the following from the comment cover letter, "much of the … monitoring of fish and water quality, may be integrated into existing District projects and programs."

We look forward to comments with specific suggested revisions to District permits. When received, we will revise the permits as appropriate, and contingent upon the approval of other permitting agencies, to support coordinated watershed monitoring. In this way, we will follow through on our commitment in the MOU to streamline monitoring.

We would like to take this opportunity to assure the District that their "stream maintenance program" (SMP) is integral to both the Guadalupe River watershed and the Bay mercury TMDLs. The SMP includes erosion control of mercury mining waste for stream stewardship and flood control purposes, and improves habitat value, and decreases mercury loading both within the watershed and to the Bay. We did not provide a cost estimate for any permit restrictions or effectiveness monitoring because the TMDL project has not appreciably affected costs, as explained on p. 10-45. Also, we do not plan to compel the District to undertake specific sediment removal actions under the Stream Maintenance Program (see response to District comment no. A.2.)

District comment no. 2.2: Collaborative Approach Needed for Successful Implementation

The District expressed several concerns in this comment, which we numbered 2.2a–d, and respond to individually.

District comment no. 2.2a: Taking a collaborative approach rather than the aggressive command and control approach of the current proposal would be more effective and efficient. Under a collaborative approach, we believe the District is well positioned to assist with the implementation and may act as the lead for implementation of the TMDL in the Guadalupe River Watershed. Much of the interception and extraction of mercury loading to the Bay, as well as much of the monitoring of fish and water quality, may be integrated into existing District projects and programs.

We revised the proposed Basin Plan amendment (*Implementation Actions for Depositional Areas*) to reflect that we will identify mercury cleanup as a grant funding priority for the San Francisco Bay region.

This TMDL project includes many self-selected implementation actions, several of which the District is already undertaking. Therefore, we have not included a "command and control" approach for the District. Rather, we offer the District, and only the District, the opportunity to comply voluntarily.

We welcome the District's offer to act as lead for implementation, and to integrate monitoring into existing District projects and programs. We are committed to a successful partnership, i.e., a collaborative approach, with the District. In fact, we are counting on the District to take the lead on coordinated watershed monitoring.

A collaborative approach is also needed for Alamitos Creek downstream of Hacienda Furnace Yard. As stated in the proposed Basin Plan amendment, "Particularly in Alamitos Creek which is highly polluted with mercury mining waste, the Water Board encourages the District and creekside property owners to undertake a comprehensive creek bank stability and habitat restoration project." In other words, we are relying on the District to take the lead on behalf of private property owners to address this, one of the world's ten most mercury-polluted waterways. This is an important effort both within the watershed area addressed by the TMDL, and downstream of the area addressed by these TMDLs, to protect the South Bay Salt Ponds Restoration Project. We modified the proposed Basin Plan amendment to reflect that we will identify mercury cleanup as a grant funding priority for the San Francisco Bay region.

District comment no. 2.2b: The 2003 MOU between the District and the Water Board included four key commitments ... the Water Board has not yet met the third commitment to provide credits to the District for its early implementation actions …

We have provided the District many forms of credit, both for their excellent watershed stewardship and for early implementation. We worked with the District to better integrate those implementation actions for which they are responsible with their future funding and project schedule timelines. We further allow the District to comply voluntarily (see response to District comment no. 2.2a), given their excellent track record. Regarding credit for early implementation, see response to District comment no. 1 in Part 2, and response to Board Vice Chair Young in Part 1.

District comment no. 2.2c: The 2003 MOU between the District and the Water Board included four key commitments ... the Water Board has not yet met the … fourth commitment to reduce duplicative project-specific mercury monitoring activities in permits issued to the District.

We are willing to reduce duplicative project-specific monitoring requirements, as described in response to District comment no. 2.1.

District comment no. 2.2d: The District is willing to discuss the continuation of its partnership with the Water Board, and the possibility of revising the March 2003 MOU. A revised MOU would include commitments by the District to focus on implementation of the TMDL, and incorporate credits specified in the 2003 MOU for early implementation actions taken by the District that would be accounted for in load allocations, implementation plans, and compliance schedules for the TMDL; the revised MOU would also include commitments by the Water Board to address duplicative project-specific mercury monitoring activities in permits issued to the District.

We think that the 2003 MOU together with the proposed Basin Plan amendment are sufficient to support a collaborative and timely effort. In 2003, negotiations for the MOU caused an 8-month delay in the TMDL project. We are committed to removing duplicative project-specific mercury monitoring activities—see response to District comment no. 2.1.

District comment no. 2.3: Priorities Needed for Limited Public Resources

The District is also concerned that the increased burden to local agencies resulting from the proposed TMDL and proposed changes to the Urban Runoff Municipal Permit will result in a failure of both programs due to lack of funding. The recent proposed changes to the Municipal Permit for Stormwater Discharges represent estimated increases of expenditures by as much as thirty percent, at the same time that the TMDL will create the need for extensive new expenditures. The District seeks to have the Water Board prioritize its water quality needs in a manner which allows the efficient use of available resources.

We understand the District's funding constraints. We support less costly alternatives, as long as they provide an equivalent level of environmental protection. Notably, coordinated watershed monitoring may be less costly and yet provide more information/protection. We acknowledge that the District's urban runoff discharges are comparatively minimal, and we would consider any proposals the District would like to present to us on this matter.

District comment no. A.1: The Proposed Basin Plan Amendment is Too Detailed and Inflexible

The proposed Basin Plan amendment contains far too much detail than that needed for the Basin Plan amendment process. As written, there is little flexibility for Water Board staff and the responsible parties to be creative and pursue a more productive course of action, since any change would then need to be made through the lengthy Basin Plan amendment process. A more prudent approach is to simplify the proposed Basin Plan amendment to adopt the new Water Quality Objectives and specify that Water Board staff shall report back to the Water Board periodically (say, every five years) on progress implementing the plan as described in the TMDL Project Report, including amendments to the plan authorized by the Executive Officer. At a minimum, the proposed Basin Plan amendment should not specify dates, but should use "from the date of" final approval/adoption, and should use "or similar studies" should those contemplated in the far term be determined unnecessary.

We disagree that the proposed Basin Plan amendment contains more detail than that needed for the Basin Plan amendment process. The proposed Basin Plan amendment briefly and clearly summarizes who is to do what by when.

But, we agree that it would be beneficial to add flexibility to the special studies, and we revised the proposed Basin Plan amendment accordingly (see response to District comment no. A.4b).

We have tried presenting dates as either "from the date of" or "specific calendar date." It is our experience that specific calendar dates are easier for all parties to track and result in fewer disputes. Therefore, we have elected to use specific dates in this proposed Basin Plan amendment.

District comment no. A.2: Mercury Sources in Alamitos Creek are Mischaracterized

In the TMDL Project Report and proposed Basin Plan amendment all of the mercury sources in Alamitos Creek downstream of Almaden Reservoir are characterized as "depositional" and it is proposed to delay addressing these sources for as long as twenty years. ... an incorrect assumption that all deposits of mine waste in this area continue to accumulate mine waste. The District ... provided a preliminary identification of sites with deposits of eroding mine wastes. Most of these sites are creek banks that are being undercut and/or are actively eroding, adding to the load of mercury transported downstream. ... should be evaluated and verified in the first five years, and those that are eroding should be addressed by the end of the first ten years. Since 2003, the District has verified eleven of the sites ... Six of these have already been completed (resulting in the removal of 287 kg of mercury), and the other five are scheduled for completion by 2011.

The only significant depositional areas of mine wastes are the mouth of Alamitos Creek as it enters Almaden Lake, the mouth of Guadalupe Creek at its confluence with the downstream end of Almaden Lake, and above the Los Alamitos Drop Structure at the upper end of Guadalupe River. Other areas where deposition occurs (primarily due to mercury-containing fines that pass the Drop Structure) are benches and depositional areas of Guadalupe River, mostly between Montague Expressway and the SPRR crossing. The District agrees that these areas should be addressed after all upstream sources have been controlled. However, under a collaborative approach, sediment removal in these latter areas could be integrated into the ongoing District's long-term stream maintenance program to obtain faster results.

The proposed Basin Plan amendment, in the sources section, explains that "depositional areas discharge mercury mining waste (in the form of mercury-laden sediment) to surface waters during periods of erosive flows". In other words, these areas do not solely accumulate mining waste, they also discharge it. This is consistent with the Walker Creek mercury TMDL, which described this source as follows:

> **Downstream depositional features –** Mercury-laden sediments in depositional areas (creek beds, banks, and floodplains) downstream of the mercury mines, which discharge mercury to the creek during storms

We are not proposing to delay for twenty years before addressing this source. TMDL implementation is phased, such that downstream depositional areas will be addressed during the second 10-year phase. Ideally, project construction will be completed by about year 17. This would allow for several years of effectiveness monitoring, and time for corrective actions if necessary, within the twenty years planned for implementation.

The District is responsible for many miles of engineered (i.e., flood control) channels that drain New Almaden (Randol, Greystone, Golf, McAbee, and Alamitos creeks, and Guadalupe River). The District regularly undertakes maintenance of its engineered channels, including removal of mercury-laden sediment. These maintenance activities are regulated under the Stream Maintenance Program, and these actions will count towards attaining both the Guadalupe depositional area mercury allocations and Bay legacy mercury allocations.

As previously stated, we do not plan to compel the District to undertake any specific Stream Maintenance Program-related sediment removal actions, rather we allow the District to complete these projects on their self-determined budget and program cycle. Moreover, we urge the District to follow-through on the important geomorphic and related studies needed to cleanup and restore habitat and creekbank stability along Alamitos Creek.

We plan to evaluate the District's progress on cleanup and restoration efforts for Alamitos Creek by the end of Phase 1, and we will consider whether it is necessary to compel the District (and other parties responsible for flood control) to take implementation actions to attain the depositional area allocations, in accordance with the adaptive implementation plan. See response to CWA comment no. 1, in which we describe a revision to the Staff Report regarding compelling cleanup and restoration of Alamitos Creek.

District comment no. A.3: Percolation Ponds are Mischaracterized

The proposed Basin Plan amendment and Project Report list percolation ponds under "Depositional Areas" and intimate that discharges of mercury occurs from the operation and maintenance of these ponds in the form of "sediment-laden" mercury or from "erosive flows" caused by discharges from the ponds. The operation and maintenance of percolation ponds does not result in either of these discharges, nor are the ponds depositional. Operation of the ponds is achieved by in-stream diversions that fill the ponds under controlled conditions when creek flows are low and not

transporting sediment. The water is never immediately discharged back to the creek but allowed to percolate into the ground. Maintenance activities consist of periodic scraping of the bottom of the ponds to remove algal mats that inhibit percolation. Occasionally, discharges to the creek occur during intensive rain events that overfill the ponds, but these are neither "sediment-laden" nor "erosive" and are small volumes already permitted.

The occasional overflow discharges from percolation ponds could be sediment-laden if the intensive rain event has caused erosive and turbulent flows which have stirred up bottom sediments. However, our main concern with these ponds is fish bioaccumulation of mercury. Percolation ponds are shallow impoundments, and as we proposed in the Basin Plan amendment, we "will consider the need to control methylmercury production and bioaccumulation in shallow impoundments" by the end of Phase 1 of implementation. The District's extensive network of percolation ponds has provided tremendous benefit by re-charging the underlying aquifer and stopping subsidence. To date, we have refrained from regulating percolation ponds, but plan to reconsider our regulatory strategy by the end of Phase 1, in accordance with the adaptive implementation plan.

Our concern with percolation ponds is that fish in these ponds have elevated mercury concentrations. Consequently, these ponds were included in the County's 1987 fish consumption advisory/prohibition. We think the appropriate time to address percolation ponds is in Phase 2, because these ponds are located downstream of reservoirs, and we are hopeful that methylmercury controls in reservoirs will have tremendous benefits in downstream areas. During Phase 2, we can address both mercury transport and methylation in percolation ponds, as needed.

District comment no. A.4: Reservoir Implementation Requirements are Mis-Timed

The District expressed two concerns in this comment, which we numbered A.4a and A.4b, and respond to individually.

District comment no. A.4a: The proposed Basin Plan amendment needs to be revised to adjust the timing of implementation of activities that will be required in the TMDL. If elimination of sources upstream is not completed before downstream sources are addressed, then the downstream efforts will be negated by additional contamination. We believe that once background conditions have been restored, the reservoirs will not need treatment or need only minimal treatment to meet applicable requirements.

… The Water Board now proposes in the subject documents to allow these uncontrolled discharges to continue up to an additional ten years while exonerating responsibility for the impact on [*surface*] waters for both past and future discharges. Further, the Water Board proposes in the subject documents to place full responsibility onto the District for the treatment and amelioration of the negative effects of these discharges on water quality. The District contends that any discharger of mercury must be held responsible for negative effects on [*surface*] waters, rather than transfer the responsibility to the downstream owner. If treatment is required, the dischargers must participate in a commensurate share of the costs until the discharge is stopped and its effects ameliorated. The District is the injured party, not the responsible party.

We respectfully disagree. We find the District responsible for constructing reservoirs in streams already polluted with mining waste. We further find the District responsible for constructing "deep impoundments" that experience thermal stratification in the dry season, and thereby causing water quality conditions to be very different from pre-mining or natural stream condition. Prior to the mining era, there were no natural "deep impoundments" in the watershed. Therefore, the District is responsible for addressing methylmercury production and bioaccumulation in reservoirs and lakes polluted with mining waste.

We propose an aggressive schedule to address mercury mine sites, which we describe in the proposed Basin Plan amendment as follows.

> Mercury mining waste control actions are phased so that mercury discharges from upstream will be eliminated or significantly reduced before downstream projects are undertaken. Erosion control actions at mercury mines shall be completed within the first 10 years (Phase 1).

Moreover, in the proposed Basin Plan amendment we offer the District the opportunity to comply voluntarily.

In fact, we are counting on the District's leadership and innovation to develop and promptly implement a cost-effective solution for the methylmercury problem in lakes and reservoirs. The District's success in this endeavor has potential for significance beyond this watershed, as mercury in fish is a global problem.

We are hopeful that once mining waste erosion controls are in place, the reservoirs will only need minimal and low-cost treatment. We are doubtful, based on data from the reference reservoir, that reservoirs will not need any treatment to attain fish targets.

District comment no. A.4b: The requirements in the proposed basin Plan Amendment for the District to conduct feasibility studies and special studies are prescriptive. Such studies should be allowable as a means of compliance at the option of the District in the event that the District determines that such studies are necessary.

We agree that the proposed Basin Plan amendment should provide an explanation of, but not prescribe special studies. (We do not use the term "feasibility study" in the proposed Basin Plan amendment or Staff Report.) Accordingly, we have revised the proposed Basin Plan amendment pertaining to special studies. However, we disagree that compliance should be at the option of the District (or any regulated entity). Nonetheless, in recognition of the District's excellent watershed stewardship, we provide the District, and only the District, the opportunity to comply voluntarily in conducting studies and leading coordinated watershed monitoring.

District comment no. A.5a: Inappropriate Allocation for Reservoirs

The proposed Basin Plan amendment and Project Report include a seasonal maximum water column concentration of 1.5 ng/l of methylmercury in the hypolimnion of the deep impoundments. This is an inappropriate allocation for several reasons, the most important being that it does not relate to the mass of methylmercury that is seasonally produced and potentially available for bioaccumulation.

We disagree that a concentration-based, as compared to a mass-based, allocation to reservoirs is inappropriate. In Section 8.2, we presented several alternatives for the allocation to reservoirs, and we recommend a seasonal maximum hypolimnion concentration of methylmercury. Concentration is directly related to mass, as concentration multiplied by volume yields mass. This allocation relates to the mass of methylmercury seasonally produced, accumulated, and potentially available for bioaccumulation. The peer reviewers concurred with our concentration-based approach for allocations and TMDLs.

District comment no. A.5b: Failed to Establish Assimilative Capacity

A more appropriate allocation is one that is related to the assimilative capacity of each reservoir, a necessary component of a TMDL that the Water Board has omitted from this TMDL project. The Water Board has failed to demonstrate that the elaborate calculations in the Project Report using limited data to estimate a relationship between water column methylmercury concentrations and fish tissue concentrations is more valid than estimating assimilative capacity. The proposed Basin Plan amendment also shows that the Water Board intends to require the District to conduct studies related to assimilative capacity, even though the Water Board has not

estimated, nor established a reasonable approach as to how to estimate, the assimilative capacity of the reservoirs.

We agree, we did not describe that the assimilative capacity is equal to the concentration-based TMDLs and allocations, and we have revised the Staff Report accordingly. We had received prior approval from U.S. EPA staff that we did not need to include this description because of our concentration based-approach.

Nonetheless, we agree that with additional data and more detailed studies, the TMDLs, assimilative capacity, and allocations could be revised. We even propose in Section 9.7 that the District may develop innovative reservoir management techniques that increase the assimilative capacity for methylmercury. We look forward to learning, a few years hence, the results of the District's efforts to control methylmercury production and bioaccumulation. We plan to revisit the TMDLs, allocations, and assimilative capacity in accordance with the adaptive implementation plan, by the end of Phase 1 (within the first 10 years of implementation).

District comment no. A.6: The Water Board Does Not Incorporate Incentives for Implementation, and Emphasizes Monitoring Over Source Control

In the proposed Basin Plan amendment, up to ten years is provided for responsible parties to address mining waste discharges, and up to twenty years to address ongoing discharges of mercury from creek banks. Yet, extensive monitoring will be required immediately and most intensively for the first five years, followed by reduced monitoring substituted with "special studies" that are likely to be as costly, if not more costly than the monitoring activities they replace. ... A more proactive approach would be to provide some flexibility and incentives to responsible parties to conduct implementation activities instead of monitoring and special studies. Another streamlining approach would be: instead of requiring "site investigations" (especially for sites already identified on Alamitos Creek), these should be optional if the responsible parties wish to go straight to construction design.

We have a different interpretation of the implementation plan. Yes, up to 10 years is provided to implement erosion control at mine sites and up to 20 years at depositional locations. However, we purposely did not specify monitoring frequency in the proposed Basin Plan amendment. We did describe our monitoring program in more detail in the Staff Report, and we would appreciate the opportunity to work collaboratively with the District to fine-tune it.

In Section 9.9, we describe that "Monitoring of Mercury Load to San Francisco Bay" should occur at two locations in the Guadalupe River (gage 23b and Highway 101) for the first five years, and one location (Highway 101) for the remaining 15 years. This is in accordance with previous discussions with and proposals from the District. We understood that the District selected the gage 23b location because it will additionally provide valuable information for design of flood control projects.

Also in Section 9.9 (p. 9-23), we state the following,

> Fish monitoring plans will be required to address the following questions regarding trends in fish tissue mercury concentrations:
>
> - What is the seasonal and inter-annual variation in fish mercury in the first 5 years of implementation, for remediation effectiveness indicators and target fish?
> - What is the trend in fish tissue mercury concentrations in target fish over the subsequent 15 years of implementation?

We see how this could be interpreted as "extensive monitoring will be required immediately and most intensively for the first five years, followed by reduced monitoring." However, that is not our our intent. Rather, the first question will allow us to determine the minimum frequency and sample size to answer the second question. This will save money and reduce the number of fish sacrificed. We are willing to collaborate with the District to answer the first question in the most cost-effective manner.

Also in this comment the District described its interpretation, that after five years "extensive monitoring will be … reduced [and] substituted with 'special studies'." We have a different interpretation of the relationship between monitoring and special studies. The special studies stand alone, and do not substitute for monitoring.

Of course, information from the special studies may be used to modify the monitoring program, if applicable. The special studies should be designed, as described in the Staff Report in Section 9.10, to verify assumptions used in developing the TMDL and to improve the scientific understanding of mercury cycling.

Similarly, information from the monitoring program may be used to answer the special study questions—which we encourage. To do so, the data objectives of the monitoring program should be designed to answer the special study questions.

Regarding the sites on Alamitos Creek, there is nothing in this TMDL project preventing the District from going straight to construction and design.

District comment no. A.7: Water Board Proposes Fish Sampling that is Potentially Harmful to Endangered and Protected Species

The District holds permits from the relevant agencies to conduct fish monitoring and sampling in the Guadalupe River Watershed below the reservoirs. These permits prohibit sampling activities during the months of October through April to protect salmonid species such as steelhead that are listed as Threatened under the Federal Endangered Species Act. ... Therefore, the District suggests that the agencies work together collaboratively to develop a fish sampling program that will allow the responsible parties to avoid this double jeopardy situation.

We revised the proposed Basin Plan amendment to make the special studies less prescriptive, as described in response to District comment no. A.4b. We are confident that together we (District and Water Board) can write sampling plans to provide necessary answers, and time the sampling to avoid harming endangered or protected species.

District comment no. A.8: Duplicate Reporting is Required

The District expressed two concerns in this comment, which we numbered A.8a and A.8b, and respond to individually.

District comment no. A.8a: The proposed Basin Plan amendment indicates the Water Board will require numerous reports from the responsible parties. In many cases, these reports are duplicative of reporting that is already being done. For example, the District already reports to the Water Board its mercury removal projects throughout the watershed through its existing Stream Maintenance Permit and its project-specific permits. … The District believes that a more appropriate approach is to provide flexibility in the Basin Plan amendment to allow existing reporting mechanisms to suffice. This will conserve resources that are better spent taking action than preparing duplicative reports.

The proposed Basin Plan amendment provides a comprehensive yet succinct record of the TMDL. More specific requirements will be detailed in permits and orders. We do not plan on duplicative efforts—any new or revised permits will reference and make use of existing efforts, including reporting. For example, we are hopeful that detailed reports prepared for the District's Board, or the District's internal work plans, or articles destined for publication in peer-reviewed journals, may suffice for reporting to the Water Board on the District's methylmercury production and bioaccumulation control studies.

District comment no. A.8b: The information for the "special studies" is already largely available in existing reports and other reports and work products being prepared for the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE). The

FAHCE is a consortium of state and federal agencies, local municipalities, and interested parties that are working toward a common goal of providing restored and improved water resources throughout the watershed and basin. The Water Board has been at arm's-length from this collaborative, yet if it were active as an effective collaborator, many of the issues of project could be addressed more comprehensively.

We do not plan to take or compel duplicative efforts. Accordingly, the scope of special studies can and will be reduced or modified based on readily available information from FAHCE and other sources.

District comment no. A.9: Beneficial Uses Supported by the Reservoirs are not Fully Characterized nor Protected

The District expressed several concerns in this comment, which we numbered A.9a–c, and respond to individually.

District comment no. A.9a: In the proposed Basin Plan amendment and TMDL Report several beneficial uses of the reservoirs are characterized as "impaired by mercury" but the reports fail to include adequate descriptions of the beneficial uses that are supported by the reservoirs.

We disagree that the proposed Basin Plan amendment and supporting Staff Report "fail to include adequate descriptions of the beneficial uses that are supported by the reservoirs." The Staff Report satisfies the "minimum required elements of TMDLs" as specified in the U.S. EPA Region IX *Guidance for Developing TMDLs in California* (USEPA 2000). A list of all the beneficial uses supported in the watershed is provided on p. 2-8.

District comment no. A.9b: In addition to providing municipal water supply and prevention of subsidence of the groundwater basin, the reservoirs support cold water fishery habitat and rare and endangered species. Without the reservoirs, there would be no cold water storage and the creeks would run dry each summer so there would be no cold water habitat; there would be no deep water habitat for the osprey or other diving birds. …. In general, operations to support the beneficial uses conflict with the objectives in the proposed Basin Plan amendment; that is, to support the habitat needs requires operation of the reservoirs that may exacerbate the production of methylmercury (such as retaining storage as long as possible to control temperature of releases).

We understand that inventing effective controls for methylmercury production and bioaccumulation is very challenging, let alone inventing controls that have no adverse effects on beneficial uses.

We remain hopeful that the District will be successful in developing methylmercury controls that are cost-effective, such as the solar-powered circulators already being tested. We also remain hopeful that this method will fully support beneficial uses. However, we recognize that protecting beneficial uses may require more costly methods, such as liquid oxygen or ozone, and consequently we accounted for these in our cost estimates in Section 10.5.

We plan to address problems such as a potential conflict between beneficial uses and TMDL objectives during adaptive implementation reviews. We provide specific questions to be addressed in the adaptive implementation portion of the implementation plan. The first questions are, "Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should this TMDL project be modified?"

District comment no. A.9c: The proposed Basin Plan amendment does not place the water quality issue into context with the environmental setting, nor does it even attempt to strike a balance with the various competing and conflicting objectives of the resource agencies. This places the District in an untenable situation, potentially forcing it to violate one agency's laws and regulations in order to comply with another's. The Regional Board needs to better coordinate with the other federal and state regulatory and trustee agencies to incorporate its concerns into the existing resource protection activities.

We disagree that the proposed Basin Plan amendment and supporting Staff Report fail to "place the water quality issue into context with the environmental setting." Section 3 provides "Watershed Description and System Characteristics," and many other facets of the environmental setting.

The TMDL addresses the challenge of mercury-contaminated fish. This aim is not in opposition to the goals of other agencies. Through the TMDL, we seek to restore the watershed to the "fishable" quality specified by the authors of the Clean Water Act. The Water Board incorporated many of the actions the District already has underway to improve this watershed in the proposed Basin Plan amendment. We have no intention of placing the District or others in an untenable situation, nor do we agree that the proposed Basin Plan amendment places anyone in an untenable situation. We are committed to continuing our successful partnership with the District, making mercury control actions a grant funding priority (see response to District comment no. 2.2a), and working through the challenges of controlling methylmercury.

District comment no. A.10: Inclusion of "Reference" Reservoirs and Lake … is Flawed

The District expressed two concerns in this comment, which we numbered A.10a and A.10b, and respond to individually.

District comment no. A.10a: The lake and reservoirs that are the subjects of the proposed Basin Plan amendment and the TMDL Project Report are unique from one another in many ways. It is impossible to collect data at the level of resolution needed for the purposes of the TMDL Project Report and the proposed Basin Plan amendment. The level of resolution that we can measure in the reservoirs will not allow meaningful comparisons between reservoirs.

We disagree that our use of reference reservoirs is flawed, or that "it is impossible to collect data at the level of resolution needed." The Peer Reviewers confirmed that the reference reservoir approach is appropriate (see also response to GRDC comment no. 6). District staff is aware of the anticipated benefits from, as well as the challenges in, the reference reservoir approach relied upon in these TMDLs. The reference reservoir approach was discussed at meetings of the Guadalupe Mercury Work Group, and early in TMDL development brought to the attention of the Technical Review Committee (TRC).

TRC member and mercury expert Don Porcella promoted the use of Lexington as a reference reservoir. In his December 2003 comment letter on the draft Conceptual Model, Don Porcella stated the following:

> Based on the presentations and the conceptual model itself, along with the discussion that took place in the meeting, I offer the following suggestions that are meant to enhance the work undertaken to answer the specific hypotheses listed in Chapter 4: …
>
> 8. Consider the possible use of Lexington Reservoir as a control for the reservoirs most affected by the Almaden mine wastes.

The TRC was an appropriate group to review the reference reservoir approach; the Peer Reviewers were another appropriate group and they also confirmed the reference reservoir approach is appropriate. District staff had full control of the budget for the Technical Review Committee (TRC), and unilaterally and without consultation with the Work Group co-chair, or other members of the Work Group, eliminated the TRC (after two TRC meetings, for which the TRC approved the preliminary Conceptual Model and Data Collection Plan, but before the TRC had a chance to review the Data Collection Report or the Draft Conceptual Model Report.)

These are the District's first written comments on the TMDL despite two previous opportunities (January 2006 and August 2007). Differences of opinion are common in technical and policy fields. We need to learn from this experience and work together in a more collaborative and productive fashion in the future.

District comment no. A.10b: The TMDL Project Report also indicates the intention of the Water Board to require the responsible parties to conduct fish tissue monitoring in Lake Elsman, Lexington Reservoir and Vasona Lake. (Note: Lake Elsman is privately-owned by a corporation not identified as a responsible party in the proposed Basin Plan amendment. It is unlikely that the Water Board can compel the responsible parties to collect samples from this lake. Also, despite its name Vasona is a reservoir owned and operated by the District. It bears little resemblance to any of the water bodies that are the subjects of the TMDL). Whatever data would be produced from such sampling is more likely to be confusing than enlightening, and further dilutes available resources away from addressing the problem: controlling the sources of mercury.

In response to this and other comments, we revised Section 9 to more clearly describe the responsible parties.

We recognize that the fish sampling plan in particular would be improved by collaborating with the District, see response to District comment no. A.7. Together, as we craft the sampling plan, we can decide if sampling Lake Elsman (upstream of Lexington Reservoir), or Vasona Lake (which, like Lake Almaden, receives urban runoff) provides answers to necessary questions.

Regarding compelling San Jose Water Company to sample Lake Elsman, except for naming the District (because of the District's status as watershed stewards), we have chosen to not name the individual responsible parties in the proposed Basin Plan amendment. As described at the outset, we revised Section 9 to more clearly describe the responsible parties. We will name responsible parties in permits and orders. Not naming responsible parties in the proposed Basin Plan amendment does not in any way prevent us from issuing California Water Code § 13267 technical report requirements to responsible parties. These § 13267 letters could require sampling be conducted or that access be provided for sampling by the coordinated watershed monitoring field team.

District comment no. A.11: The Proposed Basin Plan Amendment and TMDL Project Report Are Not Consistent with or Aligned with Other Water Board Regulations

Due to the specific and detailed nature of the proposed Basin Plan amendment [see District comment. no. A.1], it is no longer in alignment with the Municipal Regional Permit for Stormwater Discharges … . The proposed Basin Plan amendment also includes several sections where it is stated that the Water Board will use specific authorities to compel responsible parties to take actions, even though in many cases

the responsible parties are already regulated under existing permits issued by the Water Board and these permits already cover those actions.

We disagree; the proposed Basin Plan amendment is consistent and aligned with the draft Municipal Regional Permit. Where we have already compelled actions, and those actions are sufficient for TMDL purposes, we do not plan to take or compel duplicative efforts.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from County of Santa Clara, Environmental Resources Agency, Parks and Recreation Department (Parks)

The Parks comment letter consists of a cover letter from the Director with general comments (numbered 1.1, 1.2, 2, 3, 4, 5.1, and 5.2), and two attachments by their consultant, URS Corporation. The consultant's first attachment contains detailed comments (numbered A.1–A.8), and the second illustrates their requested changes to the proposed Basin Plan amendment (numbered B.1–B.3).

We thank Parks and their consultant for their constructive comments. Parks' main concerns relate to the mercury mining waste allocations, which we respond to in detail herein. In response to their and others' concerns, we revised the allocation to mining waste, and revised the Staff Report and proposed Basin Plan amendment (*footnote a in Table 7-B*) to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas.

Parks comment no. 1: Data Lacking to Support Correlation between Sediment Mercury and Bioaccumulation

Parks expressed two concerns in this comment, which we numbered 1.1 and 1.2, and respond to individually.

Parks comment no. 1.1: … [T]here continues to be a dearth of technical understanding regarding effective mercury and methylmercury management actions. This is an overarching concern of the County. In particular, the proposed Basin Plan amendment still lacks a technical justification for its central management approach, which is premised on the notion that a reduction in the concentrations of mercury in soil and sediment will result in a reduction in the levels of methylmercury in fish tissue (see SR pp7-14)

There is convincing evidence from around the world that source control (which reduces the concentration of mercury in sediment) results in reduction in the levels of methylmercury in fish tissue. Figure RTC-1 illustrates the substantial decreases in fish mercury concentrations from source control and other remediation actions. Figure RTC-1 is based on Table 4.3, *Change in Fish Tissue Mercury Concentration after Remediation Efforts* (CVRWQCB 2004).

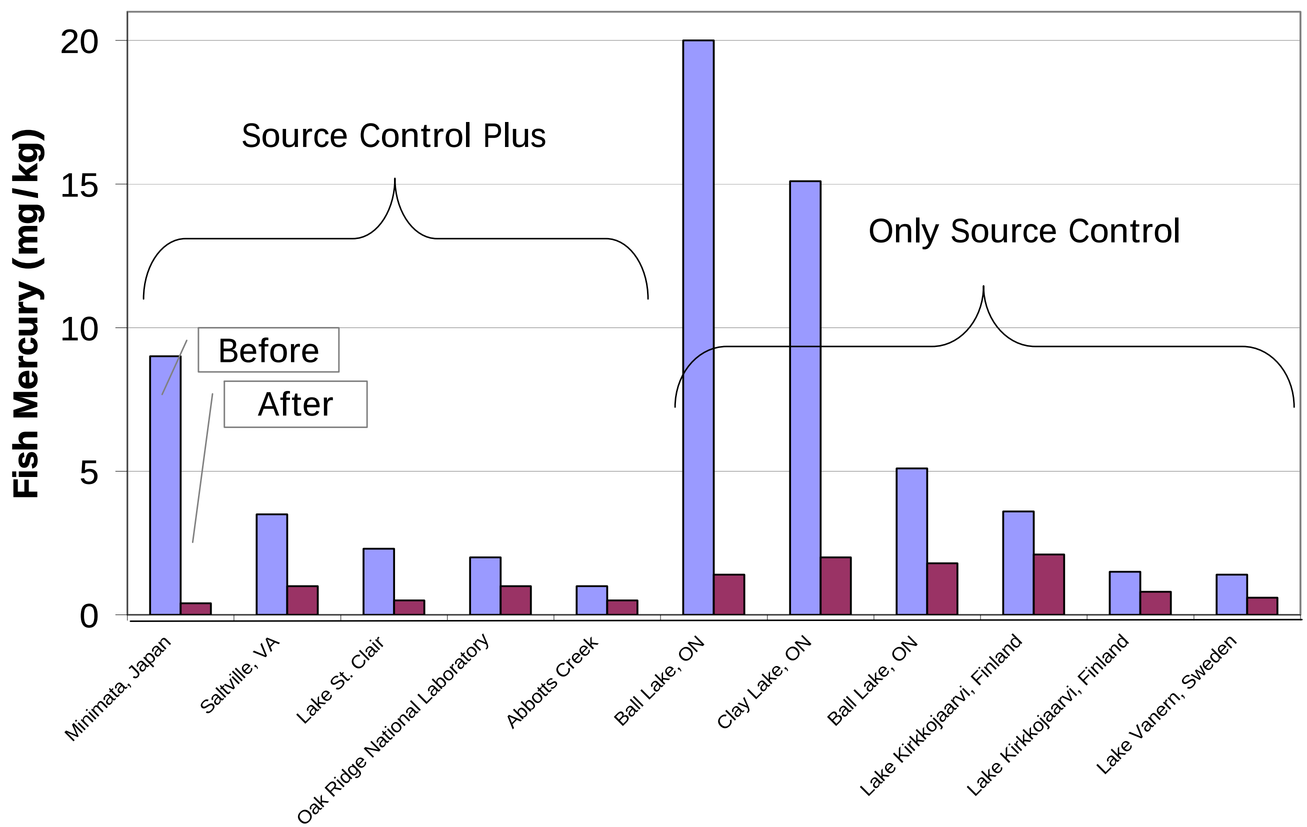

Figure RTC-1 Change in Fish Tissue Mercury Concentration after Remediation Efforts

Remediation results in substantial decreases in fish mercury concentrations from, on the right, "only source control," and on the left, source control combined with other remediation actions such as dredging. Figure RTC-1 is based on Table 4.3, Change in Fish Tissue Mercury Concentration After Remediation Efforts (CVRWQCB 2004).

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Parks comment no. 1.2: Without such a data connection, there is no basis to conclude that reduction of mercury in sediment under the proposed TMDL and Basin Plan amendment would reduce mercury in fish tissue…

In fact, data from the Guadalupe River watershed provide that connection. These data support that lower mercury concentrations in reservoir and lake bottom sediments result in lower fish tissue methylmercury concentrations (Section 7.1, Qualitative Linkage from Sources to Targets, February 2008 Staff Report for Public Comment).

Parks comment no. 2: Concern: Proposed Deadlines for Action are not Achievable

Water Board staff disagrees with changing the deadlines at the outset. We plan that implementation will be phased over 20 years, for integration with the San Francisco Bay mercury TMDL. It is important that erosion control at the mine sites be completed in the first ten years, as these upstream actions will protect downstream areas to be addressed in the second ten years.

Despite the importance of completing upstream actions first, we have left open an opportunity to extend the deadlines. As stated in the adaptive implementation section of the proposed BPA, "The Water Board staff will present an annual progress report to the Water Board on implementation ... Within ten years of the effective date of this TMDL project, the Water Board will consider amending this TMDL project and implementation plan as necessary ... Reviews ... will provide opportunities for stakeholder participation. Water Board staff will propose modifications to the … schedule ...”

Parks comment no. 3: Recommendation: Consistent Approach to Regional Problem

Establish consistent regional (Delta-Bay-Guadalupe) mercury program

The Guadalupe, Bay, and Delta mercury TMDLs are closely integrated, as required by the State Water Board (Section 8.6). The Guadalupe and Walker mercury TMDLs are also closely integrated (e.g., same water quality objectives and fish targets).

Parks comment no. 4: Recommendation: Phased Approach

… The proposed phased approach would allow the County to: (a) conduct field investigations of mercury in soil and sediment within the park, (b) integrate this research with other studies of the factors that may contribute to the methylation and

bioaccumulation of mercury in fish, and (c) propose focused efforts to reduce mercury loading in the Guadalupe watershed. …

The proposed Basin Plan amendment already incorporates this phased approach, including Parks steps (a) and (c). Under "Implementation Actions for Mercury Mines," the BPA includes both "1. Conduct a site investigation evaluating the erosion potential of mercury mining waste…" and "2. Develop plans and schedules to control mercury mining waste discharges…"

Regarding Parks step (b), Parks has already participated in just such a program as they are proposing with this comment. The Guadalupe Mercury Work Group (see Section 3.1), which Parks participated in, was established to provide oversight for development of the Conceptual Model of Mercury Behavior in the Guadalupe River Watershed. We used this conceptual model as the scientific basis of this TMDL project, and the supporting Staff Report has been subjected to the required Peer Review scrutiny.

Further, we requested that the other stakeholders, including Parks, contribute funds together with the Santa Clara Valley Water District, towards development of the Conceptual Model. Parks declined to contribute funds. At this point in time, we believe that funding is better spent on implementation of the TMDL project, rather than further scientific research.

Also regarding Parks step b), in any case, we do have a method to incorporate new scientific information into the TMDL project. Adaptive implementation allows us to consider how we should modify the TMDL project. Therefore, if Parks chooses to pursue a study of the factors that may contribute to the methylation and bioaccumulation of mercury in fish, we can potentially use these results. We would suggest Parks consider a study on creeks in and immediately downstream of the New Almaden Mining District.

Parks comment no. 5: The proposed 0.1 ppm erodible soil standard could require elimination or armoring of large areas of natural soils within the park, at great cost in monetary terms, as well substantial ecological damage.

Parks expressed two concerns in this comment, which we numbered 5.1 and 5.2, and respond to individually.

Parks comment no. 5.1: Recommendation: Flexibility for Adjusting Sediment Mercury Limits in Mineralized Areas

Almaden Quicksilver County Park is located in an area that has a high concentration of naturally occurring sediment mercury …. As noted in [Attachment A], it is not reasonable to set the same sediment mercury standards for mineralized (deposits

containing naturally occurring sediment mercury) and non-mineralized areas. Indeed, those differences between mineralized versus non-mineralized areas represent the difficulty inherent in the "one size fits all" 0.1 [mg/kg allocation]. One size does not fit all. … The [Central Valley Water Board, in their mercury TMDLs] acknowledges the differences between mineralized and non-mineralized areas and proposes to allow a higher concentration of sediment mercury in mineralized areas than non-mineralized areas. The County recommends a similar approach, which would allow further study to determine the appropriate limit for sediment mercury in the park.

Parks restates their comment no. A.7—see our response to Parks comment no. A.7.

Parks comment no. 5.2: The rare serpentine soils and related ecology, found at many locations within the County including Almaden Quicksilver County Park, provide critical habitat for such endangered species as the Bay Checkerspot Butterfly. These areas are likely to be disturbed, if not eliminated, by steps required under the proposed Guadalupe TMDL.

We revised the Staff Report in response to Parks' comments regarding potential habitat destruction. In response to comments from several parties about the mining waste allocation, we clarified that implementation actions are directed to controlling erosion of mining waste, and not natural soils. This revision should clarify that no actions are required for areas of natural soils (serpentine or otherwise), and hence minimizes disturbed areas and preserves habitat. Additionally, we revised our regulatory analysis. We revised Sections 10.3–10.5 (from the February 2008 version), pertaining to analysis required by the California Environmental Quality Act, to more completely describe how impacts to habitat and special status species will be minimized (see response to Ms. Killough's second comment in Part 1).

Parks comments on fish tissue objectives

Parks' consultant expressed several concerns relating to fish tissue objectives, which we numbered A.1—A.4, and respond to individually.

Parks comment no. A.1: Fish tissue objectives appear to be reasonable … it appears the objectives are based on the best available science at the time of the analysis.

We agree. The fish tissue objectives were developed by the U.S. Fish and Wildlife Service.

Parks comment no. A.2: Reasonable assumptions used to calculate objectives

Comment noted

Parks comment no. A.3: Consider conducting a use attainability analysis, like the Central Valley Water Board did for Sulphur Creek

We considered the Use Attainability Analysis (UAA) in Section 10.4.4, and concluded that it cannot be justified at this time. However, the UAA option could be reconsidered at the ten year mark via the adaptive implementation process, as described in the proposed BPA, "The Water Board staff will present an annual progress report to the Water Board on implementation ... Within ten years of the effective date of this TMDL project, the Water Board will consider amending this TMDL project and implementation plan as necessary ... "

Parks comment no. A.4: Add trophic level to fish tissue water quality objectives in the proposed Basin Plan amendment and Section 6 of the Staff Report

We agree, and we corrected this oversight by revising the proposed Basin Plan amendment (Table 3-4A, and *Targets* in Chapter 7) and Staff Report (Section 6) to include “Trophic Level 3”.

Parks comment no. A.5: Linkage between Sediment Loads and Load Allocations and Fish Tissue Objectives

The linkage between fish tissue concentration and sediment concentrations as described in the Staff Report is weak, and there does not appear to be a scientific basis for the identification of a TMDL of 0.1 mg/kg mercury in suspended sediments in waters upstream of reservoirs and lakes. There was no attempt to quantitatively link fish tissue concentrations to sediment concentrations, as was done for bioaccumulation factors (BAFs) for fish tissue and water concentrations in Section 7.4. It is not clear why a similar approach was not used to develop biota-sediment accumulation factors (BSAFs) to quantitatively link sediment concentrations to fish tissue concentrations. Even better would be development of a regression equation to predict fish tissue concentrations based on sediment concentrations using historical data. While there may not be enough data to identify a strong correlation, the report does not discuss any attempt to identify a quantitative link.

We revised the allocations to mercury mining waste and mercury-laden sediment in response to both Parks comment no. A.5 and GRDC comment no. 12; we respond herein to these two comments. We revised the proposed Basin Plan amendment (Tables 7-A and 7-B) and supporting Staff Report (Section 8.1; Tables 8.1, 8.4, and new Table 8.5; and Figure 8.1).

We disagree that the derivation of the 0.1 mg/kg allocation is arbitrary. The allocations to erodible soil fines, which become bottom sediments in lakes, reservoirs, and San Francisco Bay, were calculated based on their primary destination. The upstream allocation recognized that sediments discharged upstream of reservoirs and lakes are likely to be captured in these deep impoundments. The downstream allocation recognized that eventually these sediments will be transported to San Francisco Bay.

We eliminated the 0.1 mg/kg allocation to mercury mining waste and mercury-laden sediment discharged from depositional areas downstream of mercury mines, for reasons described below. These changes result in a single allocation to mercury mining waste of 0.2 mg/kg. These changes also result in a single allocation to mercury-laden sediment discharged from depositional areas (whether downstream of mercury mines or waters that convey urban stormwater runoff) of 0.2 mg/kg. The allocation to nonurban stormwater runoff discharges, i.e., non-mineralized and non-urban areas, remains 0.1 mg/kg.

Parks commented on an apparent lack of quantitative linkage analysis between fish tissue mercury concentrations and sediment mercury concentrations. The Staff Report in Section 7.1, particularly Figure 7-2, relates increases in reservoir bottom sediment mercury concentrations to increases fish mercury concentration. This is a qualitative linkage. By inspection of Figure 7-2, bottom sediment mercury concentrations lower than 0.1 mg/kg in the reference reservoir would be required to attain fish targets in reservoirs and lakes. A quantitative analysis would require extrapolation beyond the data set. Therefore, we did not pursue a quantitative linkage analysis.

The derivation of the 0.1 mg/kg allocation was provided in Section 8.1. However, the February 2008 Section 8.1, *Mining Waste Total Mercury Allocations*, incorrectly stated that fish in the reference reservoir met targets. This statement was an error from a previous version of the report.

Correction of this error results in a single allocation to mercury mining waste of 0.2 mg/kg, and a single allocation to mercury-laden sediment discharged from depositional areas of 0.2 mg/kg. The allocation to nonurban stormwater runoff discharges, i.e., non-mineralized and non-urban areas, remains 0.1 mg/kg.

Parks comment no. A.6: Sediment Loads and Load Allocations Not Appropriate for Mineralized Areas

Parks expressed two concerns in this comment, which we numbered A.6a and A.6b, and respond to individually.

Parks comment no. A.6a: It is not reasonable to set a load and load allocations for a mineralized area equal to the concentration found in an area that does not have similar geology (deposits containing cinnabar).

[Parks provides the following citation from the *Amendments to The Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Mercury in Cache Creek, Bear Creek, Sulphur Creek, and Harley Gulch. Staff Report*. October 2005, by the Central Valley Water Board. This citation discusses concentration goals intended as a guide for cleanup efforts, not TMDL allocations.]

> **These concentrations are 0.2 mg/kg, dry weight in non-mineralized areas (Churchill and Clinkenbeard, 2004) and 3 mg/kg in mineralized zones (Pearcy and Petersen, 1990), applied to the average of mercury concentrations in samples of fine-grained soil (<63 micron) entering Sulphur Creek. The goal for mineralized zones is intended as a guide for cleanup efforts and may be adjusted as more information is gathered during feasibility studies at individual mine sites.**

Such site-specific goals for sediment in mineralized areas are mentioned in the Staff report on Page 8-4 under "Potential Allocations Based on Conditions Prior to Mining". There was no justification for not selecting this approach provided in the report. In the BPA such an approach is described under special studies (Section 9.10) but not incorporated into the Tables of numeric TMDL and Load and wasteload allocation in Sections 3 and 7. We suggest modification to the BPA Tables (See Attachment B) to allow such an approach to be used to modify the objectives, TMDLs and allocations. …

We revised Section 8.1 in response to this comment, to provide a justification for not selecting allocations based on pre-mining conditions. Data are lacking to justify an allocation based on pre-mining conditions.

There are similarities and differences in the Central Valley Water Board's approach to mercury mine-related TMDLs, and our approach in the Guadalupe. Both TMDLs mention cleanup goals in mineralized zones, and we have similar goals for addressing mercury mining waste discharges.

The Central Valley's goals for Cache Creek, Bear Creek, Sulphur Creek, and Harley Gulch are the following.

> 5.2 Sulphur Creek Sediment Implementation Goals
> … The goal for mineralized zones is intended as a guide for cleanup efforts and may be adjusted as more information is gathered during feasibility studies at individual mines. … (p. 31 CVRWQCB 2005)
>
> 5.3 Mercury Mines in the Cache Creek Watershed
> … The goals of mine implementation activities are to eliminate inputs from the mine sites that are related to anthropogenic activities and restore

> the streams as closely as possible to background conditions. …
> (p. 31 ibid).

Similarly, in the Guadalupe River watershed mercury TMDL we include a discussion of cleanup goals in Section 9.10, and our implementation goal is nearly the same as that for Cache Creek.

> 9.10 Special Studies
> Calculating the Mining Waste Cleanup Goal
> … the mining waste allocations to mercury mines are expected to be met by erosion control actions. Some erosion control measures may be designed to attain natural background mercury concentrations (e.g., excavate mining waste down to ambient, pre-mining background concentrations.) …

> 8.1 Mining Waste Total Mercury Allocations
> The goal for the mining waste allocations are to eliminate inputs of mercury to surface waters caused by anthropogenic activities (i.e., mining) to restore beneficial uses.

There are significant differences in the Central Valley Water Board's approach to mercury mine-related TMDLs from our approach in the Guadalupe. The Central Valley established TMDL allocations as aqueous (unfiltered) methylmercury concentrations (i.e., total methylmercury in the water column). A component of their mercury reduction program is to "control discharges of sediments in erosive watersheds where the total mercury sediment concentrations are greater than 0.4 mg/kg, dry weight" (p. 28 CVRWQCB 2005). They establish a remediation goal for mine sites of 95% load reduction of total mercury discharged (p. 32 ibid).

In contrast, we propose to establish TMDL allocations as total mercury in suspended sediments (Section 8.1), and our implementation goal for mine sites "is to prevent further erosion of mercury mining waste by stabilizing and vegetating slopes" (Section 9.1).

Parks comment no. A.6b: Implementing such stringent sediment standards could essentially mean armoring any potentially erosive areas (which is any exposed slope) within the Park with hard surface or complete removal of all park soils and replacement and stabilization with imported fill. Since neither of these solutions are economically achievable or practical (or desired since they would potentially damage the rare serpentine ecology in the Park) the standard would never be met. In fact, such armoring projects could result in decreased infiltration of rainfall, increased runoff, shorter runoff transport times, increased runoff flow velocity and increased

erosion of stream banks and bed which could mobilize previously buried and isolated calcine deposits.

Regarding stringent [*soil cleanup*] standards, we revised the allocations to mercury mining waste and mercury-laden sediment in response comments—see our response to Parks comment no. A.5. Also regarding stringent [*soil cleanup*] standards, we revised the proposed Basin Plan amendment (*footnote a in Table 7-B*) to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas—see our response to Mr. Cox in Part 1.

Regarding loss or damage to serpentine habitat, Parks repeats their comment no. 5.2—see our response to Parks comment no. 5.2.

Parks comment no. A.7: Different sediment objectives for suspended sediments upstream and downstream of reservoirs

It is not clear why the allocation for mercury concentrations on suspended sediments upstream of reservoirs and lakes (0.1 mg/kg from Table 7A) should be different from the allocation for mercury concentrations on suspended sediments downstream of reservoirs (0.2 mg/kg). The justification provided in the Report is that the downstream target is based on the Bay Hg TMDL target. However, setting such a target for watersheds draining to the Bay does not take into account the local geology and benefit of sediment mixing with sediments discharged from other non-mineralized areas.

We respond herein regarding "benefit of sediment mixing" to both Parks comment no. A.7 and GRDC comment no. 3. We respond to upstream allocation different from downstream allocation with our response to Parks comment no. A.5.

The "sediment mixing" approach that we used in our Walker Creek mercury TMDL is not appropriate for the Guadalupe River watershed. The Gambonini mercury mine operated for a very short period and quite recently (1964-1970), and produced much less mercury than mines in the Guadalupe River watershed which operated for roughly 150 years and produced about five percent of the world's mercury production.

Additionally, the Gambonini mercury mine drainage is an ephemeral stream separated from downstream waters by a culvert that is impassable to fish. Fish targets do not apply to the Gambonini mercury mine drainage because it does not support fish.

If we were able to apply the Walker approach to Guadalupe, the logical mixing point is the top of Guadalupe River, where Alamitos and Guadalupe creeks converge. However, Alamitos, Calero, Randol, Greystone, Golf, and Guadalupe creeks do or potentially support fish (Figures 7-47 & 8-39, SCVWD 2006). Therefore, unlike Walker, allocations would have to meet fish targets. Let us examine fish in the mineralized zone in more detail.

Nearly all creeks on Los Capitancillos and Santa Teresa ridges in the Guadalupe River watershed are ephemeral and do not support fish. However, both Golf and Guadalupe creeks in the New Almaden mineralized zone support fish. Therefore, fish targets do apply to these waters. Golf Creek is located on the northeast portion of Los Capitancillos ridge. The upper portion of Golf Creek is located on Los Capitancillos ridge and does not benefit from sediment mixing. Lastly, we note there are no fish data from upper Golf Creek, which, if they met targets, and if sediment data were available, could be used to establish a sediment mercury allocation.

In contrast, Guadalupe Creek benefits from sediment mixing over its entire length. The upper portion of Guadalupe Creek drains Mt. Umunhum, outside of the mineralized zone. Guadalupe Reservoir extends to the confluence of Guadalupe and Los Capitancillos creeks, the first point at which Guadalupe Creek receives discharges from the mineralized zone. The linkage analysis shows that until methylmercury produced in and released from reservoirs is addressed, we cannot assess the importance of methylmercury production in downstream reaches. Similarly, we cannot use data from Guadalupe Creek to establish sediment mercury allocations, until methylmercury from Guadalupe Reservoir is addressed.

In conclusion, there is insufficient data available and insufficient reservoir methylmercury controls to establish an allocation that takes into account the local geology and benefit of sediment mixing with sediments discharged from other non-mineralized areas.

Parks comment no. A.8: Phased TMDL Approach
Due to the lack of a documented linkage between sediment-based load allocations and target fish tissue concentrations, a phased approach would be appropriate for this TMDL.

We are relying on the Adaptive Implementation process as described in the proposed BPA and supporting Staff Report, as we do in our other TMDL projects, rather than a "phased TMDL." We are confident that adaptive implementation will lead to the same endpoint as a phased TMDL. Under adaptive implementation, similar to a phased approach future actions are conditioned and in part crafted on the results of earlier work.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Parks Comment no. B.1: Suggested changes to Table 3-4A (freshwater water quality objectives for mercury) in the proposed Basin Plan amendment:

- **Add trophic level 3**
- **Add footnote that water quality objectives will be reviewed every five years … in accordance with phased TMDL approach**
- **Add footnote of trophic level 3 fish species from list in Staff Report**

We agree with adding trophic level 3, and have revised the proposed Basin Plan amendment (Table 3-4A) and Staff Report accordingly, as we described in response to Parks comment no. A.4. We are relying on adaptive implementation in this (and in our other TMDL projects), as described in response to Parks comment no. A.8, therefore, we do not agree with adding the first suggested footnote. We do not think it is necessary to add a footnote listing the trophic level 3 fish species, because the supporting Staff Report provides a suitable reference.

Parks Comment no. B.2: Suggested changes to Tables 7-A (TMDLs) and 7-B (Allocations) in the proposed Basin Plan amendment regarding reviewing and revising TMDLs and allocations every five years in accordance with the Phased TMDL Approach, and to add the following underlined text to the TMDL and allocation to waters upstream of reservoirs and lakes: 0.1 mg mercury per kg suspended sediment (dry wt., annual median) <u>or site-specific load</u>

Regarding reviews every five years, Parks repeats their comment no. A.8—see response to Parks comment no. A.8. Regarding revising TMDLs and allocations to a site-specific load based on mineralized geology, Parks repeats their comment no. A.7—see response to Parks comment no. A.7.

Parks Comment no. B.3: For the implementation actions for mercury mines, add a first step consisting of a work plan to be completed in six months, and then complete the site investigation on a schedule to be provided in the work plan [rather than the schedule outlined in the proposed Basin Plan amendment].

This comment repeats Parks comment no. 2, in which they expressed concern that the proposed deadlines are not achievable. We disagree with changing the deadlines at the outset, but provide schedule flexibility via adaptive implementation (see our response to Parks comment no. 2).

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Guadalupe Rubbish Disposal Company (Todd Maiden of Reed Smith LLP)

In their introductory comments, Guadalupe Rubbish Disposal Company, Inc. (GRDC) expressed appreciation for the "significant amount of work that [staff] have committed to both the project and to working with various stakeholders…"

Also in their introductory comments, GRDC mentioned some concerns. We respond to their concerns with our responses to their specific comments below. GRDC closed their introductory remarks with a statement of support for the TMDL objectives, and acceptance of the use of BMPs for erosion control at mine sites.

> We thank GRDC for acknowledging our hard work and outreach to stakeholders. We respond to their specific comments below, by topic as enumerated in their letter.

GRDC comment no. 1: The TMDL Does Not Satisfy The Clean Water Act's Requirement That TMDLs Must Be Based on a Daily Limit.

> We revised Section 8.6 (*Total Maximum Daily Loads [TMDLs]*) to include daily load expressions in grams per day (g/d), in response to numerous comments that "daily means daily", and given U.S. EPA's draft guidance providing calculation methods for "daily load expressions" (USEPA 2007).
>
> TMDLs are "[t]he sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background. … TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure" (Code of Federal Regulations, Title 40, §130.2[i]). We established concentration-based TMDLs in accordance with this provision of the Clean Water Act.
>
> The TMDLs of mercury to the impaired waters of the Guadalupe River Watershed are the combination of concentration-based allocations proposed in Sections 8.1–8.5, and summarized on Table 8.1. A daily or average daily TMDL is inappropriate for the proposed allocations due to both (1) the temporal component embedded in the applicable water quality standards that the allocations were developed to protect, and (2) the nature of mercury transport and methylmercury production in rivers and reservoirs. The allocations protect wildlife and human health beneficial uses related to consuming watershed and Bay fish. The water quality objectives, which protect these uses, are the narrative bioaccumulation objective, the numeric fish tissue objectives, and the numeric mercury CTR criterion. These objectives reflect environmental exposure over time and therefore it is preferable to assign a concentration limit (rather than a daily or average daily load [i.e., mass per time]) to ensure attainment of these objectives.

> The District of Columbia (D.C.) Circuit Court of Appeals issued a decision in *Friends of the Earth, Inc. v. EPA, et al.*, No. 05-5015 (D.C. Cir. 2006), in which the D.C. Circuit held that two TMDLs for the Anacostia River (one established by U.S. Environmental Protection Agency [EPA] and one approved by EPA) did not comply with the Clean Water Act because they were not expressed as *daily* loads. As a result of the decision, EPA issued a memorandum entitled *Establishing TMDL "Daily" Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA et. al., No. 05-5015 (April 25, 2006) and Implications for NPDES Permits* in November 2006 that recommends that all TMDLs and associated load allocations (LAs) and wasteload allocations (WLAs) include a daily time increment in conjunction with other temporal expressions (e.g., annual, seasonal) that may be necessary to implement the relevant water quality standards. Subsequently, in June 2007, the U.S. EPA Office of Wetlands, Oceans & Watersheds issued draft guidance providing calculation methods for "daily load expressions" (USEPA 2007).
>
> This D.C. Circuit precedent does not apply to California, which is subject to the 9th Circuit Court of Appeals. We nonetheless provide an interpretation of our concentration-based approach as a daily load expression in grams per day (g/d), in accordance with the draft U.S. EPA guidance. U.S. EPA noted in this guidance document that "for pollutants where the [*water quality standard*] has a longer than daily duration (e.g., monthly or seasonal average), individual values that are greater than the daily expression do not necessarily constitute an exceedance of the applicable standard."

GRDC comment no. 2: A TMDL Cannot Be Based on Mercury Concentration in "Erodible Soil."

… The proposed Basin Plan amendment and the [Staff] Report establish a TMDL based not on a daily discharge rate, but rather on a static concentration of mercury in soil, regardless of what total quantity of mercury actually discharges to navigable waters. … the [Staff] admits:

> **[T]he Guadalupe Linkage Analysis (see Section 7.1) for inorganic mercury is qualitative, so <u>it does not provide a scientific basis for a mass load in the Guadalupe River watershed</u>. [Staff] Report at 8-4 (emphasis added).**

This admission is tantamount to conceding that the TMDL does not provide the very information that it is required to provide, namely "an understanding of pollutant loading sources and the amounts and timing of pollutant discharges [that] is vital to the development of effective TMDLs." … Moreover, an "erodible soil fines" standard simply will not and cannot serve to determine "the maximum amount of a pollutant that may be delivered to the waterbody and still achieve water quality

standards." The "maximum amount" must be determined based on how much mercury is discharged to the system, and cannot be based on the concentration of mercury in the soil, i.e., one cubic yard of heavily contaminated erodible soil may result in a lower total discharge of mercury than a millions of cubic yards of lightly contaminated soil.

> We revised Section 8.1 (*Potential Mass Load Allocations*) in response to this comment. We clarified that because of the high uncertainty in the 2004 load estimates, together with high interannual variability in loads, it would be impractical to regulate on the basis of annual or daily mass loads of total mercury.
>
> We disagree that a TMDL cannot be based on the mass of mercury in erodible soil. Mercury's greatest threat is in waters where it is methylated and bioaccumulated. The primary mercury transport mechanism to waters in this watershed is stormwater erosion of mercury mining waste (see Section 4). We described in Section 8.1 that, "Soil fines on the landscape become suspended sediments when they are transported by stormwater runoff to surface waters. Erosion is assumed to be controllable and "erodible" means material readily available for transport by stormwater runoff to surface waters (see Section 8.1). Therefore, we based our allocation to mining waste on suspended sediments in the water column.
>
> We disagree that the pollutant loading (source) analysis is inadequate. In Sections 4 and 7 we provide a detailed "understanding of pollutant loading sources and the amounts and timing of pollutant discharges [that] is vital to the development of effective TMDLs". In Section 4.3 we provide an estimate of the uncertainty in loads, and state, "these load estimates are useful in comparing the relative loads from different sources and in different locations in the watershed, and [Water Board staff] do not currently anticipate a need for more precise load estimates from the upper watershed." Peer reviewer Prof. Sedlak concurred, as follows.
>
>> The identification of sources, linkage analysis and allocations are based upon data collected recently by [Tetra Tech]. Although the heterogeneity of the system and its complex hydrology make it difficult to estimate some of the values accurately, the staff has attempted to apply best professional judgment in a way that allows for cleanup to begin soon. In my opinion, the adaptive management approach advocated by the staff is superior to spending more time quantifying loadings and sources.
>
> We respond to GRDC's point regarding loading of mercury rather than soil, with our response to GRDC comment no. 4.

GRDC comment no. 3: An "Erodible Soil" Standard of 0.1 ppm or 0.2 ppm is Excessively Stringent Because It Fails to Account for Dilution

...the proposed TMDL's approach fails to consider the dilutive effect of uncontaminated sediments from entering into the watershed. If the concentration-based approach is accepted, then the erodible fines standard needs to be derived using the same method for water-based TMDLs, i.e., the erodible fines standard should be raised to include the dilutive effect of clean sediments. As proposed, the erodible fines requirements of 0.1 ppm and 0.2 ppm are excessively stringent and not consistent with the Clean Water Act.

> We disagree that the allocations are excessively stringent or not consistent with the Clean Water Act. In fact, the Clean Water Act requirement of a margin of safety in TMDLs results in stringent TMDLs. Also, neither the Clean Water Act nor regulations specify methods by which to establish TMDLs, whether sediment- or water-based TMDLs. We respond regarding "raised to include the dilutive effect of clean sediments" with our response to Parks comment no. A.7. Also as described in response to both Parks comment no. A.5 and GRDC comment no. 12, we revised the mercury mining waste allocation to 0.2 mg/kg.

GRDC comment no. 4: Standard based on "erodible soil" is vague and unworkable

Even if a TMDL based on mercury concentrations in erodible soils were lawful, the standard is unworkable as a practical matter. How does one determine which soils are "erodible?" Aren't all soils erodible to some degree? The Report defines "erodible soil" as "soil that is transported by storm runoff to [*surface*] waters." [Staff] Report at 8-17. Thus, for a landowner to know whether certain soils are "erodible soils" those soils must have already been transported by stormwater runoff to [*surface*] waters, making post hoc control of those discharges impossible...

> Soil erosion is visually obvious on the landscape. The following are some visual indicators of erosion: rills, gullies, lack of vegetation, turbid stormwater discharged from the area, slumps, and landslides. We described in Section 8.1 that, "Erosion is assumed to be controllable and "erodible" means material readily available for transport by stormwater runoff to surface waters (see Section 8.1). Soil fines on the landscape become suspended sediments when they are transported by stormwater runoff to surface waters."

> GRDC asks in this comment, "How does one determine which soils are 'erodible?' Aren't all soils erodible to some degree?" GRDC operates a landfill, and like all landfills, it is an extensive grading and construction site with comprehensive soil erosion controls designed by technical professionals, many of whom are licensed by the State of California, installed by competent operators,

and they rely on their contractors' best professional judgment based on visual assessment of the performance of these controls.

In Section 8.1, we describe "The goal for the mining waste allocations are to eliminate inputs of mercury to surface waters caused by anthropogenic activities (i.e. mining) to restore beneficial uses." Therefore, the only permissible discharge from mine property is that naturally generated by erosion of undisturbed soil. Also from Section 8.1, "The principal concern with mining waste is wet season stormwater transport of inorganic mercury to surface waters. Implementation actions [must be] taken to prevent the erosion and transport of mining waste from the landscape to surface waters …"

We currently propose to implement the allocations at mine sites by requiring the installation and maintenance of best management practices to control erosion of mining waste. These are the same methods that GRDC routinely implements at their landfill operations. Alternatively, we could pursue the same strategy as the Central Valley Water Board. They require a 95 percent load reduction at mine sites in the Cache Creek watershed, which requires mining wastes to be "protected from exposure [to stormwater]" i.e., excavated, then placed over and under impervious liners. However, unlike in the Guadalupe, mercury mines in the Cache Creek watershed generate acid mine drainage. As explained in response to Board Member Singh, we think that erosion control provides better than 70% load reduction, and is sufficient.

GRDC comment no. 5: An "Erodible Soil" Standard of 0.1 ppm or 0.2 ppm Is a De Facto Soil Cleanup Standard That Is Excessively Stringent.

As drafted, the proposed TMDL imposes de facto soil cleanup standards… While the proposed Basin Plan amendment and the [Staff] Report lack any valid basis for setting the erodible soil standard at 0.1 mg/kg, it explains that the 0.2 mg/kg erodible standard is based on the San Francisco Bay Mercury TMDL. Yet, there is no explanation in the [Staff] Report as to why a marine mercury sediment standard is appropriate for a freshwater "erodible soil" standard... the proposed Basin Plan amendment and the [Staff] Report admit that it has not undertaken any kind of scientific evaluation of the purported "cleanup standards" other than adopting a background concentration of 0.1 ppm from "background" sediment concentrations in the Lexington Reservoir.

We revised the proposed Basin Plan amendment (*footnote a in Table 7-B*), in response to numerous comments about mining waste allocations, to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas (see response to Mr. Cox in Part 1). Also, see our responses to Parks comment no. A.5. in which we describe the change in allocation to mercury mining waste.

GRDC comment no. 6: Lexington Reservoir is not an appropriate reference site because it is not located in mineralized geology

The [Water Board's] decision to use Lexington Reservoir sediments to represent background sediment concentrations is neither justified nor logical. An appropriate reference site should be a site that is mineralized but not impacted by mining operations.

The justification for Lexington Reservoir as the reference reservoir is provided in Section 7.6 (*Mercury in the Reference Reservoir*), and Section 7 *Key Points*, as follows. "Lexington Reservoir was selected as the reference reservoir for this TMDL because it receives no mercury mining waste or urban runoff." Also, see response to District comment no. A.10a regarding Technical Review Committee member Don Porcella's recommendation for Lexington Reservoir as the reference reservoir.

We disagree that Lexington Reservoir is not an appropriate reference site for the reasons provided in response to District comment no. A.10a. Theoretically, there may be better reference sites, such as a (hypothetical) reservoir in this watershed in mineralized soil but not influenced by mining. However, no such reservoir exists in this watershed. Consequently, we were careful to address the challenges of the reference site approach, by drawing this approach to the attention of the Peer Reviewers (see Section 10.3, *Peer Review…*). Prof. Tullos stated, "…Lexington Reservoir appears to be a suitable reference site for this analysis due to [its accessibility to human fishers] and lack of mining in the basin… ." Prof. Sedlak stated, "…land use data support the idea that the Lexington Reservoir may be representative of the pre-disturbance conditions in the watershed…."

(Also as discussed in Section 10.3 *Peer Review…*, Professors Sedlak and Tullos raised some questions with respect to our interpretation of fish tissue mercury concentrations in the reference reservoir. They did not suggest that the reference reservoir approach was flawed, and we revised our interpretation of fish tissue mercury concentrations.)

GRDC comment no. 7: The TMDL Does Not Provide Evidence That Downstream Mining Wastes from GRDC Are Impacting Guadalupe Creek.

The proposed Basin Plan amendment and the [Staff] Report do not provide evidence [of] mining wastes or mercury discharges from the former Guadalupe Mine area [to] Guadalupe Creek.

Data collection for the TMDL was designed to characterize typical watershed conditions. It was specifically designed to avoid pinpointing any one discharger or responsible party.

In October 2007, Water Board staff inspected GRDC. During the inspection, we pointed out areas to GRDC representatives where mining waste is eroding uncontrollably from GRDC property into Guadalupe Creek. As a result of this inspection, and other Water Board enforcement actions, GRDC has undertaken some erosion control efforts for mercury mining waste, and is in the process of developing an erosion control work plan.

GRDC comment no. 8: The [Staff] Report Confirms That There Is No Need to Assign Allocations to Mining Sources Downstream of the Reservoirs.

The TMDL admits that the reduction of mercury and methylmercury in the reservoirs and upstream mining areas is the key to meeting the water quality objectives.... There is no justification for requiring downstream mining sources to implement load reduction strategies to meet the TMDL target.

We disagree that there is no need to assign allocations to, or reduce loads from, mercury sources downstream of reservoirs and lakes. (These sources include mercury mines downstream of Guadalupe Reservoir, and depositional areas downstream of reservoirs and lakes.) We agree that reductions of mercury loads from sources downstream of reservoirs and lakes may not be needed to obtain fish targets within the watershed. This TMDL project anticipates that methylmercury controls in reservoirs and lakes will be effective in attaining these downstream targets.

However, reductions of mercury loads from sources downstream of reservoirs and lakes are needed to attain the legacy mercury allocation assigned by the Bay mercury TMDL to this watershed, and to attain the Bay TMDL's sediment target of 0.2 mg/kg. These load reductions are necessary to protect the South Bay Salt Ponds Restoration Project and San Francisco Bay.

GRDC comment no. 9: The Guadalupe Mines Are Improperly Included in the New Almaden Mining District

This is arbitrary and improper as the Guadalupe Mine area is distinctly separated in size and location from the extensive mining operations of the New Almaden Mining District.... The proposed Basin Plan amendment and the [Staff] Report fail to explain the technical basis for creating the "New Almaden Mining District" or provide justification for including the Guadalupe Mine.... The proposed Basin Plan amendment arbitrarily lumps the Guadalupe Mines with other mines to suggest that

the extremely high mercury found in other areas is present near the Guadalupe Mines.... Further, the [Staff] Report provides support for excluding the Guadalupe Mine from this arbitrary category "New Almaden Mining District." It indicates that sites located downstream from the reservoir, such as the Guadalupe Mine, appear not to be the cause of elevated methylmercury levels. [Staff] Report at 7-9. Also, much of the Lower Guadalupe Creek has been restored by the Santa Clara Valley Water District by the removal of sediments.

In response to this comment (although the Guadalupe Mine was correctly included in the New Almaden Mining District), we revised the definition of the New Almaden Mining District in Section 3.4 (*definitions*). We also revised Sections 8 and 9, and the proposed Basin Plan amendment (*Sources*, *Table 7-B*, and *Implementation Actions for Mercury Mines*).

Previously, we defined the New Almaden Mining District as, "Los Capitancillos ridge and its extensions, and the processing areas on adjacent hillsides". Guadalupe mine is located on Los Capitancillos ridge, adjoining Senador mine (p. 158 Bailey & Everhart 1964). Historically, Guadalupe Mine retained a separate name because of separate ownership and operations, despite its location on Los Capitancillos ridge.

Guadalupe mine has similar environmental problems to those identified in Almaden Quicksilver County Park, which comprises the vast majority of the New Almaden Mining District—erosion of mercury mining waste into surface waters (Guadalupe Creek). This uncontrolled erosion has re-contaminated the downstream section of Guadalupe Creek that the District restored.

However, a name change is immaterial. Therefore, we made this name change in deference to GRDC's request, and in deference to historic artifact.

GRDC comment no. 10: It Will Not Be Necessary to Impose Additional Requirements on Downstream Sources If the Upstream Reductions Achieve the Objectives of the TMDL.

We disagree for reasons provided in our response to GRDC comment no. 8.

GRDC comment no. 11: The Allocation for Mining Waste Discharges from Areas Below the Reservoirs Should Be Increased Substantially.

Even if the [Staff] Report continues to assign allocations to downstream mining sources, those "erodible soil" concentrations should be increased substantially.... the 0.2 ppm erodible soils standard is arbitrary and unnecessarily stringent for these limited downstream areas.

> We disagree for reasons provided in our response to GRDC comment no. 8.

GRDC comment no. 12: The Derivation of the 0.1 ppm/0.2 ppm Standards is Arbitrary and Logically Flawed.

The Report's target mercury concentrations in "erodible soil" are based on flawed logic. It reasons that: (1) fish in the Lexington Reservoir have acceptable mercury levels; (2) average mercury levels in the Lexington Reservoir sediments are less than 0.1 ppm; therefore (3) locations where sediment mercury concentrations exceed 0.1 ppm or even 0.2 ppm will result in fish with unacceptably high mercury concentrations. Report at 7-2 and 8-4. This logical progression is invalid. One cannot reason that if fish with acceptable mercury burdens live in a reservoir with average mercury concentrations of 0.1 mg/kg, then locations where mercury concentrations exceed 0.1 mg/kg will result in fish with unacceptably high mercury burdens. The Report does not provide any basis or evidence to conclude that fish in areas with sediment mercury concentrations higher than 0.1 ppm or 0.2 ppm will necessarily have mercury concentrations above the fish tissue targets.

> GRDC restates Parks comment no. A.5—see our response to Parks comment no. A.5.

GRDC comment no. 13: The TMDL is Improperly Limited to Sediment Load Reduction to Attain Water Quality Objectives for Methylmercury in Fish Tissue.

...the proposed Basin Plan amendment and the [Staff] Report make two wrong assumptions: (1) all mercury in the system is from former mines; and (2) control of mine wastes will reduce fish tissue methylmercury levels. ...mercury from natural bedrock exposures has been migrating into the watershed for millions of years. The TMDL provides no detailed studies to show that the mine waste piles are eroding any faster or at all. Without distinguishing natural mercury bearing sediments from sediments derived from mine waste piles, the proposed Basin Plan amendment can not properly assume that fish tissue methylmercury levels are not natural for this watershed.

> Mercury in the system is from a number of sources including mining waste piles (see proposed Basin Plan amendment pp. 5 & 6; see Staff Report Section 4). Mercury source control measures do reduce fish mercury levels (see response to Parks comment no. 1.1). Had the ore been at the surface, we would agree that pre-mining creek sediment mercury concentrations were likely equal to current levels. However, miners excavated vast quantities of mercury ore from deep underground; New Almaden was the world's deepest mercury mine. The ore was processed at the surface, and thereby mining greatly increased mercury loads to creeks.

Fish tissue methylmercury concentrations are highest in deep impoundments, but no comparison can be made to pre-mining conditions. This is because, prior to the mining era, there were no deep impoundments (as described in response to District comment no. A.4a). Fish tissue methylmercury concentrations in creeks that receive mining waste and in the River are elevated and unsafe for consumption by wildlife and so need to be reduced, as required by the Clean Water Act.

GRDC comment no. 14: The TMDL will punish dischargers who reduce sediment loading

A significant problem with the proposed TMDL is that it establishes an erodible soil concentration limit without considering the amount of sediment being discharged. High concentrations of mercury in erodible soils will have de minimis impacts on mercury loading into the Guadalupe Watershed if the quantity of erodible soils discharged is negligible. Conversely, large quantity discharges of sediment to the Watershed could substantially increase overall mercury loads to the Watershed even if the mercury concentration in those erodible soils is low. ...

This issue might be relevant for a mass-based TMDL project. However, we have established concentration-based, not mass-based, TMDLs and allocations.

In fact, reducing loads of mercury from mining waste is an important step towards restoring the watershed to pre-mining conditions. The natural soil erosion rate is quite high in the upper watershed, particularly along the slopes of Loma Prieta and Mt. Umunhum (which have high landslide rates indicated by red shading on Wentworth et al. 1997). This area lies outside the mineralized zone. Therefore, large quantity discharges of sediment with low mercury concentrations is the natural condition of this watershed.

Additionally, we described in response to comments at the May testimony hearing that the mining waste allocation is not a cleanup standard, and that it only applies to industrial process waste, it does not apply to soils that are not mercury mining waste (see Part 1). We revised the Staff Report and proposed Basin Plan amendment (*footnote a in Table 7-B*) accordingly. Further, we rely in this TMDL on the erosion of clean soils to cover contaminated bottom sediments in reservoirs and lakes.

GRDC comment no. 15: Fish in Lexington Reservoir – the Purported Background Reservoir – Do Not Appear To Meet the 0.3 ppm Target

It is unclear why the Board has concluded that the fish from the purported background reservoir meet the 0.3 ppm mercury average in "fish consumed by humans." As noted, TL4 fish are the larger species – e.g., largemouth bass – that are

typically consumed by humans; therefore, the 0.3 ppm mercury standard would presumably apply to these TL4 fish. If that is the target, then the 0.3 ppm mercury fish concentration would be virtually impossible to achieve in the Guadalupe basin given that this standard cannot even be achieved in the purported background reservoir.

In response to this comment, we corrected errors in Sections 7 (*Key Points*) and 8.1 (*Mining Waste Total Mercury Allocations*). Also, we revised the allocations to mercury mining waste and mercury-laden sediment in response to both Parks comment no. A.5 and GRDC comment no. 12; see response to Parks comment no. A.5.

The February 2008 Section 7 (*Key Points*) incorrectly stated that fish in the reference reservoir met targets. We stated correctly in Section 7.6 (*Mercury in the Reference Reservoir*), that small (prey) fish do not meet the wildlife target. Also in Section 7.6, we stated correctly that large fish that humans consume have an average mercury concentration of 0.3 mg/kg. However, our goal to protect human health is lower; 0.2 mg/kg (see Section 5). Similarly, we stated correctly in Section 8.2, *Impoundment Methylmercury Allocation*, that small (prey) fish in the reference reservoir do not meet the wildlife target. We corrected Section 7 (*Key Points*) in the September 2008 version.

Also, the February 2008 Section 8.1, *Mining Waste Total Mercury Allocations*, incorrectly stated fish in the reference reservoir met targets. As explained in response to Parks comment no. A.5, correction of this error results in a single allocation to mercury mining waste of 0.2 mg/kg, and a single allocation to mercury-laden sediment discharged from depositional areas of 0.2 mg/kg.

