CENTRAL VALLEY
REGIONAL WATER QUALITY CONTROL BOARD

AMENDMENTS TO THE WATER QUALITY CONTROL PLAN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS FOR THE CONTROL OF METHYLMERCURY AND TOTAL MERCURY IN THE SACRAMENTO-SAN JOAQUIN DELTA ESTUARY

STAFF REPORT

APRIL 2010

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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DISCLAIMER
This publication is a report by staff of the California Regional Water Quality Control Board, Central Valley Region. This report contains the evaluation of alternatives and technical support for the adoption of a Basin Plan Amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Resolution No. R5-2010-0043). Mention of specific products does not represent endorsement of those products by the Central Valley Water Board.

California Environmental Protection Agency

Regional Water Quality Control Board
Central Valley Region

Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin Delta Estuary

Staff Report

April 2010

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AMENDMENTS TO THE WATER QUALITY CONTROL PLAN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS FOR THE CONTROL OF METHYLMERCURY AND TOTAL MERCURY IN THE SACRAMENTO-SAN JOAQUIN DELTA ESTUARY

EXECUTIVE SUMMARY

This Central Valley Regional Water Quality Control Board (Central Valley Water Board) staff report describes a proposal to amend the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins to address the regulation of methylmercury and total mercury in the Sacramento-San Joaquin Delta Estuary (the Delta). The Delta is on the Clean Water Act Section 303(d) List of Impaired Water Bodies because of elevated levels of mercury in fish. The goal of the proposed Basin Plan amendments is to lower fish mercury levels in the Delta so that the beneficial uses of fishing and wildlife habitat are attained. Central Valley Water Board staff will circulate this staff report and the enclosed draft Basin Plan amendments for public review and comment prior to Central Valley Water Board consideration. The section following the Table of Contents provides the recommended format for comment submittal.

The proposed Basin Plan amendments define the Delta Mercury Control Program. Major components of the proposed Basin Plan amendments are:

- Addition of a beneficial use designation of commercial and/or sport fishing (COMM) for the Delta;
- Numeric objectives for methylmercury in fish tissue that are specific to the Delta;
- An implementation plan for controlling methylmercury and total mercury sources; and
- A surveillance and monitoring program.

2008-2009 Stakeholder Process

Staff and the Sacramento State University's Center for Collaborative Policy (CCP) have involved stakeholders in development of the Basin Plan amendments using a facilitated stakeholder process. At the April 2008 public hearing for the draft Basin Plan amendments, Central Valley Water Board members directed staff to work with stakeholders to resolve stakeholders' concerns about the proposed program. Between December 2008 and January 2010, CCP and staff held thirteen Stakeholder Group meetings (with between 30 and 60 participants at each meeting) and numerous workgroup meetings. Staff incorporated many of the stakeholders' comments into the draft Basin Plan amendments.

Proposed Modifications to Basin Plan Chapter II (Existing and Potential Beneficial Uses)

Staff proposes the addition of the commercial and sport fishing (COMM) as a designated beneficial use for the Delta and Yolo Bypass. The proposed Basin Plan amendment implementation plan is to protect the COMM beneficial use.

Proposed Modifications to Basin Plan Chapter III (Water Quality Objectives)

Staff proposes numeric objectives for methylmercury in fish tissue (referred to as fish tissue objectives) for the Delta. Methylmercury is the most toxic form of mercury and accumulates in successive levels of the food chain.

Staff evaluated five alternatives for the fish tissue objectives, including no action and a range of fish tissue objectives that are based on varying the amount and the trophic level of fish that can be safely consumed by humans. The recommended alternative would establish Delta-specific methylmercury fish tissue objectives of 0.08 and 0.24 mg/kg, wet weight, in fish tissue for large trophic level 3 and 4 fish (150-500 mm total length) and 0.03 mg/kg, wet weight, for small trophic level 2 and 3 fish (less than 50 mm). The proposed objectives are protective of threatened and endangered wildlife species that consume large and small Delta fish. In addition, the proposed objectives allow people to safely eat 32 g/day (eight ounces, uncooked, per week) of a mixture of Delta fish along with a moderate amount of commercial fish. The long-term goal of the mercury program is enable people to safely eat four to five meals per week of top tropic level fish. The proposed fish tissue objectives will be re-evaluated during the scheduled review of the Delta Mercury Control Program defined by the proposed Basin Plan amendments.

Proposed Modifications to Basin Plan Chapter IV (Implementation)

To achieve the proposed fish tissue objectives, staff proposes an implementation plan for the Delta Mercury Control Program that includes actions and time schedules to reduce methyl and inorganic mercury sources to the Delta through a phased adaptive approach. The proposed implementation plan for the Delta Mercury Control Program consists of two phases. Phase 1 spans from the USEPA approval date of this program until the Central Valley Water Board conducts a formal review of the program. Phase 1 is expected to last about nine years. Phase 1 emphasizes studies and pilot projects to develop and evaluate management practices to control methylmercury. Phase 1 includes provisions for: pollution minimization programs and interim mass limits for inorganic mercury point sources in the Delta and Yolo Bypass, and control of discharges of sediment-bound mercury in the Delta and Yolo Bypass that may become methylated in agriculture, wetland, and open-water habitats, and to reduce total mercury loading to San Francisco Bay. The program also contains requirements for improvements to the Cache Creek Settling Basin trapping efficiency, establishes inorganic mercury load reductions from upstream mercury-contaminated watersheds, establishes a mercury exposure reduction program to protect humans consuming Delta fish, and establishes a schedule and guiding principles for developing a mercury offset program and Phase 1 pilot offset projects.

At the end of Phase 1, the Central Valley Water Board will conduct a formal review of the Delta Mercury Control Program. The review will consider modification of methylmercury reduction goals, fish tissue objectives, methylmercury allocations, and compliance dates. The review also will consider requiring dischargers to implement inorganic mercury and methylmercury management practices developed in Phase 1 and will include consideration of a Mercury Offset Program for dischargers who cannot fully meet methylmercury allocations after implementing all reasonable load reduction strategies and can demonstrate no disproportionate impacts on local communities as a result. The review also will consider the potential public and environmental benefits and negative impacts of attaining the methylmercury allocations. The Phase 1 review will culminate in a revised Delta Mercury Control Program through another Basin Plan amendment in about 2019.

Phase 2 begins after the Phase 1 Delta Mercury Control Program review and lasts until 2030. During Phase 2, dischargers will implement management practices in accordance with schedules adopted for Phase 2 activities. Full compliance with the methylmercury allocations is required by 2030, unless the Central Valley Water Board modifies the final compliance date during the Phase 1 review process.

The recommended Delta Mercury Control Program has the following major components:

- Methylmercury allocations for methylmercury point and nonpoint sources in the Delta and Yolo Bypass.
- A methylmercury control study period during Phase 1. The Control Studies are required for:
    - Irrigated agricultural lands that discharge to the Yolo Bypass and Delta subareas that require methylmercury source reductions
    - Managed wetlands and wetland restoration projects that discharge to the Yolo Bypass and Delta subareas that require methylmercury source reductions.
    - Existing NPDES permitted facilities in the Delta and the Yolo Bypass.
    - Sacramento, Stockton, Contra Costa County stormwater agencies.
    - State and federal agencies whose projects affect the transport of mercury and the production and transport of methylmercury through the Yolo Bypass and Delta (Department of Water Resources, State Lands Commission, Central Valley Flood Protection Board, U.S. Army Corps of Engineers, and U.S. Bureau of Reclamation).

  The Control Studies can be developed through a stakeholder group approach or other collaborative mechanism, or by individual dischargers. Individual dischargers are not required to do individual studies if the individual dischargers join a collaborative study group(s).
- Requirements for NPDES facilities in the Delta and Yolo Bypass to implement mercury-specific pollutant minimization programs and maintain performance-based Phase 1 (interim) effluent inorganic mercury mass limits.
- Requirements for the Sacramento, Stockton, Contra Costa County stormwater agencies to continue to conduct mercury control studies to monitor and evaluate the effectiveness of existing management practices and to develop and evaluate additional management practices as needed to reduce their inorganic mercury and methylmercury discharges within and upstream of the legal Delta boundary.
- A schedule for establishing mercury TMDL control programs for major tributary inputs to the Delta.
- A schedule and guiding principles for developing a mercury offset program and Phase 1 pilot offset projects in coordination with stakeholders.
- Requirements and a schedule to plan and implement an exposure reduction program to protect humans consuming large quantities of Delta fish.

- A schedule for agencies responsible for Cache Creek Settling Basin operations and maintenance to propose and implement improvements to the Basin to reduce inorganic mercury loading to the Yolo Bypass.
- Requirements for dredging projects in the Delta to evaluate management practices to reduce methylmercury and total mercury loads from dredging activities in Delta waterways or from the disposal of dredged materials.

Proposed Modifications to Basin Plan Chapter V (Surveillance and Monitoring)

Staff proposes a surveillance and monitoring program to ensure compliance with the fish tissue methylmercury objectives and methylmercury and total mercury reduction strategy proposed for addition to Chapters III and IV. The program includes fish tissue and water monitoring.

Environmental Analysis

To satisfy requirements of the California Environmental Quality Act (CEQA), staff performed an environmental analysis of the potential impacts of the proposed Basin Plan amendments. Adoption of the proposed Basin Plan amendments will not by itself have a physical effect on the environment, nor will the Phase 1 studies. However, implementation actions taken by responsible entities to comply with some components of the proposed implementation plan and improvements to the environment by controlling mercury and/or methylmercury may have the potential for adverse environmental effects impacts. The environmental analysis determined that implementation of the proposed Basin Plan amendments could result in potentially significant impacts to biological resources, greenhouse gas emissions, hydrology/water quality, and utilities/service systems, unless mitigation is incorporated. The staff report summarizes reasonable actions to reduce the potential impacts from implementation projects. With few exceptions, potential impacts are expected to be limited and mitigated to less than significant levels, if not completely avoided, through careful project planning, design, and implementation. Mitigation measures lie within the jurisdiction of agencies implementing site-specific projects. The Central Valley Water Board does not have legal authority to specify the manner of compliance with its orders and thus cannot specify particular implementation projects nor dictate that specific mitigation measures be implemented by any particular project.

The environmental analysis found that implementation of methylmercury management practices to achieve safe fish mercury levels in the Yolo Bypass has the potential to result in cumulatively considerable impacts to habitat that supports endemic species with limited geographic ranges, such as Sacramento splittail and Delta smelt. Until the Phase 1 control studies have been completed, it is unknown whether the wetlands that act as substantial methylmercury sources in the Yolo Bypass also provide critical habitat to endemic species and whether it will be possible to avoid all potentially significant impacts. In addition, the potential costs of complying with requirements for studies, monitoring and implementation actions are substantial.

Prudent implementation of the proposed Basin Plan amendments is expected to result in overall improvement in water quality in the waters of the Delta region and to have significant positive impacts to the environment and public health over the long term by enabling humans and wildlife to safely consume Delta fish.

DRAFT BASIN PLAN AMENDMENTS

Provided as Attachment 1 to the Central Valley Water Board Resolution N0. R5-2010-0043

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ACRONYMS

§	Section
303(d) List	Clean Water Act Section 303(d) List of Impaired Water Bodies
ATSDR	U.S. Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation factor
Basin Plan	Central Valley Region Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
BCF	Bioconcentration factor
BMP	Best management practice
bwt	Body weight
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCR	California Code of Regulations
CCSB	Cache Creek Settling Basin
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDHS	California Department of Health Services, re-organized in 2007 and renamed “California Department of Public Health” (CDPH). Reports issued before the 2007 re-organization are cited as “CDHS” reports.
CDOF	California Department of Finance
CDPH	California Department of Public Health
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cf	Cubic feet
cfs	Cubic feet per second
CFSII	Continuing Survey of Food Intake by Individuals
cy	Cubic yard
CTR	California Toxics Rule
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board (a.k.a. Central Valley Water Board)
CWA	Federal Clean Water Act
CWC	California Water Code
DMC	Delta Mendota Canal
DPC	Delta Protection Commission
DTMC	Delta Tributaries Mercury Council
DWR	California Department of Water Resources
EC	Electrical Conductivity
FCM	Food chain multipliers
GHG	Greenhouse gas
GIS	Geographic Information Systems
GLWQI	Great Lakes Water Quality Initiative Final Rule
GWP	Global Warming Potential
HCI	Hydrologic Classification Index
HCP	Habitat Conservation Plan
Hg	Mercury
hr	Hour
LMB	Largemouth bass
LOAEC’s	Lowest observed adverse effect concentrations
LOAEL	Lowest-observable adverse effect level
MCL	California/USEPA drinking water standards maximum contaminant levels
mgd	Million gallons per day
MES	Mass Emissions Strategy
MeHg	Methylmercury

ACRONYMS, *continued*

MOI	Memorandum of Intent
MS4	Municipal Separate Storm Sewer System
MRC	Mercury Study Report to Congress
MRL	ATSDR Minimal Risk Level
na	Not available
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act
NCCP	Natural Communities Conservation Plan
NOAEL	No-observable adverse effect level
NPDES	National Pollutant Discharge Elimination System
NPS	Non point source
NRC	National Research Council
o/oo	Parts per thousand (salinity)
O&M	Operation and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Governor's Office of Planning and Research
RfD	Reference dose
RSC	Relative source contribution
SDIP	South Delta Improvement Project
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board (a.k.a. San Francisco Bay Water Board)
SFEI	San Francisco Estuary Institute
SRWP	Sacramento River Watershed Program
SLC	State Lands Commission
SWMP	Storm Water Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board (a.k.a. State Water Board)
TDSL	Total diet safe level
TL3	Trophic level 3
TL4	Trophic level 4
TLR	Trophic level ratios
TMDL	Total Maximum Daily Load
TMDL Report	Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury Staff Report, provided as Appendix A to this report.
TSS	Total suspended solids
UC Davis	University of California, Davis
USACE	US Army Corps of Engineers
USBR	US Bureau of Reclamation
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFDA	US Food and Drug Administration
USFWS	US Fish and Wildlife Service
WHO	World Health Organization
ww	Wet weight concentration (e.g., for fish tissue mercury concentrations)
WWTP	Wastewater treatment plants
X2	Location in the Bay-Delta Estuary with 2-o/oo bottom salinity
yr	Year

UNITS OF MEASURE

μg	microgram
μg/g	microgram per gram
μg/l	microgram per liter
μm	micrometer
cf	cubic feet
cfs	cubic feet per second
cm	centimeter
cy	cubic yard
g	gram
g/day	gram per day
g/l	gram per liter
in/yr	inches per year
kg	kilogram
l	liter
m	meter
mg	milligram
mg/g	milligram per gram
mgd	million gallons per day
Mkg	million kilograms
ml	milliliter
mm	millimeter
MMT	million metric tons
ng	nanogram
ng/l	nanograms per liter
o/oo	parts per thousand (salinity)
ppb	parts per billion; usually μg/kg
ppm	parts per million; usually mg/kg or μg/g
ppt	parts per trillion; usually ng/kg

RECOMMENDED FORMAT FOR COMMENT LETTERS

Comment letters to the Central Valley Water Board on staff recommendations serve two purposes: 1) to identify areas of agreement; and 2) to suggest revisions to staff recommendations. Clear statements of both areas of agreement and suggested revisions will assist the Central Valley Water Board and staff in determining what action, if any, to take. The following format for comment letters is recommended because it will enable the Central Valley Water Board and staff to clearly identify and respond to the specific concerns of the commenter.

Format for Comments Suggesting Revisions

The recommended format is to number the comment, state the topic in one sentence, provide a supporting argument, and make a specific recommendation. Supporting arguments should include citations, where appropriate. The recommended format is:

Comment #. *One sentence describing the topic.*
Section #, Paragraph # (only for comments regarding the staff report).
Text specifying the argument.
Text describing the suggested revision.

Additionally, for suggested revisions to the proposed Basin Plan amendments, please use underline/strikeout to show changes from the staff proposal. Commenters should support their statements with legal or scientific citations, where appropriate.

Format for Comments Supporting Staff Recommendations

The recommended format is to number the comment, state the topic in one sentence, state the section number and paragraph number (only for comments regarding the staff report), and make a statement of concurrence. An example of the recommended format is:

Comment #. *One sentence describing the topic.*
Section #, Paragraph # (only for comments regarding the staff report).
Statement of concurrence.

Commenters may include reasons for support, especially if the reasons differ from the staff rationale, or if the staff rationale could be further enhanced or clarified. Commenters also may support their statements with additional legal or scientific citations.

PREFACE TO THE APRIL 2010 DRAFT STAFF REPORT

The April 2010 draft Basin Plan Amendment draft staff report and draft TMDL report include numerous changes made since the February 2008 draft staff report. Most of the changes are associated with input from the 2008-2009 Stakeholder Process. In addition, updates were made to reflect new information and regulatory requirements. The following list identifies key changes and their locations in the two draft reports:

- 2008-2009 Stakeholder Process: Staff added new sections in Chapter 1 and 8 to describe the Stakeholder Process facilitated by the Center for Collaborative Policy after the April 2008 Board Hearing meeting. In addition, staff made changes throughout the report to reflect input provided by the:
    - Stakeholder Process after the April 2008 Board Hearing meeting;
    - Board members and stakeholders during the April 2008 meeting; and
    - Stakeholders in written comments on the February 2008 reports prior to the April 2008 meeting.
- Implementation alternatives: Staff created a different suite of options for the implementation alternatives analysis in Chapter 4 to incorporate new input from the 2008-2009 Stakeholder Process.
- Implementation cost estimates: Staff updated the cost estimates in Chapter 4 and Appendix C to reflect:
    - The recent changes to the implementation alternatives analysis;
    - Input from the stakeholders since February 2008; and
    - New cost estimates from a Tetra Tech evaluation completed in August 2008.
- Existing regulations and policies: Staff updated Chapter 6 to include policies and plans associated with NPDES compliance schedules, the Delta Vision Strategic Plan, Bay Delta Conservation Plan, Federal Bay-Delta Leadership Committee, state authorities over federal projects, and other State laws and regulations, including the State Water Board's Nonpoint Source Implementation and Enforcement Policy.
- CEQA environmental review: Staff updated the environmental evaluation in Chapter 7 to include an evaluation of climate change factors and additional information about cultural resources related to Native Americans
- Allocations: Staff made changes to the some of the methylmercury waste load allocation calculations for NPDES facilities based on stakeholder input and new information since February 2008. These changes are described in the TMDL Report, Chapters 6 and 8.

In addition, the Stakeholder Group is developing an organizational, adaptive management approach document (currently called the Memorandum of Intent) and a Control Study Workplan Guidance document, which are intended to memorialize some of the 2008-2009 Stakeholder Process and associated products as well as provide tools to help coordinate implementation activities during Phase 1 of the proposed control program. These documents are not included in the April 2010 Basin Plan amendment draft staff report because they are not part of the regulations being considered by the Central Valley Water Board. These documents and the 2008-2009 Stakeholder Process are described in Chapter 8 of this report.

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1 INTRODUCTION AND BACKGROUND

California Water Code Section 13240 requires each of the State's Regional Water Quality Control Boards (Regional Water Boards) to prepare and adopt Water Quality Control Plans, also known as Basin Plans, to regulate water quality. In addition to complying with California law, Basin Plans also satisfy the requirements of Section 303(c) of the federal Clean Water Act (CWA), which requires states to adopt water quality standards to meet federal regulatory requirements. Basin Plans are adopted and amended by the Regional Water Boards using a structured process that includes opportunities for full public participation and state environmental review. A Basin Plan identifies:

- Beneficial uses to be protected;
- Water quality objectives; and
- Implementation plans for achieving the water quality objectives.

This report addresses proposed amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan). The Basin Plan currently in effect was originally adopted by the Central Valley Regional Water Quality Control Board (Central Valley Water Board or CVRWQCB) in 1975. Updated editions were issued in 1989, 1994, and 1998; the Basin Plan was revised in September 2009 to include approved and effective amendments.

Regional Water Boards adopt and amend basin plans through a structured process involving peer review, public participation, and environmental review. Regional Water Boards must comply with the California Environmental Quality Act (CEQA) (Public Resources Code (PRC) §21000 et seq.) when amending their basin plans. The Secretary of Resources has certified the Basin Planning process as exempt from the CEQA requirement to prepare an environmental impact report or other appropriate environmental document (PRC 21080.5; Title 14 CCR §15251(g)). Instead, State Water Board regulations require the Regional Water Boards to conduct public outreach and prepare a written report and an accompanying Environmental Checklist and Determination with respect to Significant Environmental Impacts (Title 23 CCR §3775 *et seq.*).

The proposed amendments discussed in this Central Valley Water Board staff report address the regulation of methylmercury and total mercury in the Sacramento-San Joaquin Delta Estuary (the Delta). This report provides an evaluation of a variety of alternatives for water quality objectives (herein after referred to as fish tissue objectives) for the Delta and implementation options for achieving the fish tissue objectives. This report also includes an evaluation of the potential environmental impacts of the proposed objectives and implementation plan. This report contains an analysis of implementation alternatives and evaluation of their potential environmental impacts, the Environmental Checklist and conclusions of the environmental analysis.

The proposed Basin Plan amendments for control of methylmercury and total mercury in the Delta will be legally applicable once they are adopted by the Central Valley Water Board and approved by the State Water Board, the California Office of Administrative Law, and the

U.S. Environmental Protection Agency (USEPA). Implementation will begin after the Basin Plan amendments are legally applicable.

The Basin Plan amendments proposed for adoption by the Central Valley Water Board are presented after the Executive Summary at the beginning of this report. Chapter 1 of this report provides an introduction and background for the Basin Plan amendment process. Chapter 2 describes beneficial uses and existing conditions of the Delta. Chapter 3 presents the evaluation of alternative fish tissue objectives. Chapter 4 describes implementation alternatives. Chapter 5 details the recommended monitoring and surveillance plan. Chapter 6 summarizes existing federal and state laws and other policies that are relevant to the proposed fish tissue objectives and implementation plan. Chapter 7 provides the Environmental Checklist. Chapter 8 describes the public participation and agency consultations that took place throughout the TMDL and Basin Plan amendment development process. Appendix A is the methylmercury total maximum daily load (TMDL) technical staff report for the Delta (the TMDL Report), which provides the basis of many sections of the proposed Basin Plan amendments and this staff report. Appendix B provides the calculations for the different fish tissue objective alternatives. Appendix C provides the calculations of the estimated costs that support the economic consideration of the proposed fish tissue objectives and implementation program.

1.1 Terms in this Report

This report uses the term “total mercury” (TotHg) to indicate the sum of all forms of mercury (Hg) in water: physical states (e.g., dissolved, colloidal or particulate bound), chemical states (e.g., elemental, mercurous ion, or mercuric ion), organic compounds (e.g., mono-methylmercury), and inorganic compounds (e.g., cinnabar). Monomethylmercury is the predominant form of organic mercury present in biological systems and will be noted in this report as “methylmercury” (MeHg). Because methylmercury typically composes only a small portion of total mercury in ambient water,[1] the phrases “inorganic mercury” and “total mercury” are sometimes used synonymously.

1.2 Watershed Area to Be Considered

The Sacramento-San Joaquin Delta Estuary combined with the San Francisco Bay (the Bay-Delta Estuary) forms the largest estuary on the western coast of North America. The Delta encompasses a maze of river channels and embanked islands encompassing approximately 738,000 acres in Alameda, Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties (DWR, 1995).

This staff report and the proposed Basin Plan amendments address the impairment of waterways inside of the “legal” Delta boundary defined by California Water Code Section 12220 (Figure 1.1). The list of Delta waterways in Appendix 43 of the proposed Basin Plan

[1] For example, a comparison of average annual methylmercury and total mercury loads from tributary watersheds to the Delta (Tables 6.2 and 7.1) indicates that methylmercury loading comprises only about 2% of all total mercury loading from the tributaries.

amendments at the beginning of this report includes all distinct, readily identifiable water bodies within the boundaries of the legal Delta that are hydrologically connected by surface water flows (not including pumping) to the Sacramento and/or San Joaquin rivers. The waterways include flowing rivers, creeks and other upland tributaries, as well as sloughs, backwaters and constructed channels. Small agricultural drains on Delta islands or uplands were not considered "Delta waterways" and are therefore not included in the list in Appendix 43. Identification of the specific waterways clarifies application of the proposed fish tissue objectives. It is not the intent of the proposed amendments to establish fish tissue objectives in canals or drains that are not hydrologically connected by surface water flows or are not distinct and readily identifiable.

The proposed implementation plan addresses methylmercury and total mercury loads in the legal Delta and sources of both in the tributary watersheds. To better address tributary sources, the Delta was divided into eight sub-regions based on hydrology. These include:

- Sacramento River: This subarea is dominated by Sacramento River flows. It is bound to the east by the legal Delta boundary and to the west by the eastern levee of the Sacramento Deep Water Ship Channel. Although drawn as a defined line, the Sacramento River subarea's boundary with the South Yolo Bypass, Central Delta, and West Delta subareas is defined by a gradient in water quality characteristics that varies depending on the tidal cycle, magnitude of wet weather flows, diversions by within-Delta control structures, and releases from reservoirs in the upstream watersheds. The boundary shown in Figure 1.1 is based on available information.
- Yolo-Bypass (North & South): The Yolo Bypass is a 73,300-acre floodplain on the west side of the lower Sacramento River (see Figure E.2 in Appendix E of the TMDL Report). The Fremont and Sacramento weirs route floodwaters to the Yolo Bypass from the Sacramento and Feather Rivers and their associated tributary watersheds. Cache and Putah Creeks, Willow Slough and the Knights Landing Ridge Cut from the Colusa Basin Drain all drain directly to the Yolo Bypass. Only the southern two thirds of the Yolo Bypass lie within the legal Delta. This portion is divided into "north" and "south" subareas by Lisbon Weir, which limits the range of tidal fluctuations upstream of the weir. In this document the North and South subareas are sometimes referred to as 2 distinct areas, but the allocations and implementation plan apply to both sections as one subarea.
- Cosumnes/Mokelumne: This subarea includes the lower Cosumnes and Mokelumne Rivers and is defined by the legal Delta boundary to the east and the Delta Cross Channel confluence with the Mokelumne to the west.
- Marsh Creek: This subarea is defined by the portion of the Marsh Creek watershed within the legal Delta boundary that is upstream of tidal effects.
- West Delta: This subarea encompasses the confluence of the Sacramento and San Joaquin Rivers, which transport water from the Central Valley to the San Francisco Bay. The western boundary of the West Delta subarea is defined by the jurisdictional boundary between the Central Valley Water Board and the San Francisco Bay Regional Water Quality Control Board (a.k.a. San Francisco Bay Water Board or Region 2). Water quality characteristics are determined by the tidal cycle, magnitude of wet weather flows, controlled flow diversions by within-Delta structures, and releases from reservoirs in the upstream watersheds.

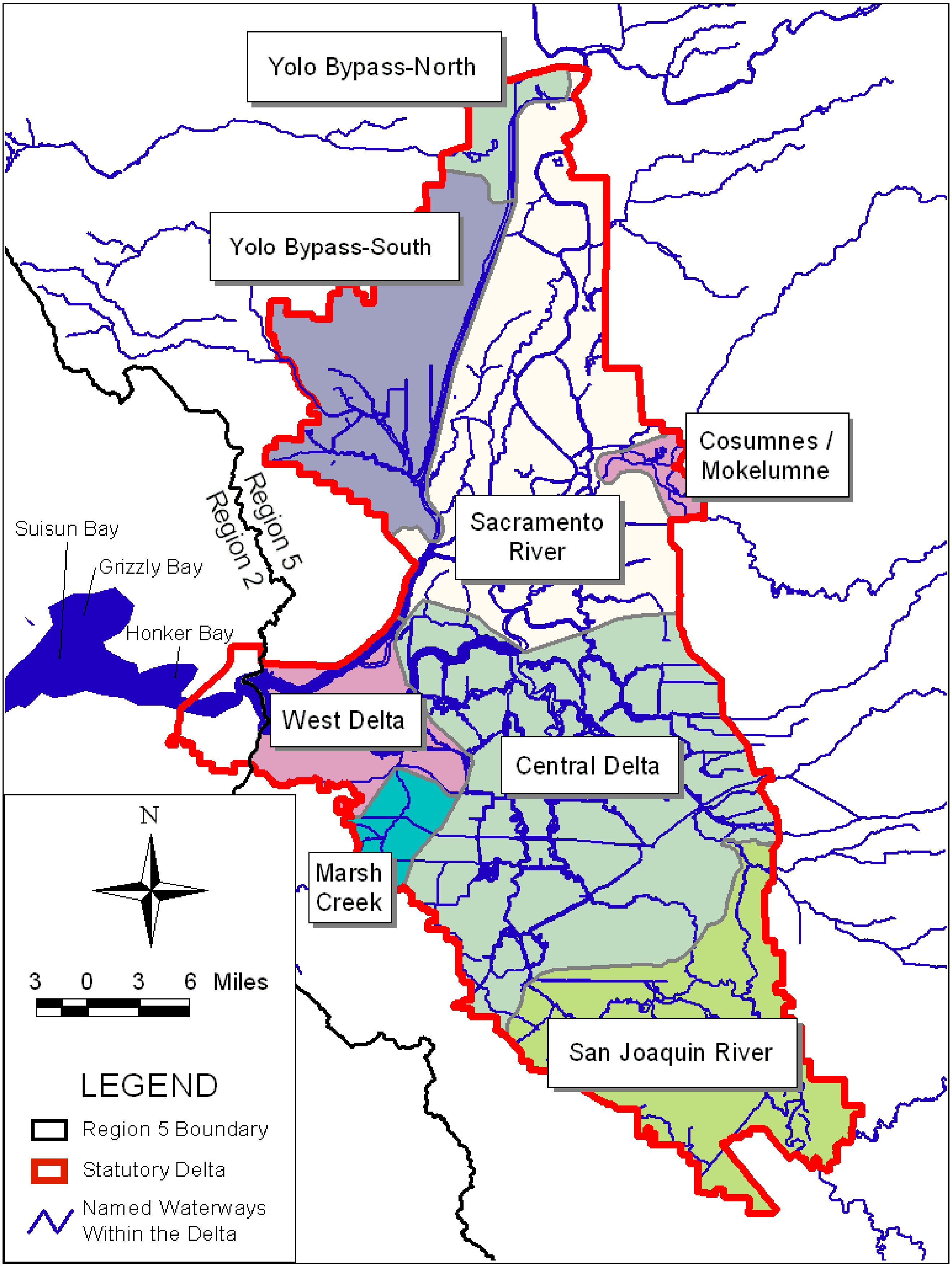

Figure 1.1: The Legal Delta Boundary Including the Eight TMDL Hydrologic Subareas

- Central Delta: This subarea includes a myriad of natural and constructed channels that transport water from the upper watersheds to San Francisco Bay to the west and the state and federal pumps to the southwest. The Central Delta tends to be most influenced by Sacramento River water.
- San Joaquin River: This subarea is defined by the legal Delta boundary to the east and south, and the Grantline Canal coupled with the beginning of the Stockton Deep Water Channel to the north. At present, the San Joaquin River is almost entirely diverted out of the Delta through the Old River and Grantline Canal for export to areas south of the Delta via the state and federal pumping facilities near Tracy.

1.3 Need for an Amendment to the Basin Plan

Section 303(d)(1)(A) of the Clean Water Act requires the Regional Water Boards to:

- Identify the Regions' waters that do not comply with water quality standards;
- Rank the impaired water bodies, taking into account factors including the severity of the pollution and the uses made of such waters; and
- Establish water quality management strategies (TMDLs) for those pollutants causing the impairments to ensure that impaired waters attain their beneficial uses.

In 1990, the State Water Board adopted the Clean Water Act 303(d) list that identified the Delta as impaired due to mercury pollution. The listing was based on a 1971 human health advisory issued for the Delta advising pregnant women and children not to eat striped bass. In 1994, the California Office of Environmental Health Hazard Assessment (OEHHA) issued an interim advisory for San Francisco Bay and the Delta that recommended no consumption of large striped bass and shark because of elevated concentrations of methylmercury and polychlorinated biphenyls (OEHHA, 1994). Additional monitoring indicates that several more species, including largemouth bass and white catfish (two commonly-caught local sport fish), also have elevated concentrations of methylmercury in their tissue (Davis *et al.*, 2003; Melwani et al., 2007; Slotton *et al.*, 2003; LWA, 2003; SWRCB-DWQ, 2002). In 2009, OEHHA released its most recent safe eating guidelines for the North Delta/Sacramento River, Central/South Delta, and the San Joaquin River. These guidelines address a variety of fish and shellfish species and indicate species that are low in mercury.

At this time, the Basin Plan does not include numeric fish tissue objectives for methylmercury in Delta fish or an implementation plan to control methylmercury or total mercury in the Delta. Therefore, Central Valley Water Board staff proposes that the Basin Plan be amended to include fish tissue objectives for methylmercury, as well as reduction strategies for methylmercury and total mercury for the Delta and its tributary watersheds.

The Central Valley Water Board will develop a water quality management strategy for each water body and pollutant in the Central Valley identified on California's 303(d) List. The management strategy for control of mercury in Delta is being conducted in several stages:

- Total Maximum Daily Load Development: Involves the technical analysis of the sources of pollutant, the fate and transport of those pollutants, the numeric target(s), and the amount of pollutant reduction that is necessary to attain the target(s). The TMDL Report for the Delta was first released to the public for comment in August 2005; a revised version was released in June 2006 for scientific peer review. This report formed the basis of many parts of the proposed Basin Plan amendment staff report. Comments received on the 2005, 2006 and 2008 draft TMDL Reports were considered in the development of this staff report and the updated TMDL Report presented in Appendix A.

- Basin Planning: Focuses on the development of Basin Plan amendments and staff report that includes information and analyses required to comply with CEQA. The Basin Planning process satisfies State Water Board regulations for the implementation of CEQA. The Basin Plan amendments will include those policies and regulations that the Central Valley Water Board believes are necessary to attain the fish tissue objectives. Comments received on the draft 2006 and 2008 Basin Plan Amendments were considered in writing this report.
- Implementation: Establishes a framework that ensures that appropriate management practices or technologies are implemented (§13241 and §13242 of the Porter-Cologne Water Quality Act).

1.4 Guiding Principles for the Delta Mercury Control Program

The Delta Methylmercury TMDL Stakeholder Group agreed upon the following "Guiding Principles" for the Delta Mercury Control Program, Methylmercury TMDL, and Basin Plan amendments on 14 May 2009. The Guiding Principles were developed between January and May 2009 in meetings of the Stakeholder Group and a Principles Workgroup. The Stakeholder Group sought consensus on the wording of the principles. The Stakeholder Group's explanatory text that accompanied some principles is available on the Board's website and is included in the Administrative Record. Details of the 2008-2009 Stakeholder Process are provided in Chapter 8 of this report.

Guiding Principles for the Delta Mercury Control Program

1. Phase 1 studies should address both inorganic mercury (inorganic Hg) and methylmercury (MeHg) from all sources. Reasonable control options should be implemented during Phase 1 for inorganic Hg and/or MeHg.
2. Phase 1 control studies should develop knowledge for effectively controlling MeHg.
3. The Basin Plan amendment (BPA) and staff report should state the current state of knowledge of the ability to control inorganic Hg and MeHg sources to attain their load and waste load allocations and fish tissue objectives. The TMDL source control requirements should be based on that knowledge and the results of the Phase 1 studies, and be reasonable.
4. The mercury control program should incorporate an adaptive management process.
5. The mercury control program should implement reasonable, feasible actions to address MeHg loads/production and human/wildlife exposure in the near-term. The BPA should particularly address public health impacts of mercury in Delta fish, including activities that reduce actual and potential exposure of – and mitigate health impacts to – those people and communities most likely to be affected by mercury in Delta-caught fish, such as subsistence fishers and their families.
6. The mercury control program should incorporate long-term stakeholder involvement in the control studies, Technical Advisory Committee, and upstream TMDLs.

7. The control program should create strategies, including incentives to encourage innovative actions, to address the accumulation of MeHg in fish tissue and to reduce MeHg exposure, including watershed approaches, offsets projects, and short and long-term actions that result in reducing inorganic Hg and MeHg. Innovative and creative solutions such as offsets should not substitute for reasonable actions to address local impacts.
8. The linkage analysis and fish tissue objectives and the attainability of the allocations should be re-evaluated based on the findings of Phase 1 control studies and other information. The linkage analysis, fish tissue objectives and allocations should be adjusted in Phase 2, if appropriate.
9. The implementation plan should include methods to assess the relative magnitudes and other factors of different MeHg and inorganic Hg sources, and prioritize study and control actions, if and when it is not feasible to pursue those actions simultaneously.
10. The Phase 1 studies should be subject to independent peer review by the Technical Advisory Committee.
11. The geographic scope of the Phase 1 mercury control studies should include all sources downstream of major dams. Allocations in the Delta TMDL should be given to all point and non-point methylmercury sources within the legal Delta and Yolo Bypass, including open waters.
12. The mercury control program and other Delta projects should recognize the multiple competing and potentially conflicting interests and projects, such as habitat restoration, flood protection, water supply, and human and wildlife consumption of fish.
    Efforts should be taken to ensure all stakeholder interests are represented in developing mercury control programs.

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2 BENEFICIAL USES AND EXISTING CONDITIONS

2.1 Delta Beneficial Uses Cited in the Basin Plan

The federal Clean Water Act and the state Porter-Cologne Water Quality Act require identification and protection of beneficial uses of water. Beneficial uses are designated by the Central Valley Water Board and are shown in Table II-1 of the Basin Plan (CVRWQCB, 2009b). Table 2.1 lists the existing and potential beneficial uses of the Delta. The Delta provides habitat for warm and cold-water species of fish and their associated aquatic communities. Additionally, the Delta and its riparian areas provide valuable wildlife habitat. There is significant use of the Delta for fishing and collection of aquatic organisms for human consumption. Further, water is diverted from the Delta for municipal (MUN) and agricultural (AGR) use.

Beneficial uses of the Delta that are impaired due to elevated methylmercury levels in fish are wildlife habitat (WILD) and human consumption of aquatic organisms. High methylmercury levels in fish pose risks for people and wildlife that eat Delta fish. A summary of Delta fish methylmercury levels is presented in Section 2.2. Note that in Table 2.1, contact recreation (REC-1) is identified as impaired by mercury. When the Central Valley Water Board first adopted the Basin Plan, the commercial and sportfishing beneficial use (COMM) was only defined for saltwater, not freshwater. Water bodies in the Central Valley were not specifically assessed for consumption of fish and shellfish and REC-1 was assumed to cover consumption where it occurred. Staff proposes adding the COMM beneficial use, which is now available for freshwater, as a designated use for waterways within the legal Delta boundary, including the southern Yolo Bypass and within the Yolo Bypass upstream of the Delta (see Section 2.3).

The municipal and industrial supply (MUN) beneficial use is designated in the Basin Plan for all waterways within the legal Delta boundary except Marsh Creek and waterways within the Yolo Bypass (e.g., Cache Creek Settling Basin outflow, Prospect Slough, and the downstream segment of Putah Creek within the Yolo Bypass). Staff evaluated whether levels of total mercury in water in Delta waterways support the MUN beneficial use. The California Toxics Rule (CTR) criterion for mercury protects humans from exposure to mercury through fish consumption and drinking water and is enforceable for all waters with a municipal and domestic water supply or aquatic beneficial use designation. As described in the TMDL Report Section 2.4.2, the CTR mercury criterion is exceeded in outflow from the Cache Creek Settling Basin and possibly in Prospect Slough, Putah Creek, and Marsh Creek; however, MUN is not designated for these waterways. Mercury reductions may be needed to meet the CTR in the Yolo Bypass downstream of the Cache Creek Settling Basin and in Marsh Creek, but these reductions will be addressed by the existing TMDL for Cache Creek and future TMDLs for the Marsh Creek and Putah Creek watersheds (see TMDL Report Section 7.4.2), in addition to actions designed to reduce fish methylmercury concentrations in the Delta/Yolo Bypass and total mercury exports to San Francisco Bay (see TMDL Report Section 8.2).

The Delta provides habitat for diverse populations of wildlife. Over two hundred and eighty species of birds and fifty species of fish inhabit the freshwater portion of the Delta, making it one of the State's most important wildlife habitats (Herbold *et al.*, 1992). Delta wildlife species that are primarily or exclusively piscivorous (that is, feed on fish) and therefore most likely at risk for mercury toxicity include: American mink, river otter, bald eagle, kingfisher, osprey, western grebe, common merganser, peregrine falcon, double crested cormorant, California least tern, and western snowy plover[2] (USEPA, 1997; CDFG 2002). Peregrine falcons are not piscivorous, but they eat birds that feed in the aquatic food chain. Bald eagles and California least terns are listed by the State of California or by the U.S. Fish and Wildlife Service (USFWS) as either threatened or endangered species. The Delta is a foraging and possible wintering habitat for bald eagles (USFWS, 2004). California least terns also forage in the Delta. There is at least one nesting colony of these terns within the Delta (USFWS, 2004). Although most of the Delta habitat is not preferred by peregrine falcons for nesting, several pairs have nested on bridges in the area (Linthicum, 2003). Although other wildlife species eat fish in the Delta, consumption patterns of the species listed above span the range of sizes of fish eaten.

Table 2.1: Existing Beneficial Uses of the Delta

Beneficial Use [(a)]	Status
Municipal and domestic supply (MUN)	Existing **[(b)]**
Agriculture – irrigation and stock watering (AGR)	Existing
Industry – process (PROC) and service supply (IND)	Existing
Contact recreation (REC-1) [(c)]	Existing **[(b)]**
Non-contact recreation (REC-2) [(c)]	Existing
Freshwater habitat (warm and cold water species)	Existing
Spawning, reproduction and/or early development of fish (SPWN) (warm water species)	Existing
Wildlife habitat (WILD)	Existing **[(b)]**
Migration of aquatic organisms (MIGR) (warm and cold water species)	Existing
Navigation (NAV)	Existing

(a) This table lists the beneficial uses designated for the Delta in Table II-1 of the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) (CVRWQCB, 2009b; available at: http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/). As noted in Chapter 1, the Yolo Bypass is a 73,300-acre floodplain on the west side of the lower Sacramento River. The lower two thirds of the Yolo Bypass are within the legal Delta, and waterways within the entire Delta are included in Clean Water Act 303(d) List as mercury-impaired. Table II-1 in the Basin Plan includes separate rows for the Yolo Bypass and Delta. Beneficial use designations are different in the two rows, but both include the REC-1 beneficial use. In a footnote, Table II-1 also has a separate beneficial use list for Marsh Creek, which includes Rec-1.

(b) These are beneficial uses impaired by mercury.

(c) REC-1 includes recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing and fishing. REC-2 includes recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, hunting and sightseeing.

[2] The CDFG *California Wildlife Habitat Relationships* database also reports observations of clapper rails in the Delta. Both of these species are federally listed as endangered and depend on the aquatic food web. However, staff of the Biological Contaminants Division of the US Geological Survey (USGS) confirmed that clapper rails prefer salt-water habitats and are only occasional visitors to the Delta regions (personal communication from Dr. S. Schwarzbach, USGS, to J. Cooke, CVRWQCB, April 2003).

2.2 Existing Concentrations of Methylmercury in Delta Fish

High levels of mercury in fish are of concern to people and wildlife that eat Delta fish. Table 2.2 summarizes average methylmercury concentrations in fish tissue for the eight Delta subareas by trophic level (TL).[3] Common small (<50 mm) TL2 and 3 fish species in the Delta include inland silverside, mosquitofish and threadfin shad. Common TL3 fish include bluegill, carp, redear sunfish, Sacramento sucker, and Chinook salmon (a.k.a. king salmon). Common TL4 fish include largemouth and striped bass, channel and white catfish and Sacramento pikeminnow. Most fish data summarized in Table 2.2 were collected between 1998 and 2001. Additional information is provided in the TMDL Report.

Significant regional variations in fish mercury concentrations exist in the Delta. Elevated concentrations occur along the periphery of the Delta while lower body burdens are measured in the central Delta. Concentrations are greater than levels identified as safe by the USEPA and USFWS (see Chapter 3) at all locations except in the central Delta. Reductions in fish methylmercury levels ranging from 0% to more than 70% in the peripheral Delta subareas are needed to achieve fish mercury levels protective of people and wildlife species that eat Delta fish.

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[3] Trophic levels are the hierarchical strata of a food web characterized by organisms that are the same number of steps removed from the primary producers. The USEPA's 1997 Mercury Study Report to Congress used the following criteria to designate trophic levels based on an organism's feeding habits:

Trophic level 1: Phytoplankton.
Trophic level 2: Zooplankton, benthic invertebrates, and plant-eating fish (Delta examples: clams, shrimp).
Trophic level 3: Organisms that eat zooplankton and other TL2 organisms (Delta examples: bluegill, carp, crayfish, Sacramento splittail, salmon, sucker, shad, sturgeon, and yellowfin goby).
Trophic level 4: Organisms that eat trophic level 3 organisms (Delta examples: largemouth, smallmouth, and striped bass; white catfish; and crappie).

Table 2.2: Weighted-Average Methylmercury Concentrations in Delta Fish

Key Species of Concern	Fish Species Trophic Level Food Group	Species-Specific Target (mg/kg)	**MeHg Concentration by Delta Subarea** (mg/kg) (a)							
			Central Delta	Marsh Creek (b)	Mokelumne River	Sacramento River	San Joaquin River	West Delta	Yolo Bypass North (c)	Yolo Bypass South (c)
Human	TL4 Fish (150-500 mm)	0.24	0.26	na	0.92	0.56	0.50	0.32	0.51	0.53
Human	TL3 Fish (150-500 mm)	0.08	0.08	na	0.28	0.21	0.11	0.11	0.28	0.19
Osprey	TL4 Fish (150-350 mm)	0.26	0.20	na	0.75	0.46	0.42	0.24	0.50	0.47
Grebe	TL3 Fish (150-350 mm)	0.08	0.08	na	0.29	0.17	0.12	0.08	na	na
Kingfisher	TL3 Fish (50-150 mm)	0.05	0.03	0.10	0.09	0.04	0.04	0.03	na	0.07
Least Tern	TL2/3 Fish (<50 mm)	0.03	0.02	na	0.07	0.03	0.04	0.03	na	0.05

(a) Samples were comprised of both individual fish and composites of multiple fish. Weighted average mercury concentration is based on the number of fish in the composite samples analyzed, rather than the number of samples. Fish mercury data were not available for every TL food group in every Delta subarea.

(b) Fish data collected in 1995 and 1996.

(c) Fish mercury data were not available for all trophic level food groups in the Yolo Bypass.

2.3 Proposed Modification to Beneficial Uses Identified in the Basin Plan

As noted in Section 2.1, the Basin Plan lists the existing and potential uses of the Delta and Yolo Bypass. The Basin Plan provides a standard definition for commercial and sport fishing (COMM). The COMM designation is defined as “uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes” (CVRWQCB, 2009b). The Basin Plan does not include the COMM designation for the Delta or Yolo Bypass. However, commercial and sport fishing is a past and present use of the Delta. To clarify the use of the Delta as a fishery, staff proposes to include the COMM beneficial use designation in the Basin Plan. The COMM designation would apply to named waterways in the Delta and Yolo Bypass. Staff listed and mapped these waterways and proposes adding them to the Basin Plan as Appendix 43. The purpose of the recommended fish tissue objectives and the implementation plan is to protect for the consumption of fish, which is more accurately covered under COMM than REC-1. The inclusion of COMM will not change fishing habits or patterns.

The Delta provides habitat for as many as fifty freshwater, saltwater and anadromous fish species (Moyle, 2002), including popular sport species such as bass, salmon, sturgeon and catfish. The California Department of Fish and Game (CDFG) issues commercial fishing licenses in California and reports active commercial fishing in the Delta. CDFG’s Marine Resources website provides summary data for commercial landings and associated costs for fishing years 2001 and 2002. The predominant species targeted include bay shrimp, crayfish and threadfin shad. Threadfin shad are used mainly as baitfish for catching striped bass. Historical data for other commercial fishing activities are not available.

Noncommercial fishing is common throughout the Delta and takes place year round. On average, sport fishing license sales in the six Delta counties account for 19% of all licenses issued in California for striped bass, salmon and steelhead. It is unknown what portion of those licenses was purchased for fishing within the statutory Delta boundary. However, creel surveys and interviews indicate that sport and subsistence anglers actively fish the Delta waterways year-round by boat and from banks. CDFG's creel surveys indicate that multiple species are caught and kept, including catfish, striped bass, black bass, and Sacramento pike minnow, Chinook salmon (a.k.a. king salmon), American shad, splittail, sunfish, sturgeon, starry flounder, common carp, Sacramento sucker, steelhead trout and rainbow trout. Recent interviews of selected groups in the Delta region found that members of Southeast Asian, Latino, African-American, and Russian communities regularly eat local fish, especially striped bass and catfish (CDHS, 2004 & 2006; Silver *et al*, 2007; see Section 4.6.3 in the TMDL Report). Several fishing derbies for striped bass, black bass and sturgeon take place in the Delta every year. Sacramento blackfish, shimofuri goby and clams may also be collected from the Delta (Moyle, 2002; anecdotal information). However, the CDFG creel surveys (CDFG, 2000-2001), anecdotal information provided by CDFG staff (Schroyer, 2003), and the other recent interviews indicate that many Delta anglers target salmon, sunfish, striped bass, largemouth bass and catfish and are not as likely to take home clams and shrimp species. For specific information on fish licenses and CDFG's creel survey data, refer to Appendix C of the TMDL Report.

Staff proposes to add the COMM designation without describing it as a potential or existing use. Designating a beneficial use in the Basin Plan means that the State is obligated to protect that beneficial use. The State's obligation to protect the use is the same, regardless of whether the use is identified in the Basin Plan as potential or existing. Sport fishing occurs widely in the Delta, but methylmercury concentrations in fish and extent of commercial fishing vary across subareas. Deciding which modifier is appropriate for each Delta subarea could be time and resource consuming and is not necessary for the scope of the current amendment. The aim of the Basin Plan amendments is to protect COMM, regardless of whether it is existing or potential.

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3 FISH TISSUE OBJECTIVES

Water quality objectives are established in Basin Plans by the Regional Water Boards to protect beneficial uses. Water quality objectives provide a specific basis for the measurement and maintenance of water quality. For this Basin Plan amendment, the objective that needs to be established to protect the beneficial use is methylmercury concentrations in fish tissue. Therefore, instead of "water quality objectives", the appropriate term for the objectives used in this report is "fish tissue objectives".

The Basin Plan for the Sacramento River and San Joaquin River Basins does not contain numeric objectives for fish tissue methylmercury within the legal Delta boundary. Not until recently have fish tissue objectives been adopted for any of the Delta's tributary watersheds (e.g., Clear Lake and Cache Creek). Methylmercury concentration in fish tissue is considered an appropriate objective for the Delta because it is the most toxic form of mercury; it is the form by which people and wildlife may be exposed in the Delta at levels to cause adverse effects; it provides the most direct assessment of fishery conditions and improvement; and a safe fishery is the foremost unmet beneficial use of the Delta.[4]

This chapter evaluates five possible alternatives for fish tissue objectives to address methylmercury in Delta fish. In developing the alternative fish tissue objectives below, Central Valley Water Board staff considered (1) existing conditions in the Delta (see Chapter 2), (2) numerical guidelines and recommended criteria available from USEPA, USFWS and other agencies, and (3) that the current listing of Delta waterways as impaired for mercury because of fish consumption advisories (OEHHA, 1994 & 2007).

Fish tissue concentrations in the Delta exceed human and wildlife guidelines of the USEPA, and USFWS. The recommended objectives incorporate current USEPA and USFWS information regarding methylmercury toxicity to people and wildlife (see Section 4.5.1 of the TMDL Report).