The average mercury concentration in adult largemouth bass was 0.6 mg/kg in both 2004 and 2006 in the reference reservoir. In Section 5 (*Wildlife Water Quality Objectives and Human Health*), we describe our goal of protecting human fishers at the rate of 4 meals per month, or 0.2 mg/kg. Section 7.6 (*2006 Large Fish and Human Consumption*), reads as follows:

> The weighted-average mercury concentration in an equal mix of TL3 and TL4 fish consumed by humans (largemouth bass, pumpkinseed, and trout) was also 0.3 mg/kg in 2006, equal to the U.S. EPA's methylmercury criterion. This is protective at a consumption rate of two servings per month of an equal mix of TL3 and TL4 fish. However, it is not protective for people who consume four servings per month, nor is it protective in the seasons (i.e. late summer and fall) when largemouth bass are abundant, but trout are not abundant.

Although the standard of 0.2 mg/kg is not currently met in the reference reservoir, we anticipate the District will develop new and innovative methylmercury control methods that will meet this standard. In their comment letter, the District indicated they have already achieved a 90 percent reduction in methylmercury concentrations in Lake Almaden.

GRDC comment no. 16: The TMDL Should Use the U.S. FDA's 1.0 ppm Mercury Action Level for Fish, Not the 0.3 ppm [U.S. EPA methylmercury criterion]

We strongly disagree. We propose fish tissue water quality objectives based on current science to protect both wildlife and humans. The U.S. EPA's methylmercury criterion of 0.3 mg/kg relies on current mercury science for protection of human health (U.S. EPA 2001). Further, we are required to follow the U.S. EPA's methodology for establishing ambient water quality criteria (USEPA 2000), and this guidance requires we set a level equal to, or more stringent than, the U.S. EPA's methylmercury criterion.

GRDC comment no. 17: The Board Cannot Unilaterally Establish a TMDL for Methylmercury

Under the Clean Water Act § 303(d), the Guadalupe River and the Guadalupe Creek are listed as impaired for elemental [*sic*] mercury, not methylmercury. The proposed Basin Plan amendment and the [Staff] Report ignore this fact and improperly establish a TMDL for methylmercury. It is inappropriate for the Board to establish a TMDL for a pollutant which was not identified in the Clean Water Act § 303(d) list as causing or expected to cause violations of the applicable water quality standards. Further, to the extent the Board desires to establish a TMDL for methylmercury, it must first be listed under the Clean Water Act.

The listing is for mercury but the impairment is due to methylation of mercury to methylmercury. Methylmercury is what we need to focus on in reservoirs and lakes to address the impairment.

GRDC comment no. 18: The [Staff] Report Fails To Adequately Quantify Loading From Wet Weather Storm Events in the Upper Watershed

One glaring – and admitted – defect in the [Staff] Report is the lack of upper watershed load estimates, particularly during wet weather when increased flows result in higher sediment transport and therefore higher mercury transport. Without this kind of information, it is not possible to develop a defensible TMDL. ...

We realize that there is some uncertainty associated with mercury loads in the wet season, however, we are confident that our estimates are adequate for TMDL purposes. Prof. Sedlak affirmed our approach in his peer review, as follows.

> The identification of sources, linkage analysis and allocations are based upon data collected recently by [Tetra Tech]. Although the heterogeneity

of the system and its complex hydrology make it difficult to estimate some of the values accurately, the staff has attempted to apply best professional judgment in a way that allows for cleanup to begin soon. In my opinion, the adaptive management approach advocated by the staff is superior to spending more time quantifying loadings and sources.

GRDC comment no. 19: GRDC's Operations Are Fully Regulated

The [Staff] Report mentions that GRDC operations are subject to a General Industrial NPDES Stormwater Permit but fails to mention the proper scope of the permit. [Staff] Report at 4-27. Discharges from the entire operations are covered by the General Permit and are addressed by the Storm Water Pollution Prevention Plan.

We concur that discharges from the entire operations are covered by the General Permit. Note that in Section 4.6 we describe that "other industrial sources" are included in urban stormwater runoff. In this way, we include GRDC as another potential source of mercury in this watershed, and do not need to mention further in the supporting Staff Report the full scope of operational areas covered by the General Industrial NPDES Stormwater Permit.

GRDC comment no. 20: The TMDL Repeatedly Fails to Support Statement with Data

In many instances, the proposed Basin Plan amendment and the [Staff] Report merely alleges findings without evidence. For example, the table on load and wasteload allocations (Table 7-B) indicates that the Guadalupe Creek is a source of mercury because of "mercury-laden sediment discharged from depositional areas in Guadalupe Creek". proposed Basin Plan amendment at 8. There is no data in the proposed Basin Plan amendment or the [Staff] Report to support this statement. … ...there is no evidence to suggest that controls are needed near the former Guadalupe Mine.

We disagree that the supporting Staff Report "repeatedly fails to support statements with data." The proposed Basin Plan amendment provides a comprehensive yet succinct record of the TMDL project. By design, and in accordance with water quality control planning requirements, it does not provide the scientific basis for the TMDL. The scientific basis is provided in the Staff Report.

Although the Staff Report provides many examples of mercury mining waste in Alamitos Creek and not Guadalupe Creek, the same mining activities impacted both creeks. Photo 5 in Figure 3.9 illustrates mining waste on the hill slope just above Guadalupe Reservoir (located in Guadalupe Creek). In October 2007, Water Board and GRDC staff observed mercury mining waste adjacent to and in

Guadalupe Creek along GRDC's property (see response to GRDC comment no. 7, which mentions GRDC's recent actions to control mining waste discharges into Guadalupe Creek).

This observation holds true for depositional areas, downstream of the Guadalupe Creek. Most sediments, including mining wastes, typically do not travel the full length of the creek and river in one season. They travel some distance, accumulate in a depositional area, and later are transported downstream another distance. Eventually, they reach San Francisco Bay. The evidence described herein of "mercury-laden sediment discharges from depositional areas in Guadalupe Creek" is sufficient for TMDL and Water Board regulatory purposes.

GRDC comment no. 21 The Implementation Actions for Mines Has Significant Uncertainties

GRDC expressed two concerns in this comment, which we numbered 21.1 and 21.2, and respond to individually.

GRDC comment no. 21.1: The proposed Basin Plan amendment mentions that responsible parties will be required to cleanup mercury mining waste (proposed Basin Plan amendment at 11, no. 3) but fails to define the term "cleanup"; natural background levels; and the contribution linkage of mine wastes not located in creeks and reservoirs.

The proposed Basin Plan amendment, *Mercury Source Control Actions*, states "Actions are required to control mercury mining waste and urban runoff sources. This section specifies actions required to control discharges from sources to surface waters." Any further definition of cleanup will be included in Water Board orders, as needed. Natural background levels are discussed in *Calculating the Mining Waste Cleanup Goal* in Section 9.10 of the supporting Staff Report. The "contribution linkage of mine wastes not located in creeks and reservoirs" is discussed in the source analysis pertaining to loads of mercury from creeks that drain mines, in Sections 4.1, *Methodology for Mining Waste Loads*, and 4.2, of the supporting Staff Report.

GRDC comment no. 21.2: The proposed Basin Plan amendment discusses the possibility of a study to examine methylmercury production and bioaccumulation in downstream creeks and rivers by "responsible parties." proposed Basin Plan amendment at 15. It is neither reasonable nor practical to expect that all "responsible parties" can coordinate and perform the possible study. How is "responsible party" defined, who makes the determination and how will free-riders be prevented?

In response to this and other comments, we revised Section 9 to more clearly describe the responsible parties.

We agree that it can be difficult to coordinate amongst parties with disparate interests. Although the Water Board cannot specify the manner and method of compliance, we can provide incentives for collaboration. Accordingly, we have provided incentives for GRDC and other responsible parties to participate in a coordinated monitoring program. Specifically, we provide the following financial incentive in the proposed Basin Plan amendment, "The Water Board encourages a coordinated watershed approach to monitoring, and will consider reducing or waiving monitoring requirement 2 (mercury load at the points of discharge), based on progress in implementation and participation in coordinated watershed monitoring."

Responsible parties are defined in the California Water Code § 13304 (a), and they will be named in the orders issued by the Water Board. In response to this and other comments, we revised Section 9.1 to more clearly describe the responsible parties.

The collaborative approach, by its nature should identify free-riders. Furthermore, the coordinated monitoring program will clearly identify the participants in the program. Depending on the circumstances at the time, identified free-riders will be immediately removed from the coordinated monitoring program, and be subject to re-imposition of monitoring requirement 2 (i.e., loss of the financial incentive).

GRDC comment no. 22: The proposed Basin Plan amendment and the [Staff] Report Have Numerous Data Gaps and Uncertainties

Environmental science inherently includes data gaps and uncertainties. That is a primary reason for the Peer Review process—and the Peer Reviewers affirmed that this TMDL project has a sound scientific basis. GRDC expressed many concerns in this comment, which we numbered A1–A6, and B–E, and respond to individually.

GRDC comment no. A1: Following remediation in the Almaden Quicksilver County Park, the Santa Clara County did not take post-remediation samples. [Staff] Report at 3-22. This is an important and significant data gap, especially in light of the proposed 0.1 ppm standard. Will the TMDL essentially re-open the relevant consent decrees and/or cleanup orders?

We revised the proposed Basin Plan amendment (*Implementation Actions for Mercury Mines*) and Section 9.3 in response to this and others' comments. We excluded the footprint of mercury cleanup projects in Almaden Quicksilver County Park, whether previously undertaken in accordance with a remedial action order, or currently underway in accordance with settlement of a NRDA claim.

The data gap will be filled during the first step of implementation for mercury mines, as described in the proposed Basin Plan amendment. "Conduct a site investigation evaluating the erosion potential of mercury mining waste and the potential for seeps to discharge mercury from mining waste to surface waters."

GRDC comment no. A2: The proposed Basin Plan amendment and the [Staff] Report fail to identify background soil concentrations of mercury to be used as a comparison with the 0.1 ppm erodible soils standard.

This 0.1 mg/kg allocation is based on sediment samples collected from the reference reservoir, as described in Section 7.6. In fact, bottom sediment samples are representative of upstream "background soil" mercury concentrations; bottom sediments in Lexington Reservoir resulted from the natural erosion of upstream hillsides.

Recall from our response to Parks comment no. A.5 that we revised the allocations to mercury mining waste and mercury-laden sediment. These changes result in a single allocation to mercury mining waste and mercury-laden sediment discharged from depositional areas of 0.2 mg/kg. The allocation to nonurban stormwater runoff discharges, i.e., non-mineralized and non-urban areas, remains 0.1 mg/kg.

In response to numerous comments received about mining waste allocations, we revised the proposed Basin Plan amendment (*footnote a in Table 7-B*) to clarify that we are not establishing a mercury cleanup standard for mine sites or depositional areas. Also, see our response to Parks comment no. A.7, on the related topic of the benefit of sediment mixing.

GRDC comment no. A3: The [Staff] Report concedes that, because of the absence of flow gauge information at any of the subwatersheds modeled, the SWAT model could not be calibrated, and this is a source of uncertainty (see Section 4.3). [Staff] Report at 4-4.

All measurements have some uncertainty; we have chosen to describe the uncertainty associated with the source analysis in Section 4. See also our response to GRDC comment no. 18.

GRDC comment no. A4: The [Staff] Report admits that the lack of high flow sample data may lead to an underestimation of the load, thus creating another source of uncertainty. [Staff] Report at 4-5.

GRDC repeats their comment no. 18; see our response to GRDC comment no. 18.

GRDC comment no. A5: The [Staff] Report recognizes that, like the Monte Carlo simulation for one year, the Monte Carlo simulation for 1960 – 2001 wet seasons (Figure 4.6) is also biased low due to lack of data for high flow events, when the greatest loads occur. [Staff] Report at 4-22.

All measurements and estimates have some uncertainty; we have chosen to describe the uncertainty associated with the source analysis in Section 4. See also our response to GRDC comment no. 18.

GRDC comment no. A6: The TMDL admits that the linkage analysis is inadequate: "However, the Guadalupe Linkage Analysis (see Section 7.1) for inorganic mercury is qualitative, so it does not provide a scientific basis for a mass load in the Guadalupe River watershed." [Staff] Report at 8-4.

GRDC repeats their comment no. 2—see our response to GRDC comment no. 2.

GRDC comment no. B: ...A critical element of any TMDL is to determine the mass loading into the waterbody. … Yet, the TMDL admits:
Mass loads were estimated in the Final Conceptual Model Report (Tetra Tech 2005c) with low precision (a high precision monitoring program was cost-prohibitive and unnecessary for the conceptual model).

GRDC repeats their comment no. 1—see our response to GRDC comment no. 1.

GRDC comment no. C: The [Staff] Report contains other statements reflecting the significant uncertainties infusing the entire TMDL calculations…wet season loads … In Figure 4.4, most dissolved mercury loads include a "background" input; however, the Guadalupe Creek load downstream of the reservoir does not include any background load. Report at 4-16. Rather, it attributes 3.9 grams to "mines" without any evidence or sampling to prove this load amount and its sources(s). …

Regarding uncertainties in wet season loads, GRDC repeats their comment no. 18—see our response to GRDC comment no. 18. Regarding Figure 4.4, dissolved mercury loads to Guadalupe Creek downstream of Guadalupe Reservoir are indicated on this figure. They include a background input of

3.3 grams, in addition to the mines input of 3.9 grams. The methodology for calculating these loads, including descriptions of the wet season sampling data, is provided in Section 4.1.

GRDC comment no. D: More fundamentally, we believe that there is a significant lack of information in the TMDL for assessing temporal and spatial contributions of mercury to the watershed. For example, fish tissue information provides very little information as to what sources are contributing to mercury loads and when those discharges occur. This is especially problematic for sources downstream of the reservoirs where fish tissue concentrations would fail to distinguish between methylmercury generation in the upstream impoundments and generation in the downstream segments.

We disagree that there is a significant lack of information in the supporting Staff Report that assesses the temporal and spatial loadings and conversion to methylmercury. This assessment is provided in Section 7 (*Linkage Analysis*). These were important concepts reviewed by the Peer Reviewers.

We agree that fish integrate methylmercury concentrations over time and space. However, fish tissue is not the only metric available to distinguish between methylmercury generation in the upstream impoundments versus downstream segments. Other available metrics include, for example, dissolved oxygen, oxidation-reduction potential, and water-column methylmercury concentrations.

If the fish targets are not attained downstream by methylmercury controls in the reservoirs and lakes, then the following special study will be conducted:

> 3b. If [*the fish targets are not attained downstream*], what factors contribute to methylmercury production and bioaccumulation in creeks and rivers? Factors to consider include, but are not limited to, shallow impoundments, excess nutrients, stagnant pools, shade cover, and aquatic vegetation.

At the time we review the sampling plan, we will take into consideration appropriate metrics, including but not limited to fish tissue mercury concentrations, dissolved oxygen, oxidation-reduction potential, and water-column methylmercury concentrations.

GRDC comment no. E: As another example, the TMDL sweeps huge areas of the watershed into the "Mining District" without describing or mapping in more detail the locations of mining areas, mining waste, mining impacts, soil types, background mercury concentrations in soil, and mercury bearing rocks.

Refer to USGS Professional Paper 360, which includes extensive geologic mapping, and indicates mining-related features circa 1947 (Bailey & Everhart 1964). We relied particularly on their Plates 1, 3, and 14 which indicate over 100 mining waste dumps.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Hillsdale Mine (Robert Bettencourt)

Mr. Bettencourt's family owns Communications Hill and the Hillsdale mercury mine site. In his comment letter of March 2008, he provided information from 1889 about a culvert to direct flow from Canoas Creek into Guadalupe River. This was a different project from the re-routing of Canoas Creek the District undertook in the 1960s described in Section 3.4, *Smaller, Less Productive Mercury Mines*.

Comment letter from Hillsdale Mine (Thomas McCloskey of Strategic Engineering & Science, Inc.)

In response to this comment, we revised the proposed Basin Plan amendment (*Sources, Table 7-B,* and *Implementation Actions for Mercury Mines*) and Staff Report (Sections 3.4, 8.1, and 9) to remove Hillsdale mercury mine from this TMDL project.

Mr. Bettencourt's family retains several consultants for the development of Communications Hill, including Strategic Engineering & Science, Inc. This comment letter provides evidence that Hillsdale mercury mine and associated processing areas and waste dumps were located on the Coyote Creek side of Communications Hill.

We discussed with Messrs. McCloskey and Bettencourt that the Hillsdale mercury mine drains via Coyote Creek to San Francisco Bay. Therefore, it is subject to essentially the same requirements in the San Francisco Bay mercury TMDL, as follows:

> Local inactive mercury mines shall be addressed through continued implementation of the Mines and Mineral Producers Discharge Control Program (Mines Program) described in Chapter 4. The key regulatory component of this established program is that property owners of inactive and active mine sites that discharge stormwater contaminated by contact with any overburden, raw material, intermediate products, finished products, byproducts, or waste products are required to comply with NPDES industrial stormwater regulations. Under the Mines Program, the Water Board has the authority to issue individual industrial permits or allow the discharger to obtain coverage under the industrial stormwater general permit issued by the State Water Resources Control Board. For those mines that are not currently meeting the conditions set forth in the Mines Program, responsible parties shall attain compliance within five years of the effective date of the San Francisco Bay mercury TMDL implementation plan.

In other words, if mercury mining waste is eroding from Hillsdale mercury mine, the current property owner will need to implement best management practices for erosion control to keep mercury on the landscape and out of surface water. The current plan is to develop Communications Hill into a dense residential area, with light industrial at the base of the hill. During the planning and permitting phases for this development, the Hillsdale mercury mine will also be subject to other (city, county planning, county public health, and/or Water Board) regulatory requirements to protect humans from direct exposure to mercury.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from City of San Jose (John Stufflebean)

The City of San Jose's comments pertain to urban stormwater runoff because they are an urban stormwater runoff permittee.

City of San Jose comment no. 1: Load Allocations

…the last sentence in the BPA section entitled "Mercury Source Control Actions" states: "Urban stormwater runoff implementation actions that reduce loads of mecury to San Francisco Bay will also count towards achieving the Guadalupe TMDL allocation to the urban stormwater source." We interpret this to mean that if large controllable urban stormwater sources found anywhere in the SCVURPPP County-wide Program area, the reduction of those sources can be counted toward meeting the urban stormwater implementation goals of the Guadalupe TMDL. If this is not the intent, then clarification of the language is needed.

We revised the proposed Basin Plan amendment in response to this comment. Underlined text was added, so the proposed Basin Plan amendment (*Mercury Source Control Actions*) now reads, "Urban stormwater runoff implementation actions <u>in the Guadalupe River watershed</u> that reduce loads of mercury to San Francisco Bay will also count towards achieving the Guadalupe TMDL allocation to the urban stormwater source." Additionally, we corrected an error in Section 9.1, *Mercury Source Control Actions for Urban Stormwater Runoff*, and Section 9.6, *Implementation Actions for Urban Stormwater Runoff*, so the corresponding sentences now read the same as above.

City of San Jose comment no. 2: Coordinated Watershed Monitoring Program

The October 15, 2008 date for submission of a coordinated watershed monitoring plan is impracticable. … The City requests that the deadline provide 24 months from TMDL adoption for submission of a coordinated watershed monitoring plan.

We revised the due date to October 15, 2009, in the proposed Basin Plan amendment (*Coordinated Watershed Monitoring Program*), and Staff Report (Section 9).

City of San Jose comment no. 3: Special Studies

The City requested clarification that urban runoff responsibility for special study 3b is contingent on outcome of special study 3a.

The proposed Basin Plan amendment clearly states that the need for special study 3b is contingent on the outcome of special study 3a, as follows.

> If [*emphasis added*] the fish targets are not attained downstream by methylmercury controls in the reservoirs and lakes [*the question to be answered by special study 3b*], Santa Clara Valley Water District together with the New Almaden Mining District and the Guadalupe, Santa Teresa and Bernal mercury mines responsible parties, and the urban stormwater runoff permittees shall conduct or cause to be conducted study 3b, or equivalent or alternative studies with prior approval of the Water Board Executive Officer, either voluntarily or in accordance with Water Code § 13267 or NPDES stormwater permit requirements….

City of San Jose comment no. 4: Consistency with Baywide Mercury TMDL

The city requested that all three methods in the Bay TMDL for urban stormwater runoff to demonstrate progress towards attaining allocations be repeated in the Guadalupe proposed Basin Plan amendment….The proposed Guadalupe Mercury TMDL prescribes only a mercury concentration-based approach to assigning WLAs…. This concentration-based WLA implies that only method #3 described above can be used to demonstrate progress in the Guadalupe Mercury TMDL. To maintain consistency with the Baywide TMDL, the City requests that Guadalupe TMDL either explicitly include or reference all three methods described [*in the Baywide TMDL*] for demonstrating progress in the Guadaupe TMDL or explicitly defer to the Baywide TMDL on criteria and methods to meet the stormwater allocation.

We explicitly defer to the "Baywide TMDL on criteria and methods to meet the" urban stormwater runoff allocation. The proposed Basin Plan amendment, in the *Mercury Source Control Actions* section of the implementation plan, states, "The implementation plan for urban stormwater runoff … is contained in the San Francisco Bay mercury TMDL." (We disagree with repeating text from the Bay mercury TMDL in the Guadalupe mercury TMDL, largely because these two implementation plans will be in the same chapter of the Basin Plan.)

Also in the *Mercury Source Control Actions* section, under *Implementation Actions for Urban Stormwater Runoff*, we explain that urban stormwater runoff permittees may choose to participate in coordinated watershed monitoring. Additionally, we provide ten years' advance notice of how we plan to compel, if necessary, urban stormwater runoff permittees to participate in special study 3b.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Santa Clara Valley Urban Runoff Pollution Prevention Program (Adam Olivieri)

Santa Clara Valley Urban Runoff Pollution Prevention (SCVURPPP) repeats several comments made by the City of San Jose.

SCVURPPP comment no. 1: Consistency with the San Francisco Bay Mercury TMDL

SCVURPPP repeats City of San Jose comment no. 4—see our response to City of San Jose comment no. 4.

SCVURPPP comment no. 2: Sources vs. Pathways

SCVURPPP expressed two concerns in this comment, which we numbered 2.1 and 2.2, and respond to individually.

SCVURPPP comment no. 2.1: SCVURPPP requests that "sources" be replaced by "source categories" in the proposed Basin Plan amendment and supporting Staff Report. SCVURPPP makes this request because they believe urban stormwater runoff is a transport pathway, not a source.

The Clean Water Act uses "nonpoint sources" and "point sources". Therefore, we use "sources" rather than "source categories" in our TMDLs.

SCVURPPP comment no. 2.2: SCURPPP requested that language in the Bay mercury TMDL be repeated in its entirety in the proposed Basin Plan amendment for the Guadalupe River watershed mercury TMDL.

SCVURPPP repeats City of San Jose comment no. 4—see our response to City of San Jose comment no. 4.

SCVURPPP comment no. 3: Consistency with the Municipal Regional Permit

The SCVURPPP supports the concept of developing a "regional monitoring collaborative" described in the Municipal Regional NPDES Permit Draft Tentative Order (Draft TO), dated December 14, 2007. However, it is unclear whether the reference to a "coordinated watershed program" in the Implementation Section of the Guadalupe River BPA is referring to the same concept.

These coordinated monitoring programs are <u>not</u> the same; herein, we encourage coordinated watershed monitoring specific to this mercury TMDL project. The Draft TO contains provisions for *Mercury Controls* (C.11), including *Monitor Stormwater Mercury Pollutant Loads and Loads Reduced* (C.11.g).

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from California Department of Transportation (Joyce Brenner)

The allocation to urban stormwater runoff includes discharges from California Department of Transportation (CalTrans) roadways and non-roadway facilities and rights-of-ways (see note c in Table 7-B). As explained in responses to comments from the City of San Jose and SCVURPPP, and as stated in the proposed Basin Plan amendment, "The implementation plan for urban stormwater runoff … is contained in the San Francisco Bay mercury TMDL."

CalTrans comment no. 1: Sources of Mercury in the Watershed

… Please re-evaluate the TMDL and ensure that [CalTrans discharges are not a significant source of mercury] is properly considered when determining loads from sources and to develop the most appropriate implementation activities. … The Department is concerned that there is not enough information to fully understand the mercury discharge problem and to ensure that the implementation actions will achieve the required effect. … [urge you to focus on] discharges of mercury from mining activities … [The Bay mercury TMDL provides greater—and crucial—flexibility for CalTrans to implement effective measures.]

TMDLs are required to address all sources. The Guadalupe implementation plan is focused on control of erodible mining wastes and mercury methylation. Caltrans discharges are an identified source in the urban stormwater runoff category. We respond to their other concerns in this comment with the following from the proposed Basin Plan amendment, "The implementation plan for urban stormwater runoff … is contained in the San Francisco Bay mercury TMDL." The required analyses to support the Bay mercury TMDL are provided in the supporting Staff Reports for the Bay mercury TMDL, dated 2004 and 2006.

CalTrans comment no. 2: Background Soil Concentrations

… The recommended allocation to urban stormwater runoff is 0.2 mg/kg in suspended sediment (annual median, dry weight). More explanation is needed to clarify how this amount accounts for background soil concentrations. [CalTrans provides other estimates of background soil mercury concentrations in California, and loads from atmospheric deposition.]

Section 8.3, *Urban Stormwater Runoff Total Mercury Allocation*, explains the basis of this allocation, and Section 8.6 describes how the Bay and Guadalupe mercury TMDLs are integrated, including for urban stormwater runoff.

CalTrans comment nos. 3–5: Source Control, Department Total Drainage Area, and No identified technology for achieving the stormwater allocations

We respond to these concerns by restating our response to CalTrans comment no. 1. "The implementation plan for urban stormwater runoff … is contained in the San Francisco Bay mercury TMDL." The required analyses to support the Bay mercury TMDL are provided in the supporting Staff Reports for the Bay mercury TMDL, dated 2004 and 2006.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from New Almaden Quicksilver County Park Association (Michael Cox)

Mr. Cox spoke at the May 2008 testimony hearing. In Part 1, we describe his extensive involvement with New Almaden and his mercury mine expertise. Additionally, Mr. Cox was an active participant in the Guadalupe Mercury Work Group, which helped guide this TMDL project, and he submitted a comment letter on the January 2006 Staff Report. We appreciate the following from his 2008 comment letter, his "… comments from 2006 have, in general, been ably addressed …". Mr. Cox's 2006 comments were constructive and instrumental in improving the Staff Report. We thank him very much for his comments, suggestions, and participation in the Guadalupe Mercury Work Group.

Mr. Cox's letter includes italicized questions; we respond to his italicized questions that he did not repeat at the May 2008 testimony hearing (our responses to those comments are provided in Part 1). Then, we respond to his comments specific to particular pages of the Staff Report.

Cox comment no. 1: Could the Board postpone the Basin Plan Amendment review until after the TMDL Report is finalized and approved?

Our response to this comment is provided in Part 1.

Cox comment no. 2: Are there any programs that can provide money for source control measures for private homeowners?

Yes, there are funding sources that can be used to remediate mercury mining waste on privately owned parcels, such as those along Alamitos Creek. Moreover, we explained in response to District comment no. 2.2a that we modified the proposed Basin Plan amendment to reflect that we will identify mercury cleanup as a grant funding priority for the San Francisco Bay region.

Cox comment no. 3: A particularly important question is the issue of how remedial actions such as those already completed and to be completed will receive "load allocation credit" under the current scheme?

We revised the proposed Basin Plan amendment and Section 9.1 in response to this and others' comments. Our detailed response is provided in response to Board Vice Chair Young in Part 1, and to GRDC comment no. A1 in Part 2.

Cox comment no. 4: … [mercury mining waste allocations are] unreasonably low and beg the question of why [allocations are] needed for sediments when the only practicable remedial measures are erosion control, mine waste capping, and reservoir stratification control—measures that have already been successfully used in the watershed?

Our response to his concern that allocations are unreasonably low is provided in Part 1. Allocations (not targets) are required for each source, regardless of implementation measures. Here, we have developed an allocation for mining waste, which is a source of mercury to the bottom sediments in reservoirs, lakes, and the Bay. We agree that erosion control and capping are effective remedial measures for mining waste, and we are hopeful that the District will develop effective methylmercury controls.

Cox comment no. 5: Mr. Cox re-states his request for a delay and concerns with the mercury mining waste allocations (Cox comment nos. 1 & 4).

Our responses are provided in response to Cox comment nos. 1 & 4, and in Part 1.

Cox comment no. 6: How exactly is atmospheric [*deposition*] addressed in the allocation scheme and Amendment?

This explanation is provided in Section 8.5.

Cox comment no. 7: Could the Amendment be reworked to clarify the additional sampling that is proposed to identify areas of erosion that might be prioritized for control? Could it also be clarified that it is not the intent to assign numeric effluent limits to suspended sediment discharge, but rather to implement erosion control for the significant sources and to demonstrate effectiveness through proper installation and maintenance? What about priority based on whether the discharge is to a body of water with a known higher potential for methylation, all other factors being equal?

Mr. Cox has succinctly captured the TMDL requirements: it is not the intent to assign numeric effluent limits to suspended sediment discharge, but rather to implement erosion control for the significant sources and to demonstrate effectiveness through proper installation and maintenance.

Mr. Cox refers to the implementation plan for mercury mine sites, which requires a site investigation. We provide clarification of the site investigation in the draft CWC § 13267 letter (see Appendix B). We respond to his and others' concerns about numeric effluent limits by clarifying that allocations are not cleanup standards (see Part 1). We agree with the suggestion to prioritize mercury mine site implementation actions for sites that drain to waters with known higher potential for methylation. Methylation potential appears to be highest in Guadalupe and Almaden reservoirs, followed by Lake Almaden.

Cox comment no. 8: Mr. Cox requested the TMDL project be revised to reflect the different bioavailability of mercury from different sources (atmospheric deposition, processed mining waste, unprocessed mining waste, water seeps, and other sources).

We respond to this comment with our response to Lamons' comment no. A.

Cox comment no. 9, Page 2-3: The second and third paragraphs contain redundant text.

We deleted the redundant text in Section 2. 3 in response to this comment.

Cox comment no. 10, Page 2-5: There is an uneasy reality when fish from some reservoirs with little mining impact have unsafe fish methylmercury concentrations. The Report implies that there will be opportunity to make adjustments for reality during the implementation phase, but how will this truly be the case … the Basin Plan is difficult or at least takes some time to amend.

We are relying on our adaptive implementation approach for this and our other TMDL projects.

Cox comment no. 11, Pages 3–15 to 3–18: "At least in Almaden Quicksilver County Park, the areas of significant potential mercury spillage, furnace dust, and calcine dumps have all been capped." Mr. Cox requested this be recognized in allocations.

We agree the Parks previous remedial actions were effective, and we will not require additional cleanup of these five areas. However, we are concerned about maintenance of these sites over the long term. Consequently, we mentioned to Parks that the Senador cleanup site needs some maintenance, and directed them to a potential source of funding for it.

We could have adjusted mass-based allocations to account for previous remedial actions. However, the allocations are concentration-based, so we cannot adjust them for previous remedial actions. If, in the future, we revise the allocations to be mass load reductions, we will account for past remedial efforts in assigning these reductions. Nonetheless, we do provide other forms of credit for previous remedial actions, see our response to Board Vice Chair Young in Part 1 regarding credit, and our discussion of *Remaining Cleanup Challenges in New Almaden Quicksilver County Park* in Section 3.5.

Cox comment no. 12, Page [3-18]: The peak concentrations in water are interesting, but the examples only serve to illuminate the extreme variability and therefore the highly uncertain targets of the TMDL.

Comment noted.

Cox comment no. 13, Page 3-20: It should be noted that although DTSC would have allowed limited removal and capping of hot-spots within the calcine waste piles, the County elected to completely stabilize and cap each pile, thereby addressing the issues of soil erosion and potential bioaccumulation of the eroded material. The next several paragraphs [in the TMDL Staff Report] confirm this and contradict the statement that "the issues of soil erosion and transport of mercury to water bodies and bioaccumulation were not addressed." ***Could the statement be clarified?***

The discussion on p. 3-20 pertains to *Cleanup of Almaden Quicksilver County Park*. This section describes the five sites that presented the greatest threat to human health from direct exposure, and which were cleaned up: Mine Hill, Hacienda Furnace Yard, and Senador, Enriquita, and San Mateo mines. The full sentence in the supporting Staff Report reads, "While this [*remedial*] effort went a long way toward addressing the most significant hazards to human health within the park, the issues of soil erosion and transport of mercury to water bodies and bioaccumulation were not addressed".

Although, neither the cleanup actions nor the investigation were <u>designed</u> to protect water quality, the cleanup actions appear to have been effective in doing so. We stated this in the Staff Report as follows, "More recently, observations from site visits to the former mines suggest that the calcine disposal areas within Almaden Quicksilver County Park are largely being protected from erosion by the vegetation and runoff control measures." In other words, the remedial efforts were largely effective in preventing erosion from the stabilized areas (see response to GRDC comment no. A1 regarding excluding the footprints of mercury cleanup projects in Almaden Quicksilver County Park). However, we remain concerned that prior investigations did not satisfactorily evaluate erosion of mining waste into surface waters, for the following reasons.

The risk assessment for the Parks cleanup did not take into account either the fish consumption advisory or that mining wastes from the Hacienda Furnace Yard were placed on the banks of Alamitos Creek, and are now widely distributed through the length of the creek. The risk assessment addressed only direct exposure to inorganic mercury in the Park, and did not account for mercury methylation and bioaccumulation downstream.

Risk Assessment, Final Report, Almaden Quicksilver County Park, Volume 1–Text. Prepared by Camp, Dresser & McKee, Inc. for Santa Clara County Parks and Recreation Department. Dated May 29, 1992.

The focus of the risk assessment was as follows:

> Human Exposure Assessment
> The exposure assessment for Almaden Quicksilver County Park evaluates potential human exposure to mercury at the park in the absence of remedial action and assuming full public use as a regional park. Significant mercury contamination is limited to areas of the park impacted by previous mining activities. These areas are widely separated by topography and distance. Therefore, in order to guide remediation activities, exposure are evaluated separately for the six major areas that have been impacted by previous mining activities. (p. ES-5)

The risk assessment evaluated exposure of nearby residents to dust blowing off-site, but did not evaluate stormwater transport of mining waste downstream, nor mercury exposure from eating watershed fish.

> 4.1.3 Potentially Exposed Populations
> Off-site residents who live adjacent to the park are not considered to be exposed at their homes…Significant off-site transport of mercury seems unlikely, however, since such transport has been limited in situations where conditions were favorable for movement of contaminants into residential areas. [The report considers wind transport of mercury-laden dust to nearby residential areas. Based on data from a former lead smelter and milling operation in Midvale, UT, the report concludes that it is unlikely that nearby residents are exposed to high levels of mercury-contaminated dust.] (pp. 4-4 to 4-5)

Cox comment no. 14, Figure 3.10, Map of Mercury Concentrations Remaining After Park Cleanup (mg/kg, parts per million): This is not an accurate rendering of mercury concentrations remaining after cleanup. The concentrations were measured prior to remedial actions. … The mines were never investigated to characterize the overall distribution of mercury in soils. The Guadalupe mine was not investigated at all, because it was a private landfill, not a public park. Could this be noted somehow?

We disagree; we think this is an accurate rendering of mercury concentrations remaining after cleanup in Almaden Quicksilver County Park (Section 3.5). This figure was created by plotting pre-remediation soil mercury concentrations, then removing data from the footprint of areas that were remediated. Therefore,

Figure 3.10 shows mercury concentrations remaining after park cleanup. We are aware and agree that no post-remediation samples were collected (see page 3-22), that the overall distribution of mercury in soils has yet to be characterized, and that the Guadalupe mine has not yet been investigated. These issues will be addressed, as needed, through the site investigation required for mercury mine sites.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Friends of Los Alamitos Watershed (Roberta Lamons)

Dr. Lamons claims in her comment letter that the proposed Basin Plan amendment is "unprofessional, unscientific, and erroneous". However, the supporting Staff Report explains much of what she is concerned about. She repeated a comment that several others made pertaining to outreach to local residents. We respond to this comment with our response to Mr. Boulland's first comment in Part 1. We condensed her remaining comments into comment nos. A & B.

Lamons comment A: Dr. Lamons believes that we have not properly evaluated the relative bioavailability of mercury from different sources.

In the linkage analysis we evaluated mercury from different sources (including atmospheric deposition). Figure 7.3 shows that the waters closest to New Almaden have the worst fish mercury problems. Therefore, even if mercury from mining is less bioavailable than mercury from atmospheric deposition, there is so much more mercury from mining that it is the main cause of the problem in this watershed.

Many of Dr. Lamons' concerns are based on results reported from the Mercury Experiment to Assess Atmospheric Loading in Canada and the U.S. (METAALICUS) project. This research is being conducted in the midwestern U.S. and in Canada, in areas affected by local and global atmospheric deposition, but not from mercury mining. The METAALICUS experiments include depositing mercury with unique isotopes separately on water and land surfaces. The mercury deposited on the water surface was shown to readily bioaccumulate, whereas in the timeframe of the experiment, the mercury on the land had not been transported to the water.

We anticipated the peer reviewers might share these concerns. Therefore, in the August 2007 *Staff Report for Peer Review*, we included *METAALICUS Contrasted to Conceptual Model in Guadalupe*, in the Linkage Analysis section. We concluded this section with the following paragraphs.

> We agree that there are differences in the solubility and relative bioavailability of mercury depending on its source and/or form. However, because most of the mercury in the Guadalupe River watershed is from mining waste, these relative differences are not germane to the source assessment, the linkage analysis, the derivation of targets and allocations, nor the implementation plan for the Guadalupe River mercury TMDL.

> Additionally, we have no other information that suggests an alternative to our one-to-one assumption regarding the reduction of mercury loads to fish tissue concentrations in Guadalupe River or for any watershed dominated by legacy mercury mining waste. While acknowledging that this is a simplification, we assert that essentially all mercury in this watershed has an equal chance of methylating and bioaccumulating. Therefore, we assert that reduction of total mercury in the watershed will, over time, reduce the amount of methylmercury produced and bioaccumulated in fish. We look forward to tracking the effectiveness of implementation and refining our understanding of these relationships as part of the adaptive implementation program.

In their reviews of this TMDL, the peer reviewers expressed no hesitation that addressing mercury from mining is key for this watershed.

Lamons comment B: Dr. Lamons stated that ten years is too long before reviewing this TMDL project.

We respectfully disagree; see our response to Parks comment no. 2.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Friends of Los Alamitos Watershed (Mike Boulland)

Mr. Boulland was the first speaker at the May 2008 testimony hearing, and responses to some of his concerns are provided in Part 1. He is a creekside property owner on Alamitos Creek, and is the president of Friends of Los Alamitos Watershed (FOLAW), a recently formed 501(c)(3) organization. We appreciate his support of the TMDL goals to protect wildlife and human health. Mr. Boulland is concerned about how the requirements for "depositional areas" apply to creekside property owners.

Mr. Boulland's comments helped us clarify the responsibilities of downstream property owners. As described in our responses to the District, we are counting on the District to lead a mercury cleanup and restoration project in Alamitos Creek downstream of Hacienda Furnace Yard, arguably one of the world's most mercury-contaminated waterways. In response to Mr. Boulland's comments, we clarified that creekside property owners must allow the District access for this project. However, if they do not allow the District access for studies, construction, and post-construction monitoring and maintenance, then we will need to compel them to pay for and conduct cleanup and restoration on their property. (See response to CWA comment no. 1 regarding compelling cleanup of Alamitos Creek.)

We respond to Mr. Boulland's enumerated comments that he did not repeat at the May 2008 testimony hearing (our responses to those comments are provided in Part 1).

Boulland comment nos. 1 & 6: The role of individual homeowners is not clear in Phase I.

We revised Section 9.1 in response to this comment. We added Table 9.1, *Summary of Implementation and Monitoring Requirements*, and added subsections describing the responsible parties, to Section 9.1.

Boulland comment no. 2: Could this document make a clearer notation found on BPA-9 as to where the location of the reference of the *Mercury Source Control Actions* and the *Monitoring Programs* may be read?

This section of the proposed Basin Plan amendment is supported by Section 9 of the Staff Report.

Boulland comment nos. 3 & 5: Mr. Boulland expresses concerns that the schedule for implementation actions in creeks downstream of the mines will be changed to an earlier date.

We confirm our schedule in the proposed Basin Plan amendment, as follows. "Mercury mining waste control actions are phased so that mercury discharges from upstream will be eliminated or significantly reduced before downstream projects are undertaken." Also, see our response to Parks comment no. 2.

Boulland comment no. 4: Mr. Boulland asked about the trigger to determine when downstream projects would be undertaken. He asked whether the upstream mine sites would have to achieve the allocation of 0.1 mg mercury per kg suspended sediment in stormwater before we would require erosion control projects in depositional areas.

We explained in response to Mr. Cox and others that we revised the proposed Basin Plan amendment (*footnote a in Table 7-B*) to clarify that the allocations are not cleanup standards (see Part 1). We confirm phasing of implementation actions in the proposed Basin Plan amendment, as follows. "Mercury mining waste control actions are phased so that mercury discharges from upstream will be eliminated or significantly reduced before downstream projects are undertaken."

Mr. Boulland also provided the following suggestions: (1) he stated support for cleanup and restoration of Alamitos Creek, (2) he expressed concern that Phase 2 actions have deadlines in 2008 & 2009, and (3) he stressed the need for outreach to creekside property owners affected by this TMDL project.

We appreciate Mr. Boulland's support for cleanup and restoration of Alamitos Creek downstream of Hacienda Furnace Yard. Phase 2 does not begin for ten years (see response to Boulland comment no. 1). We appreciate Mr. Boulland's assistance in our outreach to creekside property owners affected by this TMDL project. Mr. Boulland, Dr. Lamons, Dr. Dill, and several other local residents, and Water Board staff met on July 9 to plan for a larger outreach meeting in September. The goal of the September meeting is to educate the public about the TMDL process, the specifics of this TMDL, and better communicate what their role in implementing the TMDL will be.

Additionally, Mr. Boulland requested our support for a Special Utility District to help provide funding for cleanup and restoration of Alamitos Creek.

We hope to work with the Santa Clara Valley Water District to secure funding for this project, rather than creating a Special Utility District. See response to District comment no. 2.2a in which we describe that we revised the proposed Basin Plan amendment to make grant funding for mercury cleanup projects a priority.

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Comment letter from Residents (Amanda & Frederick Dill)

Drs. Dill are creekside property owners on Alamitos Creek, and repeat many of the concerns expressed by Mr. Boulland. We respond to their concerns that the local residents have not been informed about this TMDL project, and that they do not understand what they will be required to do, with our responses to Mr. Boulland's comments in Parts 1 and 2. We respond to their other concerns herein.

Dill comment no. 1: The creekside property owners had no part in the release of mercury mining waste onto their property.

We concur that the the creekside property owners had no part in the initial release of mercury mining waste onto their property. However, we have determined that there is a potential for a release of mercury-laden sediments from these properties. Therefore, the property owner is a discharger (responsible party) under California Water Code § 13304.

However, we also recognize that the best-equipped entity to lead cleanup and restoration of Alamitos Creek downstream of Hacienda Furnace Yard is the Santa Clara Valley Water District. In response to Mr. Boulland's comments (see Boulland comment nos. 1 & 6), we clarified that creekside property owners must allow the District access for this project. However, if they do not allow the District access for studies, construction, and post-construction monitoring and maintenance, then we will need to compel them to pay for and conduct cleanup and restoration on their property.

Dill comment no. 2: Drs. Dill expressed concern that current cleanup projects in Almaden Quicksilver County Park (in Jacques Gulch and near Hacienda Furnace Yard) will "significantly increase contaminated runoff for some time".

We disagree that these projects, which are designed to reduce contamination of runoff, will "significantly increase contaminated runoff for some time". However, these projects may cause short-term increases in mercury contamination in stormwater runoff. The permits for these projects, issued by the Water Board and other agencies, will require implementation of best management practices (BMPs) to control stormwater and monitoring to demonstrate the effectivenss of the BMPs in controlling runoff. The District and Parks are undertaking these projects. Their staff and contractors are experienced in properly deploying the appropriate control measures.

Dill comment no. 3: Drs. Dill expressed frustration with the stringent requirements of various regulatory agencies. These requirements have reportedly prevented some creekside property owners from repairing eroding creekbanks.

This exemplifies why the best entity to lead cleanup and restoration of Alamitos Creek is the Santa Clara Valley Water District. See our response to Dill comment no. 1.

Stringent requirements, although frustrating, provide needed environmental protection. Agencies involved in permitting projects require that only trained professionals undertake restoration actions in compliance with conditions or standards established by local, state, or federal government. There have been instances where well-intention, yet poorly designed stream bank repairs have exacerbated the erosion problem, either in the vicinity of the repair, or downstream of the action.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Clean Water Action (Andria Ventura)

Ms. Ventura was an active participant in the Guadalupe Mercury Work Group (see Section 3.1). Clean Water Action's (CWA's) concerns center on protecting people who consume large amounts of watershed fish, whether for cultural or economic reasons, and on local sources of mercury emissions to the air.

CWA comment no. 1: Positive Features

We appreciate CWA's strong support for the focus on both total and methyl mercury in this TMDL project, and we appreciate their support for cleanup and erosion control at the mine sites.

We revised Section 9.7 in response to CWA's concerns that cleanup and restoration in Alamitos Creek is "suggested" rather than required; CWA urges us to mandate these actions. We will evaluate, and report on annually to the Board, progress made in developing designs for a comprehensive creek bank stability and habitat restoration project on Alamitos Creek downstream of Hacienda Furnace Yard. Our current strategy is to encourage this project to proceed on a voluntary basis—including securing funding for it. However, if progress appears to be slower than needed to complete these designs within the ten-year duration of Phase 1, we may consider compelling responsible parties to undertake this project.

CWA comment no. 2: Assimilative Capacity

Ultimately the Clean Water Act aims at eradicating all discharges into U.S. waters (i.e., zero loads). … Thus, we would not support lowering load allocations as methylation is reduced.

We revised Sections 8.2 and 9.7 of the Staff Report to specify assimilative capacity for <u>methyl</u>mercury, in response to this comment. We agree that increasing the assimilative capacity for methylmercury should not result in lowering the allocations for total mercury. However, increasing the assimilative capacity for methylmercury could provide justification for revision of the methylmercury allocation.

CWA comment no. 3: Inadequate Fish Tissue Target

We strongly oppose the selection of a fish tissue [objective based on a consumption rate of] 32 g/day (one meal per week) for the human population. This decision has been made without investigating actual fishing practices in the region and is

therefore negligent to the possibility that some parts of the local population may catch and consume significantly higher levels from the watershed. … the TMDL should include a plan to investigate fishing practices in the watershed, and in the interim establish at the very least an objective in line with U.S. EPA's target of 142.4 grams/day, which would allow 4 to 5 meals a week to protect subsistence fishers.

Ms. Ventura, Baykeeper, and Board Member Peacock expressed similar concerns at the May 2008 testimony hearing. See our response to Board Member Peacock in Part 1.

CWA comment no. 4: Lack of Exposure Reduction Measures

Ms. Ventura repeated this comment at the May 2008 testimony hearing. See our response to Ms. Ventura in Part 1.

CWA comment no. 5: Daily Loads

We used a concentration-based approach for TMDLs, rather than a daily mass load, which several parties commented on. In response to their comments, we revised Section 8 to provide a daily load expression in grams per day (g/d). Our detailed response can be found in Part 2, in response to GRDC comment no. 1.

CWA comment no. 6: Air Deposition

See our response to Baykeeper in Part 1.

Part 2: Staff responses to written comments on the February 2008 Staff Report for Public Comment

Comment letter from Baykeeper (Sara Aminzadeh)

In their cover letter, Baykeeper stated, "The TMDL offers ... an opportunity ...to make lasting improvements to the health of wildlife and people in the Bay Area". Baykeeper urged "…the Water Board to ... take the necessary steps to immediately reduce mercury levels in the Guadalupe Watershed."

Baykeeper comment no. 1: Daily Loads

The TMDL should contain daily loads … . Neither the Guadalupe River Watershed nor the San Francisco Bay has any assimilative capacity for mercury… Clean Water Act requires that controllable sources such as wastewater and stormwater be allocated zero loads. ... must at a minimum, create load allocations that will meaningfully reduce mercury.

We used a concentration-based approach for TMDLs, rather than a daily mass load, which several parties commented on. In response to their comments, we revised Section 8 to provide a daily load expression in grams per day (g/d). Our detailed response can be found in Part 2, in response to GRDC comment no. 1.

There are no wastewater discharges to the waters addressed by this TMDL project. This TMDL project does provide an allocation to stormwater discharges, equivalent to the allocation in the San Francisco Bay mercury TMDL. Although allocations must be set to achieve water quality standards, they need not be zero, particularly when meeting the allocations will likely result in the eventual attainment of water quality standards. Moreover, an allocation of zero to stormwater cannot possibly be achieved. In any case, the proposed allocations and implementation plan will "meaningfully reduce mercury".

Baykeeper comment no. 2: The TMDL Implementation Plan Should Require an Inventory and Investigation of Local Facilities that Emit Mercury

Recommendation: We urge you to identify all potential aerial sources of mercury in this TMDL and issue 13267 letters requiring further study of the potential for deposition into the watershed. The reporting results should then be analyzed in a special study and used to create more accurate allocations for local aerial deposition. In the meantime, a protective load allocation should be inserted into the TMDL as a placeholder to reduce the aerial contribution of mercury to the watershed.

[T]he data relied upon to calculate the load allocation for aerial sources for the Guadalupe TMDL is unsuitable to capture the potentially significant emissions from industrial sources.

The Basin Plan amendment for the San Francisco Bay mercury TMDL states, "The Bay Area Air Quality Management District should conduct a local mercury emissions inventory, investigate the significance of local mercury air emissions, evaluate the effectiveness of existing control measures and the feasibility of additional controls." This regionwide inventory is the best approach; the significance of any effects of local sources within the watershed could not be determined given the astounding pollution levels from mining. The Hanson cement kiln is located in Cupertino, outside the Guadalupe River watershed. We respond to the recommended special study in the following paragraph. See also our response to Lamons comment no. 1, regarding relative bioavailability of mercury from different sources.

We disagree that the data used to estimate the mercury load from atmospheric deposition to San Francisco Bay are inadequate to use to estimate the load to this watershed (see Section 8.5). Proximity is an important consideration for developing this estimate, and the Guadalupe River watershed is adjacent to San Francisco Bay. Table 2.1 lists mercury concentrations in largemouth bass, standardized at 40 cm, for many waters around the region. Del Valle, Nicasio, Lake Chabot, and Lafayette reservoirs are all located away from industrialized areas, and all have similar fish mercury concentrations (from 0.4 to 0.9 mg/kg) to fish in the reference reservoir, Lexington (0.6 mg/kg), also located away from industrialized areas. Therefore, the data are adequate to support our estimated load from atmospheric deposition.

Baykeeper comment no. 3: The TMDL Should Include Exposure Reduction Language to Better Protect At-Risk Communities from the Dangers of Consuming Mercury Contaminated Fish Until the Watershed's Mercury Problem is Resolved

We revised Section 9.7, as described in response to Board Member Peacock and Ms. Ventura in Part 1.

Part 3

Peer reviewer letter no. 1: Professor David L. Sedlak

Environmental Engineering Program
Department of Civil and Environmental Engineering
University of California, Berkeley, September 11, 2007

Introductory Comments:

In general, I believe that the Staff Report uses sound scientific practices to address a complicated issue. The TMDL uses fish tissue mercury concentrations as water quality objectives to protect wildlife and humans who consume fish from the affected reservoirs. Most of these guidelines were established as part of previous TMDLs and have undergone extensive external review. The identification of sources, linkage analysis and allocations are based upon data collected recently by the Regional Board's contractor (i.e., Tetra Tech). Although the heterogeneity of the system and its complex hydrology make it difficult to estimate some of the values accurately, the staff has attempted to apply best professional judgment in a way that allows for cleanup to begin soon. In my opinion, the adaptive management approach advocated by the staff is superior to spending more time quantifying loadings and sources.

In my opinion, the main scientific issue that needs to be resolved is the use of Lexington Reservoir as a background site and the suitability of setting targets based on the conditions in the Lexington Reservoir. While land use data support the idea that the Lexington Reservoir may be representative of the pre-disturbance conditions in the watershed, the background concentrations of mercury in fish under pre-disturbance conditions may not be protective of wildlife and humans as defined by the fish tissue guidelines. Most of my criticism of the TMDL outlined below relates to this issue. In my opinion, the staff should revise the TMDL to reflect the possibility that background conditions may pose a risk rather than attempting to adjust their analysis to fit a preconceived notion that the undisturbed system would have been suitable for all of the designated uses.

We note and greatly appreciate Prof. Sedlak's endorsement of the scientific basis of this TMDL. In fact, we used the reference reservoir to establish allocations, not TMDL targets, specifically as the basis for the mining waste allocation of 0.1 mg/kg (now revised to 0.2 m/kg), and the methylmercury allocation to deep impoundments (now revised to 1.5 ng/l).

We have addressed Professor Sedlak's concerns, however, by amending our interpretation of the fish data and adding an explicit margin of safety to the methylmercury allocation. We respond to his specific comments below.

Comment S-1:

On the bottom of page 7-21 [of the August 2007 Staff Report for Peer Review], staff divides the average small fish mercury concentrations by 2 to estimate springtime concentrations of mercury in fish that would serve as prey to wildlife. …For the adjustment of concentrations to be valid, staff need to verify the following assumptions:

- **Concentrations of mercury causing adverse effects in sensitive wildlife (e.g., belted kingfisher) depend only on springtime mercury concentrations in food.**
- **USFWS recommendations of a 0.05 mg/kg threshold for mercury in TL3 fish … do not already take into account seasonal variations in exposure.**

We performed the verifications Professor Sedlak recommended, and consequently revised our interpretation of the fish data. We now state in Section 7.6 of the Staff Report for Public Comment (2008) that the fish in the reference reservoir (Lexington Reservoir) do not meet the TMDL targets.

Regarding springtime mercury concentrations in [avian] food, we relied on the U.S. FWS for our fish-tissue water quality objectives and targets (U.S. FWS 2003). They stated, "…the avian toxicological endpoint of interest for mercury is reproductive impairment…, our focus was on those species that forage in the watershed and are resident in or around the watershed during their breeding season."

However, the trophic level (TL) 3 prey fish sampled in November 2006 may have just hatched the previous spring. This would invalidate the analysis we presented in the August 2007 Staff Report for Peer Review, which assumed that those fish would have been in the same target size (50 to 150 mm), rather than just hatched. Therefore, we have changed our interpretation of the fish data. We are grateful to Professor Sedlak for his comment and suggestion.

We plan to address the mercury impairment in Lexington Reservoir, and Los Gatos Creek upstream of Vasona Dam, in a future TMDL project for San Francisco Bay Area reservoirs unaffected by mercury mining. Consequently, neither the Guadalupe River watershed mercury TMDL, nor the proposed fish tissue water quality objectives, apply to Los Gatos Creek upstream of Vasona Dam (which include Los Gatos Creek and its tributaries, Lake Elsman, Lexington Reservoir, and Vasona Lake).

We continue to use Lexington Reservoir as the reference reservoir for this TMDL project. We have retained the average bottom sediment concentration in the reference reservoir (0.1 mg/kg) as an allocation to the mercury mining waste source. We reduced the methylmercury allocation to deep impoundments from 2.6 to 1.5 ng/l. This reduction reflects both that the fish in the reference reservoir do not meet targets, and provides an explicit margin of safety.

Also in conducting this analysis, we reviewed the percent of mercury present as methylmercury in fish. Note that in large predator fish nearly all mercury is present as methylmercury, and contained in muscle tissue (see Section 7.4, Quantitative Linkage from Methylmercury in Water to Targets). Consequently, we sampled skinless filet (i.e., muscle) of the large fish that humans consume, and analyzed for total mercury. However, in small, lower trophic level fish, about ninety percent of the mercury is present as methylmercury—in samples of whole fish. Because we analyzed eviscerated prey fish for total mercury, and because most of the inorganic mercury is present in fish livers (which were removed) (Slotton 2007), we estimate that the small prey fish results are equal to methylmercury concentrations. We added fish sampling and data interpretation protocols information to the fish monitoring program (February 2008 proposed Basin Plan amendment and Staff Report Section 9.9).

The changes to the August 2007 Staff Report for Peer Review regarding the impaired waters (pp. 1-3 to 1-4), indicated in strikeout/underline, are the following:

The waters impaired by mercury and addressed by this TMDL are the following:

- Guadalupe Reservoir, Almaden Reservoir, ~~Lake Almaden, and~~ Calero Reservoir~~;~~, and ~~Guadalupe Creek, and Alamitos Creek,~~ Lake Almaden, including ~~percolation~~their tributaries, and Almaden Calero Canal
- Guadalupe Creek, Alamitos Creek, and Canoas Creek, including their tributaries
- Los Gatos Creek and its tributaries downstream of Vasona Dam
- Ross Creek and its tributaries
- Guadalupe River
- Percolation ponds along these creeks~~;~~ and the river
- ~~Guadalupe River.~~

This TMDL addresses waters already listed as impaired by mercury, and those that will be proposed for listing in the next cycle (2008 303(d) list). As explained in Section 2.1, to protect human health Santa Clara County issued a fish consumption advisory to not consume any fish from Guadalupe, Almaden, and Calero reservoirs; Alamitos and Guadalupe creeks; Guadalupe River; and percolation ponds on these creeks and river. Based on this health advisory, ~~the~~ waters listed ~~waters~~ as impaired ~~for~~by mercury in the Guadalupe River watershed (Figure 1-2) under CWA Section 303(d) are~~:~~ Alamitos Creek, Calero Reservoir, Guadalupe Reservoir, Guadalupe Creek, and the Guadalupe River. Staff ~~will recommend~~are recommending listing Almaden Reservoir and the percolation ponds on these creeks and river in the next 303(d) listing cycle (2008). Highly elevated mercury concentrations are also found in fish from Lake Almaden (downstream of New Almaden; Figure 2.1) which is also ~~will be~~ proposed for listing in ~~the next cycle (~~2008~~)~~.

~~Arroyo Calero Creek runs between two listed waters, Calero Reservoir and Alamitos Creek. During the data collection for this TMDL, mercury was detected below 20 nanograms mercury per liter water (ng/l) in three samples collected from the Calero Reservoir outlet and one downstream sample collected from Calero Creek at Harry Road (Tetra Tech 2005a). No fish were collected from Calero Creek. Therefore, there is insufficient data to support 303(d) listing. Nonetheless, this TMDL addresses mercury in Arroyo Calero Creek.~~

~~Nearly all the other water bodies draining the historic New Almaden Mining District (named creeks: McAbee, Golf, Greystone, Randol, and Los Capitancillos creeks, Jacques Gulch; and un-named tributaries) are intermittent and they support only very small populations of fish. Most water samples have been collected during low storm events with low mercury concentrations, although a few samples from some of these water bodies have been collected during large storm events with mercury detected up to nearly 30,000 ng/l (Santa Clara County Parks 2004). Nonetheless, there is insufficient data to support 303(d) listing. Therefore, these waters will be addressed as mining waste source areas in this TMDL.~~

This TMDL addresses mercury impairment in waters that drain mercury mines, including named and unnamed creeks that:

- Drain the New Almaden Mining District to the following waters:

  Guadalupe Creek and Guadalupe Reservoir

  Alamitos Creek and Almaden Reservoir

  Almaden Calero Canal, Calero Reservoir, and Arroyo Calero Creek (Arroyo Calero Creek is the official name on USGS maps; it is also referred to as Calero Creek on other maps and in this report.)

- Drain the Santa Teresa and Bernal mercury mines to Canoas Creek and Santa Teresa Creek (tributary to Calero Creek)
- Drain the Hillsdale mercury mine to Canoas Creek
- Flow into Lake Almaden and the Guadalupe River
- Including percolation ponds along these creeks and the river

This TMDL also addresses mercury impairment from urban runoff into Los Gatos Creek and its tributaries downstream of Vasona Dam; Ross Creek and its tributaries; and above-listed waters that receive urban runoff in addition to drainage from mercury mines (Guadalupe Creek, Alamitos Creek, Lake Almaden, Canoas Creek, Guadalupe River, and tributaries to these waters).

Lexington Reservoir is impaired by mercury from atmospheric deposition and naturally occurring mercury in soil, but it is not affected by mercury mining. We plan to address mercury impairments in Lexington Reservoir (and in Los Gatos Creek and its tributaries upstream of Vasona Dam, including Vasona Lake, Lexington Reservoir, and Lake Elsman) in a future TMDL project for San Francisco Bay Area reservoirs unaffected by mercury mining. Consequently, neither the Guadalupe River watershed mercury TMDL, nor the proposed fish tissue water quality objectives, apply to Los Gatos Creek and its tributaries upstream of Vasona Dam, Vasona Lake, Lexington Reservoir, and Lake Elsman.

The water quality standards for waters in the Guadalupe River watershed include

The changes to the August 2007 Staff Report for Peer Review regarding the interpretation of fish data (pp. 7-21 to 7-25), indicated in strikeout/underline, are the following:

2006 Small Prey Fish and Wildlife

The wildlife target was ~~just met~~exceeded in ~~spring~~ 2006. ~~This conclusion was based on the fish data analysis described in the next paragraph.~~

The fish caught in November 2006 match the wildlife target species and length criteria. Two TL3 fish species were caught, inland silverside (average length 105 mm) and threadfin shad~~, provide a direct measurement of wildlife prey mercury concentrations. The respective~~ (average ~~fish lengths were 105 and~~length 88 mm~~, within the target length of 50–150 mm.~~). The ~~fish mercury concentration of interest is the spring mercury concentration, because the bioaccumulation of concern is female bird consumption of fish prior to bird egg-laying (USFWS 2003).~~

~~The November 2006~~ average mercury concentration was 0.08 mg/kg~~. We estimate the spring 2006 fish mercury concentrations were one-half of the November 2006 concentrations, based on the studies at Davis Creek Reservoir~~, which ~~observed a 2-3 fold increase in juvenile largemouth bass mercury concentrations (see Small Prey Fish Mercury Concentrations and Turnover). Multiplying the average mercury concentration by one-half yields an estimated small prey fish mercury concentration~~exceeds the target of 0.~~04 +/- 0.02~~05 mg/kg ~~(+/- standard deviation), just below the target~~.

Large Fish Mercury Concentrations

…

2004 Large Fish and Human Consumption

In 2004, human health was protected for most consumers of fish from the reference reservoir, assuming consumption of an equal mix of TL3 and TL4 fish. This conclusion was based on the fish data analysis described in the ~~next paragraph~~following paragraphs.

~~Recall~~Note from Section 5 that the wildlife numeric targets are also protective of human health. In this section, and the section below (2006 Large Fish and Human Consumption), we compare the average fish mercury concentrations to two thresholds, discussed in more detail in Section 5. The first threshold is the U.S. EPA's methylmercury criterion of 0.3 mg/kg. This criterion is based on the national default consumption rate of two meals per month of freshwater and estuarine (not ocean) fish. Ninety percent of the U.S. general population consumes less than this amount of fish; U.S. EPA considers it to be indicative of the average consumption among sport fishers. The second criterion is 0.2 mg/kg, which is based on a higher fish consumption rate specific to San Francisco Bay sport fishers of four meals per month of fish from the Bay. Because 0.2 mg/kg protects the 95th percentile of Bay sport fishers, it protects well over 99~~%~~ percent of the Bay Area's population.

Adult largemouth bass and trout data provide an estimate of human prey fish mercury concentrations. The adult largemouth bass were collected from the reference reservoir on September 1, 2004. The trout were obtained directly from the hatchery in December 2006 from a shipment bound for reservoirs in Santa Clara County. Although the hatchery trout were collected in 2006, because they are raised in a controlled environment, it is reasonable to assume the 2006 mercury concentrations are representative of 2004 concentrations. ~~It is~~ We also ~~reasonable to~~ assume that the trout mercury concentrations do not change ~~much~~significantly between stocking and human consumption because human fishing pressure ~~increases immediately upon~~coincides with stocking~~. Even non-fishers (such~~, as ~~the author of this report) have easily observed this human fishing pressure when visiting reservoirs, and engaging fishers in conversations. The fishers readily acknowledge timing their fishing activities to coincide with stocking.~~ described below.

A study of stocked trout in Lafayette Reservoir, also in the San Francisco Bay Area, showed that

> the survival time of trout stocked during the summer may be quite limited.…The average weight of trout measured during the angler interviews was 114 g. Comparisons with the average weight of stocked trout during the same period (108 g) indicates that there is little growth of stocked trout prior to being caught. The low survival and/or growth is probably due to a combination of high epilimnion temperatures and predation by largemouth bass (Tetra Tech 1980).

This phenomenon has been observed at other sites. Reservoir biologists in the San Francisco Bay Area observe that most of the trout are caught soon after stocking, and the (human) fishers readily acknowledge timing their fishing activities to coincide with stocking (Gassel 2007).

The adult largemouth bass is TL4; the 2004 average mercury concentration in bass from the reference reservoir was 0.6 mg/kg. The hatchery trout is TL3; the average mercury concentration was 0.03 mg/kg. The average mercury concentration in a 50-50 mix of TL3 and TL4 is estimated as 0.3 mg/kg, ~~just~~ equal to the U.S. EPA's methylmercury criterion. This is protective at a consumption rate of two servings per month of a 50–50 mix of TL3 and TL4 fish. However, it is not protective for people who consume four ~~(or more)~~ servings per month, nor is it protective in the seasons (i.e. late summer and fall) when largemouth bass are abundant, but trout are not abundant. Therefore, in 2006 we attempted to collect a wider range of fish species consumed by humans.

2006 Large Fish and Human Consumption

In 2006, human health was protected for most consumers of fish from the reference reservoir, assuming consumption of an equal mix of TL3 and TL4 fish. This conclusion was based on the fish data analysis described in the ~~next paragraph~~following paragraphs.

The adult largemouth bass and pumpkinseed (a sunfish) from the reference reservoir, plus hatchery trout, provide an estimate of human prey mercury concentrations. Our sampling plan had called for 15 fish each of channel catfish, black crappie, sunfish, and stocked trout—species other than bass. The sample number of 15 was selected based on a statistical power analysis assuming similar variance as in 2004. However, we were only able to collect 15 adult largemouth bass and five pumpkinseed from the reference reservoir, ~~plus obtain~~ in addition to 15 rainbow trout obtained directly from the hatchery. A ~~potential~~possible reason for our poor fishing success is seasonal variations in abundance. As noted above, we were able to rule out excessive drawdown as a cause of low fish abundance, but perhaps fish populations vary seasonally in the reservoirs. For example, trout are not stocked after about May because they are not expected to survive the warm water in late summer.

The weighted-average mercury concentration in ~~a 50-50~~an equal mix of TL3 and TL4 fish ~~which~~consumed by humans ~~consume~~ (largemouth bass, pumpkinseed, and trout) was also 0.3 mg/kg in 2006, ~~just~~ equal to the U.S. EPA's methylmercury criterion. This is protective at a consumption rate of two servings per month of an equal mix of TL3 and TL4 fish. However, it is not protective for people who consume four ~~(or more)~~ servings per month, nor is it protective in the seasons (late summer and fall) when largemouth bass are abundant, but trout are not abundant.

Next, we compare the reference reservoir adult largemouth bass mercury concentrations to those from throughout the western U.S.

Comparison of Mercury Levels in Western U.S. to Reference Reservoir

Adult largemouth bass mercury concentrations in the reference reservoir appear to be typical of concentrations found in the western U.S. (They are also typical of concentrations found in the San Francisco Bay Area; see Table 2.1.) We base this preliminary conclusion on the following data analysis.

We might expect that fish mercury concentrations in the reference reservoir would be elevated compared to those in other areas of the western U.S., because of its location in the mercury-rich Coast Range. On the other hand, Coast Range mercury deposits are very localized, and no ore-grade deposits were found in its watershed. In any case, the reference reservoir fish mercury concentrations are the best achievable—without active intervention (i.e. methylmercury and bioaccumulation controls).

Researchers have recently published large fish (greater than 120 mm) mercury data from throughout the western U.S. (Peterson et al. 2007a). They collected and analyzed 2,707 large fish from 626 stream/river sites in 12 western U.S. states. ~~Mercury concentrations in over 90%~~In 57 percent of the assessed stream length, mercury concentrations in piscivorous (fish-eating, as compared to herbivores) species exceeded the U.S. EPA methylmercury criterion of 0.3 mg/kg. The lead author provided us with their adult largemouth bass data (Peterson 2007b). There are several differences between the data sets.

Adult largemouth bass from the Guadalupe TMDL study are larger than fish from …

Part 3: Staff responses to peer reviewer comments on the August 2007 Staff Report and Proposed Basin Plan Amendment for Peer Review

The changes to the August 2007 Staff Report for Peer Review regarding the revised methylmercury allocation (pp. 8-5, 8-7 to 8-8), indicated in strikeout/underline, are the following:

Recommended ~~Deep Impoundment~~ Methylmercury Allocation for Reservoirs and Lakes

Staff proposes an allocation of ~~2.6~~1.5 ng/l peak total methylmercury in the hypolimnion of ~~deep impoundments~~reservoirs and lakes downstream of ~~the New Almaden Mining District.~~mercury mines. The proposed allocation is applicable to Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden. This allocation is based on the peak methylmercury concentration in the reference reservoir, and is calculated to attain TMDL targets by minimizing the transformation of mercury to methylmercury caused by anthropogenic activities. The analysis for this allocation is presented below.

…

Calculation of ~~Deep Impoundment~~ Methylmercury Allocation for Reservoirs and Lakes

~~Recall~~Note from Section 7.6 that total methylmercury reached an estimated peak concentration of 2.6 ng/l in the hypolimnion of the reference reservoir in 2004. This is the only available estimate of peak methylmercury concentrations in the reference reservoir. Also, ~~recall from~~ as noted in Section 7.6~~ that the~~, fish tissue targets were not attained in the reference reservoir.~~ Therefore, we propose an allocation of 2.6 ng/l to the hypolimnion~~ Therefore, to calculate methylmercury allocation for reservoirs and lakes, it is necessary to adjust the measured peak methylmercury concentration down to a lower concentration that will attain the wildlife target. The steps to calculate the allocation are to first calculate a bioaccumulation factor (BAF) based on measurements, then divide the target fish mercury concentration by the BAF.

Staff calculated a BAF (see Equation 7.1) based on the reference reservoir. We divided the November 2006 average fish mercury concentration (0.083 mg/kg) by the 2004 peak methylmercury concentration (2.6 ng/l), and multiplied the result by 10^6 ng/mg, which yields a BAF of 31,923 l/kg. Staff selected an explicit margin of safety of 5 percent, which yields a fish target of 0.0475 mg/kg. The methylmercury allocation is calculated by dividing this fish tissue target (0.0475 mg/kg) by the BAF (31,923 l/kg), and multiplying the result by 10^6 ng/mg. This yields a methylmercury concentration of 1.5 ng/l to attain the wildlife target, with a 5 percent margin of safety.

We note that sampling will be required to evaluate compliance with the allocation. …

The changes to the margin of safety analysis in the August 2007 Staff Report for Peer Review, are the following:

This report relies on an explicit margin of safety (five percent) provided by the methylmercury allocation. TMDL analyses must incorporate a margin of safety to address potential uncertainties. The margin of safety is intended to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. ~~This report relies on several conservative assumptions to derive targets and allocations, and thereby provides the margin of safety implicitly.~~

The margin of safety can be derived either explicitly or implicitly. Providing an explicit margin of safety ~~would~~ involves reserving a specific mercury load allocation for the margin of safety. Alternatively, an implicit margin of safety would involve~~s~~ using conservative assumptions (assumptions more likely to be over-protective than under-protective) throughout the analysis. ~~This report relies on an implicit margin of safety.~~

~~The primary margin of safety is provided by methylation controls.~~ This TMDL project indicates that source control alone is insufficient to attain targets within the watershed. However, This TMDL project calls for mining waste and urban runoff source control actions to protect San Francisco Bay. Reducing mercury in impoundment bottom sediments to attain targets (without methylation controls) would likely require cleanup of mining waste to mercury concentrations lower than background soil mercury concentrations. An alternative, but similarly impractical, method for achieving fish tissue targets is to remove all impoundments from operation.

Therefore, Water Board staff proposes to rely on the development of new and innovative methylmercury and bioaccumulation control methods to attain targets. These promising control methods are based on adapting nutrient controls developed for reservoirs (e.g., oxygenate the hypolimnion for taste and odor control). Methylation control provides a sufficient margin of safety so that, as explained in Section 8. ~~5~~2 (see 'Alternative 3 – Shallow Impoundment Methylmercury Allocations'), the fish tissue targets are likely to be met in and downstream of Guadalupe, Almaden, and Calero reservoirs, and Almaden Lake. In other words, staff is optimistic that targets will be met in Guadalupe and Alamitos creeks, and in the Guadalupe River, by reducing methylmercury production in the deep impoundments (reservoirs and lakes) alone.

The changes to the August 2007 Staff Report for Peer Review regarding the protocol for fish tissue monitoring (p. 10-6), indicated in strikeout/underline, are the following:

The following provides the protocol for interpreting fish mercury data from large fish that humans consume. The targets for this TMDL were developed for methylmercury (see Section 5~~), because~~). Because nearly all mercury in fish ~~tissue~~ is methylmercury in the muscles (Grieb et. al. 1990), ~~fish~~ skinless filet samples may be analyzed for total mercury. The total mercury results from such sampling and analysis may be interpreted as equal to methylmercury concentrations. Interpretation of prey fish mercury concentrations is somewhat different.

The following provides the protocol for handling and interpreting prey fish mercury data. The protocol for handling samples of prey fish should include packing the samples in water (e.g. in a zip-lock plastic bag with deionized water) to prevent desiccation. About ninety percent of the mercury in small, whole prey fish is methylmercury (Slotton 2007). Therefore, prey fish methylmercury concentrations may be estimated as ninety percent of the total mercury in whole fish. The prey fish samples collected in 2004 and 2006 were eviscerated. Most of the inorganic mercury in these small fish is contained in the liver, which is removed by evisceration (Slotton 2007). Therefore, the total mercury results from eviscerated fish may be interpreted as equal to methylmercury concentrations.

Whereas grab water methylmercury samples provide an instantaneous and …

The changes to the August 2007 proposed Basin Plan amendment for peer review, indicated in strikeout/underline, are the following:

Chapter 3. Water Quality Objectives (p. BPA-1)

OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Table 3-4A: Freshwater Water Quality Objectives for Mercury in Walker Creek, Soulajule Reservoir, and all tributary ~~waters,~~Their Tributary Wwaters; and in ~~waters~~ Waters of the Guadalupe River ~~watershed~~Watershed Except Los Gatos Creek and its Tributaries Upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake

Chapter 7, Water Quality Attainment Strategies including Total Maximum Daily Loads (TMDLs)

Problem Statement (p. BPA-5)

… The waters impaired by mercury and addressed by this TMDL are the following: …

Total Maximum Daily Loads (p. BPA-7)

The TMDLs, ~~as indicated~~shown in Table 7-~~a~~A, are expressed as methylmercury and mercury concentrations~~. The TMDLs apply to waters downstream of the New Almaden Mining District, including percolation ponds along these waters.~~ in water and sediment.

TABLE 7-~~A.~~A: TOTAL MAXIMUM DAILY LOAD

Waters	TMDL
Guadalupe Creek upstream of Guadalupe Reservoir	
Alamitos Creek ~~upstream of Almaden Reservoir~~	
~~Tributaries to Almaden Reservoir, and to Guadalupe Reservoir~~	0.1 mg mercury per kg suspended sediment (dry wt., annual median)
Almaden Calero Canal	
~~Alamitos Creek upstream of Lake Almaden and downstream of Almaden Reservoir, including percolation~~Percolation ponds along these creeks	
Tributaries to these waters	

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Guadalupe Creek downstream of Guadalupe Reservoir Los Gatos Creek downstream of Vasona Dam Canoas Creek Ross Creek Guadalupe River Percolation ponds along ~~Guadalupe Creek,~~these creeks and the Guadalupe River Tributaries to these waters	0.2 mg mercury per kg suspended sediment (dry wt., annual median)
Guadalupe Reservoir~~,~~ Almaden Reservoir~~,~~ Calero Reservoir~~, and~~ Lake Almaden	~~2.6~~1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)

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Load and Wasteload Allocations (p. BPA-8)

Concentration-based pollutant allocations by source category are shown in Table 7-b.

Table 7-b. Load and Wasteload Allocations

Source	Load Allocation	Wasteload Allocation
…		
Methylmercury in Guadalupe, Almaden and Calero reservoirs, and Lake Almaden	~~2.6~~1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion) (b)	
…		

Fish Tissue Mercury Monitoring (p. BPA-14)

~~Parties responsible~~Monitoring for progress in attaining the fish tissue ~~monitoring include all implementing parties listed in Table 7-c. Additionally,~~mercury targets is required for ~~sample sites in waters which receive~~the mercury mining waste, urban stormwater runoff ~~(sites 4, 5, 7, 8, 9, 12, 13, 14~~, and ~~15), the watershed entities permitted through the Santa Clara Valley Urban Runoff Pollution Prevention Program, NPDES Permit No. CAS029718 (Santa Clara Valley Water District, County of Santa Clara, City of Campbell, Town of Los Gatos, City of Monte Sereno, City of San Jose, City of Santa Clara,~~ methylmercury source categories as specified above. In the first five years of Phase 1, fish shall be monitored at least annually. Subsequently, and ~~City of Saratoga) share responsibility with the implementing parties listed in Table 7-c.~~

~~These parties shall monitor mercury in fish tissue to evaluate progress in attaining targets. In the first 5 years of Phase 1 (years 1–5), fish shall be monitored at least annually. Subsequently,~~ through Phase 2 (years 6–20), fish shall be monitored at least every five years.

In years ~~1–5~~one through five, mercury concentrations shall be monitored in age-1 largemouth bass (remediation indicators) in ~~deep impoundments at a minimum~~reservoirs and lakes in the fall, soon after ~~turnover.~~mixing occurs. Also in years ~~1–5~~one through five, mercury concentrations shall be monitored in fish ~~species consumed by wildlife, of~~, both 5–15 cm and 15–35 cm in length, of species consumed by wildlife, at all sampling locations ~~at a minimum during the bird~~just before the belted kingfisher and osprey breeding season ~~(TMDL targets).~~. Twice in years one through five, this fish monitoring should be repeated during the belted kingfisher and osprey breeding season. The Water Board will determine fish species and sizes to be monitored in subsequent years ~~6–20~~ based upon a review of data from years ~~1–5. Water quality shall be monitored with fish collection for total mercury, dissolved mercury, total methylmercury, dissolved methylmercury, suspended sediment, and general water quality parameters~~one through five.