3.1 Alternatives Considered

To develop fish tissue objective alternatives, staff used a formula that incorporated the safe daily intake of methylmercury (reference dose), consumer's body weight, and fish consumption rate. See Appendix B for calculations of the alternatives. Chapter 4 (Numeric Targets) in the TMDL Report provides detailed explanations of these calculations and:

- Shows how the safe level of mercury in fish varies between fish trophic level and length;

[4] In the Delta TMDL Report, Central Valley Water Board staff provided safe methylmercury concentrations in piscivorous and omnivorous birds eaten by bald eagles and peregrine falcons. Existing concentrations in such "avian prey" are not known. Because people do not typically eat birds that are preyed upon by bald eagles and peregrine falcons, it would be difficult to determine whether a safe concentration in avian prey is protective of people who eat Delta fish. For these reasons, Central Valley Water Board staff is not proposing tissue objectives for avian prey species. The USFWS concluded that meeting protective levels in fish tissue would adequately reduce methylmercury levels in the avian prey species that eat Delta fish or invertebrates (USFWS, 2004).

- Evaluates the safe level of mercury in fish for human consumption under 15 different scenarios based on different consumption rates and trophic level (TL) distributions (see Table 4.5 in the TMDL Report).
- Determines whether safe levels for human and wildlife consumption of large TL4 fish equate to safe levels for wildlife consumption of small fish.

This alternatives analysis focuses on five of the scenarios described in the TMDL Report. The alternatives vary in the amount and trophic level of fish that can be safely eaten by people and wildlife, as depicted in Table 3.1. Numeric objectives are proposed as average concentrations in fish muscle tissue (for large fish) or in whole fish (for small fish).

Although the fish tissue objectives are based on bodyweights and consumption rates for adults, the objectives also protect children. Children have smaller bodyweights than adults and typically eat less fish than adults. Under the recommended fish tissue objectives, children are only at risk of mercury toxicity if they eat more than the average portion for their body size. OEHHA advises that children 12 and under be served no more than half of an adult portion size (8 ounces uncooked; OEHHA, 2008).

Wildlife species most at risk from methylmercury are primarily or exclusively piscivorous. Species at risk in the Delta include the American mink, bald eagle, California least tern, common merganser, double crested cormorant, kingfisher, osprey, peregrine falcon, river otter, western grebe, and western snowy plover. Evaluation of the alternatives takes into account protection of wildlife. In addition, Alternatives 3 and 4 include an objective for small (less than 50 mm total length) TL2 and TL3 fish to ensure that wildlife species eating these fish are protected.

The following sections describe the alternatives' fish tissue objectives with their corresponding human consumption rates.

Table 3.1: Comparison of Fish Tissue Objective Alternatives

Alternative	**Recommended Objective for MeHg in Large TL4 Fish** (mg/kg)	**Potential Human Consumption Rates & Trophic Level Distributions of Delta Fish Consumed** [b]
2	0.58	3.8 g/day of TL2 fish, 8.0 g/day of TL3 fish, and 5.7 g/day of TL4 fish, for a sum of 17.5 g/day
3 [a]	0.29	17.5 g/day of large TL4 fish
4 [a]	0.24	32 g/day of a 50/50 mix of large TL3 and 4 fish
5	0.05	142.4 g/day of large TL4 fish

(a) Alternatives 3 and 4 also propose an objective for small, whole TL2 and TL3 fish of 0.03 mg/kg to protect wildlife species that eat small fish. In addition, Alternative 4 proposes a methylmercury objective for large TL3 fish of 0.08 mg/kg.

(b) Consumption rates are in terms of uncooked fish.

3.1.1 *Alternative 1. No Action*

Alternative 1 contains no fish tissue objective for the Delta. The existing toxicity-related narrative objective of the Basin Plan would still apply: “All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal or aquatic life.” The criterion likely to be used to interpret the narrative objective is the California Toxics Rule criterion of 50 ng/l for total recoverable mercury in water.

This alternative does not sufficiently protect people or sensitive fish-eating wildlife that eat Delta fish. Although water column total mercury concentrations are less than the CTR throughout the Delta (see Chapter 7 in the TMDL Report), fish mercury levels still exceed safe levels for people and wildlife. As explained later in Section 3.2.3 of this chapter, water column total mercury concentrations lower than the CTR criterion would be needed to protect people and wildlife species that consume Delta fish and the safe levels would vary throughout different areas of the Delta. For that reason, Alternatives 2 through 5 propose numerical fish tissue objectives to explain the narrative objective in the current Basin Plan and facilitate implementation of a water quality management strategy to reduce methylmercury levels in Delta fish.

3.1.2 *Alternative 2. Fish Tissue Objective of 0.58 mg/kg Methylmercury in Large TL4 Fish*

Alternative 2 contains one fish tissue objective (average methylmercury concentration): **0.58 mg methylmercury/kg muscle tissue, wet weight, for large TL4 fish** (legal size if designated by CDFG, otherwise 150-500 mm total length). The large fish tissue objective is based on the following scenario:

- People eat 17.5 grams/day of freshwater/estuarine (local Delta) fish (one fish meal every two weeks) and 12.46 g/day of marine (commercial) fish (0.4 fish meals per week; USEPA, 2000b).[5] A national survey found that 90% of the nation’s population eats 17.5 g/day or less of freshwater (local) fish.
- Adult body weight is 70 kg (about 154 pounds).
- Fish or shellfish eaten are from a variety of trophic levels (TL2, TL3, and TL4, with consumption rates of 3.8, 8.0, and 5.7 g/day, respectively).
- The USEPA reference dose (RfD) for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.

As noted in Table 4.5 of the TMDL Report, mercury concentrations in TL2 and TL3 fish that correspond to the TL4 fish objective are 0.04 and 0.20 mg/kg, respectively. By meeting the TL4 fish objective, these concentrations will be met as well.

Alternative 2 uses the same methods and assumptions that the USEPA used in developing its recommended methylmercury criterion to protect human health (USEPA, 2001). The USEPA

[5] One meal of fish for an adult human is assumed to be eight ounces of uncooked fish or shellfish (6 ounces cooked). The consumption rate of 17.5 g/day is equivalent to one eight-ounce meal per 2-week period, or four ounces per week (2.3 meals/month).

recommends an ambient water quality criterion of 0.3 mg/kg methylmercury in fish tissue, on a wet weight basis,[6] which represents the concentration in fish tissue that should not be exceeded based on a total consumption of locally caught fish of 17.5 g/day. The USEPA criterion, like Alternative 2, assumes that people will eat a mixture of locally caught freshwater or estuarine fish from trophic levels 2, 3, and 4 in the proportions described above.

Alternative 2 is not protective of people eating mainly TL4 fish (such as bass and catfish) and also is not protective of several fish-eating wildlife species, including bald eagle, osprey, river otter, grebe, common merganser, and least tern (as shown in Table 4.3 of the TMDL Report). However, this alternative would be protective of mink, double-crested cormorant, belted kingfisher, and western snowy plover.

Therefore, Alternative 2 is protective of (a) people who eat a moderate amount of fish from different trophic levels (TL2, 3, and 4), and (b) some sensitive fish-eating wildlife.

3.1.3 Alternative 3. Fish Tissue Objectives of 0.29 mg/kg Methylmercury in Large TL4 Fish and 0.03 mg/kg in Small TL2/3 Fish

Alternative 3 contains two fish tissue objectives (average methylmercury concentration): **0.29 mg methylmercury/kg muscle tissue, wet weight, for large TL4 fish** (legal size if designated by CDFG, otherwise 150-500 mm total length) and **0.03 mg methylmercury/kg whole fish, wet weight, for small TL2 and TL3 fish** (less than 50 mm total length).

USEPA's 2001 Water Quality Criterion report allows for using site-specific information to set a local methylmercury criterion. The large fish tissue objective is based on the following scenario, which makes use of site-specific information:

- Some of the same conditions as Alternative 2 (USEPA default), that is:
  - People eat 17.5 g/day of freshwater/estuarine (local Delta) fish and 12.5 g/day of marine (commercial) fish.
  - Adult body weight is 70 kg (about 154 pounds).
  - The USEPA RfD for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.
- One change from the conditions in Alternative 2, that is, local Delta anglers prefer to eat primarily TL4 fish (not a mixture of TL 2, 3, and 4 fish), as evidenced by CDFG creel surveys (CDFG, 2000-2001), anecdotal information by CDFG staff (Schroyer, 2003), and other recent local surveys (see Section 4.6.3 in the TMDL Report).
- Delta creel surveys show that anglers may target an almost even mix of TL3 (American shad, salmon, sunfish, and splittail) and TL4 fish (catfish and striped bass) in the Sacramento and Mokelumne Rivers subareas of the Delta, and primarily TL4 species in other areas of the Delta. Local anglers take home fewer TL2 species, such as clams,

[6] USEPA's criterion of 0.3 was rounded to one significant digit from 0.288 mg/kg. The fish tissue objective alternatives calculations were based on a methylmercury in fish tissue concentration of 0.29 mg/kg to incorporate two significant digits. Detailed calculations are included in Appendix B and in Chapter 4 in the TMDL Report.

shrimp, and shimofuri goby, than indicated in the national dietary used in the USEPA methylmercury criterion and Alternative 2.

In several small surveys in the Delta, the California Department of Public Health found that while striped bass (a TL4 species) is frequently sought, people who regularly eat Delta fish do so from both trophic levels 3 and 4 (CDHS, 2004-2006; Silver *et al.*, 2007; Ujihara, 2006); see Section 4.6.3 in the TMDL Report). TL3 species such as bluegill are available year-round. Popular fish such as salmon and shad are available seasonally.

In addition to the large fish objective, Alternative 3 includes a small fish objective for TL2 and TL3 fish to protect wildlife that eat small fish. This objective represents the safe level for prey eaten by the California least tern, a federally endangered species. This small fish objective also protects other wildlife consuming small fish in the Delta, including herons, rails, egrets, western snowy plovers, and other species of concern. Meeting the objective for large TL4 fish is expected to reduce methylmercury in smaller fish sufficient to protect wildlife because methylmercury concentrations in large TL4 fish show statistically significant, positive relationships with concentrations in smaller fish and in fish in different trophic levels. Alternative 3 includes an objective of 0.03 mg/kg methylmercury in whole, TL2 and TL3 fish less than 50 mm in length so that fish monitoring may verify that small fish mercury levels decrease to protective levels as large fish mercury levels decrease.

Therefore, Alternative 3 is protective of (a) people who eat a moderate amount of fish that are primarily large TL4 species, and (b) all sensitive fish-eating wildlife.

3.1.4 Alternative 4. Fish Tissue Objectives of 0.24 mg/kg Methylmercury in Large TL4 Fish, 0.08 mg/kg in Large TL3 Fish and 0.03 mg/kg in Small TL2/3 Fish

Alternative 4 contains three fish tissue objectives (average methylmercury concentration). For large fish, the objectives are **0.08 and 0.24 mg methylmercury/ kg, wet weight, in muscle tissue of large TL3 and 4 fish**, respectively (legal size if designated by CDFG, otherwise 150-500 mm total length). These objectives are protective of (a) people eating 32 g/day (eight ounces, uncooked fish per week) of commonly eaten, legal size fish, and (b) all wildlife species that eat large fish. For small fish, the objective is **0.03 mg methylmercury/ kg, wet weight, in whole TL2 and TL3 fish less than 50 mm** in total length.

These large fish tissue objectives are based on the following scenario:

- Some of the same conditions as Alternative 2 (USEPA default), that is:
    - Adult body weight is 70 kg (about 154 pounds).
    - The USEPA RfD for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.
- Two changes from the conditions in Alternative 2, that is:
    - People eat more local fish, at a rate of 32 g/day (one fish meal per week).
    - People eat a 50/50 combination of TL3 and 4 fish, based on CDFG creel surveys in the Sacramento River and Mokelumne subareas of the Delta and CDPH angler surveys of Delta subpopulations.

The higher consumption rate is based on a detailed angler consumption survey for San Francisco Bay that was conducted in 1998 and 1999 (CDHS & SFEI, 2001). The consumption rates for the 95th percentile of anglers that were "consumers" (ate Bay fish at least once prior to the interview) was 32 g/day (about one eight-ounce meal per week). San Francisco Bay Water Board staff used this consumption rate to develop the water quality objective for mercury in Bay fish, which was approved by the San Francisco Bay and State Water Boards (see Section 6.2.11 in Chapter 6). One meal per week is also used by OEHHA in development of fish consumption advisories (OEHHA, 2004; 2005).

Like Alternative 2, Alternative 3 includes a small fish objective of 0.03 mg/kg methylmercury in whole TL2 and TL3 fish to ensure that wildlife species that eat small fish are protected, even though the objective for large TL4 fish is expected to reduce methylmercury in smaller fish sufficient to protect wildlife. The recommended small fish objective is the level needed by the California least tern and will protect other fish-eating wildlife species.

Therefore, Alternative 4 is protective of (a) people who eat a relatively high amount of fish that are an even mixture of TL3 and TL4 species, and (b) all sensitive fish-eating wildlife.

3.1.5 Alternative 5. Fish Tissue Objective of 0.05 mg/kg Methylmercury in Large TL4 Fish

Alternative 5 contains one fish tissue objective (average methylmercury concentration): **0.05 mg methylmercury/kg muscle tissue, wet weight, for large TL4 fish** (legal size if designated by CDFG, otherwise 150-500 mm total length). This fish tissue objective is based on the following scenario:

- Some of the same conditions as Alternative 2 (USEPA default), that is:
  - Adult body weight is 70 kg (about 154 pounds).
  - The USEPA RfD for people (0.1 micrograms per kilogram body weight per day; USEPA 2001) is an acceptable daily intake level.
- Two changes from the conditions in Alternative 2:
  - Some people are subsistence consumers; because of tradition or need, these people have high consumption rates of locally caught fish, represented by a rate of 142.4 g/day (four to five fish meals per week). This rate is the 99th percentile consumption rate identified in a national food intake survey and recommended by USEPA for subsistence anglers and their families. These subsistence anglers are expected to eat mainly TL4 species like catfish and bass.
  - The calculations assume that methylmercury intake is from only Delta fish and that none is from commercial fish.

Alternative 5 does not include a small fish objective because the large TL4 fish objective (0.05 mg/kg) is so close to the safe level for the smallest fish (0.03 mg/kg). Additionally, the large TL4 fish objective is substantially lower than necessary to protect wildlife consuming large TL3 and TL4 fish (see Table 4.9 in the TMDL Report).

Therefore, Alternative 5 is protective of (a) people who eat a very high amount of TL4 fish species, and (b) all sensitive fish-eating wildlife.

3.2 Evaluation of Alternatives

Section 13241 of the Porter-Cologne Water Quality Act identifies six factors that must be addressed when evaluating a fish tissue objective. Factors to be considered are:

- Past, present, and probable future beneficial uses of water;
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water.

The alternatives for fish tissue objectives are evaluated with respect to these factors in the following six sections. The alternatives are evaluated with respect to applicable state and federal policies in Chapter 6.

3.2.1 Beneficial Uses

Several beneficial uses of Delta waters are impaired by mercury: consumption of fish and shellfish by people (REC-1, COMM), and wildlife habitat (WILD). The recommended fish tissue objectives and implementation plan are intended to restore these beneficial uses.

Under Alternative 1, beneficial uses are protected by the narrative toxicity objective of the Basin Plan. However, evaluating the success of methylmercury reduction efforts (as part of the implementation plan) will be easier using numeric fish tissue objectives such as those in Alternatives 2 through 5.

Alternatives 2 through 5 protect the REC-1 beneficial use already identified in the Basin Plan and the proposed COMM beneficial use. Alternative 2 is not fully protective of the WILD beneficial use because the alternative exceeds the safe methylmercury levels for some wildlife species. Alternatives 3 through 5 fully protect the WILD beneficial use. Alternative 5 provides the greatest protection to people who eat Delta fish.

3.2.2 Environmental Characteristics of the Hydrographic Unit

Delta water is used for drinking water, irrigation, contact recreation, stock watering, commercial/sport fishing, and habitat for warm- and cold-water aquatic species. In addition, the Delta provides a significant fishery and habitat for terrestrial wildlife. Environmental characteristics and existing conditions of the Delta and tributaries are discussed in more detail in Chapters 1 and 2, respectively.

All alternatives would affect environmental characteristics of the hydrologic unit by improving water quality conditions of the Delta and its tributaries to varying degrees. Improvements likely to be achieved by each alternative (through different numeric fish tissue objectives for methylmercury) are described in the next section. Methylmercury levels in water and fish in the Delta vary as a function of hydrology and patterns of flow of water from the major tributaries into and through the Delta. To ensure that the water quality objectives are attained throughout the Delta, the recommended control program divides the Delta into seven hydrologically-based subareas with specific source reduction requirements for each subarea.

3.2.3 Water Quality Conditions That Could Reasonably Be Achieved

Alternatives and Consumption Rates They Would Allow

Alternative 1 (No Action) contains no fish tissue objective for the Delta, but defaults to the Basin Plan's existing narrative toxicity objective, which is translated into a numerical objective (based on the USEPA CTR criterion) of 50 ng/l total mercury in the water column. However, calculations show that a lower CTR criterion is needed to protect people and sensitive wildlife species that eat Delta fish. The CTR criterion was derived using similar factors as the fish tissue alternatives, with an additional factor to relate fish tissue methylmercury concentrations to water total mercury concentrations. This additional factor, termed the practical bioconcentration factor (BCF), is the ratio of mercury concentrations in fish and water. The BCF used for the CTR criterion is 7,342.6 (USEPA, 2000a). In comparison, the BCFs for large TL4 fish and ambient total mercury in the Delta vary by subarea and range between 18,000 and 170,000, and the BCFs for large TL3 fish and ambient total mercury in the Delta range between 6,300 and 53,000. The presence of higher BCFs in the Delta, compared to the CTR's BCF, indicate that a total mercury concentration lower than the CTR criterion would be needed to protect people and wildlife species that eat Delta fish. The final Great Lakes Water Quality Guidance developed bioaccumulation factors (BAFs) for TL3 and TL4 fish of the Great Lakes Basin by multiplying watershed-specific BCFs by a food-chain multiplier. The BAFs for mercury for TL3 and TL4 fish were 27,900 and 140,000, respectively, which are comparable to the TL3 and TL4 BCFs calculated for the Delta, indicating that the BCFs for the Delta are not anomalous.

Alternative 2 has a fish tissue objective that allows people to safely eat a moderate amount of Delta fish from a variety of trophic levels but does not fully protect all sensitive fish-eating wildlife. Under Alternative 2, people safely may eat up to 17.5 g/day of local fish (one eight-ounce meal every two weeks), if they eat a mixture of TL2 (21.7%), TL3 (45.7%), and TL4 (32.6%) fish. Alternative 2, however, could exceed the safe intake levels identified by the USFWS for bald eagle and least tern.

Alternative 3 has fish tissue objectives that allow people to safely eat a moderate amount of Delta TL4 fish and also fully protects all sensitive fish-eating wildlife. Under Alternative 3, people safely may eat up to 17.5 g/day of local TL4 fish such as bass and catfish. Alternative 3 is more protective of people than Alternative 2 because, by protecting people who eat more of the Delta fish that are highest in methylmercury (TL4 fish), the fish tissue objective is lower in Alternative 3 than in Alternative 2.

Alternative 4 has fish tissue objectives that allow people to safely eat a relatively high amount of Delta TL3 and TL4 fish and also fully protects all sensitive fish-eating wildlife. Under Alternative 4, people may safely eat up to 32 g/day (one eight-ounce meal week) of local fish, if they eat an even mixture of TL3 and TL4 fish. Alternative 4 is more protective of people than

Alternative 3 because, by protecting people who eat more Delta fish, the fish tissue objective is lower in Alternative 4 than in Alternative 3.

Alternative 5 has a fish tissue objective that allows people to safely eat a very high amount of Delta TL4 fish and also fully protects all sensitive fish-eating wildlife. Under Alternative 5, people may safely eat up to 142.4 g/day (four to five meals per week) of local TL4 fish. Alternative 5 is more protective of people than Alternative 4 because, by protecting people who eat the most Delta fish (due to tradition or need), the fish tissue objective is lower than in Alternative 5 than in Alternative 4. Accordingly, Alternative 5 has the lowest fish tissue objective of any alternative.

Alternatives Compared to Current Conditions

Currently, Alternatives 2 through 5 have varying levels of attainment of fish tissue objectives. Alternative 2 currently is attained in seven of eight subareas of the Delta, while Alternative 3 currently is attained in only one subarea (Central Delta subarea). Alternative 4 is close to attainment in the Central Delta subarea, but not in other subareas. Alternative 5 is not attained in any subareas of the Delta.

The level of reduction required by each alternative depends on the subarea. For example, to attain Alternative 2, methylmercury in large TL4 fish must decrease by 43% in the Mokelumne/Cosumnes subarea while no reductions are needed in other subareas. To attain Alternatives 3 and 4, methylmercury in fish must decrease from little to none in the Central Delta subarea, but must decrease by greater than 70% in the Mokelumne/Cosumnes subarea. To attain Alternative 5, methylmercury in large TL4 fish must decrease by 81% to 95% in all subareas of the Delta.

Alternatives Compared to Regional Mercury Levels and Their Potential Attainability

In a recent study, the USEPA and Oregon State University collected and analyzed 2,707 large TL3 and 4 fish from 626 streams and river segments in the western United States, including California, using a probability design (Peterson *et al.*, 2007). The purpose of the study was to assess the distribution of mercury in fish across the region. Central Valley Water Board staff evaluated the study results in terms of the existing fish mercury levels in the Delta and alternative fish tissue objectives (Foe, 2007). Only 1 to 3% of the waterways evaluated by the study had fish mercury concentrations higher than those observed in the Mokelumne/Cosumnes subarea of the Delta. Fish mercury concentrations in the Sacramento, San Joaquin, and Yolo Bypass subareas were in the top 20 to 25% of fish mercury concentrations observed throughout the western United States. These comparisons confirm that Delta fish have elevated concentrations in comparison to regional background levels and suggest that the Delta and its tributary watersheds contain mercury sources in addition to atmospheric deposition, e.g., abandoned mines and sites where the mercury is efficiently converted to methylmercury that bioaccumulates in the aquatic food web (Foe, 2007).

Of the sampled waterways in the western United States, none supported a fish population with mercury concentrations as low as Alternative 5 (0.05 mg/kg in large TL4 fish) (Peterson *et al.*, 2007; Foe, 2007). Therefore, Alternative 5 may not be attainable. In contrast, about 30% to

40% of the sampled waterways supported a fish population with mercury concentrations lower than Alternatives 3 and 4, suggesting that these alternatives may be attainable with implementation of a vigorous control program.

Alternatives and Effectiveness of Their Implementation Programs

As described in the TMDL Report (Chapters 3 and 5), the problem with methylmercury in Delta fish can be defined as biotic exposure to methylmercury. Therefore, decreasing biotic exposure to methylmercury is the ultimate goal of the Delta methylmercury TMDL implementation program, with methyl and total mercury source control actions focused on reducing methylmercury levels in ambient Delta waters. The implementation program for Alternative 2 requires source controls only for the Mokelumne/Cosumnes River subarea, thus would not measurably improve conditions in the rest of the Delta. The implementation programs for Alternatives 3 through 5 also would focus on source controls but vary regarding (a) where source controls are required, (b) the number of individual sources required to characterize and control their source inputs (methyl and total mercury), and/or (c) the percent reductions required for source inputs.

Attainment of Alternative 5 will be difficult to track. This is because Alternative 5 (0.05 mg/kg in large TL4 fish) is substantially below existing conditions, thus making it difficult to accurately extrapolate from methylmercury in fish (fish tissue objective) to corresponding methylmercury in water (aqueous methylmercury concentration). Such extrapolation for Alternative 5 produces a concentration of 0.028 ng/l methylmercury in water, which is below the current minimum reporting level for laboratory analyses for methylmercury. (Minimum reporting levels are equivalent to the lowest calibration standard for methylmercury, which is currently 0.05 ng/l.) Though aqueous methylmercury concentrations below the minimum reporting level can be detected, they cannot be quantified accurately; thus, Alternative 5 progress will be difficult to quantify and track. In contrast, Alterative 4 (0.24 mg/kg in large TL4 fish) corresponds to 0.066 ng/l methylmercury in water, which is above the minimum reporting level of 0.05 ng/l and thus can be quantified accurately.

Time to Reach Attainment

In general, the lower the fish tissue objective, the greater the source reductions needed to attain the objective and the greater the time expected to reach attainment. Alternative 1 (No Action), by definition, does not require adoption of new objectives. Under Alternative 1, staff would likely use the CTR mercury criterion when numeric interpretation of the Basin Plan’s narrative toxicity objective is needed. Mercury reductions may be needed to meet the CTR in the Yolo Bypass downstream of the Cache Creek Settling Basin and in Marsh Creek, but these reductions will be addressed in existing (Cache Creek) and future (Marsh Creek) TMDLs (see TMDL Report Section 7.4.2). Because the CTR is less protective than any of the fish tissue objective alternatives, the Delta would continue to be impaired by mercury. Alternative 2 (0.58 mg/kg in large TL4 fish) currently is attained in seven of eight subareas of the Delta and requires an average fish mercury reduction of 43% in the Mokelumne/Cosumnes subarea. In contrast, Alternative 5 (0.05 mg/kg in large TL4 fish) requires fish mercury reductions of 81% to 95% in all subareas of the Delta.

Concentrations of methylmercury in water and fish are expected to decrease as sediment mercury concentrations decline due to total mercury source control actions. Mercury control programs in other states and countries demonstrated significant reductions in fish methylmercury concentrations after source control, but decades later the fish mercury levels were still higher than at uncontaminated, comparison sites.[7] In these mercury control programs, efforts were directed solely at total mercury sources and not at a combination of total mercury and methylmercury sources. A total mercury-focused control program would likely attain Alternative 2 because Alternative 2 requires a comparatively modest reduction in fish mercury levels in only one Delta subarea (Mokelumne/Cosumnes subarea) that is supplied by a relatively small watershed within the Sierra Foothills (compared to the watershed that supplies the Sacramento, Yolo Bypass, San Joaquin subareas; see Figure 6.1 in the TMDL Report).

Targeting methylmercury sources in addition to total mercury sources – by reducing methylmercury discharges or curtailing the methylation process – is expected to more rapidly reduce methylmercury concentrations in fish and enable full compliance with Alternatives 3 and 4. Under an implementation plan to reduce methyl and total mercury sources, measurable decreases in fish methylmercury concentrations are expected to occur within approximately five to ten years (two to three fish life cycles) after control actions are implemented and allocations for Delta/Yolo Bypass sources are achieved. Staff expects additional decreases as upstream mercury control programs are developed and implemented to achieve the tributary allocations. However, those decreases would be followed by a long, gradual decline because natural erosion (a slow process) may be needed to wash out legacy mercury in the Delta's tributary channels (see Chapter 4). Thus, actual attainment of Alternatives 3 and 4 could take more than a hundred years, assuming that legacy and new inputs of mercury are significantly reduced.[8] As noted earlier, Alternative 5 may not be attainable because its fish tissue objective is below regional background fish mercury levels observed in the western United States.

3.2.4 Economic Considerations

Cost of Implementation

Depending on the alternative, anticipated costs of implementation include some or all of the following activities: public education, fish tissue monitoring, construction and maintenance. Alternative 1 involves only public education, while Alternatives 2 through 5 involve all four activities. The costs for education – about $130,000 per year – are relatively small, compared to costs for monitoring, construction and maintenance (see Chapter 4, Tables 4.4 and 4.5, and Appendix C).

Alternative 1 is the least expensive of the alternatives, because Alternative 1 involves only public education. Alternative 2 is the next least expensive because control programs are

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[7] See the review of mercury cleanup projects in Chapter 3 of the TMDL Report.

[8] For additional discussion of the estimated time to reduce inorganic mercury inputs and attain fish tissue objectives, see "Staff's Initial Responses to Board and Stakeholder Questions and Comments at the April 2008 Hearing", items 3 and 44, available in the Administrative Record.

needed in only one subarea. However, these alternatives do not sufficiently protect people and sensitive wildlife species.

Alternatives 3 through 5 have essentially the same cost for Phases 1 and 2 of the control program, despite their different fish tissue objectives, because these alternatives require control programs throughout the entire Delta region. (The Alternative 3 objective currently is met in only one subarea of the Delta, and the Alternatives 4 and 5 objectives currently are not met in any subarea.) Costs associated with the Phase 1 methylmercury control studies for existing sources may range from about $4.4 million to $14.7 million. Annual costs associated with monitoring activities may range from $75,000/yr to $276,000/yr. Annual costs associated with new total mercury minimization activities implemented by point sources may range from about $1.8 million to $7.3 million. Annual costs for Phase 2 methylmercury reduction actions may range from about $2.4 million/yr to $26.5 million/yr. Costs will be less if an alternative with higher fish tissue objectives is selected because higher objectives may take less time and effort to be attained, thereby reducing the cost of reduction activities as well as long-term monitoring and public outreach and education costs.

Importance of Delta Fishery

The Central Valley Water Board is not legally required to estimate the value of resources as part of the economic considerations. However, because information is available on the value of the fishery and the potential costs of mercury intake, this information is summarized below.

The Delta fishery is a valuable resource. In 1994, the Delta Protection Commission estimated the value of recreational activities, including fishing, for the local economy. Anglers on average spent an estimated $186 million inside the Delta and $206 million outside of the Delta, for sport-fishing activities in the Delta (Goldman *et al.,* 1998). The worth of Delta fish as a food source, particularly for people who eat local fish because of custom or to supplement their diet, has not been calculated but is likely substantial.

OEHHA issued an interim fish consumption advisory for the Delta in 1994 and released a draft advisory for the south Delta in March 2007 that addresses a variety of fish and shellfish species. Recent publicity about consumption advisories for the Delta may decrease angling in the near term, but the use of Delta fish as a food resource could increase as methylmercury levels decline, which would benefit the Delta economy.

Under existing conditions, consumption of some Delta fish more than one or two times per month may cause adverse health effects. Mercury is a toxicant that can have lasting effects on neurological development and abilities of persons exposed *in utero* and as children. People exposed to methylmercury through consumption of fish showed deficits in memory, attention, language, fine motor control, and visual-spatial perception that can result in lowered intelligence (NRC, 2000; Trasande *et al.*, 2005).

Lower intelligence causes a decrease in income that persists over the lifetimes of affected persons. To estimate the loss in earnings to children born in one year and exposed to mercury in Delta fish, staff used national survey data of methylmercury concentrations in blood of women of childbearing age (Mahaffey *et al.*, 2004), the income loss calculation of Trasande and colleagues (2005), and United States census data on population and birth rates in six Delta counties in 2000.[9] In year 2000 dollars, the calculated loss in income for all Delta residents entering the workforce in a single year is $156 million,[10] but could range from $41 to 250 million[11] (best-case to worst-case scenario).

3.2.5 Need for Housing

None of the alternatives restricts the development of housing in the Delta. Additionally, the alternatives are consistent with existing requirements for new urban development, including the municipal separate storm sewer system (MS4[12]) permitting program.

The reduced wastewater waste load allocations described in Chapter 4 of this report and in Chapter 8 of the TMDL Report may result in economic costs due to wastewater treatment system improvements. Municipal wastewater treatment capacity is often designed to accommodate a large percentage of possible housing development in the collection area. Wastewater treatment system improvements may be necessary to accommodate new housing development because the waste load allocations are based on current performance, not plant design capacity. In addition, it is conceivable that wastewater treatment plant (WWTP) upgrades and new best management measures (BMPs) to control total mercury and methylmercury implemented by urban stormwater management agencies to comply with the recommended Basin Plan amendments could entail the displacement of available housing or possibly require land that takes the place of new housing development. However, these concerns are not likely to affect more than a few housing units in the Delta, if any, for several reasons:

- It is reasonable to assume that wastewater treatment system improvements will be undertaken over the next one to two decades for a range of reasons including replacing aging infrastructure, TMDLs for other pollutants, and other regulatory actions unrelated to the Clean Water Act. These improvements could simultaneously address requirements for methylmercury reductions.
- The State Water Resources Control Board and the federal government offer funding for wastewater treatment system improvement, which would limit the economic impact of treatment improvements on development of new housing.

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[9] U.S. census information is available at: http://quickfacts.census.gov/qfd/states/.

[10] Assumptions: 10% of mothers have methylmercury levels in blood that result in decreased IQ of their children; the decreases in IQ cause certain percentage decrease in expected income over lifetime.

[11] Trasande and colleagues (2005) varied the modeling of the dose-effect relationship, the ratio of methylmercury in maternal to fetal blood, and the lowest methylmercury concentration at which impairments were observed in children. The low estimate assumes the combination of variables that produce the least severe effect. The high estimate is the “worst case” combination of variables. All estimates provide cost due to anthropogenic sources of mercury, based on understanding that about 70% of mercury worldwide comes from anthropogenic sources.

[12] A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances that include roads with drainage systems, municipal streets, alleys, catch basins, curbs, gutters, ditches, manmade channels, or storm drains, owned by a State, city, county, town or other public body. MS4s are designed and used for collecting or conveying storm water and do not include combined sewer systems or parts of a publicly owned treatment works. MS4s discharge to waters of the United States. The Municipal Storm Water Permitting Program regulates storm water discharges from MS4s.

- More than 500,000 acres of the Delta's 738,000-acre area is within the Primary Zone, an area where the Delta Protection Act of 1992 has the goal to "Protect, maintain, and, where possible, enhance and restore the overall quality of the delta environment, including, but not limited to, agriculture, wildlife habitat, and recreational activities." Substantial urban development has not taken place in the lowland areas encompassed by the Primary Zone. In contrast, the periphery of the Delta (the Secondary Zone) has undergone rapid urbanization associated with substantial population growth. However, with only two exceptions for Rio Vista and Ironhouse Sanitary District, the Delta Protection Act does not allow the location of new WWTPs that support urban development or business in the Secondary Zone to occur within the Primary Zone. As a result, WWTP improvements are unlikely to affect housing throughout at least 500,000 acres of the Delta.
- As described in Section 4.3.10, there are multiple reasonably foreseeable methods of compliance with the recommended Basin Plan amendment requirements to reduce methylmercury loading from wastewater treatment systems and urban runoff. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would require the displacement of available housing when other compliance methods are available.

3.2.6 Need to Develop and Use Recycled Water

None of the alternatives restricts the development or use of recycled water. Currently, there are no restrictions on recycling of water due to mercury. The alternatives, therefore, are consistent with the need to develop and use recycled water. Recycling water may be the most feasible management measure for limiting discharge of methylmercury from some irrigated agricultural fields and managed wetlands.

3.3 Recommended Alternative

Staff recommends the adoption of Alternative 4. Alternative 4 establishes Delta objectives of 0.24 and 0.08 mg/kg methylmercury in wet weight fish muscle tissue, as the average concentration in large fish of trophic levels (TL) 4 and 3, respectively, and 0.03 mg/kg methylmercury, wet weight, in small whole TL2 and 3 fish less than 50 mm total length. The objectives for large fish protect of people and sensitive wildlife (including bald eagle, otter, and osprey) that eat large Delta fish, allowing people to safely eat 32 g/day of an even mixture of large TL3 and TL4 fish from the Delta and 12.5 g/day of commercial fish. The objective for small fish protects the California least tern (a federally endangered species) and other wildlife (including herons and rails) that eat small Delta fish or aquatic invertebrates.

Alternative 4 is recommended for the following reasons:

- It fully protects wildlife species, including threatened and endangered species as required by the Endangered Species Act.
- It protects people who eat Delta fish by safely allowing the consumption of one eight-ounce meal per week of Delta fish with a mixture of TL3 and TL 4 species (i.e., bass, catfish, salmon, and sunfish). This consumption rate is greater than the USEPA default rate used in Alternatives 2 and 3. The Alternative 4 objectives are therefore more protective of people who by custom, need, or enjoyment, more frequently eat Delta fish.

- It incorporates local consumption patterns, which show that Delta anglers commonly target fish like salmon (TL3) and striped bass (TL4). Under the Alternative 4 objectives, consumers that select low-mercury species, such as salmon, shad, Sacramento blackfish, and bluegill, would be able to safely eat more than one meal of Delta fish per week.
- It is consistent with the fish tissue objectives approved by the State Water Board for San Francisco Bay (SFBRWQCB, 2006; SWRCB, 2007)). Like the Alternative 4 large fish objectives, San Francisco Bay's methylmercury objective is based on protecting people who eat 32 g/day of local fish. Alternative 4 takes into consideration that people, fish-eating wildlife and their prey (e.g., anadromous species) travel between the Delta and San Francisco Bay.
- It contains fish tissue mercury concentrations that are lower than concentrations currently in much of the Delta, but that are seen elsewhere in the western United States. Observation of these fish mercury concentrations elsewhere suggests that this alternative can be achieved.

Alternative 1 (No Action; default to the existing narrative toxicity objective) is not recommended because the default numerical criterion (USEPA's CTR criterion of 50 ng/l total mercury in the water column) does not sufficiently protect people and threatened and endangered wildlife species that eat Delta fish.

Alternative 2 is not recommended because it does not reflect local consumption patterns or protect all fish-eating wildlife. The Alternative 2 objective of 0.58 mg/kg methylmercury in large TL4 fish is too high to protect bald eagle, osprey, river otter, western grebe, and other sensitive wildlife, as determined by the USFWS risk assessment (2004).

Alternative 3 is not recommended because it does not reflect local consumption patterns. Interviews and surveys show that many local people, particularly Southeast Asians and African Americans, eat more than 17.5 g/day (one 8-ounce meal every two weeks) of freshwater/estuarine fish (CDHS, 2004; Ujihara, 2006; Silver *et al.*, 2007). Therefore, Alternative 3 may not be sufficiently protective of people who eat Delta fish.

Alternative 5 is not recommended because it may not be achievable or reliably measured (in terms of the fish tissue objective's corresponding aqueous methylmercury concentration).

Staff will reevaluate the Delta fish tissue objectives during Phase 1 of the Delta mercury control program, as more information is learned about local consumption patterns and more technology is developed. An expanded exposure reduction program should be implemented to protect people with the highest consumption rates of Delta fish even before consumption studies are conducted or methylmercury reductions are achieved.

3.4 Recommended Alternative Applied to the Basin Plan

The recommended alternative (Alternative 4), if adopted into the Basin Plan, would establish:

- Delta-specific numerical fish tissue objectives for methylmercury in large TL3 fish, large TL4 fish, and small TL2/3 fish in the Delta; and

- A monitoring program that specifies fish species and sizes within each target trophic level to facilitate evaluating compliance with the fish tissue objectives.

Chapter 5 in this report describes staff recommendations for a monitoring program. The Central Valley Water Board will be the lead agency in developing or reviewing detailed monitoring plans to evaluate compliance with the recommended fish tissue objectives.

Along with the fish tissue objectives, the recommended Basin Plan amendments contain a long-term goal for lower Delta fish tissue objectives and a commitment to review the fish tissue objectives at the end of Phase 1 of implementation. Stakeholders, including representatives of Native American Tribes, Delta community-based organizations, and Environmental Justice organizations, informed staff that the recommended objectives will not protect the many people who regularly eat more than one meal per week of Delta fish. Staff carefully considered these comments. As described in Section 3.2.3, fish data from other streams in the western United States suggest that the recommended fish tissue objectives can be achieved, but that lower levels might not be met. Because the USEPA requires that a TMDL exhibit assurance of being achieved, staff did not change its recommendation for the fish tissue objectives. Staff recognizes that there are people who eat more than one meal per week of Delta fish and agrees that the objectives should be as protective as possible. In response to stakeholders' comments, staff recommends that the Central Valley Water Board commit, in the Basin Plan, to reviewing Delta fish tissue objectives to determine whether more protective fish tissue objectives can be attained. The reviews will occur at the end of Phase 1 of implementation and in later program reviews.

4 PROGRAM OF IMPLEMENTATION

The recommended water quality objectives for methylmercury in Delta fish (fish tissue objectives) are exceeded throughout much of the Delta. Per the Porter-Cologne Water Quality Act Section 13050(j)(3), the recommended Basin Plan amendments must include an implementation program for the TMDL to bring the Delta into compliance with the proposed objectives to protect beneficial uses. Water Code Section 13242 prescribes the contents of an implementation plan, which include: 1) a description of the actions necessary to achieve the water quality objectives; 2) a time schedule; and 3) a monitoring and surveillance program.

This chapter evaluates implementation alternatives and recommended actions and timelines to reduce methyl and total mercury sources. The chapter is divided into five sections:

- Section 4.1 describes methyl and inorganic mercury sources to the Delta, the linkage between methylmercury in water and fish tissue, and the ambient methylmercury reductions needed to achieve the proposed fish tissue objectives.
- Section 4.2 reviews the nine main considerations for the TMDL implementation program, describes options for addressing each consideration, and formulates four implementation alternatives from different combinations of the options.
- Section 4.3 describes potential regulatory actions and reasonably foreseeable methods of compliance for each alternative. The Central Valley Water Board will not specify particular practices or technologies. Reasonably foreseeable methods of compliance are reviewed so that the potential environmental effects, costs, ability to achieve the proposed fish tissue objectives, and overall feasibility of each alternative can be evaluated.
- Section 4.4 evaluates each alternative for potential environmental effects, costs, ability to attain water quality objectives, feasibility, and consistency with federal and state regulations and policies. Detailed reviews of existing federal and state regulations and policies, potential environmental effects, and cost considerations are in Chapters 6 and 7 and Appendix C, respectively.
- Section 4.5 further evaluates the different alternatives and identifies staff's recommended implementation alternative.

The proposed Basin Plan amendments (after the Executive Summary) reflect the recommended implementation alternative and include an implementation plan. The proposed Basin Plan amendments have been developed in conjunction with an extensive formal stakeholder process (described in Chapter 8). The implementation plan (a.k.a. the Delta Mercury Control Program) describes the actions necessary to achieve proposed fish tissue objectives, the actions the Central Valley Water Board will take, a time schedule, and a monitoring and surveillance program. The proposed amendments also include recommendations to the State Water Board and other agencies regarding actions for which the Central Valley Water Board does not have direct authority.

The implementation plan must ensure that all applicable water quality criteria will be attained and maintained. The applicable water quality criteria consist of:

1. The proposed Delta-specific methylmercury fish tissue objectives for the protection of wildlife and human health (Chapter 3).

2. The five-year average total mercury load reduction of 110 kg/yr required within 20 years by the San Francisco Bay mercury TMDL implementation program for Central Valley outflows to the Bay (SFBRWQCB, 2006; SWRCB, 2007).
3. The California Toxics Rule total mercury water column criterion for the protection of human health (50 μg/l total recoverable mercury; USEPA, 2000a).

The implementation plan must include actions necessary to reduce methylmercury inputs to the Delta to achieve the fish tissue objectives. The TMDL methylmercury allocations are in the form of methylmercury loads in unfiltered water discharged by point and nonpoint sources to the Delta and Yolo Bypass. The allocations are specifically correlated with and set to attain and maintain the proposed fish tissue objectives. In addition, the proposed implementation actions are designed to reduce the amount of *total* mercury entering the Delta to ensure attainment and maintenance of both the San Francisco Bay TMDL's allocation for total mercury loading and the CTR total recoverable water column criterion. Reducing total mercury inputs will reduce the amount of mercury available for methylation in the Delta's aquatic environment and therefore further reduce methylmercury in ambient Delta waters.

Tables A through D in the proposed Basin Plan amendments list the recommended methylmercury load and waste load allocations for nonpoint and point sources within and tributary inputs to the Delta and Yolo Bypass, as well as interim (Phase 1) total mercury mass limits for point sources in the Delta and Yolo Bypass. A detailed description of the allocation calculation methods is in Chapter 8 of the TMDL Report (Appendix A of this report). The strategy that directs how the allocations and Phase 1 limits are determined reflects the recommended implementation alternative summarized in Section 4.5 of this chapter.

4.1 Methyl & Total Mercury Sources & Necessary Reductions

This section provides a brief description of methyl and inorganic mercury sources, the linkage between methylmercury in water and fish tissue, and ambient methylmercury reductions needed to meet the proposed water quality objective. The TMDL Report (Appendix A of this report) contains detailed discussions of each of these topics.

4.1.1 Methyl and Inorganic Mercury Sources

Sources of inorganic mercury in the Delta include tributary inflows from upstream watersheds, atmospheric deposition, urban runoff, dredging activities, and municipal and industrial wastewater. Sources of inorganic mercury in the watersheds upstream of the Delta (a.k.a. "the Delta's tributary watersheds") include gold and mercury mine sites, legacy mercury in the stream channel sediments, geothermal springs, atmospheric deposition, urban runoff, and municipal and industrial wastewater. Figure 4.1 illustrates average annual total mercury loading to the Delta during water years[13] (WY) 1984 through 2003, a period that includes a mix of wet

[13] A "water year" (WY) is defined as the period between 1 October and 30 September of the following year; for example, WY2001 is the period between 1 October 2000 and 30 September 2001. Water year types in California

and dry years statistically similar to conditions in the Sacramento Basin over the last 100 years. About 98% of identified total mercury loading to the Delta comes from tributary inputs; within-Delta sources are a very small component of overall loading. The Sacramento Basin (Sacramento River + Yolo Bypass) contributed almost 90% of total mercury fluxing through the Delta. Of the watersheds in the Sacramento Basin, the Cache Creek, Feather River, American River and Putah Creek watersheds had both relatively large mercury loadings and high mercury concentrations in suspended sediment, which makes those watersheds effective candidates for total mercury load reduction programs (see Chapters 7 and 8 in the TMDL Report). Although it is not as large a source of total mercury loading, the Mokelumne/Cosumnes watershed in the San Joaquin Basin also may be an effective candidate because of its high mercury concentrations in suspended sediment.

The San Francisco Bay mercury TMDL implementation program assigned the Central Valley a five-year average mercury load allocation of 330 kg/yr or a decrease of 110 kg/yr. This represents about a 28% decrease in the 20-year average annual loading from Delta tributaries and would enable Delta waters to maintain compliance with the CTR criterion of 50 ng/l (see Section 7.4 in the TMDL Report). Staff has estimated that mercury loading to the Delta will likely need to be reduced by more than 110 kg/yr (see Section 8.2 in the TMDL Report) and coordinated with methylmercury management practices in the tributary watersheds in order to address the mercury impairment in the Delta as well as impairments in the watersheds.

Sources of methylmercury in Delta waters include tributary inputs from upstream watersheds and within-Delta sources such as methylmercury production in wetland and open water habitat sediments, municipal and industrial wastewater, agricultural drainage, and urban runoff. Figure 4.2 illustrates the Delta's average annual methylmercury inputs for WY2000 to 2003, a relatively dry period that encompasses the available methylmercury information. Methylmercury inputs from wetland/open-water sediments and tributary watersheds during this period account for about 30 and 60%, respectively, of methylmercury inputs to the Delta.

As illustrated in Figure 1.1 in Chapter 1 and described in more detail in the TMDL Report, the methylmercury linkage and source analyses divide the Delta into subareas based on the hydrologic characteristics and mixing of the source waters. Figure 4.3 shows the contribution of each source category's estimated methylmercury loading to each subarea. A separate methylmercury allocation system is required for each subarea because of substantially different levels of fish mercury impairment and substantially different types and amounts of methylmercury inputs to each subarea. For example, wetland and open-water habitat within the Yolo Bypass may contribute almost as much methylmercury to the subarea as its tributaries, in contrast to the Sacramento and San Joaquin subareas, which receive substantially more annual methylmercury loading from their tributaries.

As discussed in the attached TMDL Report, CalFed mercury study results that became available after the February 2008 Basin Plan Amendment and TMDL draft staff reports were developed indicate that when wet years are included in the methylmercury source analysis,

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are classified according to the natural water production of the major basins. See Appendix E in the TMDL Report for more information about water year classifications.

tributary inputs provide a much larger relative methylmercury load contribution to the Delta than within-Delta sources. This is not unexpected, given that the tributary watersheds (about 42,500 square miles; see Table 2.1 in the TMDL Report) span an area almost 40 times the area of the Delta (about 1,100 square miles), a difference that becomes even more apparent during wet years. Since tributary watersheds account for a substantial amount of methylmercury loading to the Delta, TMDLs for the upstream watersheds will be developed during Phase 1 of the Delta implementation plan.   A TMDL for the Delta is needed for the following reasons:

- In June 1999, the State Water Board adopted the Consolidated Toxic Hot Spots Cleanup Plan (Cleanup Plan), as required by California Water Code Section 13394. The Cleanup Plan identifies the entire Delta as a hot spot for mercury due to elevated mercury levels in fish and contains cleanup requirements for mercury in the Delta. [See Section 6.2.6 for additional discussion.]
- The Delta TMDL's methylmercury allocations for tributary inputs establish the minimum net reductions that must be accomplished for the tributary watersheds. [Note, additional methylmercury and total mercury load reductions may be required within those watersheds to address any mercury impairment within those watersheds.]
- Completing the Delta TMDL and implementing actions to reduce Delta fish methylmercury concentrations is a high priority because of the high number of people who consume Delta fish, especially because of the number of people who consume Delta fish at levels likely harmful to their health. In a survey of 500 anglers and members of community-based organizations, UC Davis researchers found that approximately half of Delta anglers and their families take in methylmercury above the USEPA reference dose and 5% are exposed to methylmercury at 10 times the reference dose (Shilling, 2009). [Methylmercury intake at 10 times the reference dose affects memory, fine motor control, and audiovisual learning in children (NRC, 2000).]

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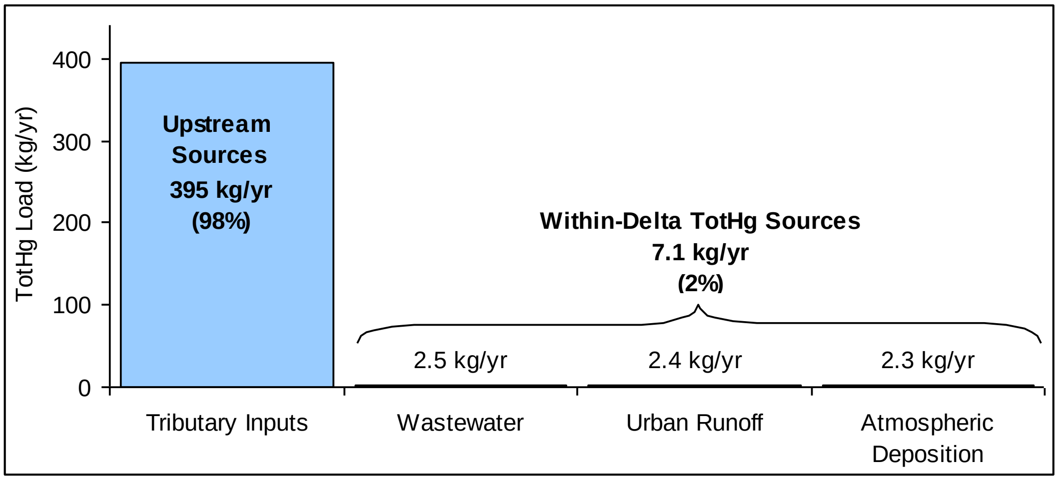

Figure 4.1: Twenty-year Average Annual Total Mercury Inputs to the Delta

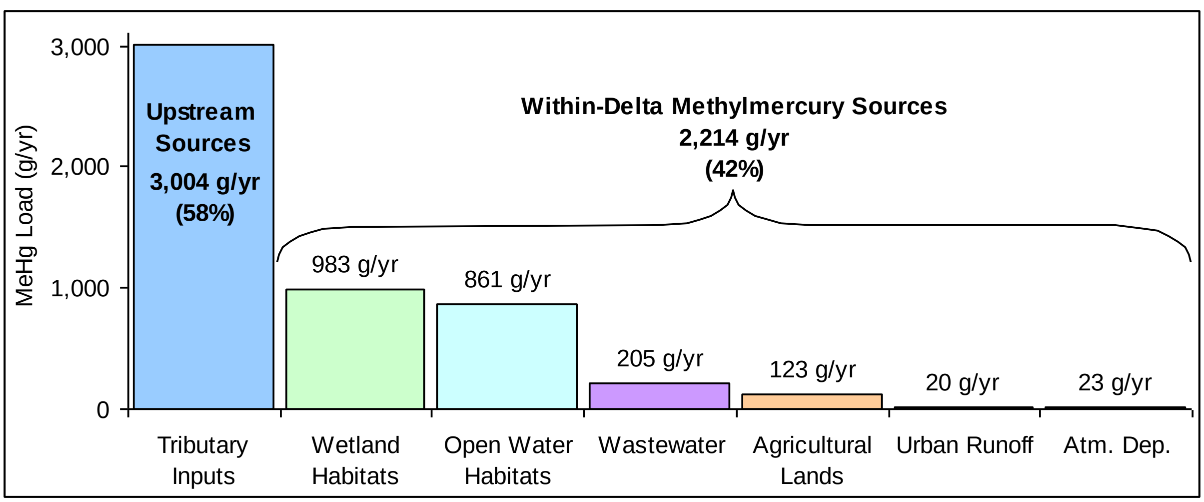

Figure 4.2: Average Annual Methylmercury Inputs to the Delta
during WY2000 to 2003

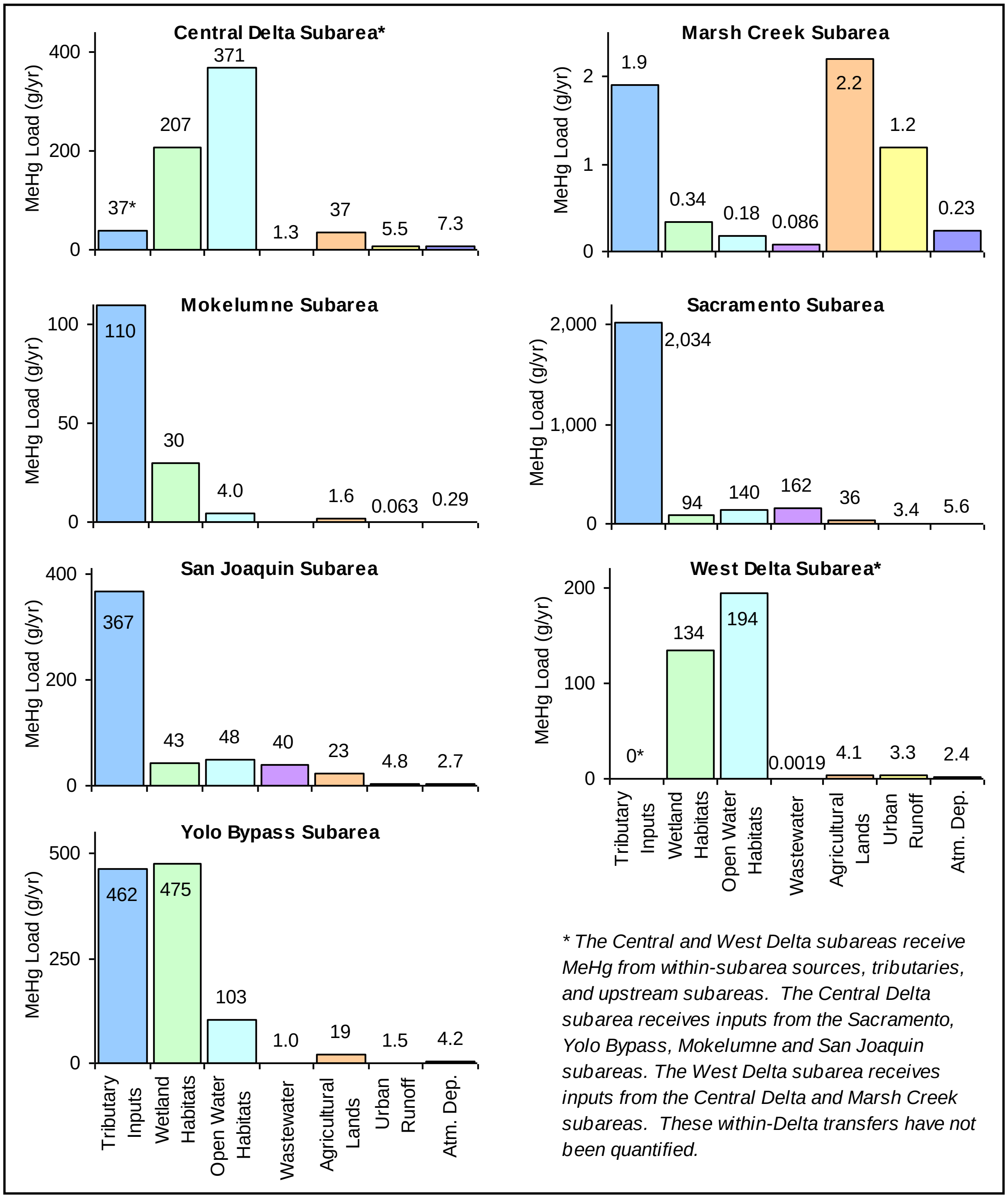

Figure 4.3: Average Annual Methylmercury Inputs to the Delta Subareas during WY2000 to 2003

4.1.2 Linkage between Methylmercury in Water and Fish Tissue

As described in the previous chapter, staff recommends three fish tissue objectives: 0.24 mg/kg (wet weight) in muscle tissue of large[14] TL4 fish such as bass and catfish; 0.08 mg/kg (wet weight) in muscle tissue of large TL3 fish such as carp and salmon; and 0.03 mg/kg (wet weight) in whole TL2 and 3 fish less than 50 mm in length. The TMDL links methylmercury concentrations in fish to methylmercury concentrations in water to determine an acceptable ambient methylmercury concentration that could then be used to determine methylmercury source reductions necessary to achieve the fish tissue objectives.

Chapter 5 (Linkage Analysis) in the TMDL Report describes in detail the relationships between methylmercury in ambient water and largemouth bass in the Delta. Largemouth bass was selected for the linkage analysis for several reasons:

- Largemouth bass was the only species systematically collected near many of the aqueous methylmercury sampling locations used in the TMDL source and linkage analyses.
- Largemouth bass are abundant, are widely distributed throughout the Delta, and stay at one location (Davis *et al.,* 2003), making them useful bioindicators of spatial variation in mercury accumulation in the aquatic food chain.
- Spatial trends in standard 350-mm largemouth bass mercury concentrations across the Delta are representative of spatial trends in mercury levels in other Delta fish species (see Sections 4.7 and 4.8 in the TMDL Report).

As detailed in Section 4.8 of the TMDL Report, it was possible to describe the proposed fish tissue objectives for large TL3 and 4 fish and small TL2/3 fish in terms of the equivalent methylmercury concentration in standard 350-mm largemouth bass. As shown in Figure 4.4:

- A methylmercury concentration of 0.28 mg/kg in 350-mm largemouth bass is equivalent to the fish tissue of 0.24 mg/kg for large TL4 fish.
- A methylmercury concentration of 0.24 mg/kg in 350 mm largemouth bass is equivalent to the fish tissue of 0.08 mg/kg for TL3 fish.
- A methylmercury concentration of 0.42 mg/kg in 350 mm largemouth bass is equivalent to the fish tissue of 0.03 mg/kg for small fish.

Of the three concentrations above, the most protective is the second one: a methylmercury concentration of 0.24 mg/kg in bass predicted to correspond with the TL3 fish tissue objective. This concentration of 0.24 mg/kg in bass protects both human and wildlife consumers of higher and lower trophic level fish in the Delta because the concentration is the lowest of the bass values predicted for the three fish tissue objectives. As a result, a methylmercury concentration of 0.24 mg/kg in 350 mm largemouth bass is proposed as the implementation goal for largemouth bass throughout the rest of this report.

Strong, positive correlations have been found between methylmercury in unfiltered ambient water and methylmercury in largemouth bass. The relationship between methylmercury

[14] Large fish are defined as 150-500 mm total length or legal catch length if designated by CDFG.

concentrations in ambient water and standard 350-mm largemouth bass sampled in the Delta is illustrated in Figure 4.5. Substitution of the implementation goal of 0.24 mg/kg methylmercury for largemouth bass into the equation developed by this regression results in a predicted safe ambient water methylmercury concentration of 0.066 ng/l. Staff incorporated an explicit margin of safety of about 10% to develop the recommended **implementation goal for unfiltered ambient water of 0.06 ng/l methylmercury**. This goal describes the assimilative capacity of Delta waters in terms of concentration and would be applied as an annual average methylmercury concentration. Figures 4.4 and 4.5 show the coefficient of determination (R^2) for each regression. Staff used the R^2 to compare between regression equations, but did not rely solely on the value of R^2 as the foundation for the methylmercury fish/water linkage (see Chapter 5 in the TMDL Staff Report).

It is anticipated that, as the average concentration of methylmercury in ambient water in each Delta subarea decreases to the implementation goal, the fish tissue objectives will be attained. The implementation goal for methylmercury in ambient water is intended to be used to determine the amount of methylmercury source reduction needed to achieve the proposed fish tissue objectives and to track progress in meeting the objectives.

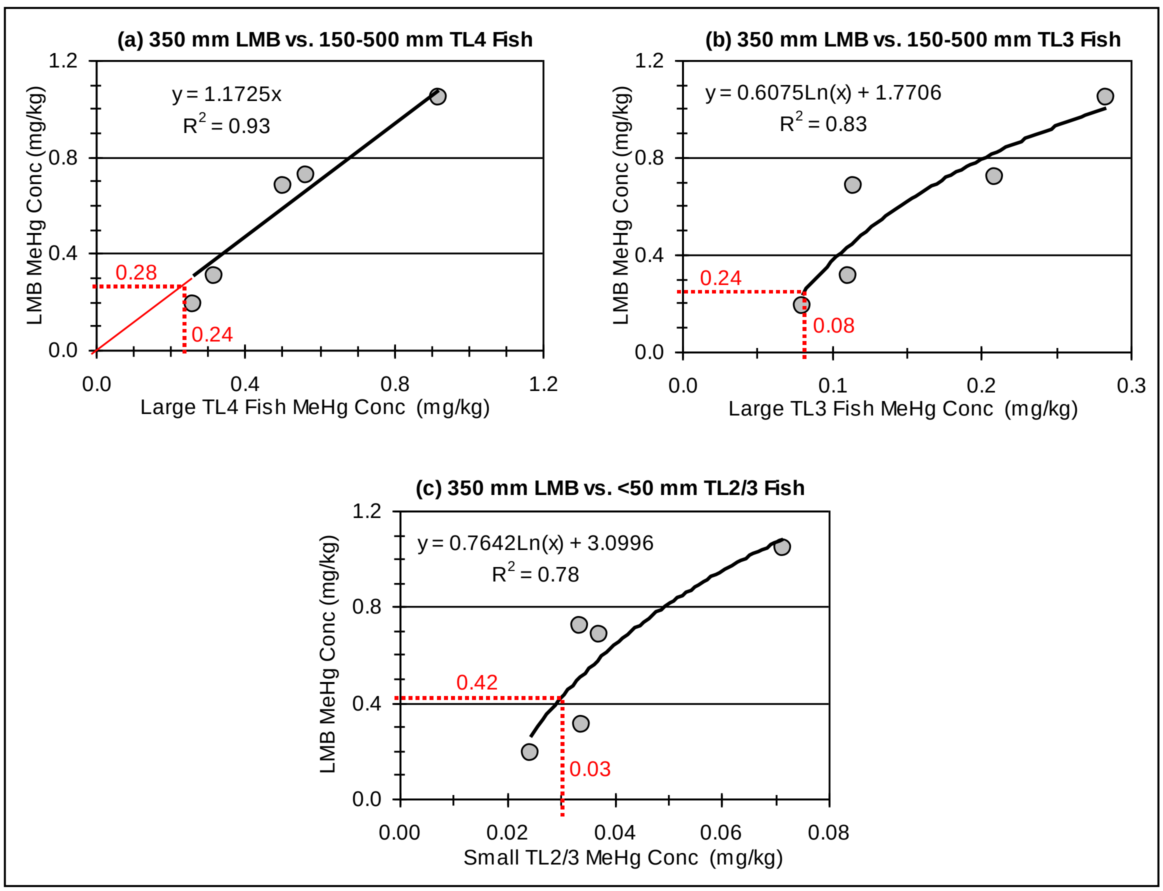

Figure 4.4: Comparison of Methylmercury Concentrations in Standard 350-mm Largemouth Bass (LMB) Caught in September/October 2000 and Composites of Fish Sampled between 1998 and 2001 from (a) 150-500 mm Trophic Level 4 Fish, (b) 150-500 mm Trophic Level 3 Fish, and (c) <50 mm Trophic Level 2/3 Fish

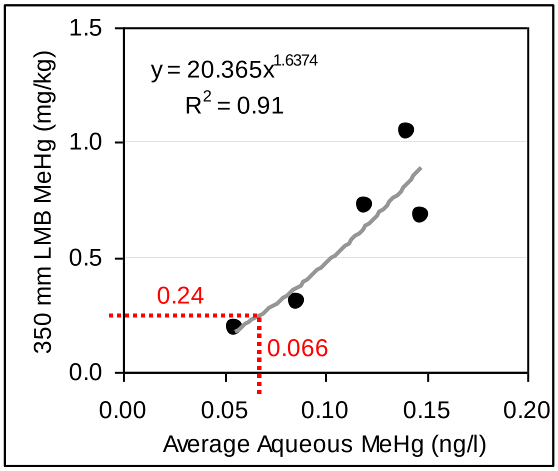

Figure 4.5: Relationship between Methylmercury Levels in Standard 350-mm Largemouth Bass Caught in September/October 2000 and Average Unfiltered Ambient Water Sampled in March-October 2000

4.1.3 Ambient Methylmercury Reductions Needed

Methylmercury source load reductions were calculated in terms of the existing assimilative capacity of the different Delta subareas. The existing average methylmercury concentration of ambient water in each Delta subarea was compared to the implementation goal (Table 4.1) to determine the amount of reduction needed to achieve the proposed fish tissue objectives in each subarea, expressed as a percent of the existing concentration. The percent reductions range from 0 to 78% for different subareas, due to varying levels of impairment in, and different sources to, each subarea. Accordingly, a separate methylmercury allocation system was developed for each Delta subarea. For example, the sum of all within-subarea and tributary inputs to the West Delta subarea should be reduced by 28%, while the sum of all inputs to the Yolo Bypass subarea should be reduced by 78%.

As noted in Table 4.1, the average methylmercury concentration of ambient water in the Central Delta subarea complies with the proposed implementation goal. Also, as show in Table 2.2, five of six trophic level food group safe mercury levels are met in the Central Delta subarea. The average mercury concentration of large TL4 fish in the Central Delta (0.26 mg/kg) is slightly higher than the proposed objective of 0.24 mg/kg for large TL4 fish. Because Central Delta water quality is dominated by inflows from upstream Delta subareas that require ambient methylmercury reductions ranging from 44 to 78% (Table 4.1), Central Delta TL4 fish tissue mercury concentrations are expected to decrease to safe levels when actions are implemented to reduce up-basin aqueous and fish methylmercury levels.

Alternatives are described in the following sections regarding how to allocate reductions to source categories and individual responsible parties for methyl and inorganic mercury inputs to the Delta and its tributary watersheds.

Table 4.1: Percent Reductions Needed to Meet the Proposed Implementation Goal of 0.06 ng/l for Methylmercury in Ambient Water.

	Delta Subareas						
	Central Delta	Marsh Creek	Mokelumne River	Sacramento River	San Joaquin River	West Delta	Yolo Bypass
Average Annual Aqueous MeHg Concentrations (ng/l)	0.060	0.224	0.166	0.108	0.160	0.083	0.273
Percent Reduction Needed to Meet the Proposed MeHg Goal	0%	73%	64%	44%	63%	28%	78%

4.2 Implementation Alternatives

This is an "exceedingly complex" TMDL control program, as described in California Water Code section 13246(b)(1), in that:

- The TMDL control program for the Delta is addressing sources of both methylmercury and total (inorganic) mercury;
- The reduction of methylmercury and inorganic mercury levels in the Delta also requires the control of methylmercury and inorganic mercury sources in numerous upstream watersheds;
- This control of mercury requires the development and implementation of numerous additional TMDLs in upstream watersheds;
- Controlling methylmercury, a bioaccumulative constituent, is exceedingly complex given California's Gold Rush legacy, the natural presence of mercury in the environment, the ubiquitous nature of society's use of it, and that to some degree mercury comes from upwind sources outside of the Central Valley, State of California, and the United States;
- Local and global sources of inorganic mercury are expected to increase due to population growth and related mercury discharges to air and water;
- Wetland restoration projects in the Delta and Yolo Bypass and new reservoirs upstream of the Delta have the potential to increase methylmercury loading; and
- The effects of existing and new water and flood management projects on methylmercury levels in Delta water and fish needs additional evaluation.

Any implementation alternative developed will have to address this complexity. An almost infinite number of implementation alternatives are possible. Therefore, staff identified primary considerations and options to help develop a manageable number of implementation alternatives. This section describes the evaluation criteria, considerations, and options that form the basis of the implementation alternatives that are further evaluated in Sections 4.3 and 4.4. It has been updated since the February 2008 draft to include additional options identified by the 2008-2009 Stakeholder Process. Staff indicated which options were developed by the Stakeholder Process. In addition, staff combined some of the considerations and options in order to improve clarity.

Evaluation criteria include: likelihood of success; equitability; time needed to observe improvements; the degree to which a given option or alternative can respond or adapt to new data and information; and consistency with state and federal laws and policies. In addition, since the release of the February 2008 draft staff report, the Stakeholder Group developed a draft list of "Guiding Principles" (see Chapter 1) for the Delta mercury control program as well as additional options to consider. The evaluation criteria, along with the May 2009 version of the draft Guiding Principles, are considered throughout the evaluation of the various options and alternatives.

4.2.1 Primary Considerations & Options

Nine primary considerations specific to this TMDL and implementation program were identified. This section explains these considerations and identifies options for how to address each of them. Each option is preliminarily screened against the evaluation criteria defined in the previous section. If one or more preferred options for addressing a particular consideration are not selected as part of this preliminary screening, then all the options for that particular consideration are carried forward for further evaluation as part of a comprehensive alternatives analysis in Section 4.2.2.

Consideration #1: Public Outreach and Other Exposure Reduction Actions

Comprehensive fish monitoring in the Delta found that commonly consumed sport fish (largemouth bass, striped bass, Sacramento pike minnow, channel catfish and white catfish) routinely have tissue concentrations greater than the USEPA criterion of 0.3 mg/kg for protection of human health (Davis *et al.*, 2003) and the proposed fish tissue objectives. Some samples exceed 1.0 mg/kg (wet weight).

Until the fish tissue objectives are attained, the public should continually be informed about safe fish consumption levels. Fish mercury advisories for the Bay-Delta region were released in the 1970s and 1990s for striped bass, sturgeon and shark, and a draft health advisory for a variety of fish and shellfish, including largemouth bass and catfish, was released in March 2007 for the South Delta and San Joaquin River. While a fish advisory will be read by some, it may not reach parts of the population at risk of consuming locally-caught fish. Sensitive groups of consumers, such as pregnant women and children, may not catch fish themselves and are less likely to receive the advisory information. For example, a recent fish consumption and advisory awareness survey of low-income women at a WIC[15] clinic in Stockton (Silver *et al.*, 2007) indicated that of the 500 survey participants:

- 32% consumed sport fish;
- 29% consumed a combination of commercial and sport fish that exceeded the USFDA/USEPA national advisory limit;[16] and

[15] Special Supplemental Nutrition program for Women, Infants, and Children (WIC).

[16] The USFDA and USEPA recommend that sensitive populations (i.e., women of childbearing age, pregnant and breastfeeding women and children) completely avoid consuming high-mercury fish (e.g., shark, swordfish, king

- Women who demonstrated advisory awareness and knowledge of health-protective behaviors ate less fish overall.

Some consumers eat Delta fish at levels likely harmful to their health. In a survey of 500 anglers and members of community-based organizations, UC Davis researchers found that approximately half of Delta anglers and their families take in methylmercury above the USEPA reference dose and 5% are exposed to methylmercury at 10 times the reference dose (Shilling, 2009). Methylmercury intake at 10 times the reference dose affects memory, fine motor control, and audiovisual learning in children (NRC, 2000).

Because fishing is popular in the Delta, an exposure reduction program is extremely important. Creel surveys estimate that anglers spend over two million hours per year fishing on the Sacramento River alone (CDFG, 2000-2001; Shilling, 2003). In addition, bass and catfish may be the primary fish kept by anglers throughout much of the Delta (Appendix C in the TMDL Report, Figure C.1). People depend on Delta fish for sustenance and cultural reasons. Yet there is low awareness among anglers about fish contamination issues, indicating a need for an expanded and sustained exposure reduction program. The program could include public education and outreach (including fish species, catch locations, and sizes that are safe to consume and levels of mercury intake that pose health risks), targeted health screening and advice through medical providers, and other activities to reduce exposure to mercury. Delta fish consumers and community-based organizations should be fully integrated in planning and implementation of exposure reduction activities. Different communities have different preferred avenues of receiving information (Shilling *et. al*., 2008). Stakeholders have requested that an exposure reduction program include activities that go beyond outreach and education (one suggestion was a system to trade Delta-caught fish with high mercury levels for other fish or protein source). Specifics of these activities will need to be proposed by Delta fish consumers and community-based organizations to best suit their needs.

Consideration #1 has two options:

- Option 1(a): Incorporate exposure reduction programs that include public outreach, education, and other activities to reduce fish consumers' mercury exposure.
- Option 1(b): Do not incorporate exposure reduction programs.

Central Valley Water Board staff encourages an expanded exposure reduction program of public education, outreach, and other activities (Option 1(a)). Staff proposes that the program coordinate efforts between the State and Regional Water Boards, Office of Environmental Health Hazard Assessment (OEHHA), California Department of Public Health (CDPH), local county health departments, members of local fishing and consumer communities, and dischargers to:

- Provide additional outreach and education regarding the risks of consuming fish containing mercury, emphasizing portions of the population at risk, such as pregnant women and children, and instructing people about the sizes and species of fish that may be harmful to

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mackerel, and tilefish) and limit consumption of other commercial fish (12 oz/week, or 48.6 g/day) and sport-caught fish (6 oz/week, or 24.3 g/day) (USFDA and USEPA, 2004).

consume while highlighting that other less contaminated varieties are an excellent source of protein.

- Report results of fish tissue monitoring for methylmercury to the public and the Central Valley Water Board.
- Work with Delta community groups and fish consumers and local health organizations to investigate ways to address the public health impacts of methylmercury in Delta fish, including activities that decrease actual and potential exposure to people most likely to be affected, including subsistence fishers and their families.

Text from the last bullet is taken from State Water Resources Control Board Resolution 2005-0060, in which the State Water Board directed the San Francisco Bay and Central Valley Water Boards to coordinate on mercury TMDLs and address public health impacts. Resolution 2005-0060 also contained the language, "… and mitigate health impacts to people and communities most likely to be affected" by mercury in fish. The exposure reduction program could still consider how to do this. However, as CDPH staff stated during the Delta methylmercury TMDL stakeholder process, actually identifying health effects in an individual as due to mercury exposure may be difficult and probably should not be mandated for the program.

Section 4.3.1 provides a more detailed recommendation for a public education and outreach program. A public education component accompanies all of the implementation alternatives discussed in Section 4.2.2, even the "no action" alternative. If the "no action" alternative were adopted, there would be an even greater need for a long-term exposure reduction program.

Consideration #2: Address Both Methyl & Total Mercury Sources

A direct, positive correlation has been observed between methylmercury concentrations in water and fish tissue in the Delta and elsewhere (refer to Chapter 5 of the TMDL Report). This indicates that aqueous methylmercury concentrations are a major factor influencing methylmercury bioaccumulation in fish. Therefore, reducing aqueous concentrations should reduce fish tissue methylmercury levels and decrease the exposure to mercury in Delta fish.

The Cache Creek, Bear Creek and Harley Gulch TMDLs and their implementation program were the first to focus source reduction efforts on both methyl and total mercury sources (Cooke and Morris, 2005). Other TMDL efforts in California and the United States have focused only on total mercury source reductions. The amount and kind of inorganic mercury present in the sediment are potentially controllable factors important in net methylmercury production. Therefore there are three options to consider:

- Option 2(a): Incorporate total mercury source controls only.
- Option 2(b): Incorporate both methyl and total mercury source controls.
- Option 2(c): Incorporate methylmercury source controls only.

Millions of kilograms of mercury were released to waterways by historic mining in the Coastal Range and Sierra Nevada. Much remains in Central Valley channels (see Chapter 7 of the

TMDL Report) and may be untreatable due to environmental and economic factors, thereby necessitating reliance on natural erosion as a reduction strategy. Natural erosional processes may take centuries to wash mercury from waterways;[17] incorporating methylmercury source controls may reduce the time needed to observe fish tissue improvements from centuries to decades. In addition, if methylmercury sources were not addressed, the mercury impairment likely would become worse as additional wetland restoration, water impoundment, and wastewater treatment plant projects are completed in the Delta and its tributary watersheds. Also, incorporating methylmercury source controls in addition to total mercury source controls may be a more equitable way to address the impairment.

Alternatively, focusing exclusively on methylmercury sources could delay a potentially substantial method of reducing methylmercury production in the Delta. Total mercury loading to areas that methylate mercury should be reduced. Some upstream watersheds that are large sources of mercury-contaminated sediment to the Delta may not themselves be large sources of methylmercury to the Delta. As noted earlier, the Feather River and Cache Creek watersheds, among others, export large volumes of highly contaminated sediment. As described in Chapter 3 of the TMDL Report, the amount of inorganic mercury present in the sediment is a factor important in net methylmercury production. In addition, the TMDL implementation program for the Delta must enable compliance with the San Francisco Bay TMDL's total mercury allocation for the Central Valley (a five-year average total mercury load reduction of 110 kg/yr within 20 years) and the USEPA's CTR criterion of 50 ng/l for total mercury in the water column.

Based on this evaluation, Option 2(b) is the preferred option and will be incorporated into the alternatives analysis in Section 4.2.2. Options 2(a) and 2(c) will receive no further consideration.

Consideration #3: Phased Approach

Consideration must be given to whether enough is known about the methylmercury sources – particularly nonpoint sources – and the control of both point and nonpoint sources such that reasonable and effective allocations can be rationalized. Little published information is available to describe methylmercury levels in discharges from individual sources within the wetlands source category (see Chapter 6 in the TMDL Report). However, some local point and nonpoint source methylmercury information is available. As reviewed in more detail in the TMDL Report (Chapters 3 and 6), recent studies indicate substantial variability in methylmercury levels in discharges from different types of WWTPs throughout the Central Valley, different soil types on farmed Delta Islands, and different types of wetlands in the Delta, Suisun Bay, Cache Creek watershed, and Mud and Salt Sloughs in the upper San Joaquin River watershed. This variability implies that technologies or management practices may be able to reduce

[17] See "Staff's Initial Responses to Board and Stakeholder Questions and Comments at the April 2008 Hearing" for additional discussion on this topic. The document is available in the Administrative Record and at the following Board website: http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/stakeholder_meetings/25nov08_hearing_rtc.pdf

methylmercury production from some sources. In addition, the initial monitoring results for a municipal WWTP in the Delta that recently made treatment and operation upgrades indicate that some upgrades might lead to reductions in multiple pollutants (e.g., ammonia, total mercury, and methylmercury) (see Chapter 6 in the TMDL Report for more discussion). However, more studies are needed to identify the causes of these differences and to develop effective and economically feasible technologies and management practices to control methylmercury.

Based on uncertainties about how to control the various sources, consideration needs to be given to if, and how quickly, to proceed with the TMDL and implementation program. Therefore, Consideration #3 has the following options:

- Option 3(a): Postpone including an implementation program until recent CalFed studies and other studies that identify and assess methylmercury source control methods are incorporated into the TMDL. Other considerations related to methylmercury control still would be relevant; however, their timing would be delayed.
- Option 3(b): Develop an implementation program based on the current understanding of factors that contribute to methylmercury in the Delta.
- Option 3(c): Proceed with an implementation program, but incorporate a phased, adaptive management approach. Incorporate recent CalFed studies and other methylmercury control studies' results into the TMDL before dischargers must take actions to achieve their allocations. In Phase 1, incorporate a methylmercury study period wherein dischargers would conduct studies to evaluate methylmercury and/or inorganic mercury controls to achieve allocations. The Phase 1 studies' design and implementation would be guided by allocations adopted by the amendments, along with new results from CalFed and other recent studies. Final reports for Phase 1 control studies could include:
    - A description of methylmercury and/or inorganic (total) mercury management practices identified in Phase 1;
    - An evaluation of the effectiveness, costs, potential environmental effects, and overall feasibility of the control actions;
    - Proposed implementation plans and schedules to comply with methylmercury allocations; and
    - If a control study's results indicate that achieving a given methylmercury allocation is infeasible, then the discharger, or an entity representing a discharger, would provide detailed information on why full compliance is not achievable, what methylmercury load reduction is achievable, and an implementation plan and schedule to achieve partial compliance.
- At the end of Phase 1, the Central Valley Water Board would conduct a Phase 1 Delta mercury control program review that assesses and considers:
    - The effectiveness, costs, potential public and environmental benefits and negative impacts of attaining the allocations, and technical and economic feasibility of potential methylmercury control methods;
    - Whether implementation of some control methods would have negative impacts on other beneficial uses of Delta waters;
    - Methods that can be employed to minimize or avoid potentially significant negative impacts that may result from control methods;

- Implementation plans and schedules proposed by the dischargers;
- Re-evaluation of the fish tissue objectives, the linkage analysis between objectives and sources, and the attainability of the allocations;
- Modification of methylmercury goals, objectives, allocations and/or the final compliance date for allocations based on the findings of Phase 1 control studies and other information;
- Implementation of management practices and schedules for methylmercury controls; and
- Adoption of a Mercury Offset Program for dischargers who cannot fully meet load allocations after implementing reasonable load reduction strategies and can demonstrate no disproportionate impacts on local human and wildlife communities as a result.

• In Phase 2, implement methylmercury control actions based on studies completed before and during Phase 1. During Phase 2, the Central Valley Water Board could consider enforcement actions if sufficient progress is not made implementing control actions. During Phases 1 and 2, staff would continue to develop TMDLs to address upstream impairments. In Phase 3 (after 2030), dischargers would continue maintenance of control actions implemented during Phases 1 and 2. Continued maintenance of control actions in the Delta and upstream, along with natural erosion processes that remove total mercury deposited in creek beds and banks that could not otherwise be remediated, ultimately would lead to achievement of the fish tissue objectives throughout the Delta.

To be consistent with the Clean Water Act and Porter-Cologne Act, a TMDL and implementation program must be prepared because the Delta has unsafe levels of mercury in fish. The consideration, therefore, is whether or how far to proceed at this time based on the best available science regarding impairment causes and potential solutions. It is possible to be consistent with laws and policies if the best available science is at an appropriate level of development to support a particular option. The available science is adequate to establish individual allocations for NPDES-permitted point sources in the Delta and Yolo Bypass, and grouped (subarea) methylmercury allocations for nonpoint sources, which will guide methylmercury control studies in a phased TMDL implementation program. However, the current uncertainty about the control of methylmercury sources makes it difficult to implement control actions for all point and nonpoint sources of methylmercury at this time.

Therefore, Option 3(c) is the preferred option and will be incorporated into the alternatives analysis in Section 4.2.2.

This consideration was addressed by the draft Guiding Principles developed by the Stakeholder Group and other stakeholder comments after the release of the February 2008 draft staff report. Guiding Principle 4 states, “The mercury control program should incorporate an adaptive management process.”

Although adaptive management concepts were discussed at length by the Stakeholder Group, particularly during the March 2009 stakeholder meeting, a definition was not included in Guiding Principle #4. Based on the Stakeholder Group discussions, as well as definitions employed by other TMDL programs in California,[18] Board staff used the following working definition for purposes of this staff report: *Adaptive management is a systematic process that uses scientific information to help formulate management policies and practices and allows for continually improving those policies and practices by learning from the outcomes of implementation and monitoring programs.* The stakeholders developing the Phase 1 organizational, adaptive management approach document are also developing a definition of adaptive management to help guide the Phase 1 studies.

Having a phased approach that incorporates a study period is consistent with an adaptive management process. The Guiding Principles and other stakeholder comments suggested additional elements for the phased approach:

- Reasonable control options should be implemented during Phase 1 for inorganic mercury and/or methylmercury (Principle #1). The mercury control program should implement reasonable, feasible actions to address methylmercury loads/production and human/wildlife exposure in the near-term (Principle #5).
- The Phase 2 source control requirements should be based on the current state of knowledge of the ability to control inorganic mercury and methylmercury sources to attain their load and waste load allocations and the results of the Phase 1 studies, and be reasonable (Principle #3).
- The linkage analysis and fish tissue objectives and the attainability of the allocations should be re-evaluated based on the findings of Phase 1 control studies and other information. The linkage analysis, fish tissue objectives and allocations should be adjusted in Phase 2, if appropriate (Principle #8).
- In Phase 2, implement methylmercury control actions based on studies completed before and during Phase 1.

Staff concurs that these are useful elements to include in Option 3(c) and will forward these on as part of the alternatives analysis.

Dischargers that participated in the stakeholder meetings had concerns that if they implement reasonable control actions that result in reducing their total mercury and/or methylmercury discharges during Phase 1, their allocations would be re-calculated at the end of Phase 1 using the same percent reduction but a different (lower) baseline data set, which could unfairly penalize them for implementing control actions during Phase 1. Staff agrees with this concern and recommends language for the Basin Plan amendments that indicates that interim limits established during Phase 1 and allocations will not be reduced as a result of early actions conducted to reduce inorganic mercury and/or methylmercury discharges.

[18] For example, the San Lorenzo River Total Maximum Daily Load for Sediment, adopted by the USEPA and State and Central Coast Water Boards in 2003.

Consideration #4: Mercury Offset Program

The intent of an offset program is to best use limited resources to maximize environmental benefits. The overall objectives for an offset program are to (1) provide more flexibility than the current regulatory system provides to improve the environment while meeting regulatory requirements (i.e., comply with load and waste load allocations) at a lower overall cost and (2) promote watershed-based initiatives that encourage earlier and larger load reductions to the Delta than would otherwise occur. With an offset program, dischargers could implement feasible off-site methylmercury and/or total mercury source controls *in lieu* of making costly on-site methylmercury controls that achieve limited environmental benefit.

An offset program enables equitable distribution of responsibility to parties complying with methylmercury and/or total mercury reduction requirements. An offset program may be essential for maintaining equitability if the proposed Phase 1 methylmercury control studies indicate that on-site controls needed to achieve load and waste load allocations are not technically or economically feasible for some dischargers. If an offset program is not developed and some individual dischargers have no feasible method to achieve their allocations through on-site controls, then the Central Valley Water Board would need to adjust allocations to require greater reductions from the dischargers for which methylmercury controls are feasible, which would be an inequitable distribution of responsibility.

The California State Water Resources Control Board Resolution No. 2005-0060 directs State Water Board staff to develop a state policy for water quality control that establishes alternative methods to allow dischargers to meet mercury effluent limitations that are directed to preventing contributions to excursions above water quality standards. The resolution states that the policy should:

- Allow dischargers to perform other activities aside from eliminating more mercury from their discharges than they would be required to remove by applicable technology-based effluent limitations.
- Require more rigorous activities for: (a) dischargers not in compliance with their waste load allocations and/or other applicable criteria or objectives; and (b) dischargers seeking to increase their mercury loading.
- Include provisions that recognize the efforts of those dischargers who are meeting or out-performing their waste load allocations, and that recognize the expenditures made by dischargers who are employing higher treatment levels.
- Include provisions that prevent localized disparate impacts.
- Not include requirements that would leverage existing point source discharges as a means of forcing dischargers to bear more than their fair share of responsibility for causing or contributing to exceedances of water quality standards. In this context “fair share” refers to the dischargers’ proportional contribution to the impairment.

Several options are available for a methylmercury and total mercury offset program:

- Option 4(a): Do not develop an offset program.
- Option 4(b): During Phase 1 allow voluntary pilot offset projects and develop a long-term offset program to implement during Phase 2. Include general guiding principles for the pilot

offset projects and long-term offset program and a schedule for the development of a long-term offset program in the Basin Plan amendments. Include specific guiding principles in the Phase 1 organizational, adaptive management approach document being developed by stakeholders. The Phase 2 offset program would be guided by results of the proposed Phase 1 methylmercury control studies (see Consideration #3) and pilot offset projects.

- Option 4(c): Develop an offset program based on currently available information.

Option 4(a) is inherently in Alternative 1, the "no action" alternative. Inadequate information is currently available to successfully implement a technically valid and legally defensible offset program; hence, Option 4(c) is not forwarded.

Staff recommends that a long-term offset program be developed in conjunction with the completion of the proposed Phase 1 methylmercury control studies because the Phase 1 studies are expected to identify methylmercury sources for which technically and economically feasible on-site methylmercury control methods are possible and which sources may need to participate in an offsets program. As a result, only Option 4(b) was forwarded in the February 2008 draft report.

For the February 2008 draft Basin Plan amendments, staff developed the following text for Option 4(b) pilot projects:

> "By [8 years after the effective date of this amendment], the Regional Water Board intends to consider adoption of an offset program to allow dischargers to offset methylmercury and/or total mercury in their discharges by implementing more feasible or cost effective projects elsewhere in the watershed. The offset program will be consistent with any State Water Board offset policy that is developed. In the interim, the Regional Water Board will allow all mercury and/or methylmercury dischargers to conduct pilot offset projects. The pilot offset projects could achieve one or more of several goals: accomplish early implementation of mercury and methylmercury reduction projects; provide information that can be used to develop the offset program in Phase 2; and/or earn credit to offset methylmercury allocation requirements during Phase 2.
>
> The Regional Water Board will use the following to evaluate proposed pilot projects:
>
> 1. Proposed projects will be evaluated and credits calculated based on estimates of mercury and/or methylmercury load reductions achieved on an annual basis in the Delta or Yolo Bypass.
> 2. During the Phase 1 pilot program, the baseline for purposes of calculating and generating offset credits is defined by the conditions existing as of 2005.
> 3. In cases where the site for the pilot project has a methylmercury allocation and the owner of the site intends to keep a portion of the credits generated from the offset demonstration project, the partners in the project must document how credit for the project will be apportioned.
> 4. The implementation of pilot offset projects must not result in changes to the total of the methylmercury allocations that are applicable in the Delta.
> 5. The Regional Water Board preference is that pilot offset projects occur within the same watershed as the offset proponent's discharge; however, the Regional Water Board will consider approving pilot projects in an adjacent watershed, when it can be demonstrated that the offset project will provide significant Delta-wide benefits. In this case, load and

waste load allocations for all sources would need to be adjusted within the discharger's watershed to account for environmental impacts at the discharger's point of discharge.

6. To be most useful, the pilot offset projects should focus on projects that can be implemented relatively quickly. The Regional Water Board preference is that pilot offset projects result in long-term (at least 20 years) annual load reductions. However, the Regional Water Board may consider approving a pilot offset project that is not expected to result in long-term annual load reductions if the project would result in substantial short-term improvements.

7. Mercury and methylmercury reductions from the following sources would be acceptable for offset projects: mercury and gold mine sites, Cache Creek Settling Basin, in stream contaminated sediments, NPDES facility and MS4 discharges, wetlands, irrigated agriculture, flood conveyance and water management activities, or other Regional Water Board approved projects.

The following requirements apply to offset pilot projects:

1. Dischargers that implement approved pilot total mercury and methylmercury offset projects to accumulate credits may use the credits to extend time schedules for compliance with methylmercury waste load allocations by up to five years, but shall not use the credits to extend schedules beyond 2035.

2. Any discharger proposing a pilot offset project shall conduct the Characterization and Control Studies to determine the feasibility of on-site controls for its own methylmercury discharges.

3. Pilot offset proposals must be submitted to the Regional Water Board by [4 years after the effective date of this amendment].

4. Pilot offset proposals shall evaluate mercury/methylmercury transformations in the environment at the location of the offset project, and shall include an appropriate offset ratio and safety factor to account for the location and uncertainties of the benefits of the offset project versus the environmental impact of the effluent discharge.

5. Any proposed project shall be subject to scientific peer review under the State Water Board's external scientific peer review process developed to comply with Health and Safety Code section 57004. Following peer review, staff shall circulate the proposal for public review and comment and then shall present the proposal for consideration for approval by resolution of the Regional Water Board.

6. The period for offset credit accumulation shall not exceed 10 years following Regional Water Board approval of the pilot offset project. At any time, the Regional Water Board may review the project and consider a time extension.

7. The pilot offset project proponent shall submit documentation of the estimated mercury and/or methylmercury load reductions achieved at the project site as well as reductions expected to be achieved in the Delta or Yolo Bypass, or other receiving water.

8. Credits accumulated by an offset project shall not be tradable to any other party."

The 2008-2009 Stakeholder Group/Offsets Workgroup participants indicated that developing detailed guidance for voluntary offset projects at this time would be too complex and suggested including more details for developing an offset program in the Phase 1 organizational, adaptive management approach document rather than in the Basin Plan amendments. In addition, other stakeholders indicated that the Central Valley Water Board should consider the environmental and cultural issues of the environmental justice and tribal communities when considering allowing pilot and/or long-term offset projects. Staff agreed with these suggestions and consequently modified Option 4(b). The Workgroup participants, including Central Valley Water Board staff, subsequently developed the following recommended language for the Basin Plan amendments:

> On or before [nine years after Effective Date] the Regional Board will consider adoption of a mercury (inorganic and/or methyl) offsets program. During Phase 1, stakeholders may propose pilot offset projects for public review and Regional Board approval. The offsets program and any Phase 1 pilot offset projects shall be based on the following principles:
>
> - Offsets should be consistent with existing USEPA and State Board policies and with the assumptions and requirements upon which this and other mercury control programs are established.
> - Offsets should not include requirements that would leverage existing discharges as a means of forcing dischargers to bear more than their fair share of responsibility for causing or contributing to any violation of water quality standards. In this context "fair share" refers to the dischargers' proportional contribution of methylmercury load.
> - Offset credits should only be available to fulfill a discharger's responsibility to meet its (waste) load allocation after reasonable control measures and pollution prevention strategies have been implemented.
> - Offsets should not be allowed in cases where local human or wildlife communities bear a disparate or disproportionate pollution burden as a result of the offset.
> - Offset credits should be available upon generation (i.e., after an offset project is implemented) and last long enough (i.e., not expire quickly) to encourage feasible projects.
> - Creditable load reductions achieved should be real, quantifiable, verifiable, and enforceable by the Regional Board.
> - Alternatives to direct load credits may be developed, such as time extensions to the Final Compliance Date.

As in the February 2008 draft report, only Option 4(b) is forwarded for more evaluation.

Considerations #5 through #9: Apportioning Source Control Responsibility for Existing and New Sources

Considerations #5 through #9 address questions critical to apportioning responsibility for studying, controlling, and reducing the variety of existing methyl and total mercury sources:

- Should the implementation plan focus only on existing within-Delta methyl and total mercury sources, or should the implementation also address existing upstream sources?
- Should load reduction efforts focus on methyl and total mercury source categories that contribute the most loading, or should reduction efforts be required of all sources?
- Should load reduction efforts focus on individual methylmercury sources within each source category that have discharges with high methylmercury concentrations or loads or should all individual sources be reduced?
- How should new sources be addressed?
- Should all parties responsible for methylmercury and total mercury discharges be required to complete methylmercury control studies?

The following paragraphs outline options that address each of these questions.

<u>Consideration #5: Responsibility Apportioned to Total Mercury Source Categories</u>. About 30% of the methylmercury in the Delta is produced locally in sediment (Figure 4.2). Methylmercury production is a positive linear function of the inorganic mercury content of sediment; inorganic mercury load reductions elsewhere have resulted in decreases in fish tissue methylmercury concentrations (see Chapter 3 in the TMDL Report). Existing inorganic mercury (a.k.a. "total mercury") sources include tributary inputs, municipal and industrial wastewater treatment plants, urban runoff, and air emissions. About 98% of identified total mercury loading to the Delta comes from tributary inputs; within-Delta sources are a very small component of overall loading. As noted earlier, the Cache Creek, Feather River, American River and Putah Creek watersheds in the Sacramento Basin, and the Mokelumne/Cosumnes watershed in the San Joaquin Basin, appear to export the largest volumes of highly contaminated sediment.

The San Francisco Bay mercury TMDL implementation program assigned the Central Valley a five-year average total mercury load allocation of 330 kg/yr or a decrease of 110 kg/yr from existing conditions. This represents about a 28% decrease in the 20-year average annual loading from Delta tributaries and would enable Delta waters to maintain compliance with the CTR criterion of 50 ng/l (see Section 7.4 in the TMDL Report). A 110 kg/yr reduction in total mercury from the Sacramento Basin, which represents a 31% decrease in the 20-year average annual loading from Sacramento Basin tributaries, is a reasonable goal for the initial phases of the Delta TMDL implementation program; staff estimated that substantially more than 110 kg/yr would need to be reduced if the method used to reduce methylmercury in Delta water and fish was to reduce only inorganic mercury in sediment (see Section 8.2 in the TMDL Report).

"New" methylmercury and inorganic mercury sources are those that increase methylmercury or inorganic mercury loading to the Delta/Yolo Bypass or the tributary watersheds after the Basin Plan amendment adoption date. Increases in methylmercury loading to the Delta would almost certainly cause the fish mercury impairment to worsen. In addition, any new inorganic mercury input to the Delta and its tributary watersheds has the potential to be methylated in the Delta, its tributaries, or the San Francisco Bay. Therefore, efforts need to be taken during Phase 1 and later phases of the Delta mercury control program to minimize increases in net methylmercury and inorganic mercury loading to the Delta.

The following are reasonably foreseeable ways that methylmercury and inorganic mercury loading to the Delta could increase:

- <u>Population growth</u>. The California Department of Finance predicts that populations in the Delta/Yolo Bypass counties[19] will increase 76% to 213% by 2050, with an average increase of about 120% (CDOF, 2007). Increasing populations are expected to result in increasing total mercury and methylmercury discharges from municipal wastewater treatment plants (WWTPs) and urban runoff if efforts are not made to compensate for the population

[19] The California Department of Finance (CDOF) predicts the following population increases by 2050: Contra Costa County - 89%, Sacramento County - 76%, San Joaquin County - 213%, Solano County - 105%, and Yolo County - 93% (CDOF, 2007).

increases.[20] NPDES facilities and MS4s in the Delta contribute only about 2% of the total mercury load to the Delta, and upstream NPDES permitted discharges likely contribute an even smaller percentage to the tributary loads. Even so, the relative bioavailability of mercury in local methylmercury sources remains unknown; it is conceivable that discharges from some sources could be more bioavailable than others, which therefore could have a disproportionate effect on ambient methylmercury if such sources were to increase.

- Wetland restoration projects. The Record of Decision (ROD) for the California Bay-Delta Authority (CBDA) commits it to restore 30,000 to 45,000 acres of fresh, emergent tidal wetlands, 17,000 acres of fresh, emergent nontidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CalFed Bay-Delta Program, 2000a & 2000c). This is a total of 75,000 to 90,000 acres of additional seasonal and permanent wetlands in the Delta, which represents about a three to four times increase in wetland acreage from current conditions (about 21,000 acres). The Bay Delta Conservation Plan (BDCP) effort also identifies "priority projects" for near-term implementation that may increase the acreage of wetland and seasonally flooded habitat in the Delta (e.g., BDCP, 2010). Much of the restoration is expected to take place in the Yolo Bypass, Cosumnes/Mokelumne, Marsh Creek and San Joaquin subareas, areas that require substantial reductions from existing methylmercury sources to achieve the proposed methylmercury allocations. These areas also are downstream of major sources of mercury-contaminated sediment.
- New or enlarged reservoirs in the tributary watersheds. New or enlarged reservoirs in the tributary watersheds could lead to increases in the methylmercury loads contributed by the tributaries to the Delta.
- Water management. Regional water and flood management changes could lead to increased erosion and/or transport of inorganic mercury, as well as changes in ambient water column sulfate concentrations in the Delta that could lead to increased methylmercury levels in the Delta.
- Dredging and excavation activities and dredge material reuse. Changes in deep water ship channel dredging and levee management practices could lead to increases in methylmercury inputs from dredge material return water discharged to Delta/Yolo Bypass waterways and/or exposure of mercury-contaminated sediments, which could lead to increased methylmercury and/or total mercury inputs from the open-water sediments.
- Increased atmospheric deposition from local and global emissions. Mercury emitted to the air may enter directly into the global atmosphere in a vaporous elemental mercury form and may be deposited as particulate matter or in a reactive gaseous mercury form. This could lead to increases in the inorganic mercury and methylmercury loads contributed by atmospheric deposition to the Delta and its tributary watersheds.
- Wetland restoration, preservation, or expansion or other forms of "carbon capture farming". Efforts to create green house gas (GHG) sinks in the Delta, such as carbon sequestration projects in the Delta and tributaries of the Delta that focus on "carbon capture farming"

[20] Urbanization increases (a) volume and discharge velocity of runoff because of the increase in impervious surfaces, and (b) pollutant loading because impervious surfaces neither absorb water nor remove pollutants and urban development tends to create new anthropogenic mercury pollution sources.

could lead to increased methylmercury levels depending on their proximity to mercury sources.

Options for apportioning responsibility for methylmercury source control to the different point and nonpoint methylmercury sources by geographic region, category and individual discharges are reviewed by Considerations #6, 7 and 8, respectively. Several options are possible for apportioning responsibility for total mercury source control to the different categories of point and nonpoint sources (i.e. tributary inputs, municipal and industrial wastewater treatment plants, urban runoff, and air emissions):

- Option 5(a): Do not establish requirements for total mercury discharges from new or existing sources.
- Option 5(b): Establish a requirement that total mercury loading in tributary watershed inputs to the Delta be reduced by a minimum of 110 kg/yr. Do not require reductions from other existing and new point and nonpoint sources in the Delta. Initial total mercury load reduction efforts should focus on the tributary watersheds that export the most mercury-contaminated sediment (e.g., Cache Creek, Feather River, American River, Putah Creek, and Mokelumne/Cosumnes Rivers).
- Option 5(c): Establish a requirement that total mercury loading in tributary watershed inputs to the Delta be reduced by a minimum of 110 kg/yr. Initial total mercury load reduction efforts should focus on the tributary watersheds that export the most mercury-contaminated sediment. This option also would entail:
    - Requiring existing point sources in the Delta/Yolo Bypass and tributary watersheds to minimize their total mercury loading by requiring:
        - NPDES facilities that discharge greater than 1 mgd in the Delta and its tributary watersheds (downstream of major dams) to implement mercury-specific pollutant minimization programs, maintain compliance with a USEPA approved pretreatment program, as applicable, and determine baseline effluent total mercury concentrations in order to evaluate the effectiveness of the pollutant minimization programs [see Section 4.3.2.3 for an explanation of why this subset of NPDES facilities was selected];
        - NPDES MS4s that intersect the Delta and service more than 100,000 people[21] (Contra Costa County, Sacramento, and Stockton) to implement mercury-specific pollution prevention measures and best management practices (BMPs) to control their total mercury discharges.

[21] MS4 permits were issued in two phases. Under “Phase I”, which started in 1990, the Regional Water Boards have adopted NPDES storm water permits for medium (serving between 100,000 and 250,000 people) and large (serving greater than 250,000 people) municipalities. Most of these permits are issued to a group of co-permittees encompassing an entire metropolitan area. These permits are reissued as the permits expire. As part of Phase II, the State Water Board adopted a General Permit for the discharge of storm water from small MS4s (WQ Order No. 2003-0005-DWQ, NPDES No. CAS000004) to provide permit coverage for smaller municipalities, including non-traditional small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes. Phases I and II of the Municipal Storm Water Permitting Program should not to be confused with Phases 1 and 2 of the Delta mercury program discussed in this document.