Prey fish methylmercury concentrations shall be estimated as (a) one hundred percent of the total mercury in eviscerated fish, or (b) ninety-five percent of the total mercury in whole fish, or (c) a different percentage based on scientific studies and upon approval of the Executive Officer of the Water Board. Large predator fish methylmercury concentrations shall be estimated as one hundred percent of the total mercury in skinless filet samples. Water quality shall be monitored at the same time and location as fish collection for mercury species, nutrients, and general water quality parameters.

The fish and water sampling sites are: Guadalupe Reservoir ~~(~~site 1 (S1), and one site on Guadalupe Creek (S2); Almaden Reservoir (S3), and two sites on Alamitos Creek (~~4&~~S4 and S5); Calero Reservoir (S6), and one site on Arroyo Calero Creek (S7); two sites on the Guadalupe River (~~8&~~S8 and S9); Lake Elsman (S10), Lexington Reservoir (S11) , Vasona Lake (S12), and one site on Los Gatos Creek (S13); and one site on each of Ross (S14) and Canoas (S15) creeks.

Comment S-2: "After eliminating the possibility that trophic level 3 fish pose a risk to wildlife, staff ignore the possible wildlife risks associated consumption of trophic level 4 (TL4) fish by wildlife. Table 5.2 (page 5-3) indicates a TL4 threshold of 0.20 mg/kg for protection of osprey. Given the fact that TL4 fish that osprey are likely

to consume (e.g., largemouth bass) generally contain more than 0.2 mg/kg of mercury, and mercury concentrations do not undergo dramatic seasonal fluctuations in TL4 fish, it seems as if Lexington Reservoir could pose a wildlife risk."

We disagree with Professor Sedlak's interpretation of adult largemouth bass data because these fish exceed the target size. We interpret this comment to refer to 400 mm largemouth bass. The target size is listed in Table 5.2, Safe Prey Fish Methylmercury Levels (August 2007 Staff Report for Peer Review), and is 0.20 mg/kg in TL4 fish 150-350 mm in length. The TL4 fish collected in 2006 and 2004 were largemouth bass bigger than the wildlife target. From Table A.7a, Lexington Reservoir Fish Mercury Concentration Summary (2006) (Appendix A, August 2007 Staff Report for Peer Review), adult largemouth bass ranged in size from 369 to 512 mm with an average length of 405 mm. The adult largemouth bass caught in 2004 were also bigger than the wildlife target (Table A.8a). No corresponding targets have been developed for TL4 fish of this length. Therefore, we disagree that TL4 fish present a risk to wildlife.

Comment S-3: "In the evaluation of human exposure to mercury through large fish (page 7-22), staff make an assumption that half of the human consumption of fish involves fish that are caught immediately upon stocking of the reservoir. The basis for this assumption is an observation that fishing pressure increases immediately after stocking. …the implicit assumption is that humans who catch more than half of their fish outside of a narrow, undefined period immediately after restocking will not be protected from adverse effects of mercury."

In our response to comment S-1, we explained that we have modified the August 2007 Staff Report for Peer Review regarding the interpretation of fish data (pp. 7-21 to 7-25) to read, "This is protective at a consumption rate of two servings per month of an equal mix of TL3 and TL4 fish. However, it is not protective for people who consume four servings per month, nor is it protective in the seasons when largemouth bass are abundant, but trout are not abundant."

Comment S-4: "Even after this assumption [see comment S-3] is made, staff compared the threshold value with the USEPA 0.30 mg/kg threshold instead of the 0.20 mg/kg threshold that has been used in other recent RWQCB mercury TMDLs. From a policy standpoint, this appears to be inconsistent."

Although this comment goes beyond the scope of the review (scientific basis), we choose to respond to it. Professor Sedlak is partly correct. The 0.2 mg/kg threshold has been used for two recent TMDLs, for the San Francisco Bay (SFBRWQCB 2006) and the Sacramento-San Joaquin River Delta (CVRWQCB 2006). This is because a fish consumption study was conducted specific to San

Francisco Bay, and the Bay and Delta are contiguous water bodies. As discussed in the Staff Report (page 5-6), no fish consumption study for the Guadalupe River watershed or reservoirs is available. However, we compare fish mercury concentrations (objectives) to both the U.S. EPA national criterion of 0.3 mg/kg, and to the more protective 0.2 mg/kg threshold and conclude that the proposed fish tissue wildlife objective will attain the 0.2 mg/kg threshold. Therefore, the proposed water quality objectives are based on consistent policy.

Comment S-5: "To further justify the conclusion that the Lexington Reservoir is a representative background site, staff compared data from the reservoir with data from the Western US (Figure 7.12)….A glance at the data for larger fish (e.g., those that were over 30 cm) suggests that mercury concentrations in the Lexington Reservoir are higher than those included in the Peterson et al. survey."

In response to this comment, the changes to the August 2007 Staff Report for Peer Review, indicated in strikeout/underline, are the following:

Comparison of Mercury Levels in Western U.S. to Reference Reservoir

Adult largemouth bass mercury concentrations in the reference reservoir appear to be typical of concentrations found in the western U.S. <u>(They are also typical of concentrations found in the San Francisco Bay Area; see Table 2.1.)</u> We base this preliminary conclusion on the following data analysis.

Comment S-6: "In Table 2.1, concentrations of Hg in fish from locations around Central California are compared for a standardized 40 cm Largemouth Bass. …This observation appears to offer stronger support to the idea that Hg concentrations in Largemouth Bass of 0.4-0.8 mg/kg are typical for reservoirs in this part of California. Perhaps the data from those other studies could be mentioned in Chapter 7."

Comment noted.

Comment S-7: "The report advocates using the maximum concentration of total methylmercury in the hypolimnion of the Lexington Reservoir as the benchmark for the other reservoirs. On page 8-8 the staff advocates sampling from reservoir outlets for simplicity. However, it is unclear how well the outlet structures capture the conditions in the hypolimnion. On page 10-4 staff acknowledges this issue and suggests that it might be resolved later as part of a special study. Given the uncertainty in this key parameter, I suggest that the monitoring program go through the additional effort to collect true hypolimnetic samples…. "

This question will be addressed by special study 2, "How do the deep impoundments (reservoirs and lakes) differ from one another?" (p. 10-8). In response to this comment, we have expanded the study to include the following question: "Do outlet samples adequately represent hypolimnetic methylmercury concentrations for each reservoir?"

Both the Basin Plan Amendment and the August 2007 Staff Report for Peer Review (page 10-8) have been modified as follows:

How do the reservoirs and lakes differ from one another? Factors to consider include, but are not limited to, area of connected wetlands, food web, water chemistry (phosphorus, pH, acid neutralizing capacity, and dissolved organic carbon), water level fluctuations, and infrastructure (outlet structure). <u>Do outlet samples adequately represent hypolimnetic methylmercury concentrations for each reservoir?</u> How significant are these differences?

Comment S-8: "Page 4-5: To obtain average particulate mercury concentrations from streams in the mining district, data in Table 4.2 are used. These data only account for a fraction of the available data collected by Tetra Tech. The report needs to explain why these specific samples were chosen to represent conditions in the watershed."

Professor Sedlak has perhaps confused "mining district" creeks with "watershed" creeks. Table 4.2 lists the mining district creeks and the corresponding data from Tetra Tech's sampling efforts. The other samples referenced by Professor Sedlak are samples from creeks which do not drain the mining district, and therefore were not included in this loading estimate. (We note that data from both creeks which drain the mining district and other creeks in the watershed are all lumped together in the two tables from the Data Collection Report cited in Table 4.2.)

Comment S-9: "Page 7-15: The report should caution the reader about interpretation of the redox data in Figure 7.9. Data on redox conditions in natural waters collected with electrodes is notoriously unreliable. The electrode can probably indicate the disappearance of oxygen by a decrease in potential, but otherwise it is not very useful. …. In the future, much more information on redox conditions could be obtained by monitoring Fe(II), SO4 2- and S(-II) with depth."

As Professor Sedlak has indicated, the shape of the curves, especially the depth at which redox decreases, is what is important in these figures, not the redox reading. In the special studies proposed in Section 10.3 (renumbered to Section 9.10 in the February 2008 Staff Report) we will consider the need to monitor Fe(II), SO4 2- and S(-II) with depth.

Part 3: Staff responses to peer reviewer comments on the August 2007 Staff Report and Proposed Basin Plan Amendment for Peer Review

Both the Basin Plan Amendment and the August 2007 Staff Report for Peer Review have been modified as follows:

> Is it feasible to control methylmercury production in the hypolimnion of deep impoundments? Do field redox measurements provide sufficient information, or is it necessary to monitor for Fe(II), SO4 2- and S(-II) with depth to understand methylation in the deep impoundments? If it is feasible to control methylmercury production in the hypolimnion of deep impoundments, does it result in attaining the fish tissue targets? If not, what other controls are feasible in deep impoundments, and do they result in attaining targets?

Comment S-10: "Page 7-12: The discussion of bioaccumulation factors considers using both total and dissolved mercury and methylmercury concentrations. Staff acknowledges that using particle-associated mercury and methylmercury concentrations in the calculations is problematic. …Bioaccumulation factors are typically based on the ratio of concentration in fish tissue to the dissolved concentration. …I suggest that staff rewrite this section using data from filtered samples or after adjusting total concentrations for dissolved concentrations using partition coefficients."

> Staff has revised this section using available data from unfiltered (total methylmercury) and filtered (dissolved) methylmercury samples. We considered the suggestion that we calculate a partition coefficient, and elected to rely on the future studies proposed in the implementation and monitoring section of the TMDL to provide greater insight into the differences between reservoirs.

We made the following changes to pages 7-12 through 7-14 of the August 2007 Staff Report for Peer Review:

… and show the importance of the uptake of methylmercury by the lower trophic levels.

To support development of fish BAFs and other TMDL ~~work~~calculations, measurements of total mercury in fish throughout the watershed were collected in 2004 ~~in the data collection effort~~ (see Section 3.1). ~~Nearly all mercury in fish is methylmercury (Grieb et al. 1990).~~ USEPA collected adult and age-1 largemouth bass from ~~five impoundments~~ four reservoirs (Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lexington Reservoir), and Lake Almaden ~~Lake~~). The Santa Clara Valley Water District collected age-1 California roach (*Lavinia symmetricus*) at six creek and river locations.

~~Adult~~ BAFs for adult largemouth bass ~~BAFs~~ were developed from average total mercury concentrations in fish and unfiltered (total) and filtered (dissolved) methylmercury concentrations in the surface and hypolimnion of the five ~~largest~~ impoundments ~~(Tetra Tech 2005d; SFBRWQCB 2005e). The water~~. (See Appendix B, Calculation B.1.) In Table 7.1 we present the BAFs for both total and dissolved methylmercury, and both average and peak concentrations ~~are averages of measurements~~ , at ~~Almaden and Guadalupe reservoirs on one date in July 2003 and six dates between May 11 and August~~

~~31, 2004. These measurements were taken at both~~ the ~~surface and at the reservoir outlet~~discharge point (referred to as ~~hypolimnetic samples~~hypolimnion, since water is released from ~~the bottom of the~~ reservoirs at a depth below the thermocline). ~~The mercury concentrations at Almaden and~~ (In Appendix B, Calculation B.1, we include BAFs for the full data set.)

The BAFs for adult fish compared to average hypolimnion total and dissolved methylmercury range from 400,000 to 1.8 million. The BAFs for adult fish compared to peak hypolimnion total and dissolved methylmercury range from 240,000 to 1.1 million (see Table 7.1).

Water column mercury concentrations in Almaden, Guadalupe, and Lexington reservoirs are well characterized. ~~A single value is used for the surface-water methylmercury concentration at Almaden Lake. This value is the average of two samples collected at the outlet in April 2004 as part of the Wet Weather Sampling under Part 1 of the Data Collection Plan (Tetra Tech 2005a).~~ Average concentrations for Almaden and Guadalupe reservoirs are from measurements taken on one day in July 2003 and six days between May 11 and August 31, 2004. Average concentrations for Lexington Reservoir are from measurements on one day in July 2003 and semi-monthly samples in 2004. Peak concentrations for Guadalupe, Almaden, and Lexington reservoirs are estimated from measurements taken between mid-May and early September 2004. A single value is used for the surface-water methylmercury concentration at Lake Almaden and Calero Reservoir. These samples were collected in 2003 during the synoptic survey (Tetra Tech 2003). There is no measurement for the hypolimnion at Almaden Lake. ~~The surface-water and hypolimnion values for Calero and Lexington reservoirs are from samples collected on one date in July 2003.~~

Table 7.1 Adult Largemouth Bass Bioaccumulation Factors (l/kg)

	Hypolimnion (discharge point) Average 2003-2004		Hypolimnion (discharge point) 2004 Estimated Peak	
	Total Methylmercury	Dissolved Methylmercury	Total Methylmercury	Dissolved Methylmercury
Guadalupe Reservoir	**1,100,000**	**1,700,000**	**500,000**	**800,000**
Almaden Reservoir	**990,000**	**1,800,000**	**580,000**	**1,100,000**
Lake Almaden	- -	- -	- -	- -
Calero Reservoir	**400,000**	**830,000**	- -	- -
Lexington Reservoir	**1,100,000**	- -	**240,000**	- -

- - = not measured

Similarly, age-1 largemouth bass BAFs were calculated from measurements of total mercury in the fish and the same set of impoundment methylmercury data used for the adult BAFs. The BAFs for age-1 fish compared to average hypolimnion total and dissolved methylmercury range from ~~80~~76,000 to ~~200~~390,000. The BAFs for age-1 fish compared to ~~surface~~peak hypolimnion total and dissolved methylmercury range from ~~400~~35,000 to 240,000 (see Table 7.2 ~~million.~~).

~~The BAFs for adult fish compared to hypolimnion methylmercury range from 400,000 to 1,000,000. The BAFs for adult fish compared to surface total methylmercury range from 3.2 million to 12 million.~~

Table 7.2 2004 Age-1 Largemouth Bass Bioaccumulation Factors

	Average Methylmercury 2003-2004		2004 Estimated Peak Methylmercury	
	Total Methylmercury	Dissolved Methylmercury	Total Methylmercury	Dissolved Methylmercury
Guadalupe Reservoir	150,000	230,000	70,000	110,000
Almaden Reservoir	220,000	390,000	130,000	240,000
Lake Almaden	- -	- -	- -	- -
Calero Reservoir	76,000	160,000	- -	- -
Lexington Reservoir	170,000	- -	35,000	- -

- - = not measured

Because the zooplankton methylmercury concentrations are reported on a dry-weight …

We made the following changes to Appendix B, pages B-2 to B-4, of the August 2007 Staff Report for Peer Review:

Calculation B.1 Bioaccumulation Factors (BAFs)

In Table B.1a on the following pages we provide the 2004 surface, depth profile, and discharge point methylmercury concentrations used to develop the BAFs. In the following two tables, Tables B.1b and B.1c, we provide the 2004 fish mercury concentrations and BAFs for adult largemouth bass and age-1 largemouth bass, respectively. Also in Table B.1c, we provide the BAFs for threadfin shad and inland silversides (TL3 fish 50-150mm in length) collected in 2006 from Lexington Reservoir.

~~Table B.3a on the following page provides the range of bioaccumulation factors (BAFs) which is the ratio of tissue concentration to water column concentration in units of liters per kilogram (L/Kg). It also provides a check on the average unfiltered methylmercury in surface and hypolimnion samples collected at Guadalupe Reservoir. Tetra Tech had~~

~~provided averages of 0.46 and 5.61 ng/l respectively without the supporting calculations; Water Board averages were 0.69 and 5.52 ng/l respectively, which is in close accord with the Tetra Tech calculations (Table 8-6 Tetra Tech 2005a).~~

~~The BAFs for age-1 largemouth bass range from 80,000 L/Kg at Calero Reservoir to 200,000 L/Kg at Almaden Reservoir for the hypolimnion, and 400,000 L/Kg at Lexington Reservoir to 2 million L/Kg at Guadalupe Reservoir for the surface.~~

~~The BAFs for adult largemouth bass range from 400,000 L/Kg at Calero Reservoir to 1 million L/Kg at Guadalupe Reservoir for the hypolimnion, and 3.1 million L/Kg at Lexington Reservoir to 12.6 million L/Kg at Guadalupe Reservoir for the surface.~~

~~The BAF tables from Tetra Tech are provided as Tables B.3b, B.3c, and B.3d, below.~~

~~Reference~~

~~Tetra Tech, Inc. (Tetra Tech 2005a). *Technical Memorandum 5.3.2*, *Data Collection Report*, *Volume 1*, Prepared for Santa Clara Valley Water District. February 8. http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Watershed_info_&_projects/Guadalupe/_Guadalupe_River_TMDL_project/index.shtm~~

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Table B.1a Methylmercury Concentrations Used to Calculate Bioaccumulation Factors (BAFs)

			Surface			Hypolimnion (true)			Hypolimnion (discharge point)		
			Total	Dissolved	Depth	Total	Dissolved	Dissolved	Total	Dissolved	Dissol
	Sample Date	Sample ID	MeHg (ng/l)	MeHg (ng/l)	(ft)	MeHg (ng/l)	MeHg (ng/l)	%	MeHg (ng/l)	MeHg (ng/l)	%
	Guadalupe Reservoir										
(Tetra Tech 2003)											
Table 3-2	7/31/2003	Site 19B			40	2.91	0.743	26%			
Table 3-3	7/31/2003	Site 11							8.27	6.073	73%
Table 3-2	7/31/2003	Site 19T	3.31	0.491							
"	7/31/2003	Site 20	4.62	0.744							
"	7/31/2003	Site 20V	1.00	0.595							
(Tetra Tech 2005a)											
Table 4-3	5/11/2004		0.566	0.171	50	0.463	0.247	53%	0.853	0.552	65%
	6/10/2004		0.472	0.157	50	0.424	0.226	53%	1.240	0.772	62%
	7/15/2004		0.299	0.123	50	0.965	0.802	83%	1.540	1.010	66%
	7/15/2004		0.267	0.117							
	8/2/2004		0.204	0.128	50	3.810	3.58	94%	6.430	3.73	58%
	8/12/2004		0.324	0.117	50	11.000	8.27	75%	8.100	6.08	75%
	8/12/2004				50	5.090	5.47	107%			
	8/31/2004		0.272	0.085	50	11.5	7.2	63%	12.80	7.24	57%
	9/18/2004										
		Average methylmercury 2003-2004:	1.13	0.27		4.52	3.32		5.60	3.64	
		Peak methylmercury on Sep. 18, 2004:				10.73	8.17		11.82	7.29	
	% dissolved methylmercury	min						26%			57%
		mean						69%			65%
		max						107%			75%

Table B.1a Methylmercury Concentrations Used to Calculate Bioaccumulation Factors (BAFs)

	Sample Date	Sample ID	Surface Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Depth (ft)	Hypolimnion (true) Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Dissolved %	Hypolimnion (discharge point) Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Dissol %
Almaden Reservoir											
(Tetra Tech 2003)											
Table 3-2	7/30/2003	Site 21B			40	2.25	0.556				
Table 3-3	7/30/2003	Site 1							4.34	3.78	
Table 3-2	7/30/2003	Site 21T	2.26	0.610							
"	7/30/2003	Site 22	1.75	0.414							
"	7/30/2003	Site 22V	3.26	1.06							
(Tetra Tech 2005a)											
Table 4-3	5/11/2004		0.336	0.164	50	0.518	0.298	58%	2.271	1.219	54%
	6/10/2004		0.506	0.333	50	1.287	0.817	63%	2.771	1.584	57%
	6/10/2004								2.909	1.515	52%
	7/15/2004		0.446	0.266	50	2.300	1.140	50%	4.720	1.110	24%
	8/2/2004		0.582	0.287	50	2.070	1.07	52%	4.150	2.38	57%
	8/2/2004		0.511	0.233							
	8/12/2004		0.466	0.237	50	1.830	2.81	154%	7.200	4.29	60%
	8/31/2004		0.369	0.277	50	5.49	3.09	56%	6.47	3.69	57%
	8/31/2004				50	5.09	2.68	53%			
	9/18/2004										
		Average methylmercury 2003-2004:	1.05	0.39		2.60	1.56		4.35	2.45	
		Peak methylmercury on Sep. 18, 2004:				4.87	3.10		7.40	4.03	
	% dissolved methylmercury	min						50%			24%
		mean						69%			51%
		max						154%			60%

Table B.1a Methylmercury Concentrations Used to Calculate Bioaccumulation Factors (BAFs)

			Surface			Hypolimnion (true)			Hypolimnion (discharge point)		
			Total	Dissolved	Depth	Total	Dissolved	Dissolved	Total	Dissolved	Dissol
	Sample Date	Sample ID	MeHg (ng/l)	MeHg (ng/l)	(ft)	MeHg (ng/l)	MeHg (ng/l)	%	MeHg (ng/l)	MeHg (ng/l)	%
Calero Reservoir (Tetra Tech 2003)											
Table 3-2	7/30/2003	Site 23B			40	3.05	1.25	41%			
Table 3-3	7/30/2003	Site 8							2.77	1.33	48%
Table 3-2	7/30/2003	Site 23T	0.92	0.203							
"	7/30/2003	Site 23T Rep	0.77	0.083							
"	7/30/2003	Site 24	1.06	0.192							
"	7/30/2003	Site 24V	0.29	0.185							
No methylmercury data was collected from Calero Reservoir in 2004											
Lake Almaden (Tetra Tech 2003)											
Table 3-3	7/29/2003	Site 7	17.85	1.72	(depth not reported)						
No methylmercury data was collected from Lake Almaden in 2004											

Table B.1a Methylmercury Concentrations Used to Calculate Bioaccumulation Factors (BAFs)

-	-	-	Surface	-	-	Hypolimnion (true)	-	-	Hypolimnion (discharge point)		
-			Total	Dissolved	Depth	Total	Dissolved	Dissolved	Total	Dissolved	Dissol
-	Sample Date	Sample ID	MeHg (ng/l)	MeHg (ng/l)	(ft)	MeHg (ng/l)	MeHg (ng/l)	%	MeHg (ng/l)	MeHg (ng/l)	%
Lexington Reservoir		-	-	-	-	-	-	-	-	-	-
(Tetra Tech 2003)											-
Table 3-2	7/31/2003	Site 18B			40	1.25	0.735	59%			-
Table 3-3	7/31/2003	Site 16							0.756	0.745	99
Table 3-2	7/31/2003	Site 18T	0.57	0.069							-
(LAS 2004)											-
-	1/12/2004	03128-1							0.125		-
	1/12/2004	03128-1 Replicate							0.142		
-	3/4/2004	03128-2							0.045		-
-	3/4/2004	03128-2 Replicate							0.045		-
-	3/18/2004	03128-3							0.05		-
-	3/18/2004	03128-3 Replicate							0.061		-
-	4/6/2004	03128-4							0.064		-
-	4/6/2004	03128-4 Replicate							0.045		-
-	4/26/2004	03128-5							0.106		-
-	4/26/2004	03128-5 Replicate							0.045		-
-	5/11/2004										-
-	5/13/2004	03128-6							0.057		-
-	5/13/2004	03128-6 Replicate							0.045		-
-	5/25/2004	03128-7							0.17		-

Table B.1a Methylmercury Concentrations Used to Calculate Bioaccumulation Factors (BAFs)

Sample Date	Sample ID	Surface Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Depth (ft)	Hypolimnion (true) Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Dissolved %	Hypolimnion (discharge point) Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Dissol %
Lexington Reservoir - continued										
5/25/2004	03128-7 Replicate							0.169		
6/16/2004	03128-8							0.32		
6/16/2004	03128-8 Replicate							0.314		
7/1/2004	03128-9							0.609		
7/1/2004	03128-9 Replicate							0.59		
7/13/2004	03128-10							0.863		
7/13/2004	03128-10 Replicate							0.787		
7/29/2004	03128-11							1.45		
7/29/2004	03128-11 Replicate							1.54		
8/19/2004	03128-11							2.14		
8/19/2004	03128-11 Replicate							2.18		
9/2/2004	03128-13							2.1		
9/2/2004	03128-13 Replicate							2.43		
9/18/2004										
9/27/2004	03331-14							0.592		
9/27/2004	03331-14 Replicate							0.594		
10/14/2004	03331-15							0.219		

Table B.1a Methylmercury Concentrations Used to Calculate Bioaccumulation Factors (BAFs)

		Surface			Hypolimnion (true)			Hypolimnion (discharge point)		
		Total	Dissolved	Depth	Total	Dissolved	Dissolved	Total	Dissolved	Dissol
Sample Date	Sample ID	MeHg (ng/l)	MeHg (ng/l)	(ft)	MeHg (ng/l)	MeHg (ng/l)	%	MeHg (ng/l)	MeHg (ng/l)	%
10/14/2004	03331-15 Replicate							0.286		
10/28/2004	03128-16							0.221		
10/28/2004	03128-16 Replicate							0.19		
11/15/2004	03128-17							0.102		
11/15/2004	03128-17 Replicate							0.097		
12/2/2004	03331-18							0.094		
12/2/2004	03331-18 Replicate							0.095		
Lexington Reservoir										
	Average methylmercury 2003-2004:							0.53		
	Peak methylmercury on Sep. 18, 2004:							2.6		

Table B.1b Bioaccumulation Factors for 2004 Adult Largemouth Bass

	Surface		Hypolimnion (true)		Hypolimnion (discharge point)		Average Fish Tissue
	Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Total MeHg (ng/l)	Dissolved MeHg (ng/l)	Total Hg (mg/kg ww) 2004 Adult Largemouth Bass
Guadalupe Reservoir							6.1
Average methylmercury 2003-2004:	1.13	0.27	4.52	3.32	5.60	3.64	
BAF:	5,400,000	22,000,000	1,300,000	1,800,000	1,100,000	1,700,000	
Peak methylmercury on Sep. 18, 2004:			10.73	8.17	11.82	7.29	
BAF:			570,000	700,000	500,000	800,000	
Almaden Reservoir							4.3
Average methylmercury 2003-2004:	1.05	0.39	2.60	1.56	4.35	2.45	
BAF:	4,100,000	11,000,000	1,700,000	2,800,000	990,000	1,800,000	
Peak methylmercury on Sep. 18, 2004:			4.87	3.10	7.40	4.03	
BAF:			880,000	1,400,000	580,000	1,100,000	
Calero Reservoir							1.1
Average methylmercury 2003-2004:	0.76	0.17	3.05	1.25	2.77	1.33	
BAF:	1,400,000	6,600,000	360,000	880,000	400,000	830,000	
Lake Almaden							2.3
One measurement in 2003:	17.85	1.72					
BAF:	130,000	1,300,000					

Table B.1b Bioaccumulation Factors for 2004 Adult Largemouth Bass

	Surface		Hypolimnion (true)		Hypolimnion (discharge point)		Average Fish Tissue
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total Hg (mg/kg ww)
	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	2004 Adult Largemouth Bass
Lexington Reservoir							0.6
Average methylmercury 2003-2004:					0.53		
BAF:					1,100,000		
Peak methylmercury on Sep. 18, 2004:					2.55		
BAF:					240,000		

Table B.1c Bioaccumulation Factors for 2004 Age-1 Largemouth Bass and 2006 TL3 Species

	Surface		Hypolimnion (true)		Hypolimnion (discharge point)		Average Fish Tissue	Average Fish Tissue
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total Hg (mg/kg ww)	Total Hg (mg/kg ww)
	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	2004 Age-1 Largemouth Bass	2006 TL3 species
Guadalupe Reservoir							0.83	
Average methylmercury 2003-2004:	1.13	0.27	4.52	3.32	5.60	3.64		
BAF:	730,000	3,000,000	180,000	250,000	150,000	230,000		
Peak methylmercury on Sep. 18, 2004:			10.73	8.17	11.82	7.29		
BAF:			77,000	100,000	70,000	110,000		
Almaden Reservoir							0.96	
Average methylmercury 2003-2004:	1.05	0.39	2.60	1.56	4.35	2.45		
BAF:	920,000	2,500,000	370,000	620,000	220,000	390,000		
Peak methylmercury on Sep. 18, 2004:			4.87	3.10	7.40	4.03		
BAF:			200,000	310,000	130,000	240,000		
Calero Reservoir							0.21	
Average methylmercury 2003-2004:	0.76	0.17	3.05	1.25	2.77	1.33		
BAF:	280,000	1,300,000	69,000	170,000	76,000	160,000		

Table B.1c Bioaccumulation Factors for 2004 Age-1 Largemouth Bass and 2006 TL3 Species

	Surface		Hypolimnion (true)		Hypolimnion (discharge point)		Average Fish Tissue	Average Fish Tissue
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total Hg (mg/kg ww)	Total Hg (mg/kg ww)
	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	MeHg (ng/l)	2004 Age-1 Largemouth Bass	2006 TL3 species
Lake Almaden							0.39	
One measurement in 2003:	17.85	1.72						
BAF:	22,000	230,000						
Lexington Reservoir							0.09	0.083
Average methylmercury 2003-2004:					0.53			
2004 Age-1 Largemouth Bass BAF:					170,000			
2006 TL3 species BAF:					160,000			
Peak methylmercury on Sep. 18, 2004:					2.55			
2004 Age-1 Largemouth Bass BAF:					35,000			
2006 TL3 species BAF:					33,000			

Comment S-11: "Figure 7-19 is inconsistent with the text. The text indicates a maximum hypolimnion methylmercury concentration of 2.6 ng/L while the figure indicates maximum concentration of 3.1 ng/L. I believe that the discrepancy arises from the fact that the figure uses a regression that includes one extra observation (May 13)."

We appreciate the comment, and have revised Figure 7-10 (on page 7-19) for better legibility.

Comment S-12: "On page 8-13, the discussion of the margin of safety implies that a margin of safety is implicit in the plan because control methods in the deep impoundments will greatly reduce methylmercury concentrations.…As written, the TMDL instructs the managers of the reservoirs to achieve a maximum hypolimnetic methylmercury concentration that will yield fish that have a mercury concentration at the threshold for wildlife effects. There is no provision that they should operate the system to achieve lower levels (if that is possible). Thus, a hypolimnetic oxygenation system operated intermittently could achieve the requirements of the TMDL without providing a margin of safety.… If necessary, staff should revisit assumptions to achieve an appropriate margin of safety."

See response to comment S-1 for our detailed response. In response to several of Professors Sedlak's and Tullos' comments, we have added an <u>ex</u>plicit margin of safety to the methylmercury allocation to deep impoundments.

Comment S-13: "A number of recent studies suggest that forest fires can mobilize mercury and increase methylmercury uptake into the food chain. Fires and fire management issues are not addressed in the TMDL. Perhaps this is beyond the scope and control of the RWQCB, but it might be useful to anticipate how the effect of fires will be considered with respect to monitoring the progress of compliance. In addition, consideration of the effects of fire on mercury might merit additional efforts for fire suppression in the mining district."

Comment noted. In the event of a wildfire, erosion control measures are expected to be taken to prevent excessive sedimentation of downstream waters in the subsequent wet season.

Comment S-14: "The same paragraph is repeated at the bottom of page 2-1 and the top of page 2-3."

We have removed the duplicated text.

Comment S-15: "Page 4-24: Figure 4.11 shows a negative cumulative export from the Almaden Reservoir between May and July. Is there an explanation for this?"

Professor Sedlak may have reversed the two figures shown side-by-side at the top of page 4-24. On the upper left is Figure 4-10(a), Almaden Reservoir Methylmercury Mass, which shows a decline in the mass of methylmercury in Almaden Reservoir between May and June. On the upper right is Figure 4-11(a), Almaden-Methylmercury export. The cumulative load of methylmercury exports from Almaden Reservoir has a fairly steady increase from May through August.

Peer reviewer letter no. 2: Professor Desiree Tullos

Biological and Ecological Engineering
Oregon State University, Corvallis, September 22, 2007

Introductory Comments:

While the basis for this TMDL certainly is an acceptable use of scientific information, I do have some concerns about the study, particularly regarding the human consumption rates, ability to protect human health, and the implementation, monitoring, and enforcement of this TMDL.

We are pleased to note that Professor Tullos finds the basis for TMDL to be an acceptable use of scientific information. In the following responses to her specific comments, we address her concerns regarding protection of human health, and implementation, monitoring and enforcement of the TMDL.

Fish Tissue Mercury Water Quality Objectives

Comment T-1a: "The logic and approach for determining the numeric fish-tissue objectives (0.05 and 0.1 mg methylmercury/kg fish for respective lengths of 5–15 cm and 15–35 cm) is scientifically sound. The authors rightfully determined that this target will protect humans consuming as much as one meal of fish per week from this watershed."

We note Professor Tullos' endorsement of the proposed wildlife water quality objectives, and their protectiveness of human health.

Comment T-1b: "However, I would like to see a more detailed description of (a) whether the use of regional consumption rates is appropriate in this basin and (b) the level of risk involved with under- or over-predicting consumption rates."

See our response to comment S-4; we note that a risk assessment is not required either to establish water quality objectives or a TMDL.

Source Analysis

Comment T-2a: "Identification of Source Categories
The source analysis provides an excellent record of the source types, locations, and connections, making important distinctions in the seasonal contributions of mercury to the Guadalupe River watershed. I believe this analysis is based on sound scientific

knowledge given the limited time and resources available for water quality sampling."

Comment noted.

Comment T-2b: "Methodology of Load Estimates
The approach for load estimates is scientifically sound.…while uncertainty in load estimates is high,…this uncertainty is probably not critical since the purpose of load estimates is to compare relative importance, rather than absolute magnitudes, of various sources (e.g. mining wastes, urban runoff, soil mercury, and atmospheric) in the watershed, which are dominated by mining. Therefore, acknowledging the limitation posed by small storm event sampling, I believe the source analysis for mercury in the Guadalupe River watershed is based upon scientifically sound methods and practices."

Comment noted.

Linkage Analysis

Comment T-3a: "Linkages between sources and numeric targets
Conceptual and descriptive links of Mercury sources and targets are well-described and scientifically valid, including indirect links, such as through methylmercury production. Use of the bioaccumulation factor methodology to link sources and targets is supported through mercury measurements in water, plankton, and fish."

Comment noted.

Comment T-3b: "Reference site approach
While Lexington Reservoir appears to be a suitable reference site for this analysis due to the accessibility and lack of mining in the basin, I am concerned that fish are safe for consumption by humans for only two servings per month. … Two options for addressing this inconsistency may be (1) selecting an alternative reference reservoir if available, and/or (2) performing a fish consumption study of the area rather than using regional rates to evaluate whether once per week is an appropriate consumption rate."

See response to comment S-4.

Allocations

Comment T-4a: "Seasonal Variations and Critical Conditions
As reported by the literature at other sites in Mediterranean climates, particulate

mercury is transported by stormwater in the wet season and methylmercury is produced and bioaccumulated during the dry season under anoxic conditions. Again, while limited by only a single season of sampling, mechanisms and effects of seasonal variations are well-described and scientifically valid."

Comment noted.

Comment T-4b: "Margin of Safety
The author states that by "making conservative choices throughout the analysis, where appropriate, to afford a tangible but unquantified margin of safety", … . Due to the high uncertainty in load estimates as expressed in Section 2b of this review, I suggest that the authors dedicate a few more sentences addressing the issue of uncertainty …"

Section 8.8 (Margin of Safety) has been revised to include a 5 percent margin of safety. See our response to comment S-1.

Adaptive Implementation and Monitoring

Comment T-5: "With the identification of mercury concentrations in fish samples to be greatest in Guadalupe and Almaden reservoirs immediately downstream of the mining district, it makes sense to focus efforts on managing reservoirs to limit methylmercury production. Further, preventing soil erosion and the transport of mercury-contaminated sediment throughout the watershed is also an appropriate action towards reduction of mercury in the Guadalupe River. While the proposed actions are based upon sound scientific knowledge, I have serious doubts regarding the implementation and enforcement and ultimately, the effectiveness of the proposed actions."

Professor Tullos' comment T-5 is quite lengthy. For clarification, we present first her introduction, followed by specific comments T-5a through T-5c. We provide responses to each of T-5a through T-5e.

Comment T-5a: "I have concerns regarding the erosion control measures and their evaluations. How will best management practices (BMPs) be selected, funded, and implemented?"

The Water Board will issue permits that require the implementation actions specified in the TMDL (see "Legal Authorities and Requirements" in Section 9, Implementation Plan). The parties responsible for compliance with the permits are identified in Section 9 (Implementation Plan). These parties will select, fund, and implement the BMPs for erosion control. Although the Water Board's authority is to set standards to be attained, but not to specify manner or method of compliance, Water Board staff will review and approve the selection of BMPs prior to construction. This is specified in the August 2007 Staff Report for Peer Review and Basin Plan as follows, "The responsible parties shall develop plans and schedules to implement all reasonable and feasible actions to control erosion of mercury mining waste and seep discharges to surface waters. The feasibility study, design plans, and implementation schedules shall be submitted to the Water Board within 6 months of Water Board approval of the site investigation report."

Comment T-5b: "Also, the proposed standard for "excessive turbidity" is not a transparent, enforceable, or accepted criterion for evaluating erosion. I suggest that substantial effort be applied to developing and committing resources to a scheduled field monitoring plan, using accepted methodology for documenting bed and bank erosion and turbidity sampling. At the author's request, I would be happy to provide some references for commonly practiced approaches."

We concur that the effectiveness monitoring should be revised, and propose the following changes to the August 2007 Staff Report for Peer Review and basin plan amendment.

Changes to Section 10.2 of the August 2007 Staff Report for Peer Review are the following:

Effectiveness of Mining Waste Erosion Control Measures

Monitoring the effectiveness of erosion control actions is required for the mercury ~~mining waste source category. Parties~~mines and downstream depositional areas. Entities responsible for erosion control effectiveness monitoring are the ~~implementing~~responsible parties for the mercury mine sites and depositional areas~~, as follows: Myers Industries, Inc., Buckhorn, Inc., Sunoco, Inc., Newson, Inc., E.A. Viner, International, Co., Inc., County of Santa Clara, Midpeninsula Regional Open Space District, Guadalupe Rubbish and Disposal Company, Inc., and private property owners of the former Hacienda Furnace Yard site outside of the Almaden Quicksilver County Park boundary, and prior operators and current owners of the Santa Teresa, Bernal, and Hillsdale mercury mines~~.

~~These parties shall measure their compliance with the mercury mining waste allocations by evaluating the effectiveness of erosion control measures. In the first five years after construction, erosion control effectiveness shall be evaluated at least twice annually, once during a storm event, and again late in the dry season. Subsequently, erosion control effectiveness shall be evaluated at least once annually late in the dry season. The storm event monitoring should occur when the ground is saturated. Storm event monitoring shall consist of a visual inspection for excessive turbidity in downstream waters, and if found, determining whether the excessive turbidity is from the erosion control construction site.~~ Mercury mines are subject to the State of California's Industrial

Stormwater NPDES General Permit. Erosion control actions, also referred to herein as implementation measures, are called best management practices in the General Permit. This General Permit, in Section B.2.d, requires monitoring to "(m)easure the effectiveness of best management practices (BMPs) to prevent or reduce pollutants in storm water discharges…". Erosion control actions at downstream depositional areas are subject to Clean Water Act Section 401 certifications. The 401 certifications will specify monitoring and reporting requirements to demonstrate the effectiveness of erosion control measures in floodplains, creek banks, creek beds, and shallow impoundments. Monitoring requirements are specific to the location—landscape or creek.

Landscape Erosion Control Monitoring

The responsible parties shall document their compliance with their respective mercury mining waste allocations by evaluating the effectiveness of erosion control measures they undertake. Erosion control effectiveness monitoring for landscape projects (i.e. projects not located within the banks of a creek or river) consists of repeated visual inspections and photographs of the construction project and adjacent landscape. Water Board-issued permits will specify standards for construction, operations and maintenance, and monitoring of erosion control projects. Within six weeks after completion of construction, the responsible party shall submit as-built plans, showing permanent photo-points. Additionally, parties will provide site maps with the photo points clearly located, and immediate post-construction photo documentation attached.

In the first five years after construction, erosion control effectiveness shall be evaluated at least twice annually: once during a storm event, and again late in the dry season. Subsequently, erosion control effectiveness shall be evaluated at least once annually late in the dry season.

Storm event monitoring shall occur when the ground is saturated. Storm event monitoring shall consist of visual inspection and photo documentation of excessive turbidity, if any, in downstream waters. If excessive turbidity is found, responsible parties shall determine whether its source is the erosion control construction site.

Dry season monitoring shall consist of a visual inspection and photo documentation of the erosion control construction site, for areas lacking vegetative cover or other evidence of soil erosion. These visual clues are most obvious late in the dry season when vegetation is dormant.

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Some erosion control projects may include excavation and disposal of mining waste, re-contouring of the landscape, and revegetation. Consequently, some of these excavations may be designed to achieve the naturally-occurring concentration of mercury in local surface soil. ~~Section 10.3 presents methods for consideration to calculate project-specific mercury mining waste clean-up goals~~Section 9.9 suggests methods for calculating goals for specific cleanup projects at mercury mine sites.

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Creek Erosion Control Monitoring

Erosion control effectiveness monitoring for creek (i.e. floodplain, bank, and bed) projects consists of repeated surveys and photographs of each construction project and the adjacent landscape. The responsible parties shall measure their compliance with the mercury mining waste allocations by evaluating the effectiveness of erosion control measures. Within six weeks after completion of construction, the party responsible for the project shall submit as-built plans including monumented cross-sections and profiles of the channel, floodplain, and terraces in the project area. Permanent photo points and survey locations shall be established and recorded on the as-built plans. Additionally, responsible parties shall submit a site map with the photo survey points clearly located, and immediate post-construction photo documentation attached.

The purpose of the monumented cross-sections, profiles, and photographs is to track changes in channel plan form, dimensions, and slope; and changes in hillslopes, landscape, and vegetation subsequent to construction of erosion controls. Profiles and cross-sections shall be surveyed at photo documentation points located not less than 10 channel widths apart on the stream channel, and at time intervals of no less than three years in order to provide a record of changes for ten years after construction.

Water Board-issued permits will specify standards for construction, operations and maintenance, and monitoring of erosion control projects. As-built plans for areas to be stabilized with re-vegetation, and projects that incorporate soil bioengineering systems, shall contain construction specifications for geotextile fabrics, soil bioengineering systems, seeding, container plants, plugs, and other re-vegetation and stabilization methods. Responsible parties shall routinely check the operations and performance of irrigation systems, if used, to assure their effectiveness.

Plants, including plants used in soil bioengineering systems, that do not survive to thrive within a three year period following planting shall be replaced. The performance goal for plants and soil bioengineering systems is eighty-five percent plant survival (percentage as compared to the as-built plans) within five years.

Landscape and Creek Monitoring Reports

Responsible parties shall submit annual erosion control effectiveness monitoring reports to the Executive Officer of the Water Board. These reports will describe any significant changes made to an erosion control construction site and areas both up and down hill influenced by the site. If additional measures are needed to increase landscape, floodplain, creek bank, or creek bed stability, or vegetation survival, the annual reports shall propose additional measures. Construction of the additional measures is subject to Water Board review and approval.

The changes to the proposed Basin Plan amendment, indicated in strikeout/underline, are the following:

Erosion Control Effectiveness Monitoring

Monitoring of the effectiveness of erosion control is required for mercury mining waste source categories as specified above. Erosion control effectiveness monitoring for landscape projects (i.e. projects not located in the creek or river) consists of repeated visual inspections and photographs of the construction project and adjacent landscape. Erosion control effectiveness monitoring for floodplain, creek bank, and creek bed projects consists of repeated surveys and photographs of the construction project and adjacent landscape. The surveys shall include cross-sections and profiles of the channel, floodplain, and terraces in the project area.

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Annual erosion control effectiveness monitoring reports will be submitted to the Water Board.

~~Monitoring of the effectiveness of erosion control is required for the mercury mining waste source category (see Table 7-c). Parties responsible for erosion control effectiveness monitoring are the implementing parties for the mercury mine sites and depositional areas listed in Table 7-c (first and second rows). These parties shall measure their compliance with the mercury mining waste allocations by evaluating the effectiveness of erosion control measures. In the first 5 years after construction, erosion control effectiveness shall be evaluated at least twice annually, once during a storm event, and again late in the dry season. Subsequently, erosion control effectiveness shall be evaluated at least once annually late in the dry season. The storm event monitoring should occur when the ground is saturated. Storm event monitoring shall consist of a visual inspection for excessive turbidity in downstream waters, and if found, determining whether the excessive turbidity is from the erosion control construction site. Dry season monitoring shall consist of a visual inspection of the erosion control construction site.~~

Comment T-5c: "The implementation plan would be stronger if it included roles and responsibilities for implementation and monitoring. Are landowners expected to voluntarily conform to the TMDL? How will the criteria be enforced? It is not clear to me who will shoulder the resource burden to implement, maintain, and evaluate the erosion control measures. Indeed, the Staff Report states that previous cleanup efforts to cover and revegetate sites showed limited success with revegetation, so I question how these issues will be better addressed under this TMDL? Without committed support to implement, maintain, and evaluate the erosion control practices and reservoir management, I question how 'increasingly effective actions can be taken'."

These roles and responsibilities are specified in both the August 2007 Staff Report for Peer Review (Section 9, Implementation Plan), and August 2007 Appendix D, draft proposed Basin Plan amendment (Table 7-c, Table 7-d, and Monitoring Program and Special Studies pp. BPA-14 to BPA-16).

Comment T-5d: "Further, with methylmercury control dependent on developing new technologies, I question whether the timeline for reaching water quality objectives is attainable."

The timeline will be adjusted under Adaptive Implementation in Section 10 (Section 9.7 in the February 2008 version) as necessary for this and other reasons.

Comment T-5e: "Thus, my greatest concern regarding this proposed TMDL is that the Adaptive Implementation and Monitoring plan is insufficiently developed and risks

a failure to meet the water quality objectives. Therefore, I recommend further development of the monitoring plan for the proposed actions following implementation and outlining a course of action to address deficiencies so that sufficient resources can be allocated to support implementation of corrective actions proposed under this TMDL."

Comment noted.

Closing Comments

In summary, taken as a whole, the scientific portion of the proposed rule is based upon sound scientific knowledge, methods, and practices. The analysis of sources, linkages, and allocations are logical and well-developed. My primary concerns are:

- **The fish consumption rates in the reference reservoir as compared to the protection level under the proposed TMDL**
- **The lack of protocol for developing, implementing, and enforcing proposed actions under the Adaptive Implementation and Monitoring**

We note and greatly appreciate Professor Tullos' endorsement of the scientific basis of the TMDL. We have responded to her specific concerns above.

Peer reviewer letter no. 3: Professor Michael Josselyn, PhD, PWS

Professor Emeritus of Biological Sciences
San Francisco State University, San Francisco, California, October 15, 2007

Fish Tissue Mercury Water Quality Objectives

Comment J-1a: "The Board has proposed two numeric targets for fish-tissue water quality objectives: 0.05 mg methylmercury per kg fish (measured in whole fish 5-15 cm in length) and 0.1 mg methylmercury per kg fish (measured in whole fish 15-35 cm in length). … The fish in the New Almaden Mining District watersheds contain one to two orders of magnitude higher concentrations than the proposed standards whereas fish outside of these watersheds are within the same order of magnitude as the proposed standard. For that reason, it appears reasonable to expect that the proposed levels reflect concentrations similar to background conditions where Hg contamination is not present."

Comment noted.

Comment J-1b: "For the Clear Lake Hg TMDL, the Board staff targeted fish that would be consumed by humans ... . The most difficult component of the Clear Lake analysis is the measure of the amount of human consumption of sport fish compared to other sources of protein. Unfortunately, there are no consumption studies available that could guide the selection of a criterion for the Guadalupe River watershed."

Comment noted.

Comment J-1c: "The proposed wildlife TMDL targets for the Guadalupe River are within the same order of magnitude for small fish as contained in the San Francisco Bay Hg TMDL. … Therefore, I believe it appropriate to use these lower standards and not just rely on human consumption to set the standard."

Comment noted.

Comment J-1d: "… The USFWS developed the methodology and recommendations for safe Hg levels in fish consumed by fish eating birds; … the belted kingfisher and Forster's tern as the species to set the target Hg TMDL. I believe that this level is certainly protective of other wildlife, but question whether the assumptions used by the FWS are valid and the standard may be too low. The Board staff state that it will be reviewed and, pending further data review, could be raised to 0.1 mg/kg fish tissue."

Comment noted.

Comment J-1e: "I find that the analysis conducted by the Board to determine whether the proposed standard contained in the Guadalupe River TMDL is also adequate to protect human health is appropriate and the standard proposed is considerably lower than the EPA standard. …"

Comment noted.

Comment J-1f: "The Board's TMDL focuses on wildlife and human consumption of fish. There is only brief mention of drinking water standards. I believe that some additional clarification on why water concentration TMDLs are not being proposed (or were removed) for protecting municipal supply beneficial uses. The lack of such a discussion appears to minimize human health protections to a larger number of people who drink from this water supply."

The drinking water standard is 2,000 ng/l (Basin Plan, Table 3-5). The highest concentration of total mercury measured in the reservoir discharges was 39 ng/l (Tetra Tech 2005, Tables 3-3 & 3-6). Mercury has high affinity for particles, which makes it relatively easy to remove before water is placed into the distribution system. Hypothetically, reservoir mercury concentrations could exceed 2,000 ng/l during storm events. However, this would correspond to periods of high turbidity, and such turbid water would not be used as a drinking water supply.

Comment J-1g: "I suggest that it would be useful in this document to have a comparison that shows the TMDLs that have been based on fish tissue that have been determined for other freshwater systems such as Clear Lake, Minnesota lakes, and others to illustrate that the standards proposed by the Board for this area are certainly protective and reasonable. The San Francisco Bay standards should also be shown. It may be necessary in such comparisons to state what the primary sources are and the primary consumers used to set the standard to explain the differences that may be present. "

Comment noted.

Identification of Source Categories/Methodology of Load Estimates

Comment J-2a: "For this watershed, the mining waste sources are historically and presently well known and quantified. While there is some uncertainty in the measurements, the data on these sources is much more defined than often seen in similar reports on TMDLs that deal with atmospheric deposition from coal generated

power plant sources. The work performed by Tetra Tech appears to be well described and the use of an accepted watershed model, SWAT, is appropriate to this watershed. …"

Comment noted.

Comment J-2b: "The primary consideration is that sediment load to the reservoirs is significantly driven by the flow rates into those reservoirs and the data set collected by Tetra Tech was not indicative of the potential high flow events that may occur and there was limited calibration data available for the upper watershed. I find that the Monte Carlo methodology that was used in the SWAT model is innovative and necessary in the storm-driven loading conditions of this watershed. It provided for an estimate of the range of uncertainties in the flow and provided a better measure of the loading to the reservoirs, especially when the collection of data during such storm events is difficult."

Comment noted.

Comment J-2c: "It is not clear whether the source of Hg from streams is from sediment storage in the streams themselves or from surface erosion in the watershed during major storm events. I think additional information on stream bed concentrations would be useful (see below)."

See responses to comments J-2e and J-4c.

Comment J-2d: "Atmospheric deposition was estimated from various sampling locations in the South Bay which are closer to generation sources. Therefore, the estimates used here appear to be conservative. It is not clear, however, if direct loading via precipitation to the reservoirs was included in the loading determination from this source."

For the wet season loading estimates (Section 4.1, 4.2, and 4.3), direct loading to the reservoirs from atmospheric deposition was included in <u>discharges</u> from the reservoirs, but not in loads <u>to</u> the reservoirs themselves. In Section 8.5, staff estimate that wet and dry season deposition directly to reservoir surface is a mere 0.1 kilogram per year—a very, very tiny fraction of the mercury loading in this watershed.

Comment J-2e: "What is not clear in this analysis is the magnitude of the sources, e.g., how much Hg is potentially occurring in the watershed within the soil versus how much is within the sediments of the reservoirs. Equally important is how much Hg is

potentially in the more erodible portions of the creeks themselves, e.g., the immediate stream banks and sediments. I do not think that the loading estimates alone (Table 4.3) can be used to determine source magnitude in terms of what might be the most effective in terms of clean up—mine surface areas; stream banks or sediments; or reservoir sediments. I understand that this type of estimate would be an order of magnitude only; however, it could assist in providing some prioritization of actions to remove the sources through either erosion control, stream habitat restoration, or reservoir management."

In fact, the TMDL does contain a prioritization for clean-up actions (see Section 9, Implementation Plan). Implementation of the TMDL will occur in two phases, starting at the sources in the upper watershed. The mine sites are to be cleaned-up first, within the first ten years of implementation. Also in these first ten years, methylmercury controls are to be deployed in the deep impoundments. We have rejected clean-up of the reservoir sediments, because mine clean-ups will result in clean sediments being transported to the deep impoundments. These clean sediments will bury the mercury mining wastes presently at the bottom of the deep impoundments. Cleanup of downstream creek beds, banks, and floodplains is scheduled for the second ten years of implementation. Cleanup of these downstream areas is deliberately delayed until the source areas are addressed, so that these downstream sites will be minimally inundated by erosion of upstream mining wastes.

Linkages between Sources and the Numeric Targets/Reference Site Approach

Comment J-3: "The conceptual modeling approach used in this TMDL is appropriate and consistent with the scientific understanding of both biological concentration in the food webs and physical and chemical processes occurring within lakes and reservoirs. The conceptual models summarized in this report are clear and accurate in my opinion; however, I did not undertake a separate review of the Conceptual Model Report prepared by Tetra Tech. …"

Comment noted.

Allocations

Comment J-4a: "The linkages between lake sediment concentrations and fish tissue are clearly shown in the data presented and the findings are consistent with that found in other lakes with Hg contamination from land erosion processes. The discussion on this process and the accompanying figures are clear and accurate. I agree with staff's comparison of the differences between atmospheric deposition conceptual models and Guadalupe watershed situation. … The report discusses bioaccumulation factors and relies on both accepted values from the literature as well

as those calculated from data collected within the watershed. I find these BAF's to be within the ranges expected."

Comment noted.

Comment J-4b: "The use of a reference reservoir that is not subject to significant Hg input that is within the same climatic and chemical conditions as the affected reservoirs is a unique situation and offers the opportunity to examine the methylmercury processes and the relative concentrations in the water and fish. … I believe that these data provide substantial justification for the allocation to reservoirs."

We note and greatly appreciate Professor Josselyn's endorsement of the allocation to deep impoundments.

Comment J-4c: "I believe that the allocation to mining waste and erodible soils is not as well justified. The report needs to be clearer as to the precise sources in the watershed from which Hg is being transported to the reservoirs as it will assist in the determination of allocations and priority actions for clean up. The winter inflow partitioning of the particulate Hg is important–is it coming primarily from surface runoff from the former mines or sediment bed loads in the creeks that are being transported downstream? Should the allocation be applied creek beds so that some effort will be undertaken to clean up the creek beds themselves; both upstream and downstream of the reservoirs? Clearly, the creek beds should not be cleaned up prior to actions undertaken at the mining waste sites as they would just become contaminated again."

We agree that the creek beds downstream of the mines should not be cleaned up prior to mine cleanup; see response to comment J-2e. On page 1-4 of the August 2007 Staff Report for Peer Review, we state that the creeks which drain the historic New Almaden Mining District (named creeks: McAbee, Golf, Greystone, Randol, and Los Capitancillos creeks, Jacques Gulch; and un-named tributaries) will be addressed as mining waste source areas in this TMDL; i.e., mining waste in these creeks will be addressed during Phase 1 of implementation. In Phase 2 of implementation, the creeks downstream of the mine areas will be addressed.

Seasonal Variations and Critical Conditions/Margin of Safety

Comment J-5a: "The proposal to increase eutrophication through nutrient addition to add to the assimilative capacity of the reservoirs seems inappropriate to me. It would lead to more sustained anoxic conditions in the hypolimnion and therefore add to the

problem of methylization. I understand that this is merely a proposal; however, I believe it is not appropriate as a means to achieve a margin of safety."

Section 8.8 (Margin of Safety) has been revised in response to comment S-12. To clarify comment J-5a, in Section 8.8 we did not consider nutrient <u>addition</u> to increase eutrophication. Rather, we considered controls which reduce nutrient releases from bottom sediments, which reduces eutrophication.

Comment J-5b: "I believe that the optimism stated by staff for methods to treat the reservoirs is not explained in this TMDL. There is no discussion of the various techniques that might be applied; how they would be tested, and what is the effectiveness when viewed from the experience of these techniques in other lakes. In addition, what are some of the potential environmental consequences. There needs to be at least a table that provides a list of the potential actions and a comparison of their effectiveness and potential environmental impacts. Because the reservoir treatments are so critical to the success of the TMDL, I believe that further discussion of the practicality and feasibility of the potential techniques needs to be included in this section of the document."

In response to this comment, we have added a section describing the ongoing experiments by the Santa Clara Valley Water District. Yes, we are optimistic that effective methods will be developed; and we acknowledge that they are critical to the success of this TMDL. We are unable to make the suggested comparison of effectiveness in other lakes because we are unaware of any methylation control experiments being undertaken anywhere else in the world. Lastly, the potential environmental consequences will be considered in accordance with the California Environmental Quality Act. This environmental analysis will be presented in the forthcoming Staff Report for Public Comment.

The changes to pages 9-4 and 9-5 of the August 2007 Staff Report for Peer Review, indicated in strikeout/underline, are the following:

<u>9.4 Implementation Actions to Reduce Methylmercury Production and Bioaccumulation in Reservoirs and Lakes</u>

…

<u>Technical Study Requirements</u>

<u>Based on our understanding of efforts already underway at the Santa Clara Valley Water District (SCVWD) to develop technology that will reduce the rate of methylation in reservoirs, this TMDL's implementation plan requires SCVWD to conduct technical studies of hypolimnion methylmercury controls, and other reservoir management techniques that have the potential to reduce bioaccumulation of mercury. Staff of the</u>

Santa Clara Valley Water District (Water District) described their technical studies in a 2005 Staff Report to their Board, as follows (SCVWD 2005):

> Aeration and oxygenation of reservoirs is a proven technology to reduce algae production, promote aerobic digestion of organic detritus, and improve habitat for fisheries (primarily by making more oxygen available by reducing biological oxygen demand).…The technology may also interrupt the biologically-mediated methylation of mercury, resulting in less mercury bio-concentrated in the food web.…
>
> This is the first phase of a three-phase project to evaluate the feasibility of this technology, pilot test a recommended system, and design and install systems in three District reservoirs (Almaden, Calero, and Guadalupe).…The first phase (the subject of this agenda item) will develop and implement a sampling program to characterize the water quality in the three reservoirs from March through November, develop recommendations regarding the feasibility of aeration/oxygenation to improve water quality in each reservoir, and design a recommended system for one of the reservoirs for the purpose of pilot testing.
>
> The second phase (subject to Board approval and assuming the recommendation from the first phase is positive) will be the acquisition and installation of the pilot system, operation and monitoring performance of the system in one reservoir over a period from March through November, and design of recommended systems for the remaining two reservoirs.
>
> The third phase (subject to Board approval) would be preparation of environmental documents, acquisition, installation and startup of systems in all three reservoirs, and operation and maintenance for up to two years to transition over to District staff. However, if the second phase requires environmental documentation, this will be expanded to include all three reservoirs, to save costs and time in implementing the third phase (again, subject to the findings of the first phase and Board approval).…
>
> The District's Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) Settlement process, the District's Guadalupe River watershed mercury study, and ongoing algae production and taste and odor issues in drinking water treatment plant source water have provided the impetus to explore this technology as a potential means to meet multiple objectives, and the opportunity to cost share this project. Specifically, the FAHCE agreement requires the District to conduct feasibility studies of aeration on Almaden and Guadalupe reservoirs (the former to reduce methylmercury production, and the latter to improve fisheries habitat downstream). Recurring taste and odor issues due to algae production in San Luis and Calero reservoirs may be significantly increasing treatment costs and/or reducing the effective availability of supply, and aeration/oxygenation may be a cost-effective solution for this issue.…

The Water District's studies have proceeded, and expanded from one solar-powered circulator in Lake Almaden in 2006, to, in 2007, two circulators in Lake Almaden, and three circulators in each of Almaden and Guadalupe reservoirs. Recently (Fall 2007), District staff presented a paper entitiled "Reduction of methyl mercury concentrations in an urban lake using a solar-powered circulator" at the North American Lake Management Society meeting. The abstract indicates that experiments show considerable success in reducing methylmercury concentrations (Drury 2007).

> Lake Almaden is the centerpiece of a suburban recreational park in San Jose, CA. It was created by gravel extraction operations in the 1950s and 1960s and is impacted by legacy mercury mining activities conducted nearby between 1850 through 1972. Monitoring data collected in 2005 showed a seasonal production of unfiltered methyl mercury (the form of mercury that is biologically available) strongly correlated with lake stratification and anoxia in the hypolimnion. In 2006, a solar-powered circulator was deployed in one portion of the lake just after stratification had occurred to improve the transfer of oxygen from the surface to the hypolimnion. Because of the unique bathymetry of the lake, the effects of the circulator were localized to one portion of the lake, allowing for comparisons of seasonal production of unfiltered methyl mercury both spatially and temporally.
>
> In 2006, unfiltered methyl mercury concentrations in the treated portion of the lake were reduced by over 96 percent from 2005, which is attributed to improved Oxidation Reduction Potential conditions in the water column created by the circulator. In comparison, unfiltered methyl mercury concentrations in the untreated portion of the lake were slightly higher in 2006 than in 2005. In 2007, a second circulator was deployed in the untreated area, and data from 2007 will be included in the presentation.

Unless actions are satisfactorily undertaken on a voluntary basis, the Water Board will compel technical studies of methylmercury, bioaccumulation, and effective control measures for reservoirs and lakes; and studies to evaluate whether such actions are sufficient to attain targets downstream, through Water Code § 13267 requirements. (The Water Board will consider the need to control methylmercury production and bioaccumulation in shallow impoundments in the reviews described below under "Adaptive Implementation.")

Adaptive Implementation and Monitoring

Comment J-6: "I suggest adding an additional study to develop more information on wildlife bioaccumulation of Hg from fish. This was addressed early in the document, but not reiterated in this section of the report. As this is the beneficial use being protected, more information needs to be developed on this linkage. Many birds are either migratory or forage over a number of sites; so similar issues arise over consumptive patterns as with humans."

> Staff considered expanding the special studies to incorporate this suggestion. However, from our interactions with mercury researchers, we believe that similar studies of mercury bioaccumulation and effects on wildlife are underway. Consequently, we do not propose to revise the special studies. As stated in Section 10.1 (*Adaptive Implementation*, August 2007 version), we will

"adapt the TMDL to incorporate new and relevant scientific information… [a]pproximately every five years…".

Scientific support for proposed rule

Comment J-7: "I am very impressed with the thoroughness of the scientific analysis within this document; particularly the conceptual model and data analysis that was undertaken. It goes beyond that I have seen in other TMDL documents, perhaps because it is building on information generated in other reports. I believe that the background work has been substantial and, with the caveats expressed above, is supportive of the staff recommendations."

We note and greatly appreciate Professor Josselyn's endorsement of the scientific basis of this TMDL.

Part 4

Water Board staff have made a number of insignificant editorial changes to the proposed Basin Plan amendment and Staff Report, intended to clarify or amplify the draft documents (February 2008). These changes are shown in underline/strikeout in the "markup" versions of these two documents (Appendices D & E herein).

Selected changes are described below.

Correction to beneficial uses of Guadalupe River, shown in Table 2-1 of the Water Quality Plan for the San Francisco Bay Basin

We have corrected an error made during the 2005 Basin Planning process, in which the reference to the Guadalupe River was replaced with a reference to the Guadalupe Reservoir in Table 2-1, *Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region*. We provide the justification for this correction in Section 2.2 of the Staff Report.

Table 2-1 is placed on the next page.

Clarifying change to the Project Objectives in Staff Report

We have modified the Project Objectives (Staff Report Section 2.2, Project Objectives; and Section 10.4.1, Environmental Checklist) to clarify our intent:

The proposed Basin Plan Amendment is intended to reduce existing and future mercury discharges to, and methylmercury production in, waters of the Guadalupe River watershed and San Francisco Bay. Specific objectives of the project are as follows:

- Revise mercury water quality objectives to reflect current scientific information and the latest U.S. EPA and U.S. Fish and Wildlife Service guidance
- Restore and protect beneficial uses in waters of the Guadalupe River watershed by attaining TMDL numeric targets and water quality standards while maintaining—enhancing where possible—habitat for wildlife
- Restore and protect downstream beneficial uses by reducing mercury discharges to San Francisco Bay from legacy and urban stormwater runoff sources
- Favor implementation actions with multiple benefits; phase implementation to control upstream sources before downstream sources are addressed and while methylmercury controls are being developed

Table 2-1: Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region

COUNTY Waterbody	AGR	MUN	FRSH	GWR	IND	PROC	COMM	SHEL	COLD	EST	MAR	MIGR	RARE	SPWN	WARM	WILD	REC-1	REC-2	NAV
SANTA CLARA COUNTY																			
…																			
Guadalupe R<u>iver</u>~~eservoir~~									E			P		P	E	E	P	E	
…																			
<u>Guadalupe Reservoir</u>		<u>E</u>		<u>E</u>					<u>E</u>					<u>E</u>	<u>E</u>	<u>E</u>	<u>E</u>	<u>E</u>	
…																			

- Implement effective source control measures for mining waste at mine sites and in downstream depositional areas
- Complete studies of methylmercury and bioaccumulation controls in reservoirs and lakes, and implement effective controls
- Achieve the legacy mercury and urban stormwater runoff mercury load allocations assigned to the Guadalupe River watershed by the San Francisco Bay mercury TMDL
- Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards; Avoid actions that will have unreasonable costs relative to their environmental benefits
- Comply with the Clean Water Act requirements to adopt TMDLs for 303(d) listed water bodies and comply with the State Water Board's directive to integrate the Bay and Guadalupe mercury TMDLs
- Consider site-specific factors relating to mercury sources and methylmercury production, ambient conditions, watershed characteristics, and response to management actions; Avoid arbitrary decisions and speculation when computing loads, setting targets, setting allocations, determining implementation actions, and defining a margin of safety
- Establish allocations based on the goals of (a) eliminating inputs of mercury caused by anthropogenic activities, particularly mining and urban stormwater runoff, and (b) minimizing the transformation of mercury to methylmercury caused by anthropogenic activities, particularly the construction and operation of reservoirs, lakes and shallow impoundments
- Provide details of an implementation plan that includes: a description of the nature of actions necessary to meet allocations and targets and thereby achieve water quality standards; a schedule for actions to be taken; and a description of monitoring to be undertaken to determine progress toward meeting allocations, targets and water quality objectives
- ~~Complete implementation of~~Attain the TMDL targets in as short a time as ~~is~~ feasible, and no longer than 20 years
- Base decisions on readily available information on ambient conditions, loads, fish consumption patterns, and fate and effects; Establish a decision-making framework where management actions adapt to future knowledge or conditions
- Correct an error made during the 2005 Basin Planning process, in which the reference to the Guadalupe River was inadvertently removed and replaced with a reference to the Guadalupe Reservoir in Table 2-1, Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region. Include the Guadalupe River's beneficial uses, as shown in the 1986 Basin Plan: Cold Freshwater Habitat (COLD), Fish Migration (MIGR) (potential), Fish Spawning (SPWN) (potential), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC1) (potential); and Noncontact Water Recreation (REC2).

Part 4: Staff-initiated changes

Corrections to the Staff Report

We made the following change to Staff Report Section 8.2 (Impoundment Methylmercury Allocation).

> As described in Section ~~4 (Source Analysis)~~3.3 (Hydrology–Reservoirs), prior to the mining era there were no lakes or other large natural impoundments in the Guadalupe River watershed.

We also added this description to Staff Report Section 3.3, Hydrology–Reservoirs.

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APPENDIX A

Appendix A provides responses to questions from the September 2008 public meeting on this TMDL project for residents along and nearby upper Alamitos Creek.

Appendix A: Responses to questions from the September 2008 public meeting regarding Alamitos Creek

This appendix contains responses to questions asked at a public meeting on September 11, 2008. Water Board staff conducted this public meeting for residents, particularly residential property owners, along and nearby upper Alamitos Creek, in response to requests made at the May hearing and in written comments. The goal of the public meeting was to explain the TMDL project to residential property owners and communicate what their roles and responsibilities will be under the TMDL.

TMDL and Hillside residents

Residents question no. 1: What is the physical area that Phase 2 will cover in the other parts of the Guadalupe watershed?

Phase 2 of implementation is focused on cleanup of creeks downstream of mines, and if needed, methylmercury controls for shallow impoundments on creeks and river. See introductory paragraphs in Section 9, and *Overview of Implementation Actions* in Section 9.1 in the September 2008 Staff Report.

Residents question no. 2: How did you determine the upland (hillside) goals for nonurban runoff in Phase 2?

The goal for nonurban stormwater runoff is the allocation of 0.1 mg/kg. No implementation actions are required for nonurban stormwater runoff because this allocation is equal to current loads. See *Overview of Implementation Actions* in Section 9.1 in the September 2008 Staff Report.

Residents question no. 3: Who would be responsible for hillside non-urban water runoff that flows into the creek as it is stated in Phase 2 of the TMDL Amendment?

No responsibility for implementation actions is assigned to nonurban stormwater discharges, because no actions are required for this source (see response to Residents question no. 2).

Residents question no. 4: Why is the Almaden community being singled out in comparison to other impacted areas, such as along Randol Creek and other areas?

The logistics to cleanup legacy pollution are complex; we are not singling out any one individual or group. Responsibility for the stretch of Alamitos Creek between Harry Rd. and Almaden Dam is different from the other creeks that drain New Almaden. This is because the Santa Clara Valley Water District (District) does not have easements along this stretch of Alamitos Creek. (The District has easements and extensive maintenance responsibilities including mercury cleanup and creek restoration for the stretches of creeks in engineered channels that drain New Almaden, such as Randol, Greystone, Golf, McAbee, and Alamitos creeks, and the Guadalupe River. The District carries out their maintenance responsibilities in these creeks under a multi-agency permit to the District for their “stream maintenance program”.) As you know, our strategy is to rely on the District to be the technical lead for mercury cleanup and creek restoration.

Residents question no. 5: Our expectation is that the [*District*] and other agencies will address Alamitos Creek’s banks, because it receives run off from the whole watershed. Why are a few homeowners responsible for the upland drainage area?

Similar to your expectation, our strategy to address mercury mining waste eroding from the banks and bed of Alamitos Creek is to rely on the District to be the technical lead for a mercury cleanup and creek restoration project. Our strategy requires the few creekside property owners along Alamitos Creek between Harry Road and Almaden Dam to allow the District and its partners reasonable access for the project, and to not worsen discharges of mercury mining waste.

Residents question no. 6: Why is the New Almaden community responsible for the drainage from the Santa Clara Valley Water District upstream from us?

The New Almaden community is not responsible for the drainage from upstream (see response to Residents question no. 5).

Fish Attainment Targets

Residents question no. 7: Our New Almaden community disagrees with the certainty of the fish attainment target. It seems to be a total mercury target and we believe not well supported by findings of significant effects. Does the plan include any specific actions to validate the target or does the plan allow for reconsideration where new scientific information and findings come forward?

The water quality objectives and targets are described in Sections 5 & 6 of the February 2008 Staff Report. They are all methylmercury concentrations in fish tissue. Special studies (see Section 9.10) will validate the assumptions used in calculating these objectives and targets. The adaptive implementation plan (see

Section 9.7) lays out the steps for reconsideration where new scientific information and findings come forward.

Solar Bees

Residents question no. 8: What is a Solar Bee? How much has it reduced methylmercury in Almaden Lake and Reservoir?

SolarBee, Inc. is the manufacturer of the water circulators the District is testing. See Section 9.4 of the Staff Report for more information, including a quote regarding 96 percent reduction in methylmercury concentrations in water in Lake Almaden.

TMDL and Fish Mercury Levels

Residents question no. 9: Can a TMDL technically be stated in terms of fish total mercury concentrations rather than daily mass loading reductions to be achieved in order to reduce fish mercury levels?

TMDLs are the amount of a pollutant that can be allowed into a waterbody while still attaining water quality standards. TMDLs are then allocated to sources, as mass loads per unit time, percent load reduction, concentration in sediment (as in this TMDL project), and in other ways. Implementation plans describe how each source will reduce its pollutant load in accordance with its allocation. Because of how TMDLs and allocations are defined, it would be difficult to state TMDLs and allocations in terms of pollutant concentrations in fish.

Residents question no. 10: Can a TMDL allow engineering controls to reverse fish uptake as opposed to source sediment mass reduction via potentially unlimited sediment erosion controls and existing stream and bank excavation and replacement?

TMDLs allow measures that result in attainment of water quality standards. In this TMDL project, we are counting both on methylmercury controls in reservoirs and lakes to reduce fish uptake, and counting on reduction of mercury load in accordance with the San Francisco Bay mercury TMDL. We do not plan "potentially unlimited" projects—we think we have crafted a reasonable and feasible implementation plan. See (in the September 2008 Staff Report) introductory paragraphs in Section 9, *Overview of Implementation Actions* in Section 9.1, and *Integration with San Francisco Bay Mercury TMDL (*Section 8.6 in February 2008 Staff Report).

Residents question no. 11: [*How do TMDLs address uncontrollable sources that alone cause impairment of water quality? For example, mercury from atmospheric deposition makes fish around the Bay and worldwide unsafe.*]

There are no specific federal or state requirements for how TMDLs are to address uncontrollable sources, including sources that alone account cause impairment of water quality. We state in Section 9.1: "This TMDL project anticipates that before the end of the implementation period, new methylmercury production controls in reservoirs and lakes will reduce methylmercury bioaccumulation both in the reservoirs and lakes, and downstream." In other words, we are hopeful that these controls will result in attaining the fish tissue targets in reservoirs and lakes, and by reducing methylmercury discharges, also result in attaining the fish tissue targets downstream.

Species of Mercury and Standards

Residents question no. 12: Why doesn't the TMDL account for the fact that only some types of mercury are a problem? Shouldn't the forms of mercury with significant bioavailability be separated from forms that are much less significant?

See response in Part 1 to "Board Member McGrath noted that total mercury is not the metric that we are going to use for all time…."

Residents question no. 13: Most of the mercury in Quicksilver Park and in Alamitos Creek is non-reactive; what will be sampled specifically, how, where, and when, to evaluate the results from the erosion controls and waste cleanup? Why does the TMDL only base its standards on reactive mercury, when the Guadalupe Watershed has more elemental mercury and cinnabar that is in the non-reactive state and is below the EPA level?

Regarding monitoring, the general details of required monitoring are provided in "*Effectiveness of Mining Waste Erosion Control Measures*" in Section 9.9, *Monitoring Program*. The specific monitoring details will be developed by the project applicants, and the approved versions will be incorporated into Section 401 certifications and other Water Board orders.

Regarding reactive mercury, this TMDL establishes limits for methylmercury (water quality objectives, fish tissue targets, and TMDLs and allocations for reservoirs and lakes), and limits for total mercury (TMDLs for creeks and river, and allocations to all other sources). This TMDL is focused on legacy pollution from mercury mines; mining waste is defined by CWC § 13050(q)(1) (see Section 8.1). It is unclear what EPA level the residents are referring to. This TMDL project is not based on reactive mercury.

Residents question no. 14: Why didn't you set the [mercury mining waste allocation] 0.2 ppm methylmercury [rather than total mercury]? How this was standard derived?

The mining waste allocation is equal to the sediment target in the San Francisco Bay mercury TMDL. Detailed explanations are provided in *Mining Waste Total Mercury Allocation* (Section 8.1), and *Integration with San Francisco Bay Mercury TMDL (*Section 8.6 in February 2008 Staff Report).

Mercury Sediment Loads

Residents question no. 15: Wouldn't it be better to install [*suspended sediment*] monitoring stations similar to what was done at the Gambonini Mine and establish definitively the loads of mercury over a period of time as opposed to spot samples, and then do work to determine which discharges need controls due to higher bioavailability?

Although we agree that an intensive monitoring program, like those employed at the Gambonini Mercury mine (on Walker Creek in the Tomales Bay watershed), and on the Guadalupe River at Highway, result in more precise mercury loads, we disagree that greater precision in loads is necessary or desirable for this TMDL Project (see response to GRDC comment no. 2). We also agree that prioritizing mercury mining waste cleanup to address the most bioavailable forms first is desirable. Nothing in the proposed Basin Plan amendment prevents this prioritization effort at mercury mines. However, our TMDL is in accordance with the definition of mining waste in California Water Code, and therefore discharges of waste—including erosion of unroasted mining wastes (including overburden)—to surface water must be cleaned up and abated.

Collaboration

Residents question no. 16: What do you mean the responsible parties need to collaborate? How will that be accomplished?

See response to residents question no. 5.

Restoration

Residents question no. 17: What is involved in restoration of the creek?

Both Table 9.4, *Suggested Implementation Actions for Alamitos Creek*, in the Staff Report, and the District's handbook referenced in question no. 18, provide examples of what is involved in mercury cleanup, creekbank stabilization, and habitat restoration. It is too soon to be more specific.

Project Costs

Residents question no. 18: I have read in the stream restoration handbook passed out by the Santa Clara Valley Water District and in the Appendix it details what the average property owner along the creek might have to pay to clean up for the watershed as a whole. These costs looked pretty outrageous, is this true?

Our strategy to address mercury mining waste eroding from the banks and bed of Alamitos Creek requires the few creekside property owners along Alamitos Creek between Harry Road and Almaden Dam to allow the District and its partners reasonable access for the project, and to not worsen discharges of mercury mining waste. If our strategy is successful, the project will proceed solely with public funding—we have no plans to require downstream property owners to pay for the project. (See response to Residents question no. 5.)

Attainment or Closure

Residents question no. 19: What happens if the work doesn't meet the goals, especially after the three five-year evaluation periods?

We are relying on our adaptive implementation plan, described in Section 9.7 of the Staff Report, to ensure that fish targets (goals) are attained in 20 years. We are not sure that after three five-year evaluation periods that the targets will be attained in waters downstream of reservoirs. Therefore, we included special study question 3b, to help identify additional actions to be taken in the fourth five-year period, if necessary.