        - All MS4s to implement BMPs to control erosion and sediment discharges with the goal of reducing their mercury discharges, within the legal Delta boundary and its tributary watersheds downstream of major dams, consistent with their existing NPDES permits and orders.
        - New urban development and WWTP projects in the Delta and its upstream watersheds (downstream of major dams) that have the potential to increase total mercury loading to evaluate their potential effects and implement on-site projects to minimize any increase in total mercury loading.
    - Requiring new water management projects that have the potential to increase total loading to the Delta/Yolo Bypass to evaluate their potential effects and implement on-site projects to minimize any increase in total mercury loading.
    - Recommending that the State Water Board, California Air Resources Board, and USEPA develop a memorandum of understanding to evaluate local and statewide mercury air emissions and deposition patterns and, if local emissions substantially contribute to mercury loading to the Delta or its tributary watersheds, develop and implement a mercury control program for air emissions from existing and future facilities.
- Option 5(d): Establish a requirement that total mercury loading in tributary watershed inputs to the Delta be reduced by a minimum of 110 kg/yr. Initial total mercury load reduction efforts should focus on the tributary watersheds that export the most mercury-contaminated sediment. This option would entail:
    - Requiring existing point sources in the Delta/Yolo Bypass to minimize their total mercury loading by requiring:
        - All existing and new NPDES facilities in the Delta/Yolo Bypass to implement pollutant minimization programs and maintain Phase 1 (interim) effluent TotHg load limits;
        - NPDES MS4s that intersect the Delta and service more than 100,000 people (Contra Costa County, Sacramento, and Stockton) to implement mercury-specific pollution prevention measures and best management practices (BMPs) to control their total mercury discharges; and
        - All MS4s within the legal Delta boundary to implement BMPs to control erosion and sediment discharges with the goal of reducing their mercury discharges, consistent with their existing NPDES permits and orders.
    - Requiring new and existing water management projects that have the potential to increase TotHg loading to the Delta/Yolo Bypass to evaluate their potential effects and implement on-site projects to minimize any increase in total mercury loading.
    - Requiring other nonpoint sources in the Delta/Yolo Bypass to implement reasonable, feasible actions to reduce sediment in runoff with the goal of reducing inorganic mercury loading to the Yolo Bypass and Delta, in compliance with existing Basin Plan objectives and requirements and Irrigated Lands Regulatory Program requirements. Nonpoint sources would be regulated through the authority contained in State laws and regulations, including the State Water Resources Control Board’s Nonpoint Source Implementation and Enforcement Policy.

- Recommending that the State Water Board, California Air Resources Board, and USEPA develop a memorandum of understanding to evaluate local and statewide mercury air emissions and deposition patterns and, if local emissions substantially contribute to mercury loading to the Delta or its tributary watersheds, develop and implement a mercury control program for air emissions from existing and future facilities.

- Option 5(e): Reduce the tributary watershed inputs and point and nonpoint source discharges within the Delta/Yolo Bypass equally by the percent reduction needed to reduce overall total mercury loading to the Delta by at least 110 kg/yr. This option would entail developing total mercury load reduction requirements for tributary inputs to the Delta/Yolo Bypass and all point and nonpoint sources within the Delta/Yolo Bypass.
- Option 5(f): Require existing and new projects that have the potential to increase total mercury loading to the Delta or Yolo Bypass to evaluate their potential effects and implement on-site or offset control projects to ensure no net increase in total mercury loading. This option would entail developing total mercury load reduction requirements for tributary inputs to the Delta/Yolo Bypass and all point and nonpoint sources within the Delta/Yolo Bypass.

Because the majority of total mercury (>97%) that enters the Delta comes from the tributary watersheds, it could be argued that assigning total mercury load reduction requirements could wait until the upstream TMDLs are developed. In addition, there is limited information available about total mercury loads contributed by individual sources in the tributary watersheds. However, there is abundant information about which watersheds contribute the most mercury-contaminated sediment. Also, substantial mercury reductions – 110 kg/yr – are required for Central Valley inputs to the San Francisco Bay. It is more likely that total mercury reduction efforts in the watersheds, and subsequent methylmercury reductions in open-water, wetland and agricultural areas in the Delta, will take place more quickly if watershed total mercury load reduction requirements are included in the Delta mercury control program. As discussed in Section 8.2 of the TMDL Report, additional total mercury and methylmercury reductions likely will be needed from most if not all of the watersheds to address the methylmercury impairment in each area of the Delta and impairments specific to upstream watersheds. In consideration of these factors, Option 5(a) is not forwarded for additional analysis.

Option 5(e) is the most equitable option in that it would require point and nonpoint mercury sources in and upstream of the Delta to make the same percent reduction. Similar approaches have been used elsewhere; for example, NPDES facilities and MS4s were required to reduce their mercury discharges to San Francisco Bay by 20-40% and 52%, respectively, by the San Francisco Bay mercury TMDL implementation program, even though they accounted for 1% and 13%, respectively, of the total mercury loading to the Bay (San Francisco Bay Water Board, 2006). Option 5(e) would require larger percent reductions for NPDES inputs than Options 5(a) through 5(d). In general, load reductions from point sources (not nonpoint sources) are the most likely to succeed within a timely period. Even so, focusing intensive control efforts on point sources is likely not an effective strategy for mercury in the Delta. Point sources (NPDES facilities and MS4s) within the Delta contribute about 2% of the total mercury load to the Delta, and point sources upstream of the Delta are expected to contribute a similar small percentage. As a result, focusing intensive efforts on total mercury discharges from NPDES WWTPs and

MS4s in and upstream of the Delta/Yolo Bypass would be costly while achieving limited environmental benefit regarding mercury. Instead, focusing on upstream nonpoint sources of inorganic mercury is more likely to succeed in measurably reducing Delta fish methylmercury levels within a reasonable time. In addition, if no technically valid and legally defensible offset program can be developed, then it may not be possible for existing or new point sources to comply with load limits that entail substantial reductions, much less to ensure no net increase in total mercury loading. Also, Options 5(e) and (f) may not be consistent with the Stakeholder Group's Guiding Principle #1, "Reasonable control options should be implemented during Phase 1 for inorganic Hg". In consideration of all these factors, Options 5(b), 5(c) and 5(d) are carried into the alternatives evaluation.

Consideration #6: Address Upstream Methylmercury Sources or Only Within-Delta Methylmercury Sources. There are numerous point and nonpoint sources of methylmercury just outside the legal Delta boundary in the Delta's tributary watersheds. The Delta implementation plan could include methylmercury allocations only for within-Delta sources, or it could expand to include methylmercury allocations for upstream sources. As a result, there are several options for the geographic scope of the allocations:

- Option 6(a): Establish methylmercury allocations for within-Delta sources and for tributary loads where the tributaries enter the Delta, and address upstream sources that contribute to the tributary inputs in future Basin Plan amendments (e.g., for TMDL programs for the upstream 303(d)-listed waterways).
- Option 6(b): Establish methylmercury allocations for sources within the Delta (as in Option 6(a)) and the Yolo Bypass north of the legal Delta boundary (Figure 4.6), as well as for tributary loads where the tributaries enter the Delta/Yolo Bypass. (Option 6(a) does not include allocations for sources within the Yolo Bypass north of the legal Delta boundary.) Address upstream sources that contribute to the tributary inputs in future Basin Plan amendments (e.g., for TMDL programs for the upstream 303(d)-listed waterways).
- Option 6(c): Establish methylmercury allocations for sources within the Delta and the Yolo Bypass north of the legal Delta boundary (Figure 4.6), as well as for tributary loads where the tributaries enter the Delta/Yolo Bypass (as in Option 6(b)). Address upstream sources that contribute to the tributary inputs in future Basin Plan amendments (e.g., for TMDL programs for the upstream 303(d)-listed waterways). Include a schedule for the completion of the major upstream TMDLs in the Phase 1 schedule in the Basin Plan amendments. (Option 6(b) does not include a schedule for the completion of the major upstream TMDLs.)
- Option 6(d): Establish methylmercury allocations for all methylmercury sources in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams. [22]
- Option 6(e): Establish methylmercury allocations for all methylmercury sources in the Delta, Yolo Bypass, and tributary watersheds both upstream and downstream of major dams.

[22] Major reservoirs and lakes in the Sacramento Basin include Shasta, Whiskeytown, Oroville, Englebright, Camp Far West, Folsom, and Black Butte, Indian Valley, Clear Lake and Lake Berryessa. Major reservoirs and lakes in the San Joaquin Basin include Camanche, New Hogan, New Melones/Tulloch, Don Pedro, McClure, Burns, Bear, Owens, Eastman, Hensley, Millerton and Marsh Creek.

It would be more efficient and fair to evaluate and implement controls on both within-Delta and upstream sources as part of the Delta implementation plan, to the extent justified by available information. This is because about 60% of methylmercury loading comes from tributary inputs. Therefore, achievement of the proposed fish tissue objectives in the Delta will rely on reducing upstream sources as well as within-Delta sources. In addition, there is a need for a control program that is consistent in addressing NPDES permits within and adjacent to the Delta. For example, applying different regulations to a given MS4 service area split by the legal Delta boundary would be more difficult to implement.

Available information indicates that tributary inputs to, and sources within, the Yolo Bypass are a substantial source of methylmercury to the Delta (refer to the methylmercury source analyses described in the TMDL staff report Chapter 6). As a result, staff prefers that methylmercury allocations be applied to methylmercury sources to the Yolo Bypass as well as the Delta, and that Options 6(b) and 6(c) be advanced to the alternatives analysis.

Methylmercury contributions from upstream sources are inherently included in the tributary inputs to the Delta and Yolo Bypass, which are assigned load allocations. However, stakeholder comments indicated a desire to assign methylmercury allocations to specific upstream sources such as reservoir releases and legacy mercury sources upstream of the reservoirs. Dams on the major tributaries act as controls on water volumes and sediment loading from the upper watersheds (Wright and Schoellhamer, 2004; James, 2004). As a result, sediment-bound methylmercury discharged downstream of dams is more likely to eventually be transported to the Delta. Hence, Option 6(e) is not forwarded for additional analysis for the Delta mercury control program. [Note, however, that 303(d) listed reservoirs and tributaries upstream of the reservoirs that are impaired by mercury will be addressed by future TMDLs even though they are not included in the Delta mercury control program.]

As discussed in the TMDL Report, not enough information is yet available to assign methylmercury allocations to specific individual methylmercury sources – especially nonpoint sources – upstream of the Delta/Yolo Bypass, much less upstream of the reservoirs. Also, less is known about the transport and subsequent conservation of methylmercury discharged by sources in the upper tributary watersheds. For example, methylmercury in waters discharged by Shasta Dam on the Sacramento River may undergo several transformations in the waters' 250-mile journey to the Delta. Additional source investigations are needed. Staff will complete additional source and linkage analyses as well as assign allocations and control requirements to individual methylmercury and total mercury sources within the upstream watersheds, including reservoir releases and sources upstream of the reservoirs, when the upstream TMDLs are developed. The Delta TMDL's methylmercury allocations for tributary inputs establish the minimum net reductions that must be accomplished for the tributary watersheds. [Note, additional methylmercury and total mercury load reductions may be required within those watersheds to address any mercury impairment within those watersheds.] In response to stakeholder requests, a Phase 1 schedule for the completion of the major upstream TMDLs is included in Option 6(c). Staff proposes that the Phase 1 schedule include the adoption of mercury control programs for the Sacramento River (three impaired segments), San Joaquin River (five impaired segments), lower Feather River, lower American River, lower Mokelumne River, Cosumnes River, Marsh Creek and Reservoir (three segments), Putah Creek, and

Morrison Creek, for a total of 17 impaired reaches. TMDLs for other impaired waters will also be developed during Phase 1.

As a result of these factors, only Options 6(b) and (c) are carried into the alternatives evaluation.

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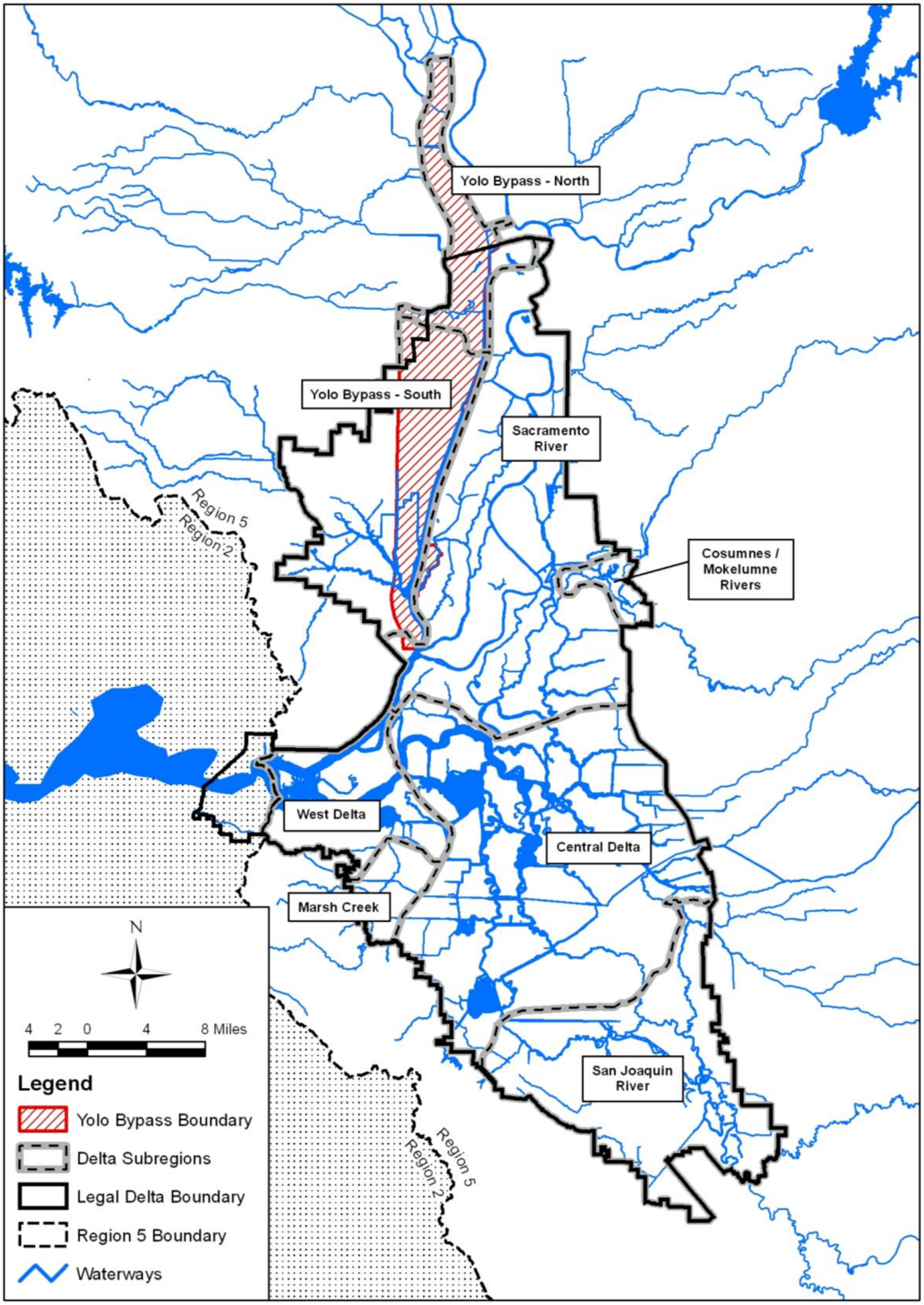

Figure 4.6: Legal Delta Boundary and Yolo Bypass

Consideration #7: Responsibility Apportioned to Methylmercury Source Categories. Existing methylmercury sources in the Delta include: municipal and industrial wastewater treatment plants; MS4s; agriculture; atmospheric deposition; and methylmercury flux from wetland, open-water, and floodplain sediments. The tributary watersheds likely include a similar suite of point and nonpoint sources. Water management activities such as reservoir releases, salinity control (with the resulting effects on sulfate concentrations), flood conveyance, and dredging influence methylmercury inputs to the Delta resulting from methylmercury production in open-water and wetland sediments (see Chapter 3 in the TMDL Report).

As noted by Consideration #5, new methylmercury sources to the Delta/Yolo Bypass and the tributary watersheds may include increases in urban runoff and municipal wastewater discharges resulting from population growth, wetland restoration projects, new or enlarged reservoirs in the tributary watersheds, changes in regional water and flood management operations, and changes in deep water ship channel dredging and levee management practices. Increases in methylmercury loading to the Delta would almost certainly cause the fish mercury impairment to worsen. Therefore, efforts need to be taken during Phase 1 of the Delta mercury control program to minimize increases in net methylmercury loading to the Delta.

Existing and new sources in the Delta and its tributary watersheds with discharge methylmercury concentrations less than the implementation goal for methylmercury in ambient water may be able to contribute methylmercury loading to the Delta without causing ambient methylmercury concentrations to exceed the proposed implementation goal. Sources with discharge methylmercury concentrations greater than the implementation goal in the Delta or its tributary watersheds downstream of major dams could cause ambient methylmercury levels in the Delta to exceed the implementation goal.[23]

As noted under Consideration #3, staff proposes that only Option 3(c) be forwarded to the alternatives analysis. Option 3(c) entails proceeding with an implementation program that incorporates a phased, adaptive management approach that incorporates a methylmercury study period during Phase 1. The Phase 1 control studies' design and implementation would be guided by the methylmercury allocations. Important factors guiding study design should include the type (methylmercury source categories) and amount (magnitude of source reductions) of the allocations. Compliance with the allocations and associated control actions would not be required until Phase 2, after the study results are evaluated and the allocations are adjusted as needed.

Designating methylmercury allocations is a critical component of the implementation program because it identifies the entities that could be responsible for ensuring that allocations are achieved, either through on-site actions or offset projects. In addition, allocations are a legally required component of a TMDL program. An allocation strategy can address feasibility,

[23] Because of the concentration and amount of their discharge relative to the receiving water and other factors, existing individual sources (e.g., a single facility outfall, MS4 outfall or wetland) may or may not result in a measurable increase in the methylmercury concentration of downstream Delta waters. However, the sum of such sources results in measurable increases in fish mercury levels. The same is expected to be true of new methylmercury sources.

institutional constraints, cost-effectiveness, and equity. However, any allocation strategy ultimately must enable water quality objectives to be met.

There are several challenges in developing equitable and effective methylmercury allocations:

- Several source categories (e.g., agriculture and wetlands) until recently have not been regulated by the Central Valley Water Board.
- The Central Valley Water Board has limited regulatory authority to require control of methylmercury impacts caused by atmospheric deposition and water management activities.
- TMDL regulations and guidance focus on controlling discharges of pollutants to address water quality impairments, and do not clearly address how to handle other contributing factors such as water management activities.
- Because of the amount of their discharge relative to the receiving water and other factors, many individual point and nonpoint sources may or may not individually result in a measurable increase in the methylmercury concentration of downstream Delta waters. However, the sum of such source loads results in measurable impairment in Delta fish.
- Several methylmercury source categories are expected to increase their discharges in the near- and long-term.

A variety of options are possible for designating methylmercury allocations by source category:

- Option 7(a): Designate methylmercury allocations only for source categories that have been traditionally regulated (e.g., point discharges from municipal and industrial wastewater treatment plants and MS4s). Do not develop allocations for wetland and agricultural methylmercury inputs, water management activities and atmospheric deposition. Methylmercury flux from sediment in open water and wetland habitats in the Delta – the largest within-Delta source of methylmercury (about 30%) – would be expected to gradually decline as total mercury control actions completed in the tributary watersheds and natural erosional processes result in reductions in sediment mercury concentrations in the Delta waterways. However, such declines would take place very slowly (hundreds of years to geologic time scale, depending on the extensiveness of mine remediation efforts and natural erosional processes) and may not be adequate to achieve fish tissue objectives throughout the Delta. Even without specific methylmercury allocations for nonpoint sources, additional characterization studies of nonpoint methylmercury sources still would need to take place to identify the specific wetlands and other nonpoint discharges that produce the most methylmercury in and upstream of the Delta and the specific sources of inorganic mercury that supply those methylmercury sources, leading to an expansion of the inorganic mercury control efforts described under Consideration #5. In addition, ambient methylmercury declines resulting from inorganic mercury reduction could be countered by nonpoint source factors such as:
    - Increases in wetland acreage and associated increases in methylmercury production resulting from proposed wetland restoration projects in the Delta, Yolo Bypass and tributary watersheds;
    - Changes in current water and flood management activities (e.g., new flood conveyance or water storage projects, or changes in salinity control activities); and/or

- Increases in atmospheric deposition of methylmercury and/or total mercury.

- Option 7(b): Develop methylmercury allocations for all source categories. Incorporate reductions needed to achieve the fish tissue objectives in each Delta subarea into the allocations for the source categories that contribute the most methylmercury to the Delta (e.g., tributary inputs and methylmercury generated in open water and wetland habitats). Set allocations for other source categories at existing methylmercury levels discharged by those sources. This option relies upon issuance of WDRs, utilization of 401-certification authority over future watershed projects, coordination with State Water Board authority over water rights, and development of plans by state and federal agencies to address methylmercury resulting from water management activities and wetlands. This option also requires some combination of in situ methylmercury management practices and upstream total mercury source reduction to reduce methylmercury flux from Delta open-water and wetland habitats.
- Option 7(c): Develop methylmercury allocations for all source categories. Set allocations for the urban runoff outside of MS4 service areas, open-water habitat, and atmospheric deposition source categories (which are expected to be very difficult to control by within-Delta sources and the Regional Board) at existing levels, except in the Yolo Bypass and Marsh Creek subareas, where inputs from open-water areas must be reduced to achieve the proposed fish tissue objectives. The Central Valley Water Board would request that the State Water Board and other state and federal agencies conduct studies to determine baseline conditions and potential management practices for nonpoint sources of methylmercury. Incorporate reductions needed to achieve the proposed fish tissue objectives in each Delta subarea into the methylmercury allocations for the other source categories (e.g., discharges from NPDES facilities and MS4s, agricultural lands and wetlands). This option relies upon issuance of NPDES permits and WDRs, utilization of 401-certification authority over future watershed projects, coordination with State Water Board authority over water rights, and development of plans by state and federal agencies. Methylmercury flux from open-water habitats is expected to decline gradually as total mercury control actions completed in the tributary watersheds and natural erosion reduces the mercury concentration of sediment deposited in the Delta waterways.
- Option 7(d): Develop methylmercury allocations for all source categories. Set allocations for atmospheric deposition and urban runoff outside of MS4 service areas at existing levels. Incorporate reductions needed to achieve the proposed fish tissue objectives in each Delta subarea into the methylmercury allocations for the other source categories (e.g., inputs from open-water habitat and flooded floodplains, municipal and industrial wastewater treatment plants, MS4s, agricultural lands and wetlands). As described more in Consideration #9, the State Water Board and other state and federal agencies would need to conduct studies to determine baseline conditions and potential management practices for nonpoint sources of methylmercury to determine methods for reducing current methylmercury loads from open-water habitat and floodplains (when flooded) as well as to determine the effects of new water management projects on methylmercury levels in the Delta. This option relies upon issuance of NPDES permits and WDRs, utilization of 401-certification authority over future watershed projects, coordination with State Water Board authority over water rights, and development of plans by state and federal agencies. Responsibility for complying with the open-water allocations would be assigned jointly to agencies with jurisdiction over "waters of the State" and water diversions and flood

management, i.e., the State Lands Commission, California Department of Water Resources, and Central Valley Flood Protection Board. Open water allocations would apply to the methylmercury load that fluxes to the water column from sediments in open-water habitats within channels and floodplains in the Delta and Yolo Bypass. Because they affect the transport of mercury and the production and transport of methylmercury, activities such as water management and storage in and upstream of the Delta and Yolo Bypass, maintenance of and changes to salinity objectives, dredging and dredge materials disposal and reuse, and management of flood conveyance flows would be subject to the open water methylmercury allocations. As with Option 7(c), methylmercury flux from sediments deposited in wetland and open-water habitats is expected to decline gradually as total mercury control actions completed in the tributary watersheds and natural erosion reduces the mercury concentration of sediment deposited in the Delta waterways. However, this option places a more upfront and immediate burden on the state and federal governments to evaluate open-water methylmercury sources and evaluate methylmercury and total mercury reduction methods, which is in keeping with stakeholder requests.[24]

- Option 7(e): Develop methylmercury allocations for all source categories. Incorporate reductions needed to achieve the water quality objectives in each Delta subarea in all allocations. This option relies upon issuance of NPDES permits and WDRs, utilization of 401-certification authority over future watershed projects, coordination with SWRCB authority over water rights, and development of inter-agency agreements.
- Option 7(f): Develop methylmercury allocations for all methylmercury source categories based on an effluent limit equal to the proposed implementation goal (0.06 ng/l).

Nonpoint source categories comprise a much larger portion of methylmercury to some subareas of the Delta and Yolo Bypass than point source categories; as a result, Options 7(b) through 7(f) are more equitable than Option 7(a). Also, allocations for identified sources are a legally required component of a TMDL program. The Delta methylmercury TMDL would need to incorporate a margin of safety greater than 40% to address wetlands, agricultural areas and water management activities if they were not given specific allocations. However, the Stakeholder Group's Guiding Principle #11 states, "Allocations in the Delta TMDL should be given to all point and non-point methylmercury sources within the legal Delta and Yolo Bypass, including open waters". Using a TMDL to address methylmercury inputs from previously unregulated sources (agriculture, wetlands and water management activities) is consistent with laws and regulations as long as the implementation actions are within Central Valley Water Board jurisdiction (refer to Chapter 6). In fact, the Central Valley Water Board Watershed Policy (page IV-21.00 of the Basin Plan) supports focusing implementation actions on the most important problems and those sources contributing most significantly to those problems. For example, the dissolved oxygen TMDL for the Stockton Deep Water Ship Channel recently

[24] For example, as written in the 9 April 2008 joint letter signed by the California Farm Bureau Federation, California Rice Commission, California Waterfowl Association, Central Valley Clean Water Association, City of Sacramento, City of Vacaville, County of Sacramento, Ducks Unlimited, Northern California Water Association, Sacramento Regional County Sanitation District, and The Nature Conservancy. This letter is available in the Administrative Record and on the Board website: http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/staff_report_feb08/public_comments_feb08/feb08_stfrpt_mercurystakeholder_com.pdf

approved by the California Office of Administrative Law allocates equal responsibility to entities responsible for flow, channel geometry, and sources of oxygen-demanding substances for excesses of net oxygen demand and requires responsible entities to engage in studies of the causes (California Code of Regulations §3949.2). Also, achieving fish tissue objectives may not occur for many generations, if ever, if wetland acreage increases or water management activities change without any consideration for potential impacts from associated methylmercury production. Therefore, the resulting consideration is how to account for the impacts of wetlands, agriculture, water management activities and atmospheric deposition in the designation of methylmercury allocations.

None-the-less, each source category is comprised of a myriad of smaller individual sources, each with its own intrinsic value and financial constraints; hence, Option 7(b) could place a disproportionate burden on individual entities within each nonpoint source category (e.g., wetland landowners and water management agencies). As noted earlier, allocation strategies must balance equitability, time to implement improvements, likelihood of success, and flexibility. As with the total mercury source categories discussed under Consideration #5, it would be most equitable to establish allocations that include reductions for all methylmercury point and nonpoint source categories in the Delta and Yolo Bypass by equal percentages required to achieve the proposed fish tissue objectives in every Delta subarea.[25] The methylmercury source analysis described in the TMDL Report indicates that reducing or eliminating any one source is unlikely to result in achieving the proposed fish tissue objectives throughout the Delta.

However, little is known about methylmercury control methods for either point or nonpoint sources or which methylmercury sources would be the most feasible to control. As a result, the decision to establish allocations that incorporate reductions for some sources while allowing others to increase would be based solely on a subjective evaluation of which projects are more valuable to the citizens of California. Based on these factors, Options 7(a) and (b) are not carried into the alternatives evaluation.

Option 7(e) is more equitable than Options 7(c) and 7(d) because it directly accounts for the effects of methylmercury inputs from open water habitats and atmospheric deposition on existing conditions in the Delta, rather than placing the burden entirely on other sources. Option 7(e) also involves a greater flexibility and likelihood of success because more causes and potential solutions are considered. However, because of the complexity of open water and atmospheric methylmercury sources, and because the Central Valley Water Board has limited jurisdiction over these sources, there is greater uncertainty about whether these sources can be addressed in a timely manner. This is especially so for atmospheric deposition. Atmospheric

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[25] As described in Section 4.2.1, different amounts of source reduction are needed in the different Delta subareas because the existing fish tissue methylmercury levels in each Delta subarea are different. The average methylmercury concentrations in ambient water in the Central Delta already achieve the proposed implementation goal for methylmercury in ambient water (0.06 ng/l), while the peripheral subareas require percent reductions ranging from 28 to 78% to achieve the proposed implementation goal for methylmercury in ambient water and proposed fish tissue objectives (see Chapter 8 in the TMDL Report). Although different amounts of source reduction will be needed for each Delta subarea, the implementation program must have a consistent strategy for addressing the different source categories and individual discharges that contribute methylmercury to each Delta subarea.

wet deposition of methylmercury and total mercury directly to the Delta/Yolo Bypass makes up only about 1% or less of all methylmercury and total mercury loading to the Delta/Yolo Bypass (see Tables 6.2 and 7.1 in the TMDL Report). However, a rough estimate of the annual contribution of total mercury from atmospheric wet deposition in the tributary watersheds for water year 2001 indicated that wet deposition could account for 23 to 69% of the total incoming total mercury load to the Delta (Foe, 2003). In addition, as reviewed in more detail in the TMDL Report (Chapter 8), recent studies indicate that:

- Mercury in atmospheric deposition in northern California comes from both local sources and sources outside of California and the United States.
- Atmospheric deposition of mercury in northern California and elsewhere in the world has increased substantially – by two- to twenty-fold – during the last 150 years, with recent (i.e., 1990s) declines in some areas due to local implementation of mercury emission controls and recent increases in other areas due mostly to increases in population and associated increased demand for energy as well as increasing gold production using mercury recovery methods.
- Asia, especially coal combustion in China, is a large source of mercury to the global atmosphere. In spite of the economic slowdown, China's demand for energy has remained high. This is expected to result in continued and even increasing contributions of mercury from China to the global pool, which in turn could result in increasing atmospheric deposition of mercury to the Delta and its tributary watersheds.

While the Central Valley Water Board, California Air Resources Board, and USEPA have authority to require the control of discharges to surface water and emissions to the atmosphere from sources in California, they do not have the authority to control emission sources in other countries such as China. Reducing local mercury emissions is expected to help compensate for increases in global sources; however, it likely will be impossible to achieve substantial reductions in current methylmercury and total mercury loads contributed by atmospheric deposition given likely increases in global emissions. As a result, staff proposes setting the methylmercury TMDL allocations for atmospheric deposition at existing levels for the different Delta/Yolo Bypass subareas. These allocations can be modified at the end of Phase 1 once source analyses have been completed for the tributary watersheds and additional information is available about mercury contributions from global sources.

At the same time, numerous stakeholders want the State to be responsible for studies and implementation of control measures for methylmercury produced in waters of the State. Based on these contrasting issues, Options 7(c) and 7(d) will be carried into the alternatives evaluation.

For equitability and cost effectiveness reasons, Option 7(f) will not be carried into the alternatives evaluation. Because dilution sources and methylmercury loss factors vary across the Delta, some Delta subareas are less impaired by methylmercury than others. As a result, requiring all sources to be reduced to the implementation goal may be overly onerous. However, this option may be re-considered at the end of Phase 1 based on the results of the proposed methylmercury control studies and other new information about the extent of impairment and transport of methylmercury throughout the Delta.

Wetland managers who submitted written comments for the February 2008 report and participated in the 2008-2009 Stakeholder Process had concerns about regulating methylmercury discharged by wetlands, in particular that capping or requiring reductions in methylmercury discharges from wetlands would delay or prevent the restoration of wetlands or otherwise impair the desirable functions of wetlands (see Chapter 7 for additional discussion on this concern). To address this particular concern, the Stakeholder Group developed the following recommended language for the Basin Plan amendments:

> As part of the Phase 1 Delta Mercury Control Program Review and subsequent program reviews, the Regional Water Board may consider adjusting the allocations to allow methylmercury discharges from existing and new wetland restoration and other aquatic habitat enhancement projects if dischargers provide information that demonstrates that 1) all reasonable management practices to limit methylmercury discharges are being implemented and 2) implementing additional methylmercury management practices would negatively impact fish and wildlife habitat or other project benefits. The Regional Water Board will consider the merits of the project(s) and whether to require the discharger(s) to propose other activities in the watershed that could offset the methylmercury. The Regional Water Board will periodically review the progress towards achieving the allocations and may consider additional conditions if the plan described above is ineffective.

Staff recommends including this language in the alternatives analysis and subsequent Chapter 7 CEQA Review and Basin Plan amendments. At the same time, staff recognizes that other source categories also have benefits to the public and environment. The Phase 1 Delta mercury control program review described by Option 3(c) under Consideration #3 includes the above concepts described for evaluating wetlands projects for other sources as well.

Consideration #8: Responsibility Apportioned to Individual Point Sources and Individual Nonpoint Methylmercury Sources. As described under Consideration #3, staff proposes that the implementation program incorporate a phased approach; methylmercury control studies and reasonable total mercury and methylmercury control actions would take place during Phase 1, and additional methylmercury control actions needed to comply with the methylmercury allocations would take place during Phase 2. Although compliance with the methylmercury allocations would not be required during Phase 1, methylmercury allocations still must be designated for all sources to (a) guide the development of the control studies and (b) comply with Clean Water Act TMDL requirements.

Currently, only point sources such as WWTPs and MS4s have methylmercury concentration data available for individual discharge locations in the Delta region and can be assigned allocations on a permit-by-permit basis. Results from methylmercury monitoring by NPDES facilities in the Central Valley indicate that many facilities have average effluent methylmercury levels that approach or are less than the proposed implementation goal for unfiltered methylmercury in ambient Delta waters (0.06 ng/l), while other facilities have much higher methylmercury levels (see Chapters 3 and 6 and Appendix G in the TMDL Report and Bosworth *et al.*, 2010). This indicates that some discharges, though they contribute methylmercury loading to the Delta, may act as dilution because of their low methylmercury concentrations. It is expected that technologies or management practices able to reduce methylmercury discharges from some point sources will be developed based on the understanding of such differences.

CalFed studies evaluating aqueous and fish methylmercury levels in wetlands in the Delta region have found a similar pattern: some wetlands have higher methylmercury levels than others (see Chapter 3 in the TMDL Report). As with the point sources, it is expected that management practices able to reduce methylmercury discharges from some nonpoint sources will be developed based on the understanding of such differences. However, methylmercury data are not available for individual discharges from nonpoint sources such as wetlands, agricultural lands, open channel areas, and urban runoff (outside of MS4 service areas) on a parcel-by-parcel basis. As result, these source categories will be assigned subarea allocations. For example, all inputs from existing wetlands within the Central Delta would be grouped into a single Central Delta wetlands allocation; methylmercury inputs from new wetland restoration projects completed after the effective date of the Basin Plan amendments would be incorporated in the subarea allocations for existing wetlands. Subarea allocations for nonpoint sources in subareas that need reductions to accomplish the proposed fish tissue objectives would incorporate reductions, as outlined by the options in Consideration #7; subarea allocations for nonpoint sources in subareas that do not need reductions to accomplish the proposed fish tissue objectives would be set at existing levels. These subarea allocations may be adjusted in the future as needed based on new information using a strategy similar to that described below for point sources. According to available information described in the TMDL Report and a recent study of farmed islands in the Delta (Heim *et al*., 2009), none of the nonpoint sources have discharge methylmercury concentrations low enough to act as sources of dilution, although some wetlands and agricultural areas may act, either seasonally or annually, as net sinks for methylmercury.

The available MS4 methylmercury concentration data collected at eleven sites in Sacramento, Tracy and Stockton ranged from 0.04 to 2.04 ng/l; all but two of the 58 samples had methylmercury concentrations that exceeded the proposed ambient water methylmercury goal, and the average methylmercury concentrations observed at each sample location exceeded the proposed ambient goal (Section 6.2.5 and Appendices H and L in the TMDL Report). In addition, inspection of the available methylmercury data suggests that the differences between urban watersheds are not related entirely to land use. Therefore, it is not known at this time how to extrapolate the available data to estimate loads discharged by every individual outfall within the MS4s. As a result, there is adequate information to assign NPDES MS4 waste load allocations on a permit-by-permit basis in each subarea, but there is not adequate information to assign allocations to individual discharges within each MS4 permit area. All outfall discharges within a given MS4 service area within a given subarea are grouped into a single allocation. For example, all inputs from existing urban areas within the Sacramento MS4 service area within the Sacramento River subarea would be grouped into a single allocation; methylmercury inputs from new urban developments within that MS4 service area completed after the effective date of the Basin Plan amendments would be incorporated in the Sacramento River subarea allocation for the Sacramento MS4. The MS4 subarea allocations may be adjusted in the future as needed based on new information using a strategy similar to that proposed for NPDES facilities. According to available information described in the TMDL Report, none of the MS4s have discharge methylmercury concentrations low enough to act as sources of dilution.

Staff proposes that individual NPDES facilities that discharge to Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives and have discharge methylmercury concentrations above the proposed implementation goal be assigned methylmercury allocations that incorporate reductions needed to accomplish the proposed fish tissue objectives. Staff proposes that individual point sources with discharges that act as dilution (e.g., have average discharge methylmercury concentrations below the proposed goal for methylmercury in ambient water of 0.06 ng/l or below their source water methylmercury concentration) be assigned allocations based on their existing discharge methylmercury concentrations. Conceptually, there is no short-term need to limit the loading from sources that act as dilution, given the overall extent of impairment throughout the Delta. However, to enable the calculation of allocations required for other sources, load-based allocations must be calculated even for those sources that act as dilution (see Chapter 8 in the TMDL Report). As a result, staff proposes that individual NPDES facility discharges that act as dilution have allocations based on discharge volumes that incorporate expected growth (refer to Section 4.3.2 for additional discussion). Discharge volumes from individual NPDES facilities that do not act as dilution could be allowed to increase so long as their discharge loads do not increase above their allocated loads. That is, an increase in discharge volume would necessitate a decrease in methylmercury concentration to maintain the load allocation so that the increased volume does not cause an increase in receiving water methylmercury concentration.[26]

All load and waste load allocations for nonpoint and point sources in Delta subareas that do not require source reductions to achieve the proposed fish tissue objectives (Central and West Delta subareas) would be set at existing levels regardless of the volume of their discharge. Several allocation options are available to address existing and new sources in the subareas that require source reductions (Sacramento, San Joaquin, Mokelumne/Cosumnes, Marsh Creek, and Yolo Bypass subareas):

- Option 8(a): Designate allocations equal to existing discharge loads for relatively small NPDES methylmercury discharges (e.g., WWTPs that discharge less than 1 mgd and MS4s that service less than 100,000 people). Designate allocations for larger methylmercury point sources that include load reductions necessary to achieve the fish tissue objectives in each Delta subarea in which the proposed fish tissue objectives are not achieved, except for those that act as dilution. Establish a waste load allocation for each subarea that allows assimilative capacity to be reserved for new or expanded NPDES facility discharges. Apply Phase 1 methylmercury concentration limits to existing large point sources and new point sources in the Delta/Yolo Bypass and tributary watersheds downstream of major dams because, of the 43 upstream municipal WWTPs, the 25 that discharge greater than 1 mgd account for about 95% of the municipal WWTP discharge volume (Bosworth *et al.*, 2010). All nonpoint source subarea allocations – except those for atmospheric deposition, open-water areas [except in the March Creek and Yolo Bypass subareas], and urban runoff outside of MS4 service areas – would include reductions, but only the landowners/managers for large tracts would be responsible for implementing control actions needed to achieve the allocations. In addition, require all new or expanded methylmercury point and nonpoint sources in the Delta/Yolo Bypass and upstream watersheds to conduct individual or participate in collaborative control studies; submit a methylmercury control plan to the Central Valley Water Board at the completion of the

[26] If an offset program is developed, another option could be for such a WWTP to compensate for increases in its load by completing offset projects upstream.

studies that indicates how their projects will minimize their methylmercury discharges; and implement control measures as reasonable and feasible during Phase 1 to minimize their methylmercury discharges. [Refer to Consideration #9 for additional discussion about which entities will be responsible for control studies.]

- Option 8(b): Designate allocations that include methylmercury load reductions for all individual point sources in subareas in which the proposed fish tissue objectives are not achieved except for those that act as dilution, rather than requiring only the larger point sources to reduce their methylmercury discharges. Apply Phase 1 methylmercury concentration limits to existing large point sources and new point sources in the Delta/Yolo Bypass and tributary watersheds downstream of major dams. All nonpoint source subarea allocations – except those for atmospheric deposition, open-water areas [except in the March Creek and Yolo Bypass subareas], and urban runoff outside of MS4 service areas – would include reductions; all of the landowners/managers would be responsible for implementing reductions needed to achieve the allocations. In addition, require all new or expanded methylmercury point and nonpoint sources in the Delta/Yolo Bypass and upstream watersheds to conduct individual or participate in collaborative control studies, submit a methylmercury control plan to the Central Valley Water Board at the completion of the studies that indicates how their projects will minimize their methylmercury discharges, and implement control measures as reasonable and feasible during Phase 1 to minimize their methylmercury discharges. [Refer to Consideration #9 for additional discussion about which entities will be responsible for control studies.]
- Option 8(c): Designate allocations that include methylmercury load reductions for all individual point sources in subareas in which the proposed fish tissue objectives are not achieved, rather than requiring only the larger point sources to reduce their methylmercury discharges. All nonpoint source subarea allocations – except those for atmospheric deposition and urban runoff outside of MS4 service areas – would include reductions. In addition, require all new or expanded methylmercury sources in the Delta/Yolo Bypass, as well as new or expanded flood and water management projects in the upstream watersheds that could affect methylmercury levels in the Delta/Yolo Bypass to conduct individual or participate in collaborative control studies and submit a methylmercury control plan to the Central Valley Water Board at the completion of the studies that indicates how their projects will minimize their methylmercury discharges; and implement control measures as reasonable and feasible during Phase 1 to minimize their methylmercury discharges. [Refer to Consideration #9 for additional discussion about which entities will be responsible for control studies.]
- Option 8(d): Designate allocations that include methylmercury load reductions for all individual point sources in subareas in which the proposed fish tissue objectives are not achieved. All nonpoint source subarea allocations would include reductions. Delay the completion of new projects in and upstream of the Delta/Yolo Bypass – unless they can ensure no net increase in methylmercury loading to the Delta/Yolo Bypass – until the end of Phase 1, after the proposed methylmercury control studies are completed, so that new projects can incorporate methylmercury controls.

Depending on the magnitude and discharge characteristics of new sources that begin during Phases 1 and 2, the allocations under any of these strategies may need to be adjusted by another Basin Plan amendment at the beginning of Phase 2 or during later phases of the control program to accommodate any resulting increase in ambient methylmercury levels in the Delta.

To delay new projects until the end of Phase 1 could prove costly, and could result in an unnecessary delay for projects that otherwise provide substantial benefits to the citizens and ecosystems of California. As a result, Option 8(d) is not forwarded for additional analysis and Options 8(a) through 8(c) are forwarded.

The Central Valley Water Board will evaluate additional options for new projects implemented during and after Phase 1 of the program, once Board members have assessed the results of the proposed Phase 1 control studies.

Consideration #9: Responsibility for Studies. Source control studies require substantial effort and funds. Staff encourages dischargers to conduct collaborative studies to save costs and increase the likelihood of useful results.

As noted in Consideration #8, all new or expanded methylmercury point and nonpoint sources in the Delta/Yolo Bypass, including proponents for new water and flood management projects that have the potential to increase ambient methylmercury and/or total mercury concentrations or loads in the Delta/Yolo Bypass, would be required to conduct control studies. Options for criteria to determine which existing sources ought to be responsible for studies include:

- Option 9(a): Dischargers that meet the following criteria would be responsible for conducting studies:
    - Discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives;
    - Have relatively large volumes of discharge compared to other individual sources in each respective source category (e.g., MS4s that intersect the Delta and service more than 100,000 people (Contra Costa, Sacramento, and Stockton and MS4s) and WWTPs that discharge greater than 1 mgd); and
    - Have discharge methylmercury concentrations that exceed the proposed implementation goal (or exceed intake water methylmercury concentrations).

  Dischargers in the Central Valley that are not subject to the Delta mercury control program but may be subject to future mercury control programs in upstream tributary watersheds could participate in the coordinated Delta control studies. Dischargers in and upstream of the Delta who participate in the control studies would be exempt from conducting equivalent control studies required by future upstream mercury control programs. [For example, the Sacramento MS4 service area straddles the legal Delta and several upstream watersheds that are 303(d) listed. If its control study addresses its discharges in and upstream of the Delta, then it would not be required to conduct another study as part of an upstream control program.]

  The Central Valley Water Board's Irrigated Land Regulatory Program or other coalition or collaborative group could implement the Delta methylmercury TMDL implementation program for irrigated agriculture and managed wetlands; not every landowner would necessarily be responsible for conducting a study although all large landowners may be required to contribute funds towards a collaborative study and/or allow access to their land for monitoring purposes. In addition, landowners of non-irrigated agricultural parcels and unmanaged wetlands (e.g., not irrigated or otherwise subject to periodic vegetation or other water or land management activities) would not be required to participate in control studies because discharges from these areas are not currently regulated by any state or federal program and as a result there is a very poor likelihood of success in implementing on-site methylmercury controls for these areas. Similarly, small NPDES facilities and MS4s (MS4s that serve municipalities with less than 100,000 people, which are regulated by a statewide general permit [NPDES No. CAS000004] rather than individual permits) and urban areas outside of MS4 service areas (which are considered to be nonpoint sources by the USEPA and are not regulated by any individual or statewide general permit) are excluded from control study requirements. However, both large and small point and nonpoint dischargers in the Delta/Yolo Bypass would be required to implement reasonable total mercury and sediment control measures during Phase 1 and may be required to implement feasible methylmercury control technologies and management practices during Phase 2. Upstream dischargers would be identified as Board staff work on upstream TMDLs. Upstream dischargers may be required to conduct control studies as part of upstream TMDL implementation efforts. Dischargers upstream of the Delta who participate in the Delta control studies would be exempt from conducting equivalent control studies required by future upstream mercury control programs. Upstream dischargers may be required to implement feasible controls as part of Phase 2 of the Delta Mercury Control program or as part of upstream TMDL implementation programs.

- Option 9(b): Dischargers that meet the following criteria would be responsible for conducting studies:
    - Discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives <u>or</u> discharge to the tributary watersheds downstream of major dams that drain to those subareas and have direct evidence of methylmercury loading to surface water;
    - Have relatively large volumes of discharge compared to other individual sources in each respective source category (e.g., MS4s that service greater than 100,000 people (Contra Costa County, Sacramento, and Stockton) and WWTPs that discharge greater than 1 mgd); and
    - Have discharge methylmercury concentrations that exceed the proposed implementation goal (or exceed intake water methylmercury concentrations).

  Dischargers in Delta subareas that do not require methylmercury source reductions should participate in individual or collaborative studies if they expect to increase the volume of their discharges in the future. Dischargers in the Central Valley that are not subject to the Delta mercury control program but may be subject to future mercury control programs in upstream tributary watersheds could participate in the coordinated Delta control studies. Dischargers upstream of the Delta who participate in the Delta control studies would be exempt from conducting equivalent control studies required by future upstream mercury control programs. [For example, the Sacramento MS4 service area straddles the legal Delta and several upstream watersheds that are 303(d) listed. If its control study addresses its discharges in and upstream of the Delta, then it would not be required to conduct another study as part of an upstream control program.]

At the time the February 2008 Basin Plan amendment staff report was developed, there was no published, direct evidence of methylmercury loading from wetlands and agricultural areas in the tributary watersheds is available; the TMDL Report load estimates for these sources within the Delta and Yolo Bypass are based on limited Delta-specific data. Hence, only landowner/management agencies for agricultural and wetland areas in the Delta and Yolo Bypass would be responsible for conducting studies. The Central Valley Water Board's Irrigated Land Regulatory Program or other coalition or collaborative group could implement the Delta methylmercury TMDL implementation program for irrigated agriculture and managed wetlands; not every landowner would necessarily be responsible for conducting a study although all large landowners may be required to contribute funds towards a collaborative study and/or allow access to their land for monitoring purposes. In addition, landowners of non-irrigated agricultural parcels and unmanaged wetlands (e.g., not irrigated or otherwise subject to periodic vegetation or other management activities) would not be required to participate in control studies because discharges from these areas are not currently regulated by any state or federal program and as a result there is a very poor likelihood of success in implementing on-site methylmercury controls for these areas. The Central Valley Water Board will develop methylmercury source analyses for the tributary watersheds as part of upstream TMDL development efforts and include agricultural and wetland areas in the tributary watersheds methylmercury control studies specific to those TMDLs as appropriate based on data available at that time.

Because of the integrated nature of water and flood management operations throughout the Central Valley, it would be most effective to evaluate new projects both within and upstream of the Delta.

As described in Chapter 6 of the TMDL Report and Bosworth and others' 2010 report, direct evidence of methylmercury loading from NPDES facilities in the tributary watersheds is available. For this option, all existing NPDES WWTPs that discharge greater than 1 mgd and greater than 0.06 ng/l MeHg in the Delta/Yolo Bypass subareas that require source reductions to achieve fish tissue objectives <u>and their tributary watersheds</u> (downstream of major dams) are required to conduct control studies because population growth is expected to cause their discharges within and upstream of the Delta to increase. Note, the large MS4s that meet the criteria outlined by Options 9(a) and (b) are the same (Contra Costa County, Sacramento, and Stockton MS4s). Other MS4s and urban areas outside of MS4 service areas (which are considered to be nonpoint sources by the USEPA and are not regulated by any individual or statewide general permit) are excluded from control study requirements. Other upstream dischargers would be identified as Board staff work on upstream TMDLs. Upstream dischargers may be required to conduct control studies as part of upstream TMDL implementation efforts. Dischargers upstream of the Delta who participate in the Delta mercury control program's control studies would be exempt from conducting equivalent control studies required by future upstream mercury control programs. Both small and large dischargers in the Delta/Yolo Bypass would be required to implement reasonable total mercury and sediment control measures during Phase 1; and small and large dischargers in the Delta/Yolo Bypass and upstream watersheds may be required to implement feasible methylmercury controls as part of Phase 2 of the Delta Mercury Control program or as part of upstream TMDL implementation programs.

- Option 9(c): Dischargers that meet the following criteria would be responsible for conducting studies:
  - Nonpoint sources (except urban runoff outside of MS4 service areas) that discharge directly to Delta/Yolo Bypass subareas that require methylmercury source reductions to achieve the proposed fish tissue objectives; and
  - NPDES facilities and large MS4s regardless of where in the Delta/Yolo Bypass their discharges occur.
  - Proponents for <u>existing</u> as well as new water and flood management projects that have the potential to increase ambient MeHg and/or TotHg concentrations or loads in the Delta/Yolo Bypass.

  This option was compiled by the 2008-2009 Stakeholder Process. For this option, all NPDES facilities in the Delta/Yolo Bypass – including those in subareas for which within-subarea source reductions are not required to achieve fish tissue objectives – would be required to participate in control studies because it makes sense to study the facilities as a group to identify which treatment processes employed by facilities with low effluent methylmercury concentrations result in the low concentrations and can be implemented by the other facilities. Although all NPDES facilities in the Delta/Yolo Bypass are required to participate in control studies, the nature of that participation could be defined by a collaborative effort so long as that effort is approved by the Board Executive Officer. For example, facilities with very low effluent methylmercury concentrations could participate in the studies by allowing access to their facilities for monitoring purposes.

  Dischargers in the Central Valley that are not subject to the Delta mercury control program but may be subject to future mercury control programs in upstream tributary watersheds could participate in the coordinated Delta control studies. Dischargers upstream of the Delta who participate in the Delta control studies would be exempt from conducting equivalent control studies required by future upstream mercury control programs. [For example, the Sacramento MS4 service area straddles the legal Delta and several upstream watersheds that are 303(d) listed. If its control study addresses its discharges in and upstream of the Delta, then it would not be required to conduct another study as part of an upstream control program.]

  The Central Valley Water Board's Irrigated Land Regulatory Program or other coalition or collaborative group could implement the Delta methylmercury TMDL implementation program for irrigated agriculture and managed wetlands; not every landowner would necessarily be responsible for conducting a study although they may be required to contribute funds towards a collaborative study and/or allow access to their land for monitoring purposes. In addition, landowners of non-irrigated agricultural parcels and unmanaged wetlands (e.g., not irrigated or otherwise subject to periodic vegetation or other management activities) would not be required to participate in control studies because discharges from these areas are not currently regulated by any state or federal program and as a result there is a very poor likelihood of success in implementing on-site methylmercury controls for these areas.