Independent Review

Residents question no. 20: Has an independent scientific body reviewed this Basin Plan to the TMDL? May we read those reviews from that independent body? Has this independent scientific body reviewed the .01 sediment levels?

Information related to peer review is provided in Section 10.2 of the Staff Report, and the peer reviewer comments (and our responses and changes) are provided herein in Part 3. Yes, they reviewed the allocations based on 0.1 mg mercury per kg bottom sediments in the reference reservoir.

Property Access Agreement

Residents question no. 21: Can you be more specific on what you actually want homeowners to do? It is not clear to us.

As described in response to residents question no. 5, our strategy requires the creekside property owners along Alamitos Creek between Harry Road and Almaden Dam to allow the District and its partners reasonable access for the project, and to not worsen discharges of mercury mining waste from their property. We clarified these requirements in the proposed Basin Plan amendment and Staff Report. Please refer to the *Implementation Actions for Depositional Areas* in each of these September 2008 documents.

Funding Sources

Residents question no. 22: When it comes to the enormous cost of the TMDL mandates, what grants will be available for our communities? Will this be a collaboration of all responsible parties to obtain? How could these grants be obtained?

The State Water Resources Control Board funds cleanup projects through the Cleanup and Abatement Account, and funds TMDL implementation projects with federal Clean Water Act § 319(h) and state bond measure funds. Our strategy to address mercury mining waste discharges in Alamitos Creek relies on public agencies to seek these and other funds.

Hot Spots

Residents question no. 23: Is it true that once your department identifies a hot spot this can eliminate any grants or funding from agencies to help pay for the cost of the cleanup for the responsible party?

Commonly, grants are not awarded in cases where there is a responsible party under order to conduct pollutant cleanup. In particular, although funds from the Cleanup and Abatement Account (see response to residents question no. 15) may be obtained and used for cleanup, they are contingent upon repayment by responsible parties. Of course, with legacy pollution sources such as at New Almaden, it may be impossible to find or recover monies from responsible parties.

The California legislature has already placed some Good Samaritan language in the California Water Code, which we reference in the proposed Basin Plan amendment, as follows:

> Water Code Chapter 5.7 contains a program for public agencies and cooperating private parties, who are not otherwise legally responsible for

> abandoned mine lands, to reduce the threat to water quality caused by these lands without becoming responsible for completely remediating mining waste from abandoned mines. The Water Board encourages these parties to participate in the program.

The Senate has considered, but not yet passed, Good Samaritan mining legislation to encourage interested third parties, including community groups and mining companies not associated with the original pollution, to undertake cleanup efforts without assuming legal liability for the pollution.

Closing Comment

Our historic New Almaden community residents will not be able to live in the village due to the [*requirements*] of the TMDL[*; it*] is infringing economically on the New Almaden community.

As described in responses to residents questions nos. 5 & 18, if our strategy for Alamitos Creek is successful, the project will proceed solely with public funding—we have no plans to require downstream property owners to pay for the project.

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APPENDIX B

Appendix B provides an example of a technical report requirement letter that staff intends to issue pursuant to the TMDL Implementation Plan and California Water Code § 13267. It will be issued by June 30, 2009, and the subsequent § 13304 orders will be issued by December 31, 2010, to persons who have discharged or are suspected of having discharged mercury mining wastes, such as the following:

> *Previous owners and operators of mercury mines in the New Almaden Mining District, including but not limited to: Myers Industries, Inc., Buckhorn, Inc., Sunoco, Inc., Newson, Inc., and E.A. Viner, International, Co., Inc.;*
>
> *Previous owners and operators of Guadalupe, Santa Teresa, and Bernal mercury mines;*
>
> *Current property owners in the New Almaden Mining District: County of Santa Clara, Midpeninsula Regional Open Space District, and owners of the former Hacienda Furnace Yard site outside of the Almaden Quicksilver County Park boundary;*
>
> *Current property owner of Guadalupe mercury mine: Guadalupe Rubbish and Disposal Company, Inc.;*
>
> *Current property owners of Santa Teresa mercury mine: (private party); and*
>
> *Current property owner of Bernal mercury mine: County of Santa Clara*

Appendix B: Example 13267 Technical Report Requirement for Mercury Mines

This letter requires that you submit a report on the erosion potential of mercury mining wastes to surface waters in the Guadalupe River watershed from mercury mine and processing areas. As explained below, this information will help Board staff to obtain information necessary to cause cleanup and containment of mercury mining waste.

Many waters in the Guadalupe River watershed are polluted and/or impaired by mercury. This is described in detail in the supporting Staff Report for the Guadalupe River watershed mercury TMDL project. TMDL project documents are available at: http://www.waterboards.ca.gov/sanfranciscobay/tmdlmain.shtml. This technical report requirement is in accordance with the Implementation Plan of the Guadalupe River watershed mercury TMDL project.

Goals for the first phase of implementation of this TMDL project include implementing effective source control measures for mercury mining waste at mine sites including ore processing areas. (Section 8 of the Staff Report provides a definition of mercury mining waste.) This technical report requirement is necessary to identify the locations of mercury mining waste that is eroding, or potentially eroding, into surface waters. Also as described in the TMDL project document, your organization is receiving this letter because it has discharged, discharges, or is suspected of discharged or discharging mercury mining waste into surface waters of the Guadalupe River watershed. Information supporting your status as an actual or suspected discharger is available in the supporting Staff Report for this TMDL project, available as described above.

You are required to submit a report containing the following information by December 31, 2010:

1. Describe and map in detail, for the parcels of land you own, owned, or on which you operated mercury mines and/or ore processing facilities the:
    a. Geology, including soil types, locations of seeps, and landslides
    b. Historic locations of mining and/or ore processing
    c. Current locations of mining wastes and locations of seeps

2. Describe and map in detail results of an investigation of the potential for mercury mining wastes to erode (from stormwater, discharge from seeps, or landslides) into surface waters (for the parcels specified in 1). Describe and map in detail the current locations of mining wastes, seeps, and landslides and the potential for mining wastes to erode into surface waters.

3. Also describe in general terms, based on observations made during the investigation, the appropriate controls necessary to contain the mining wastes that erode, or may potentially erode, into surface waters for the parcels specified in 1. Examples of general terms include: landslide will require geotechnical investigation, large slump will require extensive grading, or minor surface grading and revegetation needed.

There are many available sources of information. A recent geologic map is: USGS Miscellaneous Field Studies Map MF-2373, 2001[1]. Historic records may be helpful to locate historic mining and/or or processing areas on the parcels. For example, the U.S. Geological Survey, in their Professional Paper 360[2], identified over 100 mercury mining waste dumps (Plates 1, 3, & 14) circa 1947. Mining company records may provide additional information, many of which reportedly are available at Stanford University.

This requirement for a report is made pursuant to California Water Code § 13267, which allows the Board to require technical or monitoring program reports from any person who has discharged, discharges, proposes to discharge, or is suspected of discharging waste that could affect water quality. The attachment provides additional information about § 13267 requirements. Any extension in the above deadline must be confirmed in writing by Board staff.

Failure to comply with this letter may subject you to civil liability in an amount no to exceed $1,000 for each day of violation. Falsifying any information in the required report may subject you to misdemeanor charges and civil liability not to exceed $25,000 for each day of violation.

---

[1] McLaughlin et al. 2001. *Geologic Maps and Structure Sections of the Southwestern Santa Clara Valley and Southern Santa Cruz Mountains, Santa Clara and Santa Cruz Counties, California*. USGS Miscellaneous Field Studies Map MF-2373. McLaughlin RJ, Clark JC, Brabb EE, Helley EJ, and Colon CJ.
[2] Bailey, Edgar H. and Donald L. Everhart (Bailey & Everhart) 1964. *Geology and Quicksilver Deposits of the New Almaden District, Santa Clara County, California*. U.S. Geological Survey Professional Paper 360

Fact Sheet – Requirements for Submitting Technical Reports
Under Section 13267 of the California Water Code

What does it mean when the Regional Water Board requires a technical report?
Section 13267[1] of the California Water Code provides that "…the regional board may require that any person who has discharged, discharges, or who is suspected of having discharged or discharging, or who proposes to discharge waste...that could affect the quality of waters...shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires."

This requirement for a technical report seems to mean that I am guilty of something, or at least responsible for cleaning something up. What if that is not so?

The requirement for a technical report is a tool the Regional Water Board uses to investigate water quality issues or problems. The information provided can be used by the Regional Water Board to clarify whether a given party has responsibility.

Are there limits to what the Regional Water Board can ask for?

Yes. The information required must relate to an actual or suspected or proposed discharge of waste (including discharges of waste where the initial discharge occurred many years ago), and the burden of compliance must bear a reasonable relationship to the need for the report and the benefits obtained. The Regional Water Board is required to explain the reasons for its request.

What if I can provide the information, but not by the date specified?

A time extension may be given for good cause. Your request should be promptly submitted in writing, giving reasons.

Are there penalties if I don't comply?
Depending on the situation, the Regional Water Board can impose a fine of up to $5,000 per day, and a court can impose fines of up to $25,000 per day as well as criminal penalties. A person who submits false information or fails to comply with a requirement to submit a technical report may be found guilty of a misdemeanor. For some reports, submission of false information may be a felony.

Do I have to use a consultant or attorney to comply?
There is no legal requirement for this, but as a practical matter, in most cases the specialized nature of the information required makes use of a consultant and/or attorney advisable.

What if I disagree with the 13267 requirements and the Regional Water Board staff will not change the requirement and/or date to comply?

You may ask that the Regional Water Board reconsider the requirement, and/or submit a petition to the State Water Resources Control Board. See California Water Code sections 13320 and 13321 for details. A request for reconsideration to the Regional Water Board does not affect the 30-day deadline within which to file a petition to the State Water Resources Control Board.

If I have more questions, whom do I ask?
Requirements for technical reports include the name, telephone number, and email address of the Regional Water Board staff contact.

Revised January 2008

[1] All code sections referenced herein can be found by going to www.leginfo.ca.gov.

APPENDIX C

Appendix C provides an example of a Technical Report requirement for coordinated watershed monitoring. This 1992 letter was an important step in establishing the Regional Monitoring Program for San Francisco Bay, and was in accordance with CWC § 13267. Water Board staff may issue a similar requirement for coordinated watershed monitoring for mercury in the Guadalupe River watershed, as necessary.

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STATE OF CALIFORNIA

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION
2101 WEBSTER STREET, SUITE 500
OAKLAND, CA 94612
(510) 464-1255

12 June 1992

TO: Attached Mailing List

SUBJECT: Implementation of a Regional Monitoring Program for the San Francisco Estuary.

On April 15, 1992, the San Francisco Bay Regional Board adopted Resolution 92-043 directing the Executive Officer to implement the Regional Monitoring Plan for San Francisco Bay. The Regional Monitoring Plan is designed to collect information on the concentrations of pollutants in water, sediment and biota from throughout the estuary. The RMP will allow the Regional Board to evaluate the effectiveness of its water quality control program.

This letter is a formal request under Section 13267 of the California Water Code that your agency participate in the implementation of the baseline portion of the RMP. It is imperative that the implementation be as a collective rather than individual monitoring. A reply by July 7, 1992 on your intention to implement the RMP is requested. Failure to comply could result in an enforcement action under Section 13268 of the California Water Code. I intend to inform the Regional Board at the July 15, 1992 monthly meeting on the progress of implementing the RMP.

There are several operating principles I will be following in implementing the RMP. First, portions of the RMP will be phased in over time and thus costs may increased in future years. Second, there will be linkage to existing or proposed programs by other agencies to eliminate duplication and thereby keep costs reasonable. Third, the RMP in future years will be examining cause and effect relationship which dictates that a certain portion of future efforts be categorized as research. Finally, the program must be accountable and credible to the regulatory agencies, sponsoring agencies and the public. Therefore, we will continue to provide a strong leadership and technical role in the implementation of the RMP.

In addition, Resolution 92-043 provides that certain routine monitoring of effluents and ambient waters contained in NPDES permits could be reduced or suspended. Examples of effluent monitoring reductions are daily BOD or total suspended solids, ammonia, and oil/grease. Examples of ambient monitoring parameters that could be suspended are dissolved oxygen, ammonia, pH, conductivity (or salinity), temperature, and coliforms. All reductions or suspensions will be considered on a case-by case basis. There will be no reduction or suspension in toxicity monitoring. There will be consideration in reducing the frequency of toxic pollutant monitoring based on past monitoring results. Proposals for reductions or suspensions should be made directly to your contact in the Surface Water Management Division subsequent to the July 7 response deadline.

Regional Board staff and I have had numerous meetings with 28 dischargers (13 POTWs, 12 Industrial, Santa Clara and Alameda urban runoff programs, and the U.S. Army Corps of Engineers) regarding this action. I believe that all POTWs should be included at this time, at least at a minimal level. Exact cost participation will be decided soon for the 1992-1993 fiscal year. In the 1993-1994 fiscal year, additional urban runoff and small industrial dischargers will be included.

If you have any questions regarding this request please contact me at (510)464-0516 or Michael P. Carlin at (510)464-1325 of my staff.

Sincerely,

STEVEN R. RITCHIE
Executive Officer

Attachments: Resolution 92-043
Mailing List

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

RESOLUTION NO. 92-043

IMPLEMENTATION OF THE REGIONAL MONITORING PLAN WITHIN THE SAN FRANCISCO BAY REGION

I. WHEREAS, the California Regional Water Quality Control Board, San Francisco Bay Region (Regional Board) has adopted a Water Quality Control Plan, San Francisco Bay Basin (Basin Plan) which recognizes the need for cost-effective, coordinated regional monitoring and surveillance to evaluate the effectiveness of it's water quality control program; and

II. WHEREAS, the State Water Resources Control Board has adopted the Pollutant Policy Document which stated the need for a multi-media regional monitoring program to assess pollutant trends in the Bay-Delta; and

III. WHEREAS, the Regional Board since 1989 has implemented regional monitoring pilot studies through funds from the Bay Protection and Toxic Cleanup Program, Basin Planning Program, and grants from the U.S. Environmental Protection Agency; and

IV. WHEREAS, the results of the Regional Board's pilot studies have demonstrated the ability to conduct cost-effective regional monitoring that addresses water quality management objectives; and *

V. WHEREAS, the Regional Board under the Bay Protection and Toxic Cleanup Program has developed a Regional Monitoring Plan (Attachment A) that covers the entire estuarine system and is designed to evaluate it's water quality control program through the collection of information on the concentrations of pollutants in water, sediment and biota; and

VI. WHEREAS, the San Francisco Estuary Project (SFEP), a State/Federal cooperative endeavor, is currently developing a comprehensive monitoring strategy and conducted a Regional Monitoring Workshop to begin identifying long-term program elements of the strategy including institutional arrangements and research needs; and

VII. WHEREAS, the participants of SFEP's Regional Monitoring Workshop generated a set of principles to guide the advancement of the monitoring strategy; and

VIII. WHEREAS, SFEP has requested that the Aquatic Habitat Institute Board of Directors recommend alternative institutional arrangements for conducting comprehensive regional monitoring and research within the Estuary; and

IX. WHEREAS, the Regional Board will suspend selected current monitoring requirements for permitted dischargers in order for dischargers to redistribute resources to implement baseline portions of the Regional Monitoring Plan; and

X. WHEREAS, the Regional Board recognizes that dischargers will need to expend additional resources in order to fully implement the Regional Monitoring Plan; and

XI. WHEREAS, the Regional Board will be taking a phased approach to implementing the RMP to insure the effective management of the RMP;and

XII. WHEREAS, this action is categorically exempt from the provisions of the California Environmental Quality Act, pursuant to Section 15306, Title 14, California Code of Regulations, in that it involves basic data collection, research, management and resource evaluation activities which will not result in a serious or major disturbance to the environment.

THEREFORE BE IT RESOLVED that the Regional Board endorses in concept the development and implementation of a Regional Monitoring Program for San Francisco Bay and directs the Executive Officer to implement the Regional Monitoring Plan (Attachment A) pursuant to California Water Code Sections 13267 and 13383 (authority) and 13268 and 13385 (penalty provisions).

BE IT FURTHER RESOLVED, that the Executive Officer will select dischargers to participate in the program based on the following criteria: discharger classification, representation of a high percentage of the permitted discharge flow to the Estuary and geographical distribution; and

BE IT FURTHER RESOLVED, that the Regional Board's Executive Officer shall work with the selected dischargers to prepare an implementation plan for the RMP including a schedule for execution and submittal of progress reports and an annual report. The Executive Officer shall report to the Regional Board no later than July 15, 1992 on the status of implementation of the RMP including cost-sharing and institutional arrangements; and

BE IT FURTHER RESOLVED, that the Regional Board, as part of SFEP, will continue to assist in the development of the regional monitoring strategy and will offer for consideration inclusion of this Regional Monitoring Plan into the SFEP strategy; and

BE IT FURTHER RESOLVED, that the Regional Board no later than July 1, 1993 will notify additional selected permitted dischargers to require their participation in the implementing the Regional Monitoring Plan and expanding the Regional Monitoring Plan as necessary; and

BE IT FURTHER RESOLVED, that the Regional Board will include the requirement of participation in implementing the Regional Monitoring Plan into the selected dischargers' permits at the time of reissuance and issuance.

I, Steven R. Ritchie, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on April 15, 1992.

Steven R. Ritchie
Executive Officer

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(mpc/monitor.res)

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APPENDIX D

Appendix D shows changes since February 2008 to draft proposed Basin Plan amendment.

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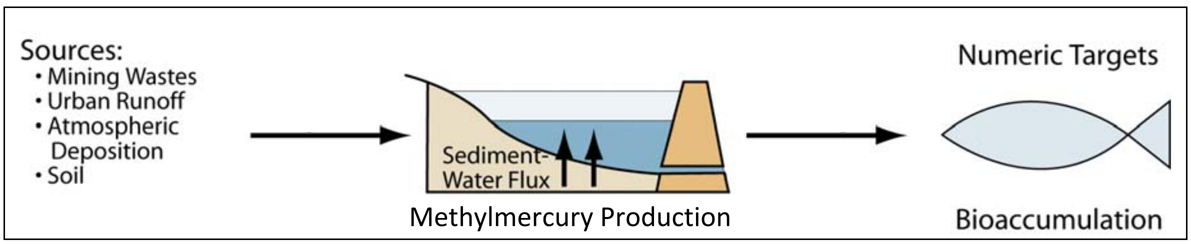
Guadalupe River Watershed

Mercury

Total Maximum Daily Load (TMDL) Project

PROPOSED BASIN PLAN AMENDMENT



California Regional Water Quality Control Board

San Francisco Bay Region

~~February~~September 2008

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PROPOSED BASIN PLAN AMENDMENT

Amending Mercury Water Quality Objectives in
Waters of the Guadalupe River Watershed
and Incorporating a
Total Maximum Daily Load and Implementation Plan
to Reduce Mercury in Waters of the Guadalupe River Watershed

Revisions to entries in Table 2-1, indicated in single underline/strikeout, are proposed for Chapter 2, Beneficial Uses. These changes, which were not included in the February 2008 version, are to correct a typographical error in Table 2-1. For clarity, only the revisions to entries in Table 2-1 (not the entire Table 2-1) are shown here.

CHAPTER 2: BENEFICIAL USES

Table 2-1: Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region

COUNTY Waterbody	AGR	MUN	FRSH	GWR	IND	PROC	COMM	SHEL	COLD	EST	MAR	MIGR	RARE	SPWN	WARM	WILD	REC-1	REC-2	NAV
SANTA CLARA COUNTY																			
…																			
Guadalupe River~~reservoir~~									E			P		P	E	E	P	E	
…																			
Guadalupe Reservoir		E		E					E					E	E	E	E	E	
…																			

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Revisions indicated in single underline/strikeout are proposed for Chapter 3, Water Quality Objectives. Changes since February 2008 are shown in single underline/strikeout with a vertical bar in the left margin.

Text shown in double underline is from the Walker Creek mercury TMDL, which was adopted in January 2007 by the San Francisco Bay Regional Water Quality Control Board, approved in August 2008 by the State Water Resources Control Board and in September 2008 by the Office of Administrative Law,~~2007 (Walker Creek mercury TMDL),~~ and is pending approval by ~~by the State Water Resources Control Board, the Office of Administrative Law, and~~ the U.S. Environmental Protection Agency.

Chapter 3. Water Quality Objectives

3.3.21 OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants for surface waters are given in Tables 3-3, 3-3A, 3-3B, ~~and~~ 3-4, and 3-4A.

The Regional Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Regional Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. The objectives in Tables 3-3 and 3-4 apply throughout the region except as otherwise indicated in the Tables or when site-specific objectives for the pollutant parameter have been adopted. Site-specific objectives for copper and nickel, adopted for South San Francisco Bay south of the Dumbarton Bridge, are listed in Table 3-3A. Objectives for mercury that apply to San Francisco Bay are listed in Table 3-3B. Objectives for mercury that apply to Walker Creek, Soulajule Reservoir and their tributaries, and to waters of the Guadalupe River watershed, are listed in Table 3-4A.

Table 3-4: Freshwater[a] Water Quality Objectives for Toxic Pollutants for Surface Waters (all values in ug/l)

Compound	4-day Average	1-hr Average
Arsenic[b, c, d]	150	340
Cadmium[b, d]	e	e
Chromium III[f]		
Chromium VI[b, c, d, g]	11	16
Copper[b, c, d]	9.0[h]	13[h]
Cyanide[i]		
Lead[b, c, d]	2.5[j]	65[j]
Mercury[k]	0.025	2.4
Nickel[b, c, d]	52[l]	470[l]
Selenium[m]		
Silver[b, c, d]		3.4[n]
Tributyltin[o]		
Zinc[b, c, d]	120[p]	120[p]

Notes:

[a] Freshwaters are those in which the salinity is equal to or less than 1 part per thousand 95% of the time, as set forth in Chapter 4 of the Basin Plan. Unless a site-specific objective has been adopted, these objectives shall apply to all freshwaters except for the South Bay south of Dumbarton Bridge, where the California Toxics Rule (CTR) applies. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable objectives are the more stringent of the marine (Table 3-3) and freshwater objectives.

[b] Source: 40 CFR Part 131.38 (California Toxics Rule or CTR), May 18, 2000.

[c] These objectives for metals are expressed in terms of the dissolved fraction of the metal in the water column.

[d] These objectives are expressed as a function of the water-effect ratio (WER), which is a measure of the toxicity of a pollutant in site water divided by the same measure of the toxicity of the same pollutant in laboratory dilution water. The 1-hr. and 4-day objectives = table value X WER. The table values assume a WER equal to one.

[e] The objectives for cadmium and other noted metals are expressed by formulas where H = ln (hardness) as CaCO3 in mg/l: The four-day average objective for cadmium is $e^{(0.7852 H - 3.490)}$. This is 1.1 µg/l at a hardness of 100 mg/l as CaCO3. The one-hour average objective for cadmium is $e^{(1.128 H - 3.828)}$. This is 3.9 µg/l at a hardness of 100 mg/l as CaCO3.

[f] Chromium III criteria were promulgated in the National Toxics Rule (NTR). The NTR criteria specifically apply to San Francisco Bay upstream to and including Suisun Bay and Sacramento-San Joaquin Delta. Note: at the time of writing, the values are 180 ug/l (4-day average) and 550 ug/l (1-hr. average). The objectives for chromium III are based on hardness. The values in this footnote assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective for chromium III is $e^{(0.8190H+1.561)}$. The 1-hour average for chromium III is $e^{(0.8190 H+3.688)}$.

[g] This objective may be met as total chromium.

[h] The objectives for copper are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective for copper is $e^{(0.8545H-1.702)}$. The 1-hour average for copper is $e^{(0.9422H-1.700)}$.

[i] Cyanide criteria were promulgated in the National Toxics Rule (NTR). The NTR criteria specifically apply to San Francisco Bay upstream to and including Suisun Bay and Sacramento-San Joaquin Delta. Note: at the time of writing, the values are 5.2 ug/l (4-day average) and 22 ug/l (1-hr. average).

[j] The objectives for lead are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective is $e^{(1.273H -4.705)}$. The 1-hour average for lead is $e^{(1.273H-1.460)}$.

[k] Source: U.S. EPA Quality Criteria for Water 1986 (EPA 440/5-86-001), which established a mercury criterion of 0.012 ug/l. The Basin Plan set the objective at 0.025 based on considerations of the level of detection attainable at that time. The 4-day average value for mercury does not apply to Walker Creek and Soulajule Reservoir and their tributaries, nor to waters of the Guadalupe River watershed listed in Table 3-4A; instead, the water quality objectives specified in Table 3-4A applyi~~es~~. The 1-hour average value continues to apply to ~~these~~ waters specified in Table 3-4A.

[l] The objectives for nickel are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective is $e^{(0.8460H + 0.0584)}$. The 1-hour average objective is $e^{(0.8460H + 2.255)}$.

[m] Selenium criteria were promulgated for all San Francisco Bay/Delta waters in the National Toxics Rule (NTR). The NTR criteria specifically apply to San Francisco Bay upstream to and including Suisun Bay and Sacramento-San Joaquin Delta. Note: at the time of writing, the values are 5.0 ug/l (4-day average) and 20 ug/l (1-hr. average).

[n] The objective for silver is based on hardness. The table value assumes a hardness of 100 mg/l CaCO3. At other hardnesses, the objective must be calculated using the following formula where H = ln (hardness): The 1-hour average objective for silver is $e^{(1.72H - 6.52)}$. U.S. EPA has not developed a 4-day criterion.

[o] Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations. U.S. EPA has published draft criteria for protection of aquatic life (Federal Register: December 27, 2002, Vol. 67, No. 249, Page 79090-79091). These criteria are cited for advisory purposes. The draft criteria may be revised.

[p] The objectives for zinc are based on hardness. The table values assume a hardness of 100 mg/l CaCO3. At other hardnesses, the objectives must be calculated using the following formulas where H = ln (hardness): The 4-day average objective for zinc is $e^{(0.8473 H+0.884)}$. The 1-hour average for zinc is $e^{(0.8473 H+ 0.884)}$.

Table 3-4A: Freshwater Water Quality Objectives for Mercury in Walker Creek, Soulajule Reservoir, and ~~all tributary~~ Their Tributaries; and in Waters of the Guadalupe River Watershed, Except Los Gatos Creek and its Tributaries Upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake

Protection of Aquatic Organisms and Wildlife[a]	0.05 mg methylmercury per kg fish	Average wet weight concentration measured in whole trophic level 3 fish 5–15 cm in length
	0.1 mg methylmercury per kg fish	Average wet weight concentration measured in whole trophic level 3 fish >15–35 cm in length

Note:

[a] The freshwater water quality objectives for the protection of aquatic organisms and wildlife also protect humans who consume fish from the Walker Creek and Guadalupe River watersheds.

The following text is proposed for insertion in entirety into Chapter 7, Water Quality Attainment Strategies including Total Maximum Daily Loads (TMDLs). Changes since February 2008 are shown in single underline/strikeout.

Chapter 7. Water Quality Attainment Strategies, Including Total Maximum Daily Loads

~~*The following text is proposed for insertion into Chapter 7, Water Quality Attainment Strategies including Total Maximum Daily Loads (TMDLs). Because this text will be added in its entirety, it is not shown below in underline/strikeout.*~~

Total Maximum Daily Loads for Mercury in Waters of the Guadalupe River Watershed

The following sections establish TMDLs for mercury in ~~the~~ impaired waters of the Guadalupe River watershed. These TMDLs and associated allocations implement the mercury water quality objectives in waters of the Guadalupe River watershed listed in Table 3-4A.

~~These TMDLs apply to waters in the portion of the watershed downstream of mercury mines and waters that receive urban runoff, from the headwaters of the Guadalupe River to tidal influence.~~These TMDLs address seven mercury-impaired waters: five waters on the 2006 303(d) list of impaired waters, Guadalupe Reservoir, Calero Reservoir, Guadalupe Creek, Alamitos Creek, and the Guadalupe River upstream of tidal influence; and two additional waters, Almaden Reservoir and Lake Almaden, which are also impaired by mercury.

~~The waters impaired by mercury and addressed by these TMDLs are the following waters of the Guadalupe River watershed (except Los Gatos Creek and its tributaries upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake):~~

- ~~Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden~~
- ~~Guadalupe Creek, Alamitos Creek, and Canoas Creek~~
- ~~Los Gatos Creek and its tributaries downstream of Vasona Dam~~
- ~~Ross Creek~~
- ~~Guadalupe River~~
- ~~Percolation ponds along these creeks and the Guadalupe River~~
- ~~Tributaries to these waters~~

These TMDLs are closely integrated with the San Francisco Bay mercury TMDL, which addresses the lower portion of the watershed (from tidal influence to open Bay water, including the Guadalupe River below about Highway 237, both Guadalupe and Alviso sloughs, and the former salt ponds adjacent to these sloughs). Implementation actions in the Guadalupe River watershed TMDLs implementation plan ~~also~~ implement the legacy mercury ~~and urban stormwater runoff~~ allocation~~s~~ of the San Francisco Bay mercury TMDL to the Guadalupe River watershed.

Problem Statement

Fish downstream of the New Almaden Mining District have extremely high concentrations of mercury in their tissues. As of 2004, Guadalupe Reservoir had the highest recorded fish mercury concentrations in California—about 20 times higher than the U.S. EPA methylmercury criterion. To protect the health of humans who consume fish that may be contaminated by mercury, in 1987 Santa Clara County issued a fish consumption advisory warning people not to eat any fish from Guadalupe, Almaden and Calero reservoirs, Guadalupe and Alamitos creeks, the Guadalupe River, and percolation ponds along the river and creeks.

Terrestrial wildlife that primarily or exclusively eat fish (such as piscivorous birds, the most sensitive wildlife species in the watershed) are at risk from mercury. Because mercury concentrations in fish in waters downstream of the New Almaden Mining District exceed both the narrative bioaccumulation objective (see Section 3.3.21) and the numeric aquatic organism and wildlife mercury water quality objectives (Table 3-4A) the health of piscivorous birds is threatened. Beneficial uses of waters in the watershed that are impaired by mercury are water contact recreation (due to human consumption of fish), wildlife habitat, and preservation of rare and endangered species.

Sources

Mercury mining waste is the largest source of mercury to waters of the Guadalupe River watershed and San Francisco Bay. Mercury is a legacy pollutant from the California Gold Rush, when cinnabar mines in the Central Coast Ranges produced the mercury used to extract gold from the Sierra Nevada. The world's fifth-largest mercury mine was the historic New Almaden Mercury Mining District, located in the headwaters of the Guadalupe River watershed.

Current sources of mercury in the Guadalupe River watershed include 1) mercury mining waste, 2) reservoirs, lakes, and shallow impoundments, where mercury is converted to methylmercury, 3) urban stormwater runoff, 4) nonurban stormwater runoff, and 5) atmospheric deposition.

1) **Mercury mining waste**
   Mercury mining waste is found at historic mine sites and downstream of them, at three categories of locations:
   a) **New Almaden Mining District and Guadalupe Mine**. The New Almaden Mining District includes the following mines and their associated processing areas and mining wastes:
      - New Almaden Mine (Mine Hill, Cora Blanca, Harry, Velasco, Central stope, Victoria, North Randol, South Randol, San Francisco, Santa Mariana, and San Pedro-Almaden mines)
      - America Mine
      - Providencia Mine
      - Enriquita Mine
      - San Antonio Mine
      - San Mateo Mine
      - ~~Senator~~ Senador Mine
      - ~~Guadalupe Mine~~
      - Deep Gulch placer cinnabar deposit

      Guadalupe mine is located on Los Capitancillos ridge contiguous with the New Almaden Mining District, but because of separate ownership, it has retained a distinct name. Because mining waste was not contained on these mine sites, the wastes continue to erode and discharge large quantities of mercury-laden sediments to streams in the watershed.
   b) **Santa Teresa~~,~~ and Bernal~~, and Hillsdale~~ mercury mines**. These much smaller, less productive mercury mines are located within the Guadalupe River watershed outside of the New Almaden Mining District. These mines include the mine sites, their associated processing areas, and mining wastes.

c) **Depositional areas**. Depositional areas downstream of mercury mines ~~are areas that~~ accumulate mercury mining waste and include creek beds, banks, and floodplains, percolation ponds, and shallow impoundments. Impoundments are slow-moving water bodies that form behind engineered structures and anthropogenic alterations to the landscape that pond water. Depositional areas also accumulate mercury from other sources, such as urban stormwater runoff and atmospheric deposition. Depositional areas discharge mercury mining waste (in the form of mercury-laden sediment) to surface waters during periods of erosive flows.

2) **Reservoirs and lakes.** Reservoirs and lakes (deep impoundments) undergo thermal stratification in the dry season. Thermal stratification increases the conversion of inorganic mercury to methylmercury, a bioaccumulative toxin, in the deep, cold waters of a reservoir or lake's hypolimnion. In the dry season, reservoirs and lakes discharge elevated methylmercury concentrations to downstream waters.

3) **Urban stormwater runoff**. Urban stormwater runoff contains mercury from controllable urban sources, such as improperly discarded fluorescent lamps, electrical switches, thermostats, thermometers, and other mercury-containing devices; historical and ongoing industrial activities; and naturally occurring mercury in soil. Mercury in urban stormwater runoff also results in part from atmospheric deposition to the land surface.

4) **Nonurban stormwater runoff.** Nonurban stormwater runoff contains mercury from atmospheric deposition to the land surface, and from naturally occurring mercury in soil.

5) **Atmospheric deposition.** Mercury emissions from many industrial processes are widely dispersed in the atmosphere and deposit directly on the land and water surface. Mercury deposition from the atmosphere is minimal relative to other loads in the watershed.

Targets

The numeric TMDL targets are the fish-tissue water quality objectives from Table 3-4A designed to protect aquatic organisms and wildlife. They are also protective of human health. The targets are:

- 0.05 mg methylmercury per kg fish, average wet weight concentration measured in whole trophic level 3 fish 5–15 cm in length, and
- 0.1 mg methylmercury per kg fish, average wet weight concentration measured in whole trophic level 3 fish ≥15–35 cm in length.

Total Maximum Daily Loads

The TMDLs, shown in Table 7-A, are expressed as methylmercury and mercury concentrations in water and sediment.

Table 7-A: Total Maximum Daily Loads

Waters	TMDLs
Creeks and river~~Waters upstream of reservoirs and lakes~~: • Guadalupe Creek ~~upstream of Guadalupe Reservoir~~ • Alamitos Creek • Guadalupe River ~~•Percolation ponds along these creeks~~	0.2~~0.1~~ mg mercury per kg suspended sediment (dry wt., annual median)

• ~~Tributaries to these waters~~	
Reservoirs and lakes: • Guadalupe Reservoir • Almaden Reservoir • Calero Reservoir • Lake Almaden	1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)
~~**Waters downstream of reservoirs and lakes:**~~ ~~•Guadalupe Creek downstream of Guadalupe Reservoir~~ ~~•Los Gatos Creek downstream of Vasona Dam~~ ~~•Canoas Creek~~ ~~•Ross Creek~~ ~~•Guadalupe River~~ ~~•Percolation ponds along these creeks and the Guadalupe River~~ • ~~Tributaries to these waters~~	~~0.2 mg mercury per kg suspended sediment (dry wt., annual median)~~

Load and Wasteload Allocations

Concentration-based pollutant allocations by source category, equal to the TMDLs in Table 7-A, are shown in Table 7-B.

Table 7-B: Load and Wasteload Allocations

Source	Load Allocation	Wasteload Allocation
Total Mercury Sources ~~to waters upstream of reservoirs and lakes~~:		
Mercury mining waste discharged from the New Almaden Mining District, and Guadalupe, Santa Teresa, and Bernal mercury mines	0.2~~0.1~~ mg mercury per kg erodi~~a~~ble ~~soil fines~~mercury mining waste (dry wt., median)[a, b, c]	
Mercury-laden sediment discharged from depositional areas in Alamitos Creek, Guadalupe Creek ~~upstream of Guadalupe Reservoir~~, Los Gatos Creek downstream of Vasona Dam[d], Canoas Creek, Ross Creek, Guadalupe River, tributaries to these creeks that drain mercury mines, and percolation ponds along these creeks	0.2~~0.1~~ mg mercury per kg ~~erodable~~ erodible sediment~~soil fines~~ (dry wt., median)[a, b]	
Urban stormwater runoff discharges[e]: Santa Clara Valley Water District, County of Santa Clara, Town of Los Gatos, cities of Campbell, Monte Sereno, San José, Santa Clara, and Saratoga		0.2 mg mercury per kg suspended sediment (dry wt., annual median)[f]
Nonurban stormwater runoff discharges[g]	0.1 mg mercury per kg suspended sediment (dry wt., annual median)[~~d~~h]	
Atmospheric deposition	0.02 mg mercury per square meter of water surface (per year)[i]	
Methylmercury production in reservoirs and lakes:		
Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden	1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)[b]	
~~Sources to waters downstream of reservoirs and lakes:~~		
~~Mercury mining waste discharged from the New Almaden Mining District, and Hillsdale mercury mine~~	~~0.2 mg mercury per kg erodable soil fines (dry wt., median)[a]~~	
~~Mercury-laden sediment discharged from depositional areas in Guadalupe Creek downstream of Guadalupe Reservoir, Los Gatos Creek downstream of Vasona Dam, Canoas Creek, Ross Creek, Guadalupe River, tributaries to these waters, and percolation ponds along these waters~~	~~0.2 mg mercury per kg erodable soil fines (dry wt., median)[a]~~	

Table 7-B: Load and Wasteload Allocations

Source	Load Allocation	Wasteload Allocation
~~Urban stormwater runoff discharges: Santa Clara Valley Water District, County of Santa Clara, City of Campbell, Town of Los Gatos, cities of Monte Sereno, San José, Santa Clara, and Saratoga~~		~~0.2 mg mercury per kg suspended sediment (dry wt., annual median)~~[e]
~~**Sources to all waters:**~~		
~~Atmospheric deposition~~	~~0.02 mg mercury per square meter of water surface (per year)~~[e]	

Notes continued on next page

Notes:

[a] Allocations to mercury mining waste and mercury-laden sediment are not cleanup standards. These allocations are equal to the mercury suspended sediment TMDLs in Table 7-A.~~Soil fines (i.e., particulates, suspended sediment) are less than 63 microns in diameter. Erodable soil is the portion of bulk material that is potentially available for transport by storm runoff or already deposited in the stream. The erodable soil fines allocations are equal to the mercury suspended sediment TMDLs in Table 7-A.~~

[b] "Erodible" means material readily available for transport by stormwater runoff to surface waters~~The methylmercury allocation to reservoirs and lakes is equal to the methylmercury TMDL in Table 7-A~~.

[c] The mercury mining waste allocation shall be measured in fines less than 63 microns in diameter.

[d] This allocation applies to the Los Gatos Creek watershed between Vasona Dam and Lenihan Dam.

[e] Urban stormwater runoff is subject to an NPDES permit. At the time of adoption, the permit no. was CAS029718

[f] The urban stormwater runoff allocation is proportionally equivalent to the mass allocation (7.2 kg mercury per year) in the San Francisco Bay mercury TMDL. The urban stormwater runoff allocation is the fraction of the Santa Clara Valley Urban Runoff Pollution Prevention Program allocation attributed to the Guadalupe River watershed. The urban stormwater runoff allocation implicitly includes all current and future permitted discharges within the geographic boundaries of municipalities and unincorporated areas including, but not limited to, California Department of Transportation (Caltrans) roadways and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

[g] This allocation applies to waters that do not drain areas mined for mercury upstream of Lenihan Dam, Guadalupe Reservoir, Almaden Reservoir, and Calero Reservoir.

[h~~d~~] The nonurban stormwater runoff allocation is proportionally equivalent to the mass allocation (0.5 kg mercury per year) in the San Francisco Bay mercury TMDL. The nonurban stormwater runoff allocation is the fraction of the regionwide allocation attributed to the Guadalupe River watershed. The background mercury concentration in non-urban and non-mined areas is equal to the nonurban stormwater runoff allocation (0.1 mg mercury per kg suspended sediment), and includes mercury from both naturally occurring mercury in soil and atmospheric deposition.

[i~~e~~] The atmospheric deposition allocation to water surfaces in the Guadalupe River watershed is equal to the rate in the San Francisco Bay mercury TMDL.

[j] The methylmercury allocation to reservoirs and lakes is equal to the methylmercury TMDL in Table 7-A.

Implementation Plan

This implementation plan:

- Implements these TMDLs, allocations, and the water quality objectives in Table 3-4A
- Builds upon past and ongoing successful efforts to reduce mercury loads both in the Guadalupe River watershed and to San Francisco Bay, and anticipates the development of new and innovative methylmercury control methods
- Encourages a coordinated watershed approach
- Reduces mercury loads in the watershed and simultaneously to the South Bay Salt Pond Restoration Project adjacent to Alviso Slough and to San Francisco Bay
- Reduces methylmercury production in the watershed, and reduces the risks from methylmercury exposure to both humans and wildlife.

The Guadalupe River watershed mercury TMDLs implementation plan will proceed in two phases, beginning January 1, 2009, with targets to be attained before 2029~~2028~~. The goals for the first phase include implementing effective source control measures for mining waste at mine sites; completing studies to reduce discharge of mining waste accumulated in Alamitos Creek; and completing studies of methylmercury and bioaccumulation controls in reservoirs and lakes, by December 31, ~~2017~~2018. The goal for the second 10-year phase of implementation is the attainment of the watershed fish tissue targets and the San Francisco Bay mercury TMDL allocations to urban stormwater runoff and legacy mercury sources in the Guadalupe River watershed, by December 31, ~~2027~~2028.

~~The~~ This plan establishes requirements for responsible parties to reduce or control mercury loads using available technology (see Mercury Source Control Actions). If methods under development to reduce methylmercury production and bioaccumulation prove feasible and effective, this plan also requires responsible parties to implement proven methods in Phase I (see Methylmercury Production Control Actions). Monitoring of mercury loads, mercury and methylmercury concentrations in water and suspended sediments, and bioaccumulation will occur throughout both phases to ensure that mercury and methylmercury levels have declined and fish targets are attained (see Coordinated Watershed Monitoring Program). The adaptive implementation section describes the approach and schedule for evaluating and adapting the TMDLs and implementation plan as needed to assure water quality standards are attained.

Mercury Source Control Actions

Actions are required to control mercury mining waste and urban runoff sources. This section specifies actions required to control discharges from sources to ~~receiving~~surface waters.

Mercury mining waste control actions are phased so that mercury discharges from upstream will be eliminated or significantly reduced before downstream projects are undertaken. Erosion control actions at mercury mines shall be completed within the first 10 years (Phase 1). Water Code Chapter 5.7 contains a program for public agencies and cooperating private parties, who are not otherwise legally responsible for abandoned mine lands, to reduce the threat to water quality caused by these lands without becoming responsible for completely remediating mining waste from abandoned mines. The Water Board encourages these parties to participate in the program.

Downstream erosion control actions shall be completed within the second 10 years (Phase 2). Implementation actions that reduce loads of mercury mining waste and/or mercury-laden sediment to the waters of the Guadalupe River watershed downstream of dams will also count towards achieving the San Francisco Bay mercury TMDL allocation to legacy mercury sources in the Guadalupe River watershed.

The implementation plan for urban stormwater runoff, nonurban stormwater runoff, and atmospheric deposition source categories is contained in the San Francisco Bay mercury TMDL. Monitoring required in the Bay mercury TMDL for urban stormwater runoff is similar to the monitoring requirements herein. Consequently, the urban stormwater runoff permittees may find it is advantageous to participate in coordinated watershed monitoring. Urban stormwater runoff implementation actions in the Guadalupe River watershed that reduce loads of mercury to San Francisco Bay will also count towards achieving the Guadalupe TMDL allocation to the urban stormwater runoff source.

Implementation Actions for Mercury Mines

The Water Board will implement load allocations for mercury mining waste discharged from the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal~~, and Hillsdale~~ mercury mines through Water Code §§ 13267 and 13304 orders to compel investigation, clean up and monitoring, as well as through Basin Plan Section 4.21.4 (*Mining Program Description*) to the extent applicable. Parties responsible for investigation, cleanup, and monitoring include, but are not limited to, current mine site property owners and prior mine owners and/or operators that have caused or permitted, or threaten to cause or permit, mercury to be discharged or deposited where it will probably be discharged into waters of the State and create a condition of pollution or nuisance. Except for the cleanup and restoration projects at Hacienda Furnace Yard (including immediately adjacent reaches in Alamitos Creek); Mine Hill; San Francisco Open Cut; Senador, Enriquita and San Mateo mines; Jacques Gulch; and Deep Gulch; t~~T~~he Water Board will issue the § 13267 orders by June 30, 2009, and the § 13304 orders by June 30, 2011~~December 31, 2010~~.

These orders will collectively require the responsible parties to:

1. Conduct a site investigation evaluating the erosion potential of mercury mining waste and the potential for seeps to discharge mercury from mining waste to ~~receiving~~surface waters. Submit the site investigation report for review and approval by the Executive Officer within the first two years of Phase 1, but no later than December 31, ~~2009~~2010.

2. Develop plans and schedules to control mercury mining waste discharges to ~~receiving~~surface waters. Submit plans and schedules for review and approval by the Executive Officer within 6 months of approval of the investigation report. Implement the approved plans in accordance with the approved schedule.

3. Cleanup and abate discharges of mercury mining waste within the 10-year duration of Phase 1. Submit a cleanup report for review and approval by the Executive Officer no later than December 31, ~~2017~~2018.

4. Monitor to evaluate the following:

   a) effectiveness of erosion control measures
   b) mercury loads discharged annually to waters of the State at the points of discharge
   c) fish bioaccumulation of mercury in waters downstream of the discharge
   d) mercury loads discharged annually to San Francisco Bay, and
   e) answer the questions posed by special study 3b

   Alternatively, the responsible parties may participate in a coordinated watershed monitoring program ~~(described below)~~ to address above monitoring requirements c) to e)~~b) to e)~~; ~~above~~see Coordinated Watershed Monitoring Program. The Water Board may consider waiving or reducing monitoring requirement b), on an individual basis, based on progress on abating discharges of mining waste and participation in an approved coordinated watershed monitoring program. ~~The responsible parties will be required to submit a (individual or coordinated watershed) monitoring plan for review and approval by the Executive Officer no later than October 15, 2008.~~

Implementation Actions for Depositional Areas

The Water Board will implement load allocations to depositional areas, as defined above, in creeks and the Guadalupe River downstream of mercury mines through Clean Water Act § 401 certifications and/or waste discharge requirements to minimize discharge of mercury-laden sediment. Specifically, when projects are proposed in depositional areas that may result in sediment discharges and/or require § 401 certifications, the Water Board will require projects designed for channel stability and implementation of measures to minimize erosion. Additionally, it will impose monitoring and reporting requirements to demonstrate the effectiveness of erosion control measures in floodplains, creek banks, creek beds, and shallow impoundments.

Examples of projects subject to these requirements include riparian habitat restoration and creek bank stability projects by the ~~Santa Clara Valley Water~~ District ~~("the District")~~ and creekside property owners. The District may also propose projects in shallow impoundments, which will be regulated through the existing § 401 certifications and waste discharge requirements for the District's Stream Maintenance Program. The Water Board will issue § 401 certifications and/or waste discharge requirements to the District for percolation pond operations and maintenance activities unless actions are satisfactorily undertaken on a voluntary basis.

~~Particularly in~~The Water Board's strategy for Alamitos Creek, which is highly polluted with mercury mining waste, ~~the Water Board~~is to encourage a cooperative effort among~~s~~ the District, ~~land use authorities~~local agencies, and creekside property owners to undertake a comprehensive creek bank stability and habitat restoration project. The Water Board encourages the District to be the technical lead for this project, and to seek funding for it. The Water Board will identify mercury cleanup as a grant funding priority for the San Francisco Bay region. Where necessary, the Water Board will invoke its cleanup authority to compel upstream dischargers who initially discharged mercury mining waste into depositional areas, to cleanup and abate mercury mining waste. Creekside property owners are responsible to provide reasonable access to the creek for project studies, construction, and monitoring, and to not take actions on their property that worsen the discharge of mercury mining waste into the creek. ~~The following actions are suggested to address the mercury mining waste component of this project:We~~The Water Board urges the District and its partners to complete studies by December 31, ~~2015~~2016~~,~~; s

~~1. Conduct a site investigation evaluating the erosion potential of mercury mining waste accumulated in the beds, banks, floodplains, and shallow impoundments. Submit the site investigation report for review and approval by the Executive Officer in Alamitos Creek within the first eight years of Phase 1, and no later than December 31, 2015.~~

~~2. Develop plans and schedules to control mercury discharges to receiving waters. S~~Submit plans and schedules for review and approval by the Executive Officer ~~within the 10-year duration of Phase 1, and no later than~~by December 31, ~~2017~~2018~~,~~; and complete and report on the project~~. Implement the approved plans in accordance with the approved schedule.~~

~~3. Cleanup and abate discharges of mercury mining waste~~ within the 10-year duration of Phase 2, by~~. Submit a cleanup report for review and approval by the Executive Officer no later than December~~ December 31, ~~2027~~2028. ~~The Water Board will provide up to 160 hours of staff time per year to assist the District with fundraising for all phases of this effort.~~

Implementation Actions for Urban Stormwater Runoff
The San Francisco Bay mercury TMDL and urban stormwater NPDES permit require control programs for mercury and monitoring (mercury is a pollutant of concern). The stormwater permit allows for a coordinated and collaborative watershed monitoring program. Urban runoff permittees may participate in a coordinated watershed monitoring program to a) determine fish bioaccumulation of mercury in waters downstream of the discharge ("studies aimed at better understanding the fate, transport, and biological uptake of mercury discharged in urban runoff to San Francisco Bay and tidal areas"), and b) determine the loads of mercury discharged annually to San Francisco Bay; see Coordinated Watershed Monitoring Program. Additionally, if the Water Board determines that special study 3b is necessary, urban runoff permittees shall participate in special study 3b during the second 10-year phase of implementation (see "Special Studies" section below), to determine whether urban stormwater runoff contributes to methylmercury production and bioaccumulation. ~~This~~ If special study 3b ~~special study~~ is necessary and it is not undertaken voluntarily, the Water Board will compel permittees and others (see Special Studies) to undertake special study 3b ~~shall be implemented~~ through Water Code § 13267 requirements ~~to compel technical studies of methylmercury unless actions are satisfactorily undertaken on a voluntary basis~~. ~~To participate in the coordinated watershed monitoring program, participating parties shall submit a coordinated watershed monitoring plan for review and approval by the Executive Officer no later than October 15, 2008.~~

Methylmercury Production Control Actions

The Santa Clara Valley Water District is a leading researcher in methods of controlling methylmercury production and bioaccumulation in reservoirs and lakes. This TMDL project anticipates that before the end of the implementation period (20 years), new methylmercury production controls in reservoirs and lakes will reduce methylmercury bioaccumulation both in the reservoirs and lakes, and downstream. However, if implementation actions in the reservoirs and lakes do not result in attaining targets downstream, the Santa Clara Valley Water District shall evaluate and test additional methods of controlling methylmercury production and bioaccumulation in shallow impoundments.

Implementation Actions for Reservoirs and Lakes
The District shall voluntarily conduct or cause to be conducted technical studies of methylmercury production and control. As necessary, t~~T~~he Water Board will compel the District to undertake technical studies of methylmercury production and control through Water Code § 13267 requirements ~~unless actions are satisfactorily undertaken on a voluntary basis~~. The responsible party for these studies and subsequent implementation actions is the owner and operator of the reservoirs and lakes, the ~~Santa Clara Valley Water~~ District ~~("the District")~~. Without methylmercury controls, construction and operation of reservoirs and lakes create nuisance conditions and discharges of methylmercury, which pollutes downstream waters.

The District shall continue to operate, maintain and improve the performance of, or replace with newer technology, existing methylmercury controls already in place on Lake Almaden, Almaden Reservoir, and Guadalupe Reservoir. The District shall install methylmercury controls in Calero Reservoir, if necessary, by December 31, 2017. The District shall report to the Water Board, by December 31 of odd years beginning in 2009 until directed to stop, on the operation and effectiveness of the methylmercury controls.~~complete technical studies of hypolimnion methylmercury controls, and other reservoir and lake management techniques that have the potential to reduce bioaccumulation of methylmercury, no later than December 31, 2012.~~

Where the Water Board finds it is feasible to reduce methylmercury production and/or bioaccumulation, the Water Board will issue cleanup and abatement orders to the District to undertake actions to reduce fish mercury concentrations to attain the targets. ~~These permits will require the District to undertake the following cleanup actions:~~

~~1. Develop plans and schedules to implement all reasonable and feasible control actions. Submit plans and schedules for review and approval by the Executive Officer by December 31, 2013.~~

~~2. Implement methylmercury production and bioaccumulation controls in reservoirs and lakes. Submit a report of control actions implemented for review and approval by the Executive Officer within the first eight years of Phase 1, and no later than December 31, 2015.~~

The Water Code § 13267 requirements and/or cleanup and abatement orders will also require the District to a) determine the loads of mercury discharged annually to waters of the State at the points of discharge, b) monitor mercury in fish tissue, c) determine the loads of mercury discharged annually to San Francisco Bay, and to d) conduct the special studies described in the Monitoring Program below. Alternatively, the District may participate in a coordinated watershed monitoring program to address monitoring requirements b and c, ~~a, b, and c,~~ and to address special study 3b); see Coordinated Watershed Monitoring Program. The Water Board may consider waiving or reducing monitoring requirement a), based on participation in an approved coordinated watershed monitoring program. ~~To participate in the coordinated watershed monitoring program, the participating parties shall submit a coordinated watershed monitoring plan for review and approval by the Executive Officer no later than October 15, 2008.~~

~~The District shall conduct additional technical studies to evaluate whether implementation actions for reservoirs and lakes are sufficient to attain targets downstream. These studies may be undertaken on a voluntary basis or compelled via Water Code § 13267 requirements as described above. The District shall submit to the Executive Officer of the Water Board a report of these technical studies within the 10 year duration of Phase 1, and no later than December 31, 2017.~~

The Water Board will consider the need to control methylmercury production and bioaccumulation in shallow impoundments in the reviews described below under “Adaptive Implementation.”

Monitoring Program

The monitoring program encompasses:

1. Monitoring to ensure continued effectiveness of erosion control measures to reduce discharges of mercury mining wastes, including mercury-laden sediment (applicable to mercury mines and depositional areas)

2. Monitoring of mercury load at the points of discharge to demonstrate progress in reducing loads (applicable to mercury mines, and reservoirs and lakes)

3. Fish tissue mercury monitoring to assess progress in attaining targets (applicable to mercury mines, and reservoirs and lakes)

4. Monitoring of mercury load to San Francisco Bay to assess progress in attaining the legacy and urban stormwater runoff mass load allocations assigned by the Bay mercury TMDL (applicable to mercury mines, urban stormwater runoff, and reservoirs and lakes)

5. Special studies to inform adaptive implementation of these TMDLs
   (applicable to mercury mines, urban stormwater runoff, and reservoirs and lakes)

The Water Board will compel the responsible parties to conduct monitoring through NPDES stormwater permits, Water Code § 13267 requirements, and/or cleanup and abatement orders, as described above, which will require t~~.~~he responsible parties to submit a (individual or coordinated watershed) monitoring plan for review and approval by the Executive Officer no later than October 15, 2009. Although the responsible parties are required to satisfy the monitoring requirements individually, the Water Board encourages a coordinated watershed approach particularly for mercury in fish tissue and loads to San Francisco Bay. The Water Board will collaborate with other resource agencies to coordinate fish monitoring, to leverage their expertise and, where possible, to achieve multiple objectives.

Prey fish (i.e., fish that wildlife consume) methylmercury concentrations shall be estimated as ~~(~~a) one hundred percent of the total mercury in eviscerated fish, or ~~(~~b) ninety-five percent of the total mercury in whole fish, or ~~(~~c) a percentage of methylmercury (as total mercury) in fish tissue based on scientific studies and upon approval of the Executive Officer of the Water Board. Large predator fish (i.e., fish that humans consume) methylmercury concentrations shall be estimated as one hundred percent of the total mercury in skinless filet samples. Water quality shall be monitored at the same time and location as fish collection for mercury species, nutrients, and general water quality parameters.

Coordinated Watershed Monitoring Program

The responsible parties may satisfy monitoring requirements 2–5 through a coordinated effort. Fish mercury monitoring is best undertaken in a coordinated effort, because fish integrate methylmercury over time and space. Monitoring of legacy (i.e., mercury mining waste) and urban stormwater runoff mercury discharges to San Francisco Bay is best undertaken in a coordinated effort, because this load to the Bay is from a combination of sources and responsible parties. The Water Board encourages a coordinated watershed approach to monitoring, and will consider reducing or waiving monitoring requirement 2 (mercury load at the points of discharge), based on progress in implementation and participation in coordinated watershed monitoring. To participate in the coordinated watershed monitoring program, participating parties shall submit a coordinated watershed monitoring plan no later than October 15, 2009 for review and approval by the Executive Officer ~~no later than October 15, 2008~~.

Special Studies

Additional studies ~~are~~ may be needed to provide information to improve ~~our~~ understanding of mercury cycling in the watershed, and to verify assumptions used in developing these TMDLs. Results of the studies will inform adaptive implementation of these TMDLs and the implementation plan. ~~At a minimum, t~~The special studies ~~shall~~ should address the following questions.

1. How do the reservoirs and lakes in the Guadalupe River watershed differ from one another? Factors to consider include, but are not limited to, area of connected wetlands, food web, water chemistry (phosphorus, pH, acid neutralizing capacity, and dissolved organic carbon), water level fluctuations, and infrastructure (outlet structure). Do outlet samples adequately represent hypolimnetic methylmercury concentrations for each reservoir? How significant are these differences?

2. Is it possible to increase the assimilative capacity for methylmercury in reservoirs and lakes? Is it feasible? If it is feasible, will this help to attain the fish tissue targets? How does increasing the assimilative capacity affect the food web: Is the resulting food chain multiplier from large (>15 cm) trophic level 3 (TL3) to large TL4 fish significantly different from 2? If it is significantly different, where and at what frequency should large predator fish (i.e., fish that humans consume) be monitored?~~we monitor larger fish, which humans consume~~

If the monitoring program has not already provided the information to answer these questions, t~~T~~he Santa Clara Valley Water District shall voluntarily conduct or cause to be conducted studies 1 and 2, or equivalent or alternative studies with prior approval of the Water Board Executive Officer. As necessary, the Water Board will compel the District to undertake these studies ~~, either voluntarily or~~ in accordance with Water Code § 13267 requirements (see “Implementation Actions for Reservoirs and Lakes”~~.~~). Completing s~~S~~tudy 1 ~~shall be completed~~ within the first five years of Phase 1 (by ~~, and no later than~~ December 31, ~~2012~~2013), and completing ~~. S~~study 2 ~~shall be completed~~ within the 10-year duration of Phase 1~~, and no later than~~(by December 31, ~~2017~~2018),~~.~~ would meet the following goal for the first phase of implementation: “completing studies of methylmercury and bioaccumulation controls in reservoirs and lakes”.

3a. What effect do the reservoir and lake control measures have on methylmercury bioaccumulation downstream? Are the fish targets attained downstream?

3b. If not, what factors contribute to methylmercury production and bioaccumulation in creeks and rivers? Factors to consider include, but are not limited to, shallow impoundments, excess nutrients, stagnant pools, shade cover, and aquatic vegetation.

If the monitoring program has not already provided the information to answer these questions, t~~T~~he Santa Clara Valley Water District shall voluntarily conduct or cause to be conducted study 3a, or equivalent or alternative studies with prior approval of the Water Board Executive Officer~~,~~. As necessary, the Water Board will compel the District to undertake these technical studies ~~either voluntarily or~~ in accordance with Water Code § 13267 requirements (see “Implementation Actions for ~~Methylmercury in~~ Reservoirs and Lakes”~~.~~). If the fish targets are not attained downstream by methylmercury controls in the reservoirs and lakes, Santa Clara Valley Water District together with the New Almaden Mining District and the Guadalupe, Santa Teresa~~,~~ and Bernal~~, and Hillsdale Mercury~~ mercury ~~Mines~~ mines responsible parties, and the urban stormwater runoff permittees shall conduct or cause to be conducted study 3b, or equivalent or alternative studies with prior approval of the Water Board Executive Officer, either voluntarily or in accordance with Water Code § 13267 or NPDES stormwater permit requirements (see above). Completing ~~Studies~~ studies 3a and 3b ~~shall be completed~~ within the first 5 years of Phase 2 (by~~,~~ ~~and no later than~~ December 31, ~~2021~~2023) would support the Water Board’s effort to identify whether methylmercury production and bioaccumulation controls are necessary in shallow impoundments, in accordance with the adaptive implementation program.

4. Where the TL3 50–150 mm target is attained, is methylmercury in fish that Forster’s terns consume (fish less than 50 mm in length), at or below 0.05 mg/kg? Where the TL3 ≥150–350 mm target is attained, is methylmercury in fish that ospreys consume (TL4 ≥150–350 mm target), at or below 0.20 mg/kg? If these assumptions pertaining to proportional bioaccumulation are not valid for this watershed, what monitoring should be conducted to support a revised water quality objective and target to protect piscivorous wildlife?

5. Where the larger TL3 target is attained (in fish $\geq$150–350 mm), is the smaller TL3 target also attained (fish 50–150 mm)? If so, how should the monitoring frequency for the smaller TL3 target be reduced?

If the monitoring program has not already provided the information to answer these questions, t~~T~~he Water Board will conduct studies 4 and 5. Completing study 4 within the 10-year duration of Phase 1 (by December 31, 2018), would provide timely information to support whether the water quality objectives require revision through the adaptive implementation process. The timing for study 5 is contingent upon the effectiveness of methylmercury controls.

Adaptive Implementation

Adaptive implementation entails taking actions commensurate with the existing, available information, reviewing new information as it becomes available, and modifying actions as necessary based on the new information. Taking action allows progress to occur while more and better information is collected and the effectiveness of current actions is evaluated. Accordingly, these TMDLs will be implemented in phases starting with source controls at mine sites so that upstream mercury discharges will be eliminated or significantly reduced before downstream projects are undertaken.

The Water Board will adapt these TMDLs and the implementation plan to incorporate new and relevant scientific information, so that effective and efficient actions can be taken to attain TMDL allocations and targets. The Water Board recognizes that attaining the methylmercury allocation may be especially difficult because of the need for new and innovative control methods. The Water Board staff will present an annual progress report to the Water Board on implementation of the TMDL that includes evaluation of new and relevant information that becomes available through implementation actions, monitoring, special studies, and current scientific literature. Within ten years of the effective date of this TMDL project (by December 31, 2018), the Water Board will consider amending this TMDL project and implementation plan as necessary to ensure attainment of fish targets in a timely manner.

Reviews will be coordinated through the Water Board's continuing planning program and will provide opportunities for stakeholder participation. Water Board staff will propose modifications to the targets, allocations, implementation plan actions, or the schedule in this Basin Plan amendment. At a minimum, answers to the following questions will be included in the reviews. Water Board staff will develop additional questions in collaboration with stakeholders during each review.

- Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should this TMDL project be modified?
- Is the watershed progressing toward TMDL targets as expected? If progress is unclear, how should monitoring efforts be modified to detect trends? If there has not been adequate progress, how should the implementation actions or allocations be modified?
- Does additional sediment, water column, or fish tissue mercury or methylmercury data support our understanding of linkages and food webs in the watershed? Does new data suggest an alternative allocation or implementation strategy?
- What are the current pollutant loads from the various sources? Have these loads changed over time? Are they meeting the allocations? How might source control measures be modified to further reduce loads?

- Are Water Board strategies to encourage and compel implementation actions effective? If not, how should the Water Board revise its strategies to reach the goal of attaining fish tissue targets within 20 years?
- Can the assimilative capacity for mercury in reservoirs and lakes be increased? If so, how can reservoirs and lakes be managed to reduce bioaccumulation? Should the implementation actions or allocations be modified? If so, how?
- Are capital projects like the Lower, Downtown, and Upper Guadalupe Flood Control Projects helping to meet TMDL allocations or are these projects causing increasing loads of mercury and methylmercury to the Guadalupe River and San Francisco Bay? If the loads are increased over pre-project conditions, how might the loads be reduced or their effects be mitigated?

APPENDIX E

Appendix E shows changes since February 2008 to Staff Report. Changes were made to the following sections:

1.3 Changes from February 2008 Report

2.2 Project Objectives

2.3 Problem Statement

2.4 Impaired Waters and Applicable Water Quality Standards

3.3 Watershed Description and System Characteristics

3.4 Mining Operations

5. Proposed Water Quality Objectives

6. Numeric Targets

7.1 Qualitative Linkage from Sources to Targets

7.6 Mercury in the Reference Reservoir

Key Points

8. Allocations and TMDLs

8.1 Mining Waste Total Mercury Allocations

8.2 Impoundment Methylmercury Allocation

8.3 Urban Stormwater Runoff Total Mercury Allocation

8.4 Nonurban Stormwater Runoff Total Mercury Allocation

8.5 Atmospheric Deposition Total Mercury Allocation

8.6 Total Maximum Daily Loads (TMDLs)

8.7 Water Quality Standards Attainment

8.8 Integration with San Francisco Bay Mercury TMDL

Key Points

9. Implementation and Monitoring

9.1 Overview of Implementation Actions

9.2 Legal Authorities and Requirements

9.3 Implementation Actions for Mercury Mines

9.4 Implementation Actions for Reservoirs and Lakes

9.5 Implementation Actions for Depositional Areas

9.6 Implementation Actions for Urban Stormwater Runoff

9.7 Adaptive Implementation

9.8 Water Board Implementation Actions

9.9 Monitoring Program

9.10 Special Studies

10. Regulatory Analyses

10.1 Regulatory Framework

10.2 Regulatory Analyses Required to Establish New Water Quality Objectives

10.3 Peer Review Requirement Under CaliforniaHealth and Safety Code § 57004

10.4 Analysis required by the California Environmental Quality Act

10.5 Economic Considerations

11. References

Appendix A – Data

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1. Introduction

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1.3 Changes from February 2008 Report

This September 2008 final *Staff Report* has been revised in response to comments on the February 2008 *Staff Report for Public Comment*. We present a summary of the changes in Table 1.1. We revised the February 2008 proposed Basin Plan amendment accordingly.

Table 1.1 Summary of Changes to Staff Report since February 2008

Section No. & Title (Feb. 2008)	**Summary of Changes to Staff Report from February 2008 *Staff Report for Public Comment* to September 2008 final *Staff Report***
2.2 Project Objectives	We added a project objective relating to the beneficial uses for the Guadalupe River.
2.4 Impaired Waters and Applicable Water Quality Standards	We clarified that this TMDL project addresses seven waters "impaired" by mercury, and assigns allocations to many other waters that either drain historic mercury mines or convey urban stormwater runoff.
3.4 Mining Operations	*Definition of New Almaden Mining District for TMDL* slightly revised to refer separately to Guadalupe mercury mine. *Smaller, Less Productive Mercury Mines* revised to explain that Hillsdale mercury mine does not drain to Canoas Creek (or any waters in Guadalupe River watershed). Consequently, we removed Hillsdale mercury mine from the Guadalupe River watershed mercury TMDL project, although it is still subject to the same erosion control requirements of the San Francisco Bay mercury TMDL.
5. Proposed Water Quality Objectives, and 6. Numeric Targets	We clarified that both the objectives and targets apply to trophic level 3 fish, and the 0.1 mg/kg objective and target is for fish larger than 15 centimeters (>15–35 cm).
7.1 Qualitative Linkage from Sources to Targets	We rearranged this section to focus on the strongest linkage between sources and targets, namely, methylmercury production in reservoirs..
7.6 Mercury in the Reference Reservoir	We edited this section for clarity.
7 Key Points	We corrected errors in the key points.
8. Allocations and TMDLs	We made significant revisions to the mercury mining waste allocations in Section 8.1. We moved the text regarding TMDLs from page 8-1 to a new section, 8.6 Total Maximum Daily Loads (TMDLs). We clarified the seven waters for which we established TMDLs, assimilative capacity, moved the margin of safety and seasonal variations to Section 8.6, and added daily load expressions. We clarified that both the urban and non-urban stormwater runoff allocations apply to segments of Los Gatos Creek upstream of Vasona Dam.
9. Implementation and Monitoring	We added a summary table of the implementation and monitoring plan to the beginning of Section 9 (Table 9-1). We listed the responsible parties on Table 9-1, and in Section 9-1. We clarified our strategy to address Alamitos Creek in Section 9.5.
10. Regulatory Analyses	We slightly revised the analyses required by the California Environmental Quality Act in Sections 10.3–10.5.
11. References	References have been added, where necessary, for changes described above.
Appendix A.	We added Table A.10, *Fish Mercury Concentrations in Almaden Reservoir and Lake Almaden*

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2. Project Definition

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2.2 Project Objectives

The proposed Basin Plan Amendment is intended to reduce existing and future mercury discharges to, and methylmercury production in, waters of the Guadalupe River watershed and San Francisco Bay. Specific objectives of the project are as follows:

- *Revise mercury water quality objectives to reflect current scientific information and the latest U.S. EPA and U.S. Fish and Wildlife Service guidance*
- *Restore and protect beneficial uses in waters of the Guadalupe River watershed by attaining TMDL numeric targets and water quality standards while maintaining—enhancing where possible—habitat for wildlife*
- *Restore and protect downstream beneficial uses by reducing mercury discharges to San Francisco Bay from legacy and urban stormwater runoff sources*
- *Favor implementation actions with multiple benefits; phase implementation to control upstream sources before downstream sources are addressed and while methylmercury controls are being developed*
- *Implement effective source control measures for mining waste at mine sites and in downstream depositional areas*
- *Complete studies of methylmercury and bioaccumulation controls in reservoirs and lakes, and implement effective controls*
- *Achieve the legacy mercury and urban stormwater runoff mercury load allocations assigned to the Guadalupe River watershed by the San Francisco Bay mercury TMDL*
- *Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards; Avoid actions that will have unreasonable costs relative to their environmental benefits*
- *Comply with the Clean Water Act requirements to adopt TMDLs for 303(d) listed water bodies and comply with the State Water Board's directive to integrate the Bay and Guadalupe mercury TMDLs*
- *Consider site-specific factors relating to mercury sources and methylmercury production, ambient conditions, watershed characteristics, and response to management actions; Avoid arbitrary decisions and speculation when computing loads, setting targets, setting allocations, determining implementation actions, and defining a margin of safety*
- *Establish allocations based on the goals of (a) eliminating inputs of mercury caused by anthropogenic activities, particularly mining and urban stormwater runoff, and (b) minimizing the transformation of mercury to methylmercury*

caused by anthropogenic activities, particularly the construction and operation of reservoirs, lakes and shallow impoundments

- *Provide details of an implementation plan that includes: a description of the nature of actions necessary to meet allocations and targets and thereby achieve water quality standards; a schedule for actions to be taken; and a description of monitoring to be undertaken to determine progress toward meeting allocations, targets and water quality objectives*
- *~~Complete implementation of~~Attain the TMDL targets in as short a time as ~~is~~ feasible, and no longer than 20 years*
- *Base decisions on readily available information on ambient conditions, loads, fish consumption patterns, and fate and effects; Establish a decision-making framework where management actions adapt to future knowledge or conditions*
- *Correct an error made during the 2005 Basin Planning process, in which the reference to the Guadalupe River was inadvertently removed and replaced with a reference to the Guadalupe Reservoir in Table 2-1, Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region. Include the Guadalupe River's beneficial uses, as shown in the 1986 Basin Plan: Cold Freshwater Habitat (COLD), Fish Migration (MIGR) (potential), Fish Spawning (SPWN) (potential), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC1) (potential); and Noncontact Water Recreation (REC2).*

2.3 Problem Statement

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Fish Consumption and Human Health

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In humans, mercury is neurotoxic, affecting the brain and spinal cord, and interfering with nerve function. Pregnant women and nursing mothers can pass mercury to their fetuses and infants through the placenta and breast milk. In children, particularly those under age six, mercury can decrease brain size, delay physical development, impair mental abilities, cause abnormal muscle tone, and result in coordination problems. Substantial mercury exposure is also associated with birth defects and infant mortality. Adults exposed to mercury may experience abnormal sensations in their hands and feet, tiredness, or blurred vision. Higher levels of mercury exposure can impair hearing and speech. Long-term exposure can damage the kidneys (D'Itri 1991; Davies 1991; COEHHA 1997; USDHHS 1999; USEPA 1997c). In summary, the main human health concern is for the fetus and young children.

Results of fish samples collected from throughout the Guadalupe River watershed in 2004 are shown on Figure 2.1. The adult largemouth bass were about 40 centimeters (cm) in length, which is believed to be representative of the size consumed by humans. (See Section 5 for how we propose to protect human health from mercury in fish.) Mercury concentrations in adult largemouth bass were greatest in Guadalupe and Almaden reservoirs located immediately downstream of the mining district, and were still elevated in Almaden Lake and Calero Reservoir, which are farther downstream. In contrast, adult largemouth bass in Lexington Reservoir, which does not receive mining waste or urban runoff, have much lower concentrations of mercury.

The adult largemouth bass were about 40 centimeters (cm) in length, which is believed to be representative of the size consumed by humans. (There are no fish consumption surveys for this or similar and nearby watersheds that could provide fish consumption information.) ~~Mercury concentrations in adult largemouth bass are greatest in Guadalupe and Almaden reservoirs located immediately downstream of the mining district, and were still elevated in Almaden Lake and Calero Reservoir, which are farther downstream. In contrast, adult largemouth bass in Lexington Reservoir, which does not receive mining waste or urban runoff, have much lower concentrations of mercury.~~

In Figure 2.2 (see Table A.1 in Appendix A for data and references) we present three decades of fish mercury data from Guadalupe Reservoir, which shows that mercury in fish has been, and remains, elevated.

2.4 Impaired Waters and Applicable Water Quality Standards

The seven waters impaired by mercury and addressed by this TMDL project are the following:

- Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden
- Guadalupe Creek, Alamitos Creek, and Guadalupe River
- ~~Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden~~
- ~~Guadalupe Creek, Alamitos Creek, and Canoas Creek~~
- ~~Los Gatos Creek and its tributaries downstream of Vasona Dam~~
- ~~Ross Creek~~
- ~~Guadalupe River~~
- ~~Percolation ponds along these creeks and the Guadalupe River~~
- ~~Tributaries to these waters~~

This TMDL project addresses five waters already listed as impaired by mercury and two that~~, and those~~ will be proposed for listing in the next cycle (2008 303(d) list). As explained in Section 2.3, to protect human health Santa Clara County issued a fish consumption advisory to not consume any fish from Guadalupe, Almaden, and Calero reservoirs; Alamitos and Guadalupe creeks; Guadalupe River; and percolation ponds on these creeks and river. Based on this health advisory, the following five waters were listed in 1998 as impaired by mercury in the Guadalupe River watershed (Figure 1-2) under CWA Section 303(d): Alamitos Creek, Calero Reservoir, Guadalupe Reservoir, Guadalupe Creek, and the Guadalupe River.

Staff will recommend listing both Almaden Reservoir and Lake Almaden in the next 303(d) listing cycle (2008). Highly elevated mercury concentrations are found in fish in both of these waters (Figure 2.1). Table A.10 in Appendix A presents mercury concentrations in skinless fish filet samples from Almaden Reservoir and Lake Almaden. All but two of these 66 samples exceed the U.S. EPA criterion for the protection of human health of 0.3 milligrams of methylmercury per kilogram of fish tissue (mg/kg). This level of exceedance satisfies the requirements of the 303(d) listing policy to list these waters as impaired (SWRCB 2004).

~~Staff are recommending listing Almaden Reservoir and the percolation ponds on these creeks and river in the next 303(d) listing cycle (2008). Highly elevated mercury concentrations are also found in fish from Lake Almaden (downstream of New Almaden; Figure 2.1) which is also proposed for listing in 2008.~~

~~This TMDL addresses mercury impairment in waters that drain mercury mines, including named and unnamed creeks that:~~

- ~~Drain the New Almaden Mining District to the following waters:~~

  ~~Guadalupe Creek and Guadalupe Reservoir~~

  ~~Alamitos Creek and Almaden Reservoir~~

  ~~Almaden Calero Canal, Calero Reservoir, and Arroyo Calero Creek (Arroyo Calero Creek is the official name on USGS maps; it is also referred to as Calero Creek on other maps and in this report.)~~

- ~~Drain the Santa Teresa and Bernal mercury mines to Canoas Creek and Santa Teresa Creek (tributary to Calero Creek)~~
- ~~Drain the Hillsdale mercury mine to Canoas Creek~~
- ~~Flow into Lake Almaden and the Guadalupe River~~
- ~~Including percolation ponds along these creeks and the river~~

~~This TMDL also addresses mercury impairment from urban runoff into Los Gatos Creek and its tributaries downstream of Vasona Dam; Ross Creek and its tributaries; and above-listed waters that receive urban runoff in addition to drainage from mercury mines (Guadalupe Creek, Alamitos Creek, Lake Almaden, Canoas Creek, Guadalupe River, and tributaries to these waters).~~

~~Lexington Reservoir is impaired by mercury from atmospheric deposition and naturally occurring mercury in soil, but it is not affected by mercury mining. We plan to address mercury impairments in Lexington Reservoir (and in Los Gatos Creek and its tributaries upstream of Vasona Dam, including Vasona Lake, Lexington Reservoir, and Lake Elsman) in a future TMDL project for San Francisco Bay Area reservoirs unaffected by mercury mining. Consequently, neither the Guadalupe River watershed mercury TMDLs, nor the proposed fish tissue water quality objectives, apply to Los Gatos Creek and its tributaries upstream of Vasona Dam, including Vasona Lake, Lexington Reservoir, and Lake Elsman (see Figure 1.2).~~

This TMDL project includes waters “impaired” by mercury, creeks that drain mercury mines, and waters that convey urban stormwater runoff. All waters drain eventually to Guadalupe River, which is impaired. (Table 2.3 provides a summary of waters addressed by this TMDL project, and whether they are impaired, drain creeks, or convey urban stormwater runoff. Table 8.6 describes which waters are assigned allocations, TMDLs, and/or new fish tissue water quality objectives.)

We do not propose to formally list waters, not already on the 303(d) list, that drain mercury mines or convey urban stormwater runoff as impaired. In 2004, the State adopted a guidance policy for placing waters on the 303(d) list (SWRCB 2004). This policy has very rigorous data sufficiency requirements, and there are not data of sufficient quality and quantity to list every segment of every waterbody that drains mercury mines or conveys urban stormwater runoff. The creeks that drain mercury mines and convey urban stormwater runoff are all tributaries to, or segments of, one or more of the impaired waters. The seven impaired waters extend continuously from the highest watershed reaches that drain mercury mines, the highest reaches that receive urban stormwater runoff, to reservoirs and lakes, and down to the bottom of this watershed where Guadalupe River meets the Bay. Therefore, these seven waters adequately characterize impaired waters in the portion of the watershed addressed by this TMDL project. We believe that the efforts of all parties are better spent on solving the mercury problem, than on sampling efforts to generate sufficient data to list each and every segment individually.

Additionally, this TMDL project includes many waters that drain from non-mine (i.e., non-mineralized) and non-urban portions of the upper watershed. Allocations are assigned to these waters because they are a source of mercury to impaired waters, albeit small loads. These waters are too numerous to list, but examples include Barrett Canyon (drains Loma Prieta into Alamitos Creek at Almaden Reservoir), upper Guadalupe Creek and Rincon Creek (drain Mt. Umunhum into Guadalupe Creek), and Los Gatos Creek above Lexington Dam.

Lexington Reservoir receives mercury from atmospheric deposition and naturally occurring mercury in soil, but it is not affected by mercury mining. We plan to address mercury impacts to Lexington Reservoir (and to Los Gatos Creek and its tributaries upstream of Vasona Dam, including Vasona Lake, Lexington Reservoir, and Lake Elsman) in a future TMDL project for San Francisco Bay Area reservoirs unaffected by mercury mining. Consequently, ~~neither the Guadalupe River watershed mercury TMDLs, allocations, nor~~ the proposed fish tissue water quality objectives and the implementation plan~~,~~ do not apply to Los Gatos Creek and its tributaries upstream of Vasona Dam, including Vasona Lake, Lexington Reservoir, and Lake Elsman (see Figure 1.2).
Table 2.3 provides a summary of waters addressed by this TMDL project.

Table 2.3 List of Waters Addressed by this TMDL Project

Waters	Mercury Sources: Mercury Mine	Mercury Sources: Urban Stormwater Runoff	Mercury Sources: Soil	Impaired 303(d)-listed	Creeks: drain mercury mines	Creeks: convey urban stormwater runoff
Guadalupe Creek & percolation ponds	X	O		✓		
Tributaries from New Almaden	X				✓	
Upper watershed non-urban non-mined tributaries			X			
Tributaries from urban non-mined areas		X				✓
Guadalupe Reservoir	X			✓		
Alamitos Creek & percolation ponds	X	O		✓		
Tributaries from New Almaden	X	O			✓	
Upper watershed non-urban non-mined tributaries			X			
Tributaries from urban non-mined areas		X				✓
Almaden Reservoir	X			✓		
Lake Almaden	X	O		✓		
Calero Reservoir	X			✓		
Calero Creek	X	O			✓	
Canoas Creek	X	O			✓	
Ross Creek		X				✓
Los Gatos Creek & tributaries upstream of Lenihan Dam		X				
Los Gatos Creek & tributaries downstream of Lenihan Dam & percolation ponds		X				✓
Guadalupe River & percolation ponds	X	O		✓		

Notes:
X = Primary mercury source (soil includes atmospheric deposition)
O = Some segments of these waters receive mercury from this source
✓ = Primary consideration

Table 8.5 describes which waters are assigned allocations, TMDLs, and/or new water quality objectives.

Applicable Water Quality Standards

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3. BACKGROUND

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3.3 Watershed Description and System Characteristics

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HYDROLOGY – RESERVOIRS

Prior to the mining era, there were no lakes or other large natural impoundments in the Guadalupe River watershed. All lakes and reservoirs were constructed behind dams or fill former quarry pits (see *Definitions* in Section 8.2). The watershed contains six water conservation and storage reservoirs (Figure 3.2). These reservoirs are Calero Reservoir on Calero Creek; Guadalupe Reservoir on Guadalupe Creek; Almaden Reservoir on Alamitos Creek; and Lake Elsman, Lexington Reservoir, and Vasona Lake on Los Gatos Creek. The three reservoirs in or near the former mining area, Almaden, Guadalupe, and Calero, were built in the creek canyons. Water is transferred to Calero Reservoir from Almaden Reservoir via the Almaden-Calero Canal and from the Central Valley Project (CVP). The volume of water retained in the reservoirs changes over the year, depending on precipitation, releases to the streams and evaporation. Vasona Lake is small, and spills when large storms occur, such as from February 25-27, 2004. The other reservoirs rarely spill. Hydraulic modeling for Almaden Reservoir estimated that it would spill 6 percent of the time in 100 years. The four other reservoirs (besides Vasona) may spill in a 100-year flood event, but did not spill in 2003 or 2004.

GEOLOGY

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3.4 Mining Operations

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SMALLER, LESS PRODUCTIVE MERCURY MINES

Mercury extraction operations in the area also extended to three much smaller mercury mines, the Santa Teresa and Bernal mercury mines on the eastern side of the Santa Teresa Hills, and the Hillsdale Mine on a hill now commonly referred to as the county communications center (see Figure 3.2). Santa Teresa and Bernal mercury mines ~~These three mines appear to have~~ drained ~~primarily~~ to Canoas Creek~~, but operations areas and waste dumps at Santa Teresa and Bernal mines may have drained to Santa Teresa Creek~~. Hillsdale Mine drains to Coyote Creek, and therefore is located outside the Guadalupe River watershed.

Mining companies operated the Santa Teresa Mine as an underground mine from three main adits (horizontal passages from surface to mine). In 1903, they installed a 40-ton Scott furnace, which produced nine flasks of mercury.

The Bernal Mine, located in Santa Teresa County Park, appears to now drain to Coyote Alamitos Canal, and Canoas Creek. The Bernal Mine was an underground mine with two shafts and an adit by 1902. In 1942, miners excavated two new mine openings, and in 1946, extended the adit and installed a retort. The mine was idle by 1947, and no evidence of mercury production was found in the abandoned retort.

~~The Hillsdale Mine produced 30 to 40 flasks in spring 1871, and small amounts up to 1874, idled from 1875 to 1892, when it was reopened by R.H. Harper of San Jose and worked intermittently and in a small way up to 1907. In 1915, under the name New Discovery Quicksilver Company, a lease and bond was taken and a few flasks of quicksilver produced; but little work was done underground, and the lease forfeited. Operators returned to rework Hillsdale from 1939 to 1946. During operations, the Hillsdale Mine drained to Cincos Creek, now called Canoas Creek. In the 1960s, engineers rerouted the lower portion of Canoas Creek to enter the Guadalupe River farther upstream, and channelized its side slopes with concrete. Sometime later the Hillsdale Mine area became a gravel quarry, and the quarry operators excavated part of Hillsdale Mine in the early 1980s.~~

DEFINITION OF NEW ALMADEN MINING DISTRICT FOR TMDL

For the purposes of the Guadalupe River watershed mercury TMDL, the New Almaden Mining District is defined as the Los Capitancillos ridge and its extensions, and the processing areas on adjacent hillsides (Figure 4.1). Such processing areas, for example, include both sides of Alamitos Creek next to the Hacienda Furnace Yard, and mining waste piles at Hicks Flat. Guadalupe mine is located on Los Capitancillos ridge contiguous with the New Almaden Mining District, but because of separate ownership, it has retained a distinct name. ~~Notably different from historical descriptions, but important for the purposes of this TMDL, which addresses the entire watershed, Guadalupe Mine, located on an extension of Los Capitancillos Ridge, is included in the New Almaden Mining District.~~

NEW ALMADEN COMPARED TO CALIFORNIA'S OTHER MINES

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5. PROPOSED WATER QUALITY OBJECTIVES

Water quality objectives for mercury in waters of the San Francisco Bay region vary from watershed to watershed based on resident species, salinity, and beneficial uses.

The amendment we are proposing to the San Francisco Basin Plan is similar to that adopted in January 2007 for the Walker Creek watershed. The proposed amendment will add two new freshwater mercury water quality objectives and vacate an outdated objective for the Guadalupe River watershed. Mercury water quality objectives for all other water bodies in the San Francisco Bay Region will be updated either as part of a statewide action or as TMDLs are developed for mercury impaired waters.

The proposed objectives to protect aquatic organisms and wildlife apply to fish (5–15 cm in length and ≥15–35 cm in length) consumed by fish-eating birds in the watershed. The objectives are 0.05 mg methylmercury per kg fish (average wet weight concentration measured in whole trophic level 3 fish) for fish from 5 up to 15 cm~~5–15 cm~~ in length and 0.1 mg methylmercury per kg fish (average wet weight concentration measured in whole trophic level 3 fish) for fish greater than 15 up to 35~~15–35~~ cm in length.

The new objectives will replace the water column four-day average freshwater mercury objective, which will no longer apply to the Guadalupe River watershed. Replacement of the four-day average freshwater mercury objective with these fish tissue objectives reflects current scientific information and the latest U.S. EPA and U.S. Fish and Wildlife Service guidance.

Proposed Aquatic Organisms and Wildlife Objectives

Numerous studies document methylmercury accumulation within the aquatic food web and its toxic effects on birds (Wiener et al. 2003). In the Bay Area, birds feeding on fish and other aquatic organisms are among the most sensitive wildlife methylmercury receptors (CDFG 2002; Davis et al. 2003). Bioaccumulation is largely dependent on the relative location of the species in the food chain, called the trophic level. Trophic level 1 plants are consumed by trophic level 2 herbivores, which are consumed by trophic level 3 predators, which are then consumed by trophic level 4 top predators. Because methylmercury bioaccumulates in the tissues of animals that ingest it, the highest methylmercury levels are found in the highest trophic level resident fish-eating (piscivorous) species. In this TMDL, staff proposes fish tissue methylmercury objectives that will protect the highest trophic level at-risk bird species in the Guadalupe River watershed.

The U.S. Fish and Wildlife Service (USFWS) developed the fish methylmercury thresholds discussed in this section with assistance from biologists at the Santa Clara Valley Water District regarding species present in the watershed. This section, “Proposed Aquatic Organisms and Wildlife Objectives,” is largely based on *Derivation of Numeric Wildlife Targets for Methylmercury in the Development of a Total Maximum Daily Load for the Guadalupe River Watershed* (USFWS 2005). USFWS determined that a wildlife threshold that protects birds is also expected to protect other wildlife that rely on the Guadalupe River watershed for food.

Wildlife most likely at risk from methylmercury in the aquatic environment are terrestrial species that are primarily or exclusively piscivorous—they consume methylmercury that has bioaccumulated in their aquatic prey. Aquatic-dependent terrestrial species include reptiles, amphibians, mammals, and birds. State or federally listed threatened and endangered species in the Guadalupe River watershed include amphibians (e.g., red-legged frog), fish (e.g., Central California coast steelhead), and birds (e.g., California least tern and bald eagle). The fall-run chinook salmon is not listed; however it is regulated by NOAA Fisheries under the Magnuson-Stevens Fishery Conservation and Management Act.

Research into the effects of methylmercury on wildlife has generally focused on higher trophic level predators, such as piscivorous birds and mammals, rather than on reptiles and amphibians. The higher the trophic level, the greater the amount of methylmercury ingested from aquatic prey. Two piscivorous mammals, mink and river otter, are likely to be present in this watershed. Based on dietary analysis of piscivorous mammals and birds for the Cache Creek watershed, USFWS concluded that safe methylmercury thresholds for birds would be protective of these mammals. Therefore, thresholds protective of wildlife were developed for piscivorous birds (USFWS 2005). Prey fish species are listed in Table 5.1 by trophic level.

Table 5.1 Fish Species Potentially Consumed by Piscivorous Birds

TL2	TL3	TL4
None	Small bullheads, carp, small catfishes, black crappie, white crappie, goldfish, killifish, bigscale logperch, mosquitofish, California roach, golden shiner, inland silverside, Sacramento sucker, sunfishes (including pumpkinseed, bluegill, redear, and green), and steelhead/rainbow trout	Largemouth bass, large bullheads, large catfishes, anadromous steelhead

Note: Trophic levels are approximate and simplified to primary trophic level.

Many piscivorous bird species frequent the watershed during the year. Because reproductive effects are the most sensitive indicators of methylmercury toxicity, the target species are those that forage in the watershed or are resident in or around the watershed during their breeding seasons. The five piscivorous species most vulnerable to methylmercury in the breeding season in the Guadalupe River watershed are common merganser (*Mergus merganser*), osprey (*Pandion haliaetus*), belted kingfisher (*Ceryle alcyon*), great blue heron (*Ardea herodias*), and Forster's tern (*Sterna forsteri*). Bald eagles visit only in winter and are not known to breed near or in the watershed. California least terns forage in South San Francisco Bay and are addressed in the San Francisco Bay Mercury TMDL.

The USFWS methodology for deriving wildlife thresholds recognizes that piscivorous birds obtain most of their methylmercury from fish in their diet, and that reproductive effects are the most sensitive indicators of adverse impacts from methylmercury. Previously published results of feeding studies on mallards were used to estimate the safe daily exposure to methylmercury. A margin of safety was applied to estimate a no-observable-adverse-effects concentration (NOAEC).

To better assess what types and sizes of fish birds in the watershed consume, USFWS reviewed published literature and determined that there are four main dietary preferences: TL3 fish less than 50 millimeters (mm) in length, 50-150 mm in length, and 150-350 mm in length; and TL4 fish 150- 350 mm in length. Note that the fourth size is smaller than the TL4 fish evaluated for human health (400 mm). The fish consumption rate, fish size, and fish trophic level were evaluated for each of these five bird species. Transfer of methylmercury between fish trophic levels was also considered. USFWS determined safe levels of prey fish methylmercury for wildlife in the Guadalupe River watershed as listed in Table 5.2.

Table 5.2 Safe Prey Fish Methylmercury Levels

	TL3 Fish < 50 mm	TL3 Fish 50–150 mm	TL3 Fish 150–350 mm	TL4 Fish 150–350 mm
	(mg methylmercury per kg fish tissue, wet weight)			
Great Blue Heron		0.12		
Osprey			0.10	0.20
Common Merganser			0.10	
Forster's Tern	0.05			
Belted Kingfisher		0.05		

USFWS determined that the threshold for belted kingfisher (0.05 mg methylmercury per kilogram of fish tissue [mg/kg] TL3 fish between 50–150 mm long) is sufficient to protect the great blue heron and should also be protective of the Forster's tern. Similarly, the threshold for common mergansers (0.1 mg/kg [rounded to one significant figure] TL3 fish between 150–350 mm long) is also protective of osprey. These TL3 size classes overlap at 150 mm, with the more protective methylmercury concentration being 0.05 mg/kg to protect the kingfisher.

Based on the USFWS work, and converting to centimeters (cm), **Water Board staff proposes water quality objectives of 0.05 mg methylmercury per kg fish tissue average wet weight concentration measured in whole TL3 fish between 5–15 cm long and 0.1 mg methylmercury per kg fish tissue average wet weight concentration measured in whole TL3 fish ~~between~~ ≥15–35 cm long to protect wildlife.**

USFWS recommends that a fish tissue monitoring plan be developed to determine whether the assumptions it relied on to develop the thresholds are valid for the watershed (see Monitoring Program and Special Studies in Section 9). Furthermore, should its assumptions hold, it proposes that it would be reasonable to assign one threshold concentration (i.e., 0.1 mg/kg in ≥150–350 mm TL3 fish) that would be protective of all wildlife species in the watershed. Such a change in water quality objectives could be considered in the future through the adaptive implementation process described in Section 9.

Wildlife Water Quality Objectives and Human Health

The new mercury water quality objectives proposed in Section 5.1 are intended to protect aquatic organisms and wildlife. These objectives have been calculated to protect piscivorous birds that, pound for pound, consume more fish than humans do. Therefore, we expect these wildlife objectives to be protective of human health. In this section we provide a quantitative analysis to demonstrate that this is the case.

When the wildlife water quality objective of 0.1 mg/kg average is achieved for ≥15–35 cm fish in the watershed, it is expected that the lower trophic level fish in the size class will have less methylmercury than the higher trophic level fish in the same class, and that the overall fish diet for piscivorous birds will average 0.1 mg/kg methylmercury. In our human health analysis, we assume that 1) the wildlife water quality objective of 0.1 mg/kg applies to TL3 fish only, and 2), a higher average methylmercury fish tissue concentration will be found in TL4 fish. This assumption is conservative in view of our goal of protecting human health.

…

Key Points

- Water Board staff proposes fish methylmercury targets to protect aquatic organisms and wildlife. The two targets are equal to the water quality objectives, and are the following:

  0.05 mg/kg average wet weight concentration measured in whole TL3 fish between 5–15 cm long, and

  0.1 mg/kg average wet weight concentration measured in whole TL3 fish $\geq$15–35 cm long.

- The wildlife objectives also provide protection of humans who consume up to one meal per week of watershed fish.
- Water Board staff proposes to vacate the 4-day average water quality objective.

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6. Numeric Targets

"Numeric targets" are measurable conditions that demonstrate attainment of water quality standards. Targets are the maximum amount of mercury (solid, suspended, liquid, or airborne) allowed in a certain amount of water, fish tissue, or sediments. A numeric target can be a 1) numeric water quality objective, 2) numeric interpretation of a narrative objective, or 3) numeric measure of some other parameter necessary to meet water quality standards. Targets must be measurable, and they must be designed to demonstrate attainment of water quality standards. The proposed targets are equal to the proposed water quality objectives.

To protect human health and wildlife in the Guadalupe River Watershed, Water Board staff proposes two methylmercury fish targets. The proposed targets are intended to protect beneficial uses of waters impaired by mercury. The targets are based on available information and are intended to be at least as protective as established water quality objectives. Other targets could also be equally protective of beneficial uses and could be considered in the future through the adaptive implementation process described in Section 9 (Implementation and Monitoring).

In addition to numeric targets, Water Board staff proposes age-1 fish tissue methylmercury concentrations as remediation effectiveness indicators. A description of age-1 fish and corresponding methylmercury data are provided in the *Data Collection* and *Final Conceptual Model Reports* (Tetra Tech 2005a & 2005c), and the remediation effectiveness indicators are described in Section 9.9 (Fish Tissue Mercury Monitoring).

Numeric Targets

The numeric targets are the fish-tissue water quality objectives for the protection of aquatic organisms and wildlife, which are also protective of humans who consume as much as one meal per week of watershed fish (see Section 5). The targets are the following:

- 0.05 mg methylmercury per kg fish, average wet weight concentration measured in whole trophic level 3 fish 5–15 cm in length, and
- 0.1 mg methylmercury per kg fish, average wet weight concentration measured in whole trophic level 3 fish ≥15–35 cm in length.

Anti-Degradation

The numeric targets proposed in this TMDL must be consistent with antidegradation policies. Title 40 of the Code of Federal Regulations (§131.12) contains the federal antidegradation policy. State Water Resources Control Board Resolution 68-16 contains California's antidegradation policy. These antidegradation policies are intended to protect beneficial uses and the water quality necessary to sustain them. When water quality is sufficient to sustain beneficial uses, it cannot be lowered unless doing so is consistent with the maximum benefit to the citizens of California. Even then, water quality must sustain existing beneficial uses.

To be consistent with the antidegradation policies, the numeric targets proposed in this TMDL, taken together, cannot be less stringent than existing water quality objectives. As described in "Water Quality Standards Attainment" (see Section 7.7), the proposed numeric targets together are as protective as the Basin Plan narrative water quality objective for bioaccumulation. Because fish methylmercury concentrations already exceed the bioaccumulation objective, meeting the numeric targets would improve current water quality conditions and resolve the bioaccumulation impairment. Therefore, the proposed targets are consistent with the antidegradation policies and the protection of water quality and beneficial uses.

Key Points

- "Numeric targets" are measurable conditions that demonstrate attainment of water quality standards.
- Water Board staff proposes two fish-tissue targets equal to the proposed water quality objectives, as follows:

  0.05 mg methylmercury per kg fish average wet weight concentration measured in whole trophic level 3 fish 5–15 cm in length, and

  0.1 mg methylmercury per kg fish average wet weight concentration measured in whole trophic level 3 fish 15–35 cm in length.

- These targets also protect humans who consume as much as one meal per week of watershed fish.

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7. LINKAGE ANALYSIS

The main purpose of the linkage analysis is to describe the links between sources and targets (fish tissue methylmercury concentrations) and to determine appropriate TMDLs and allocations (Section 8). These links include the transport of mercury from sources to water bodies, the chemical transformations that occur in water, and the bioaccumulation of mercury. The linkage analysis is presented in the following sections:

This analysis describes the four sources of mercury in this watershed: mining waste, urban runoff, atmospheric deposition, and naturally occurring mercury in soil. But the linkage between these sources and the numeric targets (fish tissue methylmercury concentrations) is not direct. As illustrated in the diagram below (Figure 7.1), the sources and the numeric targets are linked by the sites where methylmercury is produced.

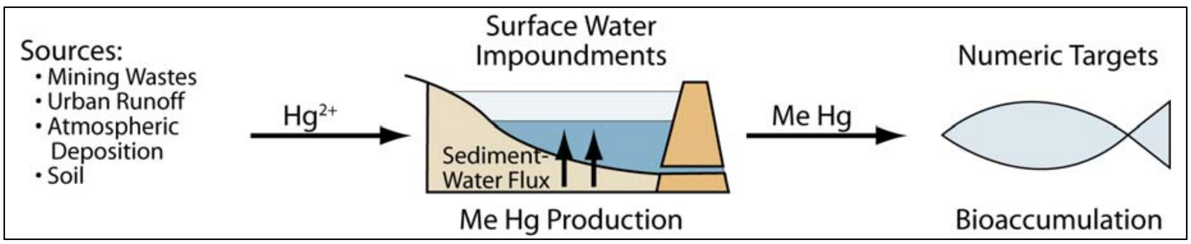


Figure 7.1 Linkage Between Sources, Methylmercury, and Targets

Citation: Prepared by Tetra Tech under contract to Water Board

Dissolved mercury (Hg^{2+}) enters surface waters, is converted to methylmercury (MeHg) primarily in reservoirs and lakes (surface impoundments), and then bioaccumulated up the food chain into fish.

Impoundments are engineered structures, such as dams, drop structures, and former quarries, which cause water to pond. In the Guadalupe River watershed, the largest impoundments on the creeks and river—Guadalupe, Almaden, and Calero reservoirs and Lake Almaden—have been identified as the primary sites of methylmercury production and bioaccumulation. Data supporting the linkage from mercury sources to fish tissue targets is described in the next section.

7.1 Qualitative Linkage from Sources to Targets

The largest source of mercury in the Guadalupe system is mining waste (see Table 4.3). A strong indication of the linkage between sources and targets in the watershed is the high fish tissue mercury concentrations in close proximity to the New Almaden Mining District, and the lower fish tissue concentrations both farther downstream from the mining district and in Los Gatos Creek outside the mining district, as illustrated on Figure 7.2.

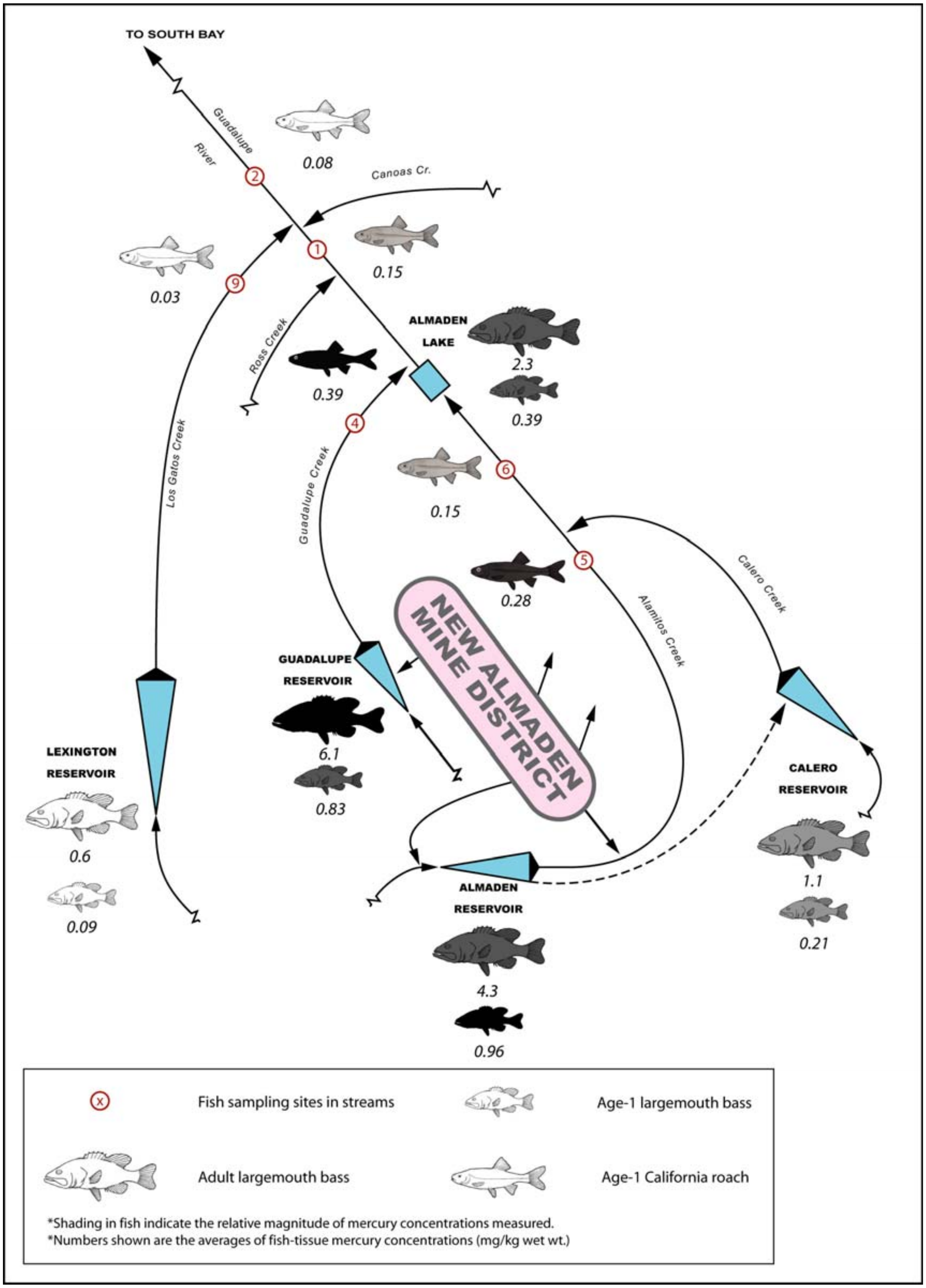


Figure 7.2~~3~~ Summary of 2004 Fish Data

Citation: Figure 3-25 Final Conceptual Model Report (Tetra Tech 2005c)

Fish with highest mercury concentrations are darkest, and found in close proximity to mercury mines.

Mines discharge mercury-laden sediment, some of which accumulates in impoundment bottom sediments. ~~It is not surprising to most of us, then, that the strongest evidence of the linkage between sources and targets in the watershed is reservoir sediment and corresponding fish tissue mercury concentrations.~~ Figure 7.~~2~~ 3 illustrates 2005 sediment and 2004 fish data from three reservoirs (Tetra Tech 2005b and 2005a, respectively, and Appendix B). Lexington Reservoir sediment samples ranged from 85–100% fines (silts and clays of less than 63 microns; see Section 7.6). There is a clear trend toward higher mercury concentrations in fish tissue with higher reservoir sediment mercury concentrations. The median reservoir bottom sediment total mercury concentrations range from 0.1 milligrams of mercury per kilogram of sediment (mg/kg, parts per million) in Lexington to 3.0 mg/kg in Guadalupe Reservoir. Corresponding fish tissue mercury concentrations in standardized 40 cm largemouth bass range from 0.6 mg/kg in Lexington to 5.8 mg/kg in Guadalupe Reservoir.

~~Another strong indication of the linkage between sources and targets in the watershed is the high fish tissue mercury concentrations in close proximity to the New Almaden Mining District, and the lower fish tissue concentrations both farther downstream from the mining district and in Los Gatos Creek outside the mining district, as illustrated on Figure 7.3.~~

~~CONCEPTUAL MODEL REPORT~~

~~The data collection efforts and *Final Conceptual Model Report* that inform the scientific basis of this TMDL are described in Section 3 (Conceptual Model). Sections 7.2 through 7.5 herein are taken largely from the *Final Conceptual Model Report* which, particularly in Section 5.0, provides a detailed explanation of the linkage between sources and targets (namely mercury transport, transformation, and biological uptake and bioaccumulation in fish, Tetra Tech 2005c). The *Conceptual Model Report* references studies described in the literature which show that in order for mercury to bioaccumulate in fish tissue, it must first be converted into the organic methylmercury form. The conditions in reservoirs in the watershed that lead to methylmercury production and bioaccumulation are described in the next section.~~

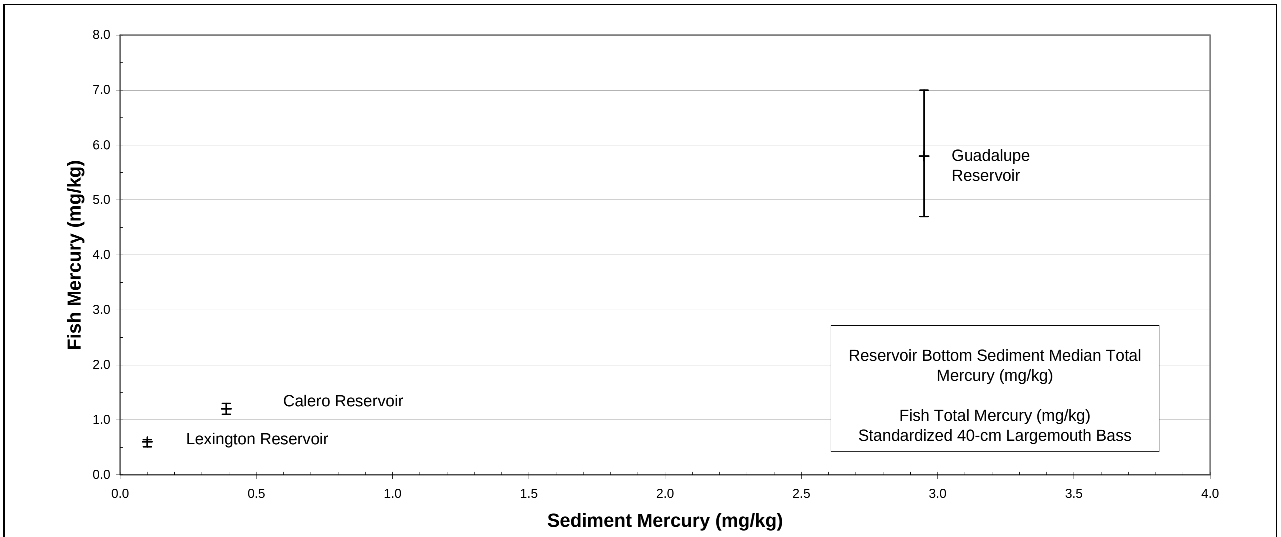


Figure 7.3~~2~~ Fish and Reservoir Sediment Mercury Results

Reservoir bottom sediment and fish tissue mercury concentrations increase from the reference reservoir (Lexington), to Calero (receives mining waste via a canal), to Guadalupe Reservoir (located immediately downstream of mercury mines).

CONCEPTUAL MODEL REPORT

The data collection efforts and *Final Conceptual Model Report* that inform the scientific basis of this TMDL are described in Section 3 (Conceptual Model). Sections 7.2 through 7.5 herein are taken largely from the *Final Conceptual Model Report* which, particularly in Section 5.0, provides a detailed explanation of the linkage between sources and targets (namely mercury transport, transformation, and biological uptake and bioaccumulation in fish, Tetra Tech 2005c). The *Conceptual Model Report* references studies described in the literature which show that in order for mercury to bioaccumulate in fish tissue, it must first be converted into the organic methylmercury form. The conditions in reservoirs in the watershed that lead to methylmercury production and bioaccumulation are described in the next section.

7.2 Conditions in Guadalupe Watershed Reservoirs

…

7.6 Mercury in the Reference Reservoir

…

INORGANIC MERCURY IN RESERVOIRS

~~Reservoir bottom sediment mercury concentrations are the best available measure of inorganic mercury.~~Mercury on the land surface is from several sources (mining waste, atmospheric deposition, and naturally occurring mercury in soil). Erodible surface soil and mercury mining waste are~~The land surface is~~ eroded by storm water, which transports inorganic mercury to receiving waters. In this manner, mercury is transported to reservoirs and accumulates in bottom sediments. (Above, we described the key to bioaccumulation of mercury from bottom sediments—dissolution, conversion to methylmercury, incorporation into algae and subsequent bioaccumulation.)

Three metrics are available to characterize these loads: (1) mass loads of total mercury, (2) mass loads of dissolved mercury, and (3) bottom sediment mercury concentrations. Mass loads were estimated in the *Final Conceptual Model Report* (Tetra Tech 2005c), but with low precision (a high precision monitoring program was cost-prohibitive and unnecessary for the conceptual model). We do not propose to examine mass loads further due to the low precision of the estimate. ~~In contrast~~Additionally, a statistically robust set of impoundment bottom sediment samples were collected (see Figure 7.~~2~~3) and provide a qualitative linkage from sources to targets (Section 7.1).

Bottom Sediment Total Mercury

Mercury concentrations in the reference reservoir bottom sediment samples (Tetra Tech 2005b; Table A.2) had a small range from 0.07–0.18 mg/kg dry weight, with average mercury of 0.1 mg/kg. More than half of the samples were 100% fines (silts and clays of less than 63 microns); percent fines ranged from 85–100%. As described above, these soil fines were transported to the reservoir as suspended sediment in storm water runoff.

In Section 8.~~2~~4, *Nonurban Stormwater Runoff Total Mercury Concentrations*, we evaluate bottom sediment mercury concentrations as a potential allocation for ~~this TMDL~~upper watershed areas (i.e., non-urban and non-mineralized); these upper watershed areas are geologically distinct from the mineralized zone (i.e., Los Capitancillos ridge, and portions of Santa Teresa ridge).

Key Points

- Lexington Reservoir was selected as the reference reservoir for this TMDL because it receives no mercury mining waste or urban runoff. There are two mercury sources to the reference reservoir, naturally occurring mercury in soil, and atmospheric deposition.
- ~~Fish~~ Small (prey) fish in the reference reservoir are not safe for consumption by wildlife. Similarly, larger fish that humans prefer are only appropriate for consumption at a rate of two servings per month of a 50–50 mix of TL3 and TL4 fish. However, this is not protective for people who consume four servings per month (the goal), nor is it protective in the seasons (i.e. late summer and fall) when largemouth bass are abundant, but trout are not abundant~~, and for human consumption of up to two serving per month~~. Methylmercury reached a peak concentration of 2.6 ng/l in the reference reservoir in 2004. The average total mercury in the reference reservoir bottom sediments is 0.1 mg/kg; these sediments are primarily soil fines (silts and clays less than 63 microns).
- The linkage between sources (mining waste, urban runoff, atmospheric deposition, and naturally occurring mercury in soil) and the numeric targets (fish tissue methylmercury concentrations) is not direct. As illustrated in Figure 7.1, the sources and the numeric targets are linked by the sites where methylmercury is produced.
- ~~The strongest evidence of the linkage between sources and targets in the watershed is reservoir sediment and corresponding fish tissue mercury concentrations.~~
- The wet season is largely a time of transport of inorganic particulate mercury, whereas methylation and bioaccumulation largely occur in the dry season when and where the critical condition of low oxygen (anoxic conditions) occurs. One implication of the linkage is that both dissolved and total mercury loads must be reduced; mining waste erosion controls will keep mercury on the landscape and out of the aquatic system where it may dissolve.
- Methylation principally occurs in the oxygen-depleted depths of impoundments. “Impoundments” are engineered structures, such as dams, drop structures, and former quarries, which cause water to pond—and are very different from natural conditions as there are no natural deep lakes in this watershed.
- Methylmercury bioconcentrates as it moves up the food chain from algae to zooplankton to prey fish and to predator fish (Figure 7.8). The largest single jump in concentration occurs from the water to algae.
- Although there may be sites for methylation in the stream and river channels, as discussed in “mercury transport and linkage” above, their total contribution to methylmercury production is much smaller than the exports from the reservoirs and Lake Almaden during the dry season. This suggests that that reducing methylmercury production to attain TMDL targets in reservoirs downstream of mercury mines and Lake Almaden will likely also attain targets in downstream waters.

8. Allocations and TMDLs ~~and Allocations~~

This section presents allocations, total maximum daily loads (TMDLs), and integration between the Guadalupe River watershed and San Francisco Bay mercury TMDL projects. The allocations describe the reductions needed in mercury loads by source. In this section, we also establish t~~T~~he TMDLs ~~total maximum daily loads (TMDLs)~~for impaired waters. These allocations and TMDLs implement the mercury water quality objectives in certain waters of the Guadalupe River watershed (see Figure 1.2). ~~of mercury to the waters of the Guadalupe River Watershed are the combination of concentration-based allocations proposed in Sections 8.1–8.5, see Table 8.1. In addition to the TMDLs, this section presents recommended allocations for mercury reduction among the sources in the Guadalupe River watershed.~~ A summary table of the allocations (Table 8.5~~2~~) is provided in Key Points at the end of Section 8, followed by a watershed map illustrating the allocations (Figure 8.1).

~~Table 8.1 Total Maximum Daily Loads~~

~~TMDL~~	~~Waters~~
~~0.1 mg mercury per kg suspended sediment (dry wt., annual median)~~	**~~Waters upstream of reservoirs and lakes~~**: ~~Guadalupe Creek upstream of Guadalupe Reservoir~~ ~~Alamitos Creek~~ ~~Percolation ponds along these creeks~~ ~~Tributaries to these waters~~
~~1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)~~	**~~Reservoirs and Lakes~~**: ~~Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden~~
~~0.2 mg mercury per kg suspended sediment (dry wt., annual median)~~	**~~Waters downstream of reservoirs and lakes~~**: ~~Guadalupe Creek downstream of Guadalupe Reservoir~~ ~~Los Gatos Creek downstream of Vasona Dam~~ ~~Canoas Creek~~ ~~Ross Creek~~ ~~Guadalupe River~~ ~~Percolation ponds along these creeks and the Guadalupe River~~ ~~Tributaries to these waters~~

As shown by the Linkage Analysis (Section 7), mercury bioaccumulation in the Guadalupe River watershed cannot be reduced unless loads of dissolved and total mercury and methylmercury production are reduced. Reductions in total mercury are also necessary to meet the legacy and urban stormwater runoff allocations that the San Francisco Bay mercury TMDL assigns to the watershed. Allocations are based on goals of (a) eliminating inputs of mercury caused by anthropogenic activities, particularly mining and urban stormwater runoff, and (b) minimizing the transformation of mercury to methylmercury caused by anthropogenic activities, particularly the operation of impoundments (see Section 8.2 for the definition of impoundments).

~~A TMDL need not be stated as a daily load (Code of Federal Regulations, Title 40, §130.2[i]). Other measures are allowed if more appropriate. A daily or average daily TMDL is inappropriate for the proposed allocations due to both (1) the temporal~~

~~component embedded in the applicable water quality standards that the allocations were developed to protect, and (2) the nature of mercury transport and methylmercury production in rivers and reservoirs. The allocations protect wildlife and human health beneficial uses related to consuming watershed and Bay fish. The water quality objectives, which protect these uses, are the narrative bioaccumulation objective, the numeric fish tissue objectives, and the numeric mercury CTR criterion. These objectives reflect environmental exposure over time and therefore it is preferable to assign a concentration limit (rather than a daily or average daily load) to ensure attainment of these objectives.~~

The allocations proposed below are concentration limits within the watershed. The total mercury allocations are equal~~te~~ to~~, or are more stringent than,~~ the mass load allocations assigned by the San Francisco Bay mercury TMDL to mercury mining legacy, ~~and~~ urban stormwater runoff, nonurban stormwater runoff, and atmospheric deposition sources. Mass loads and concentrations of total mercury are expected to fluctuate with the magnitude of precipitation, flow, and resulting soil erosion from the land surface and from the banks, floodplains, and bottoms of creeks and rivers. The total mercury allocations are intended to represent long-term averages and account for long-term variability, including seasonal variability. ~~As discussed in Section 8.8 below, the proposed allocations involve an explicit margin of safety.~~

Achieving the allocations detailed below will be part of a two-phase TMDL implementation process described in the Implementation Plan (Section 9). In general, the goals for the first phase of implementation are to (a) implement effective source control measures at mercury mine sites~~for mining waste in the New Almaden Mining District~~, (b) complete studies to reduce discharge of mining waste accumulated in downstream beds, banks, and floodplains, and (c) complete studies of methylmercury and bioaccumulation controls in reservoirs and lakes. The goal for the second 10-year phase of implementation is to achieve the watershed fish tissue targets and the total mercury load allocation assigned by the San Francisco Bay mercury TMDL. Throughout both phases, the mercury load, concentrations, and bioaccumulation will be monitored to ensure that total and methylmercury levels have declined and fish targets are attained. As described in Section 9 (Monitoring and Implementation), monitoring may be undertaken in a coordinated effort by many entities. Guiding both phases, and remaining central to the implementation process, will be the allocations for each source described below.

8.1 Mining Waste Total Mercury Allocations

The goal for the mining waste allocations are to eliminate inputs of mercury to surface waters caused by anthropogenic activities (i.e., mining) to restore beneficial uses. This goal is consistent with the Basin Plan's (Chapter 4.21 *Implementation Plan*) goals for mines and mineral producers to "…restore and protect beneficial uses of ~~receiving~~ surface waters now impaired or threatened with impairment resulting from past or present mining activities." It is also consistent with the Clean Water Act requirement that "the TMDL and associated wasteload and load allocations must be set at levels necessary to result in attainment of all applicable water quality standards… 40CFR130.7(c)(1)."

DEFINITIONS

Mining waste is defined in the California Water Code §13050 (q)(1) as "all solid, semisolid, and liquid waste materials from the extraction, beneficiation, and processing of ores and minerals. Mining waste includes, but is not limited to, soil, waste rock, and overburden, as defined in Section 2732 of the Public Resources Code, and tailings, slag, and other processed waste materials…" The mining waste allocations apply to mining waste as defined above, including ore piles, soil under processing sites, stormwater runoff from processing facilities and equipment, and other process areas and equipment impacted by mine operations and exposed to stormwater such that mercury may be transported to ~~receiving~~ surface waters.

Mining waste is located in the New Almaden Mining District (defined in Section 3.4); ~~notably for purposes of This TMDL project, it includes the former Guadalupe Mine),~~ and at the ~~Santa Teresa, Bernal, and Hillsdale~~Guadalupe, Santa Teresa, and Bernal mercury mines. Due to wet season transport over more than a century, mining waste is also located in the downstream bed, banks, and floodplains of Guadalupe, Alamitos, and Calero creeks, and the Guadalupe River. These areas are referred to as downstream "depositional" mining waste source areas.

"Erodible" means material readily available for transport by stormwater runoff to surface waters ~~We define an allocation to erodable soil fines~~. Soil fines on the landscape become suspended sediments when they are transported by stormwater runoff to surface waters. Erosion is assumed to be controllable ~~and "erodable soil" is defined as soil that is transported by stormwater runoff during periods of erosive flow to receiving waters~~. Fines are the silt and clay portion of soil that is less than 63 microns in diameter. ~~Soil fines are transported as suspended sediment in stormwater runoff.~~ Mercury concentrations on suspended sediment are best characterized by the annual median.

RECOMMENDED MINING WASTE TOTAL MERCURY ALLOCATIONS

Water Board staff proposes two total mercury mining waste allocations as follows:

- 0.2 mg mercury per kg mercury mining waste (dry wt., median) in erodible mercury mining waste from the New Almaden Mining District, and Guadalupe, Santa Teresa, and Bernal mercury mines; this allocation shall be measured in fines less than 63 microns in diameter~~0.1 mg/kg mercury (median, dry weight) in erodable soil fines transported from the following areas which drain to reservoirs and lakes: New Almaden Mining District, Santa Teresa and Bernal mercury mines, depositional areas on Alamitos Creek, and depositional areas on Guadalupe Creek upstream of Guadalupe Reservoir~~; and
- 0.2 mg mercury per kg erodible sediment (dry wt., median) discharged from depositional areas in creeks that drain mercury mines~~0.2 mg/kg mercury (median, dry weight) in erodable soil fines from the following areas: the remaining 10 percent of the New Almaden Mining District (drains to Guadalupe Creek below Guadalupe Reservoir); Hillsdale mercury mine; and depositional areas on Guadalupe Creek downstream of Guadalupe Reservoir, and depositional areas on the Guadalupe River~~.

The mining waste allocations are equal to the TMDLs, except that they are 'medians' rather than 'annual medians' because of temporal differences in sampling. Measurements of mercury in ~~erodable~~erodible soil fines are collected at one time (on the date when surface soil is sampled), whereas measurements of mercury in suspended sediments are averaged over a year of stormwater runoff. The analysis for these allocations is presented below.

POTENTIAL MINING WASTE ALLOCATIONS

Water Board staff considered forms of mercury appropriate for this allocation. The principal concern with mining waste is wet season stormwater transport of inorganic mercury to ~~receiving~~ surface waters. Implementation actions taken to prevent the erosion and transport of mining waste from the landscape to surface waters will effectively address dissolved mercury from mining waste; methylmercury production is addressed as a separate allocation below. Therefore, the mining waste allocation is for total mercury.

We also considered several options for the mining waste allocations and associated compliance monitoring, such as a mass load, restoring to pre-mining conditions, and based on data from the reference reservoir. Examples and evaluations of these allocations and compliance monitoring are provided below.

Potential Mass Load Allocations

Examples of mass load allocations are the total maximum annual load that the San Francisco Bay mercury TMDL assigns to the Guadalupe River watershed (SFBRWQCB 2004), and the 95 percent mass load reduction assigned to mines in the Cache Creek watershed (CVRWQCB 2004b.) However, the Source~~Guadalupe Linkage~~ Analysis provided loads for only one year (2004). Especially for loads from the upper watershed, there is high uncertainty in these estimates (see Section 4.3~~7.1~~) ~~for inorganic mercury is qualitative, so it does not provide a scientific basis for a mass load in the Guadalupe River watershed~~. Compounding this uncertainty, the loads vary widely from year-to-year depending on rainfall. Therefore, it would be impractical to regulate on annual or daily mass loads of total mercury. Therefore, we recommend allocations in a metric that has much less interannual variability; hence we recommend concentration-based allocations.

Additionally, compliance monitoring for a mass load would require considerable precision for discharges from many creeks in the several-thousand-acre New Almaden Mining District, and separately from Guadalupe, Santa Teresa, and Bernal mercury mines, and downstream creek beds, banks, and floodplains. Due to the wide range in annual precipitation, monitoring would be required over several years. Presumably, the 95 percent mass load reduction approach to allocations would require even greater monitoring precision. We propose that the funding for these monitoring efforts would be better spent on implementation to restore beneficial uses.

Potential Allocations Based on Conditions Prior to Mining

Examples of allocations to restore the landscape to pre-mining conditions include establishing pre-mining surface soil mercury concentrations to use as mine site cleanup goals (CVRWQCB 2004b), or mineralized zone perimeter sediment mercury concentrations to use as mine site cleanup goals (CVRWQCB 2004a). Data are lacking to justify allocations in the Guadalupe River watershed based on pre-mining conditions.

(See Section 9.10 regarding establishing cleanup goals [not allocations] based on pre-mining conditions.) ~~It is reasonable to assume that the inefficient processing methods—and lack of air pollution controls—widely distributed mercury onto surface soils in the New Almaden Mining District, and at Santa Teresa, Bernal, and Hillsdale mine sites. Therefore, the main difficulty with these approaches is determining pre-mining mercury concentrations. Compliance monitoring would be based on the simple and immediate approach used for hazardous waste cleanups—collect a statistically valid set of samples, determine average mercury, and complete remediation when the cleanup goal is met.~~

~~Recommended~~ Potential Allocation Based on Reference Reservoir

~~Lastly,~~ W~~w~~e considered an allocation based on sediment mercury concentrations in the reference reservoir (Lexington Reservoir, see Section 7.6). ~~Based on this reference reservoir, b~~Bottom sediment concentrations in the reference reservoir ~~of~~ are 0.1 mg/kg total mercury in fines (less than 63 microns). These soil fines were transported to the bottom of the reservoir as suspended sediment in stormwater runoff, and hence represent surface soil mercury concentrations. This allocation would correspond to undisturbed conditions ~~correspond to fish mercury concentrations at or below the targets~~. ~~Therefore, we propose 0.1 mg/kg total mercury in fines as an allocation to mining waste sources which drain to reservoirs and lakes.~~However, the reference reservoir is located outside the mercury-enriched portion ("mineralized zone") of the watershed. Therefore, the reference reservoir does not adequately characterize pre-mining surface soil mercury concentrations in the mineralized zone of the watershed. Even recognizing that New Almaden was the world's deepest mercury mine because ores were located far underground, surface soils in the mineralized zone are likely enriched in mercury. Therefore, we reject this potential allocation.

~~This allocation is calculated from mercury concentrations in Lexington Reservoir bottom sediment samples (Tetra Tech 2005b; Table A.2). These samples had a small range from 0.07–0.18 mg/kg dry weight, with median mercury of 0.10 mg/kg. More than half of the reference reservoir bottom sediment samples were 100% fines (silts and clays of less than 63 microns); percent fines ranged from 85–100%. These soil fines were transported to the bottom of the reservoir as suspended sediment in stormwater runoff.~~

~~This allocation is applicable to mining waste sources which drain to reservoirs and lakes. This allocation is applicable to the majority (about 90 percent) of the New Almaden Mining District, to the area which drains to reservoirs and lakes. This allocation is also applicable to the areas of Santa Teresa and Bernal mercury mines that drain to Santa Teresa Creek and then to Lake Almaden, depositional areas in Alamitos Creek (which drains to Lake Almaden), and depositional areas in Guadalupe Creek upstream of Guadalupe Reservoir.~~

Recommended Allocation Based on San Francisco Bay Mercury TMDL

We propose a total mercury ~~an~~ allocation of 0.2 mg/kg (~~annual median, dry weight~~dry weight, median) to mercury mining waste. This allocation is based on the San Francisco Bay mercury TMDL suspended sediment mercury target of 0.2 mg/kg (dry weight, annual median) to attain fish tissue and bird egg targets protective of Bay wildlife beneficial uses.

~~This portion of the watershed does not drain to reservoirs and lakes, but it does drain to San Francisco Bay. The Linkage Analysis (Section 7) does not provide a quantitative linkage for this segment of the watershed, but it does explain that the methylmercury discharged from the reservoirs and lakes is much greater than the in-stream production (Section 7.3). Therefore, we focus on total mercury in sediments. Mercury in sediment samples collected in 2004 from the Guadalupe River ranged from 0.07 mg/kg to 39.28 mg/kg (dry-wt basis), with a median of 2.8 mg/kg. The lower river samples consisted of silts and clays (Tetra Tech 2005a). Because the Guadalupe River discharges to San Francisco Bay, we propose the Bay Mercury TMDL sediment target as an allocation.~~

~~Mining Waste Allocations Are Not Cleanup~~

Water Board staff proposes to evaluate attainment of the mining waste allocations through Water Board oversight of selection, design, construction, and operations and maintenance of best management practices for erosion control, see Section 9 (Implementation). ~~This is the same evaluation method as proposed for the inactive mercury mines in the Cache Creek watershed, for which mercury loads must be reduced by 95 percent (CVRWQCB 2005). Similarly, in the Tomales Bay Pathogens TMDL, to demonstrate attainment of applicable allocations, responsible parties are responsible for compliance with specified best management practices and applicable waste discharge requirements or waiver conditions. It is important to note that the fish tissue numeric targets, TMDLs, and the TMDL allocations are not directly enforceable. However, the Water Board may specify conditions in water quality certifications (if applicable), and cleanup levels in waste discharge requirements (WDRs), in cleanup and abatement orders (CAOs), or in other Water Board orders.~~

8.2 Impoundment Methylmercury Allocation

The goal for allocations to impoundments (see ‘definitions’ below) is to operate these engineered features in a manner such that they attain TMDL targets. This goal is consistent with the Clean Water Act requirement that “the TMDL and associated wasteload and load allocations must be set at levels necessary to result in attainment of all applicable water quality standards… 40CFR130.7(c)(1).”

POTENTIAL ALLOCATIONS

Water Board staff proposes total methylmercury allocations to reservoirs and lakes. We evaluated numerous potential allocations in the process of forming this recommendation. In the sections below, we define terms used in this section, explain the basis of the recommendation, and discuss other potential allocations and why we rejected them.

Definitions

Impoundments occur behind engineered structures and anthropogenic alterations to the landscape that pond water. Engineered structures include dams, which impound water in reservoirs and artificial lakes, and flood control structures, such as drop structures, which typically form smaller impoundments. Anthropogenic alterations to the landscape include vegetation that ponds water. As described in Section 4 (Source Analysis), prior to the mining era, there were no lakes or other large natural impoundments in the Guadalupe River watershed. Deep impoundments (reservoirs and lakes) undergo thermal stratification in the dry season; shallow impoundments do not stratify.

Peak methylmercury is the term we use to describe the dry season maximum methylmercury concentration in the hypolimnion of reservoirs and lakes. This seasonal peak is also the annual peak (see Section 7.2).

Recommended Methylmercury Allocation for Reservoirs and Lakes

Staff proposes an allocation of 1.5 ng/l peak total methylmercury in the hypolimnion of reservoirs and lakes downstream of mercury mines. The proposed allocation is applicable to Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden. This allocation is based on the peak methylmercury concentration in the reference reservoir, and is calculated to attain TMDL targets by minimizing the transformation of mercury to methylmercury caused by anthropogenic activities. The analysis for this allocation is presented below.

DEVELOPMENT OF METHYLMERCURY ALLOCATIONS TO RESERVOIRS AND LAKES

In developing the recommended allocation, we considered the following approaches: (a) national default or site-specific data, (b) annual average or peak hypolimnion methylmercury concentrations, (c) depth-averaged or depth-specific concentrations, or (d) dissolved or total methylmercury. We present staff's analysis of the merits of these different approaches to allocations in the sections below.

(a) National Default or Site-Specific Data

We reject the default approach, which consists of using national default data, because we have a large data set from 2004 of reservoir aqueous methylmercury data in the Guadalupe River watershed reservoirs. Instead, we propose an allocation based on site-specific data from the reference reservoir (see Calculation of Methylmercury Allocations for Reservoirs and Lakes).

The default approach results in an allocation of 0.04 ng/l dissolved methylmercury, annual average, to the entire deep impoundment. This is calculated by dividing the desired fish tissue concentration by the default BAF (BAFs are defined in Section 7.4). The desired fish tissue concentration is the wildlife target for TL3 fish 5-15 cm in length of 0.05 mg/kg. The default BAF is from the U.S. EPA methylmercury criterion for the protection of human health. The U.S. EPA calculated a draft national BAF of 1,300,000 on average for dissolved methylmercury in lakes and mercury in TL3 fish (Table A-1, USEPA 2001). Dividing the target by the BAF (0.05 mg/kg divided by 1,300,000) and multiplying by 10^6 (to convert from milligrams to nanograms) yields 0.04 ng/l dissolved methylmercury, annual average, to the entire deep impoundment. We previously employed this default approach for Soulajule Reservoir in the Walker Creek watershed where we have no reservoir aqueous methylmercury data (SFBRWQCB 2007).

(b) Annual Average or Peak Hypolimnion Methylmercury Concentrations

Staff proposes allocations of peak, rather than annual average, hypolimnion methylmercury concentrations. From the reference reservoir depth profiles in Figures 7.9a–c, we observe well-mixed conditions characterized by nearly constant depth profiles during winter and fall (1/12/04–3/04/04, and 9/27/04–12/02/04). Weak stratification characterized by small changes with depth occurs in the spring (3/18/04 - 5/13/04). Strong stratification during the dry season is characterized by an abrupt shift in the depth profiles (5/25/04 – 9/02/04). If the key to controlling hypolimnion methylmercury production is oxygen—and it does appear to be the key—then we observe that oxygen inputs are only necessary during stratification. Therefore, we eliminate annual average methylmercury concentration as a potential allocation, and instead propose the peak methylmercury concentration for the allocation.

(c) Depth-Averaged or Depth-Specific Concentrations

Staff proposes depth-specific rather than depth-averaged allocations. (During thermal stratification, the warmer top water layer is the epilimnion, the middle transition zone is the metalimnion, and the cooler deeper water is the hypolimnion.) This conclusion was based on the analysis described in the next paragraph.

The hypolimnion is the portion of the water body in which methylmercury concentrations increase greatly during the dry season. For example, the total methylmercury concentration in the Guadalupe Reservoir hypolimnion increased during stratification from about 0.9 ng/l to nearly 13 ng/l (measured at the outlet, Appendix A, Table A.6). In contrast, the Guadalupe Reservoir epilimnion samples collected during the dry season at one-foot depth remained fairly constant at less than 0.5 ng/l.

The Santa Clara Valley Water District is currently studying hypolimnion methylmercury controls. A further reason to reject depth-averaged allocations is practical; staff is unaware of any efforts to develop methylmercury production controls for the epilimnion or metalimnion. Therefore, we eliminate depth-averaged methylmercury concentrations as a potential allocation, and instead propose a depth-specific allocation to the hypolimnion.

(d) Dissolved or Total Methylmercury

Staff proposes total methylmercury rather than dissolved methylmercury allocations, because total also protects consumers of benthic organisms as well as consumers of fish. This conclusion was based on the analysis described in the following paragraphs.

Dissolved and total methylmercury measurements were collected by Tetra Tech from reservoirs during the July 2003 synoptic survey sampling event, the 2004 wet season sampling, and the 2004 dry season depth profiles in two reservoirs (Table A.6.) Only total methylmercury measurements were collected by Light, Air and Space from the reference reservoir (Lexington) throughout 2004 (Appendix A, Table A.3b).

Bioavailable methylmercury includes both that in the dissolved form (accumulated principally by phytoplankton) and that in the particulate form, such as in or adsorbed to phytoplankton (accumulated principally by zooplankton.) Dissolved methylmercury is considered a better measure of the first step in bioaccumulation from water to phytoplankton and eventually to fish—that is why U.S. EPA uses dissolved methylmercury in their calculation of BAFs (see Default Approach for Methylmercury Allocation, above.)

Because total methylmercury is inclusive of dissolved methylmercury, and because total methylmercury protects predators of fish and benthic organisms, we propose a total methylmercury allocation. Total methylmercury is bioaccumulated by benthic organisms, and affects the benthic community and their predators, including people who consume crayfish. Therefore, we eliminate dissolved methylmercury concentrations as a potential allocation, and instead propose a total methylmercury allocation.

In summary, we propose an allocation that is based on the following factors: (a) site-specific data, (b) peak concentrations, (c) depth-specific to the hypolimnion, and (d) total methylmercury concentrations. We present staff's calculation of the allocation below.

CALCULATION OF METHYLMERCURY ALLOCATION FOR RESERVOIRS AND LAKES

Note from Section 7.6 that total methylmercury reached an estimated peak concentration of 2.6 ng/l in the hypolimnion of the reference reservoir in 2004. This is the only available estimate of peak methylmercury concentrations in the reference reservoir. Also, as noted in Section 7.6, fish tissue targets were not attained in the reference reservoir. Therefore, to calculate methylmercury allocation for reservoirs and lakes, it is necessary to adjust the measured peak methylmercury concentration down to a lower concentration that will attain the wildlife target. The steps to calculate the allocation are to first calculate a bioaccumulation factor (BAF) based on measurements, then divide the target fish mercury concentration by the BAF.

Staff calculated a BAF (see Equation 7.1) based on the reference reservoir. We divided the November 2006 average fish mercury concentration (0.083 mg/kg) by the 2004 peak methylmercury concentration (2.6 ng/l), and multiplied the result by 10^6 ng/mg, which yields a BAF of 31,923 l/kg. Staff selected an explicit margin of safety of 5 percent, which yields a fish target of 0.0475 mg/kg. The methylmercury allocation is calculated by dividing this fish tissue target (0.0475 mg/kg) by the BAF (31,923 l/kg), and multiplying the result by 10^6 ng/mg. This yields a methylmercury concentration of 1.5 ng/l to attain the wildlife target, with a 5 percent margin of safety.

We note that sampling will be required to evaluate compliance with the allocation. Hypolimnion samples are easier, safer, and less time-consuming to collect from the outlet. Therefore, we developed this allocation for the outlet, to be applicable to discharge samples collected from Guadalupe, Almaden, and Calero reservoirs. However, Lake Almaden discharges from the surface. Consequently, hypolimnion samples from Lake Almaden will require a boat.

Confirm the Allocation Is Appropriate

Staff compared the proposed allocation to influent data and confirmed the allocation is appropriate. It would not be appropriate if influent methylmercury concentrations were similar to the proposed allocation. This conclusion was based on the analysis described in the following paragraphs.

We evaluated available dry season influent methylmercury concentrations to confirm that influent loadings are not as significant as methylmercury produced within the reservoirs and lakes. Dry season data was collected upstream of impoundments from a mine seep and Deep Gulch Creek during the 2003 Synoptic Survey fieldwork (Tetra Tech 2003a). Total methylmercury concentrations were 0.131 and 0.201 ng/l, respectively, well below the levels attained in the reservoirs and lakes. This data, together with the calculations in Section 4.4 that show 3 to 10 times as much methylmercury accumulated in the hypolimnion as the epilimnion, demonstrate that the allocation is appropriate in the dry season.

Similarly, our analysis of wet season data demonstrates that the allocation is appropriate. Wet season data was collected in numerous tributaries to Lexington, Guadalupe, Almaden, and Calero reservoirs (Tetra Tech 2005a). Maximum creek (influent) total methylmercury concentrations ranged from 0.141 to 0.289 ng/l; maximum total methylmercury discharge concentrations ranged from 0.072 ng/l from Lexington to 0.704 ng/l from Guadalupe. These wet season influent and discharge methylmercury concentrations are lower than the proposed allocation, and considerably lower than the seasonal maximum in Guadalupe Reservoir, so we conclude that the allocation is appropriate.

Increasing Assimilative Capacity for Methylmercury

An additional factor staff considered in developing methylmercury allocations is bioaccumulation control strategies. In other words, can the bioaccumulation—rather than the production—of methylmercury be controlled? In TMDL lingo, can the assimilative capacity for methylmercury be increased? These allocations do not account for food web differences between waters nor year-to-year variability. Some studies indicate that given the same methylmercury production rates, if biological productivity is increased, especially at the lowest trophic levels, then methylmercury bioaccumulation will be decreased (in a sense, diluted) (Chen 2005). We propose special studies (Section 9.10) to provide site-specific information. In Adaptive Implementation (Section 9.8), we describe how we propose to use the study results to refine the methylmercury allocation, as necessary.

ALTERNATIVE ALLOCATIONS FOR IMPOUNDMENTS

In this section, we present brief descriptions of other potential allocations to impoundments, and why we rejected them.

Alternative 1 – Total Mercury Allocations

Staff does not propose total mercury allocations for shallow or deep impoundments. The main concern with mercury in the aquatic system is its transformation to methylmercury and bioaccumulation. In This TMDL project, we are focusing on the main concern in impoundments—methylmercury.

An additional reason to reject total mercury allocations to impoundments is that they act as sediment traps (except possibly during episodic high flow events when accumulated sediment may be scoured and discharged). The deep impoundments are particularly efficient sediment traps—reportedly, Almaden Reservoir’s outlet structure had to be raised over 30 feet due to sediment accumulation.

An impoundment can be modeled as a simple, one-box model. Sediment flows into the impoundment, mixes, and settles at the bottom. The proportion that settles is dependent on the water velocity. Sediment accumulates more readily under low water velocity, which is nearly always the case in the deep impoundments, as evidenced by their high sediment accumulation rate. We anticipate that the mining waste total mercury allocations, and the accompanying implementation plan, will reduce the transport of mercury-laden sediment into the reservoirs. Because clean sediment will continue to be transported from non-mined areas, it will, in effect, dilute the mercury concentration in the top layer of reservoir bottom sediments. The resulting effect—lower mercury concentrations in bottom sediments—is desirable (see Figure 7.2).

A further reason to reject total mercury allocations to impoundments is that it would unnecessarily duplicate the mining legacy allocation assigned to this watershed by the San Francisco Bay mercury TMDL. For flood control purposes the Santa Clara Valley Water District regularly undertakes removal of mercury-laden sediment accumulated in shallow impoundments and depositional areas, which contributes to attaining the mining legacy mass allocation (see Section 8.6) established by the San Francisco Bay mercury TMDL. Therefore, staff does not propose total mercury allocations for impoundments.

Guadalupe Reservoir is a potential exception because “a known mine was inundated by the reservoir and there were small mines along its banks (Summers 2007)”. Consequently, Guadalupe Reservoir may be affected by or discharge mercury from this mine and ore processing site. Alternatively, potentially large volumes of mining waste may have been transported to this reservoir from “Los Capitancillos Creek below the America Mine, where a post-mining landslide occurred (Summers 2007)”. In any case, the dilution effect is also expected for Guadalupe Reservoir.

Alternative 2 – Dissolved Total Mercury Allocations

Staff does not propose dissolved total mercury allocations for shallow or deep impoundments because the main concern is methylmercury. Staff evaluated options for allocations related to mercury transformations from the inorganic solid state to dissolved mercury, then to methylmercury, and subsequent bioaccumulation. As discussed in Section 7.5, we are unsure whether it is loads of dissolved mercury from the preceding wet season which are methylated, or whether dissolution of mercury from bottom sediments is methylated. For this reason, and because erosion control (see Section 9.3) will keep inorganic solid mercury on the landscape and out of the aquatic system where it may dissolve, we do not propose dissolved mercury allocations.

Alternative 3 – Shallow Impoundment Methylmercury Allocations

Staff proposes studies to support methylmercury allocations for shallow impoundments. (Shallow impoundments do not undergo thermal stratification in the dry season.) The need for these studies is contingent on the effectiveness of deep impoundment control measures. If needed, the studies will be undertaken in Phase 2 of implementation.

Mercury may be transformed to methylmercury nearly anywhere anoxic conditions occur (see Section 7.2). Anoxic locations are potentially widespread in this watershed, including in shallow impoundments. Methylmercury production in this watershed has only been studied in deep impoundments, and appears to be a key factor in methylmercury production, uptake in the deep impoundments themselves, transport downstream, and downstream uptake. Therefore, staff proposes methylmercury allocations to deep impoundments.

Staff proposes studies of methylmercury production and bioaccumulation in shallow impoundments. Many shallow impoundments in urbanized areas exist due to controllable human activities. Methylmercury production and bioaccumulation have not yet been studied sufficiently in this watershed to support a methylmercury allocation to shallow impoundments. We propose these special studies (see Section 10), to be undertaken if methylmercury and bioaccumulation controls in the deep impoundments do not attain targets downstream.

8.3 Urban Stormwater Runoff Total Mercury Allocation

The mercury in urban stormwater runoff results in part from controllable urban sources, such as improperly discarded fluorescent lights, electrical switches, thermometers, and other mercury-containing devices, and from historical and ongoing industrial activities (SFBRWQCB 2004.) Atmospheric deposition and naturally occurring mercury in background soils, which are assumed to be difficult to control, also contribute to the mercury in urban stormwater runoff. The estimated suspended sediment load discharged from the Guadalupe River watershed to San Francisco Bay is 44 million kilograms per year (M kg/yr), of which 36 M kg/yr is from urban stormwater runoff (SFBRWQCB 2004). Sediment load multiplied by the San Francisco Bay mercury TMDL target concentration of 0.2 mg/kg total mercury in suspended sediment (SFBRWQCB 2004) yields the Bay TMDL urban stormwater runoff wasteload allocation of 7.2 kilograms per year total mercury to be attained within 20 years. The Bay TMDL interim wasteload allocation to urban stormwater runoff is halfway between the current load and the allocation, 11 kilograms to be attained within 10 years.

The Bay mercury TMDL is allocated by mass. Staff proposes to allocate the TMDL of mercury to the Guadalupe River watershed by the proportionally equivalent concentration.

This allocation also ~~does not~~ appl~~y~~ies to~~, and no implementation actions are required in this TMDL for,~~ a small section of Los Gatos Creek waters that receive urban runoff. These waters include Vasona Lake and Los Gatos Creek and its tributaries between Vasona Lake and Lexington Dam (the upper limit of urban stormwater runoff discharges to Los Gatos Creek).

This allocation applies to the Santa Clara Valley Urban Runoff Pollution Prevention Program, currently regulated under NPDES Permit No. CAS029718. This permit is revised and reissued approximately every five years, and the permit number changes accordingly.~~Staff proposes to address these waters in a future TMDL effort. (As described in Section 1, a future TMDL and implementation plan will address mercury impairment in the upper western portion of the watershed, which includes Los Gatos Creek and its tributaries upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake.)~~

RECOMMENDED URBAN STORMWATER RUNOFF TOTAL MERCURY ALLOCATION

Staff recommends an allocation of 0.2 mg mercury per kg suspended sediment (~~annual median, dry weight~~dry weight, annual median) to urban stormwater runoff in the Guadalupe River watershed.

8.4 Nonurban Stormwater Runoff Total Mercury Allocation

Erosion of background, non-mineralized soil is a source of mercury. This source, naturally occurring mercury in soil, is distinct from mining waste (see Section 4). Because erosion from non-urban background areas of the watershed may be exacerbated by grazing, road cuts, or other anthropogenic activities, the loads are somewhat controllable. In the San Francisco Bay mercury TMDL, the Guadalupe River watershed's suspended sediment load was estimated to be 44 M kg/yr, of which 8.5 M kg/yr is derived from non-urban stormwater runoff (SFBRWQCB 2004). The estimated mercury sediment concentration in Bay Area open space today of 0.06 mg/kg is close to the estimated pre-mining background concentration of 0.08 mg/kg in San Francisco Bay, and well below the San Francisco Bay mercury TMDL target of 0.2 mg/kg (SFBRWQCB 2004). Therefore, the San Francisco Bay mercury TMDL nonurban stormwater runoff load allocation is the current load. The Guadalupe sediment load multiplied by the estimated open space mercury concentration of 0.06 mg/kg total mercury in suspended sediment yields the Bay TMDL nonurban stormwater runoff load allocation of 0.5 kilograms per year of total mercury.

The Bay mercury TMDL is allocated by mass. Staff proposes to allocate the TMDL of mercury to the Guadalupe River watershed by the proportionally equivalent concentration, the measured concentration of mercury in bottom sediments of the reference reservoir (Section 7.6). This measured concentration is 0.1 mg/kg, similar to the estimated pre-mining background concentration of 0.08 mg/kg, and well below the San Francisco Bay mercury TMDL target of 0.2 mg/kg (SFBRWQCB 2004). This allocation also applies to waters in the Los Gatos Creek watershed upstream of Lenihan Dam, including Lexington Reservoir, Lake Elsman, and Los Gatos Creek and its tributaries upstream of Lexington Reservoir.

Recommended Nonurban Stormwater Runoff Total Mercury Allocation

Staff recommends an allocation of 0.1 mg mercury per kg suspended sediment (~~annual median, dry weight~~dry weight, annual median) to nonurban stormwater runoff in the Guadalupe River watershed.

8.5 Atmospheric Deposition Total Mercury Allocation

Deposition from the atmosphere is minimal relative to other loads in the watershed. As described in Section 4 (Source Analysis), the load of mercury from atmospheric deposition onto land surface has not been quantified separately from the background soil load, and therefore is included in the nonurban stormwater runoff load allocation above. However, there is also direct atmospheric deposition onto waters, which is addressed by this load allocation. No reductions are called for partly because this load is reflected in the mining waste allocations of 0.1 & 0.2 mg/kg mercury (~~annual median, dry weight~~dry weight, annual median) in ~~erodable~~erodible soil fines (see Sections 7.6 and 8.1).

Mercury in the atmosphere enters the watershed during dry weather (dry deposition) and rainy weather (wet deposition). To determine the mercury load associated with dry and wet deposition, the Regional Monitoring Program for Trace Substances collected ambient air and precipitation samples at three Bay Area sites. The study estimated the average dry and wet deposition rate to be 23.2 micrograms of mercury per square meter per year (SFEI 2001). About 1 percent of the 170-square-mile watershed is water surface, which is approximately 4.8 million square meters.

The deposition rate multiplied by the area yields the existing load of 0.1 kilograms per year of total mercury. Because the potential to reduce deposition by controlling local sources is believed to be limited, and because reductions in the global atmospheric pool are beyond the scope of this TMDL project, the atmospheric deposition load allocation is the existing load. It is anticipated that remediation of the New Almaden Mining District will reduce atmospheric inputs from local and regional sources, but no estimates are available.

The Bay mercury TMDL is allocated by mass. Staff proposes to allocate the TMDL of mercury to the Guadalupe River watershed by the proportionally equivalent concentration.

RECOMMENDED ATMOSPHERIC DEPOSITION TOTAL MERCURY ALLOCATION

Staff recommends an allocation of 23.2 micrograms of mercury per square meter per year to atmospheric deposition directly to waters in the Guadalupe River watershed.

8.6 Total Maximum Daily Loads (TMDLs)

In Section 8.6, we present the TMDLs and the following related analyses: assimilative capacity, margin of safety, seasonal variations and critical conditions, and daily load expressions.

TMDLs are "[t]he sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background. … TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure" (Code of Federal Regulations, Title 40, §130.2[i]). We are establishing concentration-based TMDLs in accordance with this provision of the Clean Water Act.

The TMDLs of mercury to the impaired waters of the Guadalupe River Watershed are the combination of concentration-based allocations proposed in Sections 8.1–8.5, and summarized on Table 8.1.

Table 8.1 Total Maximum Daily Loads

TMDL	Impaired Waters
~~0.1~~0.2 mg mercury per kg suspended sediment (dry wt., annual median)	**~~Waters upstream of reservoirs and lakes~~Creeks and river**: Guadalupe Creek ~~upstream of Guadalupe Reservoir~~ Alamitos Creek Guadalupe River ~~Percolation ponds along these creeks~~ ~~Tributaries to these waters~~
1.5 ng total methylmercury per liter water (seasonal maximum, hypolimnion)	**Reservoirs and Lakes**: Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir, and Lake Almaden
~~0.2 mg mercury per kg suspended sediment (dry wt., annual median)~~	~~Guadalupe Creek downstream of Guadalupe Reservoir~~ ~~Los Gatos Creek downstream of Vasona Dam~~ ~~Canoas Creek~~ ~~Ross Creek~~ ~~Guadalupe River~~ ~~Percolation ponds along these creeks and the Guadalupe River~~ ~~Tributaries to these waters~~

ASSIMILATIVE CAPACITY

Assimilative (load) capacity is "[t]he greatest amount of loading that a water can receive without violating water quality standards" (Code of Federal Regulations, Title 40, §130.2[f]). The assimilative capacity for mercury is equal to the concentration-based TMDLs and allocations, which are summarized on Tables 8.1 and 8.5~~4~~.

MARGIN OF SAFETY

~~8.8 Margin of Safety~~

TMDL analyses must incorporate a margin of safety to address potential uncertainties. The margin of safety is intended to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. This report relies on an explicit five percent margin of safety in the methylmercury allocation.

The margin of safety can be derived either explicitly or implicitly. Providing an implicit margin of safety would involve using conservative assumptions (assumptions more likely to be over-protective than under-protective) throughout the analysis. Alternatively, an explicit margin of safety involves reserving a specific mercury load allocation for the margin of safety.

The primary margin of safety is provided by an explicit five percent margin in the methylmercury allocation (see Section 8.2.) A secondary, and implicit, margin of safety is provided by a conservative assumption in a water quality objective, which was set at the most protective level in TL3 fish of 15 cm (see Section 5).

This TMDL project indicates that source control alone is insufficient to attain targets within the watershed. However, This TMDL project calls for mining waste and urban runoff source control actions to protect San Francisco Bay. Reducing mercury in impoundment bottom sediments to attain targets (without methylation controls) would likely require cleanup of mining waste to mercury concentrations lower than background soil mercury concentrations. An alternative, but similarly impractical, method for achieving fish tissue targets is to remove all impoundments from operation.

Therefore, Water Board staff proposes to rely on the development of new and innovative methylmercury and bioaccumulation control methods to attain targets. These promising control methods are based on adapting nutrient controls developed for reservoirs (e.g., oxygenate the hypolimnion for taste and odor control). Methylation control provides a sufficient margin of safety so that, as explained in Section 8.2, the fish tissue targets are likely to be met in and downstream of Guadalupe, Almaden, and Calero reservoirs, and Lake Almaden. In other words, staff is optimistic that targets will be met in Guadalupe and Alamitos creeks, and in the Guadalupe River, by reducing methylmercury production in the deep impoundments (reservoirs and lakes) alone.

SEASONAL VARIATIONS AND CRITICAL CONDITIONS

~~8.7 Seasonal Variations & Critical Conditions~~

Federal regulations require TMDLs to account for seasonal variations and critical conditions. The possible factors to consider for seasonal variability include pollutant loads, beneficial use impairment, and ambient concentrations of total mercury and methylmercury in water and sediment. Seasonal variability in loads is a key feature in the Guadalupe River watershed, and it is discussed extensively in Section 7 (Linkage). Essentially, in the wet season, total mercury is transported in stormwater, whereas methylation and bioaccumulation largely occur in the dry season when and where the critical condition of low oxygen (anoxic conditions) occurs. The allocations proposed in Section 8 are intended to address seasonal variations and critical conditions.

DAILY LOAD EXPRESSIONS

We provide the following daily load expressions in light of a recent court decision and draft U.S. EPA guidance, despite the fact that a daily or average daily TMDL is not appropriate for this TMDL project. The District of Columbia (D.C.) Circuit Court of Appeals issued a decision in *Friends of the Earth, Inc. v. EPA, et al.*, No. 05-5015 (D.C. Cir. 2006), in which the D.C. Circuit held that two TMDLs for the Anacostia River (one established by U.S. Environmental Protection Agency [EPA] and one approved by EPA) did not comply with the Clean Water Act because they were not expressed as *daily* loads. This D.C. Circuit precedent does not apply to California, which is subject to the 9th Circuit Court of Appeals.

As a result of the decision, EPA issued a memorandum entitled *Establishing TMDL "Daily" Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA et. al., No. 05-5015* (April 25, 2006) and Implications for NPDES Permits in November 2006 that recommends that all TMDLs and associated load allocations (LAs) and wasteload allocations (WLAs) include a daily time increment in conjunction with other temporal expressions (e.g., annual, seasonal) that may be necessary to implement the relevant water quality standards.