  Both large and small dischargers in the Delta/Yolo Bypass would be required to implement reasonable total mercury and sediment control measures during Phase 1 and may be required to implement feasible methylmercury control technologies and management practices during Phase 2. Upstream dischargers may be required to implement feasible total mercury and methylmercury controls as part of Phase 2 or as part of upstream TMDL implementation programs.

Proponents for existing as well as new water and flood management projects that have the potential to increase ambient MeHg and/or TotHg concentrations or loads in the Delta/Yolo Bypass are included in this option because Option 7(d) entails a reduction in methylmercury loading from existing inputs from open-water habitats in all subareas except the Central and West Delta subareas. Because of the integrated nature of water and flood management operations throughout the Central Valley, it would be most effective to evaluate operations both within and upstream of the Delta.

- Option 9(d): Responsible parties for all individual methylmercury sources – regardless of size or location – in the Delta and its tributary watersheds for which direct evidence of methylmercury loading is available would be responsible for conducting the studies.
- Option 9(e): Responsible parties for all individual methylmercury sources in the Delta and its tributary watersheds would be responsible for conducting the studies.

All of these options would include control studies for existing projects, new projects or changes to existing projects that have the potential to increase ambient inorganic mercury and/or methylmercury levels in the Delta or Yolo Bypass. Such projects may be related, but not limited, to flood conveyance, water management and storage in and upstream of the Delta and Yolo Bypass, dredging, dredge material disposal and reuse, and maintenance of and changes to salinity objectives. State and federal agencies whose projects affect the transport of mercury and the production and transport of methylmercury through the Yolo Bypass and Delta, or manage open water areas in the Yolo Bypass and Delta, include but are not limited to the California Department of Water Resources, State Lands Commission, Central Valley Flood Protection Board, U.S. Army Corps of Engineers, and U.S. Bureau of Reclamation. These agencies may conduct their own coordinated control studies or may work with the other stakeholders in comprehensive, coordinated control studies.

The control study requirements need to acknowledge that some discharges may act as dilution because of their low methylmercury concentrations, and at the same time acknowledge that any discharge that contains methylmercury, regardless of volume or concentration, contributes to the methylmercury impairment in the Delta. This is especially critical given several sources are expected to increase in the short- and long-term. As a result, Option 9(a) is not forwarded to the alternatives analysis.

The 2008-2009 Stakeholder Group's Guiding Principle #11 "The geographic scope of the Phase 1 mercury control studies should include all sources downstream of major dams". Upstream sources contribute to upstream impairments and may also contribute to the Delta impairment; many major and minor tributaries are 303(d)-listed as mercury impaired. Many upstream sources may eventually be required to conduct methylmercury control studies; hence, it would be more efficient and cost effective to coordinate studies between Delta and upstream sources. Staff will be focusing the next set of TMDLs on the tributaries downstream from the major dams and may concurrently develop TMDLs for the major reservoirs. However, it is likely that methylmercury sources and transport in higher-elevation watersheds upstream of major reservoirs will be substantially different from downstream sources and would be better addressed by separate study efforts. Therefore, Options 9(d) and (e) are not forwarded to the alternatives analysis.

In addition to considering which dischargers should be required to conduct control studies, the 2008-2009 Stakeholder Group also considered what the studies themselves should entail, as summarized in the draft Guiding Principles developed by the Stakeholder Group and other stakeholder comments after the release of the February 2008 draft staff report:

- "Phase 1 studies should address both inorganic mercury (inorganic Hg) and methylmercury (MeHg) from all sources" (Principle #1).
- "Phase 1 control studies should develop knowledge for effectively controlling MeHg" (Principle #2).
- The mercury control program should incorporate long-term stakeholder involvement in the control studies, Technical Advisory Committee, and upstream TMDLs (Principle #6).
- "The implementation plan should include methods to assess the relative magnitudes and other factors of different MeHg and inorganic Hg sources, and prioritize study and control actions, if and when it is not feasible to pursue those actions simultaneously" (Principle #9).
- "The Phase 1 studies should be subject to independent peer review by the Technical Advisory Committee" (Principle #10).

In addition, the Stakeholder Group supported addition of language to the Basin Plan amendments that states that the Phase 1 studies' designs should focus on evaluating existing control methods and developing new methods as needed to achieve the allocations, as well as evaluating the feasibility of reducing sources more than the minimum amount needed to achieve allocations.

Board staff, as a member of the Stakeholder Group, participated in the development of the above Guiding Principle text and agrees with their intent. These study attributes will be included as a component of both Options 9(b) and 9(c).

4.2.2 Implementation Alternatives Considered

Table 4.2 shows how four alternatives are formulated from different combinations of the options described in Section 4.2.1. Consideration #1 Option 1(a) [Incorporate exposure reduction (public outreach, education, and activities with consumers of Delta fish) programs"] is selected for all four alternatives. The first alternative, the "No Action" alternative, would require no active methyl or total mercury control actions. The other three alternatives require varying levels of control effort. The progression of Alternatives 2 and 3 generally represents increasing levels of effort to a greater number of responsible parties. Alternative 4 represents the combination of options identified by the 2008-2009 Stakeholder Process. Consideration #2 Option 2(b) [Incorporate both methyl and total mercury source controls] and Consideration #3 Option 3(b) [Proceed with an implementation program, but incorporate a phased, adaptive management approach] are selected for Alternatives 2, 3 and 4. Table 4.2 illustrates which elements of the options for Considerations 4 through 9 are common and unique to each alternative.

Regular reporting to the Central Valley Water Board regarding progress toward meeting the recommended water quality objectives is contained in all alternatives. Under each implementation alternative, the Central Valley Water Board will review progress toward meeting the water quality objectives. Staff will evaluate current scientific information regarding methyl and total mercury reductions to determine if changes are required for the implementation program, incorporating an adaptive management approach.

Table 4.2: Summary of Implementation Alternatives

	CONSIDERATION OPTIONS	Alternatives			
		1	2	3	4
1(a)	Incorporate exposure reduction (public education, outreach, and other activities with consumers of Delta fish) programs.	X	X	X	X
2(b)	Incorporate both methyl and total mercury source controls.		X	X	X
3(c)	Incorporate a phased, adaptive management approach that includes a methylmercury (MeHg) control study period in the Phase 1 implementation plan.		X	X	X
4(b)	During Phase 1 allow voluntary pilot offset projects and develop a long-term offset program to implement during Phase 2. Include general guiding principles for the pilot offset projects and long-term offset program and a schedule for the development of a long-term offset program in the Basin Plan amendments. .		X	X	X
5	Common elements: - Establish a requirement that total mercury loading in tributary watershed inputs to the Delta be reduced by a minimum of 110 kg/yr. Initial total mercury (TotHg) load reduction efforts should focus on tributary watersheds exporting the most mercury-contaminated sediment (e.g., Cache Creek, Feather River, American River, Putah Creek and Mokelumne/Cosumnes).		X	X	X
5(b)	- Do not require other existing and new point and nonpoint sources in the Delta and tributary watersheds to implement measures to control their TotHg discharges.		X		
5(c)	- Require the Sacramento, Stockton and Contra Costa MS4s to implement mercury-specific pollution prevention measures and BMPs to control their TotHg discharges. - Require all MS4s to implement BMPs to control erosion and sediment discharges with the goal of reducing their mercury discharges, within the Delta and its tributary watersheds downstream of major dams. - Require NPDES facilities that discharge greater than 1 mgd in the Delta and its upstream watersheds (downstream of major dams) to implement mercury-specific pollutant minimization programs, maintain compliance with a USEPA approved pretreatment program, as applicable, and determine baseline effluent TotHg concentrations in order to evaluate the effectiveness of the pollutant minimization programs. - Require new urban development and WWTP projects in the Delta and its upstream watersheds (downstream of major dams) that have the potential to increase TotHg loading to evaluate their potential effects and implement on-site projects to minimize any increase in TotHg loading. - Require new water management projects that have the potential to increase TotHg loading to the Delta/Yolo Bypass to evaluate their potential effects and implement projects to minimize to the extent practicable any increase in TotHg loading.			X	

Table 4.2: Summary of Implementation Alternatives

CONSIDERATION OPTIONS		Alternatives			
		1	2	3	4
5(d)	- Require the Sacramento, Stockton and Contra Costa MS4s to implement mercury-specific pollution prevention measures and BMPs to control their TotHg discharges. - Require all MS4s in the Delta/Yolo Bypass to implement BMPs to control erosion and sediment discharges with the goal of reducing their mercury discharges. - Require all existing and new NPDES facilities in the Delta/Yolo Bypass to implement mercury-specific pollutant minimization programs, and maintain performance-based Phase 1 (interim) effluent TotHg load limits. - Require new and existing water management projects that have the potential to increase TotHg loading to the Delta/Yolo Bypass to evaluate their potential effects and implement on-site projects to minimize to the extent practicable any increase in TotHg loading. - Require other nonpoint sources in the Delta/Yolo Bypass to implement reasonable, feasible actions to reduce sediment in runoff with the goal of reducing inorganic mercury loading to the Yolo Bypass and Delta, in compliance with existing Basin Plan objectives and requirements, and Irrigated Lands Regulatory Program requirements.				X
6	<u>Common elements</u>: Establish MeHg allocations for sources within the Delta and the Yolo Bypass north of the legal Delta boundary, as well as for tributary loads where the tributaries enter the Delta/Yolo Bypass. Address upstream sources that contribute to the tributary inputs in future Basin Plan amendments (e.g., for TMDL programs for the upstream 303(d)-listed waterways).		X	X	X
6(b)	- Do not include a schedule for the completion of the major upstream TMDLs in the Phase 1 schedule in the Basin Plan amendment.		X	X	
6(c)	- Include a schedule for the completion of the major upstream TMDLs in the Phase 1 schedule in the Basin Plan amendment.				X
7	<u>Common elements</u>: Set MeHg load allocations for atmospheric deposition and urban runoff outside of MS4 service areas in the Delta/Yolo Bypass at existing levels. Incorporate reductions needed to achieve the proposed fish tissue objectives in each Delta/Yolo Bypass subarea into the MeHg load and waste load allocations for NPDES facilities and MS4s, agricultural lands and wetlands.		X	X	X
7(c)	- Set MeHg load allocations for open-water areas at existing levels, with the exception of open-water areas in the Yolo Bypass and Marsh Creek subareas. Incorporate reductions needed to achieve the proposed fish tissue objectives into the MeHg load allocations for open-water areas in the Yolo Bypass and Marsh Creek subareas.		X	X	
7(d)	- Incorporate reductions into the MeHg load allocations for open-water areas needed to achieve the proposed fish tissue objectives in each Delta/Yolo Bypass subarea.				X
8	<u>Common elements</u>: Require MeHg allocations to incorporate reductions to allow assimilative capacity for new sources. Require all new or expanded MeHg point and nonpoint sources <u>in the Delta/Yolo Bypass</u> to evaluate their discharges and submit a MeHg control plan to the Central Valley Water Board at the completion of the studies that indicates how their projects will minimize their MeHg discharges; and implement reasonable and feasible control measures during Phase 1 to minimize their MeHg discharges. Do not require allocations to incorporate load reductions for existing or new sources that act as dilution. Do not require allocations to incorporate reductions for existing sources that discharge to Delta/Yolo Bypass subareas that do not need within-subarea source reductions to achieve fish tissue objectives (Central and West Delta subareas).		X	X	X
8(a)	- Designate MeHg allocations that incorporate reductions only for <u>large</u> individual sources within the NPDES facility, MS4, agricultural, wetland, and tributary source categories that discharge to Delta/Yolo Bypass subareas that require MeHg source reductions to achieve fish tissue objectives. - Include control study and control requirements for new or expanded point and nonpoint MeHg sources in the upstream watersheds. - Apply performance-based Phase 1 (interim) MeHg concentration limits to existing large point sources and new point sources in the Delta/Yolo Bypass and tributary watersheds downstream of major dams.		X		

Table 4.2: Summary of Implementation Alternatives

	CONSIDERATION OPTIONS	Alternatives			
		1	2	3	4
8(b)	- Designate MeHg allocations that incorporate reductions for all individual NPDES facility and MS4 permitted sources and for nonpoint sources grouped by subarea (except atmospheric deposition) that discharge to Delta/Yolo Bypass subareas that require MeHg source reductions to achieve fish tissue objectives. - Include control study and control requirements for new or expanded point and nonpoint MeHg sources in the upstream watersheds. - Apply performance-based Phase 1 (interim) MeHg concentration limits to existing large point sources and new point sources in the Delta/Yolo Bypass and tributary watersheds downstream of major dams.			X	
8(c)	- Designate MeHg allocations that incorporate reductions for all individual NPDES facility and MS4 permitted sources and for nonpoint sources grouped by subarea (except atmospheric deposition) that discharge to Delta/Yolo Bypass subareas that require MeHg source reductions to achieve fish tissue objectives. - Include control study and control requirements for new and existing flood and water management projects in the Delta/Yolo Bypass and upstream watersheds that could affect MeHg levels in the Delta/Yolo Bypass.				X
9	Responsible parties for MeHg sources that meet the following criteria would be responsible for conducting studies. This includes MeHg point and nonpoint sources in the Delta/Yolo Bypass; also included are proponents for new water and flood management projects in and upstream of the Delta/Yolo Bypass that have the potential to increase ambient MeHg and/or TotHg concentrations or loads in the Delta/Yolo Bypass.		X	X	X
9(a)	Also include: - Large individual wetland and agriculture dischargers, and NPDES WWTPs that discharge greater than 1 mgd and greater than 0.06 ng/l MeHg, in the Delta/Yolo Bypass subareas that require within-subarea sources to be reduced to achieve fish tissue objectives (Sacramento, San Joaquin, Mokelumne/Cosumnes, Marsh Creek, and Yolo Bypass subareas). - Sacramento, Stockton and Contra Costa County MS4s.		X		
9(b)	Also include: - Large individual wetland and agriculture dischargers in the Delta/Yolo Bypass subareas that require within-subarea sources to be reduced to achieve fish tissue objectives. - Existing NPDES WWTPs that discharge greater than 1 mgd and greater than 0.06 ng/l MeHg in the Delta and <u>tributary watersheds</u> (downstream of major dams) that drain to the Delta/Yolo Bypass subareas that require within-subarea sources to be reduced to achieve fish tissue objectives. - Sacramento, Stockton and Contra Costa County MS4s and any new/expanded large MS4s in the <u>tributary watersheds</u> (downstream of major dams) that drain to Delta/Yolo Bypass subareas that require source reductions to achieve fish tissue objectives. - All new or expanded MeHg point sources in the tributary watersheds downstream of major dams that contribute to the Delta/Yolo Bypass subareas that require source reductions.			X	
9(c)	Also include: - <u>All</u> wetland and agriculture dischargers in the Delta/Yolo Bypass subareas that require within-subarea sources to be reduced to achieve fish tissue objectives. - Sacramento, Stockton and Contra Costa County MS4s. - NPDES facilities throughout the Delta/Yolo Bypass. - <u>Existing</u> as well as new water and flood management projects in and upstream of the Delta that have the potential to increase ambient MeHg and/or TotHg concentrations or loads in the Delta/Yolo Bypass.				X

4.3 Reasonably Foreseeable Methods of Compliance with Alternatives 1 through 4

Public Resources Code Section 21159 *et seq*. requires state agencies such as the Air Resources Board, Department of Toxic Substances Control and State and Regional Water Boards to perform, at the time of the adoption of a rule or regulation requiring the installation of pollution control equipment, an environmental analysis of the reasonably foreseeable methods of compliance that at minimum:

- Includes an analysis of:
    - The reasonably foreseeable environmental impacts of the methods of compliance;
    - The reasonably foreseeable feasible mitigation measures; and
    - The reasonably foreseeable alternative means of compliance with the rule or regulation.
- Takes into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites.

The Public Resources Code specifically does not require agencies to engage in speculation or conjecture or to conduct a project level analysis.

The following sections describe the reasonably foreseeable methods of compliance with Alternatives 1-4 so that the potential environmental effects, costs, ability to achieve the proposed fish tissue objectives, and overall feasibility of each alternative can be evaluated in compliance with Public Resources Code Section 21159 *et seq.*, Porter-Cologne Water Quality Act Section 13241 (see Section 3.2 in Chapter 3), and the evaluation criteria described at the beginning of Section 4.2. Although staff considers these reasonably foreseeable methods of compliance, the Central Valley Water Board will not require implementation of specific practices or technologies.

Chapter 7 provides a programmatic-level analysis of the reasonably foreseeable environmental impacts of the potential methods of compliance and identifies reasonably foreseeable feasible mitigation measures and alternative means of compliance that take into account a range of environmental, economic, and technical factors, and population and geographic areas. This analysis is summarized in Section 4.4.1.

All four alternatives require exposure reduction activities (e.g., public outreach, education, and other activities regarding consumption of contaminated fish), fish tissue mercury monitoring in Phase 2, and regular reporting to the Board. Alternative 1 does not require any methyl or total mercury control actions. Alternatives 2 through 4 require varying levels of control actions that address existing and new sources of methyl and total mercury in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams. Alternatives 2 through 4 have several differences that center mainly on the level of effort required from the variety of source categories and individual dischargers of methyl and total mercury. The appropriate actions for individual dischargers to take will vary depending on discharge-specific characteristics.

4.3.1 Exposure Reduction

Until methylmercury reductions are reflected in attainment of the proposed fish tissue objectives, activities need to be undertaken to help manage the health risk and reduce methylmercury exposure to people who eat Delta fish. All four implementation alternatives include a requirement that programs be developed and implemented to reduce mercury exposure and health effects in humans.

An exposure reduction program would involve methylmercury dischargers in the Delta and the Central Valley Water Board staff working with members of local fishing and consumer communities, the State Water Board, Office of Environmental Health Hazard Assessment, California Department of Public Health (CDPH), and local county health departments to develop and implement an effective strategy. The program could incorporate outreach to educate the public regarding the levels of fish consumption that may cause adverse health effects and other ways to reduce the mercury exposure to people eating Delta fish. Outreach would provide information about the health effects of mercury and about which local fish species to avoid or eat less frequently. Participants are encouraged to pool resources for a coordinated effort and to utilize activities and materials that already exist.

Foreseeable methods of compliance for the exposure reduction program component may involve the following:

- Collaboration with affected communities, dischargers, local agencies, and health and social service providers to determine their knowledge, concerns, fish consumption patterns, and information needs. Local groups would be involved in design and implementation of the education and other activities.
- Development, distribution, and evaluation of educational materials with translation into appropriate languages. Materials could include Delta fish advisory signs and posters, fact sheets and other written materials, and other media.
- Trainings for community-based organizations, agencies, and health and social service providers that serve pregnant women and young children.
- Evaluation of mercury exposure by monitoring hair or blood.
- Coordination with affected communities to develop of other exposure reduction activities as needed, possibly including health screenings and intervention, if possible, to limit harmful effects of mercury exposure.
- Conducting consumption surveys or other studies to identify people with high consumption rates of Delta fish and/or potentially highest health risk from fish consumption.
- Evaluating effectiveness of exposure reduction activities.

The Central Valley Water Board funded staff at UC Davis and a Delta community-based organization to develop a strategy for management of risks arising from eating fish contaminated with mercury (Shilling *et. al.*, 2008). Dischargers may use this strategy as a guide in planning exposure reduction activities. As described by the strategy, local organizations that represent and work with Delta fish consumers should be fully involved in all stages of planning and conducting activities and studies. There are community groups in the Delta that already have training and experience in educating their community members about mercury in fish.[27]

The California Department of Public Health should have a key role in advising exposure reduction activities. In 2004-2007, CDPH assisted Delta community groups to conduct public outreach and education as part of the CalFed-funded Fish Mercury Project. CDPH has also assessed levels of fish consumption and awareness of consumption advisories among low-income and pregnant women and worked with a Sacramento-area clinic to test mercury levels in blood of clients reporting high levels of fish consumption (Silver *et al.*, 2007).

Success of the exposure reduction program will depend partially on the amount of funding. Alternatives 1-4 would require dischargers in the Delta and Yolo Bypass to participate in the exposure reduction program. Staff intends to work with stakeholders during Phase 1 of the Delta control program to determine equitable discharger contributions and identify other possible funding mechanisms. Possible sources of funds could include governmental or private grant programs, new bond or other state funds that allow spending on exposure reduction, and public health programs. In the February 2008 version of the draft Basin Plan amendments, staff proposed that agencies planning new wetland projects and the largest WWTPs and MS4s that discharge methylmercury above the aqueous methylmercury goal be required to participate in the exposure reduction program. During discussions with stakeholders, staff heard that because within-Delta dischargers contribute only a small percentage of overall methylmercury loading to the Delta, they should not be responsible for funding the entire exposure reduction program. Staff agrees that additional funding will likely be necessary to have a successful program. Under the recommended Basin Plan amendments, the dischargers are to form a stakeholder group to develop, implement, and report on an exposure reduction program. In the review after Phase 1, if a robust exposure reduction program has not been implemented, staff will reconsider the program requirements, including the need for naming specific dischargers.

The exposure reduction program is consistent with a resolution issued by the State Water Board in 2005. In Resolution No. 2005-0060, the State Water Board:

> *"Directs the San Francisco Bay and Central Valley Water Boards to investigate ways, consistent with their regulatory authority, to address public health impacts of mercury in San Francisco Bay/Delta fish, including activities that reduce actual and potential exposure of and mitigate health impacts to those people and communities most likely to be affected by mercury in San Francisco Bay-Delta caught fish, such as subsistence fishers and their families."*

The San Francisco Bay Water Board's Basin Plan amendment for mercury in the San Francisco Bay contains specific requirements for NPDES permits for municipal and industrial wastewater discharges and urban runoff to *"Develop and implement effective programs to reduce mercury-related risks to humans and wildlife and quantify risk reductions resulting from these activities."*

[27] For examples of community involvement in exposure reduction, see reports from the Fish Mercury Project funded by CalFed: http://www.sfei.org/cmr/fishmercury/.

The State Water Board approved the San Francisco Bay amendments in July 2007 with Resolution No. 2007-0045 (see Section 6.2.11 in Chapter 6).

4.3.2 Methylmercury Load and Waste Load Allocations, Phase 1 Limits, and Total Mercury Minimization Requirements

This section describes ways that allocations, Phase 1 limits, and total mercury minimization requirements can be developed for each alternative, building on information provided in Section 4.2. Reasonably foreseeable methods of complying with the potential requirements are described in later sections.

1. Methylmercury Load and Waste Load Allocations

Alternatives 2 through 4 include establishment of load allocations (for nonpoint sources) and waste load allocations (for point sources) for all methylmercury dischargers in the legal Delta boundary and Yolo Bypass, including irrigated agriculture, wetlands, municipal and industrial wastewater treatment plants, urban runoff, and open water. As described under Consideration #8, given the nature of the available information, the load allocations for the nonpoint sources are derived as subarea allocations, e.g., all inputs from existing wetlands and new restoration projects within the Central Delta would be grouped into a single Central Delta wetlands allocation. Waste load allocations for point sources – NPDES MS4s and facilities – are assigned on a permit-by-permit basis. The alternatives also contain methylmercury allocations for tributary inputs to the Delta and Yolo Bypass, including a methylmercury allocation for methylmercury outflow from Cache Creek to Yolo Bypass.

Although none of the alternatives includes allocations for individual sources upstream of the Delta/Yolo Bypass, at the request of stakeholders, Alternative 4 includes a schedule for the development of TMDLs for major upstream water bodies during Phase 1. The schedule contains these water bodies and dates: 2012 – American River; 2016 – Feather, Sacramento, San Joaquin, and Mokelumne Rivers, and Marsh and Putah Creeks; and 2017 – Cosumnes River and Morrison Creek.

Alternative 2 designates methylmercury allocations that incorporate reductions for large sources that (a) discharge to subareas of the Delta and Yolo Bypass that require methylmercury source reductions to achieve the fish tissue objectives and (b) exceed the proposed implementation goal for methylmercury in ambient water (or their intake methylmercury concentration). Alternatives 3 and 4 designate methylmercury allocations that require reductions for both large and small sources that meet these criteria.

Both Alternatives 2 and 3 designate methylmercury allocations for open water, atmospheric deposition, and runoff from urban lands outside of MS4 service areas[28] that cap average annual

[28] Discharges from urban areas that are not currently subject to Phase I or Phase II of the NPDES storm water program are not required to obtain NPDES permits (see 33 U.S.C. §1342(p)(1) & (p)(6)). Therefore, for regulatory purposes, they are analogous to nonpoint sources (see 40 C.F.R. §130.2(g)). Available information indicates within-Delta urban areas outside of MS4 service areas comprise less than 4% of all urban acreage and associated

loading at current levels, with one exception. Reductions will be needed in the open-water methylmercury contributions to the Marsh Creek and Yolo Bypass subareas to achieve the fish tissue objectives in those subareas. These methylmercury reductions would be achieved through requirements for reductions in tributary total mercury inputs rather than through requirements specific to the open-water areas in the Delta/Yolo Bypass. In contrast, Alternative 4 requires load reductions from open-water areas in all subareas except the Central and West Delta subareas. For Alternatives 2 through 4, methylmercury flux from sediments deposited in open-water habitats is expected to decline gradually as total mercury control actions completed in the tributary watersheds and natural erosion reduces the mercury concentration of sediment deposited in the Delta waterways. However, Alternative 4 requires greater reductions in open-water inputs and places a more upfront and immediate burden on the state and federal governments to evaluate open-water methylmercury sources and evaluate methylmercury and total mercury reduction methods, which is consistent with numerous stakeholder requests.

As noted earlier, populations in the Delta/Yolo Bypass counties are predicted to increase 76% to 213% by 2050 (CDOF, 2007), with an average increase of about 120%. Staff assumed that half of the growth between now and 2050 would be serviced by existing municipal WWTPs and half of the growth would be serviced by new municipal WWTPs (see Chapter 8 in the TMDL Report). To ensure that new and expanded facilities do not further impair the Delta, new facilities should have load allocations based an effluent methylmercury concentration of 0.06 ng/l, and expanded discharges from existing facilities should be incorporated in the allocations for those facilities to the extent feasible, as described below.

As described in Section 4.2.1 (Consideration #8) and Chapter 8 in the TMDL Report, individual NPDES facilities that act as dilution (e.g., have discharge methylmercury concentrations less than the proposed implementation goal) would have allocations that incorporate expected increases in discharge volume. Staff proposes that discharges from new WWTPs be encompassed by "Unassigned WWTP allocations" for each subarea. The "Unassigned WWTP allocations" should be based on the volume predicted for new WWTPs in each subarea multiplied by 0.06 ng/l methylmercury (see Section 8.1.2 in the TMDL Report). Facilities with effluent methylmercury concentrations greater than 0.06 ng/l that need to increase their discharge volume would have three options: (1) reduce their effluent methylmercury concentration to compensate for any increase in discharge volume in order to maintain compliance with their allocations; (2) access the "Unassigned WWTP allocation" for their specific subarea for that portion of their discharges that exceed their allocations but does not exceed the product of the net increase in flow volume and 0.06 ng/l methylmercury; and (3) conduct an offset project that complies with any offset program in place. This approach is consistent with State Water Board Resolution No. 2005-0060,[29] which required the San

urban methylmercury loading to the Delta. Urban areas outside of MS4 service areas in the Delta's tributary watersheds comprise a similarly small percentage. As a result, methylmercury source reductions will not be required unless such urban areas expand significantly, or are found to be significant contributors of mercury or other pollutants, and are as a result become designated Phase II MS4 dischargers and required to develop and implement mercury control plans like those proposed for existing Phase II dischargers.

[29] On September 7, 2005, the State Water Board adopted Resolution No. 2005-0060 ("Remand Order") remanding the San Francisco Bay Water Board's San Francisco Bay Mercury TMDL Amendment with requirements for specific revisions to the TMDL and associated implementation plan.

Francisco Bay Water Board to incorporate provisions that acknowledge the efforts of those point sources whose effluent quality demonstrates good performance, and require improvement by other dischargers, when establishing waste load allocations. This approach is expected to support Water Board goals for the regionalization of WWTPs in the Central Valley. Also, if NPDES facilities that have allocations regionalize or consolidate, their waste load allocations can be summed.

Methylmercury loads and concentrations in heating/cooling and power facility discharges that use ambient water for cooling water vary with intake water conditions. Based on the comparison of the available intake and outfall methylmercury data (Bosworth *et al.*, 2010), power and heating/cooling facilities that use ambient water for cooling water do not appear to act as a source of methylmercury to the Delta. As a result, staff suggests that such dischargers in the Delta/Yolo Bypass conduct concurrent monitoring of intake water and effluent and have allocations equal to 100%, such that the discharge limits equal the detected methylmercury concentrations found in the intake water. GWF Power Systems (CA0082309) acquires its intake water from sources other than ambient surface water (see Chapter 8 in the TMDL Report) and has effluent methylmercury concentrations less than the analytical method detection limit (0.03 ng/l). As a result, staff assigned it an allocation equal to an annual load of 0.0052 g/yr, calculated by using the design flow (0.125 mgd) and the methylmercury method detection limit (0.03 ng/l).

Discharge methylmercury data were not available for the Lincoln Center Groundwater Treatment Facility (CA0084255) in Stockton, which discharges treated groundwater to Fourteenmile Slough in the Central Delta subarea. The groundwater treatment facility discharges monitored elsewhere to date have average methylmercury concentrations below current method detection limits (< 0.03 ng/l; Bosworth *et al.*, 2010). As a result, staff proposed that its allocation be equal to an annual load of 0.018 g/yr, calculated by using the design flow (0.43 mgd) and the methylmercury method detection limit (0.03 ng/l). This allocation can be modified at the end of Phase 1, after facility-specific discharge methylmercury data is collected.

Discharge methylmercury data were not available for the Metropolitan Stevedore Company (CA0084174), a marine bulk commodity terminal on leased land at the Port of Stockton in the Central Delta subarea. Storm water runoff, dust suppression water, and wash down water from bulk materials handling operations collect in a primary retention basin and some other low areas onsite, and evaporate or percolate into groundwater. Discharges may occur during intense storm events or when annual accumulated rainfall far exceeds the average for a given year. Staff proposes that a methylmercury waste load allocation for non-storm water discharges from the Metropolitan Stevedore Company be established in its NPDES permit once it completes at least three sampling events for methylmercury in its discharges. Its waste load allocation would be a component of the “Unassigned WWTP Allocation” for the Central Delta subarea.

2. Phase 1 Methylmercury Concentration Limits (Alternatives 2 and 3)

Alternatives 2 and 3 incorporate performance-based Phase 1 (interim) methylmercury concentration limits for NPDES facilities and MS4s in the Delta/Yolo Bypass and tributary watersheds. Phase 1 limits under Alternatives 2-3 would be assigned in NPDES permits; these interim limits would be added to NPDES permits during the normal course of permit renewal cycles. Maintenance of the limits – along with implementation of mercury minimization programs – would minimize the potential for population growth to worsen the methylmercury impairment in the Delta/Yolo Bypass while control studies and actions are implemented. Alternative 4 does not include any Phase 1 methylmercury concentration limits.

NPDES MS4 Phase 1 Methylmercury Concentration Limits. Developing methylmercury concentration limits for large MS4s is complicated by variable short- and long-term climate conditions (e.g., wet versus dry years, antecedent conditions before storms, storm frequency and intensity, etc.). Much of the MS4 methylmercury data used in the Delta TMDL was collected during a relatively dry period during just a few runoff events. To account for variable runoff conditions, MS4 limits for Alternatives 2 and 3 are based on the 90th percentile methylmercury concentration of urban runoff samples collected during 2000 to 2010 (a period expected to have a range of meteorological and climatic conditions) and that the limits become effective in 2012 (e.g., four years after the effective date of the proposed Basin Plan amendments, assuming an effective date in 2008).

For Alternatives 2 and 3, Phase 1 methylmercury concentration limits apply to the Contra Costa, Sacramento, and Stockton because they are MS4s that intersect the Delta and service more than 100,000 people each. The Sacramento and Stockton MS4s alone service more than half of the population in the Delta and its tributary watersheds serviced by MS4s.

The February 2008 staff report also included the Tracy MS4 because it is encompassed within the legal Delta boundary and is a rapidly growing municipality. However, the 2008-2009 Stakeholder Process identified the concern that, although the Tracy MS4 services a population that approaches 100,000 people and is entirely within the legal Delta boundary, its runoff is governed by statewide general permit [NPDES No. CAS000004]. Staff now recommends that the Tracy MS4 be assigned a methylmercury allocation but not be required to conduct a methylmercury control study during Phase 1. Methylmercury management practices developed in Phase 1 may be used by the Tracy MS4 in the future to comply with its allocation.

The Contra Costa County MS4 discharges to both the Delta and San Francisco Bay and is governed by both the Central Valley and San Francisco Bay Water Boards through NPDES permits CAS083313 and CAS612008, respectively. Most of the MS4's service area falls within the San Francisco Bay Water Board's jurisdiction. Therefore, the February 2008 staff report did not include the Contra Costa County MS4 in any requirements for Phase 1 methylmercury concentration limits or Phase methylmercury control studies, and instead proposed that the mercury control requirements included in the Water Quality Control Plan for the San Francisco Bay Basin (San Francisco Bay Basin Plan) for the Contra Costa County MS4 be applied to its service area within the Central Valley Water Board's jurisdiction. The San Francisco Bay Basin Plan includes requirements for: (1) monitoring concentrations of methyl and total mercury in urban runoff discharges and receiving waters, and (2) implementing management practices to reduce total mercury discharges. However, during the 2008-2009 Stakeholder Process staff determined that the portion of the Contra Costa County MS4 permit that is within the Central Valley Region cannot be managed under the jurisdiction of the San Francisco Bay Basin Plan or CAS612008, and subsequently modified the recommendations to include Contra Costa County in the Delta mercury control program.

Under Alternatives 2 and 3, Phase 1 limits for other large MS4s upstream of the Delta would be considered as part of upstream TMDL programs or at the end of Phase 1 of the Delta TMDL implementation program. Alternative 4, staff does not contain methylmercury concentration limits for MS4s during Phase 1.

NPDES Facility Phase 1 Methylmercury Concentration Limits. In response to the July 2004 13267 Order (see Section 6.2.4 in the TMDL Report), effluent methylmercury concentration data was collected by virtually all of the NPDES facilities in the Delta and its tributary watersheds downstream of major dams. Alternatives 2 and 3 establish Phase 1 methylmercury concentration limits at the average annual concentration measured at the time the Delta TMDL was developed. However, many facilities did not continue effluent methylmercury monitoring beyond that required by the July 2004 13267 Order. As a result, the alternatives indicate that the Phase 1 methylmercury concentration limits become effective in the January three years after the effective date of the proposed Basin Plan amendments. This implementation schedule allows time for facilities to amend their monitoring programs, collect one year of methylmercury effluent data, and incorporate compliance time schedules in their permits as needed should their effluent methylmercury concentrations have increased since TMDL development. Staff suggests that compliance time schedules be allowed to extend through the Phase 1 control study period (see Sections 4.3.3 and 4.3.8), not to exceed ten years, so that a facility can make use of new management practices and control methods developed by the studies to come into compliance with its Phase 1 concentration limit.

Alternatives 2 and 3 include Phase 1 methylmercury concentration limits for all NPDES facilities that discharge to the Delta or Yolo Bypass and large municipal WWTPs (those that discharge > 1 mgd) in the tributary watersheds downstream of major dams, because, of the 43 upstream municipal WWTPs, the 25 that discharge greater than 1 mgd account for about 95% of the municipal WWTP discharge volume.

Many of the municipal WWTPs have average effluent methylmercury concentrations less than the proposed implementation goal for methylmercury in ambient water (0.06 ng/l), most of which have average concentrations less than the current minimum reporting level, and some even less than the method detection limit, for laboratory analyses for methylmercury. Minimum reporting levels are equivalent to the lowest calibration standard for methylmercury, which is currently 0.05 ng/l. Though water methylmercury concentrations below the minimum reporting level can be detected, they cannot be quantified accurately. Thus, in Alternatives 2 and 3, facilities with existing average methylmercury concentrations less than 0.06 ng/l have Phase 1 methylmercury concentration limits set equal to 0.06 ng/l.

As noted earlier, power and heating/cooling facilities that use ambient water for cooling water do not appear to act as a source of methylmercury to the Delta. However, the annual volume discharged by power and heating/cooling facilities in the Delta comprises more than 30% of all NPDES facility discharges in the Delta. As a result, Alternatives 2 and 3 require that such facilities in the Delta with discharges greater than 1 mgd conduct concurrent monitoring of intake water and effluent and have Phase 1 methylmercury concentration limits equal to 100%, such that the discharge limits equal the detected methylmercury concentration found in the intake water. GWF Power Systems, which discharges less than 1 mgd to the Delta, acquires its intake water from sources other than ambient surface water (see Chapter 8 in the TMDL

Report) and has effluent methylmercury concentrations less than the minimum reporting level. As a result, its Phase 1 methylmercury concentration limit is set equal to 0.06 ng/l. Alternatives 2 and 3 establish that the Phase 1 methylmercury concentration limit be set equal to 0.06 ng/l for the Lincoln Center Groundwater Treatment Facility.

There are several other commercial, industrial and aquaculture facilities that discharge greater than 1 mgd to the tributary watersheds downstream of major dams. Under Alternatives 2 and 3, these facilities are not assigned Phase 1 methylmercury concentration limits for the following reasons:

- The groundwater treatment, aggregate/cement, and food preparation facility discharges monitored to date have average methylmercury concentrations below current method detection limits (< 0.03 ng/l; Bosworth *et al.*, 2010). In addition, the annual volume discharged by these facilities comprises only a couple percent of all NPDES facility discharges in the tributary watersheds and it is not expected to increase substantially during the next ten years.
- The annual volume discharged by paper mills comprises less than one percent of all NPDES facility discharges in the tributary watersheds (Bosworth *et al.*, 2010), only one of the paper mills, Pactiv Corporation Molded Pulp Mill (CA0004821), discharges greater than 1 mgd, and none are expected to substantially increase their discharges during the next ten years. The Pactiv facility's 2004/2005 13276 Order monitoring indicated very low methylmercury concentrations (twelve samples that ranges between nondetect and 0.085 ng/l, with five samples with concentrations below 0.02 ng/l, and another three samples with concentrations below 0.05 ng/l), and its 2004 NPDES permit reported discharges with low total mercury concentrations (six samples that ranged between 0.7 and 4.78 ng/l total mercury).
- Aquaculture facility discharges comprise about half of all NPDES facility discharges in the tributary watersheds and available monitoring data indicate that the facilities may act as sources of methylmercury (Bosworth *et al.*, 2010). However, all but one of the aquaculture facilities have average discharge methylmercury concentrations equal to or less than 0.06 ng/l (Bosworth *et al.*, 2010), and their discharges are not expected to increase substantially during the next ten years.

For Alternatives 2 and 3, new facilities that begin discharging during Phase 1 would be required to conduct one year of monthly monitoring and have Phase 1 methylmercury concentration limits set equal to the annual average effluent methylmercury concentration calculated from their first 12 months of monitoring. As noted earlier, facilities that discharge greater than 0.06 ng/l methylmercury would be required to take part in the proposed Phase 1 methylmercury control studies.

For Alternatives 2 and 3, the Phase 1 methylmercury concentration limits for existing NPDES facilities would replace the interim total mercury mass limits that have been included in many of the NPDES permits for facilities in the Delta and its tributary watersheds downstream of major dams. Facilities that are not assigned methylmercury concentration limits as part of Phase 1 would not be required to have Phase 1 limits in their NPDES permits under the TMDL implementation plan. However, the Central Valley Water Board may require such facilities to monitor methylmercury and can assign methylmercury concentration limits based on facility-and receiving water-specific conditions in their NPDES permits. In addition, NPDES facilities and MS4s in the tributary watersheds could be assigned methylmercury allocations or other effluent limits as part of upstream TMDL implementation programs or during later phases of the Delta TMDL implementation program.

Alternative 4 does not establish Phase 1 methylmercury concentration limits for NPDES facilities.

3. Total Mercury Limits & Minimization Requirements

Alternatives 2, 3 and 4 include establishing a requirement that total mercury loading in tributary watershed inputs to the Delta be reduced by a minimum of 110 kg/yr. Initial total mercury load reduction efforts should focus on the tributary watersheds that export the most mercury-contaminated sediment (e.g., the Cache, Feather, American, Putah, and Mokelumne/Cosumnes watersheds).

Alternative 3 includes requirements for minimizing total mercury discharges from large NPDES municipal WWTPs (e.g., those that discharge greater than 1 mgd) in the Delta and its upstream watersheds and from MS4s that intersect the Delta and service more than 100,000 people (Contra Costa County, Sacramento, and Stockton MS4s) by implementing pollutant minimization programs for mercury. All MS4s in the Delta source region would implement BMPs to the maximum extent practicable to control erosion and sediment discharges, in compliance with their existing permits, which also will be effective in reducing mercury discharges because mercury is typically particle-bound.

Alternative 3 incorporates several factors regarding which NPDES facilities should implement pollutant minimization programs:

- Of the 128 NPDES facilities that discharge to the Delta and its tributary watersheds downstream of major dams, 62 facilities discharge less than 1 mgd. These small facilities account for only about 3% of the volume discharged by NPDES facilities to the Delta source region. Therefore, Alternatives 2 and 3 do not require facilities that discharge less than 1 mgd to implement mercury evaluation and minimization programs.
- Power, heating/cooling and aquaculture facilities, which account for about 50% of the volume discharged by NPDES facilities to the Delta source region, do not appear to act as measurable sources of total mercury to the Delta and its source region. However, the NPDES permits for several power and heating/cooling facilities in the tributary watersheds indicate that mercury-containing chemicals may be added to their cooling water and other low-volume waste streams may be included in their discharges (see Tables G.6 and G.7 in Appendix G of the TMDL Report). As a result, power and heating/cooling plants that discharge greater than 1 mgd are required to implement mercury evaluation and minimization programs, unless they can demonstrate that (1) they use ambient surface water for cooling water and (2) do not add any mercury-containing treatment chemicals to their cooling water or other waste to their discharge.
- A limited amount of total mercury data are available for groundwater treatment plants currently discharging in the Delta source region. Between November 2005 and June 2007, effluent discharged from the Lincoln Center Groundwater Treatment Facility in Stockton

had total mercury concentrations ranging from less than 0.2 ng/l to 1.3 ng/l total mercury (average 0.6 ng/l, 20 samples). According to the contractor that collected the data, these concentration generally reflect background concentrations (LFR, 2007). Six influent samples were collected between January and June 2007 at the same time effluent samples were collected; these samples had total mercury concentrations ranging from 0.58 to 10 ng/l (average 2.3 ng/l). The ratio of the total mercury concentrations of the six paired influent:effluent samples ranged from 1.7 to 15, indicating that the groundwater treatment process likely does not contribute mercury to the discharges. Groundwater treatment facilities and other commercial and industrial facilities contribute only a small percentage of overall NPDES discharges and are not expected to increase their discharges. As a result, total mercury minimization requirements are not required for under Alternatives 2 and 3.

For Alternative 4, the Sacramento, Stockton, and Contra Costa MS4s would be required to implement mercury-specific pollution prevention measures and BMPs, and all MS4s in the Delta and Yolo Bypass to implement best management practices to control erosion and sediment discharges consistent with their existing permits and orders with the goal of reducing mercury discharges. All NPDES facilities in the Delta/Yolo Bypass (but none in the tributary watersheds), would be required to implement mercury-specific pollutant minimization programs. Alternative 4 also includes performance-based Phase 1 (interim) total mercury load limits for NPDES facilities in the Delta and Yolo Bypass. These interim total mercury mass limits under Alternative 4 would be added to NPDES permits during the normal course of permit renewal cycles.

Section 4.3.12 describes reasonably foreseeable methods of compliance with point source requirements for minimization of total mercury discharges and maintenance of total mercury load limits. Depending on the geographic scope of future population growth in the Delta source region, and the results of the proposed Phase 1 methylmercury control studies, the Central Valley Water Board could consider applying total mercury minimization requirements to additional point and nonpoint sources during Phase 2 of the Delta TMDL implementation program or as a component of upstream TMDL programs.

Alterative 4 also entails all nonpoint sources in the Delta and Yolo Bypass implementing reasonable, feasible actions to reduce sediment in runoff during Phase 1 with the goal of reducing inorganic mercury loading to the Yolo Bypass and Delta, in compliance with existing Basin Plan objectives and requirements, and Irrigated Lands Regulatory Program requirements. Alternative 4 does not entail new requirements for sediment control by nonpoint sources and, as a result, reasonably foreseeable methods of compliance are not discussed.

4.3.3 Implementation Phases

Because Alternative 1 does not establish methylmercury allocations or total mercury limits, nor entails any source control actions, there is no need for implementation of any actions except those for exposure reduction. Alternatives 2, 3 and 4 all have multiple phases for achieving the methylmercury allocations. The length of each phase is the same for the different alternatives. Phase 1 of the implementation program would encompass:

- Dischargers developing and implementing methylmercury source control studies;

- Development of the TMDL control programs for the major upstream tributaries;
- Evaluation of the progress of the methylmercury source control studies, other Delta mercury control program's Phase 1 implementation plan elements, reporting to the Board, and making changes to the entire program at the end of Phase 1 as needed using an adaptive management approach;
- Source analyses and feasibility studies to identify and prioritize potential actions to reduce total mercury in the tributary watersheds, with initial focus on the watersheds that export the most mercury-contaminated sediment (e.g., outflows from the Cache Creek, Feather River, American River, Putah Creek, and Mokelumne/Cosumnes Rivers watersheds), with the goal of reducing annual mercury loading into the Delta by at least 110 kg/yr;
- Actions to reduce inorganic mercury loading from the Cache Creek Settling Basin;
- Development of a mercury offset program and implementation of voluntary pilot methylmercury or total mercury offset projects; and
- Reasonable and feasible actions to reduce methyl and total mercury inputs from sources in the Delta/Yolo Bypass (Alternatives 2-4) and its tributary watersheds downstream of major dams (Alternatives 2-3).

Phase 1 should be long enough for entities responsible for methylmercury control studies to develop funding sources for studies; plan the studies with oversight from the Central Valley Water Board staff, a technical advisory committee (TAC), and stakeholder advisory group (SAG); implement the Phase 1 studies (Alternatives 2-4) and any pilot projects (Alternatives 2-4); and evaluate the results to propose an implementation plan for achieving their methylmercury allocations. Based on past experience and input from stakeholders expected to conduct the studies, staff recommends that Phase 1 encompass seven years after the effective date of the Basin Plan amendments. An additional two years should be allowed for the TAC and Central Valley Water Board staff to review results from the studies and any pilot projects and to work with stakeholders to develop amendments to the mercury control program for implementation during Phase 2.

At the end of Phase 1, the Central Valley Water Board would conduct a Phase 1 Delta mercury control program review that assesses and considers:

- The effectiveness, costs, potential public and environmental benefits and negative impacts of attaining the allocations, and technical and economic feasibility of potential methylmercury control methods;
- Whether implementation of some methylmercury control methods would have negative impacts on other beneficial uses of Delta waters;
- Methods that can be employed to minimize or avoid potentially significant negative impacts that may result from control methods;
- Implementation plans and schedules proposed by the dischargers;
- Re-evaluation of the fish tissue objectives, the linkage analysis between objectives and sources, and the attainability of the allocations;
- Modification of methylmercury goals, objectives, allocations and/or the final compliance date for allocations based on the findings of Phase 1 control studies and other information;
- Implementation of management practices and schedules for methylmercury controls; and

- Adoption of a Mercury Offset Program for dischargers who cannot fully meet load allocations after implementing all reasonable load reduction strategies and can demonstrate no disproportionate impacts on local human and wildlife communities as a result.

The implementation program for Phase 2 activities could encompass:

- Actions to reduce methylmercury discharges to the Delta and Yolo Bypass from existing local and upstream methylmercury sources to comply with the Delta/Yolo Bypass methylmercury allocations, including Cache Creek inflow to Yolo Bypass;
- Actions to reduce total mercury discharges to comply with the Delta/Yolo Bypass methylmercury allocations and the San Francisco Bay TMDL's total mercury allocation for the Central Valley, with particular focus on nonpoint sources in the tributary watersheds that discharge the most mercury-contaminated sediment to the Delta and Yolo Bypass;
- Implementation of a monitoring and surveillance program;
- Implementation of upstream TMDL program control actions; and
- Implementation of a long-term methylmercury and total mercury offset program.

For completion of Phase 2, staff recommends a date no later than 2030. This period is long enough for entities responsible for methyl and total mercury control actions to develop long-term funding sources and implement the actions. The proposed Basin Plan amendments set the maximum time that will be allowed for NPDES permittees to comply with their requirements. Specific compliance schedules will be determined for each NPDES permit and will be based on the individual permittee's need for time during Phase 2 to construct facilities or infrastructure, implement programs, and secure funding.

Reasonably foreseeable methods of compliance with Phase 2 for Alternatives 2, 3 and 4 are reviewed in the following sections so that the potential environmental effects and costs of various alternatives can be evaluated. However, until the Phase 1 methylmercury control studies are completed, evaluation of potential methylmercury and total mercury control actions for many sources is speculative. The intent of the Phase 1 methylmercury control studies is to identify and evaluate new ways for dischargers to meet their allocations.

Some methylmercury allocations – such as the tributary watershed input allocations and the open-water allocations for the Yolo Bypass and Marsh Creek subareas – likely will not be achieved until after 2030. Phase 3 (about 2031 onward) for Alternatives 2 through 4 is expected to encompass:

- Continued maintenance of control actions implemented during Phases 1 and 2;
- Continued implementation of upstream TMDL program control actions; and
- Natural erosion processes that remove total mercury deposited in creek beds and banks that could not otherwise be remediated.

Upstream TMDL program control actions will be evaluated and implemented by future Basin Plan amendments specific to those TMDL implementation programs.

4.3.4 Surveillance and Monitoring Program

All four alternatives incorporate a surveillance and monitoring program to track compliance with fish tissue methylmercury objectives. Reasonable means of compliance could include fish tissue and water quality monitoring, which are types of monitoring that have been successfully conducted by various agencies, researchers, and dischargers over the past several years. The initial fish tissue monitoring could take place at the following compliance reaches in each subarea to represent subarea-specific conditions:

- Central Delta subarea: Middle River between Bullfrog Landing and Mildred Island;
- Marsh Creek subarea: Marsh Creek from Highway 4 to Cypress Road;
- Mokelumne/Cosumnes River subarea: Mokelumne River from the Interstate 5 bridge to New Hope Landing;
- Sacramento River subarea: Sacramento River from River Mile 40 to River Mile 44;
- San Joaquin River subarea: San Joaquin River from Vernalis to the Highway 120 bridge;
- West Delta subarea: Sacramento/San Joaquin River confluence near Sherman Island;
- Yolo Bypass-North subarea: Tule Canal downstream of its confluence with Cache Creek; and
- Yolo Bypass-South subarea: Toe Drain between Lisbon and Little Holland Tract.

Once fish tissue methylmercury concentrations at a given subarea's compliance reach equal the methylmercury fish tissue objectives, fish tissue monitoring could take place at additional waterways in the subarea to ensure that the objectives are achieved throughout the subarea.

Compliance fish methylmercury monitoring should include representative fish species for comparison to each methylmercury fish tissue objective, for example:

- Trophic Level 4: bass (largemouth and striped), channel and white catfish, crappie, and Sacramento pikeminnow.
- Trophic Level 3: American shad, black bullhead, bluegill, carp, Chinook salmon, redear sunfish, Sacramento blackfish, Sacramento sucker, and white sturgeon.
- Small (<50 mm) fish: primary prey species consumed by wildlife in the Delta, which may include juveniles of the species listed above, as well as inland silverside, juvenile bluegill, mosquitofish, red shiner, threadfin shad, or other fish less than 50 mm.

Trophic level 3 and 4 fish sample sets should include three species from each trophic level and should include anadromous and non-anadromous fish. Trophic level 3 and 4 fish sample sets should include a range of fish sizes between 150 and 500 mm total length. Striped bass, largemouth bass, and sturgeon caught for mercury analysis must be within the CDFG legal catch size limits. Sample sets for fish less than 50 mm should include at least two fish species that are the primary prey species consumed by wildlife at sensitive life stages. In any subarea, if multiple species for a particular trophic level are not available, one species in the sample set would be considered acceptable.