Subsequently, in June 2007, the U.S. EPA Office of Wetlands, Oceans & Watersheds issued draft guidance providing calculation methods for "daily load expressions" (USEPA 2007). This draft guidance states the following.

> …In an effort to fully understand the physical and chemical dynamics of a waterbody, many TMDLs are developed using methodologies that result in identified allocations of monthly or greater time periods. EPA encourages TMDL developers to continue to apply accepted and reasonable methodologies when calculating TMDLs for impaired waterbodies and to use the most appropriate averaging period for developing allocations based on factors such as available data, watershed and waterbody characteristics, pollutant loading considerations, applicable standards, and the TMDL development methodology, among other things. For a variety of reasons, EPA recognizes that it might continue to be appropriate and necessary to identify non-daily allocations in TMDL development despite the need to also identify daily loads. For parameters such as sediment, for which narrative water quality criteria often apply, attainment of [*water quality standards*] cannot always be judged on a daily basis. Assessment of cumulative loading impacts is necessary to understand how to achieve [*water quality standards*] and to estimate the allowable loading capacity; therefore identifying long-term allocations for

> such situations is appropriate and informative from a management perspective. For TMDLs in which it is determined that a non-daily allocation is more meaningful in understanding the pollutant/waterbody dynamics, EPA recommends that practitioners identify and include such an allocation, as well as a daily load expression with the final TMDL submission….

A daily or average daily TMDL is inappropriate for the proposed allocations and TMDLs due to both (1) the temporal component embedded in the applicable water quality standards that the allocations were developed to protect, and (2) the nature of mercury transport and methylmercury production in rivers and reservoirs. The allocations protect wildlife and human health beneficial uses related to consuming watershed and Bay fish. The water quality objectives, which protect these uses, are the narrative bioaccumulation objective, the numeric fish tissue objectives, and the numeric mercury CTR criterion. These objectives reflect environmental exposure over time and therefore it is preferable to assign a concentration limit (rather than a daily or average daily load [i.e., mass per time]) to ensure attainment of these objectives.

In any case, U.S. EPA noted in this guidance document that "for pollutants where the [*water quality standard*] has a longer than daily duration (e.g., monthly or seasonal average), individual values that are greater than the daily expression do not necessarily constitute an exceedance of the applicable standard." This is the case with this TMDL project, which is in response to elevated mercury concentrations in fish tissue, which is accumulated over months to years. We nonetheless provide the following interpretations of our concentration-based allocations and TMDLs as a daily load expression in grams per day (g/d), in accordance with the draft U.S. EPA guidance. However, this is a complex system and these interpretations are based on simplifying assumptions, so we intend to implement the concentration-based TMDLs and allocations (see Table 8.5).

METHYLMERCURY DAILY LOAD EXPRESSIONS

The daily methylmercury load expressions are maximum daily net methylmercury production. They are calculated by multiplying the concentration limit by volume and dividing by number of days of methylmercury accumulation. This method maintains consistency with the original approach by recognizing that methylmercury is produced and accumulated in the dry season, and it reflects the critical condition of methylmercury uptake after turnover in the fall, in accordance with the U.S. EPA guidance document (USEPA 2007). The methylmercury concentration limit in reservoirs and lakes is the allocation, a seasonal peak of 1.5 ng/l. The volume is the estimated volume of the hypolimnion. The number of days is the duration of methylmercury production from mid-May to mid-September, approximately 120 days. This results in a maximum daily load (i.e., daily net production) of methylmercury in grams per day, calculated to one significant figure (to maintain consistency with the original approach).

The hypolimnion volume generally decreases over this period because, typically, reservoirs are drawn down during this period. The Santa Clara Valley Water District's (District's) website provides reservoir capacity (design capacity) and percent of capacity (actual volume as a percent of design capacity). In 2007, Guadalupe, Almaden, and Calero reservoirs were filled to about 40 percent of capacity in mid-September (SCVWD

ALERT Reservoir Gauge Information, Historic Reservoir Gauge Report, http://alert.valleywater.org/cgi-bin/gageresv). No information is provided about Lake Almaden, probably because it is not a reservoir. We estimate its volume to be one-half that of Almaden Reservoir.

In 2004, Tetra Tech conducted detailed studies of Almaden and Guadalupe reservoirs, including depth profiles. These depth profiles indicate that the hypolimnion extended up to about one-half the depth of the reservoirs (Figure 4-2, Tetra Tech 2005a). Because these reservoirs are located in steep-sided canyons, the volume decreases with depth. Therefore, we estimate that the hypolimnion is about one-third of reservoir and lake volume remaining in mid-September.

The methylmercury daily load expressions are presented in Table 8.2; the allocations and TMDLs remain unchanged and are presented on Table 8.5.

Table 8.2 Methylmercury Daily Load Expressions

Water Body	Capacity (acre-feet)	Hypolimnion Volume (estimated, mid-September, acre-feet)	Daily Load Expressions (g/d)
Guadalupe Reservoir	3,415	451	0.01
Almaden Reservoir	1,586	209	0.003
Calero Reservoir	9,934	1,311	0.02
Lake Almaden	793	105	0.002

Total Mercury Daily Load Expressions

The daily total mercury load expressions are maximum daily loads. They are a percentage of the annual loads assigned by the San Francisco Bay mercury TMDL to the Guadalupe River watershed. This method maintains consistency with the original approach, namely loads assigned by Bay mercury TMDL to Guadalupe River watershed, and it reflects the critical condition of large storms with high rainfall intensity, in accordance with the U.S. EPA guidance document (USEPA 2007).

The largest loads of total mercury are transported in large storms with intense rainfall (Whyte & Kirchner 2000). Measurements in this two-month study of discharge from a mercury mine in the San Francisco Bay region during a very wet year included a large storm with intense rainfall, and 40 percent of the load was transported in just over one day (28 hours). Assuming that this Bay region study is applicable to the Guadalupe River watershed, and recognizing that the allocation is for 12 months rather than the 2-month period studied, we assume that up to 20 percent of the total mercury load is transported in the Guadalupe River watershed in one day. Therefore, the total mercury load expressions are 20 percent of the Bay TMDL mass allocations, and are presented in Table 8.3; the allocations and TMDLs remain unchanged and are presented on Table 8.5.

Table 8.3 Total Mercury Daily Load Expressions

Description	Allocation (kg/yr)	Daily Load Expressions (g/d)
Mining Legacy	1.7	340
Urban Stormwater Runoff	7.2	1,440
Nonurban Stormwater Runoff	0.5	100

8.~~9~~7 Water Quality Standards Attainment

Natural erosion and sediment deposition may eventually wash the mining waste out of the Guadalupe River watershed, or bury it. In the Cache Creek watershed, which contains much less mining waste but extends a longer distance to San Francisco Bay compared to Guadalupe, it is estimated that this natural process will take at least 500 years (Cooke & Morris 2004). Consequently, in the Cache Creek Mercury TMDL, Central Valley Water Board staff proposes extensive implementation actions to stop discharges of mining waste and reduce methylmercury production, hence restoring the watershed in fewer than 500 years.

Similarly, San Francisco Bay Water Board staff proposes in this TMDL project (see Section 9) to require extensive implementation actions to reduce discharges of mining waste and methylmercury production. These actions will restore impaired beneficial uses and attain applicable water quality objectives in a timeframe that is more reasonable and acceptable to the public, dischargers, and, presumably, wildlife.

These mercury TMDLs must comply with the federal Clean Water Act, and result in attainment of the Basin Plan narrative objective for bioaccumulation, the Basin Plan numeric water quality objectives, and the USEPA California Toxics Rule numeric water quality objective. The Clean Water Act requires that a TMDL and associated wasteload and load allocations be set at levels that attain all applicable water quality standards, which include beneficial use protections, narrative water quality objectives, numeric water quality objectives, and anti-degradation policies (Section 6.2). As described in the Introduction (Section 1), to protect beneficial uses, the applicable water quality standards are those related to mercury impairment and include the following:

Mercury Concentration Standards Applicable to the Water Column:

- Basin Plan numeric water quality objective (water column 1-hour average)
- California Toxics Rule (CTR) numeric water quality objective (30-day average)

Mercury Concentration Standards Applicable to Fish Tissue:

- Beneficial uses for human consumption of fish: Water Contact Recreation (REC1)
- Beneficial uses for wildlife consumption of fish: Preservation of Rare and Endangered Species (RARE), and Wildlife Habitat (WILD)
- Basin Plan narrative water quality objective for bioaccumulation
- Basin Plan numeric water quality objectives (proposed wildlife objectives in fish tissue)

First, we evaluate water quality standards attainment for the water column standards. The total mercury TMDLs and wasteload and load allocations proposed in this section are set at levels to attain the Basin Plan and CTR water column standards. (Recall from Section 5 that the Basin Plan 4-day average water column objective is being vacated.) Suspended sediment concentrations (SSC) were measured in the Guadalupe River at Highway 101 during four recent wet seasons, water years 2003 [WY03] through WY06. The maximum 1-hour and 30-day average SSC were 1,153 mg/l in WY03 and 84 mg/l in WY06, respectively (McKee 2007). Multiplying the measured SSC concentration by the higher of the allocations proposed in Section 8, 0.2 mg/kg mercury, and noting that the resulting units are ng/l, both the Basin Plan 1-hour (2,400 ng/l) and CTR 30-day (50 ng/l) water quality standards will be met.

Furthermore, this attainment analysis for the water column standards is conservative for the following reasons. First, it is reasonable to assume that the implementation plan for this TMDL (Section 9), which calls for erosion control at and downstream of mercury mines, will result in lower SSC. Second, the total mercury allocations are set at both 0.1 and 0.2 mg/kg, but we performed the analysis at the higher level of 0.2 mg/kg. Next, we evaluate water quality standards attainment for the fish tissue standards.

The fish tissue targets (see Section 6, Numeric Targets) are set at levels to attain the Basin Plan numeric and narrative standards. The proposed fish methylmercury targets are equal to the proposed wildlife objectives and provide a numeric interpretation of the Basin Plan narrative objective for bioaccumulation, and are protective of wildlife and human health (see Section 5.2). Achieving these targets will attain the REC1, RARE, and WILD beneficial uses, the Basin Plan narrative objective for bioaccumulation, and the proposed wildlife objectives.

In summary, these mercury TMDLs and wasteload and load allocations are set at levels to attain the applicable water quality standards.

8.~~6~~8 Integration with San Francisco Bay Mercury TMDL

The Guadalupe River watershed mercury TMDL will be the primary regulatory vehicle for achieving water quality goals in the watershed and will simultaneously reduce the load of mercury to the Bay in accordance with the requirements of the San Francisco Bay mercury TMDL (SFBRWQCB 2004 & 2006). In accordance with State Board guidance, the two TMDLs are being carefully integrated in terms of load allocations. The San Francisco Bay mercury TMDL assigns allocations to the Guadalupe River watershed as listed in Table 8.4~~2~~.

Table 8.4~~2~~ Bay Mercury TMDL Allocations to Guadalupe River Watershed

Description	Existing Load (kg/yr)	Allocation (kg/yr)	Load Reduction (%)
Mining Legacy	92	1.7	98%
Urban Stormwater Runoff	14	7.2	49%
Nonurban Stormwater Runoff	0.5	0.5	None
Bay TMDL total:	**106.5**	**9.4**	**- -**

The two TMDLs are integrated in the following ways:

1) Urban stormwater runoff is assigned the equivalent allocation (7.2 kg/yr in the Bay TMDL, and 0.2 mg/kg in the Guadalupe TMDL, to be achieved within 20 years).
2) Nonurban stormwater runoff in the Bay TMDL is called naturally occurring mercury in soil in the Guadalupe TMDL, and is assigned the equivalent allocation (0.5 kg/yr in the Bay TMDL, and 0.1 mg/kg in the Guadalupe TMDL).
3) There is an extensive transition zone from the Guadalupe River through the tidal Alviso Slough to San Francisco Bay. The two TMDLs will be coordinated to ensure that the fate and transport of mercury-laden sediments from the river will be addressed, particularly in the hundreds of acres of soon-to-be-restored salt ponds adjacent to, and near the mouth of, Guadalupe and Alviso sloughs (South Bay Salt Ponds Restoration Project.)

Key Points

Table 8.54 Allocations

Impoundment Methylmercury Allocation

- 1.5 ng/l seasonal maximum of methylmercury in the hypolimnion of Guadalupe, Almaden, and Calero reservoirs, and Lake Almaden

  Definition of impoundments: engineered structures that pond water. They include dams (i.e., reservoirs), former quarries (i.e., lakes and percolation ponds), flood control structures, other engineered features (such as drop structures), and vegetation that ponds water.

Mining Waste Total Mercury Allocations

- 0.2 mg mercury per kg mercury mining waste (dry wt., median) in erodible mercury mining waste from the New Almaden Mining District, and Guadalupe, Santa Teresa, and Bernal mercury mines; this allocation shall be measured in fines less than 63 microns in diameter; and
- 0.2 mg mercury per kg erodible sediment (dry wt., median) discharged from depositional areas in creeks that drain mercury mines.
- ~~0.1 mg/kg mercury (median, dry weight) in erodable soil fines transported from the following areas which drain to deep impoundments:~~
  ~~New Almaden Mining District; Santa Teresa and Bernal mercury mines; depositional areas on Alamitos Creek and its tributaries; and depositional areas on Guadalupe Creek and its tributaries upstream of Guadalupe Reservoir~~
- ~~0.2 mg/kg mercury (median, dry weight) in erodable soil fines transported from the following areas: the remaining 10 percent of the New Almaden Mining District; Hillsdale mercury mine; depositional areas on Guadalupe Creek and its tributaries downstream of Guadalupe Reservoir; and depositional areas on the Guadalupe River~~

  Definition of “erodible”~~erodable soil~~: material readily available for transport by stormwater runoff to surface waters~~soil that is transported by stormwater runoff **to receiving waters**; soil fines (i.e. particulates, suspended sediment) are less than 63 microns in diameter~~.

Urban Stormwater Runoff Total Mercury Allocation

- 0.2 mg/kg mercury (~~annual median, dry weight~~dry weight, annual median) in suspended sediments

Nonurban Stormwater Runoff Total Mercury Allocation

- 0.1 mg/kg mercury (~~annual median, dry weight~~dry weight, annual median) in suspended sediments

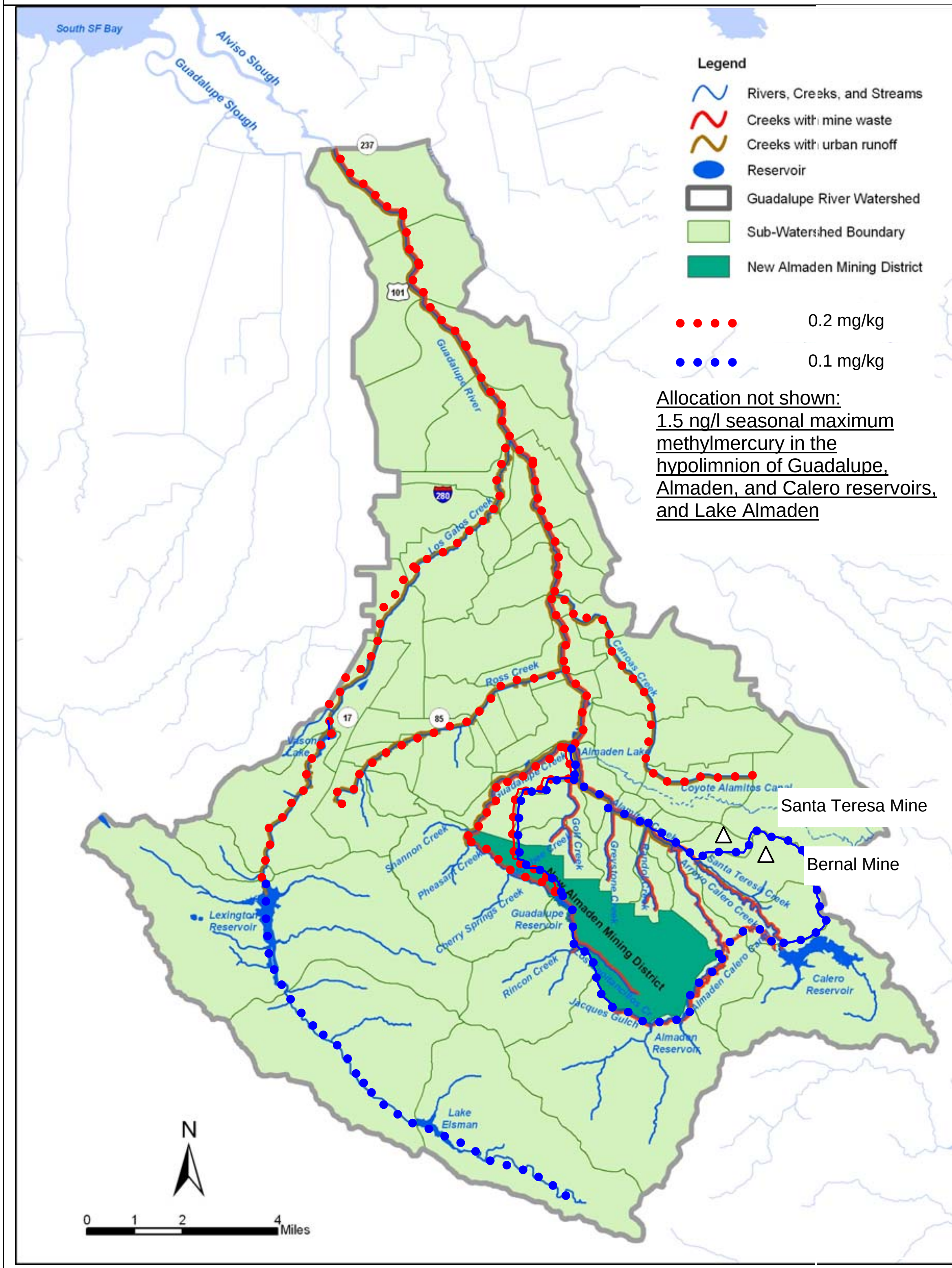
Atmospheric Deposition Total Mercury Allocation

- 23.2 micrograms of mercury per square meter per year

Table 8.6 Waters, Allocations & TMDLs

Waters	Allocation	TMDL	New Water Quality Objectives Apply	Implementation
Impaired—303(d) listed reservoirs & lakes Guadalupe, Almaden, and Calero reservoirs, and Lake Almaden	**1.5 ng/l methylmercury** seasonal maximum in hypolimnion	Same as allocation	Yes	See Section 9
Impaired—303(d) listed creeks & river Guadalupe and Alamitos creeks, Guadalupe River	**0.2 mg/kg mercury** in erodible sediment (dry weight, median)	**0.2 mg/kg mercury** (annual median, dry weight) in suspended sediments	Yes	See Section 9
Creeks that drain mercury mines	**0.2 mg/kg mercury** in erodible sediment (dry weight, median)	No	Yes	See Section 9 for waters that drain mercury mines See San Francisco Bay mercury TMDL for waters that convey urban stormwater runoff
Creeks that convey urban stormwater runoff	**0.2 mg/kg mercury** (dry weight, annual median) in suspended sediments	No	No	See San Francisco Bay mercury TMDL for waters that convey urban stormwater runoff
Source—non-urban, non-mine mercury source to 303(d) listed waters i.e., naturally occurring mercury in soil and atmospheric deposition				
Waters upstream of Lenihan Dam	**0.1 mg/kg mercury** (annual median, dry weight) in suspended sediments	No	No	No actions required See Section 9
Waters upstream of Guadalupe Reservoir (except tributaries that drain Los Capitancillos Ridge, including but not limited to Los Capitancillos Creek) Waters upstream of Almaden Reservoir (except tributaries that drain Los Capitancillos Ridge, including but not limited to Jacques Gulch) Waters upstream of Calero Reservoir	**0.1 mg/kg mercury** (annual median, dry weight) in suspended sediments	No	Yes	No actions required See Section 9

Figure 8.1 Allocations



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9. Implementation and Monitoring

The goals of this implementation plan for mercury in the Guadalupe River watershed are:

- To restore and protect beneficial uses in waters of the Guadalupe River watershed by reducing mercury loads and methylmercury production
- To restore and protect beneficial uses in San Francisco Bay by reducing legacy and urban stormwater runoff mercury loads

In this section we present our strategy to achieve these goals. Periodically, we will evaluate the effectiveness of this strategy in attaining these goals, and if progress is not proceeding as planned, we will revise our strategy as necessary.

IMPLEMENTATION SEQUENCE

The TMDLs for mercury in the Guadalupe River watershed will be implemented in two phases, with targets to be achieved in 20 years. A comprehensive review of progress and prospects for achieving the TMDLs will be conducted at the end of the first, 10-year phase.

Goals for the first phase of implementation are:

- Implement effective source control measures for mining waste at mine sites
- Complete studies and designs to cleanup and restore Alamitos Creek
- Complete studies of methylmercury and bioaccumulation controls in reservoirs and lakes and implement effective controls

The goals for the second phase of implementation, which the Water Board also anticipates to extend over 10 years, are to achieve both the fish tissue targets specified in this TMDL project and the legacy and urban stormwater runoff mercury load allocations assigned to the Guadalupe River watershed by the San Francisco Bay mercury TMDL (SFBRWQCB 2006).

Throughout both phases, the Water Board will require responsible parties and permittees to monitor mercury loading, concentrations, and bioaccumulation to ensure that total and methylmercury levels decline adequately. As described in Section 9.9, although responsible parties may conduct the required monitoring individually, the Water Board encourages a coordinated watershed approach to monitoring.

Organization of this Section

This section contains the implementation plan to achieve the goals, describes our regulatory authority to compel actions, specifies implementation actions and parties responsible for these actions, and monitoring and reporting requirements including special studies. The implementation plan and monitoring requirements are presented in the following sections:

9.1 Overview of Implementation Actions

In this section we present a brief overview of the implementation actions by source category. Detailed implementation actions are provided below in Sections 9.3–9.6. (These detailed sections are organized by geographic location, from the top to the bottom of the watershed, and focus on the first, 10-year phase of implementation).~~.)~~

This implementation plan builds upon existing efforts that have successfully reduced mercury loads in this watershed (see Cleanup of Almaden Quicksilver County Park; Natural Resources Damages Assessment; and Water District Mitigation, Maintenance, and Restoration Projects, all in Section 3.5). In requiring actions to further reduce mercury, the Water Board relies on its existing authorities and ongoing regulatory programs, such as the Clean Water Act's Section 401/404 certification program, Santa Clara Valley Water District's Stream Maintenance Program, and other mechanisms that will help to achieve the TMDLs in an efficient and cost effective manner (see Section 9.2, Legal Authorities and Requirements.)

A summary of implementation and monitoring requirements is provided on Table 9.1.

Table 9.1 Summary of Implementation and Monitoring Requirements, Phase 1 (first 10 years)

Sources, Goals, and Responsible Parties	Responsible Party Actions	Responsible Party Monitoring Requirements
Source: Mercury Mines Goal: Implement effective source control measures for mining waste at mine sites Responsible parties: previous owners and operators of mercury mines, and current mine property owners	Investigate erosion of mercury mining waste to ~~receiving~~ surface waters within the first two years of Phase 1, but no later than December 31, 2010 Develop plans and schedules to control mercury mining waste discharges to ~~receiving~~ surface waters, within 6 months of approval of the investigation report Cleanup and abate discharges of mercury mining waste within the 10-year duration of Phase 1, and no later than December 31, 2018	1[a]) effectiveness of erosion control measures 2) mercury loads at discharge points 3) fish bioaccumulation of mercury in downstream waters 4) mercury loads discharged to San Francisco Bay 5) special study 3b Requirements 3), 4), and 5) may be satisfied through a coordinated watershed monitoring program
Source: Reservoirs and Lakes Goal: Complete studies of methylmercury and bioaccumulation controls and implement effective controls Responsible party: Santa Clara Valley Water District (District)	Continue to operate, maintain and improve the performance of, or replace with newer technology, existing methylmercury controls already in place on Lake Almaden, Almaden Reservoir, and Guadalupe Reservoir	2[a]) mercury loads at discharge points 3) fish bioaccumulation of mercury in downstream waters 4) mercury loads discharged to San Francisco Bay 5) conduct special studies 1, 2, 3a, & 3b Requirements 3), 4) , and special study 3b may be satisfied through a coordinated watershed monitoring program

a. Numbering of monitoring requirements corresponds to Monitoring Program (see Section 9.9).

Phase 1 continued on next page

Table 9.1 Summary of Implementation and Monitoring Requirements, Phase 1 (first 10 years) - continued

Sources, Goals, and Responsible Parties	Responsible Party Actions	Responsible Party Monitoring Requirements
Source: Depositional Areas Project Type: Individual projects undertaken voluntarily, such as creekbank stabilization projects Responsible Parties: project applicants	Applicants to comply with conditions in § 401 certifications and/or waste discharge requirements	1 [a]) effectiveness of erosion control measures~~Monitoring and reporting to demonstrate erosion controls are effective~~
Project Type & Goal: Complete studies and designs to cleanup and restore Alamitos Creek, which is highly polluted with mercury mining waste Responsible Parties: District, local agencies, and creekside property owners	District will continue its stream stewardship by completing studies and designs to cleanup and restore Alamitos Creek Creekside property owners along Alamitos creek to provide occasional access to support design studies, and participate in District's public process	Alamitos Creek: no monitoring required during Phase 1
Source: Urban Stormwater Runoff Responsible Parties: Permit holders (cities, districts, and county)	The implementation plan for urban stormwater runoff is contained in the San Francisco Bay mercury TMDL.	Permit holders may choose to participate in coordinated watershed monitoring
Source: Nonurban Stormwater Runoff	No implementation actions are required for nonurban and/or non-mined areas of the watershed.	No monitoring required
Source: Atmospheric Deposition	The implementation plan for atmospheric deposition is contained in the San Francisco Bay mercury TMDL.	No monitoring required

a. Numbering of monitoring requirements corresponds to Monitoring Program (see Section 9.9).

Table 9.1 Summary of Implementation and Monitoring Requirements, Phase 2 (second 10 years)

Sources, Goals, and Responsible Parties	Responsible Party Actions	Responsible Party Monitoring Requirements
Source: Mercury Mines	Erosion control to be completed in Phase 1	Same as Phase 1
Source: Reservoirs and Lakes	If necessary, methylmercury controls to be implemented in Calero Reservoir	Same as Phase 1
Source: Shallow Impoundments Goal: If reservoir and lake controls do not attain targets downstream, then control methylmercury production and bioaccumulation in shallow impoundments Responsible parties: District and mercury mines responsible parties	Complete study 3a as soon as possible, and no later than December 31, 2023 Complete study 3b no later than December 31, 2023	5 [a]) District to conduct special study 3a, as deemed necessary by the Water Board Executive Officer 5 [a]) If directed by Water Board, District, mercury mines responsible parties, and urban stormwater runoff permittees to conduct special study 3b
a. Numbering of monitoring requirements corresponds to Monitoring Program (see Section 9.9).		

Phase 2 continued on next page

Table 9.1 Summary of Implementation and Monitoring Requirements, Phase 2 (second 10 years) -- continued		
Sources, Goals, and Responsible Parties	**Responsible Party Actions**	**Responsible Party Monitoring Requirements**
Source: Depositional Areas Project Type: Individual projects undertaken voluntarily, such as creekbank stabilization projects Responsible Parties: Project applicants	Applicants to comply with conditions in § 401 certifications and/or waste discharge requirements	1 [a]) effectiveness of erosion control measures ~~Monitoring and reporting to demonstrate erosion controls are effective~~
Source: Depositional Areas Project Type & Goal: Cleanup and restore Alamitos Creek Responsible Parties: District, local agencies, and creekside property owners	District and local agencies to complete cleanup and restoration of Alamitos Creek Creekside property owners along Alamitos creek provide the District occasional access for construction and monitoring	1 [a]) District and local agencies to monitor effectiveness of erosion control measures ~~and report to demonstrate erosion control is effective~~ Creekside property owners provide occasional access for construction and monitoring
Source: Urban Stormwater Runoff Responsible Parties: Permit holders (cities, districts, and county)	The implementation plan for urban stormwater runoff is contained in the San Francisco Bay mercury TMDL.	Permit holders may choose to participate in coordinated watershed monitoring
Source: Nonurban Stormwater Runoff	No implementation actions are required for nonurban and/or non-mined areas of the watershed.	No monitoring required
Source: Atmospheric Deposition	The implementation plan for atmospheric deposition is contained in the San Francisco Bay mercury TMDL.	No monitoring required
a. Numbering of monitoring requirements corresponds to Monitoring Program (see Section 9.9).		

MERCURY SOURCE CONTROL ACTIONS FOR MINING WASTE

Actions are required to control mercury mining waste sources. Sections 9.3 and 9.5 specify actions required to reduce discharges of ~~from~~ sources of mercury mining wastes to ~~receiving~~surface waters. In Tables 9.~~1~~ 2 and 9.~~3~~ 4 we note example implementation measures for mercury mine-related sources. Goals for these actions are as follows:

- In the New Almaden Mining District, and Guadalupe, Santa Teresa, and Bernal~~,~~ ~~and Hillsdale~~ mercury mines, the goal is to prevent ~~further~~ excessive erosion of mercury mining waste by stabilizing and vegetating slopes. Excessive erosion results from anthropogenic alterations to the land surface that produce, for example, landslides, slumps, gullies, rills, and loss of vegetation. The goal is to restore the landscape by reasonable and feasible means to nearly natural erosion rates. Source control actions for mercury mining waste will be phased so that mercury discharges from upstream mine sites will be eliminated or significantly reduced before downstream projects are undertaken.
- In downstream depositional areas along Guadalupe, Alamitos, ~~and~~ Calero and Canoas creeks and downstream reaches of the Guadalupe River, the goal is to prevent further erosion of mercury mining waste and resuspension of mercury-laden sediments accumulated in creek beds, banks, and floodplains, and in shallow impoundments.

The allocations to mercury mining waste and mercury-laden sediment (Section 8.1) are not cleanup standards (see Section 9.2). Implementation actions that reduce loads of mercury from mining waste and/or mercury-laden sediment to the waters of the Guadalupe River watershed downstream of dams will also count towards achieving the San Francisco Bay mercury TMDL allocation to legacy mercury sources in the Guadalupe River watershed.

Mercury Mining Waste Responsible Parties

Responsible parties, and their responsibilities under this TMDL project, are defined in CWC § 13304(a) as follows.

> Any person…who has caused or permitted, causes or permits, or threatens to cause or permit any waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance, shall upon order of the regional board, clean up the waste or abate the effects of the waste, or, in the case of threatened pollution or nuisance, take other necessary remedial action, including, but not limited to, overseeing cleanup and abatement efforts.

Responsible parties include, but are not limited to, current mine site property owners and prior mine owners and/or operators. These parties are responsible for investigation of the erosion potential of mercury mining waste, source control for mercury mining waste with potential to erode into surface waters, monitoring to ensure that erosion controls are effective, and other monitoring (see Section 9.3).

The parties responsible for controlling mercury mining waste discharges from the New Almaden Mining District include, but are not limited to, the following:

- Previous owners and operators of mercury mines, including but not limited to: Myers Industries, Inc., Buckhorn, Inc., Sunoco, Inc., Newson, Inc., E.A. Viner International Co., Inc.
- Current property owners: County of Santa Clara, Midpeninsula Regional Open Space District, and owners of the former Hacienda Furnace Yard site outside of the Almaden Quicksilver County Park boundary

The parties responsible for controlling mercury mining waste discharges from Guadalupe, Santa Teresa, and Bernal mercury mines include, but are not limited to, the following:

- Previous owners and/or operators of mercury mines
- Current property owner of Guadalupe mercury mine: Guadalupe Rubbish and Disposal Company, Inc.
- Current property owners of Santa Teresa mercury mine: (residential landowner)
- Current property owner of Bernal mercury mine: County of Santa Clara

MERCURY SOURCE CONTROL ACTIONS FOR URBAN STORMWATER RUNOFF

The source control and pollution prevention actions required by the San Francisco Bay mercury TMDL for the urban stormwater runoff source are anticipated to be sufficient to attain the allocation for discharges to waters of the Guadalupe River watershed. Therefore, we do not propose additional implementation actions for this source for the first, 10-year phase of Guadalupe implementation. At the completion of this first phase, we will evaluate whether additional implementation actions will be needed for the second, 10-year phase of implementation. Urban stormwater runoff implementation actions in the Guadalupe River watershed that reduce loads of mercury to San Francisco Bay ~~the waters of the Guadalupe River watershed~~ will also count towards achieving the Guadalupe River watershed mercury TMDL allocation to the urban stormwater runoff source.

Urban Stormwater Runoff Responsible Parties

Urban stormwater runoff is subject to NPDES permits. These NPDES permits are reissued every five years. The dischargers regulated under NPDES permit no. CAS029718, the permit in effect in September 2008, are the following: Santa Clara Valley Water District, County of Santa Clara, Town of Los Gatos, cities of Campbell, Monte Sereno, San José, Santa Clara, and Saratoga.

NO ACTIONS PROPOSED FOR NONURBAN STORMWATER RUNOFF AND ATMOSPHERIC DEPOSITION

Parallel with the Bay mercury TMDL, the Guadalupe load allocations to nonurban stormwater runoff and atmospheric deposition are their current loads. No implementation actions are proposed for these two sources, for the reasons provided below.

No implementation actions are proposed for the nonurban stormwater runoff source because no waters in the Guadalupe River watershed are listed for impairment by sediment. Also, natural rates of erosion of this low-mercury sediment are desirable, as this will provide clean sediment to the bottom of reservoirs, lakes, and depositional areas, thus capping sediments containing mining waste. Bottom sediment mercury concentrations are closely linked to fish mercury concentrations (see Section 7, Linkage).

As discussed in Section 8.5, no reductions are called for in the nonurban stormwater runoff source. Vegetating~~Capping of~~ exposed mining waste as part of mine site erosion control actions will reduce atmospheric inputs from local sources. In the Bay mercury TMDL, we acknowledged the predominant role of global (non-local) sources, and our limited authority in this international arena. Nonetheless, we called for the U.S. EPA to actively pursue international efforts to address this issue, and for the Bay Area Air Quality Management District to conduct a local mercury emissions inventory. These actions are not only sufficient to address this source, but they are better undertaken at these larger regional, national, and international scales. Therefore, no implementation actions are required for atmospheric deposition.

METHYLMERCURY PRODUCTION CONTROL ACTIONS

The Santa Clara Valley Water District is a leading researcher in methods of controlling methylmercury production and bioaccumulation. This TMDL project anticipates that before the end of the implementation period, new methylmercury production controls in reservoirs and lakes will reduce methylmercury bioaccumulation both in the reservoirs and lakes, and downstream. However, if implementation actions in the reservoirs and lakes do not result in attaining targets downstream, the Water Board will require evaluation of methods to control methylmercury production and bioaccumulation in shallow impoundments. In ~~Table 9.2~~Table 9.3 we note example implementation actions for reservoirs and Lake Almaden. Goals for these actions are:

- In the Guadalupe, Almaden, and Calero reservoirs and Lake Almaden, the goal is to reduce production of methylmercury and bioaccumulation. As explained in the linkage discussion (Section 7), mercury methylates in the cold, anoxic waters of these deep impoundments. Methylmercury is then discharged downstream in reservoir and lake releases. Reducing methylmercury production in, and methylmercury releases from, these deep impoundments should also reduce methylmercury levels in downstream waters (see ~~Table 9.2~~Table 9.3.)

Methylmercury Responsible Parties

The party responsible for controlling methylmercury production in and releases from reservoirs and lakes is the Santa Clara Valley Water District. The parties responsible for controlling methylmercury production in, and releases from, shallow impoundments include, but are not limited to, mercury mine responsible parties and the Santa Clara Valley Water District. Potential additional responsible parties may include urban stormwater runoff permittees that discharge excess nutrients and contribute to methylation of mercury (see Section 9.7, *Excess Nutrients from Controllable Sources*).

9.2 Legal Authorities and Requirements

California law and the federal Clean Water Act give the Water Board responsibility and broad authority for regional water quality control and planning. Under the Porter-Cologne Water Quality Control Act (California Water Code, Division 7; referred to as the Water Code or CWC), the Water Board issues requirements for submission of technical or monitoring program reports (Water Code § 13267), compels cleanup of waste discharges

(Water Code § 13304), and issues general or individual waste discharge permits (Water Code § 13260 et seq.). The Water Board must also follow California Code of Regulations § 22470 et seq., which specifies mine closure performance standards as follows: "new and existing mining units shall be closed so that they no longer pose a threat to water quality."

The Basin Plan, in Section 4 (Implementation Plan), contains a plan to address the water quality problems associated with mines (Section 4.21.4). We have developed Section 9.3 herein to be consistent with the Basin Plan requirements for inactive mine sites.

Additionally, the Water Board has authority under the Clean Water Act (CWA) to issue NPDES stormwater permits for point sources of contamination. Stormwater discharges that contribute to a violation of a water quality standard or are a significant contributor of pollutants to waters of the United States require NPDES stormwater permits in accordance with CWA § 402(p)(2)(E).

Under the Clean Water Act's Section 401, every applicant for a federal permit or license for any activity that may result in a discharge to navigable waters must obtain certification from the state that the proposed activity will comply with the Clean Water Act and state requirements to protect water quality.

Mining Waste Allocations Are Not Cleanup Standards

As stated at the beginning of Section 8.1, the goal for the mining waste allocations is to eliminate inputs of mercury from legacy mining operations to surface waters. It is important to note that the fish tissue numeric targets, TMDLs, and the TMDL allocations are not directly enforceable. Further, the allocations to mercury mining waste and mercury-laden sediment (Section 8.1) are neither cleanup standards nor water quality certification performance conditions. However, the Water Board may (a) specify conditions in water quality certifications (if applicable), and (b) establish cleanup standards in waste discharge requirements (WDRs), in cleanup and abatement orders (CAOs), or in other Water Board orders. We present some ideas on how to calculate cleanup standards, such as pre-mining ambient soil mercury concentrations, in Section 9.10.

If necessary and appropriate, cleanup standards will be included in Water Board orders. However, cleanup standards are not required for many erosion control best management practices, as described in *Attainment of Mining Waste Allocations*, presented below.

Attainment of Mining Waste Allocations

Water Board staff proposes to evaluate attainment of the mining waste allocations through Water Board oversight of selection, design, construction, and operations and maintenance of best management practices for erosion control. This is the same evaluation method as proposed for the inactive mercury mines in the Cache Creek watershed, for which mercury loads must be reduced by 95 percent (CVRWQCB 2005). Similarly, in the Tomales Bay Pathogens TMDL, to demonstrate attainment of applicable allocations, responsible parties are responsible for compliance with specified best management practices and applicable waste discharge requirements or waiver conditions. In many cases, we plan to rely on visual inspections to confirm that erosion control measures are performing as designed, see Section 9.9, *Effectiveness of Mining Waste Control Measures, Landscape Erosion Control Monitoring*.

9.3 Implementation Actions for Mercury Mines

The goal for mercury mines is to restore the landscape to nearly natural erosion rates by reasonable and feasible means. Mercury mining has altered the land surface and caused excessive erosion from, for example, landslides, slumps, gullies, rills, and loss of vegetation. Some areas of unstable mining waste may require geotechnical stability studies and application of site-specific restoration and construction methods. However, we believe that most areas of mining waste will be successfully addressed by best management practices for erosion control, such as vegetation and run-on controls.

Load allocations for mercury mining waste discharged from the ~~New Almaden Mining District and the Santa Teresa, Bernal, and Hillsdale mercury mines~~New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines will be implemented through Water Code §§ 13267 and 13304 orders to compel investigation, clean up and monitoring, as well as through Basin Plan Section 4.21.4 to the extent applicable. ~~Parties responsible for investigation, cleanup, and monitoring include, but are not limited to, current property owners and prior mine owners that have caused or permitted, or threaten to cause or permit, mercury to be discharged or deposited where it will probably be discharged into waters of the State and create a condition of pollution or nuisance.~~ Responsible parties are described in Section 9.1. As previously stated, this allocation to mercury mining waste is not a cleanup standard (see Section 9.2).

Previously completed and currently underway mercury cleanup project sites in Almaden Quicksilver County Park will be excluded from Water Code §§ 13267 and 13304 orders pertaining to investigation and cleanup. However, these cleanup sites will remain subject to the Industrial Stormwater General NPDES Permit requirements for maintenance and monitoring. Previously completed mercury cleanup projects at Hacienda Furnace Yard (including immediately adjacent reaches in Alamitos Creek and Deep Gulch); Mine Hill; San Francisco Open Cut; Senador, Enriquita, and San Mateo mines will be excluded from Water Code §§ 13267 and 13304 orders. This exclusion is limited to the footprints of the projects as provided in the completion reports (CH2MHill 1998 & 1999). Also excluded from Water Code §§ 13267 and 13304 orders are mercury cleanup projects currently underway in Alamitos Creek and Deep Gulch immediately adjacent to the Hacienda Furnace Yard; and in Jacques Gulch. This exclusion is limited to the as-constructed footprints of the projects, as described in the completion report for the project. The proposed footprints are described in documents pertaining to the settlement of the NRDA claim brought by U.S. FWS (see Section 3.5; DFG 2005).

A goal of these orders and requirements is to compel responsible parties to control erosion of mercury mining waste by stabilizing and vegetating slopes. ~~Table 9.1~~Table 9.2 provides example implementation measures to achieve this goal. The Water Board will issue the § 13267 orders by June 30, 2009, and the § 13304 orders by June 30, 2011~~December 31, 2010~~ (see Tables 9.~~1~~ 2 and 9.~~4~~5.)

Implementation actions that reduce loads of mercury from mining waste and/or mercury-laden sediment to the waters of the Guadalupe River watershed downstream of dams will also count towards achieving the San Francisco Bay mercury TMDL allocation to legacy mercury sources in the Guadalupe River watershed.

REQUIRED MONITORING

Additionally, the orders will require the responsible parties to conduct monitoring beginning with the 2009-2010~~2008-09~~ wet season (if they are not already monitoring). The monitoring will be required to address the following: (1)~~a)~~ evaluate the effectiveness of erosion control measures, (2)~~b)~~ determine the loads of mercury discharged annually to surface waters ~~of the state~~ at the points of discharge, (3)~~c)~~ determine fish bioaccumulation of mercury in waters downstream of the discharge, (4)~~d)~~ determine the loads of mercury discharged annually to San Francisco Bay, and (5)~~e)~~ answer the questions posed by special study 3b. (See Section 9.9 for the details of monitoring requirements 1–4~~1–3~~, and Section 9.10 for special studies.)

Alternatively, the responsible parties may participate in the coordinated watershed monitoring program (see Section 9.9) to address monitoring requirements 3–5~~b) to e)~~, above. The Water Board may consider waiving or reducing monitoring requirement (2)~~b)~~, on an individual basis, based on progress on abating discharges of mining waste and participation in an approved coordinated watershed monitoring program. The responsible parties will be required to submit a (individual or coordinated watershed) monitoring plan for review and approval by the Water Board Executive Officer prior to the 2009-2010~~2008-09~~ wet season, by October 15, 2009~~2008~~.

~~Table 9.1~~Table 9.2 Implementation Actions for the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines~~New Almaden Mining District, and Santa Teresa, Bernal, and Hillsdale mercury mines~~

Example Implementation Measures to Control Erosion and Stablize Mining Waste	Site Assessment, Implementation, and Reporting Requirements	Completion Dates
Conduct a site investigation evaluating the erosion potential of mercury mining waste, and the potential for seeps to exacerbate discharges of mercury mining waste to ~~receiving~~surface waters. Characterize, excavate, stockpile, haul, and consolidate mercury mining waste in engineered, onsite capped/covered waste management units Cleanup and abate discharges from mercury mines and seeps. Construct surface water diversion channels and sub-drains to route clean surface water runoff away from mercury mining waste Re-contour and terrace steep or exposed slopes at mercury mining waste sites to reduce and control surface erosion and eliminate the potential for mass wasting and slope failure Plant exposed soils with grass and native vegetation to minimize sheet-flow erosion of mercury mining waste Construct and maintain stormwater retention basins, detention basins, swales, or other engineered features designed to slow surface runoff, reduce surface erosion, and eliminate sediment transport of mercury mining waste to surface ~~(receiving)~~ waters. Inventory former mine roads, assess their condition, and implement best management practices to control erosion from roads	Conduct a site investigation evaluating the erosion potential of mercury mining waste, and the potential for seeps to discharge mercury to ~~receiving~~surface waters. Submit site investigation report for review and approval by the Executive Officer.	Within the first two years of Phase 1, and no later than December 31, 2010~~2009~~
	Develop plans and schedules to control discharges to ~~receiving~~surface waters. Submit plans and schedules for review and approval by the Executive Officer.	Within 6 months of Water Board approval of investigation report
	Following cleanup and abatement of discharges from mercury mines and seeps, submit a cleanup report for review and approval by the Executive Officer.	Within the 10-year duration of Phase 1, and no later than December 31, 2018~~2017~~

9.4 Implementation Actions for Reservoirs and Lakes

Implementation actions are required to attain the targets in the following deep impoundments: Guadalupe Reservoir, Almaden Reservoir, Lake Almaden, and Calero Reservoir. The Santa Clara Valley Water District (District) is the responsible party for the implementation actions in deep impoundments. The Water Board recognizes the difficulty of attaining targets because attainment may require development and deployment of new and innovative control methods. Nonetheless, this plan calls for implementation to be completed within the 10-year duration of Phase 1 of implementation. We believe this timeline is reasonable based on ongoing studies of new methylation controls. ~~Table 9.2~~Table 9.3 provides the sequence of studies and implementation measures to attain the targets.

STATUS OF TECHNICAL STUDIES~~Y REQUIREMENTS~~

The ~~Santa Clara Valley Water~~ District ~~(District)~~ already has studies underway of methods to reduce methylmercury production in reservoirs and Lake Almaden, and other methods that have the potential to reduce bioaccumulation of mercury. District staff described their technical studies in a 2005 Staff Report to their Board, as follows (SCVWD 2005):

> Aeration and oxygenation of reservoirs is a proven technology to reduce algae production, promote aerobic digestion of organic detritus, and improve habitat for fisheries (primarily by making more oxygen available by reducing biological oxygen demand).…The technology may also interrupt the biologically-mediated methylation of mercury, resulting in less mercury bio-concentrated in the food web.…
>
> This is the first phase of a three-phase project to evaluate the feasibility of this technology, pilot test a recommended system, and design and install systems in three District reservoirs (Almaden, Calero, and Guadalupe).…The first phase (the subject of this agenda item) will develop and implement a sampling program to characterize the water quality in the three reservoirs from March through November, develop recommendations regarding the feasibility of aeration/oxygenation to improve water quality in each reservoir, and design a recommended system for one of the reservoirs for the purpose of pilot testing.
>
> The second phase (subject to Board approval and assuming the recommendation from the first phase is positive) will be the acquisition and installation of the pilot system, operation and monitoring performance of the system in one reservoir over a period from March through November, and design of recommended systems for the remaining two reservoirs.
>
> The third phase (subject to Board approval) would be preparation of environmental documents, acquisition, installation and startup of systems in all three reservoirs, and operation and maintenance for up to two years to transition over to District staff. However, if the second phase requires environmental documentation, this will be expanded to include all three reservoirs, to save costs and time in implementing the third phase (again, subject to the findings of the first phase and Board approval).…

> The District's Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) Settlement process, the District's Guadalupe River watershed mercury study, and ongoing algae production and taste and odor issues in drinking water treatment plant source water have provided the impetus to explore this technology as a potential means to meet multiple objectives, and the opportunity to cost share this project. Specifically, the FAHCE agreement requires the District to conduct feasibility studies of aeration on Almaden and Guadalupe reservoirs (the former to reduce methylmercury production, and the latter to improve fisheries habitat downstream). Recurring taste and odor issues due to algae production in San Luis and Calero reservoirs may be significantly increasing treatment costs and/or reducing the effective availability of supply, and aeration/oxygenation may be a cost-effective solution for this issue.…

The Water District's studies have proceeded, and expanded from one solar-powered circulator in Lake Almaden in 2006, to, in 2007, two circulators in Lake Almaden, and three circulators in each of Almaden and Guadalupe reservoirs. Recently (Fall 2007), District staff presented a paper entitiled "Reduction of methyl mercury concentrations in an urban lake using a solar-powered circulator" at the North American Lake Management Society meeting. The abstract indicates that experiments show considerable success in reducing methylmercury concentrations (Drury 2007).

> Lake Almaden is the centerpiece of a suburban recreational park in San Jose, CA. It was created by gravel extraction operations in the 1950s and 1960s and is impacted by legacy mercury mining activities conducted nearby between 1850 through 1972. Monitoring data collected in 2005 showed a seasonal production of unfiltered methyl mercury (the form of mercury that is biologically available) strongly correlated with lake stratification and anoxia in the hypolimnion. In 2006, a solar-powered circulator was deployed in one portion of the lake just after stratification had occurred to improve the transfer of oxygen from the surface to the hypolimnion. Because of the unique bathymetry of the lake, the effects of the circulator were localized to one portion of the lake, allowing for comparisons of seasonal production of unfiltered methyl mercury both spatially and temporally.
>
> In 2006, unfiltered methyl mercury concentrations in the treated portion of the lake were reduced by over 96 percent from 2005, which is attributed to improved Oxidation Reduction Potential conditions in the water column created by the circulator. In comparison, unfiltered methyl mercury concentrations in the untreated portion of the lake were slightly higher in 2006 than in 2005. In 2007, a second circulator was deployed in the untreated area, and data from 2007 will be included in the presentation.

Technical Study Requirements

The District is voluntarily conducting technical studies of methylmercury production and control. As necessary, ~~Unless technical studies are satisfactorily undertaken on a voluntary basis,~~ the Water Board will compel the District to undertake technical studies of methylmercury production, bioaccumulation, and effective control measures for reservoirs and lakes; and studies to evaluate whether such actions are sufficient to attain targets downstream, through Water Code § 13267 requirements.

~~Technical Study Report Requirements~~
The District will be required to demonstrate progress in methylmercury controls by reporting to the Water Board by December 31 of odd years (beginning in 2009 until directed by the Water Board to stop) on the technical studies and operation and effectiveness of the methylmercury controls. ~~A report of the District's studies in reservoirs and lakes is due to the Water Board by December 31, 2012. A report of the District's studies to evaluate attainment of targets downstream is due to the Water Board by December 31, 2017.~~ (The Water Board will consider the need to control methylmercury production and bioaccumulation in shallow impoundments in the reviews described below under "Adaptive Implementation.")

METHYLMERCURY AND BIOACCUMULATION CONTROLS REQUIRED

Load allocations will be implemented according to CWC authorities where the Executive Officer of the Water Board finds it is feasible to reduce methylmercury production and/or bioaccumulation. The Water Board will issue cleanup and abatement orders to the District to undertake actions to reduce fish mercury concentrations to attain the targets. These orders will require the District to develop plans and schedules to implement all reasonable and feasible control actions. ~~The District will be required to submit plans and schedules for review and approval by the Executive Officer of the Water Board no later than December 31, 2013.~~

~~The District will be required to implement methylmercury production and bioaccumulation controls in reservoirs and lakes. The District will be required to submit a report of control actions implemented for review and approval by the Executive Officer of the Water Board within the first eight years of Phase 1, and no later than December 31, 2015.~~

REQUIRED MONITORING

The District will also be required to conduct monitoring. The monitoring plan will be required to address the following: a) determine the loads of mercury discharged annually to surface waters ~~of the state~~ at the points of discharge, b) determine fish bioaccumulation of mercury in reservoirs, lakes, and waters downstream of the discharges, c) determine the loads of mercury discharged annually to San Francisco Bay, and d) answer the questions posed by special studies 1, 2, 3a, and 3b (see Section 9.9 for the details of monitoring requirements, and Section 9.10 for special studies.)

The Water Board encourages the District to lead a coordinated watershed approach to monitoring, particularly for mercury in fish tissue and loads to San Francisco Bay (see Section 9.9.) The Water Board may consider waiving or reducing monitoring requirement a, based on participation in the approved coordinated watershed monitoring program. As necessary, ~~Unless monitoring is satisfactorily undertaken on a voluntary basis,~~ the Water Board will compel the District to undertake monitoring and special studies through CWC § 13267 requirements.

~~Table 9.2~~Table 9.3 Implementation Actions for Reservoirs and Lakes

Measures to Reduce Methylmercury Production and Bioaccumulation in Reservoirs and Lakes	Data Gathering, Implementation, and Reporting Requirements	Completion Dates
Develop effective methylmercury control methods for reservoirs and lakes (underway at time of Basin Plan amendment adoption) Implement methylmercury production and bioaccumulation controls in reservoirs and lakes	Conduct technical studies of hypolimnion methylmercury controls, and other reservoir and lake management techniques that have the potential to reduce bioaccumulation of methylmercury. Submit report of technical studies and control actions implemented for review and approval by the Executive Officer of the Water Board.	~~No later than December 31, 2012~~Report by December 31 of odd years beginning in 2009
	Continue to operate, maintain, and improve the performance of, or replace with newer technology, existing methylmercury controls already in place on Lake Almaden, Almaden Reservoir, and Guadalupe Reservoir	On-going
	If necessary, install methylmercury controls in Calero Reservoir.	No later than December 31, 2017
	~~Develop plans and schedules to implement all reasonable and feasible control actions.~~ ~~Submit plans and schedules for review and approval by the Executive Officer of the Water Board.~~	~~No later than December 31, 2013~~
	~~Submit a report of control actions implemented, for review and approval by the Executive Officer of the Water Board~~	~~Within eight years of adoption of the Basin Plan Amendment, and no later than December 31, 2015~~
	Submit a report of achievement of downstream targets, for review and approval by the Executive Officer of the Water Board	As early as December 31, 2016, but n~~N~~o later than December 31, ~~2017~~2023

9.5 Implementation Actions for Depositional Areas

The goal for depositional areas is to restore the creek banks, beds, and floodplains to a stable configuration that minimizes excessive erosion or deposition of mercury mining waste and/or mercury-laden sediment, and avoids adverse effects on beneficial uses. Large amounts of mercury mining waste discharges have altered the configuration of creeks downstream of mercury mines. Particularly in Alamitos Creek downstream of Hacienda Furnace Yard, there are many areas of unstable and actively eroding accumulations of mercury mining waste.

Load allocations to creek beds, banks, and floodplains will be implemented according to both Clean Water Act and California Water Code authorities. We do not propose to compel cleanup of depositional areas, but rather to address these projects upon receipt of applications for CWA Section 401 certifications. The Water Board will issue CWA Section 401 certifications and/or waste discharge requirements to minimize discharge of mercury mining waste (in the form of mercury-laden sediment). Examples of projects subject to these requirements include riparian habitat restoration and creek bank stability projects by the Santa Clara Valley Water District ("the District") and creekside property owners.

Implementation actions that reduce loads of mercury from mining waste and/or mercury-laden sediment to the waters of the Guadalupe River watershed downstream of dams will also count towards achieving the San Francisco Bay mercury TMDL allocation to legacy mercury sources in the Guadalupe River watershed.

GENERAL REQUIREMENTS FOR DEPOSITIONAL AREAS

The following requirements will apply to projects proposed in depositional areas in creeks and the Guadalupe River downstream of mercury mines or that convey urban stormwater runoff that may result in sediment discharges and/or require CWA Section 401 certifications. Applicants for these projects will be required to:

- Investigate the extent of mercury-contaminated sediments
- Evaluate the erosion potential of these sediments
- Design the project to minimize discharge of mercury-laden sediment
- Monitor channel form and erosion control effectiveness

These projects will be required to be designed for channel stability, and to implement measures during construction to minimize erosion, i.e., the same measures required for all projects requiring CWA Section 401 certifications. Additionally, monitoring and reporting will be required to demonstrate the effectiveness—over time—of the design in attaining a stable channel form, and of effective erosion control, in floodplains, creek banks, and creek beds.

The District may also propose projects in shallow impoundments, which will be regulated through the existing CWA Section 401 certifications and waste discharge requirements for the District's Stream Maintenance Program. The Water Board will issue CWA Section 401 certifications and/or waste discharge requirements to the District for percolation pond operations and maintenance activities unless actions are satisfactorily undertaken on a voluntary basis.

ALAMITOS CREEK: MERCURY CLEANUP, CREEK BANK STABILITY, AND HABITAT RESTORATION

Although we are not compelling cleanup actions, we strongly encourage cleanup and restoration of Alamitos Creek. About 75 percent of all ore from the principal New Almaden mines was processed at the Hacienda Furnace Yard (Cox 2000) which is located on Alamitos Creek (downstream of Almaden Reservoir). Consequently, ~~W~~we estimate that Hacienda Furnace Yard is the single largest mercury ore processing facility in North America. Alamitos Creek is highly polluted by mining waste because common mining practice at the time included disposing of mining wastes in streams (see Section 3.4). Our strategy is to encourage this project to proceed on a voluntary basis. However, if progress appears to be slower than needed to complete permitting and designs in Phase 1 and construction in Phase 2, the Water Board may consider compelling responsible parties to undertake this project.

Recognizing the District's watershed stewardship mission, and that Alamitos Creek is highly polluted with mercury mining waste, the Water Board encourages a cooperative effort among the District, local agencies, and creekside property owners to undertake a comprehensive mercury cleanup, creek bank stability, and habitat restoration project. Water Code Chapter 5.7 contains a program for public agencies and cooperating private parties, who are not otherwise legally responsible for abandoned mine lands, to reduce the threat to water quality caused by these lands without becoming responsible for completely remediating mining waste from abandoned mines. The Water Board encourages these parties to participate in the program.

This project will reduce discharges of mining waste to Lake Almaden and Guadalupe River, and thereby reduce the District's future expenses for methylmercury controls in Lake Almaden, and disposal of mercury-laden sediment removed for flood control and other stream maintenance program purposes.

The Water Board encourages the District to be the technical lead for this project, and to seek funding for it. The Water Board will identify mercury cleanup as a grant funding priority for the San Francisco Bay region. Where necessary, the Water Board will invoke its cleanup authority to compel upstream dischargers who initially discharged mercury mining waste into depositional areas, to cleanup and abate mercury mining waste.

Responsibilities of creekside property owners include (a) providing reasonable access to the creek for project studies, construction, and monitoring, and (b) not taking actions on their property that worsen the discharge of mercury mining waste into the creek.

Suggested actions and a schedule are provided in ~~Table 9.3~~Table 9.4 for the mercury mining waste component of this important project.

~~Table 9.3~~Table 9.4 Suggested Implementation Actions for Alamitos Creek

Example Implementation Measures to Prevent Erosion and Resuspension of Mercury-laden Sediments	Site Assessment, Implementation, and Reporting Actions	Suggested Timeframe
Implement bank stabilization measures, such as channel-bank recontouring, planting riparian vegetation, installation of revetment materials Remove mining wastes from creeks and rivers, transport, and dispose at an appropriate disposal facility Reduce flow velocity by constructing detention basins or other features to reduce the erosive force of flow in creek channels.	Conduct a site investigation evaluating the erosion potential of mercury mining waste accumulated in creek beds, banks, and floodplains, and in shallow impoundments. Submit site investigation report for review and approval by the Executive Officer of the Water Board.	~~Within eight years of adoption of the Basin Plan Amendment~~By end of year 8 of Phase 1, and no later than December 31, 2016~~2015~~
	Develop plans and schedules to control discharges to ~~receiving~~surface waters. Submit plans and schedules for review and approval by the Executive Officer.	~~Within ten years of adoption of the Basin Plan Amendment~~By end of Phase 1, and no later than December 31, 2018~~2017~~
	Cleanup and abate discharges of mercury mining waste from creek beds, banks, and floodplains, and in shallow impoundments, to ~~receiving~~surface waters.	No later than December 31, 2028~~2027~~
	Submit a cleanup report for review and approval by the Executive Officer.	No later than December 31, 2028~~2027~~

9.6 Implementation Actions for Urban Stormwater Runoff

The source control and pollution prevention actions required by the San Francisco Bay mercury TMDL for the urban stormwater runoff source are anticipated to be sufficient to attain the allocation for discharges to waters of the Guadalupe River watershed. Therefore, at this time no additional implementation actions are required by this TMDL project. Urban stormwater runoff implementation actions in the Guadalupe River watershed that reduce loads of mercury to San Francisco Bay ~~the waters of the Guadalupe River watershed~~ will also count towards achieving the Guadalupe River watershed ~~San Francisco Bay~~ mercury TMDL allocation to the urban stormwater runoff source.

Wasteload allocations will be implemented through the NPDES stormwater permits issued to urban runoff management agencies and the California Department of Transportation (Caltrans). The urban stormwater runoff allocations implicitly include all current and future permitted discharges, not otherwise addressed by another allocation, and unpermitted discharges within the geographic boundaries of urban runoff management agencies (collectively, “source category”) including, but not limited to, Caltrans roadway and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

The Bay mercury TMDL relies on 1) source control, 2) pollution prevention, 3) stormwater treatment, and/or 4) sediment removal for urban stormwater runoff to attain a suspended sediment concentration of 0.2 mg/kg as it is discharged into San Francisco Bay. (This suspended sediment concentration is equal to the allocation assigned by the Guadalupe River watershed mercury TMDL project.) Source control and pollution prevention actions prevent contamination of stormwater before it is discharged. Treatment would likely route this flow from the collection system to nearby municipal wastewater treatment facilities, which do not discharge into waters of the Guadalupe River watershed. Hence, three of four actions required by the Bay mercury TMDL would result in the mercury concentration in urban stormwater runoff being equal at the point of discharge to waters of the Guadalupe River watershed and at the point of discharge to the Bay. Therefore, we do not propose additional implementation actions for this source for the first 10-year phase of Guadalupe implementation.

The comprehensive review of progress and prospects for achieving the TMDLs will specifically address whether the source control actions required by the Bay mercury TMDL are, indeed, likely to attain the allocation for discharges to waters of the Guadalupe River watershed within the second 10-year phase. This review will be conducted at the end of the first 10-year phase (see 9.7 Adaptive Implementation).

The San Francisco Bay mercury TMDL also proposes the following monitoring and reporting for the urban stormwater runoff NPDES permit requirements:

- Evaluate and report on the spatial extent, magnitude, and cause of contamination for locations where elevated mercury concentrations exist. …
- Develop and implement a monitoring system to quantify either mercury loads or the loads reduced through treatment, source control, and other management efforts. …

- Prepare an annual report that documents compliance with the above requirements and documents either mercury loads discharged or loads reduced through ongoing pollution prevention and control activities.
- Demonstrate compliance with the allocations … using one of the following methods:
    - … Quantify the mercury load as a rolling five-year annual average mercury load using data on flow and water column mercury concentrations.
    - Quantitatively demonstrate that the mercury concentration of suspended sediment that best represents sediment discharged from program areas is below the suspended sediment target.

The above monitoring requirements ("the spatial extent … elevated mercury concentrations;" and either "quantify the mercury load … flow and water column mercury concentrations," or "quantitatively demonstrate that the mercury concentration of suspended sediment … is below the suspended sediment target;") and annual reporting requirements are sufficient for the first 10-year implementation phase of the Guadalupe River watershed mercury TMDLs. These efforts may best be accomplished through a coordinated watershed monitoring effort (see Section 9.9).

The comprehensive review of progress and prospects for achieving the TMDLs described in Section 9.7 will specifically address whether the above monitoring and reporting requirements, which focus on discharges to the Bay rather than to waters of the Guadalupe River watershed, are sufficient for the second 10-year phase. Additionally, if targets are not attained downstream of reservoirs and lakes by actions (by the Santa Clara Valley Water District) implemented during Phase 1, the comprehensive review will investigate other factors contributing to the mercury problem. As discussed in Section 9.7, nutrients may be a factor that contributes to methylation of mercury. Urban stormwater runoff is one of several sources of nutrients. Consequently, in Phase 2, urban stormwater runoff permittees may be required to participate in special study 3b, which is related to nutrients and mercury methylation (see Section 9.10.)

9.7 Adaptive Implementation

Adaptive implementation entails applying the scientific method to the TMDL. A National Research Council review of U.S. EPA's TMDL program strongly suggests that the key to improving the application of science in the TMDL program is to apply the scientific method to TMDL implementation (NRC 2001). For a TMDL, applying the scientific method involves taking immediate actions commensurate with available information, defining and implementing a program for refining the information on which the immediate actions are based, and modifying actions as necessary based on new information. This approach allows the watershed to make progress toward attaining water quality standards while regulators and stakeholders improve our understanding of the system through research and by observing how it responds to the immediate actions. Accordingly, these TMDLs will be implemented in phases starting with source controls at mine sites so that upstream mercury discharges will be eliminated or significantly reduced before downstream projects are undertaken.

The adaptive implementation plan for the Guadalupe River watershed mercury TMDLs project includes the following features:

1. Immediate actions commensurate with available data and information. These are described above for each source category.
2. Monitoring to assess effectiveness of immediate actions and progress toward TMDL targets.
3. Statement of management questions, associated scientific hypotheses, and a framework and schedule for addressing the management questions.
4. A process for reviewing and incorporating into the TMDL project information obtained through the studies and monitoring.

The Water Board will adapt these TMDLs, associated allocations, and the implementation plan to incorporate new and relevant scientific information, ~~such~~ so that effective and efficient measures can be taken to achieve the targets. We recognize that attaining the methylmercury allocation may be especially difficult because of the need for new and innovative control methods.

The Water Board staff will present an annual progress report to the Water Board on implementation of the TMDL that includes evaluation of new and relevant information that becomes available through implementation actions, monitoring, special studies, and current scientific literature. The annual report will include an accounting of implementation actions undertaken and estimates of (a) mercury permanently removed from the watershed, (b) mercury loads avoided by pollution prevention or erosion control, and (c) methylmercury not produced, and/or other relevant metrics.

We will note in the annual progress report actions by any party that have made it easier for that entity or others to achieve the TMDL project goals. We will report on the District’s progress in developing and testing methylmercury controls (e.g., trends in peak methylmercury concentrations), as that information becomes available. Lastly, we will report on effectiveness of this TMDL project as measured by trends in fish tissue mercury concentrations (i.e., progress in attaining targets) and other relevant metrics (i.e., attaining legacy mercury allocation assigned by the Bay mercury TMDL).

Additionally, staff will evaluate whether the regulatory approach described in this section is effective and still appropriate. For mercury mines, we will evaluate progress in controlling erosion of mercury mining waste. If progress appears to be slower than needed to complete these actions within the ten-year duration of Phase 1, we may consider enforcement and/or reconsider our regulatory approach. For an example of the latter, we may pursue individual or general mercury mines NPDES permits in accordance with the *Mines and Mineral Producers* implementation plan in Chapter 4 of the Basin Plan. For downstream depositional areas, we will evaluate progress made during Phase 1 in developing designs for a comprehensive creek bank stability and habitat restoration project on Alamitos Creek. Our strategy is to encourage this project to proceed on a voluntary basis. However, if progress appears to be slower than needed to complete these designs within the ten-year duration of Phase 1, we may consider compelling responsible parties to undertake this project.

The Water Board, within ten years of the effective date of the TMDL, will evaluate new and relevant information from monitoring, special studies, and scientific literature. Any necessary modifications to the targets, allocations, or implementation plan will be incorporated into the Basin Plan. The Water Board will make new information available to the public and will allow opportunities for public participation regarding the results of the periodic review of the TMDLs and then current progress towards attainment of targets. At a minimum, the following focusing questions will be used to adapt the TMDL. ~~Additional focusing questions will be developed in collaboration with stakeholders prior to each review.~~

- Is the watershed progressing toward TMDL targets as expected? If progress is unclear, how should monitoring efforts be modified to detect trends? If there has not been adequate progress, how should the implementation actions or allocations be modified?
- What are the pollutant loads for the various sources? Have these loads changed over time? How do they vary seasonally? How might source control measures be modified to further reduce loads?
- Does additional sediment, water column, or fish tissue total or methylmercury data support our understanding of linkages and food webs in the watershed or suggest an alternative allocation or implementation strategy?
- Can the assimilative capacity of deep impoundments be increased? If so, how can deep impoundments be managed to reduce bioaccumulation?
- Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should the TMDLs be modified?

Additional focusing questions will be developed in collaboration with stakeholders prior to each review. We will contact the environmental justice community to discuss their concerns with human health risk, including but not limited to, exposure reduction and site-specific fish consumption rates. We will also reconsider the relative importance of mercury from sources other than mining in bioaccumulation.

Assimilative Capacity

The next-to-last question warrants additional discussion. In preparing this TMDL, we have assumed that food web complexity is static, and that the food web is identical in the watershed's reservoirs and lakes. However, a 2004 comparison of methylmercury production rates in three reservoirs (see Figure 9.1 and Appendix A, Table A.6) indicates wide variation in production rates.

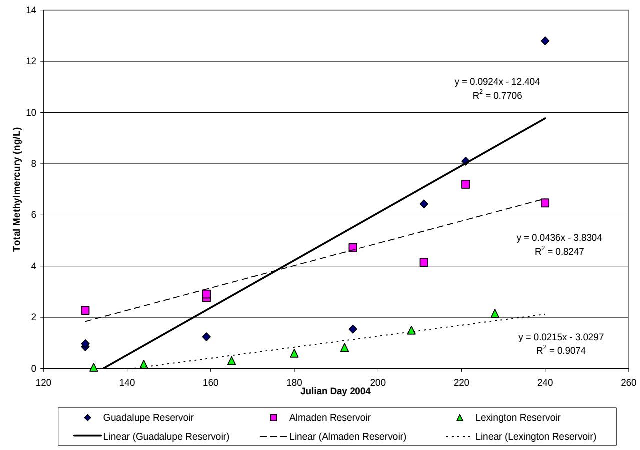

Figure 9.1 Comparison of Reservoir Methylmercury Production Rates

Prepared by Tetra Tech under contract to Water Board

We have also assumed that assimilative capacity for methylmercury is static. However, on-going research and recent literature indicates that it may be possible to increase the assimilative capacity (i.e., less bioaccumulation despite the same methylmercury production), at least in deep impoundments (i.e., managed water bodies, such as engineered reservoirs and lakes). The Santa Clara Valley Water District's lead researcher notes:

> Almaden Reservoir has a large blue-green algae population—toxic to zooplankton—but other reservoirs do not have this population. The structure of the food web is also an important control on methylmercury bioaccumulation. Methylmercury bioaccumulation increases at increasing tropic levels and with increasing food web complexity. Adding links to the food web increases the overall biomagnification of methylmercury for top level predators. Therefore, actions that alter ecosystem structure can have significant impacts on mercury accumulation.
>
> Most of the methylmercury biomagnification in the food web occurs in the lower tropic levels (e.g., from direct methylmercury uptake by phytoplankton to zooplankton). Methylmercury concentrations in lower organisms can strongly regulate methylmercury concentrations at the top of the food web. Therefore, changes in the community structure or life cycle of lower organisms such as phytoplankton and zooplankton can play a significant role in methylmercury bioaccumulation. For example, smaller phytoplankton that have not lived as long will tend to have lower methylmercury concentrations per unit mass, simply because they have not had as much time to accumulate methylmercury as larger organisms of the same species. So phytoplankton blooms which result in large standing stocks of relatively low-methylmercury phytoplankton can reduce mercury concentrations at the top of the food web, a phenomenon known as "biodilution". Intense zooplankton grazing pressure which keeps

> phytoplankton communities 'young' can also keep the average methylmercury concentration per unit mass low, resulting in lower concentrations in top level predators.
>
> This means that it is conceivable that the food web could be managed to prevent biomagnification from reaching harmful levels regardless of what the methylmercury concentration in water is at any point in time (Drury 2006a & 2006b).

Additional support for food web studies and potential manipulations include the following observations from *Inland Fishes of California* (Moyle 2002).

> A keystone predator is a species whose activities can cause changes throughout the ecosystem, usually by changing abundances of favored prey….However, largemouth bass do not appear to play a keystone role under the fluctuating conditions of reservoirs. In some situations their numbers may be regulated by the abundance of their prey. In central California reservoirs where threadfin shad were introduced to provide better forage for largemouth bass, shad actually depress survival of young bass by reducing zooplankton populations needed as food during early life history stages (Ridgway 1988)….It is ironic that plankton-feeding fishes, particularly threadfin shad, which were introduced in part to provide forage for largemouth bass, have also contributed to their decline in some reservoirs, as discussed previously. The interactions between bass and their prey are sensitive to many manipulations because a competitor at early life history stages may become important prey for larger fish (Moyle 2002).

Researchers have recently identified other key factors in methylmercury accumulation in deep impoundments contaminated by atmospheric deposition.

> A three-year (2001-2003) monitoring effort of 14 northeastern Minnesota lakes was conducted to document relationships between water-level fluctuations and mercury bioaccumulation in young-of-the-year (YOY) yellow perch (Perca favescens) collected in the fall of each year at fixed locations. …annual mean concentration ranged by nearly a factor of 2… One likely factor responsible for these wide variations is that annual water-level fluctuations are strongly correlated with mercury levels in YOY perch for both data sets (Sorensen 2005).

In a study of northeastern forests and freshwaters, researchers

> have identified several chemical thresholds to predict high fish mercury: total phosphorus concentrations of less than 30 micrograms per liter [µg/l, parts per billion]; pH of less than 6.0; acid neutralizing capacity of less than 100 [microequivalents] µeq per liter; and dissolved organic carbon of more than 4 mg carbon per liter" (Driscoll et al. 2007).

In a study of weakly stratified impoundments in Voyageurs National Park in Minnesota, researchers found a positive correlation between total organic carbon concentrations and the area of connected wetlands (defined as wetlands adjoining the lakeshore or connected to the lake by a surface inflow). They further found positive correlations between pH, dissolved sulfate and connected wetlands to mercury accumulation in 1-year-old yellow perch (Wiener et al. 2006).

Now let us examine two additional factors that may suggest modifications to targets, allocations, or implementation actions, (a) measurement of hypolimnion methylmercury concentrations, and (b) excess nutrients from controllable sources.

Measurement of Hypolimnion Methylmercury Concentrations

Methylmercury data from the hypolimnion of the reference reservoir were used to calculate the methylmercury allocation. These samples were collected from the outlet, not from the reservoir bottom (see Section 7.6, Mercury in Reference Reservoir, and Section 8.2, Impoundment Methylmercury Allocation). Outlet measurements may not reflect conditions at depth. Also, the outlet structures may differ between the impoundments; some reservoirs may have energy dissipaters or non-pressurized pipes with substantial surface exposure to air—both of which may introduce oxygen and change methylmercury concentrations before the discharge reaches the sampling location. Unlike the reservoirs, Lake Almaden does not discharge from the hypolimnion. A study is warranted to evaluate whether there is sufficient difference between each reservoir’s hypolimnion and outlet methylmercury to support revising the methylmercury allocation.

Excess Nutrients from Controllable Sources

In developing these TMDLs we have not assessed whether excess nutrients from human activities induce oxygen depletion and hence contribute to mercury methylmercury production and bioaccumulation. Potential sources include untreated urban stormwater runoff which, especially in first flush, may contribute excess nutrients from areas served by storm sewers (see Appendix C, Figure C.1). Similarly, excess nutrients may be contributed by malfunctioning on-site disposal systems (septic systems). Areas lacking sanitary sewers include significant stretches of Alamitos and Guadalupe creeks and their tributaries, and an area in the vicinity of Lake Almaden (see Appendix C, Figure C.2).

In summary, several factors may suggest modifications to targets, allocations, or implementation actions. The food web, water-level fluctuations, total phosphorus, pH, acid neutralizing capacity, dissolved organic carbon, dissolved sulfate and the area of connected wetlands may all play a role in the bioaccumulation of mercury, and may explain differences between the different impoundments in the Guadalupe River watershed. Some of these may be controllable water quality factors, and may support adding actions in the course of adaptive implementation that increase assimilative capacity. Alternatively, additional watershed studies may support site-specific methylmercury allocations, for example, due to differences in outlet structures. Lastly, the identification of excess nutrients from controllable sources, and identification of the role nutrients play in methylmercury production, may support adding nutrient source control to the implementation plan.

9.8 Water Board Implementation Actions

The Water Board will undertake the actions described in ~~Table 9.4~~Table 9.5, as necessary, to ensure implementation of the Guadalupe River watershed mercury TMDL.

~~Table 9.4~~Table 9.5 Water Board Actions
• Issue Water Code § 13267 technical report requirements, Water Code § 13304 cleanup and abatement orders, CWA Section 401 certifications, and other orders as necessary to implement the TMDLs and attain the targets
• Issue Water Code § 13267 requirements as necessary to obtain additional information needed to inform implementation and achievement of these TMDLs
• In coordination with responsible parties, monitor progress toward attainment of targets and compliance with the implementation plan
• Assist responsible parties in identifying funding mechanisms for implementation and monitoring
• Report annually to the Board and stakeholders on progress in implementation of management measures and attainment of targets, including discussion of options for additional regulatory action and follow-up, as needed.

9.9 Monitoring Program

The monitoring program together with the special studies (Section 9.10) will measure progress in attaining the goals of this TMDL project and inform the adaptive implementation process (Section 9.7). Specifically, the monitoring program encompasses the following:

1. Monitoring to ensure continued effectiveness of erosion control measures to reduce discharges of mercury mining wastes and/or mercury-laden sediment (applicable to mercury mines and depositional areas)
2. Monitoring of mercury load at the points of discharge to demonstrate progress in reducing loads (applicable to mercury mines, and reservoirs and lakes)
3. Fish tissue mercury monitoring to assess progress in attaining targets (applicable to mercury mines, and reservoirs and lakes)
4. Monitoring of mercury load to San Francisco Bay to assess progress in attaining the legacy and urban stormwater runoff mass load allocations assigned by the Bay mercury TMDL (applicable to mercury mines, urban stormwater runoff, and reservoirs and lakes)
5. Special studies to inform adaptive implementation of these TMDLs (Section 9.10) (applicable to mercury mines, urban stormwater runoff, and reservoirs and lakes)

The Water Board will compel the responsible parties to conduct monitoring through Water Code §§ 13267 and 13304 orders, and other authorities as needed, as described in Sections 9.3–9.6. Although the responsible parties are required to satisfy the monitoring requirements individually, the Water Board encourages a coordinated watershed approach particularly for 3) mercury in fish tissue and 4) loads to San Francisco Bay. The Water Board will collaborate with other resource agencies to coordinate fish monitoring, to leverage their expertise and, where possible, to achieve multiple objectives.

COORDINATED WATERSHED MONITORING PROGRAM

The responsible parties may satisfy monitoring requirements 3–5~~2–5~~ through a coordinated effort. Fish mercury monitoring is best undertaken in a coordinated effort, because fish integrate methylmercury over time and space. Monitoring of legacy (i.e., mercury mining waste) and urban stormwater runoff mercury discharges to San Francisco Bay is best undertaken in a coordinated effort, because this load to the Bay is from a combination of sources and responsible parties. The Water Board encourages a coordinated watershed approach to monitoring, and will consider reducing or waiving monitoring requirement 2, based on progress in implementation and participation in coordinated watershed monitoring. To participate in the coordinated watershed monitoring program, submit the coordinated watershed monitoring plan for review and approval by the Executive Officer no later than October 15, 2009~~2008~~.

EFFECTIVENESS OF MINING WASTE EROSION CONTROL MEASURES

The purpose of this monitoring is to ensure that the measures employed to reduce and control erosion of mercury mining waste are performing effectively, and if not, to determine why not, and to fix the problem. By effectively, we mean at least as well as specified in the construction design documents.

As described in Section 9.3, the parties responsible for mercury mining waste in the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines ~~New Almaden Mining District, and Santa Teresa, Bernal, and Hillsdale mercury mines~~ will be required to conduct this monitoring through CWC § 13267 requirements or other Water Board authorities. This TMDL project requires the monitoring plan(s) to be submitted by October 15, 2009~~2008~~.

As described in Section 9.5, the applicants for CWA Section 401 certifications are the parties responsible for mercury mining waste in depositional areas and will be required to conduct this monitoring. Implementation is phased so that erosion control actions will be required first at mercury mines, and later downstream at depositional areas. Monitoring plans (and monitoring) will be required by CWA Section 401 certifications at downstream depositional areas.

Monitoring should be tailored to the location—landscape or creek. Mine site areas requiring erosion control may include both landscape and creek areas, because historically mercury mining waste was frequently disposed in creeks.

Landscape Erosion Control Monitoring

Monitoring plans will be required to address the following questions regarding the effectiveness of erosion control measures to prevent or reduce stormwater discharges of mercury mining waste and/or mercury-laden sediment:

- What is the design level of performance? Are the erosion control measures performing at least as well as designed?
- If not, why not? What is necessary to improve performance to the design level? How soon can these measures be implemented?
- How turbid is the stormwater at each point of discharge? How does it vary between discharge locations? How does it compare to the turbidity of the receiving surface water? Does the design level of performance appear to be adequate?
- If not, why not? What is necessary to improve performance to an adequate level? How soon can these measures be implemented?

The following are suggested components for monitoring plans for landscape projects (i.e., projects not located within the banks of a creek or river). Erosion control effectiveness monitoring may consist of repeated visual inspections and photographs of the construction project and adjacent landscape. Within six weeks after completion of construction, the responsible party will be required to submit as-built plans, showing permanent photo-points. Additionally, parties will provide site maps with the photo points clearly located, and immediate post-construction photo documentation attached.

In the first five years after construction, erosion control effectiveness will be required to be evaluated at least twice annually: once during a storm event, and again late in the dry season. Subsequently, erosion control effectiveness will be required to be evaluated at least once annually late in the dry season.

Storm event monitoring should be timed to occur when the ground is saturated. Storm event monitoring may consist of visual inspection and photo documentation of both the erosion control measures and downstream waters. Visual inspection of the erosion control measures is required to confirm the measures are performing as designed, and are minimizing discharges of mercury mining wastes. Visual inspection of downstream water clarity is required to confirm that the erosion control measures are preventing excessive turbidity.

Dry season monitoring will be required to consist of a visual inspection and photo documentation of the erosion control construction site, for areas lacking vegetative cover or other evidence of soil erosion. These visual clues are most obvious late in the dry season when vegetation is dormant.

Some erosion control projects may include excavation and disposal of mining waste, re-contouring of the landscape, and revegetation. Consequently, some of these excavations may be designed to achieve the naturally-occurring concentration of mercury in local surface soil. Section 9.10 suggests methods for calculating goals for specific cleanup projects at mercury mine sites.

Creek Erosion Control Monitoring

Monitoring plans will be required to address the following questions regarding the effectiveness of erosion control measures to prevent or reduce stormwater discharges of mercury mining waste and/or mercury-laden sediment:

- What is the design level of performance? Are the erosion control measures performing at least as well as designed?
- If not, why not? What is necessary to improve performance to the design level? How soon can these measures be implemented?

The following are suggested components for monitoring plans for creek projects (i.e., projects located within floodplains, banks, and beds). Erosion control effectiveness monitoring may consist of repeated surveys and photographs of each construction project and the adjacent landscape. Within six weeks after completion of construction, the party responsible for the project will be required to submit as-built plans including monumented cross-sections and profiles of the channel, floodplain, and terraces in the project area. Permanent photo points and survey locations will be established and recorded on the as-built plans. Additionally, responsible parties will be required to submit a site map with the photo survey points clearly located, and immediate post-construction photo documentation attached.

The purpose of the monumented cross-sections, profiles, and photographs is to track changes in channel plan form, dimensions, and slope; and changes in hillslopes, landscape, and vegetation subsequent to construction of erosion controls. Profiles and cross-sections will be surveyed at photo documentation points located not less than 10 channel widths apart on the stream channel, and at time intervals of no less than three years in order to provide a record of changes for ten years after construction.

As-built plans for areas to be stabilized with re-vegetation, and projects that incorporate soil bioengineering systems, will contain construction specifications for geotextile fabrics, soil bioengineering systems, seeding, container plants, plugs, and other re-vegetation and stabilization methods. Responsible parties will be required to routinely check the operations and performance of irrigation systems, if used, to assure their effectiveness.

Plants, including plants used in soil bioengineering systems, that do not survive to thrive within a three year period following planting will be required to be replaced. The performance goal for plants and soil bioengineering systems is eighty-five percent plant survival (percentage as compared to the as-built plans) within five years.

Landscape and Creek Monitoring Reports

Responsible parties will be required to submit annual erosion control effectiveness monitoring reports to the Executive Officer of the Water Board. These reports will describe any significant changes made to an erosion control construction site and areas both up and down hill influenced by the site. If additional measures were needed for landscape projects to reduce the erosion of mercury mining waste, the annual report will describe the measures implemented. If additional measures are needed for creek projects to increase floodplain, creek bank, or creek bed stability or improve vegetation survival, the responsible parties will propose additional measures in their annual reports; construction of these additional measures is subject to Water Board review and approval.

MONITORING OF MERCURY LOAD TO WATERS OF THE GUADALUPE RIVER WATERSHED

The purpose of this monitoring is to demonstrate progress over the 20-year implementation timeframe in reducing loads of mercury from mining waste to ~~receiving~~surface waters, and loads of methylmercury to downstream surface waters, at the points of discharge~~ to waters of the state~~. Two categories of responsible parties will be required to conduct this monitoring. We first discuss the requirements relating to mercury mining waste responsible parties, and then for the methylmercury production responsible party.

As described in Section 9.3, the parties responsible for mercury mining waste in the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines~~New Almaden Mining District, and Santa Teresa, Bernal, and Hillsdale mercury mines~~ will be required to conduct this monitoring through CWC § 13267 requirements or other Water Board authorities. This TMDL project requires the monitoring plan(s) to be submitted by October 15, 2009~~2008~~.

Storm water monitoring plans will be required to quantify the load of mercury discharged to ~~receiving~~surface waters by either of the following methods:

1. Quantitatively demonstrate declines in the annual mercury load using data on flow and water column mercury concentrations, or
2. Quantitatively demonstrate that the annual median suspended sediment mercury concentration is declining using water column mercury data collected on the rising limb and peak of the hydrograph during the largest storms each year.

The Water Board will consider waiving the above requirement, on an individual basis, if the responsible party both makes substantial progress on abating discharges of mining waste and participates in the approved coordinated watershed monitoring program. Next, we discuss the requirements relating to methylmercury production.

As described in Section 9.4, the District is responsible for methylmercury production in, and discharges from, lakes and reservoirs. The District will be required to conduct monitoring of loads of mercury and methylmercury discharged from reservoirs and lakes through CWC § 13267 requirements, if necessary. The District's monitoring plan will be required to quantify dry season loads of methylmercury accumulated in and discharged from reservoirs and lakes, using methods similar to Tetra Tech's (see Section 4.4), and wet and dry season loads of mercury discharged from reservoirs by either of the following methods:

1. Quantitatively demonstrate declines in the annual mercury load using data on flow and water column mercury concentrations, or
2. Quantitatively demonstrate that the annual median suspended sediment mercury concentration is declining using water column mercury data collected during discharges with highest turbidity each year.

The Water Board will consider waiving the above requirement to the District if the District both makes substantial progress on the technical studies of methylmercury production and participates in the approved coordinated watershed monitoring program.

Fish Tissue Mercury Monitoring

The purpose of this monitoring is to demonstrate progress over the 20-year implementation timeframe of this TMDL project in attaining the fish tissue mercury targets.

Several parties will be required to conduct fish tissue mercury monitoring. As described in Section 9.3, the parties responsible for mercury mining waste in the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines ~~New Almaden Mining District, and Santa Teresa, Bernal, and Hillsdale mercury mines~~ will be required to conduct this monitoring through CWC § 13267 requirements or other Water Board authorities. This TMDL project requires the monitoring plan(s) to be submitted by October 15, 2008. Also, as described in Section 9.4, the District will be required to conduct fish monitoring, which if necessary will be compelled through CWC § 13267 requirements.

This fish mercury monitoring is best undertaken in a coordinated effort, because fish integrate methylmercury over time and space. Therefore, the Water Board encourages a coordinated watershed approach to monitoring, particularly for mercury in fish tissue.

Fish monitoring plans will be required to address the following questions regarding trends in fish tissue mercury concentrations:

- What is the seasonal and inter-annual variation in fish mercury in the first 5 years of implementation, for remediation effectiveness indicators and target fish?
- What is the trend in fish tissue mercury concentrations in target fish over the subsequent 15 years of implementation?

The following are suggested components for a fish monitoring program to address the above questions. Quantify seasonal and inter-annual variation in fish mercury by monitoring fish at least annually in the first 5 years of Phase 1 (years 1–5). Subsequently, through Phase 2 (years 6–20), quantify the trend in fish mercury by monitoring fish at least every five years. In years 1–5, measure mercury concentrations in age-1 largemouth bass (remediation effectiveness indicators, described below) in reservoirs and lakes in the fall, soon after mixing occurs. Also in years 1–5, measure mercury concentrations in fish, both 5–15 cm and 15–35 cm in length, of species consumed by wildlife (target fish), and preferably in California roach (remediation effectiveness indicators) at all sampling locations just before the belted kingfisher and osprey breeding season. Twice in years 1–5, repeat this target fish monitoring during the belted kingfisher and osprey breeding season. Monitor water quality with fish collection for total mercury, dissolved mercury, total methylmercury, dissolved methylmercury, suspended sediment, and general water quality parameters.

The initial fish (and water) sampling sites should include reservoirs and lakes, reference sites (i.e., no mercury mining, no urban stormwater runoff), up- and downstream locations, surface waters receiving mercury mining waste, previous sites, and include the following: Guadalupe Reservoir site 1 (S1), and one site on Guadalupe Creek (S2);

Almaden Reservoir (S3), and two sites on Alamitos Creek (S4 and S5); Calero Reservoir (S6), and one site on Arroyo Calero Creek (S7); two sites on the Guadalupe River (S8 and S9); Lake Elsman (S10), Lexington Reservoir (S11) , Vasona Lake (S12), and one site on Los Gatos Creek (S13); and one site on each of Ross (S14) and Canoas (S15) creeks. The sampling sites may be changed upon approval of the Executive Officer.

The following provides the protocol for interpreting fish mercury data from large fish that humans consume. The targets for this TMDL project were developed for methylmercury (see Section 5). Because nearly all mercury in fish is methylmercury in the muscles (Grieb et. al. 1990), skinless filet samples may be analyzed for total mercury. The total mercury results from such sampling and analysis may be interpreted as equal to methylmercury concentrations. Interpretation of prey fish mercury concentrations is somewhat different.

The following provides the protocol for handling and interpreting prey fish mercury data. The protocol for handling samples of prey fish should include packing the samples in water (e.g., in a zip-lock plastic bag with deionized water) to prevent desiccation. About ninety percent of the mercury in small, whole prey fish is methylmercury (Slotton 2007). Therefore, prey fish methylmercury concentrations may be estimated as ninety percent of the total mercury in whole fish. The prey fish samples collected in 2004 and 2006 were eviscerated. Most of the inorganic mercury in these small fish is contained in the liver, which is removed by evisceration (Slotton 2007). Therefore, the total mercury results from eviscerated fish may be interpreted as equal to methylmercury concentrations. ~~Additionally, the water quality objectives and targets overlap for fish of 15 cm in length.~~ Data from fish of 15.0 to 15.4 cm in length should be compared to the lower and more protective target of 0.05 mg/kg.

The following describes the remediation effectiveness indicators. Whereas grab water methylmercury samples provide an instantaneous and site-specific measure of methylmercury, age-1 fish provide an integrated measure of methylmercury over time (one year) and space (their forage area within a given water body). Age-1 largemouth bass data from reservoirs and lakes in 2004 confirmed low sample variability, and therefore excellent utility for measuring environmental response to implementation actions. Similarly, age-1 California roach in creeks and the river had low sample variability. The roach, too, provides excellent utility for measuring environmental response to implementation actions.

Water Board staff assume that it will take several years for methylmercury levels in the water column to reach equilibrium after mining waste source control measures are implemented. During the period between completion of mining waste remediation actions and attainment of equilibrium, the best method for evaluating mining waste remediation effectiveness may be to compare newly collected age-1 fish mercury concentrations to the 2004 baseline age-1 data (see ~~Table 9.5~~Table 9.6). Staff expects that several years after mining waste source control implementation actions are completed; after methylmercury production controls are formulated; and within months of deploying methylmercury production controls, mercury concentrations in age-1 fish will attain the TL3 wildlife target of 0.05 mg/kg (applicable both to fish less than 50 mm length and those between 50 to 150 mm length). We further expect that it will take up to several more years of methylmercury production controls before mercury in older fish attain the

TL3 wildlife target of 0.10 mg/kg in 150-300 mm fish, and a longer timeframe for mercury concentrations to decline in larger fish which humans consume.

Therefore, staff proposes to use the 2004 baseline age-1 fish data to evaluate remediation effectiveness in the years before the targets are attained.

~~Table 9.5~~Table 9.6 Remediation Effectiveness Indicator: Age-1 Fish 2004 Baseline Data

Impoundments: Largemouth Bass

- Guadalupe Reservoir: 0.83 mg/kg
- Almaden Reservoir: 0.96 mg/kg
- Almaden Lake: 0.9 mg/kg
- Calero Reservoir: 0.21 mg/kg

Creeks & River: California Roach

- Alamitos Creek at Harry Road: 0.28 mg/kg
- Alamitos Creek at Greystone Lane: 0.15 mg/kg
- Guadalupe Creek at Meridian Ave.: 0.39 mg/kg
- Guadalupe River at Foxworthy Ave.: 0.15 mg/kg
- Guadalupe River at Coleman Ave.: 0.08 mg/kg

MONITORING OF MERCURY LOAD TO SAN FRANCISCO BAY

The purpose of this monitoring is to (a) demonstrate progress over the 20-year implementation timeframe in attaining the legacy and urban stormwater runoff mercury allocations assigned by the Bay mercury TMDL, (b) improve the understanding of dissolved and particulate mercury and methylmercury loads, and (c) verify the watershed's sediment load to the bay. This monitoring of legacy and urban stormwater runoff mercury discharges to San Francisco Bay is best undertaken in a coordinated effort, because this load to the Bay is from a combination of sources and responsible parties, and generally can be measured at one location.

Many parties will be required to conduct this monitoring. As described in Section 9.3, the parties responsible for mercury mining waste in the New Almaden Mining District and the Guadalupe, Santa Teresa, and Bernal mercury mines~~New Almaden Mining District, and Santa Teresa, Bernal, and Hillsdale mercury mines~~ will be required to conduct this monitoring through CWC § 13267 requirements or other Water Board authorities. This TMDL project requires the monitoring plan(s) to be submitted by October 15, ~~2008~~2009. As described in Section 9.4, the District is responsible for discharges from reservoirs and lakes to downstream waters, and will be required to conduct this monitoring by CWC § 13267 requirements, if necessary. As described in Section 9.6, urban stormwater runoff permittees are provided several methods in the San Francisco Bay mercury TMDL to demonstrate compliance with their wasteload allocation. Two of these three methods are the same as for the Guadalupe River watershed mercury TMDL. Consequently, the urban stormwater runoff permittees may find it advantageous to participate in this portion of the coordinated watershed monitoring program.

Monitoring plans will be required to quantify the load of mercury discharged to San Francisco Bay by either of the following methods:

1. Quantify the mercury load as a five-year annual average mercury load using data on flow and water column mercury concentrations.
2. Quantitatively demonstrate that the mercury concentration of suspended sediment that best represents sediment discharged from the watershed to San Francisco Bay is below the suspended sediment target.

The following are suggested components for this loads monitoring program: (a) measure turbidity continuously through the wet season; (b) collect grab samples of first flush (runoff from first significant storm event); and (c) collect grab samples during peak storms in 4 out of 5 years, and both small and peak storms in at least 1 out of 5 years. Analyze grab samples (b and c) for mercury species, nutrients, and general water quality parameters.

The primary sampling location is in the Guadalupe River near Highway 101 (Figure 3.6). In the first five years of Phase 1 (years 1–5), continuous and grab sampling will be conducted near Highway 101, and at Gage 23b (Figure 3.6). Additionally, the Water Board may require grab sampling at other locations, on occasion, to assess the contribution from specific areas and/or sources. Subsequent sampling (years 6–20) will occur, at a minimum, near Highway 101.

9.10 Special Studies

The special studies described below ~~will~~ may be needed to provide information to improve the scientific understanding of mercury cycling in the watershed, and verify assumptions used in developing these TMDLs. Results of these special studies will inform adaptive implementation of the TMDL and the implementation plan. ~~At a minimum, t~~The special studies ~~will~~ should address the following questions.

1. How do the reservoirs and lakes in this watershed differ from one another? Factors to consider include, but are not limited to, area of connected wetlands, food web, water chemistry (phosphorus, pH, acid neutralizing capacity, and dissolved organic carbon), water level fluctuations, and infrastructure (outlet structure). Do outlet samples adequately represent hypolimnetic methylmercury concentrations for each reservoir? How significant are these differences?
2. Is it possible to increase the assimilative capacity for methylmercury in reservoirs and lakes? Is it feasible to do so? If it is feasible, does it result in attaining the fish tissue targets? How does it affect the food web, and is the resulting food chain multiplier from large (>15 cm) TL3 to large TL4 fish significantly different from 2? If it is significantly different, where and at what frequency is monitoring of larger fish which humans consume warranted?

If the monitoring program does not provide the information to answer these questions, the District will voluntarily conduct or cause to be conducted studies 1 and 2, or equivalent or alternative studies with prior approval of the Water Board Executive Officer. As necessary, the Water Board may compel the District to undertake these studies in accordance with Water Code § 13267 requirements. Completing study 1 within the first five years of Phase 1 (by December 31, 2013), and completing study 2 within the 10-year duration of Phase 1 (by December 31, 2018), would meet the following goal for the first phase of implementation: "completing studies of methylmercury and bioaccumulation controls in reservoirs and lakes".

~~The Santa Clara Valley Water District will be required to conduct studies 1 and 2. Study 1 will be completed within the first five years of Phase 1, and no later than December 31, 2012. Study 2 will be completed within the 10-year duration of Phase 1, and no later than December 31, 2017.~~

3a. What effect do the reservoir and lake control measures have on methylmercury bioaccumulation downstream? Are the fish targets attained downstream?

3b. If not, what factors contribute to methylmercury production and bioaccumulation in creeks and rivers? Factors to consider include, but are not limited to, shallow impoundments, excess nutrients, stagnant pools, shade cover, and aquatic vegetation.

If the monitoring program does not provide the information to answer these questions, the District will voluntarily conduct or cause to be conducted study 3a, or study prior approval of the Water Board Executive Officer. As necessary, the Water Board may compel the District to undertake these technical studies in accordance with Water Code § 13267 requirements.

If the fish targets are not attained downstream by methylmercury controls in the reservoirs and lakes, the Water Board may require that the District together with the responsible parties identified for the New Almaden Mining District and the Guadalupe, Santa Teresa and Bernal mercury mines, and urban stormwater runoff permittees, to conduct study 3b, or equivalent alternative study. Study 3B will be subject to Water Board Executive Officer approval, and will occur either voluntarily or in accordance with Water Code § 13267 or NPDES stormwater permit requirements.

Completing studies 3a and 3b within the first 5 years of Phase 2 (by December 31, 2023) would support the Water Board's effort to identify whether methylmercury production and bioaccumulation controls are necessary in shallow impoundments, in accordance with the adaptive implementation program.

~~The Santa Clara Valley Water District will be required to conduct study 3a. If the fish targets are not attained downstream by methylmercury controls in the reservoirs and lakes, Santa Clara Valley Water District together with the New Almaden Mining District and the Santa Teresa, Bernal, and Hillsdale Mercury Mines responsible parties, and the urban stormwater runoff permittees will be required to conduct study 3b. Studies 3a and 3b will be completed within the first 5 years of Phase 2, and no later than December 31, 2021.~~

4. Where the TL3 50–150 mm target is attained, is mercury in fish that Forster's terns consume (fish less than 50 mm in length), at or below 0.05 mg/kg? Where the TL3 ≥150–350 mm target is attained, is mercury in fish that ospreys consume (TL4 ≥150–350 mm target), at or below 0.20 mg/kg? If these assumptions pertaining to

proportional bioaccumulation are not valid for this watershed, what monitoring should be conducted to support a revised water quality objective and target to protect piscivorous wildlife?

5. Where the larger TL3 target is attained (in fish $\geq$150–350 mm), is the smaller TL3 target also attained (fish 50–150 mm)? If so, how should the monitoring frequency for the smaller TL3 target be reduced?

If the monitoring program has not already provided the information to answer these questions, the Water Board will conduct studies 4 and 5. Completing study 4 within the 10-year duration of Phase 1 (by December 31, 2018), would provide timely information to support whether the water quality objectives require revision through the adaptive implementation process. The timing for study 5 is contingent upon the effectiveness of methylmercury controls.~~The Water Board will conduct studies 4 and 5.~~

CALCULATING THE MINING WASTE CLEANUP GOAL

This section provides some preliminary ideas on how responsible parties may conduct a special study to calculate ambient soil mercury concentrations for review and approval by Water Board staff prior to implementing mining waste source control actions. As stated above, the mining waste allocations to mercury mines are expected to be met by erosion control actions. Some erosion control measures may be designed to attain natural background mercury concentrations (e.g., excavate mining waste down to ambient, pre-mining background concentrations.)

One method is described in the Central Valley Water Board's Sulphur Creek Mercury TMDL, where staff used the concept of a mineralized zone surrounding mercury deposits to propose a preliminary cleanup goal for mercury in eroded soil fines. Based on mercury concentrations found at the periphery of the mineralized zone in the lower Sulphur Creek watershed, staff proposed a goal of no more than 3 mg/kg of mercury from eroded soil fines in runoff and the stream below mine sites—a goal that is approximately double the concentration found at the periphery (CVRWQCB 2004).

The periphery of the mineralized zone of the New Almaden Mining District has not been mapped in the same detail as in the Sulphur Creek area. Responsible parties may undertake a monitoring program to establish a perimeter surface soil mercury concentration in the New Almaden Mining District. The sampling and analysis plan will describe how sampling locations will be selected to avoid contamination by mining waste and historic local deposition from ore roasting. The sampling and analysis plan will be submitted to the Water Board staff for review and approval prior to sampling.

To plan cleanup and excavation work, some understanding of local soil and rock types, their relationships to mercury concentrations, and how historic mining operations processed and used mined materials is essential. Silica carbonate is the host rock for cinnabar mercury ore in the New Almaden Mining District (Bailey & Everhart 1964). Other soil types include Franciscan sandstone, Franciscan greenstone, chert, and serpentine. Data from pre-remediation mercury samples collected in Almaden Quicksilver County Park from each of these soil types in non-mined areas are plotted on Figure 9.2 (Dames & Moore 1989) (see Appendix A, Tables A.4 and A.5). Median mercury concentrations in these soil samples were 24 mg/kg in silica-carbonate soils and 0.84 mg/kg in other soils (indicated as "All NonMineNonSiCarb" on Figure 9.2; medians ranged from 0.16 mg/kg at CO-6, the hillside north of Randol Trail, to 3.4 mg/kg at CR-2 in native road base). In contrast, mercury concentrations in Franciscan greenstone downwind of the Hacienda Furnace Yard (where roasting cinnabar led to mercury emissions into the air) ranged from 23–79 mg/kg (*ibid*.)

The principal clue that miners used to locate ore bodies in the New Almaden Mining District was surface outcrops of silica-carbonate soils, many of which they excavated. Many of the silica-carbonate outcrops still standing today likely are located in close proximity to former ore-roasting facilities, whether permanent or mobile furnaces. Dames & Moore collected surface soil samples from the remaining outcrops from 0–2 inches below surface, and therefore these results likely included mercury from local deposition from nearby ore-roasting chimneys (*ibid*.) Consequently, the samples of silica-carbonate soils described above are likely to contain elevated mercury from nearby ore roasting facilities and therefore they do not adequately represent natural soil mercury concentrations.

Responsible parties may conduct a monitoring program to calculate site ambient, pre-mining background surface soil mercury concentrations to use as site-specific cleanup levels. These determinations may be made by soil type. An initial sampling effort may be necessary to collect depth-profile samples (for example, 5 cm increments from to 50 cm below surface) to evaluate historic local deposition from ore roasting, and determine the appropriate sample depth interval. For example, Rytuba found that the ambient mercury concentration is reached at depth of 33 cm at New Idria:

> A typical vertical profile of soils impacted by long term furnace release is shown in [Figure 9.3] from the New Idria district, the second largest producer of mercury in North America. The background concentration of mercury, 100 ng/g (ppb) [0.1 mg/kg], is reached at a depth of 33 cm. (Rytuba 2002)

This is the same concentration (0.1 mg/kg) as the bottom sediments in the reference reservoir, which is nearly equal to the Bay Area background (nonurban) soil mercury concentration (Section 8.4).

The sampling and analysis plan will characterize natural variability of mercury concentrations by subwatershed, include a statistical power analysis to support the quantity of samples proposed, and describe how sampling locations will be selected to avoid contamination by mining waste and historic local deposition from ore roasting. This plan will be submitted to the Executive Officer of the Water Board for review and approval prior to sampling.

The natural soil mercury concentrations may be applied in at least two ways to source control actions: (1) erosion-control projects in the New Almaden Mining District can be sub-divided by the two soil types. The mercury concentration appropriate to each soil type then applies; or (2) a project-specific median mercury concentration may be calculated based on the relative proportions of the two soil types and applied to the entire project site.

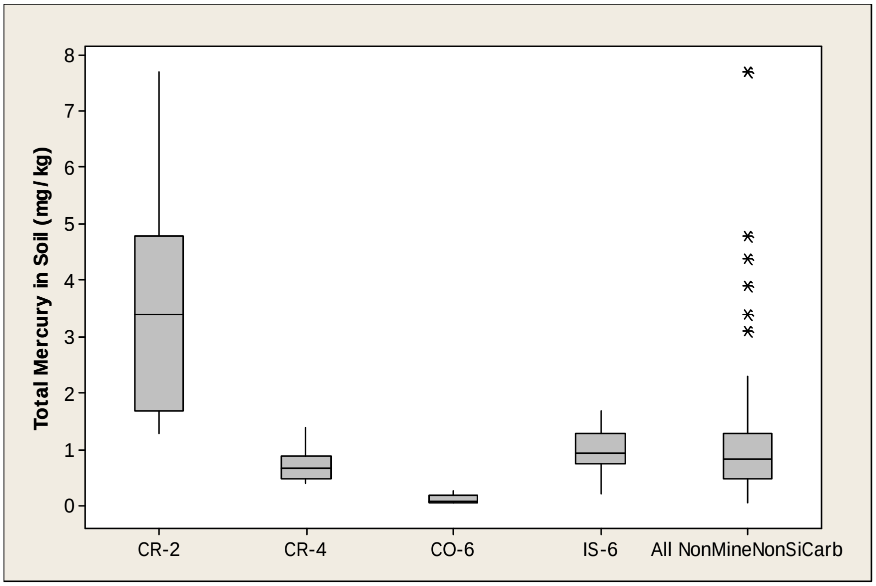

Figure 9.2 Non-mined Area Surface Soil Mercury Concentrations (1989)

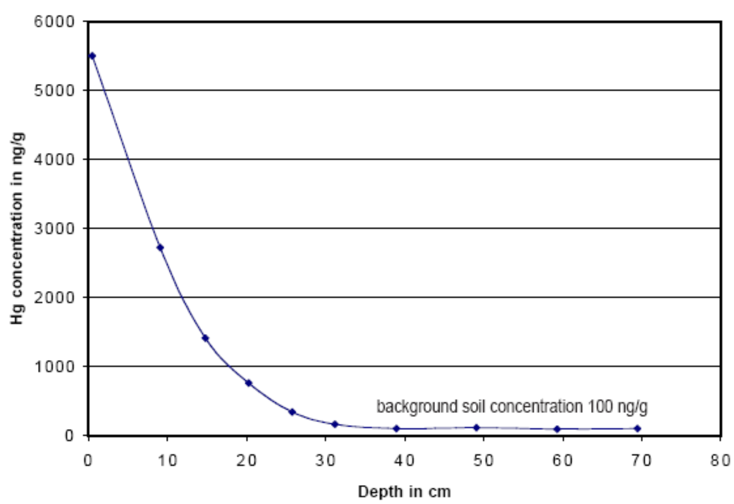

Figure 9.3 New Idria Soil Mercury Profile

10. Regulatory Analyses

This section includes regulatory analyses required for establishing new water quality objectives, and TMDLs and implementation plans for achieving TMDLs. The Basin Plan amendment proposed to reduce mercury in the Guadalupe River watershed includes the following regulatory provisions:

- Two freshwater fish tissue methylmercury water quality objectives
- TMDLs, targets, and allocations
- Required TMDL implementation actions

ORGANIZATION OF THIS SECTION

The regulatory analyses are presented in the following sections:

10.1 Regulatory Framework

Agencies with permit review or approval authority over the implementation of reasonably foreseeable means of compliance include:

San Francisco Bay Regional Water Quality Control Board

> Issues Clean Water Act Section 401 Water Quality Certifications, required to conduct dredging or filling of waters of the U.S.; NPDES permits, Waste Discharge Requirements, and Cleanup and Abatement Orders for discharges that pollute or threaten to pollute surface or groundwater, and other orders as necessary to enforce the Porter Cologne Water Quality Control Act of 1969. Enforces its Order R2-2002-0028, *Waste Discharge Requirements and Water Quality Certification for Santa Clara Valley Water District, Multi-Year Stream Maintenance Program, Santa Clara County*, which sets conditions for stream maintenance and flood control projects below 1,000 ft. elevation.

California Office of Environmental Health Hazard Assessment

> This office has issued a fish consumption advisory for Guadalupe, Calero, and Almaden reservoirs; the Guadalupe River; Guadalupe and Alamitos creeks, and "the associated percolation ponds" (groundwater recharge ponds) along the river and creeks. The advisory states, "Because of elevated mercury levels in fish, no one should consume any fish taken from these locations."

California Department of Toxic Substances Control

Issues orders in accordance with Chapter 6.8 of Division 20 of the California Health and Safety Code. Regulates handling, transportation, and disposal of hazardous waste, such as calcines and mercury-laden soils likely to be involved in future projects undertaken in compliance with the Basin Plan amendment.

U.S. Army Corps of Engineers

Issues Clean Water Act section 404 permits for discharges to waters of the United States and dredging and fill projects in navigable waters, incorporating conditions of its nationwide permits

National Oceanic Atmospheric Administration/National Marine Fisheries Service (NOAA/NMFS)

With the U.S. Fish and Wildlife Service, conducts Endangered Species Act Section 7 consultation for effects to migratory and endangered fish species; enforces the Magnuson-Stevens Fishery Conservation and Management Act, under which it regulates fall-run Chinook salmon in the Guadalupe River watershed.

U.S. Fish and Wildlife Service

With NOAA/NMFS, conducts Endangered Species Act Section 7 consultation for possible effects to listed federal species. Enforces the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.

California Department of Fish and Game

Issues permits for incidental takes of state listed species under Sections 2081(b) and (c) of the California Endangered Species Act, if specific criteria are met, and Section 2081 consultation for effects to listed species.

If the Department determines that an activity may substantially adversely affect fish and wildlife resources, the applicant must prepare a Stream Alteration Agreement that includes reasonable conditions necessary to protect those resources. Compliance with the California Environmental Quality Act (CEQA) is also required.

Santa Clara Valley Water District

Responsible for drinking water quality and supply, flood protection, and watershed management in Santa Clara County. Issues permits under its Water Resources Protection Ordinance 06-1, and District Ordinance 90-1 (regulating water wells and excavation intersecting groundwater aquifers in Santa Clara County); operates reservoirs in the County.

Municipalities including City of San José and County of Santa Clara

Issue building, grading, and utilities permits; enforces standards and ordinances related to noise, tree removal/preservation, scenic area preservation, and geologic hazards including earthquakes and landslides.

10.2 Regulatory Analyses Required to Establish New Water Quality Objectives

For the proposed water quality objectives, this section contains the analyses required by the California Water Code (CWC §-13241 and §-13242), federal water quality criteria requirements (40 Code of Federal Regulations [CFR] §-131.11), and state and federal anti-degradation requirements.

CALIFORNIA WATER CODE § 13241

The Water Board is required under CWC §-13241 to adopt such water quality objectives as in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance. The Water Code identifies six factors that must be considered when establishing water quality objectives:

(a) Past, present, and probable future beneficial uses of water

(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto

(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area

(d) Economic considerations

(e) The need for developing housing within the region

(f) The need to develop and use recycled water. (CWC §-13241)

We consider these factors in the following analysis.

Past, Present, and Probable Future Beneficial Uses

The existing and potential beneficial uses of waters in the Guadalupe River watershed include the following: cold freshwater habitat; warm freshwater habitat; wildlife habitat; preservation of rare and endangered species; fish migration; fish spawning; freshwater replenishment; groundwater recharge; municipal and domestic water supply; water contact recreation; and noncontact water recreation. Of these many beneficial uses, only human consumption of fish (water contact recreation) and wildlife consumption of fish (preservation of rare and endangered species, and wildlife habitat) are impaired because of high concentrations of mercury. When the proposed mercury water quality and fish tissue objectives are attained, these beneficial uses will be restored and protected.

Environmental Characteristics of the Hydrographic Unit

The Guadalupe River watershed (Figure 3.2) is a hydrologic subunit of the Santa Clara Basin and drains approximately 170 square miles. Its headwaters originate in the Santa Cruz Mountains near the summit of Loma Prieta (elevation 3,790 feet).The Guadalupe River begins at the confluence of Guadalupe Creek and Alamitos Creek. The Guadalupe River is the dominant drainage in the watershed. It runs from the Santa Cruz Mountains (which separate the South Bay from the Pacific Coast) and flows north through San Jose, through Alviso Slough, and into San Francisco Bay. The Guadalupe River is fed by three tributaries (Ross, Canoas, and Los Gatos creeks) along its northward course to San Francisco Bay. It is tidally-influenced in the vicinity of Alviso Slough.

Land use changes, including mercury mining, salt farming, agriculture, and urban development, have altered the environmental characteristics of the watershed since Europeans settled the Bay Area. In the vicinity of San Jose the Guadalupe River has been subject to modification dating back at least to 1866, when a canal was dug to control flooding and augment water supply to expanding orchards. Much more recently, Canoas and Ross creeks were realigned and roughly 3,000 feet of the Guadalupe River channel was widened and relocated to allow filling of the original channel for the construction of an expressway.

In addition, six reservoirs, engineered for water conservation, storage, and varying amounts of flood control, operate in this watershed. They include (from east to west) Calero Reservoir on Calero Creek, Almaden Reservoir on Alamitos Creek, Guadalupe Reservoir on Guadalupe Creek, and Lake Elsman, Lexington Reservoir, and Vasona Lake, on Los Gatos Creek. The reservoirs influence the hydrology of the watershed, altering flow schedules by holding back water in wet winters, thereby reducing the floods that punctuated the decades with washouts and flooding. The reservoirs also hold back sediment that otherwise would be transported to the Bay from the surrounding watershed in wet winters.

Lake Almaden also influences the hydrology of the watershed. Lake Almaden is the site of a former gravel quarry, not a reservoir. Consequently, in the winter it acts more like a river than a reservoir, and although it too holds back sediment, it holds back much less than the reservoirs.

The proposed TMDLs and implementation plan are designed to resolve mercury impairment in waters downstream of mercury mines and in waters that receive urban runoff in the Guadalupe River watershed (see Figure 1.2). A future TMDL and implementation plan will address mercury impairment in the remaining western portion of the watershed (Los Gatos Creek and its tributaries upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake).

Water Quality Conditions That Could Reasonably Be Achieved Through the Coordinated Control of All Factors

Coordinated control of the many factors that affect mercury concentrations in fish and waters of the Guadalupe River watershed will result in attainment of the proposed water quality objectives. The following are controllable factors that affect methylmercury concentrations in biota:

- Discharge of mercury mining waste and mercury-laden sediment from inactive mine sites
- Downstream of the inactive mines, discharge of mercury-laden sediment from eroding creek beds, banks and floodplains, shallow impoundments, and percolation ponds
- Discharge of mercury-laden sediment from urban stormwater runoff
- ~~Discharge of nutrients from septic systems and urban stormwater runoff~~
- Low dissolved oxygen in the hypolimnion of reservoirs and lakes

The proposed Guadalupe River watershed mercury TMDL project Basin Plan amendment provides a program of coordinated control of these factors by establishing TMDLs, allocations, and an implementation plan. Coordinated control of these factors through the TMDL project will result in water quality conditions that meet the proposed water quality objectives and protect beneficial uses.

Economic Considerations

The proposed fish tissue mercury water quality objectives will be implemented through the Guadalupe River watershed mercury TMDL project Basin Plan amendment. Therefore, the economic considerations for the proposed objectives are the same as those identified in Section 10.8 for TMDL implementation. The economic analysis presented Section 10.~~8~~ 5fulfills the requirements of California Environmental Quality Act Public Resource Code 21159, and Water Code § 13241.

Need for Developing Housing

Neither of the proposed fish tissue objectives would restrict the development of housing in the Guadalupe River watershed or the San Francisco Bay Area, because they do not result in significant economic costs or restrictions related to housing development.

Implementation actions necessary to meet the new objectives are consistent with actions ~~that anyone considering new development on creek side parcels would be~~ required ~~to take under the~~ for Clean Water Act ~~Section~~ Section 401 ~~requirements.~~ /404 compliance. (These sections apply to any fill or discharge below the "ordinary high water line" of a water of the United States.) Under ~~those~~ these requirements, property owners considering developing housing on land adjacent to waters are required to consider impacts to water quality if the project encroaches on a creek or wetland. Although most creekside parcels affected by the TMDL project are already developed, there are some parcels on Alamitos and Guadalupe creeks where housing could be developed. Erosion control measures for mining waste may be needed on these parcels in order to develop housing. However, these measures also provide creek bank stability, which protects the property (and the investment). Thus, the proposed implementation plan is consistent with existing regulatory requirements, and will not restrict housing development in the Guadalupe River watershed.

Need to Develop and Use Recycled Water

The proposed fish tissue objectives are consistent with the need to develop and use recycled water. There are no present restrictions on recycling of water due to mercury. In setting these objectives, the Water Board's intent is to improve water quality and reduce mercury levels in waters of the Guadalupe River watershed.

CALIFORNIA WATER CODE § 13242

Under the California Water Code (CWC), when adopting water quality objectives in the Basin Plan, a program of implementation for achieving the objectives must be included. The program must include, but not be limited to:

(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private

(b) A time schedule for the actions to be taken

(c) A description of surveillance to be undertaken to determine compliance with objectives (CWC § 13242)

Accordingly, the program of implementation to achieve the proposed water quality objectives for mercury in waters of the Guadalupe River watershed is the Guadalupe River watershed mercury TMDL project. The proposed program of implementation is described in Section 9 (Implementation and Monitoring). The Guadalupe River watershed mercury TMDL project sets forth appropriate actions by public and private entities, a time schedule for actions to be taken, and a monitoring ("surveillance") program to determine compliance with the proposed water quality objectives.

CODE OF FEDERAL REGULATIONS § 131.11

Federal regulations at 40 CFR § 131.11 require states to adopt water quality criteria that protect the designated beneficial use. The criteria must be based on sound scientific rationale and contain sufficient parameters or constituents to protect the designated use. Where multiple use designations exist, the criteria must support the most sensitive uses. For numeric values such as the fish tissue objectives proposed here, the criterion should be based on Clean Water Act § 304(a) guidance (or as modified to reflect site-specific conditions) or other scientifically defensible methods.

Section 5 (Proposed Water Quality Objectives) describes the analyses used to develop the proposed water quality objectives. The U.S. Fish and Wildlife Service have determined that the proposed water quality objectives will protect the most sensitive species in the watershed, piscivorous birds. The proposed objectives also protect human health, and are more protective than U.S. EPA's latest 304(a) criteria guidance for mercury to protect human health (0.3 mg methylmercury per kg fish tissue). In conclusion, the proposed objectives are based on U.S. EPA § 304(a) guidance and protect the most sensitive uses.

STATE AND FEDERAL ANTIDEGRADATION POLICIES

The proposed objectives and TMDLs are consistent with both state and federal antidegradation policies and the protection of water quality and beneficial uses. They are more stringent than the existing numeric water quality objective they will replace. These conclusions are supported by the analysis presented in the following paragraphs.

The proposed water quality objectives must be consistent with both federal and state antidegradation policies. Specifically, California's antidegradation policy, State Water Resources Control Board Resolution 68-16, requires the protection of high quality waters and states that water quality cannot be lowered unless doing so is consistent with the maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses, and will not result in water quality less than prescribed on policies. Resolution 68-16 has been interpreted to incorporate the federal antidegradation policy, which among other things, requires the protection of existing uses and high quality waters unless a lowering of water quality is necessary to accommodate important economic or social development.

The two proposed fish tissue objectives reflect current scientific understanding and are more stringent than the existing Basin Plan four-day average water column objective of 0.025 µg total mercury per liter of water. The existing Basin Plan four-day average objective is based on science from over two decades ago, which was derived to attain 1 mg methylmercury per kg fish tissue. The proposed objectives are based on our current understanding of methylmercury toxicity (i.e., reference doses) for both wildlife and humans. The two proposed objectives are more stringent (0.05 and 0.1 mg methylmercury per kg fish tissue) and will therefore protect beneficial uses and not result in a lowering of water quality.

10.3 Peer Review Requirement Under California Health and Safety Code § 57004

In conformance with requirements in California's Health and Safety Code, we submitted the staff report and draft proposed Basin Plan amendment for peer review of the scientific basis of the TMDLs. The peer reviewers are Prof. David L. Sedlak, Department of Civil and Environmental Engineering, University of California, Berkeley; Prof. Desiree Tullos, Biological and Ecological

Engineering, Oregon State University; Corvallis, and Michael Josselyn, Professor Emeritus of Biological Sciences, San Francisco State University, California.

The peer reviewers' responses confirmed that the scientific portion of the proposed water quality objectives are based on sound scientific knowledge, method, and practices, and thus satisfy California Health and Safety Code § 57004. Prof. Sedlak wrote,

> In general, I believe that the staff report uses sound scientific practices to address a complicated issue. The TMDL uses fish tissue mercury concentrations as water quality objectives to protect wildlife and humans who consume fish from the affected reservoirs. Most of these guidelines were established as part of previous TMDLs and have undergone extensive external review. The identification of sources, linkage analysis and allocations are based upon data collected recently by the Regional Board's contractor (i.e., Tetra Tech). Although the heterogeneity of the system and its complex hydrology make it difficult to estimate some of the values accurately, the staff has attempted to apply best professional judgment in a way that allows cleanup to begin soon. In my opinion, the adaptive management approach advocated by the staff is superior to spending more time quantifying loadings and sources. (Sedlak 2007)

Professor Tullos wrote, "In summary, taken as a whole, the scientific portion of the proposed rule is based upon sound scientific knowledge, methods, and practices. The analysis of sources, linkages, and allocations are logical and well developed. (Tullos 2007)" Professor Josselyn also expressed his support, "I am very impressed with the thoroughness of the scientific analysis within this document; particularly the conceptual model and data analysis that was undertaken. (Josselyn 2007)"

Professors Sedlak and Tullos raised some questions with respect to our interpretation of fish tissue mercury concentrations in the reference reservoir. In the Staff Report for Peer Review, we had interpreted the small prey fish data as meeting the wildlife target, and large fish data as safe for human consumption of two meals per month. In response to the peer reviewers' concerns, we modified the report to interpret the small prey fish data as exceeding the wildlife target. Consequently, we revised the methylmercury allocation, based on the reference reservoir, to include an explicit margin of safety. This will result in large fish safe for human consumption of four meals per month.

Monitoring and assessment will help us refine our understanding of mercury in the watershed and is supported by all three peer reviewers. However, Professor Tullos expressed concern about monitoring of erosion control measures in creeks. The program description stated that "storm event monitoring shall consist of a visual inspection for excessive turbidity in downstream waters, and if found, determining whether the excessive turbidity is from the erosion control construction site." Professor Tullos found this not to be a "transparent, enforceable, or accepted criterion for evaluating erosion." She further suggested that "substantial effort be applied to developing and committing resources to a scheduled field monitoring plan, using accepted methodology for documenting bed and bank erosion and turbidity sampling."

After consultation with in-house experts, we determined that for erosion control on the landscape, such as at mines, "excessive turbidity" is an appropriate standard. However, we have revised the monitoring requirement for erosion control projects in creeks to include surveying creek cross-sections to evaluate bed and bank stability.

10.4 Analysis required by the California Environmental Quality Act

This section presents the results of an environmental impact analysis required under the California Environmental Quality Act (CEQA), and a discussion of economic considerations in compliance with Pubic Resources Code § 21159 [a]. The environmental impact analysis evaluates the reasonably foreseeable environmental impacts of the implementation measures identified in the Implementation Plan (see Section 9). The discussion of economic considerations reviews costs associated with methods that may be used to implement the TMDLs.

The Water Board is the Lead Agency responsible for evaluating the potential environmental impacts of the proposed Basin Plan amendment to establish the fish tissue objectives and the TMDLs for mercury in certain portions of the Guadalupe River watershed (see Figure 1.2). Under the provisions of § 21080.5 of the California Public Resources Code, the California Secretary for Resources has the authority to certify the regulatory programs of state agencies as exempt from the requirements of preparing environmental impact reports and related documents, if the Secretary finds that the program meets the criteria specified in that section of the code. The Basin Planning process of the Water Boards is certified as such a program as described and listed in Article 17, §15251 (g) of CEQA.

Although the Water Board is not required to complete an environmental impact report for such a Certified Regulatory Program, it is not completely exempted from the provisions of CEQA; it must still comply with CEQA's other provisions, including the policy of avoiding significant adverse impacts on the environment where feasible. In order to demonstrate compliance with these requirements, we have produced this Substitute Environmental Documentation that fulfills the requirements of CEQA.

To satisfy CEQA's recommendation to engage the public and interested parties in early consultation about the scope of the environmental analysis, a scoping meeting was held at the Martin Luther King, Jr., Library in San Jose on Thursday, November 8, 2007.

This section of the Staff Report contains the environmental checklist for the proposed Basin Plan amendment and includes the required analyses mentioned above. The explanations following the checklist provide details concerning the environmental impact assessment. Based on this analysis, Water Board staff concludes that adoption of the proposed Basin Plan amendment will not cause significant adverse environmental impacts.

~~***PROJECT DESCRIPTION AND OBJECTIVES***~~

~~Recall the project definition provided in Section 2.1:~~

> ~~The proposed project is a Basin Plan amendment to establish fish tissue water quality objectives and Total Maximum Daily Loads (TMDLs) for mercury in certain waters of the Guadalupe River Watershed (see Section 1) and an implementation plan to achieve the TMDLs. The goal of the Basin Plan amendment is to improve environmental conditions by addressing mercury pollution in the Guadalupe River watershed and San Francisco Bay and to reduce mercury fish tissue concentrations. The Basin Plan amendment would include targets for small prey fish tissue methylmercury concentrations, and would establish allocations for mercury in sediment and methylmercury in the water column necessary to achieve the targets. The Basin Plan amendment implementation plan would require actions to achieve the targets and allocations for mercury and methylmercury.~~

~~The project objectives are provided in Section 2.2, including "complete implementation of the TMDL in as short a time as is feasible and no longer than 20 years." To achieve these project objectives, the proposed Basin Plan amendment contains mercury allocations by source category (see Key Points in Section 8), and a sequence of implementation actions (see Implementation Sequence in Section 9). As the Water Board is limited in prescribing the manner of compliance with state law requirements, the Basin Plan amendment does not prescribe specific projects through which dischargers and discharge categories are to meet the allocations.~~

~~While the Water Board would not directly undertake any actions that could physically change the environment, adoption of the proposed Basin Plan amendment would result in future actions by landowners, municipalities, and other agencies to comply with the requirements of the Basin Plan amendment and that may result in a physical change to the environment. The environmental impacts of such physical changes are evaluated below, to the extent that they are reasonably foreseeable. Changes that are speculative in nature are difficult to analyze and, as such, do not require environmental review.~~

~~Until the parties that must comply with requirements derived from the Basin Plan amendment propose specific projects, many physical changes cannot be anticipated. That said, it is reasonably foreseeable that the following activities may take place to comply with the Basin Plan amendment: (1) earthmoving , (2) recontouring and revegetation, (3) removal and disposal of mining waste, (4) stream bed and bank stabilization; and (5) installation and operation of reservoir oxygenation equipment. Although these activities are reasonably foreseeable methods of compliance, the implementation plan does not specify the nature of these actions. Therefore, this analysis considers these actions in general terms. Possible implementation actions are listed in Tables 9.1–9.3 (Section 9) and summarized below.~~

~~REASONABLY FORESEEABLE MEANS OF COMPLIANCE~~

- ~~***Earthmoving operations***. Approval of the Basin Plan amendment would result in earthmoving to clean up mining waste from historic mine sites and creeks and rivers downstream of the mines. For example, earthmoving to isolate mining waste from stormwater runoff and from creek channels may involve re-contouring hillslopes, terracing steep slopes and banks to reduce erosion rates, installation of erosion control materials, and replanting.~~
- ~~***Stream bed, bank and floodplain stabilization.*** Approval of the Basin Plan amendment would result in increased efforts to decrease erosion of stream bed and banks downstream of the mines that contain mercury laden sediments. These projects are likely to consist of erosion control and stabilization through bioengineering methods which primarily rely on plants, but which involve sediment removal, recontouring, and terracing, slope stabilization and replanting.~~
- ~~***Removal and disposal of mining waste.*** The Basin Plan amendment would result in clean up of mining waste at historic mine sites such as the New Almaden Mining District, and the Santa Teresa, Bernal, and Hillsdale mines. Activities could include earthmoving operations described above.~~
- ~~***Installation and operation of reservoir and lake oxygenation equipment***~~

~~These examples are not intended to be exhaustive or exclusive. Several conceivable actions that could be taken as a result of the Basin Plan amendment require speculation, and therefore, cannot be evaluated. For example, the implementation plan requires technical studies to identify the need for methylmercury reductions and development and identification of effective technology to reduce methylmercury. These activities would not result in physical changes to the environment. The Water Board would consider potential environmental impacts of future requirements to reduce methylmercury in reservoirs and lakes and a plan and schedule for implementation. Actual outcomes and specific actions resulting from preliminary technical studies are too speculative to determine at this time.~~

10.4.1 ENVIRONMENTAL CHECKLIST

Under the Water Board's certified regulatory program for basin planning, the Water Board must satisfy the substantive requirements of the California Code of Regulations, Title 23 § 3777(a), which requires a written report that includes a description of the proposed activity, an alternatives analysis, and an identification of mitigation measures to minimize any significant adverse impacts. § 3777(a) also requires the Water Board to complete an environmental checklist as part of its substitute environmental documents. Additionally, the Water Board must comply with Public Resource Code § 21159 when adopting performance standards such as those in the proposed Basin Plan amendment. ~~Section~~ Public Resources Code §21159 requires the environmental analysis to include: (1) the reasonably foreseeable environmental impacts of the method of compliance; (2) the reasonably foreseeable mitigation measures; and (3) the reasonably foreseeable alternative means of compliance with a rule or regulation. The analysis must take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites. ~~Section~~ PRC §21159 further states that the Water Board is not required to engage in speculation or conjecture or conduct a project-level environmental analysis.

This section contains the environmental checklist for the proposed project (i.e., the proposed Basin Plan amendment), and includes the required analyses mentioned above. The explanation following the checklist provides details concerning the environmental impact assessment. Based on this analysis, Water Board staff concludes that adoption of the proposed Basin Plan amendment ~~would~~will not cause any significant adverse environmental impacts.

~~*ENVIRONMENTAL CHECKLIST*~~

1.	***PROJECT TITLE:***	*GUADALUPE RIVER WATERSHED MERCURY TOTAL MAXIMUM DAILY LOAD BASIN PLAN AMENDMENT*
2.	**Lead Agency Name and Address:**	California Regional Water Quality Control Board San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, California 94612
3.	**Contact Person and Phone Number:**	Carrie Austin (510) 622-1015
4.	**Project Location:**	Guadalupe River Watershed Santa Clara County, California
5.	**Project Sponsor's Name and Address:**	California Regional Water Quality Control Board, San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, California 94612
6.	**General Plan Designation:**	Not Applicable
7.	**Zoning:**	Not Applicable
8.	**Description of Project:**	~~Refer~~

The proposed project is a Basin Plan amendment to ~~**Project Description,**~~establish fish tissue water quality objectives and Total Maximum Daily Loads (TMDLs) for mercury in certain waters of the Guadalupe River Watershed (see Section 1) and an implementation plan to achieve the TMDLs. The goal of the Basin Plan amendment is to improve environmental conditions by addressing mercury pollution in the Guadalupe River watershed and San Francisco Bay and to reduce mercury fish tissue concentrations. The proposed amendment includes targets for small prey fish tissue methylmercury concentrations, and establishes allocations for mercury in sediment and methylmercury in the water column necessary to attain the targets. The implementation plan requires actions to attain the targets and allocations for mercury and methylmercury.

The project objectives are provided in Section 2.2, including "attain TMDL targets in as short a time as is feasible, and no longer than 20 years." To achieve these project objectives, the proposed Basin Plan amendment contains mercury allocations by source category (see Key Points in Section 8), and a sequence of implementation actions (see Implementation Sequence in Section 9). As the Water Board is limited in prescribing the manner of compliance with state law requirements, the Basin Plan amendment does not prescribe specific projects through which dischargers and discharge categories are to meet the allocations.

While the Water Board would not directly undertake any actions that could physically change the environment, adoption of the proposed Basin Plan amendment will result in future actions by landowners, municipalities, and other agencies. Some compliance actions may result in physical changes to the environment. The environmental impacts of such changes are evaluated below, to the extent that they are reasonably foreseeable. Changes that are speculative in nature are difficult to analyze and, under CEQA, do not require environmental review.

Until the parties that must comply with requirements derived from the Basin Plan amendment propose specific projects, many physical changes cannot be anticipated. That said, it is reasonably foreseeable that the following activities may take place to comply with the Basin Plan amendment: (1) earthmoving , (2) recontouring and revegetation, (3) removal and disposal of mining waste, (4) stream bed and bank stabilization; and (5) installation and operation of reservoir oxygenation equipment. Although these activities are reasonably foreseeable methods of compliance, the implementation plan does not specify the nature of these actions. Therefore, this analysis considers these actions in general terms. Possible implementation actions are listed in Tables 9.1–9.3 (Section 9) and summarized below.

Reasonably Foreseeable Means of Compliance

- ***Earthmoving operations***. Approval of the Basin Plan amendment will result in earthmoving to clean up mining waste from historic mine sites and creeks and rivers downstream of the mines. For example, earthmoving to isolate mining waste from stormwater runoff and from creek channels may involve re-contouring hillslopes, terracing steep slopes and banks to reduce erosion rates, installation of erosion control materials, and replanting. All of these changes will be of short duration.

- ***Stream bed, bank and floodplain stabilization.*** Approval of the Basin Plan amendment will result in increased efforts to decrease erosion of stream bed and banks downstream of the mines that contain mercury laden sediments. These projects are likely to consist of erosion control and stabilization through bioengineering methods which primarily rely on plants, but which may also involve sediment removal, recontouring, and terracing, slope stabilization and replanting. Any such activities will also be of short duration.

- ***Removal and disposal of mining waste.*** The Basin Plan amendment will result in clean up of mining waste at historic mine sites such as the New Almaden Mining District, and the Santa Teresa, Bernal, and Hillsdale mines. Activities could include earthmoving operations, re-contouring, and erosion control actions similar to what are described above. Again, any such activities will be of short duration.

- ***Installation and operation of reservoir and lake oxygenation equipment.*** The Santa Clara Valley Water District is developing innovative technology to reduce methylation in reservoirs. The District's is currently piloting several prototype mechanisms in Guadalupe and Almaden reservoirs and Lake Almaden. These prototypes, which are visible above the surface of the water and about the size of small boats, are existing conditions and therefore not subject to this analysis. Full deployment in all reservoirs throughout the watershed is speculative at this time and therefore is not considered in the present analysis.

These examples of reasonable means of compliance are not intended to be exhaustive or exclusive. Several conceivable actions that could be taken as a result of the Basin Plan amendment require speculation, and therefore cannot be evaluated. For example, actual outcomes and specific actions resulting from technical studies that are yet to be completed are too speculative to determine at this time.

9. Surrounding Land Uses and Setting:

Setting: The Basin Plan amendment affects portions of the Guadalupe watershed influenced by historic mercury mining activities. Implementation involves specific land and water management actions in mercury mine areas, in reservoirs and other impoundments, and in creeks and rivers downstream of the mines.

Land use: The upper portion of the watershed includes historic mercury mines, open space, and rural land uses. In the lower portion of the watershed, the Guadalupe River flows through the City of San Jose, the largest city in the Bay Area, where land uses include residential, commercial, and industrial uses.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

The State Water Resources Control Board, the California Office of Administrative Law, and the U.S. Environmental Protection Agency must approve the proposed Basin Plan amendment.

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒
II. AGRICULTURE RESOURCES -- In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. **Would the project:**				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. **Would the project:**				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐~~☒~~	☒~~☐~~
IV. BIOLOGICAL RESOURCES -- Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒~~☐~~	☐~~☒~~	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the				

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒~~☐~~	☐~~☒~~	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒~~☐~~	☐~~☒~~	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒
V. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐~~☒~~	☒~~☐~~
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐~~☒~~	☒~~☐~~

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VI. GEOLOGY AND SOILS -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒~~☐~~	☐~~☒~~	☐
c) Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☒~~☐~~	☐~~☒~~	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VII. HAZARDS AND HAZARDOUS MATERIALS -- Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	~~☒~~☐	~~☐~~☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VIII. HYDROLOGY AND WATER QUALITY -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion of siltation on- or off-site?	☐	☒~~☐~~	☐~~☒~~	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation of seiche, tsunami, or mudflow?	☐	☐	☐	☒
IX. LAND USE AND PLANNING -- Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒
X. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
XI. NOISE -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XII. POPULATION AND HOUSING -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS: *Issues:*	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIII. PUBLIC SERVICES --				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒
XIV. RECREATION --				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐
XV. TRANSPORTATION / TRAFFIC -- Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-				

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks?	☐	☐	☒	☐
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒
XVI. UTILITIES AND SERVICE SYSTEMS -- Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d) Have sufficient water supplies available to serve the project from existing entitlements				

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒~~☐~~	☐~~☒~~
b) Does the project have impacts that are individually limited, but ~~cumulative~~cumulatively considerable? ("~~Cumulative~~Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒

ENVIRONMENTAL IMPACTS:

Issues:	*Potentially Significant Impact*	*Less Than Significant With Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

10.~~5~~4.2 EXPLANATIONS

The proposed Basin Plan amendment does not define the specific actions that responsible parties would take to comply with requirements derived from the Basin Plan amendment. As discussed above, some physical changes resulting from the Basin Plan amendment are foreseeable, ~~and~~ but will be of short duration. These include ~~mining waste clean up, reservoir management and down stream creek and river clean up and restoration. Future projects would be located in the Guadalupe River watershed and large scale~~ changes related to mining waste cleanup ~~would be focused in the Almaden Quicksilver County Park area.~~ and creek and river bank, bed, and floodplain stabilization and restoration. However, details of the method of cleanup, extent of excavation, and waste disposal methods are not known at this time.

~~Responsible~~Following adoption of these TMDLs, responsible parties will be required to develop ~~TMDL~~ implementation projects. These projects ~~in response to~~ will be subject to cleanup and abatement orders issued by the Water Board ~~within the first year after final adoption of the TMDLs. Therefore, this analysis considers the above-mentioned reasonably foreseeable methods of compliance with the Basin Plan amendment in general terms and concludes that the Basin Plan amendment will not have significant environmental impacts.~~

. Specific ~~compliance~~ implementation projects, when they are developed, will be subject to review and/or approval by the Water Board, which will, as part of administering its program responsibilities, likely either disapprove projects with significant and unacceptable environmental impacts (e.g., instream work with too many impacts) or require implementation of routine mitigation measures (e.g., ~~best~~ erosion control and construction best management practices) to ensure that environmental impacts remain at, or are reduced to, less-than-significant levels.

Additionally, ~~there are~~ existing local and state agency performance standards (e.g., air standards ~~and~~ , noise ordinances~~) with which these compliance projects have to comply to~~, and provisions of the Santa Clara County grading ordinance) will apply, and shall keep impacts at less-than-significant levels. ~~In sum, the regulatory programs, criteria, and requirements currently in place provide adequate assurances that impacts from the Basin Plan amendment will be less-than-~~

For these reasons, this analysis considers the above-mentioned reasonably foreseeable methods of compliance with the Basin Plan amendment in general terms and concludes that the Basin Plan amendment will not have ~~significant.~~ environmental impacts. An explanation for each box checked on the environmental checklist is provided below.

I. Aesthetics

a) The project ~~would~~will result in physical changes to the landscape of the New Almaden Mining District, Santa Teresa, Bernal and Hillsdale mines, and the surrounding landscape. Reasonably foreseeable changes may include altered topography, slope terracing, exposure of soils during grading and construction, and long-term changes in vegetation. These changes may be noticeable to park workers and ~~site~~ visitors. However, given that the mine sites have been extensively altered and modified by mining, coupled with the subtle nature of the changes, impacts to scenic vistas ~~would~~will be minimal. Replanting ~~would~~and monitoring will be required for all mining waste cleanup projects. Growth of new vegetation ~~would~~will lessen the impact of visual changes in the landscape. Therefore, visual impacts on scenic vistas ~~would~~will be less than significant.

Actions and projects that could result from the Basin Plan amendment may also cause temporary changes to the visual quality of creeks and the river. These changes to the aesthetic environment ~~would~~will be small in scale and ~~would~~will not result in significant long-term visual impacts.

b) The only state scenic highway in Santa Clara County is Highway 9. This highway is located outside the Guadalupe River watershed and ~~would~~will not be affected by this Basin Plan amendment.

c) Potential changes to the visual character of the landscape that could result from the Basin Plan amendment are described in response to question I(a) above. Long term changes in the existing visual character or quality of the mine sites, creeks and surrounding areas ~~would~~will be less than significant.

Technology under development by the Santa Clara Valley Water District to reduce methylation in reservoirs may alter the visual character of the reservoirs. Prototypes now being tested, which are visible above the surface of the water and about the size of a small boat, are existing conditions and therefore not subject to this analysis. The reservoirs where they are located (Almaden and Guadalupe reservoirs, and Lake Almaden) are in unpopulated areas high in the watershed. Future deployment of more or different mechanisms is speculative and beyond the scope of this Basin Plan amendment project.

Therefore we maintain that the Basin Plan amendment will not degrade the existing visual character or quality of the site or its surroundings to any significant extent.

d) Actions and projects that could result from the Basin Plan amendment ~~would~~will not include new lighting or installation of large structures that could generate reflected sunlight or glare. The Basin Plan amendment ~~would~~will not result in adverse light and glare impacts.

II. Agriculture Resources

a) Adoption of the Basin Plan amendment ~~would~~will affect historic mine areas and creeks and rivers in rural and urban areas. It ~~would~~will not affect agricultural land and therefore ~~would~~will not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural uses and no impact ~~would~~to these resources will occur.

b) The Basin Plan amendment ~~would~~will not affect existing agricultural zoning or any aspects of Williamson Act contract and ~~would~~will not have any adverse impact in this regard.

c) Adoption of the Basin Plan amendment ~~would~~will not affect agricultural land and ~~would~~will not result in conversion of land to non-agricultural uses. Therefore, no impact could occur.

III. Air Quality

a) Because the Basin Plan amendment ~~would~~ will not cause any significant changes in population or employment, it ~~would~~will not generate ongoing traffic-related emissions. It ~~would~~will also not involve the construction of any permanent emissions sources. For these reasons, no permanent change in air emissions ~~would~~will occur, and the Basin Plan amendment ~~would~~will not conflict with or obstruct implementation of any applicable air quality plans. ~~Therefore, no air quality impact would result.~~

b) Air emissions that could result from the Basin Plan amendment ~~are~~ would be related to grading (dust and vehicle exhaust) associated with mining waste management, cleanup, or removal. Fine particulate matter (PM10) is the pollutant of greatest concern with respect to construction. PM10 emissions can result from a variety of construction activities, including excavation, grading, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. -Temporary emissions of carbon monoxide, ozone precursors, and other vehicle exhaust byproducts would also be generated from heavy construction equipment.

The Guadalupe River Watershed is within the jurisdiction of the Bay Area Air Quality Management District (BAAQMD). The BAAQMD CEQA Guidelines (1996) recommend~~s~~ that an analysis of air quality impacts associated with construction activities emphasize ~~the~~ implementation of effective and comprehensive control measures, rather than detailed quantification of emissions. ~~As such,~~Therefore, future construction-related emissions from equipment and trucks hauling materials to and from cleanup sites are not quantified here. Although grading activities result in emission of carbon monoxide and ozone precursors, “these emissions are included in the emissions inventory that is the basis for regional air quality plans, and are not expected to impede attainment or maintenance of ozone or carbon monoxide standards ~~ion~~ in the Bay Area” (BAAQMD 1996). Therefore, while the Basin Plan amendment could result in a temporary increase in criteria pollutants, it ~~would~~will not violate any air quality standard or contribute substantially to an existing or projected air quality violation. ~~The~~Although we find this impact ~~is~~to be less-than-significant~~;~~ ~~nonetheless,~~, the following mitigation measures will be ~~imposed on~~included in cleanup and abatement orders issued by the Water Board.

Mitigation Measure AIR-1: Comply with BAAQMD Control Measures contained in Table 2 of the 1996 BAAQMD CEQA Guidelines.

1. Water all construction areas as needed to minimize and control dust
2. Cover all trucks hauling soil and other loose materials or require all trucks to maintain at least 2 feet of freeboard (the space between the top of the load and the top of the truck bed)
3. Apply water as needed, or apply non-toxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites
4. Sweep (with water sweepers) all paved access roads, parking areas, staging areas, and adjacent public streets if soil material is visible

5. Hydroseed or apply non-toxic soil stabilizers to inactive constriction areas (previously graded areas inactive for ten days or more)
6. Enclose, cover, water, or apply non-toxic soil stabilizers to exposed stockpiles of material that can generate dust.
7. Limit traffic speed on unpaved roads to 15 mph
8. Use Best Available Technology to reduce emissions from construction equipment

c) Because the Basin Plan amendment ~~would~~ will not generate ongoing traffic-related emissions or involve the construction of any permanent emissions sources, it ~~would~~will not result in a cumulatively considerable net increase of any pollutant for which the project region is non-attainment and no air quality impact ~~would~~will result.

d) The Basin Plan amendment could result in earthmoving activities in Almaden Quicksilver County Park (and at other mine sites) that could generate dust. As mentioned above, Mitigation Measure AIR-1 will be imposed on cleanup orders issued by the Water Board. No hospitals, day care facilities, or schools are located in the immediate vicinity of mining waste cleanup sites and these sensitive receptors ~~would~~will not be adversely affected. Santa Clara County Parks ~~would~~will close all construction areas to park visitors during mining waste cleanup to prevent hikers and bike riders from being exposed to potential impacts from air born dust. Therefore, impacts ~~would~~will be less than significant.

e) The Basin Plan amendment ~~would~~will result in mining waste clean up and creek and river bank stabilization, but these activities are not expected to create objectionable odors, therefore, no odor impacts ~~would~~will result.

IV. Biological Resources

~~a)~~ As stated in Section 5 of this Staff Report, wildlife most likely at risk from methylmercury in the aquatic environment are terrestrial species that primarily or exclusively consume fish in which methylmercury has bioaccumulated. State or federally listed threatened or endangered wildlife species that may be resident in the watershed include red-legged frog, yellow-legged frog, western pond turtle, southwestern pond turtle, Central California coast steelhead, native rainbow trout, Chinook salmon, California least tern, tri-colored blackbird, yellow warbler, double-crested cormorant, and bald eagle, as well as the Bay checkerspot butterfly (Santa Clara Valley Water District 2005). The red-legged frog, steelhead, and tern are all federally listed and therefore protected by the Endangered Species Act (ESA). The bald eagle has been delisted; however it is still protected by the federal Migratory Bird Treaty Act and the federal Bald and Golden Eagle Protection Act. Although the fall-run Chinook salmon is not listed; it is regulated by NOAA Fisheries under the Magnuson-Stevens Fishery Conservation and Management Act.

Plant species of concern include Mt. Hamilton thistle, Santa Clara Valley dudleya, Santa Clara red ribbons, most beautiful jewel flower, smooth lessingia, fragrant frittilary, and robust spineflower (*ibid*).

Furthermore, upland areas of the watershed contain serpentine soils, home to sensitive plant and insect communities.

The ESA protects federally listed plants and wildlife. ESA Section 9 prohibits the taking of endangered wildlife, where taking is defined as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct” (50 CFR 17.3). This statute governs removing, cutting, digging up, damaging or destroying any endangered plant on non-federal land in knowing violation of state law (16 USC 1538). ESA Section 10 provides for issuance of incidental take permits to non-federal agencies provided a habitat conservation plan is in place.

While the Basin Plan amendment is designed to benefit, enhance, restore, and protect biological resources, including fish, wildlife, and rare and endangered species~~. It~~, it is possible~~, however,~~ that ~~in order to comply with the proposed Basin Plan amendment, proposed,~~ specific mining waste cleanup or creek stabilization projects involving earthmoving activities and landscape modifications could affect sensitive or special status species, either directly or through habitat modifications. ~~Species of concern in the Guadalupe River watershed include the Golden Eagle, Tri-colored blackbird, Central California Coast Steelhead, California red-legged frog, California tiger salamander, and Western pond turtle~~However, these impacts will be mitigated to less than significant levels through adherence to the conditions, specifications, and requirements of the ESA; through avoidance of sensitive resources; and/or through the permitting actions described below.

a) ~~The~~ Mine site cleanup will be directed under Water Board ~~and other agencies~~ orders. All such orders will require ~~actions~~detailed workplans and site engineering plans, prepared by licensed professionals. Based on the presence or potential presence of threatened and/or endangered species and migratory birds, future projects will be required to comply with the requirements of the Endangered Species Act (16 USC Section 1536(a) and (h)(1)(B), and Section 1538(a); and 16 USC Section 662); the Migratory Bird Treaty of 1972 (16 USC Section 703–711); and the Rivers and Harbors Act of 1899 (33 USC Section 403) in taking action to prevent the loss of or damage to fish and wildlife.

   Permitting agencies required to approve and set conditions for projects that may affect species of concern include, for projects within stream channels, The U.S. Army Corps of Engineers (under Nationwide Permits 27 and 38, provisions 2, 3, 4, and 17(a)–(e)), U.S. Fish and Wildlife Service (enforcing the federal Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act), the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (enforcing the Magnuson-Stevens Fishery Conservation and Management Act).

   For projects on land, the state Department of Fish and Game is prohibited by Fish and Game Code Section 3505 from authorizing the incidental take of raptors, their nests, or eggs. Furthermore, all projects requiring a grading permit from Santa Clara County, including projects “where the proposed grading work consists of cut and/or fill each of which is 500 cubic yards or less in volume and the use associated with the proposed grading does not require or has already received a land use approval (e.g., building site approval)" (SCC 2001, Section C12-429.1), "shall be processed in accordance with the California Environmental Quality Act (CEQA), and regulations promulgated thereunder" (*ibid*., Section C12-430). Compliance with CEQA assures that all species of concern will be protected and unavoidable impacts will be mitigated. Required management measures ~~to~~will reduce impacts to special status species, ~~or other~~ sensitive natural communities, and rare serpentine soil habitat so that no significant impacts occur. ~~These~~Such actions include, but are not limited to, requiring pre-construction surveys for the presence of special status species; ~~construction buffers and setbacks;~~ restrictions on construction during sensitive periods of time; employment of ~~on-site~~ biologists on-site to oversee work; ~~and~~ avoidance of construction in known sensitive habitat areas or relocation of animals, and construction buffers and setbacks.

b) ~~As indicated in section IV a), above, the Basin Plan amendment is designed to provide overall benefit to biological resources, particularly protection of the food chain from mercury toxicity. Nonetheless activities~~Activities required by the Basin Plan amendment to ~~reduce~~remove mining waste residue from stream channels could have local adverse impacts on riparian habitat. Disturbance of soil from the removal of mining waste, re-contouring stream banks, and placement of reinforcement materials (rip-rap, large wood, or other materials) could affect sensitive riparian habitat.

~~Potential impacts to sensitive~~The Santa Clara County Grading Ordinance, Section C12-477.1, "Environmental protection," states that "The property owner and the person(s) doing or causing or directing the grading are responsible for protecting environmentally sensitive areas on or near the site, such as creeks, streams, wetlands, lakes, springs, trees, and riparian habitat that could be affected by the grading. The grading shall be conducted in a manner which minimizes and mitigates environmental damage." (SCC 2001)

In addition, pursuant to permit conditions and the Water Board's Order R2-2002-0028, *Waste Discharge Requirements and Water Quality Certification for Santa Clara Valley Water District, Multi-Year Stream Maintenance Program, Santa Clara County*, potential impacts to sensitive riparian habitat from the Water District's stream maintenance activities will be kept to a less than significant level ~~because the Water Board and other agencies will require actions and management measures to reduce~~or mitigated to minimize impacts to riparian areas and other sensitive natural communities. ~~These actions~~Actions to protect these communities may include, but ~~are not~~will not be limited to, requiring pre-construction habitat surveys~~,~~ including ~~a~~ wetland delineation; ~~construction buffers and setbacks;~~ employment of ~~on-site~~ biologists on-site to oversee work; avoidance of construction in known sensitive habitat areas, restrictions on construction during sensitive periods of time; and ~~avoidance of~~ construction ~~in known sensitive habitat areas~~buffers and setbacks.

~~c)~~ For future work in defined creek channels between banks, the Water Board, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service must ensure, in the course of their permitting and approval processes, that there are no potential adverse effects on riparian habitat and sensitive natural communities. Outside creek banks and adjacent to the channel, the health and quality of riparian habitat directly influences beneficial uses, and shall be protected by the Water Board as it exercises its mandate to protect beneficial uses including rare and endangered species and wildlife habitat.

At a minimum, Basin Plan amendment~~-related~~ projects must comply with standard permit conditions in the U.S. Army Corps of Engineers' Nationwide Permits nos. 13 (Bank Stabilization) and 27 (Stream and Wetland Restoration Activities). USACE final approval and issuance of a permit is only valid with CWA 401 certification of the proposed activity, which is made by the Water Board. Section 401 certifications often include conditions that are more stringent than the federal requirements. Federal requirements include, for example, nationwide permit condition 20, which states that "for losses of streams or other open waters…the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment."

Furthermore, provisions of the Santa Clara Valley Water District's stream maintenance permit require that the District mitigate temporary impacts to beneficial uses caused by stream maintenance or vegetation management activities. Beneficial uses in this watershed include wildlife habitat, protection of threatened and endangered species, and fish spawning habitat. City and county tree ordinances also apply.

Given the scope of required permitting processes and the nature of standard conditions imposed for such activities, we assert that any adverse effect on any riparian habitat or other sensitive natural community in the Guadalupe River watershed associated with the Basin Plan amendment will not be substantial, or will be mitigated to a less than significant level.

c) I~~i~~mplementation actions ~~would~~required for compliance with the Basin Plan amendment may include grading and erosion control measures that could alter federally protected wetlands, particularly in downstream reaches of the mine area, in creek channels. -At a minimum, projects must comply with standard permit conditions in the U.S. Army Corps of Engineers' Nationwide Permits nos. 13 (Bank Stabilization) and 27 (Stream and Wetland Restoration Activities). USACE final approval and issuance of a permit is only valid with CWA 401 certification of the proposed activity, which is made by the Water Board. Section 401 certifications often include conditions that are more stringent than the federal requirements. Federal requirements include, for example, standard measures to minimize soil disturbance in wetlands (Provision 11) and prohibit discharge of dredged or fill material into waters of the United States (Provision 19).