Central Valley Water Board staff will work with the State Water Board and dischargers to develop a strategy to fund the fish tissue monitoring program. For all fish tissue monitoring, analysis for total mercury is an appropriate and economical option rather than analysis for methylmercury. Methylmercury comprises 85% to 100% of the total mercury measured in fish (Becker and Bigham, 1995; Slotton *et al.*, 2004). Total mercury may be analyzed and reported without adjustment instead of methylmercury in fish samples in order to reduce analytical costs.

Alternatives 2, 3 and 4 would incorporate a fish monitoring frequency designed to track the progress of their respective methyl and total mercury source reduction strategies. Fish tissue monitoring could be initiated after dischargers implement projects to reduce methylmercury and total mercury discharges (e.g., 2025). Monitoring could take place every ten years thereafter, more frequently as needed where substantial changes in methyl or total mercury concentrations or loading occur, but not to exceed ten years elsewhere. Because no mercury reduction actions are required by Alternative 1, fish tissue monitoring could take place less frequently, e.g., about every twenty years, so that any significant increase in fish methylmercury levels could be detected and public outreach and education activities could be modified.

In addition to the fish monitoring described above, ambient water column monitoring should take place:

- The aqueous methylmercury goal of 0.06 ng/l for ambient Delta water is the annual, average concentration in unfiltered samples. For comparison of Delta waterways and tributary methylmercury concentration data with the aqueous methylmercury goal, water samples should be collected periodically throughout the year and during typical flow conditions as they vary by season, rather than targeting extreme low or high flow events. Ambient water monitoring should take place at the same locations as the fish methylmercury compliance monitoring as well as at the tributary inputs. Ambient water monitoring should take place for at least one year before the fish monitoring takes place. Aqueous methylmercury data may be collected by the Central Valley Water Board or required of project proponents.
- Delta outflows to the San Francisco Bay must comply with the total mercury allocation assigned to the Delta by the San Francisco Bay mercury TMDL implementation program, which requires a decrease in mercury loads of 110 kg/year from existing conditions. In addition, Suisun and Grizzly Bays in the San Francisco Bay region may contribute methylmercury to the western Delta by way of tidal pumping. As resources are available, the Central Valley and San Francisco Bay Water Boards should periodically monitor methylmercury and total mercury in ambient water in the western Delta and Suisun and Grizzly Bays to track progress in meeting the implementation goal for methylmercury in ambient water in the western Delta and the total mercury allocation for Delta outflows to San Francisco Bay.
- The Central Valley Water Board would continue monitoring methylmercury in Delta tributaries as part of developing TMDLs for those tributaries and implementing the Delta TMDL.
- Various responsible parties in the Delta and tributaries may need to monitor total mercury and methylmercury in ambient water.

4.3.5 Reporting Schedule & Adaptive Management

All schedules discussed in this section are based on time elapsed after the "effective date" of the Basin Plan amendments (when it is approved by the USEPA, which likely would be some date in 2011).

All four implementation alternatives would incorporate an adaptive management approach that evaluates additional information as it becomes available and adapts the exposure reduction and control programs so that effective and efficient actions can be taken. As part of this approach, Board staff would need to organize a Technical Advisory Committee (TAC) within about 18 months of the Effective Date for Alternative 1, and within about six months of the Effective Date for Alternatives 2 through 4, so that the TAC would be in place to work with Board staff and stakeholders to develop a control study guidance document that provides technical study guidelines for stakeholders to reference. Similarly, Board staff would need to participate in the formation of any Stakeholder Advisory Group(s) to provide input to the development of the control studies and amendment of the Delta mercury control program at the end of Phase 1.

Staff recommends that the TAC be composed of independent, mercury experts who would convene as needed to:

- Provide scientific and technical peer review of Phase 1 methylmercury control study workplan(s) and results;
- Advise the Board on scientific and technical issues; and
- Provide recommendations for additional studies and implementation alternatives developed by the dischargers.

The Board would form and manage the TAC with recommendations from the dischargers and other stakeholders, including community organizations. The primary purpose of the TAC is to provide an independent review of the technical studies and other aspects of the development of the control program for Phase 2 as needed so that Board staff is not the only one informing the Board if studies and conclusions are adequate or if additional studies should be conducted. Staff strongly recommends that the recommended purpose of the TAC is to be the Board's advisor. The Board would provide funding for the TAC and staff would manage the TAC contracts. Staff would take initial steps to identify TAC members, but stakeholders will have opportunities to suggest TAC members with expertise to review the studies, and to provide comments on the selected participants. TAC members need to be independent so that they can provide neutral opinions on the studies and are not tied directly to a discharger. The Executive Officer would have final approval authority of the TAC members. The Stakeholder Advisory Group could integrate and coordinate studies. The TAC could be consulted after initial study plans are developed.

Alternative 1 could have the following reporting schedule:

- Two and four years after the Effective Date of the proposed amendments, and every three years thereafter, staff would report to the Central Valley Water Board the local and state agencies' and dischargers' progress with developing and implementing programs to reduce methylmercury exposure to people who eat Delta fish.

- Two years after the Effective Date of the proposed amendments and every 20 years thereafter, staff would report to the Central Valley Water Board the recent fish mercury monitoring results, compare the results to the fish tissue mercury objectives to determine improvement or worsening, and suggest how the results could be integrated into exposure reduction efforts.

Alternatives 2, 3 and 4 could have the following reporting schedule for Phase 1 of their respective implementation programs:

- Annually staff would publically report to the Central Valley Water Board the progress of upstream TMDL development, discharger and stakeholder coordination, control study workplan status, implementation of control studies, actions implemented or proposed to meet TMDL load and waste load allocations, and the status of the formation and activities of the TAC.
- Two and four years after the effective date of the proposed amendments and every three years thereafter, staff would report to the Central Valley Water Board the stakeholders progress with developing and expanding programs to reduce methylmercury exposure to people who eat Delta fish.
- By four years after the effective date of the proposed amendments, the Executive Officer would provide a comprehensive report to the Regional Water Board on Phase 1 progress, including progress of upstream mercury control program development, control studies, actions implemented or proposed to meet Delta mercury control program load and waste load allocations, and the status and progress of the TAC.
- During years 8 and 9 after the effective date, staff would update the TMDL methyl and total mercury source analyses and reevaluate implementation strategies using information from the control studies and other available scientific information.
- By nine years after the effective date, the Central Valley Water Board would evaluate the completed studies, proposed management practices, implementation schedules, and environmental impacts of proposed methylmercury control actions. Through a public hearing process, the Central Valley Water Board then could adapt the Delta mercury control program to incorporate the new and relevant scientific information. [See Section 4.3.3 for a detailed description of what the Board review would entail.] The Board could consider allowing any combination of the following for Phase 2 of the methylmercury TMDL implementation program: modification of methylmercury allocations or total mercury limits; adoption of management practices and implementation schedules for on-site methylmercury controls; and/or adoption of an offset program to compensate for loads in excess of the methylmercury allocations or total mercury limits.

As described above, for Alternatives 2 through 4 fish tissue monitoring could be initiated after dischargers implement projects to reduce methylmercury and total mercury discharges and then conducted every ten years thereafter to assess compliance with the fish tissue objectives. Other periodic ambient water monitoring and special studies also would likely take place. As a result, a reasonably foreseeable schedule for Phase 2 would be:

- Once the results of the first round of fish monitoring are available (about 2025), staff would report to the Central Valley Water Board the (a) dischargers' progress towards compliance with required implementation actions, (b) current fish and water methylmercury and total mercury levels throughout the Delta compared to conditions during Phase 1, and (c) any other monitoring and special study results and scientific literature. The Board could adapt the TMDL implementation program at that time to ensure effective control actions take place based on recent information. Any necessary modifications to the objectives, allocations, or implementation plan would be incorporated into the Basin Plan. The Stakeholder Advisory Group and Basin Planning process would provide opportunities for stakeholder participation.

- In 2030, staff would provide progress reports to the Central Valley Water Board. If a source category or individual discharger cannot demonstrate achievement of its allocation despite implementation of all technically and economically feasible and cost effective control measures recognized by the Board as applicable for that source category or discharger, the Board could consider revising the allocations and implementation plan.
- Every ten years thereafter, staff would provide progress reports to the Central Valley Water Board that track continued changes in Delta and Yolo Bypass ambient water and fish methylmercury levels resulting from natural erosion processes that remove total mercury deposited in creek beds and banks that could not otherwise be remediated, and the addition of any new local or global sources of methyl or total mercury. During each review, the Board could consider revising the allocations and implementation plan to ensure that fish tissue objectives are ultimately achieved and maintained.

If the Board Executive Officer allows an extension for the Phase 1 methylmercury control studies' schedule or needs additional time to conduct its Delta Mercury Control Program Review, the Executive Officer could consider extending the Phase 1 schedule and would inform the public before the action was taken.

The following focusing questions, along with any additional questions developed in collaboration with stakeholders during each review, could be used to guide the Board's evaluation of the Delta methylmercury TMDL program and any new information from monitoring, special studies, and scientific literature:

- Are the Delta and Yolo Bypass progressing toward attainment of the allocations as expected? If it is unclear whether there is progress, how should monitoring efforts be modified to detect trends? If there has not been adequate progress, how might the implementation actions or allocations be modified?
- What are the methylmercury loads for the various source categories, how have these loads changed over time, and how might source control measures be modified to improve load reduction?
- Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, allocations, or implementation actions? If so, how should the TMDL be modified?
- Are effective exposure reduction activities in place to reduce human exposure to methylmercury? If not, how should these activities be modified or enhanced?
- Are watershed total mercury and methylmercury control actions proceeding as expected? Are any additional actions needed to protect water quality?

4.3.6 Actions to Reduce Total Mercury in Cache Creek Settling Basin Outflows

The Sacramento Basin (Sacramento River + Yolo Bypass) contributes almost 90% of total mercury fluxing through the Delta. Of the watersheds in the Sacramento Basin, the Cache Creek, Feather River, American River and Putah Creek watersheds have both relatively large mercury loadings and high mercury concentrations in suspended sediment, which makes them good candidates for total mercury load reduction programs (see Section 7.1.1 in the TMDL Report). Although it is not as large a source of total mercury loading, the Mokelumne/Cosumnes watershed in the San Joaquin Basin also may be an effective candidate for total mercury reduction projects because of its high mercury concentrations in suspended sediment. Alternatives 2, 3 and 4 include assigning total mercury load reduction requirements for the tributary inputs to the Delta/Yolo Bypass that incorporate a cumulative reduction of at least 110 kg/yr. The Cache Creek Settling Basin is of particular importance because it is the largest single source of mercury-contaminated sediment to the Delta. The Cache Creek Settling Basin is a 3,600-acre structure located at the base of the Cache Creek watershed that discharges to the Yolo Bypass just west of the Sacramento Airport. The basin was constructed in 1937 to contain sediment that would otherwise build up in Yolo Bypass and decrease its ability to protect the Sacramento region from flooding.

The Cache Creek Settling Basin was modified in 1993 to increase its sediment trapping efficiency. It currently traps about half of the sediment volume input from the watershed. The basin has a USACE-designed project life of 50 years with an average sediment trapping efficiency of about 50% over the entire project life (CDM, 2004a; USACE, 2005). The sediment trapping efficiency of the basin will decrease as it fills. The basin will fill to its design capacity in about 35 years, and its trapping efficiency may reach zero in about 50 years, unless a maintenance program is established. At this time, no maintenance program to maintain the trapping efficiency or life of the basin is in place.

Most of the inorganic mercury in Cache Creek is transported on sediment. As a result, the basin traps about half of the mercury transported by Cache Creek (Foe and Croyle, 1998; CDM, 2004; Cooke *et al.*, 2004; CDM, 2004). Trapping efficiency calculations vary based on the period evaluated and the calculation method. For example, Board staff estimated that the basin receives about 224 kg/yr total mercury from the Cache Creek watershed and discharges about 118 kg/yr to the Yolo Bypass (a trapping efficiency of about 47%), based on annual load estimates for a 20-year period (WY1984-2003, a period with an even mix of wet and dry years) derived from statistically-significant correlations between water column total mercury concentrations and flows (refer to the TMDL Report for methods and data). CDM estimated that about 64% of the sediment and total mercury mass input to the basin is trapped when the volumes of sand, uncompacted silt and clay are converted to sediment mass over a modeled 35-year period (see CDM, 2004b, Table 4-3). Although trapping efficiency calculations vary, they all indicate that substantial mercury loads are currently trapped in the basin. However, even though the basin traps a large portion of the mercury that comes into it, the basin still accounts for about 60% of all inorganic mercury that enters the Yolo Bypass.

The Cache Creek Settling Basin consists of levees, a roller compacted concrete outlet weir, a low-flow outlet structure, low-flow channels, internal inlet training channel and levee, and patrol roads and access ramps (CDM, 2004a and 2004b). The USACE constructed the basin in 1937, completed improvements in 1993, and turned over operation and maintenance of the basin to DWR in 1994. USACE's draft sediment management plan includes the following activities to maintain an average trapping efficiency of 50% over the 50-year life of the basin: construction and maintenance of a training channel and levee, incremental removal of the existing training levee, and raising of the outlet weir in year 25 (~2018) of the basin project. Although the USACE's draft sediment management plan for the basin has not been finalized, DWR has done some maintenance activities in the settling basin including vegetation clearing, levee maintenance, and minor sediment removal projects.

The 1979 Environmental Statement prepared by the USACE described expected maintenance activities, which included annual removal of sediments. However, the current draft operation and maintenance (O&M) plan does not include excavation or dredging of the main portion of the basin; as previously noted, the basin is expected to be filled to design capacity at the end of the project life (50 years) in about 2042 (CDM, 2004a and 2004b). Thus, settling basin O&M activities (i.e., raising the outlet weir and periodic sediment removal) could be considered part of the baseline project and not need additional environmental or cost analyses. These activities were recognized early on as reasonably foreseeable methods of compliance for reducing settling basin total mercury discharges. To be thorough, Alternatives 2 through 4 include requirements for basin maintenance and the alternatives analysis includes a discussion of possible costs and environmental effects due to O&M activities.

Initial modeling results (CDM, 2004b, Table 4-3) indicate that basin trapping efficiency increases to 68-75% (in terms of sediment and mercury mass loads) could be accomplished by several means: (1) raising the outlet weir early (e.g., in 2013 instead of 2018), (2) excavating the basin (e.g., periodically remove sediment that has accumulated in the basin), (3) enlarging the basin, or (4) a combination of excavating and raising the weir early, or enlarging the basin and raising the weir early. The modeling results indicated that the combination of excavating the basin and raising the weir early produced the largest increase (to a 75% trapping efficiency) in trapped sediment and mercury. Additional periodic excavation would likely be necessary to maintain the trapping efficiency for total mercury mass loading at 75% so that its efficiency would not decline over time.

Based on CDM's initial modeling results, staff recommended in the February 2008 draft report that improvements to the basin take place to increase its mercury-load trapping efficiency to 75%. This would require the agencies responsible for Cache Creek Settling Basin operations and maintenance (e.g., DWR and Central Valley Flood Protection Board [formerly known as the Reclamation Board]) to implement a plan to improve and maintain the trapping efficiency of the basin to reduce its total mercury discharge to the Yolo Bypass during Phase 1. As previously noted, USACE's draft sediment management plan already includes the construction and maintenance of a training channel and levee, incremental removal of the existing training levee, and raising of the outlet weir in year 25 (2018) of the basin project, but does not include excavation or dredging of the main portion of the basin. Since the release of the February 2008 draft of the report, DWR staff indicated that a more comprehensive feasibility study must take place to determine whether a 75% trapping efficiency is possible and to incorporate a stakeholder process so that local communities' concerns about potential flood hazards resulting from modifying the basin can be addressed.

Reasonably foreseeable methods of improving the trapping efficiency of the basin include structural modifications to increase the trapping efficiency (raise the outlet weir, excavate the basin, and/or expand the size of the basin) and periodic removal of contaminated sediment to maintain the trapping efficiency. Raising the outlet weir to final specifications would involve adding six feet of concrete to the existing structure; other levee improvements are not expected to be needed as they are already at design elevations. Increasing the size of the basin would require purchase of adjacent land and construction of new levees. Periodic sediment removal would require excavation equipment and trucks to transport the material outside the basin. Because the sediment likely does not contain hazardous concentrations of mercury, the sediment could be used for building materials, landfill cover, or other construction projects. Erosion control would be required to minimize erosion of the material back into surface waters. The environmental effects of these construction and maintenance activities are summarized in Section 4.4.1 and described in more detail in the CEQA analysis in Chapter 7.

Based on CDM's modeling, as part of the program to make improvements to the Cache Creek Settling Basin, the raising of the outlet weir could take place earlier than previously planned by the USACE. However, because this activity was already planned, it is considered a baseline condition, although there may be some cost considerations if the activity occurs earlier. Improving the basin's trapping efficiency also would likely entail periodic excavation to maintain the trapping efficiency at 75% and thereby extend the life of the basin. Initial plans for the basin's maintenance and sediment management call for the periodic removal of sediment accumulated within the basin to maintain flow capacities. However, the latest draft O&M plan does not mention sediment removal. For this reason, excavation of the basin is not considered a baseline condition. Any additional improvements to the basin (other than raising the weir, excavation, and expansion) are speculative and will be discussed in future Basin Planning documents.

Although Alternatives 2, 3 and 4 could require basin improvements not previously planned by the USACE and DWR, new property easements for the improvements will be required only if the basin is expanded. Land within the Cache Creek Settling Basin was condemned for the purposes of managing sediment from the Cache Creek watershed as documented in a settlement between the State of California and the landowners (Final Order of Condemnation, 14 July 1995). The State has easements in the basin to flow and impound water and sediment, excavate and remove sediment, and clear and remove any obstructions or vegetation for operations and maintenance of the basin. In addition, the landowners acknowledged that the State may modify, enlarge, or implement future modifications and improvements to the basin that may cause additional flood flows, material deposition, and other physical changes, and the Final Order of Condemnation allows the modifications, enlargements, and improvements to be implemented. However, according to CDM's initial modeling results, additional flowage easements would need to be obtained from landowners for approximately 1,500 acres if the basin were expanded (CDM, 2004b).

Since the release of the February 2008 draft BPA staff report, Tetra Tech EM Inc. completed the "Regional Mercury Load Reduction Evaluation, Central Valley, California" under contract to the USEPA (Tetra Tech, 21 August 2008). Tetra Tech included an evaluation of reducing mercury discharged from the Cache Creek Settling Basin. Tetra Tech's recommended action to increase the trapping efficiency of the Cache Creek Settling Basin was by enlarging the basin, including the creation of two settling cells and adding a new weir between the settling cells. Excavation of sediment from the Cache Creek Settling Basin also was identified by Tetra Tech as an alternative action to increase its sediment trapping efficiency. Both alternatives were identified as potentially achieving a 50% reduction in basin discharges (59 kg/yr, Tetra Tech, 2008, Table 6-3h). Tetra Tech assumed that additional wildlife and land surveys, stakeholder participation, and environmental impact analyses would be necessary to complete the projects.

The February 2008 Basin Plan amendment draft staff report included a numeric total mercury load limit for outflow from the Cache Creek Settling Basin to the Yolo Bypass based on (a) expected total mercury load reductions in the Cache Creek watershed resulting from implementation of the Cache Creek mercury control program, and (b) CDM's initial modeling results that indicated that basin trapping efficiency could be increased to 75%. As noted earlier, since the release of the February 2008 report, DWR staff indicated that a more comprehensive feasibility study must take place to determine whether a 75% trapping efficiency is possible and to incorporate a stakeholder process so that local communities' concerns about potential flood hazards resulting from modifying the basin can be addressed. The 2008-2009 Stakeholder Process participants (including staff from the Central Valley Water Board, DWR and other agencies responsible for basin operations and other stakeholders) developed suggestions for Basin Plan amendment requirements that entail:

- DWR, Central Valley Flood Protection Board, and USACE, in conjunction with any interested landowners and other stakeholders, implementing a plan for management of mercury in or discharged from the Cache Creek Settling Basin, including improvements for decreasing total mercury discharges from the Cache Creek Settling Basin, by 21 December 2018, or following Congressional authorization to modify the Cache Creek Settling Basin; and
- Time schedules for actions to:
    - Initiate the process for Congressional authorization to modify the basin.
    - Develop a long-term strategy to reduce inorganic mercury loading from the basin.
    - Submit a report describing the long term environmental benefits and costs of sustaining the basin's mercury trapping abilities indefinitely.
    - Submit a report that evaluates the trapping efficiency of the Cache Creek Settling Basin and proposes, evaluates, and recommends potentially feasible alternative(s) for mercury reduction from the basin. The report would evaluate the feasibility of decreasing mercury loads from the basin, up to and including a 50% reduction from existing loads.
    - Submit a detailed plan for improvements to the Basin.
    - Implement plans to reduce total mercury loads discharged by the Cache Creek Settling Basin and complete project improvements.

As a result, Alternatives 2 through 4 now entail evaluating and implementing feasible total mercury load reductions for basin outflows up to and including a 50% reduction from existing loads (e.g., from 118 kg/yr to 59 kg/yr), in place of a numeric load limit.

4.3.7 Monitoring Requirements for Sources Assigned Methylmercury Allocations

Alternatives 2, 3 and 4 would include monitoring requirements for sources with methylmercury allocations in the Delta and Yolo Bypass. The following describes reasonably foreseeable means of compliance with the monitoring requirements.

Both Alternatives 2 and 3 would require monitoring for irrigated agriculture and managed wetlands in all Delta/Yolo Bypass subareas except the Central and West Delta subareas. The Central and West Delta subareas do not require methylmercury source reductions,[30] and would not require monitoring under Alternatives 2 and 3 unless new agricultural or wetland restoration projects were implemented in the Central and West Delta subareas that had the potential to increase ambient methylmercury levels. Alternative 4 would require monitoring for irrigated agriculture and managed wetlands in all Delta/Yolo Bypass subareas. The design of the monitoring associated with all alternatives would be a component of the Phase 1 methylmercury studies described in the following section and would be essentially the same for all alternatives. The primary difference between the alternatives would be that Alternatives 3 and 4 would require entities responsible for smaller irrigated agriculture and managed wetland areas to participate in and/or contribute towards the monitoring efforts and Phase 1 methylmercury studies.

The goal of the monitoring would be to estimate the sum of annual methylmercury loads produced by the multitude of agriculture and wetland areas in each subarea for comparison to the subarea allocations. The monitoring design would be developed during the Phase 1 studies. The monitoring would likely need to assess the variety of wetland and agriculture types in the Delta/Yolo Bypass. Monitoring efforts could entail establishing periodic monitoring at representative sites that could evaluate irrigation/intake water, discharge and receiving water volumes and methylmercury concentrations at a frequency that addresses seasonal variability and varying management practices throughout the year. Monitoring efforts could also take a more creative approach, e.g., monitor and/or track the implementation of management practices expected to reduce discharges by the amount needed to achieve the allocations. Water Quality Coalitions established under the Irrigated Land Regulatory Program (ILRP) currently have monitoring programs that evaluate surface waters that receive discharges from agricultural and wetland areas in the Delta/Yolo Bypass, but those programs do not include analyses for methylmercury, nor sampling of irrigation or discharge waters except when special studies are conducted. Hence, a reasonably foreseeable method of compliance with the monitoring requirements for wetlands and agriculture could be for the existing ILRP monitoring programs to add methylmercury analyses to their current receiving water monitoring locations, or for a new collaborative organization to be formed to develop and implement monitoring.

Alternatives 2 and 3 would require all NPDES facilities in the Delta/Yolo Bypass to monitor methylmercury and total mercury in their effluent and receiving water and submit the monitoring results in annual reports. Alternative 4 would not require the facilities to conduct receiving water

[30] Irrigated agriculture and wetlands in the Central and West Delta subareas would require monitoring only if wetland restoration projects or widespread changes in agricultural crops or practices were to take place. Refer to Section 4.3.12, "Actions to Minimize Methyl and Total Mercury from New or Expanded Sources".

monitoring but it does require effluent methylmercury and inorganic mercury monitoring. Facilities that discharge to surface water already are required to monitor their effluent and receiving water for other constituents regulated by effluent limits mandated in NPDES permits (e.g., monthly monitoring for facilities that discharge greater than 1 mgd and quarterly monitoring for facilities that discharge less than 1 mgd) and to submit annual reports. Effluent and receiving water monitoring for compliance with the CTR criterion of 50 ng/l total recoverable mercury is a current NPDES permit requirement for WWTPs and therefore is considered a baseline condition for Basin Plan amendments. Regular methylmercury monitoring would be a new monitoring constituent for most facilities.

Alternatives 2 through 4 would not require the establishment of new monitoring programs or monitoring frequencies for any MS4s except the Contra Costa County MS4. The Sacramento and Stockton MS4s already have monitoring programs that evaluate a variety of constituents, including total mercury and methylmercury, at representative urban runoff sites during wet and dry weather conditions and submit the monitoring results in annual reports. The Contra Costa County MS4 conducted a special study for mercury in Marsh Creek in the Central Valley region, but does not currently monitor for total mercury or methylmercury in urban runoff in the Central Valley region. However, requirements for methylmercury and total mercury monitoring may be included in its revised permit, the adoption of which the Central Valley Water Board will consider in spring 2010. For the sake of cost estimates, monitoring will be considered a new requirement for the Contra Costa County MS4, although it may become a baseline requirement once an updated MS4 permit is adopted for the Contra Costa County MS4.

4.3.8 Methylmercury Control Studies

Alternatives 2 through 4 require different combinations of dischargers of existing and new methylmercury sources in the Delta, Yolo Bypass and tributary watersheds downstream of major dams to conduct methylmercury control studies. Source categories include WWTPs, urban runoff, agricultural return flows, wetlands, and water management activities that have the potential to affect methylmercury levels in the Delta.[31] The February 2008 draft BPA staff report required a methylmercury control study for the Cache Creek Settling Basin; however, methylmercury-related requirements for the basin are already included in the Basin Plan in the Cache Creek Mercury Control Program. As a result, staff prefers that redundant methylmercury-related requirements not be included in the Delta mercury control program.

Alternatives 3 and 4 would require more entities to participate in the studies than Alternative 2. Appendix C identifies the entities within each source category responsible for control studies under the different alternatives. Characterization monitoring likely will be needed as a component of the control studies for several sources and would evaluate methyl and total mercury concentrations and loads in source/irrigation waters, discharges, and receiving waters. Control studies should identify variables that control methylmercury production and loss as

[31] Water management activities that have the potential to affect methylmercury levels in the Delta include water deliveries to, diversions from, and storage within the Delta; changes to salinity standards or operations to maintain salinity standards; flood conveyance; and dredging projects and activities that reuse dredge material.

needed to identify and/or develop effective management practices, and determine implementation schedules to reduce methylmercury loads discharged to Delta/Yolo Bypass waters. Alternatives 2 through 4 all would require methylmercury control studies to be completed during Phase 1.

Reasonably foreseeable methods of compliance with the study requirements include planning for the studies, data collection and analysis, development of management practices to reduce methylmercury discharges, and on-the-ground pilot projects to evaluate the effectiveness of potential management practices. The studies could be conducted by individuals or by collaborative groups based on discharge source type, watershed area, or other organization strategy approved by the Board Executive Officer. The study requirements under Alternative 4 would have the following timeline after the "effective date" of the Basin Plan amendments (when the amendments are approved by the USEPA, which likely would be some date in 2011); the timeline and activities had substantial input from stakeholders during the 2008-2009 Stakeholder Process:

- By **six months** after the Effective Date: Entities required to conduct Control Studies submit for Executive Officer approval either: (1) a report(s) describing how dischargers and stakeholders plan to organize to develop a coordinated, comprehensive Control Study Workplan(s), or (2) a report describing how individual dischargers will develop individual Control Study Workplans. For dischargers conducting coordinated studies, the report(s) should include a list of participating dischargers, stakeholders and community groups. Dischargers would be considered in compliance with this reporting requirement upon written commitment to either be part of a group developing a Control Study Workplan or develop an individual Control Study Workplan. For state agencies responsible for open-water allocations, the report(s) should document how the agencies have secured adequate resources to fund the control studies.
- By **nine months** after the Effective Date: Control Study Workplans would be submitted to the Regional Water Board. With Executive Officer approval, an additional nine months could be allowed for Workplans being developed by a collaborative stakeholder approach. The Control Study Workplan(s) should contain a detailed plan for the Control Studies and the work to be accomplished during Phase 1. Regional Water Board staff and the TAC would review the Workplans and provide recommendations for revising Workplans if necessary. Within four months of submittal, the Executive Officer would be required to determine if the Workplans are acceptable. After four months, Workplans would be deemed approved and ready to implement if no written approval is provided by the Executive Officer, unless the Executive Officer provides written notification to extend the approval process. Dischargers would be considered in compliance with this reporting requirement upon timely submittal of workplans and revisions.
- By **four years** after the Effective Date: Entities responsible for Control Studies should submit report(s) to the Regional Water Board documenting progress towards complying with the Control Study Workplan(s). The report(s) should include amended workplans for any additional studies needed to address methylmercury reductions. The TAC would review the progress reports and could recommend what additional or revised studies should be undertaken to complete the objectives of the Control Studies.
- By **seven years** after the Effective Date: Entities responsible for Control Studies should complete the studies and submit to the Regional Water Board Control Studies final reports

that present the results and descriptions of methylmercury control options, their preferred methylmercury controls, and proposed methylmercury management plan(s) (including implementation schedules), for achieving methylmercury allocations. In addition, final report(s) should propose points of compliance for non-point sources. If the Board Executive Officer determines that dischargers are making significant progress towards developing, implementing and/or completing the Phase 1 Control Studies but that more time is needed to finish the studies, the Board Executive Officer may consider extending the studies' deadline. In addition, if the dischargers demonstrate reasonable attempts to secure funding for the Phase 1 studies but experience severe budget shortfalls, the Executive Officer could, after public notice, extend time schedules by up to two years.

Board staff would work with the TAC and Stakeholder Advisory Group(s) to review the Control Study Workplan(s) and results. As new information becomes available from the Control Studies or outside studies that result in redirection of existing studies, dischargers could amend the Control Study Workplan(s) with Executive Officer approval. If dischargers do not comply with control study implementation schedules, the Executive Officer would consider issuing issue individual waste discharge requirements or requests for technical reports and management plans.

As noted earlier, if the Board Executive Officer allows an extension for the Phase 1 methylmercury control studies' schedule or needs additional time to conduct its Delta Mercury Control Program Review, the Executive Officer could consider extending the Phase 1 schedule. There is also an option to extend the timeline due to severe budget constraints. The 2008-2009 Stakeholder Process participants (including Board staff) recommended that:

- If the Executive Officer extends Phase 1 by more than one year, the Regional Water Board should consider extending the schedule and final compliance date for Phase 2 implementation of methylmercury controls.
- The methylmercury management plan(s) developed in Phase 1 should be initiated as soon as possible, but no later than one year after Phase 2 begins.

Entities not identified in Phase 1 study requirements could be subject to future mercury control programs in upstream tributary watersheds and could participate in coordinated mercury control studies during Phase 1 of the Delta mercury control program.

4.3.9 Development of Phase 2 Offset Program & Phase 1 Offset Pilot Projects

1. Development of Phase 2 Offset Program

Under Alternatives 2, 3 and 4, the Central Valley Water Board may consider adoption of an offset program for Phase 2, if necessary, that would allow dischargers to offset total mercury and/or methylmercury in excess of requirements by implementing more feasible or cost effective projects elsewhere in the watershed. The offset program must be: (a) consistent with any State Water Board offset policy, (b) developed in coordination with the State Water Board, USEPA, dischargers, and other stakeholders, and (c) reviewed at a public workshop. Appendix C evaluates potential costs associated with the development of a Phase 2 offset program. Any type of Phase 2 offset program would be implemented by a future Basin Plan amendment.

Reasonably foreseeable methods of compliance and any costs and environmental effects associated with those methods will be evaluated as part of the Basin Planning process for the future Basin Plan amendment.

2. Phase 1 Pilot Offset Projects

During Phase 1, Alternatives 2, 3 and 4 would allow all inorganic mercury and/or methylmercury dischargers to conduct voluntary pilot offset projects. The pilot offset projects could achieve one or more of several goals: accomplish early implementation of mercury reduction projects; provide information that can be used to develop the Phase 2 offset program; and/or allow dischargers to earn credit to offset methylmercury allocation and total mercury limit requirements during Phase 2. To be most useful, the pilot offset projects should focus on projects that can be implemented relatively quickly. Any pilot project proposal must receive public review and Central Valley Water Board approval. During Phase 1, any discharger proposing a pilot offset project must also conduct control studies to determine the feasibility of on-site controls for its own methylmercury and total mercury discharges.

Consideration #4 in Section 4.2.1 provides a review of the State Water Board's Resolution No. 2005-0060 directs State Water Board staff to develop a state policy that establishes alternative methods to allow dischargers to meet mercury effluent limitations, as well as guiding principles developed by the 2008-2009 Stakeholder Process. The Offset Workgroup participants, including Central Valley Water Board staff, developed the following recommended language for the Basin Plan amendments:

> On or before [nine years after Effective Date] the Regional Board will consider adoption of a mercury (inorganic and/or methyl) offsets program. During Phase 1, stakeholders may propose pilot offset projects for public review and Regional Board approval. The offsets program and any Phase 1 pilot offset projects shall be based on the following principles:

- Offsets should be consistent with existing USEPA and State Board policies and with the assumptions and requirements upon which this and other mercury control programs are established.
- Offsets should not include requirements that would leverage existing discharges as a means of forcing dischargers to bear more than their fair share of responsibility for causing or contributing to any violation of water quality standards. In this context "fair share" refers to the dischargers' proportional contribution of methylmercury load.
- Offset credits should only be available to fulfill a discharger's responsibility to meet its (waste) load allocation after reasonable control measures and pollution prevention strategies have been implemented.
- Offsets should not be allowed in cases where local human or wildlife communities bear a disparate or disproportionate pollution burden as a result of the offset.
- Offset credits should be available upon generation (i.e., after an offset project is implemented) and last long enough (i.e., not expire quickly) to encourage feasible projects.
- Creditable load reductions achieved should be real, quantifiable, verifiable, and enforceable by the Regional Board.
- Alternatives to direct load credits may be developed, such as time extensions to the Final Compliance Date.

Alternatives 2-4 would require that pilot offset project proponents submit documentation of the total mercury and/or methylmercury reduction achieved after the project is implemented in order to receive offset credit. Implementation of pilot offset projects during Phase 1 would constitute a voluntary effort on the part of dischargers that want to accrue offset credit and comply with their allocations using less expensive means than on-site control actions and/or conduct projects that would have more environmental benefit than reducing their on-site discharges. Implementation of many watershed projects to reduce total mercury and methylmercury loads are expected to take place during Phase 2. Completion of voluntary pilot offset projects would result in cleanup actions taking place more quickly. However, there are reasonably foreseeable Phase 1 administrative and study efforts associated with obtaining approval for pilot offset projects:

1. Development and approval of a pilot offset project credit strategy by the Central Valley Water Board in coordination with the State Water Board, USEPA, dischargers and other stakeholders; and
2. Evaluation of the relative potential for inorganic mercury and/or methylmercury from different sources (e.g., the project proponent's discharge compared to the pilot offset project's discharge) to enter the food web in the Delta and Yolo Bypass.

Implementation of pilot offset projects could result in more immediate methylmercury and/or inorganic mercury reductions near the project area. In addition, offset projects are expected to reduce the overall cost of compliance with the proposed methylmercury allocations. However, there may be concerns about the location of the discharge versus the location of the offset project. For example, if a project proponent discharges to the San Joaquin subarea of the Delta, but implements a pilot project in the Cache Creek watershed, which discharges to the Yolo Bypass subarea, the pilot project would result in no improvement for the San Joaquin subarea. If the project proponent wanted to use its accrued offset credits for its discharge to the San Joaquin subarea, it may be necessary to adjust methylmercury allocations to reduce the other discharges to the San Joaquin subarea to ensure that the fish tissue objectives are met in the San Joaquin subarea.

4.3.10 Phase 2 Actions to Reduce Methylmercury Inputs from Existing Sources

Attainment of the methylmercury allocations set forth by Alternatives 2, 3 and 4 are expected to result in achieving the proposed fish tissue objectives. Methylmercury allocations for sources to the Delta and Yolo Bypass will be achieved chiefly by (1) implementation and ongoing maintenance of Delta mercury control program Phase 2 actions to reduce methylmercury and total mercury sources in the Delta, Yolo Bypass and tributary watersheds, (2) total mercury and methylmercury control actions directed by upstream TMDL implementation programs, and (3) natural erosion that removes total mercury deposited in creek beds and banks.

This section describes reasonably foreseeable actions that could be taken during Phase 2 to reduce methylmercury discharges to the Delta and Yolo Bypass from existing local and upstream sources. The methylmercury control studies conducted under Phase 1 of Alternatives 2, 3 and 4 are expected to increase the number of methylmercury control options and to determine the most effective methylmercury control options. The costs and environmental effects of control options developed by the Phase 1 control studies would be evaluated during Basin Planning efforts at the end of Phase 1.

The methylmercury allocations described in Section 4.3.2 for Alternatives 2, 3 and 4 would direct which entities within the Delta and Yolo Bypass would be required to take methylmercury reduction actions. However, if the Phase 1 studies do not determine feasible means of on-site methylmercury control for all sources required to make reductions, and a mercury offset program is not approved by the beginning of Phase 2, the allocation schemes for any of the Alternatives would likely need to be revised. TMDL programs scheduled for upstream water bodies will determine which entities upstream of the Delta and Yolo Bypass will be required to reduce methylmercury loads during Phase 2 and beyond.

1. NPDES-permitted WWTPs

Sixteen WWTPs in the Delta and Yolo Bypass have methylmercury allocations. Under Alternative 2, ten of these are not required to make reductions to their effluent methylmercury load because they discharge less than 1 mgd, their effluent acts as dilution (i.e., their effluent average methylmercury concentrations are less than the methylmercury goal for ambient water, 0.06 ng/l), they have no available data, and/or they discharge to the Central Delta or West Delta subareas, which do not require source load reductions. Alternatives 3 and 4 require all WWTPs with average effluent methylmercury concentrations greater than 0.06 ng/l to make reductions if they discharge to subareas where within-subarea source reductions are needed to achieve fish tissue objectives. Under Alternatives 3 and 4, eight WWTPs are not required to make reductions to their effluent methylmercury load.

As described later in Section 4.3.12, Alternatives 2 and 3 require municipal WWTPs that discharge greater than 1 mgd in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams to implement pollutant minimization programs to reduce total mercury discharges during Phase 1. Alternative 4 requires all NPDES facilities in the Delta/Yolo Bypass to implement pollutant implementation programs. Total mercury reductions associated with this action are expected to enable the facilities to comply with the Phase 1 total mercury load limits designated by Alternative #4. In addition, total mercury and methylmercury reductions associated with this action alone may enable some WWTPs in the Delta and Yolo Bypass to achieve and maintain their methylmercury allocations. Under Alternatives 2 and 3, WWTPs that discharge less than 1 mgd to the Delta and Yolo Bypass also could implement mercury minimization programs to reduce effluent methylmercury levels. Other reasonably foreseeable methods of compliance with the methylmercury allocations could include, but are not limited to, the following actions:

- Implement additional secondary[32] or advanced treatment processes to further reduce particle-bound methyl and total mercury, e.g., by increasing retention in aeration tanks, increasing retention in the primary and secondary clarifiers, and/or employing tertiary processes (e.g., reverse osmosis and multimedia filtration).

[32] Fate and transport studies conducted by the Sacramento Regional County Sanitation District and the San Jose/Santa Clara Pollution Control Plant indicated that most of the decrease in methylmercury concentrations is realized during secondary treatment (SJ/SC, 2007; Palmer *et al.*, 2005).

- Incorporate ultraviolet radiation disinfection in coordination with advanced filtration, which could conceivably promote photo-demethylation of the remaining methylmercury in the effluent.
- Evaluate how the City of Stockton WWTP was able to reduce its effluent methylmercury concentrations and implement similar methods, if feasible (see Chapter 6 in the TMDL Report for more discussion of the City of Stockton's recent WWTP improvements).
- Increase effluent disposal to land.
- Participate in an offset program (if one is approved by the Water Board) (see Section 4.3.9).

Alternative 4 includes Phase 1 (interim) numeric load limits for total mercury discharges from NPDES facilities. Alternatives 2 and 3 do not include numeric load limits for total mercury discharges from NPDES facilities. However, there is a possibility that, after the Phase 1 methylmercury control studies are completed, capping or reducing total mercury discharges from some facilities may be one of the only feasible methods to reduce ambient methylmercury levels in the Delta and Yolo Bypass. The above paragraphs describe reasonably foreseeable methods of compliance with total mercury load limits (if any are adopted for Phase 2) as well as the proposed methylmercury load limits.

2. NPDES-permitted MS4s

Alternative 3 requires all MS4s that discharge to the Delta, Yolo Bypass or their tributaries downstream of major dams to implement BMPs to control erosion and sediment discharges to the maximum extent practicable, and large MS4s (Sacramento, Stockton and Contra Costa County) to implement pollution prevention measures and BMPs to the maximum extent practicable to control total mercury discharges. Alternative 4 requires all MS4s in the Delta/Yolo Bypass to implement BMPs to control erosion and sediment discharges to the maximum extent practicable, and the Sacramento, Stockton and Contra Costa MS4s to also implement mercury-specific pollution prevention measures and BMPs. Because inorganic mercury and methylmercury are typically particle-bound, BMPs to control erosion and sediment transport will be effective in reducing mercury discharges. This action alone may enable some MS4s in the Delta and Yolo Bypass to achieve and maintain their methylmercury allocations under Alternatives 2-4 and Phase 1 concentration limits under either Alternative 2 or Alternative 3. Other reasonably foreseeable methods of compliance with the methylmercury allocations could include, but are not limited to, the following actions:

- Implementation of BMPs to reduce erosion and sediment transport, which are already required under existing individual and general NPDES permits;
- Modification of storm water collection and retention systems to reduce methylmercury production, for example, installation of aerators or circulation devices in basins may promote degradation of methylmercury in the water column, and removal of sediment from basins would reduce the supply of inorganic mercury available for methylation;
- Implementation of pollution prevention measures such as:
    - Thermometer exchange and fluorescent lamp recycling programs;
    - Public education and outreach on disposal of household mercury containing products and replacement with non-mercury alternatives.

- Education of auto dismantlers on how to remove, store, and dispose of mercury switches in autos.
- Enhancement of household hazardous waste collection programs to better address mercury-containing waste products (potentially including thermometers and other gauges, batteries, fluorescent and other lamps, switches, relays, sensors and thermostats).
- Survey of use, handling, and disposal of mercury-containing products used by the Sacramento, Stockton and Contra Costa County permittee agencies and development of a policy and time schedule for eliminating the use of mercury containing products by the permittees.
- Implementation of additional programs to reduce vehicle exhaust (e.g., improvements to mass transit, ride share, and bicycle-to-work programs) because emissions from vehicles powered by hydrocarbon-based fuels contain mercury (Won *et al*., 2007; Conaway *et al.*, 2005) as well as hydrocarbons that are involved in the formation of ground-level ozone and subsequently reactive gaseous mercury, which is more likely to be converted to methylmercury than other fractions of mercury. [33]
- Expansion of existing urban tree planting programs, particularly of species that have low emissions of volatile organic compounds, to help reduce ground-level ozone, particulate matter, and other pollutants (e.g., Nowak *et al.*, 2006) and subsequently reactive gaseous mercury.

- Participation in an approved offset program (see Section 4.3.9).

Such methods of compliance could conceivably be implemented by just large MS4s under Alternative 2 and both large and small MS4s under Alternatives 3 and 4 to achieve and maintain methylmercury allocations.

3. Managed Wetlands

Alternatives 2, 3 and 4 require Phase 1 control studies to evaluate feasible methods to address methylmercury produced by existing permanent and seasonal wetlands. It is speculative to guess where and which methylmercury reduction management practices would be incorporated

[33] Reactive gaseous mercury (RGM) is thought to be emitted primarily from anthropogenic point sources or formed by oxidation reactions of gaseous elemental mercury with ozone, hydroxyl radical, nitrate, hydrogen peroxide, and/or halogen containing compounds (e.g., Peterson *et al.*, 2009). RGM is more likely than other mercury fractions to be converted to methylmercury that is bioaccumulated in aquatic food chains (Whalin *et al*., 2007). Ground-level ozone is a potent irritant that causes lung damage and a variety of respiratory problems; ozone is the main component of smog and is formed by the reaction of hydrocarbons with nitrogen oxides in the presence of sunlight (USEPA OTAQ, 2007). In typical urban areas, a significant fraction of hydrocarbons comes from cars, buses, trucks, and nonroad mobile sources such as construction vehicles and boats powered by hydrocarbon-based fuels such as gasoline and diesel; hydrocarbons include many toxic compounds that cause cancer and other adverse effects (USEPA OTAQ, 2007). As a result, reducing vehicle exhaust would lead to reductions in the hydrocarbon emissions (a benefit for human health), which subsequently could reduce the formation of ground-level ozone (a second benefit for human health) and the formation of RGM, which would be a third benefit for human health by decreasing the amount of RGM to be methylated and bioaccumulated in aquatic food chains.

at existing wetland sites during Phase 2. However, a range of possibilities for methylmercury allocation compliance for existing wetlands could include, but not be limited to:

- Modify managed wetlands' design, e.g., water depth, flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands), vegetation types, and vegetation density (dense cover or more open water);
- Modify managed wetlands' discharge patterns, e.g., hold irrigation water on-site longer at wetlands to allow methylmercury concentrations to decrease before discharging the water or otherwise transfer and re-use the water at another marsh or agricultural area to decrease the amount of discharge; and
- Participate in an approved offset program (see Section 4.3.9) to reduce total mercury and methylmercury in the irrigation water obtained from surface water sources.

Such methods of compliance conceivably could be required for more wetland areas under Alternatives 3 and 4 than under Alternative 2. Alternatives 2-4 would require methylmercury reductions from wetlands that act as sources of methylmercury to Delta/Yolo Bypass subareas that need methylmercury source reductions.

Preliminary results from ongoing wetland studies (see Chapter 3 in the TMDL Report) indicate that seasonal wetlands may be overall net producers of methylmercury, while permanent freshwater and tidal wetlands may be overall less productive of methylmercury or even net sinks (that is, more methylmercury enters the wetlands than leaves). However, if seasonal wetlands are more productive (e.g., in terms of grams methylmercury produced per acre per day), permanent wetlands may produce a greater load per year because they are wet year-round. Phase 2 control practices may focus on wetlands in each Delta/Yolo Bypass subarea that produce the most methylmercury, or they may focus on wetlands for which the most effective or least cost management practices are available, or on wetlands with habitat benefits and other desirable functions that would not be negatively affected by the implementation of methylmercury management practices.

Subareas that require methylmercury source reductions include the Yolo Bypass, Sacramento, San Joaquin, Mokelumne, and Marsh Creek subareas. According to the USFWS National Wetlands Inventory (USFWS, 2006), there are about 14,400 acres of freshwater emergent wetlands in these subareas, about 11,800 acres (82%) of which are seasonal wetlands.

4. Irrigated Agriculture

The Delta is composed of 65 islands and tracts on about three-quarters of a million acres. Agriculture is the main land use, comprising more than half of a million acres. In addition, there are nearly two million acres of agricultural lands within 30 miles of the Delta. Limited methylmercury data are available for Delta island agricultural return flows. Preliminary sampling conducted during the summer of 2000 in five Delta island main drains indicated that the islands are a net source of methylmercury. More recently the State Water Board funded a study with Moss Landing Marine Laboratories (Contract 04-235-150-0) to characterize methylmercury concentrations and loads from representative drains on farmed islands in the Delta, which account for 70% of the total area of the Delta, and to use the results to determine the overall contribution of the islands to the methylmercury mass balance of the Delta. Moss Landing Marine Laboratories (MLML) researchers sampled four islands where organic (peat) soils were dominant and four islands where mineral soils were dominant (Heim *et al*., 2009). On an annual basis farmed islands appeared to be net sources of methylmercury to the Delta; however, on a seasonal basis farmed islands appeared to be net sources of methylmercury during high flow (rainy season) periods but net sinks during low flow (dry season) periods. In addition, the MLML researchers found that winter flooding and holding water on cropland appeared to be a factor in increased methylmercury concentrations in drainwater, and that farmed islands with organic dominated soils had higher net methylmercury loads than islands with mineral dominated soils (Heim *et al*., 2009). The MLML study results may prove valuable in identifying and focusing management practices on key land use practices.

Dischargers could collaborate through the Central Valley Water Board's Irrigated Lands Conditional Waiver Program's Water Quality Coalitions or other coordinated group to undertake studies to further characterize agricultural source and return waters in areas of the Delta/Yolo Bypass not addressed by the recent MLML studies as well as areas upstream of the Delta expected to be encompassed by upstream TMDL programs. Agricultural lands that act as a source of methylmercury (e.g., agricultural lands discharge methylmercury loads that are greater than methylmercury loads in the irrigation water) would conduct control studies to determine feasible management practices to reduce methylmercury discharges. Dischargers would be encouraged to use a watershed approach to coordinate the studies.

Until the Phase 1 studies are completed, it is speculative to guess which methylmercury reduction management practices would be incorporated at existing agricultural areas during Phase 2. A range of possibilities for methylmercury allocation compliance could include, but not be limited to:

- Modify return water discharge patterns, e.g., implement tailwater recovery systems to prevent discharge of irrigation water to receiving waters or hold irrigation water on-site longer to allow methylmercury concentrations to decrease (e.g., through photodegradation) before discharging the water;
- Utilize drip irrigation systems or other water-efficient systems to minimize or limit irrigation runoff and discharge to the receiving water; and
- Participate in an approved offset program (see Section 4.3.9) to implement feasible reduction actions for upstream methylmercury sources.

Such methods of compliance could conceivably be implemented by more agricultural areas under Alternatives 3 and 4 than under Alternative 2. It is likely that only a subset of agricultural areas will need to implement methylmercury management practices during Phase 2. In addition, it is likely that not all agricultural areas would be able to make use of water conservation methods such as tailwater recovery systems or drip irrigation systems, especially areas with shallow, highly saline groundwater. Phase 1 control studies are needed to identify and evaluate additional management practices for agriculture and other sources, with the goal of determining effective methylmercury management practices with no or minimal negative effects on other beneficial uses of Delta waters or current land uses.

5. Methylmercury Flux from Open-Channel Sediments

Reductions will be needed in the open-water methylmercury contributions to the Marsh Creek and Yolo Bypass subareas under both Alternatives 2 and 3, and to all subareas except the Central and West Delta subareas under Alternative 4. One reasonably foreseeable method of compliance with the open water allocations could be the reduction of total mercury inputs from upstream sources in order to decrease sediment mercury concentrations in the open channels and associated methylmercury production. Such upstream total mercury reduction efforts could be accomplished through projects carried out by the entities responsible for the open-channel areas in the Delta and Yolo Bypass, or coordinated with offset project proponents, upstream TMDL implementation programs, and efforts in the upstream watersheds to reduce inputs from historic mine sites and associated mine waste transported downstream. Sections 4.3.11 and 4.3.12.4 describes reasonably foreseeable total mercury and methylmercury control studies and projects that could take place to accomplish the open-water methylmercury allocations. The Phase 1 methylmercury control studies are expected to develop additional methylmercury management practices.

6. Cache Creek Settling Basin

Alternatives 2, 3 and 4 include a methylmercury allocation for Cache Creek that requires a substantial reduction in methylmercury loading. The allocation applies to Cache Creek flows that enter the Yolo Bypass and is designed to achieve the proposed fish tissue objectives for the Yolo Bypass and Delta. The Cache Creek Watershed Mercury Control Program, which was adopted by the Central Valley Water Board in October 2005, also contains a methylmercury allocation for the "Cache Creek Settling Basin Outflow" (see Table IV-6.1 of the Fourth Edition of the Basin Plan with February 2007 revisions). The methylmercury allocation in Table IV-6.1 of the Basin Plan requires a greater reduction than Alternatives 2-4 so that fish within the Settling Basin can achieve fish tissue objectives established for Cache Creek by the Cache Creek Mercury Control Program. As a result, staff recommends that the Delta mercury control program include an allocation for Cache Creek outflow to Yolo Bypass in order to comply with Clean Water Act requirements for the Delta TMDL, but that the Delta mercury control program not entail additional methylmercury requirements beyond those required by the Cache Creek Watershed Mercury Control Program.