Bank stabilization measures could result in minor and in many cases, temporary alteration of wetlands in creeks and rivers. These impacts, however, ~~would~~will not be substantial in scale or duration. ~~In addition, those actions~~

Actions described in IV(b) above, which the Water Board routinely requires ~~would~~and which are enumerated in Order R2-2002-0028 along with mitigation and monitoring requirements, will keep impacts to less-than-significant levels.

d) The Basin Plan amendment ~~would~~will not substantially interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Projects could be proposed to comply with the Basin Plan amendment that involve construction or earthmoving activities ~~would~~will be localized at specific mine sites and in discrete stream channel segments and are unlikely to interfere with wildlife movement, migratory corridors, or nurseries. Therefore, impacts to migratory corridors for fish and wildlife ~~would~~will be less-than-significant.

e) The Basin Plan amendment itself does not conflict with any local policies or ordinances protecting biological resources such as trees. ~~Projects proposed to comply with Basin Plan amendment requirements would include replanting with native species, which would include native riparian trees to enhance stream bank stabilization.~~ The hillslope and stream bank stabilization goals of the ~~TMDL project would~~ Basin Plan amendment promote retention of mature trees and replanting of native riparian vegetation and ~~would~~do not conflict with local policies or ordinances. Permits for local projects proposed to comply with Basin Plan amendment will require replanting with native species, including native riparian trees, to enhance stream bank stabilization.

f) The Basin Plan amendment does not conflict with any adopted Habitat Conservation Plan (HCP), Natural Community Plan (NCP), or other approved local, regional or state habitat conservation plan. Santa Clara County is developing a HCP/NCP for the Santa Clara Valley but it is not yet approved. ~~In addition, the~~ The Santa Clara Valley Water District is developing an HCP for the Guadalupe, Stevens and Coyote creek watersheds which ~~similarly, has~~ is also not yet ~~been~~ approved. These HCPs are intended to protect habitat for endangered species and are consistent with the TMDL project goal of reducing mercury concentrations in sediment, water, and fish tissue while minimizing impacts on the environment. Future projects proposed to comply with Basin Plan amendment requirements after approval of these HCPs ~~would~~will be subject to local agency review to ensure no conflict with local polices.

V. Cultural Resources

a) Projects involving earthmoving or construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. Earthmoving ~~would~~ will occur at historic mine sites, on old mining roads, and along creek channels. Construction ~~would be~~ on a small to moderate scale ~~but~~ would occur in Almaden Quicksilver County Park in the vicinity of historic mining structures ~~or~~ and features such as mine shafts or remains of equipment or foundations, and could affect areas containing historical resources. The New Almaden Mining District is a Registered National Historic Landmark because of the important contributions to U.S. history made by this mining community. ~~Therefore, the~~

~~proposed Basin Plan amendment could have potentially significant impacts on cultural resources.~~ The following ~~would~~ will reduce ~~these~~ impacts to less than significant levels.

- County General Plan policies C-RC49 and C-RC50 require that parties undertaking cleanup (Santa Clara County Parks Department and other property owners) shall:
  - Inventory and evaluate heritage resources~~;~~
  - Prevent or minimize adverse impacts on heritage resources~~; and~~
  - Restore, enhance, and commemorate resources as appropriate~~.~~
- ~~If~~ County Code and Municipal Code (1998) Division C17 Historic Preservation requires property owners to take all reasonable measures to avoid or minimize harm to the discovered resource until a qualified historian assesses the discovery. Under this ordinance, if previously unidentified historic or other cultural resources are discovered during mining waste cleanup activities, grading and other activities in the immediate vicinity of the discovery shall be halted ~~and the property owner will be required, per County Code and Municipal Code (1998) Division C17 Historic Preservation to take all reasonable measures to avoid or minimize harm to the discovered resource~~ until ~~a qualified historian assess~~ the ~~discovery. Such actions~~historian arrives. Compliance with this ordinance by ~~the~~a property owner and ~~their~~its contractors ~~would minimize~~minimizes the potential for ~~the~~ a project to directly or indirectly destroy a unique historical or other cultural resource.

Therefore the Basin Plan amendment will not cause any substantial adverse change in the significance of a historical resource, as defined in the CEQA Guidelines §15064.5.

b) Projects involving earthmoving or construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. Excavation, processing and transportation of ore at old mine sites has likely destroyed existing archeological remains that pre-date mining activities. It is unlikely that Basin Plan-related projects ~~would~~ will have significant adverse impacts in these areas. Basin Plan-related earthmoving would occur along creek channels and would be small in scale. Nonetheless, these activities could impact significant unique archeological resources defined by §-15064.5 of the CEQA Guidelines. The following ~~would~~ will reduce these impacts to less than significant levels.

- County General Plan policies C-~~CR~~RC 49 and C-~~CR50 would also~~RC 50 will reduce impacts to potentially unique archeological resources if they are found along creek channels proposed for cleanup ~~during review of cleanup plans. If~~ . The policies state:

  C-RC 49: Cultural heritage resources within Santa Clara County should be preserved, restored wherever possible, and commemorated as appropriate for their scientific, cultural, historic and place values.

C-RC 50: Countywide, the general approach to heritage resource protection should include the following strategies:

1. Inventory and evaluate heritage resources
2. Prevent or minimize adverse impacts on heritage resources
3. Restore, enhance, and commemorate resources as appropriate (SCC 2004)

Pursuant to these policies, if previously unidentified archeological resources are discovered during mining waste cleanup activities, grading and other activities in the immediate vicinity of the discovery shall be halted and the property owner will be required by Santa Clara County ~~laws and regulations~~ to take all reasonable measures to avoid or minimize harm to the discovered resource until a qualified archeologist can assess the discovery. -Such actions by the property owner and their contractors ~~would~~will minimize the potential for the project to directly or indirectly destroy a unique archeological resource.

- According to the California Health and Safety Code, six or more human burials at one location constitute a cemetery (§ 8100). Disturbance of a Native American cemetery is a felony (§ 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must consult with the California Native American Heritage Commission.
- Public Resources Code § 5097.5(a) prohibits excavating, removing, destroying, injuring, or defacing any archeological resource ("historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on public lands" such as land owned by Santa Clara County or within the jurisdiction of the Santa Clara Valley Water District). If an archaeological resource must be removed in order to complete ~~clean up than~~cleanup, the property owner will be required to consult with appropriate ~~native~~Native American groups identified by the Native American Heritage Commission. ~~Property owners will be required, through cleanup and abatement orders, or other Water Board regulatory mechanisms, to properly document, remove, and archive archeological resource. Artifacts will be evaluated by a qualified archeologist and archived at an appropriate location near the original site of their discovery.~~(PRC § 5097.9)

- ~~c)~~ Lead agencies for all projects must comply with CEQA provisions related to archaeological resources (PRC § 21083.2; CEQA Guidelines §15064.5 et seq. The Guidelines cite curation of archaeological artifacts as mitigation for unavoidable removal of cultural resources from the project site.

Therefore we assert that the Basin Plan amendment will not cause any substantial adverse change in the significance of a unique archaeological resource pursuant to CEQA Guidelines §15064.5.

c) Projects involving earthmoving or construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. However, construction ~~would~~will be confined to extensively ~~damaged~~altered mining areas where extensive geologic data indicates that no known paleontological resource (i.e., fossils, etc.) or unique geologic features occur~~.~~. Therefore the Basin Plan amendment ~~would have less-than-significant~~will not directly or indirectly destroy a unique paleontological ~~impacts~~resource or site, or unique geological feature..

d) Projects involving earthmoving or construction to comply with requirements of the proposed Basin Plan amendment are reasonably foreseeable. Construction ~~would~~will be confined to areas that have been extensively disturbed by historic mining activities, and earthmoving would likely occur in areas already disturbed by recent human activity—not at or in areas likely to contain human remains or cemeteries. Therefore, the Basin Plan amendment ~~would~~will not ~~adversely affect~~disturb human remains~~,~~, including those interred outside of formal cemeteries.~~; and its impacts would~~~~and its impacts in this regard will~~ ~~be less-than-significant.~~

VI. Geology and Soils

a) The Basin Plan amendment ~~would~~will not involve the construction of habitable structures; therefore, it ~~would~~ will not result in any human safety risks related to fault rupture, seismic ground-shaking, ground failure, or landslides.

b) Specific projects involving earthmoving or construction activities to comply with requirements of the Basin Plan amendment are reasonably foreseeable. Such activities ~~would~~will not result in substantial soil erosion or ~~the~~ loss of topsoil. The purpose of the Basin Plan amendment is to control and reduce erosion, not increase it. ~~However, temporary~~

Temporary earthmoving operations could result in short-term, limited erosion. ~~These specific~~However, mine area cleanup operations will be carried out under Water Board order, and lead agencies will incorporate rigorous erosion control measures. Future compliance projects ~~would~~that take place within a defined creek channel and between banks will be subject to ~~the review and/or approval of the Water Board, which would require implementation of routine and~~ , at a minimum, standard permit conditions in the U.S. Army Corps of Engineers' Nationwide Permits nos. 13 (Bank Stabilization) and 27 (Stream and Wetland Restoration Activities). USACE final approval and issuance of a permit is only valid with CWA 401 certification of the proposed activity, which is made by the Water

Board. Section 401 certifications often include conditions that are more stringent than the federal requirements. Federal requirements include, for example, implementation of effective construction site management and erosion control best management practices ~~and proper construction site management. In addition, construction~~ .

Dischargers whose projects ~~over one acre in size would require a general construction National Pollutant Discharge Elimination System permit~~ disturb 1 or more acres of soil or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ). Construction activity subject to this permit includes clearing, grading and disturbances to the ground such as stockpiling, or excavation.

The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP should contain a site map(s) that shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water ~~pollution prevention plan to control pollutant~~collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list the Best Management Practices (BMPs) the discharger will use to control storm water runoff ~~such as~~ and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment~~. Therefore,~~ monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

In addition, the Water Board's Order R2-2002-0028, *Waste Discharge Requirements and Water Quality Certification for Santa Clara Valley Water District*, *Multi-Year Stream Maintenance Program*, *Santa Clara County*, requires the District to incorporate effective erosion control measures, including bank stabilization and revegetation, in all of its maintenance projects in defined creek channels in Santa Clara County below 1,000 ft. elevation. Monitoring and annual reporting back to the Water Board is also required in the Order.

Finally, grading ordinances of the City of San José (City of San José Public Works Department 1992) and the County of Santa Clara (SCC 1981; SCC 2001, and SCC 2008c) require assessment of slope stability, expansive soils, and landslide protection, and mandate erosion control measures. All plans must be prepared by qualified, licensed professional engineers. Erosion control measures, including creek bank stabilization projects, must be reviewed and/or permitted by the Water Board, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, California Dept. of Fish and Game, and the Santa Clara Valley Water District.

Based on all of these overlapping permitting authorities and permit requirements, we assert that the Basin Plan amendment ~~would~~will not result in substantial soil erosion or loss of topsoil, and its impacts ~~would~~will be less-than-significant.

c) ~~c)~~ Because portions of the project are located in a seismically active area and the Basin Plan amendment includes actions intended to stabilize existing ~~sources of~~ mining waste on unstable slopes and within steam banks, some construction ~~could~~ is likely to occur in potentially unstable areas. ~~Grading for specific TMDL implementation projects would be designed to minimize~~

The County of Santa Clara revised the Geologic Hazards section of the County Code in 2002 (SCC 2002) to deal specifically with fault rupture hazard zones, landslide hazard zones, compressible soils hazard zones, and liquefaction hazard zones. This section applies to potentially unstable areas of the upper Guadalupe watershed. The County also makes available maps and data related to these seismic hazard zones (see http://www.sccgov.org/portal/site/planning/planningchp?path=%2Fv7%2FPlanning%2C%20Office%20of%20%28DEP%29%2FMaps%20%26%20GIS%2FGeologic%20Hazards%20Zones%28Maps%20%26%20Data%29).

Section C12-607 states that applications for any ~~potential~~proposed work within a geologic ~~hazards such~~ hazard zone must be reviewed by the County Planning Office and/or the County Geologist. Grading permit requirements for the County of Santa Clara include progress reports and final certification of slope stability and soil bearing capacity; and a final soils report based on the "as ~~landslides. Project plans would be reviewed and approved by the Water Board~~ built" grading plan as affected by soils or geologic factors. (Section C.12-461; SCC 2001).

In addition, project plans for projects within a defined creek channel will be subject to standard permit conditions in the U.S. Army Corps of Engineers' Nationwide Permits nos. 13 (Bank Stabilization) and 27 (Stream and Wetland Restoration Activities). Future applicants will be required to ensure that earthmoving does not result in soil erosion, bank collapse, or land instability. ~~Therefore, the~~

The Basin Plan amendment ~~would~~would not involve the construction of habitable structures, and any construction would be relatively small in scale. In view of all of the above required permit actions and associated geologic hazard assessments and regulatory oversight, the Basin Plan amendment will not involve activities that ~~would~~ could create or trigger landslides, lateral spreading, subsidence, liquefaction, or collapse, and its impacts ~~would~~will therefore be less-than-significant, and not create safety or property risks due to unstable or expansive soils.

d) The Basin Plan amendment ~~would~~will not involve construction of buildings or any habitable structures. Minor grading and construction could occur in areas with expansive soils but this activity would not create a substantial risk to life or property.

Furthermore, the County of Santa Clara's grading ordinance (Section C12-491; SCC 2001) requires removal and replacement of expansive soils if found within two feet of finished lot grade in a building location, or other measures as required by a building official based on a report by a registered civil engineer.

Therefore, the Basin Plan amendment ~~would~~will not result in impacts related to expansive soils.

e) The Basin Plan amendment ~~would~~will not require wastewater disposal systems; therefore, affected soils need not be capable of supporting the use of septic tanks or alternative wastewater disposal systems. No impacts from septic tanks or alternative wastewater disposal systems ~~would~~will result from the project.

VII. Hazards and Hazardous Materials

a) Actions to comply with the proposed Basin Plan amendment ~~would~~ will involve ~~the~~ handling and management of soil and sediment ~~with~~that could contain high concentrations of mercury. While the Water Board anticipates that most soil and sediment ~~is expected to~~will be stabilized and/or isolated on site and in place, some mercury-contaminated material may require offsite disposal. In ~~the~~ this event ~~of offsite disposal~~, soil and sediment ~~would first~~will be stockpiled and segregated, characterized for disposal by chemical analytical testing as required by the permitted landfill facility, then manifested, transported, and disposed of in accordance with federal, state, and local regulations. ~~Potential off-site~~ Handling, transportation, and disposal ~~sites may include either a Class I or Class II permitted landfill facility~~of hazardous waste is regulated by the U.S. Environmental Protection Agency, the California Department of Toxic Substances Control, and locally by the Santa Clara County Hazardous Materials Compliance Division. California's criteria for hazardous waste are more stringent than federal criteria. Compliance with all applicable laws and regulations ~~would~~will reduce potential impacts from handling and transport of potentially hazardous materials to a less-than-significant level.

b) Actions to comply with the Basin Plan amendment ~~would~~will include ~~conventional~~ cleanup of mine waste as described in the Project Description, above. Construction ~~would~~will involve use of heavy equipment (operated by petroleum based fuels) to move mine waste (soil with high concentrations of mercury). Accidents ~~would~~will be avoided or minimized to less than significant levels through compliance with ~~all~~ applicable federal, state, and local laws and regulations pertaining to grading; hazardous materials handling and transport; and employee safety.

All contractors and subcontractors working on mining waste cleanup projects are required by state law to prepare and implement a site-specific health and safety plan. Activities that involve contact with high mercury concentration mining waste ~~would~~will be conducted by 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) trained personnel.

Therefore, the Basin Plan amendment will not create a significant hazard to the public, or to the environment, through reasonably foreseeable accidents that involve release of hazardous materials to the environment.

c) Basin Plan amendment-related grading and site cleanup ~~would~~will be located in historic mine areas of the New Almaden Mining District, Santa Teresa, Bernal and Hillsdale mines, and surrounding areas~~,~~; and along stream channels in areas used as open space and for rural uses~~ that~~. None of these project locations are ~~not~~ within one-quarter mile of an existing or proposed school site.

d) ~~Basin Plan amendment actions could occur on sites that are included on lists of hazardous material~~ Almaden Quicksilver County Park, the site of historic mercury mining operations, is on California's "Cortese List," compiled pursuant to Government Code §-65962.5~~, such as leaky underground storage tank sites or sites where hazardous materials violations have occurred. It is possible that hazardous materials or substances may be encountered during project activities on or near these sites~~. Basin Plan amendment implementation actions will occur on this site. However, work on this site should not create a significant hazard to the public, or to the environment. The Water Board regulates such listed hazardous material sites~~ and would require mitigation to~~ . Compliance projects will be subject to review and~~/or~~ approval of the Water Board, which ~~would~~ requires implementation of routine and standard erosion control best management practices, proper construction site management, health and safety plans, monitoring, reporting, and measures such as fencing, traffic controls, dust controls during construction. Thus compliance with Water Board orders will ensure that the Basin Plan amendment ~~would~~will not create a significant hazard to the ~~public~~public or the environment.

The U.S. Army Corps of Engineers Nationwide Permit 38, Cleanup of Hazardous and Toxic Waste, covers "specific activities required to effect the containment, stabilization, or ~~the environment due to~~removal of hazardous ~~materials encountered at a listed site in the Guadalupe River watershed. Therefore, impacts from hazardous materials at listed sites would be~~ or toxic waste materials that are performed, ordered, or sponsored by a ~~less-than-significant impacts~~government agency" and requires the permittee to submit pre-construction notification to the district engineer before beginning work. Provisions in the Nationwide permit are entirely protective of public health and safety and the environment. .

e) The Basin Plan amendment does not include actions that ~~would~~will result in a safety hazard for people residing or working near a public airport or vicinity. No airports or air ~~ports or air field~~fields are located in the Guadalupe River watershed ~~and therefore would not be affected by the Basin Plan amendment and no impact would result~~.

f) The Basin Plan amendment ~~would~~will not result in construction of buildings or other~~s~~ structures that could result in safety hazards for people residing or working near a private air strip~~ and no impact would result~~.

g) Hazardous waste management activities resulting from the Basin Plan amendment ~~would~~will not interfere with any emergency response plans or emergency evacuation plans, and therefore no impacts ~~would~~will result.

h) The Basin Plan amendment ~~would~~will not affect the potential for wildland fires. Therefore ~~no impacts to wildfires would result~~people or structures will not be exposed to a significant risk of loss, injury, or death from wildland fire.

VIII. Hydrology and Water Quality

a) The project ~~would amend~~amends the Basin Plan, which articulates applicable water quality standards~~; therefore, ~~. Therefore, it ~~would~~will not violate standards or waste discharge requirements, and no adverse impacts to water quality ~~would~~will result.

b) The Basin Plan amendment ~~would~~will not ~~decrease~~deplete groundwater supplies or interfere with groundwater recharge. -No adverse impacts to groundwater recharge ~~would~~will result.

c) Specific projects involving earthmoving or construction activities could affect existing drainage patterns in mine areas. ~~However, changes to drainage networks would be localized and would be intended to isolate mining waste from surface water runoff and to reduce overall erosion. Specific projects to implement the Basin Plan amendment~~ Temporary earthmoving operations could result in short-term, limited erosion. Specific compliance projects would be subject to the review and~~/or~~ approval of the Water Board, which ~~would~~ ~~require~~requires implementation of routine and standard erosion control best management practices and proper construction site management. ~~In addition~~Changes to drainage networks will be localized and will be intended to isolate mining waste from surface water runoff and reduce overall erosion. As explained below, we do not foresee alteration of the course of a stream or river in a manner that would result in substantial soil erosion.

The Water Board's Order R2-2002-0028, *Waste Discharge Requirements and Water Quality Certification for Santa Clara Valley Water district, Multi-Year Stream Maintenance Program, Santa Clara County* sets conditions for alterations to streams or rivers in Santa Clara County below 1,000 ft. elevation, which includes most of the mining area. This order specifies standards for vegetation management, sediment removal, and bank protection and repair, and prohibits maintenance activities resulting in direct or indirect discharge of waste to surface waters or drainage courses; disposal of excavated sediment outside of designated disposal areas; and any discharge of decant water from temporary sediment stockpiles to surface waters or drainage courses. Above 1,000 ft. the County's grading ordinance applies.

Specific projects to implement the Basin Plan amendment will be reviewed and approved by the Water Board. At a minimum, future projects must comply with standard permit conditions in the U.S. Army Corps of Engineers' Nationwide Permits nos. 13 (Bank Stabilization) and 27 (Stream and Wetland Restoration Activities). USACE final approval and issuance of a permit is only valid with CWA 401 certification of the proposed activity, which is made by the Water Board. Section 401 requires the Water Board to certify that such projects comply with water quality standards, and as such, Section 401 certifications often include conditions that are more stringent than the federal requirements. Federal permit conditions require, for instance, implementation of routine and standard erosion control best management practices and proper construction site management.

Furthermore, construction projects over one acre in size ~~would~~ require a general construction National Pollutant Discharge Elimination System permit and preparation and implementation of a storm water pollution prevention plan. See the explanation for VI (b) above for erosion control permit requirements.

Therefore, the Basin Plan amendment ~~would~~will not result in substantial erosion, and its impacts ~~would~~will be less-than-significant.

d) ~~The~~ As stated in the previous response, the Basin Plan amendment ~~could~~ may involve ~~local and~~ localized, minor alteration of stream channels during removal and/or stabilization of mining waste~~. The TMDL project goals for mining waste~~ in the mining areas high in the Guadalupe River watershed. In areas downstream of the ~~mine areas are to isolate~~mines, TMDL project goals include isolating mercury-laden sediment and ~~otherwise restore~~restoring channels to pre-~~existing dimension~~mining period dimensions and flow capacity. Basin Plan amendment-related activities ~~would~~will not substantially increase impervious ~~surfaces~~surface area, or peak flow releases from dams in any part of the watershed.

Furthermore, permit conditions in the Water Board's Order R2-2002-0028, *Waste Discharge Requirements and Water Quality Certification for Santa Clara Valley Water District, Multi-Year Stream Maintenance Program, Santa Clara County*, specifically designed to prevent flooding, will apply to downstream projects.

Therefore, the Basin Plan amendment ~~would~~will not result in significant impacts related to increased flooding.

e) Basin Plan amendment-related activities are, by design, intended to decrease peak runoff rates from upland land uses, as needed to reduce sediment inputs from hillslopes and ~~to reduce~~ channel erosion. Therefore, the Basin Plan amendment ~~would~~will not increase the rate or amount of runoff or exceed the capacity of storm water drainage systems and no adverse impacts ~~would~~will occur.

f) Basin Plan amendment-related activities are intended to reduce erosion and improve water quality. -Therefore, the Basin Plan amendment ~~would~~will not degrade water quality and no adverse water quality impacts ~~would~~will occur.

g) The Basin Plan amendment does not include construction of housing. -Therefore ~~not~~ no housing ~~would~~will be placed within the 100-year flood hazard zone as a result of the proposed action. No flood hazard impacts ~~would~~will occur.

h) The Basin Plan amendment does not include construction of structures that could impede or redirect flood floes within a 100-year flood hazard zone and no adverse flooding impacts ~~would~~will occur.

i) The Basin Plan amendment does not ~~include~~require or foresee construction or modification of dams or levees or activities that ~~would~~will expose people to significant damage from dam or levee failure ~~and no adverse impacts would occur~~. Therefore no people or structures will be exposed to risk of loss, injury, or death from flooding or dam or levee failure.

j) Basin Plan amendment-related construction would occur upstream of the tidally influenced stream channel and ~~would~~will not be subject to substantial risks due to inundation by seiche, tsunami, or mudflow~~, and no impact would occur~~.

IX. Land Use and Planning

a) Basin Plan amendment-related grading would be located in open space and rural areas~~ and would be small~~. Projects will be limited in scale and ~~would~~will not divide ~~an~~ any established community. -No adverse land use impact ~~would~~will occur.

b) ~~The Basin Plan amendment would not conflict with any land use plan, policy, or regulation. Projects~~ Because projects proposed to comply with Basin Plan amendment requirements ~~would~~will be subject to local agency review~~ and would~~, they will not conflict with ~~local~~any land use plan~~s~~, policy, or ~~policies.~~regulation.

c) Because projects proposed to comply with Basin Plan amendment requirements will be subject to local agency review, they will not conflict with habitat conservation plans or natural community conservation plans. Please refer to response to IV. f) Biology. The Basin Plan amendment ~~would~~will not conflict with any habitat conservation plan or natural community conservation plan. ~~Projects proposed to comply with Basin Plan amendment requirements would be subject to local agency review and would not conflict with habitat conservation plans or natural community conservation plans, refer to response to Section IV f) Biology.~~

X. Mineral Resources

a) Basin Plan amendment-related excavation and construction ~~would~~will occur in an area that was mined for mercury from the mid 1800s to the 1970s. The mines have been closed for nearly 30 years because mercury ore that can be economically extracted has been ~~exhausted. Mining~~depleted. Therefore mining waste clean up at the site ~~would~~will not result in the loss of availability of any known mineral resources that ~~would~~could be of value to the region or the residents of the State.

b) Similarly, Basin Plan amendment-related excavation and construction ~~would~~will not be located in areas of mineral ~~resources of~~resource recovery delineated on any local ~~importance and no impact would occur~~general plan, specific plan, or other land use plan.

XI. Noise

a) Earthmoving and construction could temporarily generate noise. -Projects proposed to comply with requirements derived from the Basin Plan amendment ~~would~~will be required to be consistent with the local agencies' own standards.

b) ~~To~~ Future projects designed to comply with requirements derived from the Basin Plan amendment, ~~specific projects involving~~which involve earthmoving or construction, ~~which~~ could result in temporary ground-borne vibration or noise~~, are reasonably foreseeable~~. The Santa Clara County Noise Ordinance ~~has established~~ sets specific limits ~~to~~ on exterior noise; ~~these limits vary~~varying depending on land use and ~~range~~ranging from 45 ~~decibel~~decibels for low--density residential areas to 75 decibels for heavy industrial areas. ~~In addition,~~ The ordinance limits noise-generating activities ~~would be limited~~ to the hours between 7:00 a.m. and 7:00 p.m~~.~~ Monday through Saturdays ~~with~~; no activities that could create a noise disturbance permitted on ~~Sunday~~Sundays or holidays. Basin Plan amendment-related grading ~~would~~activities will be required to comply with ~~these~~all local ordinances to keep noise levels to less-than-significant levels. Therefore, the Basin Plan amendment ~~would not result in substantial noise, and its impacts would be less-than-significant~~will not result in excessive groundborne vibration or groundborne noise levels.

c) The Basin Plan amendment ~~would~~will not cause any permanent increase in ambient noise levels. Any noise ~~would~~will be short-term in nature ~~and no significant impacts would occur~~. Therefore ambient noise impacts will be less than significant.

d) To comply with requirements derived from the Basin Plan amendment, specific projects involving earthmoving or construction, which could result in temporary noise impacts, are reasonably foreseeable. -Noise-generating operations ~~would, however, have to~~ must comply with local noise ordinances, as described in ~~Section XI~~ XI (b), above. ~~Therefore,~~Compliance with local ordinances assures us that the Basin Plan amendment ~~would not result in substantial noise impacts, and its impacts would be less-than-significant.~~ will not result in substantial temporary or periodic increases in noise levels in the project vicinity.

e) San Jose International Airport is located in the downstream portion of the Guadalupe River watershed. -The airport is protected by flood protection levees~~,~~ that are part of the lower Guadalupe River Flood Control Project~~, and no~~. No additional mercury mining waste clean up actions would occur in the vicinity. ~~In addition the Bain~~The Basin Plan amendment ~~would~~will not ~~result in increased population in~~subject people living or working within two miles of the ~~watershed and no impacts from~~ airport ~~noise exposure to residents or workers would result~~to excessive noise levels.

f) The Guadalupe River watershed does not contain any private airports and no impacts ~~would~~will result from airport-generated excessive noise.

XII. Population and Housing

a) The Basin Plan amendment ~~would~~will not result in population growth in the Guadalupe River watershed. ~~It would not induce growth through such means as constructing~~No new ~~housing or~~ homes, businesses, ~~or by extending~~ roads, ~~or~~or other infrastructure~~, and no impacts would occur~~ are reasonably foreseeable consequences of compliance with the amendment.

b) The Basin Plan amendment ~~would not~~could affect ~~the population of the Guadalupe River watershed. It would~~private property in populated areas of the watershed, but it will not displace any ~~existing~~ housing or ~~any people that would need~~necessitate construction of replacement housing~~, and no address housing impacts would occur~~ elsewhere.

c) The Basin Plan amendment ~~would not affect the housing, would~~will not displace ~~people~~any residents of the Guadalupe River watershed, or create a need for the construction of replacement housing and no impacts ~~would~~will occur.

XIII. Public Services

a) The Basin Plan amendment ~~would~~will not ~~affect populations or involve~~ lead to construction or remodeling of ~~substantial new~~ government facilities~~. The Basin Plan amendment would not affect~~, or have any impacts on service ratios, response times~~,~~ or any other ~~performance objectives for any~~ aspect of public services~~, including~~ such as fire protection, police protection, schools, or parks, and no adverse impacts to public services ~~would~~will result.

XIV. Recreation

a) The Basin Plan amendment could result in temporary closure of portions of Almaden Quicksilver County Park (New Almaden Mining District), Santa Teresa County Park (Bernal mine), open space (Santa Teresa mine), and quarry operations (Hillsdale mine) during mining waste characterization and clean up. These short term closures could result in increased numbers of visitors to other portions of the parks or quarry, or perhaps, to other parks and open space destinations in the vicinity. However, any such park-use displacement will be temporary, and the project ~~would~~will not result in substantial physical deterioration of park, recreation or quarry facilities. Potential changes in recreational use patterns are expected to cause less than significant impacts on the environment. No recreational facilities ~~would~~will need to be constructed or expanded.

b) The Basin Plan amendment could result in mining waste cleanup activities that could result in changes in recreational use patterns. These changes ~~would~~will not result in ~~the need for~~ construction ~~of~~ or expansion of recreational facilities that could have an adverse affect on the environment. Any short-term changes ~~would~~will be less- than- significant.

XV. Transportation / Traffic

a) To comply with requirements derived from the Basin Plan amendment some ~~removal~~hauling of mining waste from future work sites could occur. -Mining waste ~~would~~will be removed from potentially extensive areas of the mined lands, and from limited areas in downstream creek channels. This material may be loaded onto trucks and hauled to an appropriate disposal site. This activity ~~would~~ could contribute to short term, local increases in traffic during cleanup operations. Roads in the vicinity of proposed cleanup locations are narrow rural roads and an increase in truck traffic could result in congestion at intersections and impact safety. Compliance with County traffic regulations, established truck haul routes and weight limits ~~would~~will limit these temporary transportation impacts to a less-than-significant level.

b) Because the Basin Plan amendment ~~would~~will not increase population or provide employment, it ~~would~~will not generate any ongoing motor vehicle trips and ~~would~~will not affect level of service standards established by the county congestion management agency. Therefore, the Basin Plan amendment ~~would~~will not result in significant impacts.

c) The Basin Plan amendment ~~would~~will not affect air traffic and no impacts are anticipated.

d) The Basin Plan amendment does not include provisions for the construction of new roads or modifications to existing roads, and no new hazards ~~to the design of engineering of~~in the road network in the Guadalupe River watershed ~~would~~will occur. ~~No road design or construction hazards would occur.~~

e) The Basin Plan amendment ~~would~~will result in grading and erosion control actions on unpaved roads that are not typically used for emergency access. Therefore, the project ~~would~~will not result in inadequate emergency access and on impacts ~~would~~will occur.

f) Because the Basin Plan amendment ~~would~~will not increase population or provide employment, it ~~would~~will not affect parking demand or supply, and no impacts ~~would~~will occur.

g) Because the Basin Plan amendment ~~would~~will not generate ongoing motor vehicle trips, it ~~would~~will not conflict with adopted policies, plans, or programs supporting alternative transportation.

XVI. Utilities and Service Systems

a) The project ~~would amend~~amends the Basin Plan, which is the basis for wastewater treatment requirements to improve water quality and the environment in the Bay Area~~; therefore,~~. Therefore the Basin Plan amendment ~~would~~will be consistent with such requirements.

b) The Basin Plan amendment does not include changes to wastewater treatment facilities, therefore no impacts ~~would~~will occur.

c) ~~The Basin Plan amendment would not result in~~C~~c~~onstruction of any new ~~municipal~~ storm drainage system or expansion of existing facilities as a result of the Basin Plan amendment project is speculative at this time. Local drainage improvements could be included as erosion control measures at historic mine sites but these features ~~would not~~are unlikely to be connected to municipal storm drainage systems, and in any case will be subject to future regulatory review and permitting. ~~and would not cause significant adverse environmental effects.~~

d) Because the Basin Plan amendment ~~would~~will not increase population or provide employment, it ~~would~~will not require an ongoing water supply. It ~~would~~will also not require ongoing wastewater treatment services.

e) Because the Basin Plan amendment ~~would~~will not increase population or provide employment, it ~~would~~will not require an ongoing water supply. It ~~would~~will also not require ongoing wastewater treatment services.

f) Basin Plan amendment implementation ~~would~~will not generate solid waste other than the relatively small portion of mining waste that might be off-hauled. Mining waste ~~would~~will be transported to a Class I or II landfill with adequate capacity to receive the waste. Mining waste is not expected to be -disposed of at a local Class III landfill facility and the Basin Plan amendment ~~would~~will not generate a long-term waste stream or substantially affect municipal solid waste generation or landfill capacities.

g) Basin Plan amendment implementation ~~would~~will comply with all federal, state, and local statutes and regulations related to soil waste disposal.

XVII. Mandatory Findings of Significance

a) ~~Taken as a whole,~~As discussed in the explanations for Section IV Biological Resources above, while the Basin Plan amendment ~~would not degrade the quality of the environment. The proposed Basin Plan amendment~~ is ~~intended~~designed to benefit, enhance, restore and protect biological resources, including fish, wildlife, and rare and endangered species, it is possible that specific mining waste cleanup or creek stabilization projects required for compliance and involving earthmoving activities and landscape modifications could affect sensitive or special status species, either directly or through habitat modifications. However, substantial, existing, and adequate protections are afforded by the Water Board's Order R2-2002-0028; by the U.S. Army Corps of Engineers nationwide permits; by requirements in the County of Santa Clara's comprehensive grading ordinance, and by permit requirements and project oversight provided by state and federal environmental protection agencies.

The Basin Plan amendment will not degrade the quality of the environment. It is designed specifically to benefit fish and wildlife species by decreasing the amount of mercury in sediment, water and fish tissue, both in the Guadalupe River watershed and the San Francisco Bay~~.~~, and to enhance, restore and protect habitat in the watershed.

The Water Board's adaptive management approach to implementation provides additional safeguards and guarantees that future implementation of the Basin Plan amendment will be carried out in ways that enhances, and does not degrade, the quality of the environment in the Guadalupe River watershed.

For all of these reasons, we find that the project does not have the potential to degrade the quality of the environment, substantially reduce habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal.

b) This Basin Plan amendment is specifically designed to restore natural conditions and enhance habitat values in the Guadalupe River watershed. As discussed above, the Basin Plan amendment could pose some less-than-significant adverse environmental impacts related to earthmoving and construction operations. These impacts would be individually limited, and most would be of short-term duration. It is not anticipated that the construction and restoration activities associated with the proposed amendment would combine with other planned restoration projects to result in cumulatively considerable impacts. In part, this is due to the phased and adaptive nature of the implementation plan. As specific implementation

~~proposals~~projects are developed and proposed, they ~~would~~ will be subject to ~~review and/or~~ approval by the Water Board, which would either disapprove projects with significant and unacceptable impacts or require mitigation measures, such as ~~the~~ implementation of best construction management practices, to ensure that impacts remain less-than-significant. ~~Therefore, these future projects would not lead to cumulatively considerable significant impacts. Additionally, the proposed Basin Plan amendment when viewed in connection with the effects of past, current, and probably future mining waste cleanup projects would not result in cumulatively considerable impacts.~~

c) The Basin Plan amendment ~~would~~will not cause any substantial adverse effects to human beings, either directly or indirectly. The ~~Basin Plan amendment is intended to benefit human beings through~~ amendment's purpose is to restore beneficial uses in the watershed by minimizing mercury in the environment. Human beings should benefit directly from implementation of actions ~~predicted to enhance~~designed to enhance healthy fish populations~~,~~; aesthetic attributes, and recreational opportunities~~, and contribute to a reduction in property damage in and/or nearby to stream channels in the Guadalupe River watershed.~~

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10.~~6~~4.3 ANALYSIS OF POTENTIAL CUMULATIVE IMPACTS

~~This section provides an analysis of potential cumulative impacts of the proposed basin plan amendment (CEQA Guidelines § 15130). As defined by the statute, "cumulative impacts" refers to "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."~~

~~In other words, a cumulative impact is a change in the environment that results from the incremental impact of the project when added to the impacts of other, closely related, past, present, and reasonably foreseeable future projects. In the case of the Guadalupe River watershed mercury TMDL project, such other closely related projects are those that could result in increased mining waste in water bodies, or in environmental changes that could affect conversion of mercury to its highly toxic form, methylmercury.~~

As indicated in ~~response to checklist~~the explanations for our responses to Mandatory Findings of Significance questions above, adoption of the Basin Plan amendment ~~would~~will not result in significant adverse cumulative impacts~~.~~ to the Guadalupe River watershed environment.

This section provides the rationale for our determination of less-than-significant cumulative impacts, per (CEQA Guidelines §15130). As defined in Guidelines §15130(a)(1), "a cumulative impact consists of an impact which is created as a result of the combination of the project…together with other projects causing related impacts." In the case of the Guadalupe River watershed mercury TMDL project, such other closely related projects would be those that could result in increased mining waste in water bodies, or in environmental changes that could affect conversion of mercury to its highly toxic form, methylmercury.

Past, present, and reasonably foreseeable future projects that could have environmental impacts similar to those of the ~~basin plan~~Basin Plan amendment project are identified in Table 10.1, below. These include projects ~~that would involve~~ involving earth moving and construction activities in soils with elevated mercury concentrations, such as construction grading associated with mining waste cleanup~~,~~ and disturbance of in-channel sediments~~, which may involve major construction grading in mining waste areas. We have also included~~; reservoir management plans and habitat conservations plans that could include actions affecting mercury concentrations in soil and water and the attainment of TMDL targets in the Guadalupe River watershed~~. In addition to considering such projects, we have included an analysis of impacts of~~ ; and adoption of ~~other TMDLs in the watershed. This analysis considers~~a future region-wide TMDL for mercury in reservoirs. Table 10.1 is limited to projects located in the portion of the Guadalupe River watershed covered by the proposed Basin Plan amendment (i.e., all waters in the Guadalupe River watershed except Los Gatos Creek and its tributaries upstream of Vasona Dam, Lake Elsman, Lexington Reservoir, and Vasona Lake).

All of these projects are specifically designed to eliminate mercury discharges to the waters of the Guadalupe River watershed as they improve habitat values. Many involve short-term construction in or near waters of the watershed, and all must comply with CEQA, which requires mitigation of any environmental effects. For these reasons, and because the Basin Plan amendment project will not in of itself create significant impacts, there will be no cumulative impacts attributable to this project.

Table 10.1 Projects Considered in the Cumulative Environmental Impact Analysis

Project	Status*	Project Sponsor
Mining waste remediation in Almaden Quicksilver County Park: • Mine Hill • Hacienda Furnace Yard • West bank of Alamitos Creek in the vicinity of Hacienda Furnace Yard • Senador mine • Enriquita mine • San Mateo mine	C	Santa Clara County Parks Department, under DTSC order
7,000 linear feet of Guadalupe Creek restored and mining waste removed, as mitigation for the Downtown Guadalupe River Flood Control ~~Projectt~~Project	C	Santa Clara Valley Water District
Lower Guadalupe River Flood Control Project (reduce mining waste in the stream channel)	C	Santa Clara Valley Water District
Alamitos Creek Restoration under 319(h) Grant	C	Santa Clara Valley Water District
Stream Maintenance Program (below 1,000 ft. elevation)	O	Santa Clara Valley Water District
Mining waste remediation in Almaden Quicksilver County Park: • 150-foot reach of Alamitos Creek at Hacienda Furnace Yard • 300-foot reach of Deep Gulch Creek • 2 areas in Jacques Gulch	P	Santa Clara County Parks Department, Natural Resources Damages Assessment settlement with U.S. FWS
Upper Guadalupe River Flood Control Project (reduce mining waste in the stream channel)	P	Santa Clara Valley Water District
Santa Clara Valley Habitat Conservation Plan	F	Santa Clara County and partners
Fish Habitat Management Plan (for the Guadalupe River and Coyote and Stevens creeks)	F	Santa Clara Valley Water District
San Francisco Bay Region Reservoir Mercury TMDL	F	Water Board

* C=Completed, O=On-going, P=Proposed and Funded, F=reasonably foreseeable future

In accordance with CEQA, this analysis does not include a discussion of impacts that do not result in part from the proposed Basin Plan amendment. Environmental impacts identified as "no impact" in the environmental checklist are not evaluated in this cumulative analysis because they would make no contribution to potentially cumulative future impacts. However, actions associated with improving water quality through the TMDL project, if occurring contemporaneously with other construction projects, could contribute to temporary cumulative negative impacts to air quality, cultural resources, biological resources, and traffic. Such potential cumulative effects are discussed below.

Air Quality

BAAQMD CEQA Guidelines state that if a project is found not to individually cause significant impacts to air quality, cumulative impacts should be determined based on an evaluation of the project's consistency with applicable General Plans and whether or would effect conformance of the General Plan with the regional air quality plan. The proposed Basin Plan amendment is located in Santa Clara County and the City of San Jose. Reasonably foreseeable compliance measures would not affect the conformance of either the City or County General Plan with the most recent regional air quality plan (the *Bay Area '00 Clean Air Plan*) because it would not result in an operational activity that would increase emissions in the area (such as contribute to the increase in population or long-term increase in vehicular traffic). Therefore, the proposed Basin Plan amendment would not result in cumulative impacts to regional air quality.

Biological Resources

Reasonably foreseeable compliance measures to reduce mining waste in mine areas and in creeks and rivers downstream of mine areas could affect riparian and wetland resources. Potential local impacts to biological resources would be mitigated by the standard requirements of Clean Water Act Section 401 water quality certifications, which require mitigation of temporary impacts to sensitive wetlands, as well as monitoring and reporting that ensure site vegetation and habitat restoration. Compliance with permit conditions of the Water Board, the California Department of Fish and Game, and U.S. Fish and Wildlife Service would prevent cumulative biological impacts from occurring.

Cultural Resources

As indicated in the environmental analysis, above, Santa Clara County adheres to rigorous historic preservation protocols for areas in Almaden Quicksilver County Park (in the New Almaden Mining District) (a registered National Historic Landmark). Santa Clara County has also adopted policies for archeological resource identification, protection, and mitigation procedures that will ensure protection of these resources on public lands in the watershed. The Santa Clara Valley Water District conducts stream maintenance activities, including minor creek restoration projects, under their Master Maintenance Plan and with mitigation measures specified in the Environmental Impact Report for the Stream Maintenance Plan. These laws, regulations and standard field procedures will prevent cumulative impacts on cultural resources in and near creeks and rivers downstream of the mine areas.

Hydrology and Water Quality

Implementation of the Guadalupe River watershed mercury TMDL project is expected to result in long-term improvement in water quality by reducing mercury mining waste in water bodies and reducing methylmercury concentrations in reservoirs and lakes. The Water Board will in the future develop ~~a~~ region-wide mercury TMDL for reservoirs, in order to further reduce mercury concentrations in reservoirs throughout the Bay Area. The reservoirs TMDL will focus on reducing mercury impairment from the atmospheric deposition source. The cumulative effect of other TMDL programs and implementation efforts will be to reduce mercury concentrations in the long term to background levels appropriate to the Coast Range geology. These projects will be designed to meet Clean Water Act requirements. They should result in long-term improvements in water quality.

10.~~7~~4.4 ANALYSIS OF ALTERNATIVES TO THE PROJECT

Our analysis includes the following alternatives:

1. No action/no Basin Plan amendment
2. Extend implementation over a longer period
3. Adopt U.S. EPA's methylmercury criterion
4. Adopt allocations different from those proposed in this Staff Report

In defining and presenting reasonable alternatives to the proposed Basin Plan amendment, we discuss how each alternative could affect foreseeable environmental outcomes, and the extent to which each alternative would achieve the project objectives. ~~Our analysis includes the following alternatives: (1) No Action/No Basin Plan Amendment; (2) extending the implementation period over a longer timeframe; (3) adoption of U.S. EPA's methylmercury criterion; and (4) Adopt Allocations Other than the Recommended Allocations. In addition to these, we also discuss briefly below two alternatives that we considered and rejected during the project scoping phase, and three alternative regulatory approaches that we similarly rejected.~~

A discussion of the preferred alternative, the Proposed Basin Plan amendment, is provided ~~a~~ at the end of ~~this section~~the alternatives discussion.

~~ALTERNATIVE REGULATORY APPROACHES, CONSIDERED AND REJECTED~~

~~Use Attainability Analysis (UAA)~~

~~Under this alternative, the Water Board would undertake a use attainability analysis (UAA) rather than a TMDL, as allowed by 40 CFR 131.10(g)(1-6). The four types of situations in which a UAA may be~~ In addition, we briefly discuss three alternative regulatory approaches, which we considered and rejected.

In order to be considered ~~are:~~

~~(1) When a waterbody is considered impaired but the use appears to be inappropriate or the use does not exist~~

~~(2) When adopting subcategories of a use that require less stringent criteria~~

~~(3) When the use does not appear to be attainable~~

~~(4) When meeting the use would likely result in substantial and widespread economic and social impact (40 CFR 131.10(g)).~~

~~The third condition may apply to mercury in the Guadalupe River watershed, if methylmercury production and bioaccumulation cannot be adequately controlled. However, it is not presently possible to determine whether this is the case. The Water Board or regulated entities may decide to pursue a UAA in the future, after erosion of mercury mining waste is controlled and methylmercury experiments (see Section 9) are completed. However, a UAA cannot be justified at this time.~~

~~Site Specific Objectives~~

~~An action to set a site-specific objective (SSO) modifies a water quality objective to address local conditions. An SSO~~under the requirements of the California Environmental Quality Act (CEQA), alternatives must ~~be set at a level that will protect all beneficial uses. SSOs for mercury are not appropriate for the Guadalupe River watershed because the proposed fish tissue~~ "feasibly attain most of the basic objectives ~~are based on a methylmercury reference dose – not on local conditions.~~ of the project but…avoid or substantially lessen any of the significant effects of the project" (CEQA Guidelines §15126.6(a)). Similarly, in §15126.6(b) the Guidelines interpret Public Resources Code §21002.1 as follows: "the discussion of alternatives shall focus on alternatives to the project…which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly."

~~Single Permitting Action~~

~~Similarly, a single-permitting action is not possible to resolve the mercury problem in the Guadalupe River watershed. The permits and orders appropriate to the mine sites differ substantially from the permits and orders appropriate to methylmercury production in lakes and reservoirs, and to cleanup of creek beds, banks, and floodplains.~~

~~Allocations Other than the Recommended Allocations~~

As stated in Section 2.2 of this Staff Report, the objectives of the Basin Plan amendment are as follows:

The proposed Basin Plan Amendment is intended to reduce existing and future mercury discharges to, and methylmercury production in, waters of the Guadalupe River watershed and San Francisco Bay. Specific objectives of the project are as follows:

- *Revise mercury water quality objectives to reflect current scientific information and the latest U.S. EPA and U.S. Fish and Wildlife Service guidance*
- *Restore and protect beneficial uses in waters of the Guadalupe River watershed by attaining TMDL numeric targets and water quality standards while maintaining—enhancing where possible—habitat for wildlife*
- *Restore and protect downstream beneficial uses by reducing mercury discharges to San Francisco Bay from legacy and urban stormwater runoff sources*

- *Favor implementation actions with multiple benefits; phase implementation to control upstream sources before downstream sources are addressed and while methylmercury controls are being developed*
- *Implement effective source control measures for mining waste at mine sites and in downstream depositional areas*
- *Complete studies of methylmercury and bioaccumulation controls in reservoirs and lakes, and implement effective controls*
- *Achieve the legacy mercury and urban stormwater runoff mercury load allocations assigned to the Guadalupe River watershed by the San Francisco Bay mercury TMDL*
- *Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards; Avoid actions that will have unreasonable costs relative to their environmental benefits*
- *Comply with the Clean Water Act requirements to adopt TMDLs for 303(d) listed water bodies and comply with the State Water Board's directive to integrate the Bay and Guadalupe mercury TMDLs*
- *Consider site-specific factors relating to mercury sources and methylmercury production, ambient conditions, watershed characteristics, and response to management actions; Avoid arbitrary decisions and speculation when computing loads, setting targets, setting allocations, determining implementation actions, and defining a margin of safety*
- *Establish allocations based on the goals of (a) eliminating inputs of mercury caused by anthropogenic activities, particularly mining and urban stormwater runoff, and (b) minimizing the transformation of mercury to methylmercury caused by anthropogenic activities, particularly the construction and operation of reservoirs, lakes and shallow impoundments*
- *Provide details of an implementation plan that includes: a description of the nature of actions necessary to meet allocations and targets and thereby achieve water quality standards; a schedule for actions to be taken; and a description of monitoring to be undertaken to determine progress toward meeting allocations, targets and water quality objectives*
- *~~Complete implementation of~~Attain the TMDL targets in as short a time as ~~is~~ feasible, and no longer than 20 years*
- *Base decisions on readily available information on ambient conditions, loads, fish consumption patterns, and fate and effects; Establish a decision-making framework where management actions adapt to future knowledge or conditions*
- *Correct an error made during the 2005 Basin Planning process, in which the reference to the Guadalupe River was inadvertently removed and replaced with a reference to the Guadalupe Reservoir in Table 2-1, Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region. Include the Guadalupe River's beneficial uses, as shown in the 1986 Basin Plan: Cold*

Freshwater Habitat (COLD), Fish Migration (MIGR) (potential), Fish Spawning (SPWN) (potential), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC1) (potential); and Noncontact Water Recreation (REC2).

Alternative 1: No action/no Basin Plan Amendment (No Project Alternative)

Under this alternative, which CEQA requires us to evaluate, the Water Board would not amend the Basin Plan to adopt new water quality objectives or the proposed mercury TMDLs, targets, or allocations. Nonetheless, some new implementation activities might be initiated under existing Water Board authority. For example, the Water Board could issue cleanup and abatement orders for mine sites in the absence of a TMDL project. However, if no or few actions were taken to address mercury impairment in Los Alamitos Creek or in reservoirs, mercury concentrations would likely either stay the same or decrease over a much longer timeframe (perhaps many hundreds of years; see Section 7.7, Water Quality Standards Attainment), due to continued discharge of mercury presently stored in the watershed and continued methylation in reservoirs, lakes, and shallow impoundments.

Should the Water Board decline to adopt the mercury TMDLs, the Clean Water Act requires the U.S. Environmental Protection Agency (U.S. EPA) to undertake a TMDL project for the Guadalupe River watershed due to the CWA 303(d) listing of the Guadalupe River as impaired by mercury.. How a U.S. EPA TMDL project would differ from the TMDL project described in the Basin Plan amendment is unknown. The federal agency would identify targets and allocate mercury loads, which the Water Board would be required to incorporate into the Basin Plan along with appropriate implementation.

Under the no-project alternative, TMDL implementation would likely be delayed for an unknown period of time. Negative impacts associated with this alternative are greater than with the proposed project because implementation actions would be delayed while mercury discharges and methylation continue. For this reason, and because U.S. EPA's TMDL development process does not include the California Environmental Quality Act's mandates for public participation, we reject this alternative.

Alternative 2: Extend Implementation Over a Longer Period

Under this alternative, mercury allocations to sources would be phased in over a longer period of time than the twenty years proposed in the Basin Plan amendment. Most of the project objectives would be met, although attainment of the designated beneficial uses would be postponed, and wildlife and public health would remain in jeopardy for a longer period.

As studies and early implementation actions progress and we engage in our adaptive implementation process, it may become necessary to extend the implementation timeframe for the Guadalupe River watershed mercury TMDL project. At this time, however, we believe the ten year period of Phase I is a reasonable timeframe for mine site remediation and studies of the extent of calcine deposits in creeks to be completed, and for methylmercury control technology in reservoirs to be tested and evaluated. Because we recognize no current reasons to extend the implementation timeframe, and because doing so would not meet the project objective to "complete implementation of the TMDL in as short a time as is feasible and no longer than 20 years," we reject this alternative.

Alternative 3: Adopt U.S. EPA's Methylmercury Criterion

Under this alternative, the Water Board would adopt a single fish tissue target, equal to the U.S. EPA fish tissue criterion of 0.3 mg methylmercury per kg fish tissue. This alternative would meet most of the objectives of the Basin Plan amendment.

U.S. EPA intends its criterion to protect humans who consume fish. We believe this criterion may not protect wildlife, such as osprey, because pound-for-pound, piscivorous wildlife eats more fish than humans (see Section 5). It is therefore less protective of the beneficial uses of the Guadalupe River watershed than the water quality objectives and TMDL targets in the Basin Plan amendment.

The California Toxics Rule (CTR) water column value for mercury, 0.050 µg/l (30-day average), shares EPA's intent to protect humans who eat fish. The State Water Resources Control Board is in the process of developing a statewide mercury standard that would update the CTR value, consistent with the method used to develop EPA's criterion and likely based on California-specific fish consumption rates. The Basin Plan amendment recognizes this effort; the Water Board may consider adopting the new statewide standard when it is established. Undertaking a separate standards action at this time to address human health would be an inefficient use of Regional Water Board staff resources.

Because impacts associated with this alternative are greater than the proposed project, we reject this alternative.

Alternative 4: Adopt Allocations different from those proposed in this Staff Report

Under this alternative, the Water Board would adopt allocations other than those recommended and listed in Table 8.1. We considered alternative allocations for mining waste (see Section 8.1) and in reservoirs and lakes (see Section 8.2). In Table 10.2 we summarize the alternative allocations we considered but rejected.

Table 10.2 Alternative Allocations		
Source Category	**Rejected Allocations**	**Basis of Recommended Allocations**
Mining Waste	Mass loads Pre-mining surface soil mercury concentrations Mineralized zone perimeter sediment mercury concentrations	Reference Reservoir San Francisco Bay mercury TMDL
Methylmercury in reservoirs and lakes	Total or dissolved total mercury Methylmercury allocations based on: National default data Annual average concentrations Depth-averaged data Dissolved methylmercury	Methylmercury toxicity Methylmercury allocations based on: Site-specific data Seasonal peak concentrations Depth-specific (hypolimnion) data Total methylmercury

We rejected these allocations for the reasons provided in Sections 8.1 and 8.2, including lack of data to support the alternatives, more costly monitoring that would divert funding away from implementation actions, more precise focus on methylmercury that accumulates seasonally in the hypolimnion, and to protect consumers of benthic organisms as well as consumers of fish.

~~ALTERNATIVES CONSIDERED DURING PROJECT DEVELOPMENT~~

~~Alternative 1: No Basin Plan Amendment (No Project Alternative)~~

~~Under this alternative, the Water Board would not amend the Basin Plan to adopt new water quality objectives and the proposed mercury TMDLs. Neither the proposed targets nor the proposed allocations would be adopted. Nonetheless, some new implementation activities might be initiated under existing Water Board authority. For example, Cleanup and Abatement Orders could be issued for mine sites even in the absence of a TMDL project. If no or few actions were taken to address the mercury impairment, mercury concentrations would likely either stay the same or decrease over a much longer timeframe (perhaps many hundreds of years; see Section 7.7, Water Quality Standards Attainment), due to continued discharge of mercury presently stored in the watershed and continued methylation in reservoirs, lakes, and shallow impoundments.~~

~~Should the Water Board decline to adopt the mercury TMDLs, the Clean Water Act requires the U.S. Environmental Protection Agency (U.S. EPA) to complete a TMDL project for the Guadalupe River watershed (because of the mercury impairment). How U.S. EPA's TMDL project might differ from the TMDL project described in the proposed Basin Plan amendment is unknown. U.S. EPA would likely rely, at least in part,~~

~~on analyses completed to date; however, U.S. EPA would be free to develop its own TMDL project in any manner it deemed appropriate, within legal constraints. U.S. EPA would identify targets and allocate mercury loads, and the Water Board would be expected to incorporate U.S. EPA's TMDL project and appropriate implementation actions into the Basin Plan through the continuing planning process.~~

~~Under this no-project alternative TMDL implementation would likely be delayed for an unknown period of time. Negative impacts associated with this alternative are greater than with the proposed project because implementation actions would be delayed while mercury discharges and methylation continue. For this reason, we reject this alternative.~~

~~Alternative 2: Extend Implementation Over a Longer Period~~

~~Under this alternative, the allocations would be phased in over a longer period of time than the twenty years proposed in the Basin Plan amendment. Attainment of the designated beneficial uses would be postponed, keeping wildlife and public health in jeopardy for a longer period.~~

~~At a future point it time, it may become necessary to extend the implementation timeframe for the Guadalupe River watershed mercury TMDL project. This is because we are relying on innovation to control methylmercury. However, at this time, ten years is a reasonable timeframe for these controls to be developed and tested. There are no current reasons to extend the implementation timeframe, and because it would not meet the project objective to "complete implementation of the TMDL in as short a time as is feasible and no longer than 20 years", we reject this alternative.~~

~~Alternative 3: Adopt U.S. EPA's Methylmercury Criterion~~

~~Under this alternative, the Water Board would adopt a single fish tissue target, equal to the U.S. EPA fish tissue criterion of 0.3 mg methylmercury per kg fish tissue. U.S. EPA intends this criterion to protect humans who consume fish. The California Toxics Rule (CTR) water column value for mercury, 0.050 µg/l (30-day average), has the same intent. The State Water Resources Control Board is in the process of developing a statewide mercury standard that would update or replace the CTR value. This new standard will be consistent with the method used to develop EPA's criterion and EPA guidance, and will likely be based on California-specific fish consumption rates. The proposed Basin Plan amendment recognizes this effort and will be revised when this statewide standard is established. Undertaking a separate standards action at this time to address human health would be an inefficient use of Regional Water Board staff resources.~~

~~In addition, EPA's fish tissue methylmercury criterion may not protect wildlife, such as osprey, because pound-for-pound, piscivorous wildlife eats more fish than humans (see Section 5). It is therefore less protective than the water quality objectives and TMDL targets we propose in this TMDL project. Therefore, impacts associated with this alternative are greater than the proposed project because wildlife would not be fully protected.~~

Preferred Alternative: The Proposed Basin Plan Amendment

Because the proposed Basin Plan amendment will not pose any significant adverse environmental impacts, the alternatives would not avoid or lessen any significant impacts. None of the three alternatives achieves all of the ~~goal~~goals of the TMDL project, which ~~is to establish and maintain~~include establishing environmental conditions that will result in attainment of beneficial uses in the Guadalupe River watershed, within 20 years. The three alternatives are neither considered to be environmentally superior nor will they have fewer negative impacts than the Basin Plan amendment. The proposed Basin Plan amendment is the preferred project.

ALTERNATIVE REGULATORY APPROACHES, CONSIDERED AND REJECTED

Undertake a Use Attainability Analysis Instead of a TMDL

Beneficial uses of the Guadalupe River watershed that are impaired by mercury are human consumption of fish, and wildlife consumption of fish. (See Section 2.4 of this Staff Report.)

As allowed by 40 CFR 131.10~~.8~~(g)(1-6). the Water Board may undertake a “use attainability analysis,” (i.e., remove a beneficial use from the Basin Plan), rather than a TMDL, in certain types of situations, including:

(1) Naturally occurring pollutant concentrations prevent the attainment of the use (g)(1)

(2) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place (g)(3)

(3) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use (g)(4)

~~(4) When meeting the use would likely result in substantial and widespread economic and social impact (40 CFR 131.10(g)).~~

The third condition may apply to mercury in the Guadalupe River watershed, if methylmercury production in reservoirs, and bioaccumulation in the watershed’s wildlife, cannot be adequately controlled. However, it is not presently possible to determine whether this is the case. In the course of the Water Board’s adaptive implementation process, the Board or regulated entities may decide to review beneficial uses in the future, after erosion of mercury mining waste is controlled and methylmercury experiments (see Section 9) are completed. However, a UAA cannot be justified at this time.

Set Site Specific Objectives for Mercury in the Guadalupe River watershed

An action to set a site-specific objective modifies a regional water quality objective to address local conditions. Such an objective must be set at a level that will protect all beneficial uses in the watershed or waterbody. Site-specific objectives for mercury are not appropriate for the Guadalupe River watershed because the proposed fish tissue objectives are based on a methylmercury reference dose—not on local conditions.

Cover the Guadalupe River Watershed in a Single Permitting Action

Similarly, a single permitting action would not resolve the mercury problem in the Guadalupe River watershed. Permits and orders appropriate to mine site cleanup would differ substantially from permits and orders that would be issued to reduce methylmercury production in lakes and reservoirs, and those required to guide to clean up creek beds, banks, and floodplains.

10.5 Economic Considerations

Set forth in this section are economic considerations required in the above-referenced laws. While economics are an important consideration, it is worth noting that when adopting the Porter-Cologne Act, the Legislature declared that all values of the water should be considered, but then went on to provide only broad, non-specific direction for considering economics in the regulation of water quality.

> "The Legislature further finds and declares that activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible" (CWC §13000).

The Porter-Cologne Act directs regulatory agencies to pursue the highest water quality that is reasonable, and one of the factors used to determine what is reasonable is economics. It is clear, though, that economic factors cannot be used to justify a result that would be inconsistent with the federal Clean Water Act or the Porter-Cologne Act. The Water Board is obligated to restore and protect water quality and beneficial uses.

These proposed water quality objectives and TMDLs require implementation and monitoring (compliance) actions for mercury mining waste at mine sites and in depositional areas, and methylmercury production in reservoirs and lakes. The reasonably foreseeable methods of compliance with the proposed Basin Plan amendment vary by mercury source. For mercury mining waste present at mine sites and accumulated in downstream depositional areas, the reasonably foreseeable methods of compliance consist primarily of erosion control, effectiveness monitoring, and coordinated watershed monitoring. For Guadalupe, Almaden, and Calero reservoirs, and Lake Almaden, the reasonably foreseeable methods of compliance consist of developing, testing, and deploying methylmercury controls, such as solar-powered circulators, and coordinated watershed monitoring. For urban stormwater runoff, the reasonably foreseeable methods of compliance consist of coordinated watershed monitoring.

The proposed water quality objectives and TMDLs implementation costs are estimated for these source categories for each of the proposed implementation actions contained in the Basin Plan amendment. We provide an upper and lower range of cost estimates since there is uncertainty about the exact costs given our lack of knowledge on the extent of mercury mining waste in the watershed and developmental state of water column methylmercury controls. In many cases, the particular elements of the implementation action are required to be developed at a future time, and therefore, the specifics are unknown. Cost estimates are projected for the 20-years of phased implementation planned for in this TMDL project. Costs of implementing existing requirements are not included.

IMPLEMENTATION ACTIONS FOR MERCURY MINES

The proposed Basin Plan amendment requires that responsible parties (see Section 9.3) control erosion of mercury mining waste from the New Almaden Mining District, and the Santa Teresa, Bernal, and Hillsdale Mercury Mines, and conduct monitoring. Implementation actions to prevent further erosion of mercury mining waste by stabilizing and vegetating slopes are described in Section 10.3 (Reasonably Foreseeable Means of Compliance), and in Section 9, Tables 9.1–9.3. Monitoring for erosion control effectiveness, mercury in fish tissue, mercury loads to San Francisco Bay, and special study 3b are described in Sections 9.9 and 9.10.

One-time Costs

Staff made several simplifying assumptions in developing the estimated costs to cleanup mine sites. These include:

- Modeling the scope (i.e., site assessment, risk assessment, remedial design, and construction) of future mining waste control efforts on the cleanup actions completed by Santa Clara County Parks and Recreation Department (County Parks) at the New Almaden Quicksilver County Park (see Section 3.5);
  County Parks cleaned up the following five areas: Mine Hill, Hacienda Furnace Yard, Senador Mine, Enriquita Mine, and San Mateo Mine. The projects generally consisted of excavation, hauling, and on-site placement of mining waste; slope re-contouring; stormwater runoff diversion ditches; and re-vegetation

- Reviewing geologic maps of the New Almaden Mining District (Plates 1, 3, and 14, Bailey & Everhart 1964) for the locations and acres of mining waste and dump sites;
  These maps provide the extent of mining waste and dump sites (circa 1947) for the 'New Almaden Mine' (including the 'Mine Hill" site which was cleaned up) and 'Guadalupe Mine'; these maps do not include the other sites in Almaden Quicksilver County Park which have been cleaned up (Hacienda Furnace Yard, and Senador, Enriquita, and San Mateo mines), nor do they provide detailed information on the area between 'New Almaden Mine' and 'Guadalupe Mine', which are separated by 2.3 miles and include Senador, San Mateo, San Antonio, Enriquita, and Providencia mines. These maps also do not indicate how far downstream the waste has eroded. Based on Plate 3, the Mine Hill site was about 2.5 acres

- Calculating a per-unit (i.e., per-acre) cost of cleanup by dividing the size of the New Almaden Quicksilver County Park remediation footprint by the total cost of remediation~~;~~
  . We estimate that Mine Hill was one-third of the $6 million total cost of remediation (County Parks 2008.). Therefore, the per-acre estimated cost is $800,000

- Calculating the surface area for each mining waste and dump site;
  The acres of mining waste and dump sites on Plates 3 and 14 (Bailey & Everhart 1964) total approximately 70 acres

- Multiplying the total acreage by the per unit cost for cleanup;
  The estimated total cost is $56,000,000
- Adjusting the cleanup costs for inflation;
  inflation from 1999 (cleanup completed) to 2008 is estimated to be 20.8 percent (NASA 2008). The estimated total cost, adjusted for inflation is $68,000,000 ($68 M)

This cost estimate includes project management, administration, design, and permitting. However, actual costs will depend on site topography, land use intensity, location of mining waste relative to receiving waters, land access, project complexity, and the responsible parties' preferred remedial alternative. The largest factor contributing to uncertainty in this cost estimate is the lack of a site assessment for erosion potential of mercury mining waste both at New Almaden Mining District, and also at the other mines (Santa Teresa, Bernal, and Hillsdale). Over the last 50 years (since the Bailey & Everhart maps were produced), these mining waste dumps likely have eroded and expanded greatly in size.

This hypothesis is supported by continuing high mercury concentrations in stormwater samples collected by County Parks (100,000 ng/l, see 'New Almaden Compared to California's Other Mines' in Section 3.4). See also Figure 3.10, Map of Mercury Concentrations Remaining After Park Cleanup. This map supports a key point from Section 3 that, although progress has been made to cleanup mercury from New Almaden, vastly more remains to be cleaned up in and downstream of the New Almaden Mining District.

Conversely, although unlikely, these mining waste dumps may have eroded to a stable angle of repose, revegetated naturally, and no longer discharge mercury-laden sediment to stormwater. To develop the low and high one-time cost estimates in Table 10.~~1~~3, we estimate that costs may be as low as one-third of our estimate, or range up to 10 times our estimate (adjusted for inflation), that is, ranging from $23 M to $680 M.

Annual Costs

This cost estimate does not include storm water permit, effectiveness monitoring, ~~n~~or reporting costs because these costs are already required for mine sites separately from the TMDL project. Mine sites are required to file notices to comply with California's Industrial Storm Water General Permit (see Section 9.2), implement best management practices (BMPs), conduct effectiveness monitoring, and report on implementation and effectiveness of BMPs. In any case, we estimate these costs would not exceed $15,000 per year, and are insignificant compared to other costs.

This cost estimate does include the monitoring required only by the TMDL project: fish tissue mercury monitoring to assess attainment of targets, mercury loads to San Francisco Bay, and special studies. This monitoring is required for several source categories, and the associated costs are estimated below (see 'Monitoring and Special Studies').

Annual costs include operations and maintenance of erosion control measures at the mercury mine sites, such as maintenance activities required for vegetative cover, and for engineered storm water run-on and run-off facilities (e.g. pipes and v-ditches). We assume these costs consist of:

- Project manager, site inspector, equipment operator, and 2 laborers
- One month per year
- Supplies and equipment rental

We estimate these costs to range from $10,000 to $50,000 per year. A summary of the cost estimate is provided in Table 10.3.

IMPLEMENTATION ACTIONS FOR DEPOSITIONAL AREAS

There are no costs associated with the TMDL project for this source category, namely depositional areas (creek beds, banks, and floodplains, shallow impoundments, and percolation ponds) in creeks and the Guadalupe River downstream of mercury mines. The proposed Basin Plan amendment does not require responsible parties (see Section 9.5) to undertake any new or additional actions. We anticipate that erosion control of mercury mining waste and resuspension of mercury-laden sediment will be undertaken for stream stewardship and flood control purposes. Upon receipt of Clean Water Act Section 401 applications for these projects, the Water Board will impose permit restrictions and effectiveness monitoring. Such Water Board permit conditions are standard operating procedure, and the TMDL project has not appreciably increased the associated costs.

Nonetheless, we provide this cost estimate to assist with fundraising to cleanup arguably the most mercury-polluted waterway in North America: Alamitos Creek between the Hacienda Furnace Yard and Lake Almaden. We strongly encourage creekside property owners and the Santa Clara Valley Water District to undertake a coordinated watershed stewardship project along these 6 miles.

A foreseeable design option for this project will likely include excavation and off-site disposal of mercury-laden sediments, as this is the most permanent means to reduce mercury loads and methylmercury production. A mercury removal and creek restoration project was undertaken in Guadalupe Creek at a cost of $4.5 M per mile. Alamitos Creek is much more contaminated than Guadalupe Creek; in Alamitos Creek, roasted mercury ores (calcines) form the floodplain, banks, and bed for many miles. Therefore, we estimate that Alamitos Creek would cost from 5 to 10 times as much as the project in Guadalupe Creek, for a total cost of $135 M to $270 M. A summary of the cost estimate is provided in Table 10.3.

IMPLEMENTATION ACTIONS FOR RESERVOIRS AND LAKES

The proposed Basin Plan amendment requires that the responsible party, the Santa Clara Valley Water District, conduct technical studies of hypolimnion methylmercury controls and other reservoir management techniques that have the potential to reduce bioaccumulation of mercury, and implement all reasonable and feasible control actions (see Sections 9.4, 9.8, and 9.9). Costs associated with these technical studies and implementation actions are included herein. This cost estimate does include the monitoring required only by the TMDL project: fish tissue mercury monitoring to assess attainment of targets, mercury loads to San Francisco Bay, and special studies (see 'Monitoring and Special Studies').

One-time Costs

The District has already begun technical studies of hypolimnion methylmercury controls and other reservoir management techniques that have the potential to reduce bioaccumulation of mercury. They have estimated these costs at $440,000 for their Phase 1 (baseline sampling, design and deployment of solar-powered circulators in Lake Almaden, and design for Almaden and Guadalupe Reservoirs) (SCVWD 2005). This is the first phase of a three-phase project to evaluate the feasibility of this technology, pilot test a recommended system, and design and install systems in three District reservoirs (Almaden, Calero, and Guadalupe). We estimate that each of Phases 2 and 3, scheduled to run through 2012, will also cost $440,000. Future costs may include the purchase of three solar-powered circulators for Calero Reservoir, estimated at $50,000 each. These one-time costs total approximately $1.5 M.

These technical study results may indicate that solar-powered circulators are not effective, and that alternate technologies are required. Direct delivery of liquid oxygen or ozone is an alternate technology for preventing anoxia in the hypolimnion. These are very high-cost taste and odor control, and fishery preservation, methods deployed in a few reservoirs in California, (e.g. EBMUD's Camache Reservoir). We estimate that the cost of liquid oxygen or ozone is 10 times the cost of solar-powered technologies. Given the uncertainty in technology to be deployed, we estimate the one-time costs may range from $1.5 M to $15 M.

Annual Costs

The solar-powered circulators will require replacement. They are anticipated to have an approximately 15-year service life. We estimate replacement costs for 12 solar-powered circulators once in this 20-year period, adjusted for inflation (35.2 percent from 2005 to 2020), yields an annualized cost of $40,000. If, however, either liquid oxygen or ozone is used, then the annual costs will be considerably higher due to the cost of electricity. We assume they will rely on the existing, conventional power sources for this electricity, and the cost will be 10 times the annual costs for solar-powered circulators. The annual costs for methylmercury range from $40,000 to $400,000. A summary of the cost estimate is provided in Table 10.3.

IMPLEMENTATION ACTIONS FOR URBAN STORMWATER RUNOFF

There are no costs for implementation actions associated with the TMDL project for this source category (they were previously estimated in the San Francisco Bay mercury TMDL staff report, SFBRWQCB 2006). However, there are costs associated with fish tissue mercury monitoring to assess attainment of targets, mercury loads to San Francisco Bay, and special studies (see 'Monitoring and Special Studies').

MONITORING AND SPECIAL STUDIES

This section presents a cost estimate for fish tissue mercury monitoring to assess attainment of targets, monitoring mercury loads to San Francisco Bay, and special studies. We have calculated these costs on an annual basis.

Fish mercury monitoring is scheduled to occur at least 15 times over 20 years. We estimate the cost of each event, in 2005 dollars, is $100,000. The total cost, adjusted for inflation (35.2 percent from 2005 to 2020), yields an annualized cost of $101,400, which rounds to $100,000.

Monitoring of mercury load to San Francisco Bay is required at two sites (Gage 23b and Highway 101) for the first five years, and at one site for the remaining 15 years (Highway 101). Automated turbidity monitoring is required continuously at both sites. During each of four five-year monitoring cycles, less intensive sampling (only peak storms) is required in 4 of 5 years, and more intensive sampling (both small and peak storms) in one year. District staff has estimated this sampling effort costs approximately $1 M for each 5-year effort at each site, which yields a total cost of $5 M. This total cost adjusted for inflation (35.2 percent from 2005 to 2020; $6.8), yields an annualized cost (rounded) of $300,000

Special studies have not yet been scoped in detail. For this economic considerations analysis, we assume these costs are $200,000 per year for 10 years, which yields $100,000 per year over the 20-year period of this TMDL project.

A summary of the cost estimate is provided in Table 10.3.

GRAND TOTAL COST ESTIMATE

The grand total estimated costs to implement these TMDLs range from $160 M to $1 billion (B). A summary of the combined total cost estimate is provided in Table 10.3.

Table 10.3 Summary of Estimated Costs for Guadalupe River Watershed Mercury TMDL Project Implementation (Years 0 through 20)

Implementation Actions	One-Time Costs		Annual Costs		20-year Costs	
	Low	High	Low	High	Low	High
Mercury Mining Waste at Mine Sites	$23 M	$680 M	$10,000	$50,000	$23 M	$700 M
Mercury Mining Waste in Alamitos Creek	$135 M	$270 M	$135 M	$270 M	$135 M	$270 M
Reservoirs and Lakes	$1.5 M	$15 M	$40,000	$400,000	$2.3 M	$23 M
Monitoring and Special Studies	- -	- -	- -	- -	$600,000	$10 M
GRAND TOTAL	- -	- -	- -	- -	**$160 M**	**$ 1 B**

11. REFERENCES

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APPENDIX A – DATA

Table A.10 Fish Mercury Concentrations in Almaden Reservoir and Lake Almaden

DATE	SPECIES	LENGTH (cm)	WEIGHT (g)	Mercury (mg/kg, ww)
ALMADEN RESERVOIR				
Nov-70	Black Bass			1.0
Nov-70	Black Bass			2.7
Nov-70	Black Bass			3.6
Nov-70	Goldfish			0.83
Nov-70	Goldfish			2.1
Nov-70	Red Ear Sunfish			0.52
Nov-70	Red Ear Sunfish			0.63
7/1/87	Bullhead			0.21
7/1/87	Bullhead			0.26
7/1/87	Bullhead			0.33
7/1/87	Bullhead			0.33
7/1/87	Bullhead			0.40
7/1/87	Bullhead			0.53
7/1/87	Bullhead			0.54
7/1/87	Bullhead			0.66
7/1/87	Bullhead			0.75
7/1/87	Bullhead			0.85
7/1/87	Bullhead			0.88
7/1/87	Rainbow Trout			0.39
7/1/87	Rainbow Trout			0.43
7/1/87	Rainbow Trout			0.44

Table A.10 Fish Mercury Concentrations in Almaden Reservoir and Lake Almaden

DATE	SPECIES	LENGTH (cm)	WEIGHT (g)	Mercury (mg/kg, ww)
7/1/87	Rainbow Trout			0.45
7/1/87	Rainbow Trout			0.52
7/1/87	Rainbow Trout			0.53
7/1/87	Rainbow Trout			0.55
7/1/87	Rainbow Trout			0.56
9/1/2004	Largemouth bass	330	520	2.16
9/1/2004	Largemouth bass	400	1060	2.52
9/1/2004	Largemouth bass	330	540	2.52
9/1/2004	Largemouth bass	370	840	3.08
9/1/2004	Largemouth bass	430	1480	3.30
9/1/2004	Largemouth bass	450	1660	3.52
9/1/2004	Largemouth bass	420	1030	3.57
9/1/2004	Largemouth bass	490	1900	3.78
9/1/2004	Largemouth bass	395	1070	3.96
9/1/2004	Largemouth bass	460	1930	4.62
9/1/2004	Largemouth bass	440	1370	4.84
9/1/2004	Largemouth bass	450	1680	5.04
9/1/2004	Largemouth bass	435	1700	5.04
9/1/2004	Largemouth bass	435	1520	5.06
9/1/2004	Largemouth bass	460	1670	5.06
9/1/2004	Largemouth bass	425	1230	5.25
9/1/2004	Largemouth bass	500	2080	5.28

Table A.10 Fish Mercury Concentrations in Almaden Reservoir and Lake Almaden

DATE	SPECIES	LENGTH (cm)	WEIGHT (g)	Mercury (mg/kg, ww)
9/1/2004	Largemouth bass	430	1230	5.46
9/1/2004	Largemouth bass	455	1430	5.50
9/1/2004	Largemouth bass	465	1590	7.35
LAKE ALMADEN				
8/31/2004	Largemouth bass	305	490	1.10
8/31/2004	Largemouth bass	315	530	1.17
8/31/2004	Largemouth bass	320	510	1.20
8/31/2004	Largemouth bass	365	820	1.50
8/31/2004	Largemouth bass	390	1020	1.74
8/31/2004	Largemouth bass	365	790	1.85
8/31/2004	Largemouth bass	420	1240	1.93
8/31/2004	Largemouth bass	400	1020	1.94
8/31/2004	Largemouth bass	350	810	1.96
8/31/2004	Largemouth bass	350	660	2.10
8/31/2004	Largemouth bass	500	2320	2.31
8/31/2004	Largemouth bass	465	1650	2.40
8/31/2004	Largemouth bass	395	1060	2.40
8/31/2004	Largemouth bass	440	1390	2.52
8/31/2004	Largemouth bass	445	1530	2.73
8/31/2004	Largemouth bass	400	1000	2.86
8/31/2004	Largemouth bass	455	1880	3.08
8/31/2004	Largemouth bass	480	1830	3.30
8/31/2004	Largemouth bass	480	2220	3.57
8/31/2004	Largemouth bass	520	2380	3.78

APPENDIX B – CALCULATIONS

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