Production of methylmercury in the Cache Creek watershed is positively correlated with the level of mercury in surficial sediment (Cooke and Morris, 2005). As a result, reducing total mercury loads transported to Cache Creek will reduce concentrations of mercury in sediment and is expected to reduce subsequent methylmercury production in both the creek channel and the Cache Creek Settling Basin. A reasonably foreseeable method of compliance with the methylmercury allocation for Cache Creek could be the reduction of in-basin methylmercury production through the reduction of the total mercury concentration of suspended sediment entering the settling basin from the Cache Creek watershed.

The Cache Creek watershed TMDL implementation plan includes cleanup activities at mercury mines in the watershed, control of erosion in mercury-enriched areas, and remediation/removal of contaminated floodplain sediment in the Cache Creek canyon and in Bear Creek. Such actions are expected to reduce mercury loads entering the Cache Creek Settling Basin by about

60 kg/year (Cooke and Morris, 2005). Natural erosion would further reduce sediment mercury concentrations to background levels (between 0.1 and 0.3 mg/kg, dry weight). Per the 2005 Basin Plan Amendment staff report for the Cache Creek watershed TMDL implementation plan, additional actions could take place in the watershed to achieve background mercury levels more quickly. For example, there could be select removal or remediation of sediments in lower Cache Creek streambeds and banks where mercury sediment concentrations are enriched (greater than 0.4 mg/kg). Though such actions were not a required element, the potential costs and environmental impacts of such actions were evaluated by the Basin Planning process for the watershed's mercury control program (Cooke and Morris, 2005). It may be possible to conduct additional sediment mercury remediation efforts in the Cache Creek watershed to further stabilize or remove mercury-enriched channel sediment in order to decrease sediment mercury concentrations, and associated methylmercury production, in the basin at a faster rate than would be accomplished by the Cache Creek watershed mercury control program alone.

The August 2008 Tetra Tech report, "Regional Mercury Load Reduction Evaluation, Central Valley, California", noted that stabilization of stream banks and floodplain surfaces along the lower Cache Creek from Capay to Yolo could potentially result in a mercury load reduction of 78 kg/yr (Tetra Tech, 2008). Although mercury loads would be decreased by this or a similar sediment control project in the lower Cache Creek floodplain, methylmercury loads would likely not decline because sediment in the lower floodplain has relatively low concentrations of mercury and acts to dilute more contaminated sediment from upstream.

Additional methylmercury control options that involve improvements to the Cache Creek Settling Basin will be evaluated in future reviews of the Cache Creek watershed mercury TMDL implementation program.

7. Other Tributary Watersheds

Alternatives 2, 3and 4 include methylmercury allocations for tributary inputs to the Delta and Yolo Bypass. Under Alternative 2, large tributaries that discharge to the Delta/Yolo Bypass subareas where source reductions are not needed to achieve the proposed fish tissue objectives would require reductions in their methylmercury loading; the methylmercury loading from smaller tributary inputs to these subareas and all tributary inputs to the Central and West Delta subareas would be capped. Alternatives 3 and 4 would require reductions in methylmercury loading from all tributaries that discharge to the Delta/Yolo Bypass subareas where source reductions are not needed to achieve the proposed fish tissue objectives. Table 4.3 lists which tributaries would require methylmercury reductions under the three alternatives.

Identified sources of methyl and total mercury in the Delta's tributary watersheds include geothermal springs, methylmercury flux from sediments in wetlands and open water habitats, municipal and industrial dischargers, agricultural drainage, urban runoff, atmospheric deposition, and erosion of naturally mercury-enriched soils and excavated overburden and tailings from historic gold and mercury mining operations. Reasonably foreseeable methods of compliance with the methylmercury allocations for tributary inputs to the Delta and Yolo Bypass under Alternatives 2-4 could include any or all of the methods outlined in previous sections for WWTPs, MS4s, irrigated agriculture, wetlands, and open water methylmercury sources. In addition, another reasonably foreseeable method would be to focus total mercury reduction efforts on sources that supply mercury to hotspots of methylation in the tributary watersheds. Total mercury actions associated with this method are described in the Section 4.3.11.

Several upstream waterways are also on the CWA 303(d) List as impaired by mercury and are scheduled for TMDL development during Phase 1 of this project. The watersheds with 303(d) Listed mercury-impaired waterways downstream of major dams include: American River, Colusa Basin Drain, Feather River, Marsh Creek, Merced River, Mokelumne River, Putah Creek, Sacramento River, San Joaquin River, and Stanislaus River, as well as numerous tributaries within these watersheds. As a result, Alternatives 2-4 entail coordination with upstream TMDL development efforts to identify, prioritize and implement methylmercury control projects in the tributary watersheds downstream of major dams to effectively reduce water column and fish methylmercury levels in the tributary and Delta waterways. A reasonably foreseeable method of compliance would be to develop TMDL implementation programs for these watersheds that identify watershed-specific water quality objectives to address the impairments within the watersheds and methylmercury allocations needed to achieve both the watershed-specific and Delta water quality objectives.

As part of these tributary control efforts, a comprehensive source analysis would be conducted to identify hotspots of methylmercury production. The potential costs and environmental effects of pilot projects and watershed TMDL implementation actions would be evaluated as part of the Basin Planning process for the watershed TMDLs. The potential costs and environmental effects of any actions that need to be taken beyond those watershed TMDL implementation actions to address the Delta impairment would be addressed by future Basin Planning efforts. Note, mercury control programs also will be developed for 303(d) Listed mercury-impaired waterways upstream of major dams, regardless of whether they are named in the Delta mercury control program.

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Table 4.3: Tributary Allocation Strategies under Implementation Alternatives 2 and 3

Delta Subarea	Tributary	Type of Methylmercury Allocation [a] Alternative 2	Alternatives 3 & 4
Central Delta	Calaveras River, Bear/Mosher Creeks, Bethany Reservoir Area	Cap	Cap
Marsh Creek	Marsh Creek	Cap	Reduction
Mokelumne River	Mokelumne River Cosumnes River	Reduction	Reduction
Sacramento River	Sacramento River	Reduction	Reduction
	Morrison Creek	Cap	Reduction
San Joaquin River	San Joaquin River	Reduction	Reduction
	French Camp Slough Manteca-Escalon, Mountain House & Corral Hollow Creeks Areas	Cap	Reduction
West Delta	Antioch & Montezuma Hills Areas	Cap	Cap
Yolo Bypass	Cache Creek, Fremont Weir, Knights Landing Ridge Cut, Putah Creek, Prospect Slough	Reduction	Reduction
	Cache Slough/Lindsey Slough, Dixon Area, Ulatis Creek, Willow Slough	Cap	Reduction

(a) "Cap" indicates annual average methylmercury loads must not increase; "Reduction" indicates tributary inputs must be decreased.

4.3.11 Phase 1 and 2 Actions to Identify, Prioritize and Implement Total Mercury Control Projects in the Tributary Watersheds

Total mercury control actions are needed in the Delta's tributary watersheds for Alternatives 2, 3 and 4 for two primary reasons: (1) to encourage more rapid reductions in sediment mercury levels and resulting methylmercury production in tributary and Delta open-water/wetland habitats and irrigated agricultural areas and (2) to enable full compliance with the San Francisco Bay TMDL mercury allocation for the Central Valley. As a result, the alternatives entail total mercury studies and implementation actions beyond those required for the Cache Creek Settling Basin (Section 4.3.6).

Local, state, and federal agencies responsible for water and air quality, flood conveyance, and public lands would be responsible for coordinating methylmercury control studies, of which total mercury source identification and prioritization studies are a likely component, with input from interested and affected stakeholders. Entities that wish to conduct offset projects (should an offset program be adopted by the State and Central Valley Water Boards) also could conduct their source identification and feasibility studies in coordination with the TMDL-related watershed studies. Figure 4.7 illustrates the potential sequence of the methyl and total mercury studies and implementation activities.

Alternatives 2-4, in combination with the Cache Creek watershed mercury control program, could entail a total mercury reduction of as much as 59-77 kg/yr from the Cache Creek Settling Basin outflow (see Chapter 8, Section 8.2, in the TMDL Report). Such a reduction would be approximately 70% of the 110 kg/yr reduction required by the San Francisco Bay mercury TMDL implementation program. An additional total mercury reduction of at least 33-51 kg/yr from other mercury sources would need to take place to comply with the San Francisco Bay mercury control program. An even greater reduction may be required of other sources if the more comprehensive Phase 1 feasibility study for the Cache Creek Settling Basin indicates that it is not possible to achieve the potential reductions scoped by CDM's and Tetra Tech's initial evaluation efforts (CDM, 2004b, Table 4-3; (Tetra Tech, 2008, Table 6-3h). Some fraction or even all of this additional reduction may be addressed by on-site or offset control projects to achieve methylmercury allocations for specific discharges in the Delta and Yolo Bypass during Phase 2. However, additional total mercury control actions may be required to comply with the San Francisco Bay TMDL's total mercury allocation for the Central Valley and/or to achieve the methylmercury allocations for tributary inputs and/or Delta and Yolo Bypass open water and wetland habitats.

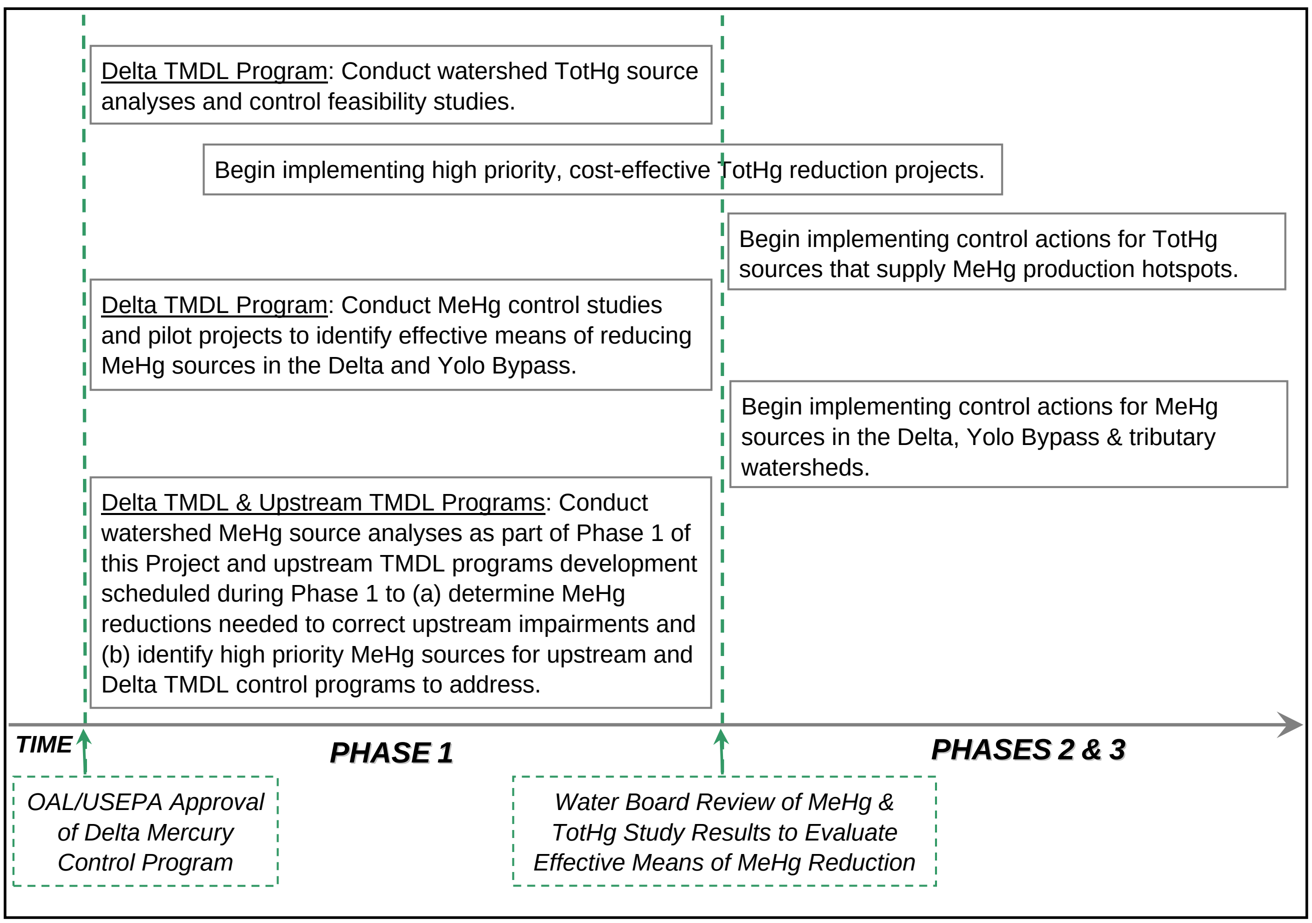

Figure 4.7: Sequence of Actions to Identify, Prioritize and Implement Total Mercury and Methylmercury Control Projects in the Tributary Watersheds

Phase 1 of Alternatives 2-4 should include watershed source analyses and feasibility studies to identify and prioritize mercury reduction projects, with initial focus on the watersheds that export the most mercury-contaminated sediment and also are on the CWA 303(d) List as impaired by mercury (e.g., the Feather, Cache, American, Putah, and Mokelumne/Cosumnes watersheds). However, total mercury reductions likely will be required in other watersheds, especially those that discharge to the Yolo Bypass, to help reduce methylmercury production in those watersheds and the Delta/Yolo Bypass.

Alternative 2-4's Phase 1 actions could include, but are not limited to, the following:

- Implementation of watershed total mercury source analyses and control feasibility studies; and
- Implementation of high priority, cost-effective total mercury reduction projects.

Phase 2 actions could include continued implementation of high priority, cost-effective total mercury reduction projects; control efforts focused on sources that supply mercury to hotspots of methylation in the tributary watersheds and Delta/Yolo Bypass; and any additional efforts required to achieve the San Francisco Bay mercury TMDL implementation program's allocation for the Central Valley.

Specific actions during Phases 1 and 2 could include, but are not limited to, the following:

- Remediation of inactive gold and mercury mines including the adjacent stream banks that contain mercury, with particular focus on mine sites downstream of major dams;
- Stabilization or remediation of dredged areas that act as ongoing sources of total mercury (e.g., potentially the Yuba and Folsom Gold Fields);
- Stabilization of mercury-enriched sediments in stream channels and floodplains downstream of mine sites and dredge fields;
- Construction of new settling basins downstream of mine sites and/or other erosive areas with contaminated sediment that cannot be otherwise stabilized or remediated;
- Identification of reservoirs that are accumulating mercury-contaminated sediment and development and implementation of sediment management plans to prevent the release of mercury-contaminated sediment during reservoir maintenance activities (e.g., by off-site disposal of dredged sediment);
- Control of erosion in mercury-enriched upland areas from activities such as grazing and road maintenance; and
- Development of a statewide atmospheric total mercury reduction program and implementation of actions to reduce mercury emissions from facilities. California Air Resources Board emissions data reviewed in Appendix J of the TMDL Report indicate that in 2002 almost 10 kg of total mercury was released in the Delta by sugar beet facilities, electric services, paper mills, feed preparation, and rice milling. Almost 113 kg of total mercury was released in the Delta's tributary watersheds; cement and concrete manufacturing facilities, crematories and electrical services in the Delta's tributary watersheds appear to have relatively high mercury emissions (35, 11, 15, and 19 kg, respectively). The two major approaches under development for controlling mercury emissions from coal-fired power plants are multi-pollutant controls (using current controls for SO_2, NO_x, and particulate matter) and mercury-specific controls (activated carbon

injection (ACI)) (Srivastava, 2004); however, the effectiveness of mercury removal for other industries is not well studied. Local air emissions and controls of mercury warrant additional research.

Because of the sediment-trapping nature of many major dams in tributary watersheds, the above mercury control actions are likely to be most effective at reducing total mercury loading to the Delta if they focus on sites downstream of major dams.

Since the release of the February 2008 draft Basin Plan amendment staff report, Tetra Tech EM Inc. completed the "Regional Mercury Load Reduction Evaluation, Central Valley, California" under contract to the USEPA (Tetra Tech, 21 August 2008). The goal of this regional mercury load reduction evaluation was to identify potential mercury load reduction alternatives and candidate project areas that could be undertaken in the Sacramento Basin to reduce the loading of total mercury to the Delta and ultimately San Francisco Bay by 110 kg/year. Tetra Tech conducted a preliminary screening of numerous potential projects and then completed a detailed, comparative evaluation of 15 land- and stream-based inorganic mercury reduction projects in the Central Valley for implementability (long term operation and maintenance, regulatory acceptance, and scheduling constraints), effectiveness (short and long term effectiveness, impacts of the alternative on humans and the environment, and community acceptance), and cost (capital and operations and maintenance). Tetra Tech ranked the best load reduction alternatives based on their projected load reduction and cost efficiencies, and highlighted the following projects for future evaluation and implementation:

- Active Channel and Floodplain of Yuba River within the Yuba Goldfields: Coordinate reservoir releases (e.g., to reduce downstream channel and floodplain erosion and in-channel scour that results in the suspension and downstream transport of mercury-laden sediment) and improve Daguerre Point Dam operation and maintenance activities (e.g., remove sediment from behind the dam to minimize mercury-laden sediment mobilization) (4.8 kg/yr load reduction at $6.85 million) and stabilize stream banks and floodplain surfaces (16 kg/yr load reduction at $62.8 million);
- Active Channel and Floodplain on Lower Cache Creek from Capay to Yolo: Stabilize stream banks and floodplain surfaces (78 kg/yr load reduction at $42.9 million); and
- Cache Creek Settling Basin: Modify existing settling basin to improve capture efficiency (59 kg/yr load reduction at $44.7 million).

All of the potential projects evaluated by Tetra Tech are on or adjacent to waterways on the 303(d) List as mercury-impaired and therefore are scheduled for TMDL development (e.g., the Yuba River) or already have TMDLs adopted (e.g., Cache Creek). Additional watershed total mercury source analyses and control feasibility studies likely will be needed as part of this Delta TMDL program and future upstream TMDL implementation programs during Phases 2 and 3 to further evaluate the potential Sacramento Basin project areas identified by the above Tetra Tech evaluation and to identify additional projects in the San Joaquin Basin.

Since the development of the Tetra Tech evaluation, a new type of pilot project is under development for a reservoir that has been accumulating mercury-contaminated sediment in the Feather River watershed. The "Combie Reservoir Sediment and Mercury Removal Project" is expected to demonstrate how water management and mineral resource extraction efforts can coordinate to restore and maintain Combie Reservoir's water storage capacity, improve recreational opportunities and boat access within Combie Reservoir, and extract marketable gravel, sand and clay by dredging sediment from the reservoir and using an "innovative recovery process" to remove elemental mercury from the sediment. As stated in the project description, "Dredging may also make the northeastern end of the reservoir that is currently shallow and warm and therefore likely conducive to methylation less conducive, because dredging will create deeper and cooler conditions. In this way the project is expected to reduce not only the source material for methylmercury (elemental mercury in the sediment) but will also change the conditions in which the methylation process currently takes place." (NID, 2009) The project sponsor, Nevada Irrigation District, is partnering with the U.S Geological Survey to measure the effects of removing elemental mercury and reducing methylation conditions by conducting environmental monitoring before, during, and after the dredging and mercury removal operations. The pilot project is estimated to take between three to five years and $6 million to $8 million to complete (NID, 2009; Locke, 2009). If this project demonstrates that mercury can be removed from river sediments, the process has the potential to be applied again at Combie Reservoir (on-going maintenance dredging to maintain reservoir capacity is estimated to reoccur on 10 year intervals) and at other reservoirs throughout the Sierra Nevada, which could help address methylmercury impairments in those reservoirs as well as potentially help reduce the amount of inorganic mercury and methylmercury transported to the Delta.

There are thousands of abandoned and inactive mines in the Central Valley, many of which are contributing to surface water pollution. Inactive mercury mines are predominately in the coastal foothills and mercury is present at and downstream of many gold mining sites in the Sierra foothills. Mine cleanup requirements for the mercury mines in the Cache Creek watershed were adopted by the Central Valley Water Board in 2005 and are considered baseline requirements for the purposes of the Delta mercury control program. The Porter Cologne Water Quality Control Act gives the Regional Water Boards the authority to require responsible persons to cleanup and abate wastes that cause or threaten to cause pollution. Mine sites that discharge wastes may be subject to waste discharge requirements (Title 27 requirements for mine wastes and/or NPDES storm water requirements). Even in the absence of a Delta mercury control program, mine owners are responsible for discharges from their property. In this context, the Delta mercury control program will not pose new economic costs or environmental impacts to address discharges from mercury and gold mines.

4.3.12 Actions to Minimize Methyl and Total Mercury Inputs from New or Expanded Sources

Alternatives 2, 3 and 4 require actions to minimize different combinations of methyl and total mercury inputs from new and expanded sources in the Delta and its tributary watersheds downstream of major dams. Several ongoing local and regional changes may affect methyl and total mercury loading in the Delta region during the next 5 to 50 years, for example: wetland restoration, population growth, and changes in water management practices due to climate change, population growth or other priorities. Extensive wetland restoration activities are underway in the Yolo Bypass and Delta that have the potential to substantially increase ambient methylmercury levels. In addition, the California Department of Finance predicts that populations in counties in the Delta/Yolo Bypass and its source region will increase 76% to 213% by 2050 (CDOF, 2007). Increasing populations will result in increasing total mercury and methylmercury discharges from municipal wastewater treatment plants and urban runoff. Changes to water diversions, salinity control, and flood conveyance, as well as dredging activities, could affect water column methylmercury and sediment total mercury concentrations in the Delta and Yolo Bypass.

1. NPDES-permitted WWTPs

Alternatives 2 and 3 require that NPDES facilities in the Delta and Yolo Bypass, and large NPDES WWTPs in the tributary watersheds, maintain Phase 1 (interim) methylmercury concentration limits; in addition, new NPDES facilities that discharge or propose to discharge methylmercury to the Delta or its upstream tributaries downstream of major dams during Phase 1 would have an effluent methylmercury concentration limit of 0.06 ng/l unless they participate in the Phase 1 control studies described in the previous section and implement controls to reduce their methylmercury concentration or otherwise offset their exceedance during Phase 2 after the completion of the control studies. Alternative 3 also requires existing and new municipal WWTPs and power and heating/cooling facilities that discharge greater than 1 mgd in the Delta, Yolo Bypass, and tributary watersheds downstream of major dams to implement mercury-specific pollutant minimization programs to reduce total mercury discharges and to determine baseline effluent TotHg concentrations in order to evaluate the effectiveness of the pollutant minimization programs. Alternative 4 requires that NPDES facilities in the Delta and Yolo Bypass maintain performance-based Phase 1 (interim) total mercury mass limits (instead of methylmercury or total mercury concentration limits) and implement mercury-specific pollutant minimization programs to reduce total mercury discharges. NPDES permitted facilities that begin discharging to the Delta or Yolo Bypass during Phase 1 would have Phase 1 interim limits assigned in their permits once sufficient data are available under Alternatives 2, 3 and 4.

The purpose of the various potential Phase 1 methylmercury concentration limits (Alternative 2 and 3), Phase 1 total mercury mass limits (Alternative 4) and pollutant minimization program requirements is to minimize any increase in ambient Delta and Yolo Bypass methylmercury concentrations due to increased facility discharges to the Delta/Yolo Bypass resulting from population growth or regionalization efforts in the Delta region while the control studies are taking place during Phase 1. Alternatives 2 and 3's Phase 1 methylmercury concentration limits would allow WWTP discharge volumes to increase, but discharge methylmercury concentrations would not be allowed to increase. The Phase 1 methylmercury concentration limits would be in effect until facilities achieve their methylmercury waste load allocations or other effluent limits are established for Phase 2, based on the results of the control studies described in the previous section and any upstream TMDL programs. Similarly, Alternative 4's Phase 1 total mercury mass limits would allow facility discharge volumes to increase so long as the performance-based mass limits are not exceeded. Phase 1 (interim) limits under Alternatives 2-4 would be assigned in NPDES permits; these interim limits would be added to NPDES permits during the normal course of permit renewal cycles.

Alternatives 2-4 would require NPDES-permitted facilities to monitor methylmercury and total mercury in their effluent. As noted in the previous section, most facilities that discharge to surface water already are required to monitor their effluent for other constituents regulated in NPDES permits. Therefore Alternatives 2-4 would not require new monitoring programs or monitoring frequencies; however, methylmercury would be a new monitoring constituent for several facilities. Effluent and receiving water monitoring for compliance with the CTR criterion of 50 ng/l total recoverable mercury is a current NPDES permit requirement and therefore is considered a baseline condition. Permittees would be required to include their monitoring results and annual average concentration calculations in annual monitoring reports that they already submit per their NPDES permit requirements.

The facility-specific Alternatives 2-3 Phase 1 methylmercury concentration limits for existing facilities are based on annual average effluent methylmercury concentrations observed at each facility in the Delta/Yolo Bypass in 2004/2005 (the period that defines available data), with the exception of the SRCSD Sacramento River WWTP, which collected data during WY2001-2003 and was the only facility that collected data during the TMDL period (WY2000-2003). Compliance with the Phase 1 methylmercury concentration limits would be determined by comparing annual average effluent methyl mercury concentrations to the facility-specific methylmercury concentration limits.

The NPDES Facility Workgroup, in which Central Valley Water Board and USEPA staff participated during the 2008-2009 Stakeholder Process, proposed that the NPDES facility Phase 1 interim performance-based mass limits be derived using current, representative data and not exceed the 99.9th percentile of a 12-month running average effluent mercury load (e.g., pounds per year).

A facility would be in compliance with the mass limit if its annual effluent total recoverable mercury loading does not exceed the limit. Staff considers this method to be adequate and included it in Alternative 4. These interim mass limits would be re-evaluated at the end of Phase 1 based on the results of the Phase 1 control studies that will evaluate the feasibility and effectives of methylmercury and total mercury reduction methods.

Reasonably foreseeable methods of compliance with the Phase 1 methylmercury concentration limits (Alternatives 2-3) and/or total mercury mass limits (Alternative 4) include maintaining the efficiency of existing facility treatment processes and pretreatment programs as discharge volumes increase. As described in the following paragraphs, many of the facilities that currently do not implement total mercury minimization programs would be required to do so during Phase 1 under Alternatives 3-4. As a result, it is expected that the effluent methylmercury concentrations will remain the same or decrease, and the increase in mass for methylmercury will increase only very slightly or even decrease. Similarly, it is expected that total mercury mass limits under Alternative 4 would not be exceeded if facility treatment process performance levels are maintained. Hence, any exceedance of the concentration or mass limits would represent a material change in treatment or pretreatment conditions.

Reasonable steps to address an exceedance of a Phase 1 methylmercury concentration limit or total mercury mass limit are those typical for maintaining other common effluent limits in current permits. Steps include: accelerated or additional monitoring as necessary to determine the nature of the increased discharge concentration; identification of the possible sources that could cause an increase (e.g., spills, untreated by-pass, or treatment processes or management practices that have suffered a temporary or permanent failure or are no longer adequate for the increased volume of discharge); submission of a control strategy; and implementation of corrective actions or improved treatments/management practices consistent with the control strategy. Section 4.3.10.1 reviews reasonably foreseeable methods for effluent methylmercury and total mercury reduction based on available information that could be implemented by existing or new facilities.

Alternatives 2 and 3 require municipal WWTPs and power and heating/cooling facilities that discharge greater than 1 mgd to the Delta or its tributary watersheds downstream of major dams to implement mercury-specific pollutant minimization programs. Alternative 4 requires all NPDES facilities within the Delta and Yolo Bypass to implement mercury-specific pollutant minimization programs. Reasonably foreseeable methods of compliance with pollutant minimization requirements could include, but are not restricted to, the following:

- Submit a mercury-specific pollutant minimization plan to the Central Valley Water Board by six months after the Effective Date of the proposed amendments and implement the pollutant minimization programs within 30 days after receipt of written Executive Officer approval of the workplans. Mercury evaluation plans could include the following elements:
    - A description of the discharger's existing mercury control efforts and baseline annual average effluent total mercury concentration and loads;
    - A description of all mercury sources contributing, or potentially contributing, to the mercury loading in the facility influent, including chemicals used by the facility that may contain mercury because of how they were produced;
    - An analysis of potential pollution prevention and control actions that could reduce effluent total mercury concentrations and/or loads;
    - A description of the tasks, cost, and time required to implement actions to control effluent total mercury concentration and load;
    - A monitoring program for determining the results of the pollution prevention and control actions; and
    - An analysis of the benefits and any potential adverse environmental impacts, including cross-media impacts or substitute chemicals, that may result from the implementation of the mercury minimization plan.
- Until a given NPDES permitted facility achieves compliance with its waste load allocation, report annually to the Board all mercury monitoring results; a summary of all actions undertaken during the previous year pursuant to the minimization plan and an evaluation of their effectiveness; and a description of actions to be taken in the following year.
- If a facility's discharge exceeds the Phase methylmercury concentration limit (Alternatives 2-3) or total mercury mass limit (Alternative 4), the discharger should conduct additional monitoring, evaluate the increase, and develop and implement changes to the mercury minimization plan to correct any performance problems. If the Alternative 2-3 Phase 2 methylmercury concentration limit were exceeded due to implementation of a water conservation program in a WWTP's service area or additional reclamation by a WWTP, the discharger could request from the Executive Officer a variance from maintaining the limit.

Reasonably foreseeable total mercury minimization actions could include, but are not restricted to, the following:

- Establish or enhance pretreatment programs that reduce sources of mercury discharges from municipal WWTPs, such as mercury thermometer exchange programs; residential drop-off programs for mercury-containing products; best management practices for hospitals, dentists, other medical facilities, laboratories, and pottery studios; and distribution of a guide for installing graywater systems.

- In the case of industrial dischargers, develop programs to identify sources of mercury in the waste stream (e.g., pH-altering chemicals, gages, and switches) and modify procedures or materials to reduce the mercury in the discharge.

Mercury control requirements for municipal WWTPs in the Delta region are not new. Because the Delta and many of its upstream tributaries are listed as impaired by mercury on the CWA Section 303(d) List, Central Valley Water Board NPDES permits have included requirements for mercury control (e.g., total mercury mass limits) in many recent new and updated permits (see Section 4.3.10). As of February 2008, existing NPDES permits required 15 of 40 municipal WWTPs that discharge greater than 1 mgd in the Delta and its tributary watersheds downstream of major dams to implement total mercury pollution prevention plans in accordance with CWC §13263.3 or other similar mercury minimization programs. One of the three municipal WWTPs that discharge less than 1 mgd in the Delta/Yolo Bypass is required to implement a mercury minimization program. Future permit cycles for other facilities that discharge to the Delta or upstream water bodies on the CWA Section 303(d) List for mercury impairment will continue to add total mercury mass limits and total mercury minimization requirements until TMDLs for the Delta and upstream water bodies are approved. The requirement for total mercury minimization programs would be new for 25 municipal WWTPs and one power plant[34] that discharge greater than 1 mgd in the Delta and its tributary watersheds downstream of major dams (Tables C.6, C.7 and C.8 in Appendix C). These or similar requirements will be in effect even without a Delta TMDL implementation program. However, including the requirement for mercury-specific pollutant minimization programs in the Basin Plan amendments will ensure their inclusion in NPDES permits and is therefore evaluated in the CEQA and cost analyses (Chapter 7 and Appendix C, respectively).

The Phase 1 methylmercury concentration limits (Alternatives 2 and 3) would replace the total mercury mass limits in the NPDES permits. As explained in Section 4.3.2, under Alternative 3, municipal WWTPs that discharge less than 1 mgd and other discharger types (e.g., commercial, industrial and aquaculture discharges), would not be required to implement mercury minimization programs or to maintain total mercury mass limits. Under Alternative 4, all of the NPDES facilities in the Delta/Yolo Bypass would be required to implement mercury minimization programs and Phase 1 total mercury mass limits. NPDES permits for new discharges would require mercury control based on best practicable treatment and control.

2. NPDES-permitted MS4s

Both Alternatives 2 and 3 include methylmercury allocations for MS4s in the Delta/Yolo Bypass and require large MS4s to develop Phase 1 methylmercury concentration limits before 2012. In

[34] The State of California Central Heating/ Cooling Facility's NPDES permit (CA0078581) indicates that it does not add any chemicals to its cooling water or other waste to its discharge. Therefore, staff recommends that it not be required to implement a total mercury evaluation and minimization program.

addition, Alternative 3 requires all MS4s that discharge to the Delta, Yolo Bypass or their tributaries downstream of major dams (Table E in the proposed Basin Plan amendment language) to implement BMPs to the maximum extent practicable to control erosion and sediment discharges. Alternative 3 also requires large MS4s (Sacramento, Stockton and Contra Costa County MS4s) to implement pollution prevention measures and BMPs to control total mercury discharges to the maximum extent practicable.

Alternative 4 requires the Sacramento, Stockton and Contra Costa County MS4s to implement pollution prevention measures and BMPs to control total mercury discharges to the maximum extent practicable, and all MS4s in the Delta and Yolo Bypass to implement BMPs to the maximum extent practicable to control erosion and sediment discharges, with the goal of reducing mercury discharges. Alternative 4 does not entail any Phase 1 limits.

The MS4 methylmercury allocations for Alternatives 2, 3 and 4 implicitly include all current and future urban discharges not otherwise addressed by another methylmercury allocation within the geographic boundaries of urban runoff management agencies, including but not limited to Caltrans roadway and non-roadway facilities and rights-of-way, public facilities, properties proximate to banks of waterways, industrial facilities, and construction sites.

The purpose of the Phase 1 methylmercury concentration limits under Alternatives 2 and 3 is to minimize any increase in MS4 methylmercury discharges to the Delta resulting from changing urban land uses and management practices in the Delta region while the control studies are taking place during Phase 1. Long-term average MS4 discharge volumes would be allowed to increase, but discharge methylmercury concentrations would not be allowed to increase. Reasonably foreseeable methods of compliance for the development and maintenance of methylmercury concentration limits would entail large MS4s monitoring methylmercury and total mercury in urban runoff. Permittees would be required to include their monitoring results and annual average concentration calculations in annual monitoring reports. Methylmercury monitoring can be added to existing monitoring programs and is not considered to be a difficult parameter to measure.

Developing methylmercury concentration limits for large MS4s is complicated by variable short- and long-term climate conditions (e.g., wet versus dry years, antecedent conditions before storms, storm frequency and intensity, etc.). As a result, limits for Alternatives 2 and 3 are based on the 90th percentile methylmercury concentration of urban runoff samples collected during 2000 to 2010 (a period expected to have a range of meteorological and climatic conditions) and would become effective in 2012. After the establishment of an MS4-specific methylmercury concentration limit, compliance during the following years could be evaluated by comparing the 95% confidence interval for the mean of the concentration data collected by a given MS4 during a given year to its methylmercury concentration limit.

The nature of the performance-based Phase 1 methylmercury concentration limits under Alternatives 2 and 3 requires that large MS4s maintain the efficiency of their best management practices as their discharge volumes increase with increased urbanization. The concentration limits are based on a range of years expected to represent normal monthly and inter-annual variability. In addition, as described in the following paragraphs, all MS4s in the Delta/Yolo Bypass (Alternatives 3 and 4) and tributary watersheds downstream of major dams

(Alternative 3) would be required to control total mercury discharges through best management practices that likely would target sediment (and associated particle-bound total mercury). Hence, any exceedance of the concentration limits would represent a material change in conditions. Reasonable steps to address an exceedance of a methylmercury concentration limit include:

- Accelerated or additional monitoring as necessary to determine the nature of the increased discharge methylmercury concentration;
- Identification of the possible sources that could cause a methylmercury increase (e.g., BMPs that have suffered a temporary or permanent failure; new developments or other changed land uses upstream of the sampling location; or implementation of new BMPs for purposes other than methylmercury control that could have resulted in increased methylmercury production);
- Submission of a control strategy; and
- Implementation of corrective actions or improved treatments/management practices consistent with the control strategy.

Alternatives 3 and 4 require all MS4s that discharge to the Delta/Yolo Bypass (Alternatives 3 and 4) or their tributaries downstream of major dams (Alternative 3) to implement BMPs to the maximum extent practicable to control erosion and sediment discharges with the goal of controlling total mercury discharges. They also require large MS4s to implement pollution prevention measures and BMPs to control total mercury discharges. Because mercury is attached to sediment, BMPs to control erosion and sediment transport will be effective in reducing mercury discharges. All MS4s currently are required to implement BMPs to the maximum extent practicable to control erosion. Sediment control is not a new requirement and therefore is considered to be baseline. In addition, the Sacramento, Stockton and Contra Costa County MS4 permits already require the permittees to implement mercury control plans.

The NPDES General Permit for Storm Water Discharges Associated with Construction Activity currently regulates construction activities; therefore, erosion control requirements are not new requirements for construction activities in the Delta and its source region. Reasonably foreseeable methods of compliance for urban erosion and sediment control could include, but are not restricted to, the following activities widely used in the Central Valley:

- Erosion control: avoidance of increased erosion and transport of contaminated soil into receiving waters via runoff by not conducting construction activities during wet weather; preservation of existing vegetation; development of slope drains; stabilization of stream banks; and use of hydraulic mulch, hydroseeding, straw mulch anchored with a tackifier, polyacrylamide, rolled erosion control products (e.g., blankets and mats), earth dikes, drainage swales, and velocity dissipation devices.
- Sediment control: installation of silt fences, sediment basins, sediment traps, fiber rolls, gravel bag berms, sandbag barriers, storm drain inlet protection, and check dams.

Mercury pollution prevention measures can include, but not be limited to, the following:

- Thermometer exchange and fluorescent lamp recycling programs;
- Public education and outreach on disposal of household mercury containing products and replacement with non-mercury alternatives.

- Education of auto dismantlers on how to remove, store, and dispose of mercury switches in autos.
- Enhancement of household hazardous waste collection programs to better address mercury-containing waste products (potentially including thermometers and other gauges, batteries, fluorescent and other lamps, switches, relays, sensors and thermostats).
- Survey of use, handling, and disposal of mercury-containing products used by the Sacramento, Stockton and Contra Costa County permittee agencies and development of a policy and time schedule for eliminating the use of mercury containing products by the permittees.
- Implementation of additional programs to reduce vehicle exhaust (e.g., improvements to mass transit, ride share, and bicycle-to-work programs) because emissions from vehicles powered by hydrocarbon-based fuels contain mercury (Won *et al*., 2007; Conaway *et al.*, 2005) as well as hydrocarbons that are involved in the formation of ground-level ozone and subsequently reactive gaseous mercury, which is more likely to be converted to methylmercury than other fractions of mercury.
- Expansion of existing urban tree planting programs, particularly of species that have low emissions of volatile organic compounds, to help reduce ground-level ozone, particulate matter, and other pollutants (e.g., Novak *et al*., 2006) and subsequently reactive gaseous mercury.

3. Wetland Restoration

Research conducted in the Delta and elsewhere has found that seasonally and permanently flooded wetlands are efficient sites for methylmercury production (see Chapter 3 in the TMDL Report). There are about 21,000 acres of freshwater emergent wetlands in the Delta and Yolo Bypass. The Record of Decision for the California Bay-Delta Authority commits it to restore 30,000 to 45,000 acres of fresh, emergent tidal wetlands, 17,000 acres of fresh, emergent nontidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CalFed Bay-Delta Program, 2000a & 2000c). This is a total of 75,000 to 90,000 acres of additional seasonal and permanent wetlands in the Delta, which represents about a three to four times increase in wetland acreage from current conditions. The Bay Delta Conservation Plan (BDCP) effort also identifies “priority projects” for near-term implementation that may increase the acreage of wetland and seasonally flooded habitat in the Delta (e.g., BDCP, 2010). Much of the restoration is expected to take place in the Yolo Bypass, Cosumnes/Mokelumne, Marsh Creek and San Joaquin subareas, which require substantial reductions from existing methylmercury sources to achieve the proposed fish tissue objectives. These areas also are downstream of major sources of mercury-contaminated sediment.

For Alternatives 2, 3 and 4, proponents of new wetland restoration projects scheduled for construction during Phase 1 would be required to:

- Either participate in collaborative methylmercury monitoring and studies as described earlier in Sections 4.3.7 and 4.3.8, or implement a site-specific monitoring and study plan;
- Evaluate practices to minimize methylmercury discharges; and
- Implement newly developed management practices, as feasible and reasonable, with monitoring to demonstrate effectiveness of management practices.

Many marsh restoration actions in the Delta require a CWA Section 401 Water Quality Certification from the Central Valley Water Board (see Section 6.5.5 in Chapter 6). In addition, managed wetlands are regulated by the Central Valley Water Board's Irrigated Land Regulatory Conditional Waiver program (Central Valley Water Board, 2003). The above requirements could be implemented through the addition of new conditions in Clean Water Act 401 Water Quality Certifications and/or the Conditional Waiver program.

Site-specific monitoring could include: (a) seasonal monitoring of methylmercury concentrations in water at the restoration site for one year before the restoration activities take place (e.g., if there was surface water at the site before restoration) and for three years after restoration actives are completed; and (b) seasonal monitoring mercury concentrations in fish before restoration activities take place (if fish are present at the site) and after restored wetlands have become established (e.g., two years after the completion of earth-moving and revegetation activities). If there were an increase in water and/or fish methylmercury concentrations that cannot be explained by pre-project seasonal variability, then after the completion of the methylmercury control studies, the project proponents would need to develop and implement management practices to reduce methylation to the extent practicable.

Additional reasonably foreseeable methods of compliance to address methylmercury from new wetlands will be evaluated during Phase 1 of Alternatives 2, 3 and 4. As with the potential methylmercury management practices for existing wetland areas (see Section 4.3.10), it is speculative to guess where and which methylmercury reduction management practices would be incorporated at various wetlands. Possibilities for compliance include modifying the following: wetland design (deep or shallow water depth); location (e.g., consider not building wetlands downstream of watersheds containing mercury or gold mines); flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands); vegetation types; vegetation density (dense cover or more open water); source water; and/or wetland discharge patterns (e.g., reuse water rather than discharge it, or hold water until methylmercury concentrations decrease). Wetland managers will be able to design and build pilot wetland projects to evaluate wetland management practices developed in Phase 1.

4. Activities that Affect Open-Channel Mercury Levels

The Delta and Yolo Bypass have almost 60,000 acres of open water (Table 6.4 in the TMDL Report), not including floodplains in the Yolo Bypass and elsewhere that only periodically flood. Associated bottom sediments produce about 15% of the annual Delta methylmercury load during a relatively dry period (WY2000-2003). Several water management practices that affect methyl and total mercury levels in the open channels of the Delta and Yolo Bypass include:

- Operations to maintain current or future salinity standards in the Delta;
- Current water deliveries to, diversions from, and storage within the Delta;
- Yolo Bypass flood conveyance; and
- Dredging projects throughout the Delta and Yolo Bypass to maintain channel levees for flood conveyance, depths of deep water ship channels, and marina depths.

Alternatives 2 and 3 require agencies that propose changes to the aforementioned activities to evaluate and minimize to the extent practicable methyl and total mercury inputs from new projects in the Delta and its tributary watersheds downstream of major dams. Alternative 4 requires agencies to evaluate and implement reasonable and feasible management practices to reduce methyl and total mercury discharges inputs from existing as well as new projects. All three alternatives require dischargers to conduct mercury studies and develop management plans if changes to water management practices and/or salinity standards would result in increased methylmercury production. Alternatives 2-4 require methylmercury control studies.

Water Management and Flood Conveyance. Methylmercury production in sediment has often been a function of pore water sulfate concentrations (see Chapter 3 in the TMDL Report). Two factors influencing sulfate concentrations in the Delta are the water quality objectives for electrical conductivity and changes in water management, such as the construction of water barriers in the southern Delta. Water Rights Decision 95-1WR specifies maximum ambient electrical conductivity values for various locations in the Delta by month and water year type. Sulfate concentrations are strongly a function of electrical conductivity. As a result, Water Rights Decision 95-1WR also regulates sulfate concentration and therefore may influence sediment methylmercury production rates.

A water management decision that may affect methylmercury production in the Delta is the Record of Decision for the Bay-Delta Authority. The Record of Decision commits the Authority to evaluate and, if practical, construct a series of permanent barriers in the southern Delta as part of the South Delta Improvement Project (SDIP). This project is intended to mitigate the water supply and water quality impacts associated with increasing the maximum allowable diversion capacity into Clifton Court Forebay, from which the State Water Project pumps its water. One alternative being considered as mitigation for the effects of increased diversion is the installation of operable flow control barriers at the head of Old River and other locations in the southern Delta. These barriers would reduce the amount of San Joaquin River flow diverted down Old River towards the pumps and away from the San Joaquin River near Stockton. Operation of the permanent barriers would control the ratio of San Joaquin to Sacramento River water in much of the southern Delta.

Sulfate concentrations in the San Joaquin are about seven times higher than in the Sacramento River. Therefore, operation of the permanent barriers could exert a strong influence on sediment sulfate concentrations in the southern Delta and may influence ambient methylmercury levels. In addition, because the implementation of the SDIP would involve dredging in some southern Delta channels and construction of other in-stream structures, a CWA Section 404 permit from the USACE and a CWA Section 401 certification from the Central Valley Water Board would be required. To obtain this certification, the SDIP would need to provide adequate mitigation measures on a specific implementation timeline for the potential impacts of the project on methylmercury conditions in the southern Delta, dissolved oxygen conditions in the Stockton Deep Water Ship Channel, and any other water quality concerns. The Central Valley Water Board could use this authority to ensure the potential impacts of this project on ambient methylmercury levels in the Delta are properly evaluated and minimized. The evaluation could entail conducting studies to characterize the project's effects on the Delta's ambient sulfate and methylmercury concentrations as well as sulfate amendment studies.

The largest acreage of marsh in the Delta is in the Yolo Bypass.[35] The Yolo Bypass was constructed as a floodwater conveyance system to divert flood flows from the Sacramento Valley at Fremont Weir around the City of Sacramento. Prospect Slough, downstream of the Cache Creek Settling Basin in the Yolo Bypass, has the second highest annual average methylmercury concentration of any location in the Delta (Cosumnes River – 0.38 ng/l, Prospect Slough – 0.26 ng/l), and Shag Slough has even higher concentrations (about 0.4 to 0.9 ng/l) when it becomes an additional export site for Yolo Bypass due to flood flows from Fremont Weir spills and Cache and Putah Creeks (Stephenson *et al*., 2008). A recent CalFed study found that *in situ* methylmercury production within the Yolo Bypass averaged 40% of the methylmercury loading to the Delta from the entire Sacramento Basin (Stephenson *et al.*, 2008). The study authors found this surprising because the Yolo Bypass is only 59,000-acres while the Sacramento Basin is 16,765,000-acres or 285 times larger. When there are no flood flows in the bypass, the wetlands and other lands in the bypass have little-to-no discharge to the Delta.

Changes in flood conveyance and other water management projects could include new or modified weirs in the Yolo Bypass, new or expanded reservoirs upstream of the Delta, and changes in the *Central Valley Project – Operations Criteria and Plan, 30 June 2004* (CVP-OCAP) that result in alterations to the currently permitted water storage or release schedules (e.g., increased flows, flood frequency, or flood duration in the Yolo Bypass). If changes to the Yolo Bypass flood conveyance or other water management projects are proposed, Alternatives 2 and 3 would require responsible agencies to conduct methyl and total mercury characterization and control studies for new projects and minimize to the extent practicable any methylmercury loading to the Delta resulting from new projects. Alternative 4 also requires the evaluation of existing projects. Reasonably foreseeable methods of compliance include conducting the studies described above and evaluating potential management options.

It is speculative to guess which methylmercury reduction management practices would be incorporated for changes to water diversions and storage, changes to salinity standards in the Delta, and/or changes to Yolo Bypass flood conveyance. However, management practices for changes in water diversions and storage and salinity standards could include:

- Alternate locations for water storage reservoirs (i.e., is the proposed project in a mercury contaminated watershed?);
- Alternative project discharge patterns (volume, frequency, season);
- Engineered controls to minimize anoxic zone (e.g., aeration and circulation);
- Modification of discharge from top or bottom of reservoirs; and
- Reduction of upstream sources of total mercury.

Methylmercury management practices for the Yolo Bypass flood conveyance could include:

- Modification of flow regimes within the Yolo Bypass;

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[35] The established marshes and duck clubs are owned by the California Department of Fish and Game and by private parties. Several State and Federal agencies also have recently purchased property in the Yolo Bypass and are in the process of converting it to wetlands. See Section 6.2.2 in the TMDL Report for more information about wetland acreage in the Yolo Bypass.

- Modification of the channel geometry to route more water down the eastern side of the bypass (away from sediment inputs from the Cache and Putah Creek watersheds); and
- Active remediation or removal of mercury-contaminated sediment within the Yolo Bypass downstream of the Cache and Putah Creek watersheds.

Flood control agencies could enter into cooperative agreements with wetland managers and agricultural landowners to conduct studies to determine the cumulative effects on methylation in bypass lands caused by flood flows and management practices that minimize methylmercury production. State and federal agencies could conduct studies to evaluate the effects of water management, flood conveyance and salinity control projects on ambient methylmercury levels in the Delta.

Dredging Operations and Dredge Material Reuse. Portions of the Delta are depositional in nature. This requires sediment removal to maintain navigation channels and marinas. Recent dredge projects within the Delta have taken place in the Sacramento River Deep Water Ship Channel, Stockton Deep Water Channel, Village West Marina, Korths Pirates Lair, Big Break Marina, Sportsman Yacht Club, and Discovery Bay. The Sacramento and Stockton deep-water channels have annual dredging programs; the locations dredged each year vary. Dredging occurs at other Delta locations when needed, when funds are available, or when special projects take place. Approximately 533,400 cubic yards of sediment are dredged annually on average, with 199,000 cubic yards from the Sacramento Deep Water Ship Channel and 270,000 cubic yards from the Stockton Deep Water Channel. Other minor dredging projects at marinas remove sediment at various frequencies for a combined total of about 64,400 cubic yards per year. Dredge material typically is pumped to either disposal ponds on Delta islands or upland areas with monitored return flow.

Alternatives 2, 3 and 4 require project proponents for future dredging and within-channel excavation activities and dredge material reuse and disposal activities in the Delta/Yolo Bypass to minimize increases in methylmercury and total mercury discharges to the Delta/Yolo Bypass waterways. As noted earlier, the Sacramento Deep Water Ship Channel and Stockton Deep Water Channel dredging activities account for approximately 469,000 of the 533,400 cubic yards of sediment removed annually on average, almost 90% of the material removed.

The 2008-2009 Stakeholder Process, which included Board staff, representatives from agencies that conduct dredging operations in the Delta and other stakeholders, developed the following language that could be included in the Basin Plan language under Alternatives 2, 3 and 4:

> The following requirements apply to dredging and excavating projects in the Delta and Yolo Bypass where a Clean Water Act 401 Water Quality Certification or other waste discharge requirements are required. The Clean Water Act 401 Water Quality Certifications shall include the following conditions:
>
> 1. Employ management practices during and after dredging activities to minimize sediment releases into the water column.
> 2. Ensure that under normal operational circumstances, including during wet weather, dredged and excavated material reused at upland sites, including the tops and dry-side of levees, is protected from erosion into open waters.
>
> In addition to the above requirements, the following requirements apply to the California Department of Water Resources, U.S. Army Corps of Engineers, the Port of Sacramento, the Port of Stockton,

and other State and federal agencies conducting dredging and excavating projects in the Delta and Yolo Bypass:

1. Characterize the total mercury mass and concentration of material removed from Delta waterways (Appendix 43) by dredging activities.
2. Conduct monitoring and studies to evaluate management practices to minimize methylmercury discharges from dredge return flows and dredge material reuse sites. Agencies shall:
   - By [two years from Effective Date] project proponents shall submit a study workplan(s) to evaluate methylmercury and mercury discharges from dredging and dredge material reuse, and to develop and evaluate management practices to minimize increases in methyl and total mercury discharges. The proponents may submit a comprehensive study workplan rather than conduct studies for individual projects. The comprehensive workplan may include exemptions for small projects. Upon Executive Officer approval, the plan shall be implemented.
   - By [seven years after the Effective Date], final reports that present the results and descriptions of mercury and methylmercury control management practices shall be submitted to the Regional Water Board.

   Studies should be designed to achieve the following aims for all dredging and dredge material reuse projects. When dredge material disposal sites are utilized to settle out solids and return waters are discharged into the adjacent surface water, methylmercury concentrations in return flows should be equal to or less than concentrations in the receiving water. When dredge material is reused at aquatic locations, such as wetland and riparian habitat restoration sites, the reuse should not add mercury-enriched sediment to the site or result in a net increase of methylmercury discharges from the reuse site.

The results of the management practices studies should be applied to future projects.

Reasonably foreseeable methods of compliance could vary based on the size of a dredging project and could include but not be limited to:

All Projects:

- Employing management practices during and after dredging and excavation activities as required by existing Basin Plan objectives for sediment and turbidity to minimize sediment (and associated sediment-bound mercury) releases into the water column. Actions to minimize sediment and associated sediment-bound mercury releases into the water column could include, but are not limited to the following:
  - Use a pipeline hydraulic suction dredge or “sealed” or “environmental” clamshell bucket dredge to reduce the amount of turbidity in the water column and the amount of water produced during the dredging operation; and/or
  - Increase dredge material disposal (DMD) pond return water hold time to remove suspended material from the return flow to the maximum extent practicable.
  - These or similarly-approved methods already are required under Waste Discharge Requirements and CWA Section 401 Certifications for dredging operations to prevent exceedances of water quality objectives for turbidity. Therefore, actions to control sediment releases are part of baseline conditions for Alternatives 2, 3 and 4.
- Ensuring that under normal operational circumstances, including during wet weather, dredged material reused at upland sites, including the tops and dry-side of levees, is protected from erosion into open waters.

- Erosion prevention measures at upland sites (e.g., levee maintenance and improvement projects) include, but are not limited to the following: re-vegetation, hard bank stabilization, and biotechnical bank stabilization.
- Alternatively, dredge material could be disposed in an upland environment that has no discharge to surface water.

State and Federal Projects (e.g., Sacramento Deep Water Ship Channel and Stockton Deep Water Channel dredging activities):

- Characterizing the total mercury mass and concentration of material removed from Delta waterways by dredge activities.
    - Total mercury loads removed from Delta/Yolo Bypass waterways by dredge activities could be calculated from project-specific pre-dredge sediment core sampling mercury results and the volume of sediment removed, which is a typical metric recorded by dredge projects.
- Addressing study goals by evaluating methylmercury management practices for return flows and for the reuse of mercury contaminated dredge materials at aquatic locations by conducting monitoring and studies to evaluate management practices to minimize methylmercury discharges and then applying the results of the management practices studies to future projects. .
    - Monitoring could include characterizing methylmercury and total mercury concentrations of return waters from dredge material disposal sites and receiving waters. If return waters discharged into the adjacent surface water have methylmercury concentrations greater than the receiving water methylmercury concentrations,[36] the project proponent(s) could then conduct studies to evaluate management practices to minimize methylmercury in return flows. Management practices could include, but are not limited to, the following:
        - The return flow could be held in settling ponds or other diked disposal sites on land for a longer hold time until methylmercury concentrations decrease (e.g., through photodegradation or settling of particles). Similar practices already are required to comply with the CTR criterion of 50 ng/l for total recoverable mercury in the water column and water quality objectives for turbidity already established in the Basin Plan.[37]

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[36] Recent WDRs for dredge projects require that return water shall not cause exceedances of water quality objectives or CTR/NTR criteria for any constituent that is on the 303(d) list for the receiving water where the effluent is discharged, unless a mixing zone is granted in the Notice of Applicability. In some DMD sites, the return water is discharged directly into agricultural drainage ditches. Recent WDRs have required that, since agricultural drainage ditches are eventually discharged into rivers and sloughs in the Delta, the limits for 303(d) constituents to be met in the eventual surface water destination be applied to the drainage ditch. Hence, methylmercury requirements proposed by Alternatives 2-4 for return flow would apply to DMD sites that discharge to agricultural ditches that ultimately drain to surface waters.

[37] Page III-9.00 of the Basin Plan states the following: "Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:

- Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU.
- Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent.
- Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs.

    - Additional sediment trapping devices could be installed to decrease particle-bound methylmercury in the discharges.
    - The return flow could be disposed to land with no discharge to surface water.
  - Monitoring could also include mercury and methylmercury monitoring at aquatic sites where dredge material is disposed and, if monitoring shows methylmercury increases due to the project, proponents could conduct studies to evaluate management practices to minimize the methylmercury discharges.
    - Monitoring could include, but is not limited to, the following: seasonal pre- and post-project monitoring of methyl and total mercury concentrations in surface sediment for one year before the project commences and one year after the site has become established (e.g., two years after earth-moving and planting activities are completed); and/or seasonal pre- and post-project monitoring of total mercury concentrations in small fish.
    - If there were an increase in surface sediment methylmercury concentration that cannot be explained by pre-project variability, then after the completion of the methylmercury control studies, the project proponents could implement management practices to reduce methylation to the extent practicable, using methods that might be like those described in Sections 4.3.10 and 4.3.11.
  - Monitoring also could include characterizing pre- and post-project surface sediment concentrations through pre-dredge sediment coring for projects expected to dredge deeper in river segments than dredged by previous projects, such that the potential exists to expose sediment with mercury concentrations that are higher than ambient concentrations, which could result in an increase in *in situ* methylmercury production. If the sediment to be exposed by the project has an average total mercury concentration greater than the surface material before dredging, the project proponent could submit a workplan for Executive Officer approval that demonstrates how the project will evaluate and minimize new methylmercury loading to the Delta/Yolo Bypass. If the sediment to be exposed by the project has an average total mercury concentration greater than the surface material before dredging, follow-up actions could include, but are not limited to, the following:
    - Dredge deeper until a horizon with lower mercury levels is exposed; or
    - Continue with the project as proposed, but conduct additional pre-project methylmercury sediment concentration monitoring and post-project monitoring (e.g., monthly monitoring for at least four months) to determine the time needed for natural sedimentation to cover the exposed surface with sediment having a lower total mercury concentration.

• Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. … For Delta waters, the general objectives for turbidity apply subject to the following: except for periods of storm runoff, the turbidity of Delta waters shall not exceed 50 NTUs in the waters of the Central Delta and 150 NTUs in other Delta waters. Exceptions to the Delta specific objectives will be considered when a dredging operation can cause an increase in turbidity. In this case, an allowable zone of dilution within which turbidity in excess of limits can be tolerated will be defined for the operation and prescribed in a discharge permit.”

Recent WDRs include requirements for dredge projects to conduct chemical and physical testing of sediments that are representative of the area to be dredged before each maintenance project, as well as of DMD site return flows to receiving waters. In addition, methylmercury monitoring of dredge slurry into and discharges from several dredge material disposal ponds was recently completed (AMS, 2010) (see discussion Appendix C, Section I).

Alternatives 2-4 actions to control sediment transport and turbidity at dredging sites and erosion from dredge disposal sites already are baseline requirements to comply with Basin Plan water quality objectives for sediment and turbidity.

4.4 Evaluation of Implementation Alternatives

The following sections summarize the analysis of economic and funding considerations for each implementation alternative as required by CWC Section 13141, summarize the potential environmental effects, evaluate the possibility of each alternative enabling the attainment of the proposed water quality objectives for methylmercury in Delta/Yolo Bypass fish, consider the feasibility of each alternative, and evaluate consistency with existing federal and state regulations and policies. Detailed reviews of the existing federal and state regulations and policies, potential environmental effects, and cost considerations are provided in Chapters 6 and 7 and Appendix C, respectively.

4.4.1 Potential Environmental Effects

Basin Plan amendments are projects subject to the California Environmental Quality Act (CEQA). Adoption of the proposed Basin Plan amendments will not by itself have a physical effect on the environment, nor will the proposed Phase 1 methylmercury control studies or expansion to existing public outreach and education programs. However, implementation actions taken by responsible entities to comply with some components of Alternatives 2, 3 and 4 could impact the environment.

Alternatives 2, 3 and 4 are expected to have the same types of environmental impacts because implementation of these Alternatives would likely require the same types of control actions for point and nonpoint sources of methylmercury and total mercury. However, Alternative 3 requires more individual dischargers to implement control actions than Alternatives 2 and 4, which would increase the number of sites where control actions are required and therefore increase the potential for cumulative environmental impacts. Chapter 7 includes a detailed discussion of potential environmental impacts that could result from the implementation of Alternative 4. The following paragraphs are a summary of the conclusions of that discussion.

Reasonably foreseeable, site-specific implementation activities are expected to have no impact or insignificant impacts on most of the environmental resources identified in the Environmental Checklist if mitigation measures identified in the Chapter 7 environmental analysis (many of which are common measures associated with construction practices), or comparable methods, are incorporated. The environmental analysis identifies potential impacts that may require the implementation of mitigation measures beyond those already incorporated in existing laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. Implementing agencies may be required to incorporate mitigation in addition to common measures to protect resources listed in the following categories: Biological Resources, Geology and Soils, Greenhouse Gases Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, and Utilities and Service Systems. Some form of mitigation is possible for all of the potentially significant environmental impacts that staff identified. However, selection and performance of mitigation is within the responsibility and jurisdiction of agencies implementing the site-specific projects.

With two exceptions, all potential impacts identified in Chapter 7 are expected to be limited and mitigated to less than significant levels, if not completely avoided, through careful project planning, design, construction, and maintenance.

The implementation of methylmercury management practices to achieve safe fish mercury levels in the Yolo Bypass under Alternatives 2, 3 and 4 has the potential to result in cumulatively considerable impacts to habitat that supports endemic species with limited geographic ranges, such as Sacramento splittail and Delta smelt. Until the proposed Phase 1 control studies have been completed, it is unknown whether the wetlands that act as substantial methylmercury sources in the Yolo Bypass also provide critical habitat to endemic species, and whether it will be possible to avoid all potentially significant impacts. However, the environmental analysis in Chapter 7 identified several methods to minimize negative effects on wetland function, including but not limited to:

- Implement only those onsite methylmercury management practices that do not change desirable wetland functions;
- Focus implementation of management practices on wetland habitats that do not support endemic species with a limited geographic range;
- Reduce upstream methylmercury sources and/or sources of mercury-contaminated sediment that supply the wetland sites;
- Participate in an offset program, if one is approved; and,
- For new habitat restoration projects, locate new wetlands away from mercury-contaminated watersheds.

In addition, as summarized in the next section and detailed in Appendix C, the potential costs of complying with requirements for studies, monitoring and implementation actions under Alternatives 2, 3 and 4 are substantial. The 2008-2009 Stakeholder Process participants identified the following potential economic impacts that could result from the estimated methylmercury study and control costs:

- Additional financial burden on growers could result in agricultural land being taken out of production. Because nearly all of the agricultural land in the Delta is considered Prime Farmland, this is of particular concern.
- For wetland restoration and management projects already underway with fixed budgets, methylmercury study and management costs could result in less wetland acreage being actively managed or restored.
- Municipalities may need to decrease other services in order to shift financial resources towards conducting studies and implementing additional best management practices and source controls to reduce methyl and inorganic mercury discharges.

Alternatives 2-4 all incorporate components that provide options that can enable parties responsible for conducting studies and control actions to lessen potential economic impacts. However, as noted previously, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. None-the-less, dischargers can choose to minimize potential economic impacts by the following means:

- Study costs can be decreased if dischargers develop coordinated and collaborative study plans.
- Implementation costs can be decreased if:
    - Entities responsible for meeting subarea methylmercury allocations collaboratively focus implementation efforts on sources with the most feasible methylmercury reduction measures (i.e., measures that are cost effective and do not have significant environmental impacts) within each subarea; and
    - Entities responsible for meeting both waste load and load allocations help develop and participate in an offset program or other watershed approach to implementation.

In addition, the proposed Basin Plan amendments include the commitment for the Board to re-consider the allocations based on an assessment of the economic feasibility of potential methylmercury control methods identified by the Phase 1 control studies. Modification of the allocations during the Phase 1 Program Review could affect potential economic impacts. Also, study, monitoring and implementation costs could be lessened by financing from a number of different sources (e.g., state and federal grants and low-interest loan programs and Supplemental Environmental Projects; see Section 7.4 in Chapter 7 for more examples).

Alternatives 2, 3 and 4 all include exposure reduction and mercury control programs for the Delta that incorporate a phased, adaptive management approach that would evaluate additional information as it becomes available and adapt the exposure reduction and control programs so that effective and efficient actions can be taken that minimize the potential for adverse environmental effects. Nonetheless, unavoidable adverse environmental effects, including economic impacts, may result from implementation of the proposed control program. The majority of these effects can be mitigated to less than significant levels, but mitigation measures lie within the jurisdiction of agencies implementing site-specific projects.

As noted in Section 7.5 (Statement of Overriding Considerations), the Central Valley Water Board staff has evaluated the environmental and other benefits of a mercury control program against the potentially unavoidable environmental risks in determining whether to recommend that the Central Valley Water Board approve a control program. Upon review of the environmental information generated and in view of the entire supporting record, staff recommends that the Central Valley Water Board conclude that the specific environmental and other benefits of a mercury control program outweigh the potentially unavoidable adverse environmental effects, and that such adverse environmental effects are acceptable under the circumstances in order to protect the health of wildlife and humans who consume contaminated Delta fish. The available environmental information documented in this staff report supports such a finding.

4.4.2 Cost Considerations

The Porter-Cologne Water Quality Control Act (CWC §13141) requires consideration of economics when water quality objectives are established, and requires that "prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of financing, shall be indicated in any regional water quality control plan."

Alternative 1 (No Action) incurs the fewest costs. The only costs associated with Alternative 1 are those incurred through the (a) expansion of existing public education and outreach programs to reduce the risk of mercury exposure to people who eat Delta fish and (b) ambient water and fish monitoring. Some key differences between Alternatives 2, 3 and 4 that affect their implementation cost are:

- Alternative 2 does not require any point sources to implement pollution prevention measures for mercury while Alternative 3 requires three MS4s and large WWTPs throughout the Delta and its tributary watersheds to implement total mercury pollution prevention measures and control actions, and Alternative 4 requires the same three MS4s and all facilities (not just large WWTPs) within the Delta/Yolo Bypass (but not the tributary watersheds) to implement pollution prevention measures.
- Alternatives 2 and 3 require new water/flood management projects that have the potential to increase methylmercury and/or total mercury loading to the Delta/Yolo Bypass to evaluate their potential effects and implement projects to minimize any increase in loading, while Alternative 4 expands that requirement to include existing water/flood management projects.
- Alternative 4 requires reductions in open-water methylmercury inputs in more subareas than do Alternatives 2 and 3.
- Alternatives 3 and 4 require methylmercury load reductions from six small watersheds that are not 303(d)-Listed as mercury impaired but drain directly to the Delta/Yolo Bypass, which are not included in Alternative 2.

The Central Valley Water Board does not specify the actual means of compliance by which responsible entities (e.g., dischargers, agencies or other persons responsible for implementing total mercury and/or methylmercury control actions) choose to comply with requirements included in the Basin Plan amendments. In addition, until the proposed Phase 1 methylmercury control studies are completed, evaluation of costs for potential methylmercury control actions for many sources is difficult.

Therefore, to estimate the potential overall cost of implementing Alternatives 1, 2, 3, and 4, assumptions were made regarding the overall number and types of actions that may be implemented to comply with amendment requirements. Appendix C provides explanations of how costs were estimated along with general assumptions. Alternative 2 costs for each source category evaluated in Appendix C are equal to or less than Alternative 3 costs. In contrast some components of Alternative 3 are more costly than Alternative 4, while others are expected to be less costly. Table 4.5 at the end of this section summarizes the potential costs for Alternatives 3 and 4 by source and activity (e.g., Phase 1 methylmercury studies, total mercury minimization actions by point sources, monitoring, and Phase 2 methylmercury control actions).

Table 4.4 summarizes key cost estimates for Alternatives 3 and 4 from Table 4.5. Table 4.5 focuses on costs to existing sources for Alternatives 3 and 4. Appendix C explains how cost estimates in Table 4.5 were developed and also reviews potential costs to new methylmercury sources in the Delta/Yolo Bypass that begin discharging during Phase 1, existing methylmercury sources in the tributary watersheds that are not listed as mercury-impaired under CWA Section 303(d), as well as the potential costs that could be associated with a local and statewide effort to evaluate and reduce air emissions.

The estimates represent only those costs that would be incurred for activities not already required under existing regulations and permits, that is, only costs associated with adoption of this proposed mercury control program are included. Study costs are presented in terms of total dollars for the studies. Staff assumed a project life of 30 years to develop standardized annual costs for ongoing actions – monitoring, exposure reduction, and implementation and maintenance of methyl and total mercury control projects – that could be implemented for several decades or longer.

Cost estimates for risk reduction activities, compliance monitoring, total mercury pollution prevention actions by point sources, and Phase 1 studies are realistic estimates. The estimated costs for Phase 2 methylmercury control actions are more speculative and will be re-evaluated at the end of Phase 1 when the Phase 1 control studies are completed and the Board evaluates which sources have feasible, cost effective methylmercury management practices and which allocations may need to be amended.

Alternative 1 entails no costs to agriculture. Alternatives 3 and 4 entail more costs for irrigated agriculture than Alternative 2 because they require methylmercury load reductions from several watersheds – Cosumnes River, French Camp Slough, Morrison Creek, Ulatis Creek, Upper Lindsay/Cache Slough, and Willow Slough – that are not 303(d)-Listed as mercury impaired but drain directly to the Delta/Yolo Bypass. Agricultural land uses comprise about 50% of the land cover in these watersheds. Hence, it is reasonably foreseeable that methylmercury management practices for agricultural lands may need to be implemented in these watersheds; however, potential costs will be re-evaluated once additional watershed source analyses have been conducted. Agricultural costs associated with Alternatives 2 through 4 break down as follows:

			Alternative	
Delta TMDL Program Component	Low	High	2	3 & 4
Phase 1 MeHg control studies:	$290,000	$1.4 million	√	√
Compliance monitoring:	$14,000/yr	$25,000/yr	√	√
Phase 2 MeHg management practices for agricultural areas in the Delta/Yolo Bypass:	$220,000/yr	$460,000/yr	√	√
Phase 2 MeHg management practices for agricultural areas in watersheds not 303(d)-Listed:	$370,000/yr	$830,000/yr		√

The agricultural implementation costs are based on the relatively expensive assumption that farmers would reduce methylmercury discharges by installing tailwater recovery systems and micro-irrigation systems for 10% to 20% of flood-irrigated agricultural lands in upland areas in the Delta/Yolo Bypass and upstream watersheds that are not currently listed as mercury-impaired under CWA Section 303(d). Agricultural lands encompass about 350,000 acres in the Delta subareas that require methylmercury source reductions and about 536,000 acres in the upstream watersheds that are not currently 303(d) listed as mercury-impaired (see Table C.17 in Appendix C and Table 6.9 in the TMDL Report for acreage information). Consequently, the implementation cost estimate for Delta/Yolo Bypass agricultural areas, $220,000/yr to $460,000/yr, equates to a per acre cost range of $0.63/acre/yr to $1.31/acre/yr; the implementation cost estimate for the agricultural areas in the upstream watersheds not currently 303(d) listed as mercury-impaired, $370,000/yr to $830,000/yr, equates to a per acre cost range of $0.69/acre/yr to $1.55/acre/yr.

It is expected that the Phase 1 control studies will develop more cost-effective methods of complying with the methylmercury allocations. Potential funding sources include those identified in the San Joaquin River Subsurface Agricultural Drainage Control Program and the Pesticide Control Program sections in Chapter IV of the Basin Plan.

As shown below, the total Phase 2 implementation costs estimated for Alternatives 3 and 4 (Table 4.4) are comparable to costs estimated for other TMDL implementation programs in the region:

TMDL Implementation	Estimated Annual Cost (averaged over 30 years)
Delta – Methylmercury:	Alternative 3: $2.4 to $18.1 million Alternative 4: $3.9 to $26.5 million
Cache Creek – Methylmercury: (Cooke and Morris, 2005)	$1.2 million
Clear Lake – Total Mercury: (Cooke and Morris, 2002)	$1.7 to $5.5 million
San Francisco Bay – Total Mercury: (Johnson & Looker, 2004; SFBRWQCB, 2006)	$530,000 to $3.5 million
Delta – Diazinon/Chlorpyrifos: (McClure *et al.*, 2006)	$6.4 to $14 million
Sacramento & Feather Rivers – Diazinon/Chlorpyrifos: (Hann *et al.*, 2007)	$300,000 to $7.7 million
Stockton Deep Water Ship Channel – Dissolved Oxygen: (Gowdy and Grober, 2005)	$530,000
San Joaquin River (Lower) – Salt & Boron: (Oppenheimer and Grober, 2004)	$27 to $38 million

The Delta methylmercury TMDL implementation program costs more than the other mercury programs because it addresses a much larger geographic area and more types of sources (point and nonpoint sources of total mercury and methylmercury). For example, the San Francisco Bay TMDL implementation cost considerations addressed only those potential costs for controlling total mercury discharges from point sources (NPDES-permitted facilities and MS4s). The Clear Lake and Cache Creek TMDLs' cost estimates addressed the remediation of mines and contaminated sediments in the watersheds.

In addition, the Delta methylmercury control program is not the first to include requirements for studies. The control program for low dissolved oxygen in the Stockton Deep Water Ship Channel also required that responsible parties conduct studies estimated to cost $15.6 million (Gowdy and Grober, 2005). This cost is comparable to the estimated study costs for methylmercury sources in the Delta: $4.4 million to $11.8 million for Alternative 3 and $5.5 million to $14.7 million for Alternative 4. A control study that evaluates mercury emissions in and upwind of the Delta source region and load reduction options could cost about $1.5 million to $3 million under both Alternatives 3 and 4.

As described in the previous section and in Section 7.4 in Chapter 7, the potential economic impacts of the study and monitoring costs can be reduced by developing coordinated study plans and regional monitoring programs. Financial impacts related to studies, monitoring and implementation costs to agricultural, municipal, and other point and nonpoint sources could also be reduced by financing from a number of different sources (e.g., state and federal grants and low-interest loan programs and Supplemental Environmental Projects; see Section 7.4 for more examples).

Table 4.4: Summary of Key Cost Estimates for Alternatives 3 and 4.

Activity	Alternative 3 Costs		Alternative 4 Costs	
	Low	High	Low	High
Phase 1 methylmercury control studies (total cost)	$4.4 million	$11.8 million	$5.5 million	$14.7 million
Monitoring by point and nonpoint sources (annual cost)	$253,900	$275,900	$74,900	$96,900
New mercury-specific pollutant minimization actions by point sources (annual cost)	$3.6 million	$7.3 million	$1.8 million	$3.7 million
Phase 2 methylmercury control actions (annual cost)	$2.4 million	$18.1 million	$3.9 million	$26.5 million

Table 4.5: Summary of Estimated Costs for Implementation Alternatives 3 and 4.[a]

Category	Action	Alternative 3 Costs		Alternative 4 Costs		Term [b]
		Low	High	Low	High	
Cache Creek Settling Basin	Develop a long-term mercury reduction strategy	$1.6 million	$1.6 million	$1.6 million	$1.6 million	Total
	Improve sediment/total mercury trapping efficiency	$600,000	$3.8 million	$600,000	$3.8 million	Annual
NPDES permitted facilities	Effluent (Alt 3-4) and receiving water (Alt 3 only) monitoring for MeHg & TotHg	$216,000	$216,000	$37,000	$37,000	Annual
	MeHg control study	$500,000	$1.3 million	$500,000	$1.3 million	Total
	TotHg minimization actions	$3.6 million	$7.3 million	$1.8 million	$3.7 million	Annual
	MeHg control actions in the Delta to comply with MeHg allocations	$0	$7.4 million	$0	$7.4 million	Annual
NPDES permitted MS4s	Urban runoff & receiving water monitoring for MeHg & TotHg	$9,900	$9,900	$9,900	$9,900	Annual
	MeHg control studies	$120,000	$1.1 million	$120,000	$1.1 million	Total
	TotHg pollution prevention & best management practices	$11,000	$46,000	$11,000	$46,000	Annual
	MeHg management practices in the Delta to comply with MeHg allocations	$83,000	$260,000	$83,000	$260,000	Annual
Wetlands	MeHg monitoring for wetlands	$14,000	$25,000	$14,000	$25,000	Annual
	MeHg control studies	$730,000	$4.7 million	$730,000	$4.7 million	Total
	MeHg management practices for existing managed wetlands to comply with MeHg allocations	$212,000	$289,000	$212,000	$289,000	Annual
Agricultural lands	MeHg monitoring for irrigated agriculture	$14,000	$25,000	$14,000	$25,000	Annual
	MeHg control studies	$290,000	$1.4 million	$290,000	$1.4 million	Total
	MeHg management practices in the Delta to comply with MeHg allocations	$220,000	$460,000	$220,000	$460,000	Annual
Yolo Bypass flood conveyance	Baseline characterization and MeHg control studies for existing (Alt 4 only) and new (Alt 3-4) projects	$336,000	$662,000	$1.1 million	$3.0 million	Total
	Implement MeHg management practices for projects as needed	$820,000	$1.6 million	$1.6 million	$3.2 million	Annual
Water management practices	MeHg control studies for existing (Alt 4 only) and new (Alt 2-4) projects	$540,000	$770,000	$900,000	$1.3 million	Total
	Implement MeHg management practices for projects as needed	$460,000	$4.2 million	$1.2 million	$11 million	Annual
Dredging within the Delta	Phase 1 evaluation of MeHg & TotHg at dredge project sites, dredge material disposal pond discharges, & dredge material reuse areas	$300,000	$300,000	$300,000	$300,000	Total
	MeHg management practices	$21,000	$46,000	$21,000	$46,000	Annual
Exposure reduction efforts	Expand public education and human health risk management programs	$130,000	$130,000	$130,000	$130,000	Annual

Table 4.5: Summary of Estimated Costs for Implementation Alternatives 3 and 4.[a]

Category	Action	Alternative 3 Costs		Alternative 4 Costs		Term [b]
		Low	High	Low	High	
Reporting to the Board & adaptive management efforts	Funding a Technical Advisory Committee	$120,000	$280,000	$120,000	$280,000	Total
	Phase 1 Studies coordination & progress reports to the Board (Board staff time over 7 years)	$35,000	$50,000	$35,000	$50,000	Annual
	Re-evaluation of Delta MeHg TMDL/implementation program at the end of Phase 1 (Board staff time over 2 years)	$130,000	$190,000	$130,000	$190,000	Annual
	Periodic (every 10 years) evaluation & adaptation of the control program based on new information from monitoring, special studies, and scientific literature	$4,500	$13,000	$4,500	$13,000	Annual
Surveillance and monitoring program	Periodic fish-tissue MeHg monitoring in the Delta to determine compliance with the fish tissue objectives	$7,200	$12,000	$7,200	$12,000	Annual
	Periodic water-column MeHg monitoring in the Delta to determine compliance with the tributary MeHg allocations & to re-evaluate the TMDL fish-water linkage	$7,500	$17,000	$7,500	$17,000	Annual
MeHg and TotHg offset program	Develop & implement Phase 1 pilot offset projects	$200,000	$200,000	$200,000	$200,000	Total
	Development of Phase 2 offset program	$775,000	$1.2 million	$775,000	$1.2 million	Total

(a) Appendix C describes the assumptions upon which this summary is based. All costs are 2007 dollars.
(b) Study costs are presented as the total costs to complete the studies entailed by Implementation Alternative 3 and 4. Monitoring and implementation costs are presented as annual costs standardized to a 30-year project life

4.4.3 Attainment of Water Quality Objectives

Although Alternative 1 requires an exposure reduction program (i.e., public outreach and education and other activities with fish consumers to reduce mercury exposure), it does not require active methyl or total mercury control actions. Alternative 1 relies on continued natural erosion and transport of sediments containing mercury out of the Delta and its tributaries and passive dilution of streambed sediments by cleaner, incoming sediment to decrease concentrations of mercury in surficial sediment, thereby decreasing methylmercury production in the Delta. Methyl and total mercury would continue to be discharged from point and nonpoint sources in the Delta. Mercury-contaminated sediments would continue to erode from channels downstream of inactive mercury and gold mines in tributary watersheds and be transported to the Delta and San Francisco Bay.

Because Alternative 1 allows continued discharge from point and nonpoint sources in the Delta and its tributary watersheds, it is highly unlikely that the fish tissue objectives would be reached through natural erosion and passive dilution alone within the next several centuries, if at all in some areas of the Delta. The same would be true for complying with the San Francisco Bay mercury TMDL implementation program's allocation for total mercury from the Central Valley. In addition, because anticipated population growth, habitat restoration projects, and changing water management practices in the Delta/Yolo Bypass and its tributary watersheds may lead to increases in methylmercury levels in Delta waters, fish tissue methylmercury levels are likely to increase in the Delta before any reductions are seen due to passive dilution of streambed sediments by cleaner, incoming sediment.

Proposed fish tissue objectives are expected to be achieved under Alternatives 2 through 4. These three alternatives would implement control actions focused on reducing methylmercury concentrations in Delta waters to 0.06 ng/l, which should result in fish tissue concentrations being reduced to levels protective of humans and wildlife consuming local fish. Staff estimates that fish tissue objectives will be achieved approximately five to ten years (two to three fish life cycles) after the methylmercury goal for ambient water is met. More rapid decreases in fish tissue concentrations are expected to occur soon after the major control actions are completed, with more gradual declines in fish tissue concentrations occurring as sediment concentrations continue to decline through natural erosion.

Both Alternatives 2 and 3 should prevent fish mercury levels from increasing by minimizing methylmercury inputs from new discharges to the Delta and its source region. Alternative 4 minimizes methylmercury inputs from new point and nonpoint discharges to the Delta by including requirements for new water/flood management projects in the upstream watersheds. Upstream TMDL programs will need to address other new point and nonpoint sources.

Alternative 2 focuses total mercury load reduction efforts on sources in the tributary watersheds with no limits for other point and nonpoint sources in the Delta and its tributary watersheds downstream of major dams. Almost all the total mercury loading to the Delta and Yolo Bypass comes from nonpoint sources in the tributary watersheds. In addition, the San Francisco Bay mercury TMDL implementation program expects the Central Valley to meet its total mercury load allocation in twenty years and has an interim milestone of half the allocation in ten years. Actions contained in the Cache Creek mercury control program require mines to be remediated and other projects to reduce mercury loading. In addition, there are ongoing mercury studies in the Yuba and Bear River watersheds within the Feather River watershed currently evaluating sources of mercury. Therefore, focusing reduction efforts on upstream nonpoint sources of total mercury would make the implementation program likely to succeed in measurably reducing total mercury loads to the Delta.

Alternative 3 is different from Alternative 2 in that it also requires:

- Proponents for activities that have the potential to increase total mercury loading to the Delta/Yolo Bypass because of population growth and climate change (e.g., new WWTP and MS4 discharges and modifications to reservoir releases, flood conveyance and levee development and maintenance) to evaluate the potential impacts of their projects on total mercury loading and implement control actions to minimize their total mercury discharges; and
- Large point sources in the Delta and its tributary watersheds downstream of major dams to minimize their total mercury discharges.

Alternative 4 is different from Alternative 3 in that it more directly addresses open-water sources of methylmercury and the effects of both existing and new water/flood management projects, and it does not have requirements for large point sources of total mercury in the Delta's tributary watersheds.

Alternatives 3 and 4 are more likely to prevent fish mercury levels from increasing than is Alternative 2 because they directly address future sources of both methylmercury and total mercury. Given the proximity of many of the Central Valley point source discharges to the Delta, assigning both methylmercury and total mercury control actions to point and nonpoint sources to minimize the impacts of increased growth and climate change is an equitable manner to apportion control responsibility that does not hinder urban development and water management.

Alternative 2 would require methylmercury reductions only from large point and nonpoint sources (except atmospheric deposition, open water habitats, and nonpoint source urban runoff) that (a) discharge to Delta/Yolo Bypass subareas that do not achieve the proposed fish tissue objectives and (b) do not act as dilution (i.e. discharge concentrations greater than the proposed methylmercury goal for ambient Delta waters). Alternatives 3 and 4 would require methylmercury reductions from all point and nonpoint sources regardless of their relative discharge amount (with the same exceptions as Alternative 2). Alternatives 3 and 4 have a more equitable approach that is more likely to succeed because (1) the MS4 and nonpoint source categories are each typically comprised of a myriad of individual discharges (no one discharge point accounts for all the loading) and, more importantly, (2) it is not yet known which methylmercury sources will be the easiest to control (it may be more cost-effective to reduce many small sources by a small amount than to reduce just a couple sources by a great amount).

Although the proposed fish tissue objectives are expected to be achieved under Alternatives 2 through 4, the time taken to achieve the objectives may be different. Alternative 2 likely would take longer to achieve the objectives than Alternatives 3 and 4 because it relies on reducing fewer sources, which could limit control options. Alternative 4 likely would take less time to achieve the objectives than Alternative 3 because, even though it relies on upstream TMDL programs not yet developed to address other new point and nonpoint sources, it more directly addresses open-water sources of methylmercury and the effects of both existing and new water/flood management projects in the Delta and its tributary watersheds, which, given the results of the source analysis in the TMDL Report, likely have a greater contribution to methylmercury loading in the Delta than do point sources in the tributary watersheds.

Although none of the alternatives include methylmercury allocations for individual sources upstream of the Delta/Yolo Bypass, at the request of stakeholders, Alternative 4 includes a schedule for the completion of major upstream TMDLs in the Phase 1 schedule. Staff recommends the following schedule: 2012 – American River; 2016 – Feather, Sacramento, San Joaquin, and Mokelumne Rivers, and Marsh and Putah Creeks; and 2017 – Cosumnes River and Morrison Creek. As described in more detail in Section 4.4.5, this schedule is consistent with the timelines in the State Water Board's "Strategic Plan Update 2008-2012". Because of the Strategic Plan timeline goals, Board staff will need to complete TMDLs for the before-mentioned water bodies and more during Phase 1 of the Delta program. Having a Phase 1 schedule specific to the Sacramento, American, Feather, and Mokelumne Rivers and Marsh, Putah, and Morrison Creeks is not expected to cause Alternative 4 to take less time to implement than Alternative 3; however, it will help prioritize the order in which the upstream TMDLs are developed.

4.4.4 Feasibility

This section examines the technical feasibility of the four implementation alternatives. Actions are considered technically feasible if current technology and remediation practices are available for the various projects.

Implementation Alternative 1 is technically feasible because (a) proposed exposure reduction activities are based on existing programs, and (b) no remediation activities are proposed.

Implementation Alternatives 2 through 4 address both total and methylmercury sources. Regarding total mercury control actions, these Alternatives are technically feasible. Erosion control BMPs, sediment control BMPs, and mercury control methods have been successfully developed and implemented by MS4s, WWTPs, and facilities with air emissions elsewhere in California and the United States. Total mercury reductions through mine remediation projects are considered feasible because mines have been remediated successfully in other parts of the Central Valley. Metal mines such as Walker Mine, Penn Mine, Iron Mountain Mine, and numerous smaller mines in the Lake Shasta watershed have significantly reduced their metal loading into surface waters by greater than 95%.[38] Similarly, inactive mines in the Cache Creek watershed are expected to be able to reduce anthropogenic sources of mercury loading by 95%. Initial remediation efforts are underway at the Abbott and Turkey Run mines in the Cache Creek watershed; monitoring results are not yet available. In addition, management practices for erosion control in mercury-enriched areas are feasible, as management practices have been developed for erosion controls. The less viable activities may include sediment removal in the

[38] Personal communication from Central Valley Water Board Redding staff.

channels contaminated with legacy mercury in areas where vehicle and equipment access is difficult or where there are sensitive habitats. Active or passive remediation of geothermal springs may be technically feasible, but treatment may not be practical if the springs are too remote.

Regarding methylmercury sources, Alternatives 2, 3 and 4 are technically feasible. Methods for accurate methylmercury sample collection and analysis are well developed. Methylmercury production has been found to be a function of the total mercury content of the sediment (see Section 3.3 in the TMDL Report); hence, reducing total mercury discharges from the watersheds that export the largest volumes of mercury-contaminated sediment to the Delta and Yolo Bypass would reduce the amount of methylmercury produced by Delta/Yolo Bypass sediments. In addition, available data indicate that detailed evaluations of methylmercury sources likely will reveal management measures to minimize methylmercury loads. For example, monitoring results from municipal WWTPs indicate that 28 of 65 facilities have effluent concentrations less than 0.06 ng/l, and that some facilities have higher effluent methyl to total mercury ratios than others (Appendix G in the TMDL Report and Bosworth *et al.*, 2010). The initial results for the City of Stockton WWTP indicate that treatment plant upgrades and/or operation changes might lead to discharge reductions in multiple pollutants (e.g., ammonia, total mercury, and methylmercury). A similar pattern is seen in preliminary data from studies of different types of wetlands in the Sacramento and San Joaquin River Basins: high aqueous and fish methylmercury concentrations in some, and low methylmercury concentrations in others (see Section 3.5 in the TMDL Report). These patterns indicate that it will likely be feasible to control methylmercury from some sources through design, management, and control options.

4.4.5 Compliance with Existing Federal and State Regulations and Policies

This section briefly describes how the implementation alternatives comply with existing federal and state regulations and policies. A more detailed review is in Chapter 6. Table 4.6 lists the regulations and policies that were evaluated.

Implementation Alternative 1 is not consistent with federal and state regulations and policies because it is not expected to attain mercury levels in fish that are safe for human and wildlife consumption. This alternative allows existing point and nonpoint methyl and total mercury sources to continue discharge at their current rates and for new sources to increase the methylmercury concentration and total mercury loading in Delta waters, which ultimately would result in further degradation of fish mercury levels.

Implementation Alternatives 2, 3 and 4 are consistent with all federal regulations and State and Central Valley Water Board policies. Alternatives 3 and 4 would be better able to achieve the long-term goals of the Consolidated Toxic Hot Spots Cleanup Plan and various anti-degradation policies (e.g., prevent the creation of new toxic hot spots and further pollution of existing hot spots) by directly addressing future point sources of total mercury in addition to future sources of methylmercury.

Alternatives 2, 3 and 4 are consistent with the California Wetlands Conservation Policy in that they do not entail a net loss in the quantity of wetlands acreage in California. As discussed in Section 4.4.1 and Chapter 7, the implementation of methylmercury management practices conceivably could affect the habitat function of wetlands. However, as noted earlier, there are measures that would enable the Delta TMDL implementation program to minimize, if not avoid altogether, negative effects on wetland function. Alternatives 2 through 4 also could result in an increase in procedural complexity for the administration of state and federal wetlands conservation programs. Both alternatives require state and federal wetland managers to participate in methylmercury studies and consider methylmercury control requirements for wetland restoration projects.

Alternative 4 includes a schedule for the completion of major upstream TMDLs in the Phase 1 schedule. Staff recommends the following schedule: 2012 – American River; 2016 – Feather, Sacramento, San Joaquin, and Mokelumne Rivers, and Marsh and Putah Creeks; and 2017 – Cosumnes River and Morrison Creek. For Alternatives 2 through 4, as described in Section 4.3.5, Phase 1 studies would conclude seven years after the effective date of the Basin Plan amendments for the Delta mercury control program, and Board staff would work with a stakeholder process to review the study results and develop program amendments for the Board members within the next two years. If the USEPA approves the Delta TMDL in 2011, Phase 1 studies would be completed by 2018 and the Board would re-evaluate the control program in 2020. Alternatives 2 through 4 all have a Phase 2 compliance date of 2030. The State Water Board's "Strategic Plan Update 2008-2012"[39] (SWRCB, 2008) has timelines that also need to be considered:

- "Goal 1. Implement strategies to fully support the beneficial uses for all 2006-listed water bodies by 2030";
- "Objective 1.1. Implement a statewide strategy to efficiently prepare, adopt, and implement TMDLs, which result in water bodies meeting water quality standards, and adopt and begin implementation of TMDLs for all 2006-listed water bodies by 2019".

Alternative 4's Phase 1 schedule for the completion of major upstream TMDLs, and the Phase 2 compliance date of 2030 associated with Alternatives 2 through 4, are consistent with the State Water Board's Strategic Plan timeline.

[39] The final Strategic Plan Update, adopted by the State Water Resources Control Board on 2 September 2008, is available at:
http://www.waterboards.ca.gov/water_issues/hot_topics/strategic_plan/docs/final_draft_strategic_plan_update_090208.pdf

Table 4.6: Federal and State Regulations and Policies Relevant to Development of Water Quality Objectives and Implementation Plans

FEDERAL	
• Clean Water Act (40 CFR §131.11 (b) *et seq.*, §401 and §404) • Antidegradation Policy (40 CFR §131.12) • Federal & State Endangered Species Acts (50 CFR *et seq*., California Fish and Game Code §2050-2116 *et seq.*) • Clean Air Act (42 U.S.C. §7401, et seq.)	
STATE WATER BOARD	
• Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy) (Resolution No. 68-16) • Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Resolution No. 74-43) • Sources of Drinking Water Policy (Resolution No. 88-63) • Pollutant Policy Document (Resolution No. 90-67) • Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 (Resolution No. 92-49) • Consolidated Toxic Hot Spots Cleanup Plan (Resolution No. 99-065 2004-0002) • Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Resolution No. 99-114 and 2004-0030)	• Water Quality Enforcement Policy (Resolution No. 2002-0040) • Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Resolution No. 2005-0019) • Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (Resolution No. 2005-0050) • Mercury Fish Tissue Objectives and TMDL for Mercury in San Francisco Bay (Resolution No. 2007-0045) • Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits (Resolution 2008-0025) • Policy for Water Quality for Recycled Water (Resolution 2009-0011)
CENTRAL VALLEY WATER BOARD	
• Urban Runoff Policy • Controllable Factors Policy • Water Quality Limited Segment Policy • Antidegradation Implementation Policy	• Application of Water Quality Objectives Policy • Watershed Policy • Policy in Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants
OTHER POLICIES AND PROGRAMS	
• California Mercury Reduction Act • DTSC Universal Waste Rule • CalFed Bay-Delta Program • Delta Protection Act of 1992 • California Wetlands Conservation Policy • Delta Vision Strategic Plan • Habitat Conservation Plans and Natural Community Conservation Plans • Bay Delta Conservation Plan	• Federal Bay-Delta Leadership Committee • Water Bond- 2009 Comprehensive Water Package • Global Warming Solutions Act of 2006 • CEQA Guidelines for Greenhouse Gas Emissions • California Air Resources Board's Climate Change Scoping Plan • California Natural Resources Agency's California Climate Adaptation Strategy

4.5 Recommended Implementation Alternative

Proposed fish tissue objectives are not expected to be achieved under Alternative 1 (No Action). This alternative allows existing point and nonpoint methyl and total mercury sources to continue to discharge at their current rates, and allows new sources to increase the methylmercury concentration and total mercury loading in Delta waters. As noted earlier, natural erosion and sediment deposition eventually will reduce sediment mercury concentrations, but the continuing inputs make significant improvements unlikely for centuries to come if at all. As a result, Board staff does not recommend the implementation of Alternative 1 and it is not discussed further.

In the February 2008 staff report, Central Valley Water Board staff recommended Implementation Alternative 3 for adoption into the Basin Plan. Since then, staff developed Alternative 4 to represent the combination of options identified by the 2008-2009 Stakeholder Process.

Alternatives 3 and 4 are both more equitable and more likely to succeed at achieving safe fish mercury levels in the Delta than Alternative 2 because they requires studies and implementation actions for a broader range of methylmercury and total mercury sources in the Delta and its tributary watersheds, and they directly address future sources in the Delta, Yolo Bypass and tributary watersheds.

Unlike Alternatives 3 and 4, Alternative 2 does not address new point and point sources of total mercury in the Delta and tributary watersheds. Although available information indicates that point sources of total mercury in and upstream of the Delta are relatively small compared to nonpoint sources upstream of the Delta, they are expected to increase as a consequence of population growth. In addition, as noted earlier, changes to existing water resource and flood management projects and new projects could cause increases in total mercury loading to the Delta. The decision to reduce loads from some existing total mercury sources while allowing some sources to increase loading without limit would be based solely on a subjective evaluation of which projects are more valuable to the citizens of California. As a result, Alternatives 3 and 4 are more preferable.

Alternative 2 includes allocations that focus reduction requirements on large point and nonpoint methylmercury discharges in the Delta/Yolo Bypass (e.g., large NPDES facilities and MS4s, and large tracts of wetlands), while Alternatives 3 and 4 include allocations that entail load reductions from both small and large dischargers. Available information indicates that technologies or management practices may be able to reduce methylmercury discharges from at least some sources. However, more studies are needed. At this time it is not known which types of existing or future methylmercury sources would be the most feasible to control. It is very conceivable that it may be more feasible to reduce inputs from many small dischargers than to focus on only the largest dischargers. As a result, Alternatives 3 and 4 are more preferable.

Both Alternatives 2 and 3 included Phase 1 (interim) methylmercury concentration limits for NPDES facilities and large MS4s, while Alternative 4 includes Phase 1 total mercury mass limits for NPDES facilities. Phase 1 (interim) limits under Alternatives 2, 3 and 4 would be assigned in NPDES permits; these interim limits would be added to NPDES permits during the normal course of permit renewal cycles. Phase 1 limits would be assigned to NPDES facilities that begin discharging to the Delta or Yolo Bypass during Phase 1 once sufficient data are available. The 2008-2009 Stakeholder Process identified conflicting opinions on whether the Phase 1 effluent limits for NPDES discharges should be based on both total mercury and methylmercury or just total mercury, and whether the limits should be set to current performance levels or incorporate reductions. Staff agrees with the discharger concerns that setting limits for methylmercury even at current levels could lead to unavoidable exceedances if methods for controlling methylmercury in discharges are not well understood for every facility and control methods have not been clearly identified for every facility until the completion of Phase 1 studies, several years from now. In addition, Alternative 4 sets the effluent total mercury mass limits at current performance levels during Phase 1 as pollutant minimization programs (PMPs) and pollution prevention measures are expected to be effective at maintaining current performance. As described in Appendix C Sections C.4 and D.4 and Table C.23, many of the facilities and large MS4s have already implemented mercury-specific PMPs. Even without the TMDL adoption, future NPDES permits for the remaining facilities and large MS4 are expected to include requirements for PMPs. As noted in earlier paragraphs of this section, requiring greater total mercury reductions than those that could be achieved by PMPs is not expected to be an effective means of reducing overall total mercury loads to the Delta. Staff also concurs with MS4 permittee concerns that short-term and long-term climate variability could confound compliance with a numeric Phase 1 limit for total mercury and that compliance with implementation requirements for total mercury control actions could be more effectively evaluated by the documentation and review of BMPs implemented to reduce total mercury. As a result, Alternative 4 is more preferable than Alternatives 2 and 3.

The preferred alternative in the February 2008 staff report (Alternative 3) addressed new methylmercury and total mercury sources in the tributary watersheds. However, extensive Stakeholder Group discussions since then noted that it would be extremely difficult to address new nonpoint sources in the tributary watersheds until more nonpoint source analyses are completed. Alternative 3 focuses on new point sources, which would be unfair if there were not similar efforts for nonpoint sources, and would be ineffective given existing and future point sources in the tributary watersheds likely will be found to contribute a small percentage of overall loading. As a result, Alternative 4 is more preferable than Alternative 3.

In addition, the preferred alternative in the February 2008 staff report (Alternative 3) did not require entities responsible for particular discharges that do not act as a methylmercury source,[40] or act as dilution (e.g., NPDES facilities with discharges less than 0.06 ng/l methylmercury), to conduct control studies even if they discharge to a subarea of the Delta that requires methylmercury load reductions to achieve the fish tissue objectives. However, the Stakeholder Process participants noted that it would be very useful to require such dischargers to participate in studies because: (a) if effective methylmercury reduction processes can be identified for those sites, such processes may be employed at other sites; and (b) it is

[40] For example, if the agricultural characterization studies indicate that discharges from agricultural areas with particular crop types or management practices do not act as a source of methylmercury to the Delta/Yolo Bypass (i.e., the return water has methylmercury loads equal to or less than the irrigation water methylmercury loads), the responsible parties for those areas would not be required to conduct further control studies.

conceivable that there may be fewer environmental impacts and/or lower costs associated with reducing those discharges than others, which is relevant information for an offset program or other watershed approach to achieving the proposed fish tissue objectives.. For similar reasons, stakeholders also suggested that NPDES facilities in the Central and West Delta subareas be required to participate in control studies, especially because they are expected to increase their discharges due to population growth. As a result, Alternative 4 requires more point and nonpoint sources to participate in Phase 1 control studies. The nature of that participation could be defined by a collaborative effort so long as that effort is approved by the Board Executive Officer. For example, facilities with very low effluent methylmercury concentrations and wetlands and agricultural areas that do not act as a net methylmercury source could participate in the studies by allowing access to their facilities for monitoring purposes.

Finally, although the Stakeholder Group stated in Guiding Principle #11 that they wanted the geographic scope of the Phase 1 methylmercury control studies to include tributary areas downstream of major dams, they concurred there was not yet adequate data to require individual upstream nonpoint methylmercury sources to conduct control studies, and also noted that it would be prohibitively unfair to require upstream point sources to conduct control studies and (inorganic) mercury minimization programs if there are not similar requirements for nonpoint sources. As a result, Alternative 4 is more preferable than Alternative 3.

Based on the above factors and other factors discussed in precious sections, Board staff selected Alternative 4 as the recommended alternative. The required and suggested actions along with implementation timelines associated with Alternative 4 are reflected in the proposed Basin Plan amendments located after the Executive Summary at the beginning of this report. Also included are recommendations to the State Water Board and other agencies regarding actions that should be taken for which the Central Valley Water Board may not have direct authority. These actions and timelines are designed to achieve the methyl and total mercury source load reductions described in Section 4.1, and thereby achieve the methylmercury allocations for sources in the Delta and Yolo Bypass, as well as the San Francisco Bay mercury TMDL implementation program's allocation for total mercury leaving the Central Valley and the USEPA's CTR criterion for total mercury in the water column.

Table 4.7 illustrates the timelines for Alternative 4's implementation components. The timelines are subject to change depending on the length of the Basin Plan amendment approval process; the assumption is that the Central Valley Water Board will adopt the Basin Plan amendments in 2010 and that the State Water Board, Office of Administrative Law and USEPA will grant approval of the amendments in late 2011.

The Central Valley Water Board will employ an adaptive management approach to implementing Phase 1 of the program and developing actions for Phases 2 and 3, incorporating new data and scientific information. The Central Valley Water Board will consider the nature of the methylmercury and total mercury sources, the feasibility of on-site controls, and the need to reduce methylmercury discharges when determining which responsible parties will be required to implement on-site control programs and/or participate in an offset program to maintain methylmercury allocations during Phases 2 and 3.

The options selected for the study and control of methylmercury and total mercury balance equitability, the likelihood of success, and jurisdictional constraints. Development and implementation of nonpoint source management practices traditionally have proved difficult in California. The Central Valley Water Board may need to consider in Phase 2 whether satisfactory progress is being made on characterizing nonpoint source concentrations and loads to the Delta and its tributary watersheds and whether effective management practices are possible. If effective management practices are not possible, then the Central Valley Water Board may consider requiring additional methylmercury load reductions from point source facilities located in critical Delta subareas and source areas upstream of the Delta.

Staff acknowledges that a variety of programmatic strategies and new projects are under development, such as the Delta Long Term Management Strategy (LTMS); Delta Special Area Management Plan (SAMP); regional, county, and local Habitat Conservation Plans and Natural Community Conservation Plans; and wetland restoration projects. In accordance with California Water Code Section 13247, lead agency staff, institutions and project managers proposing projects and programs affecting the Delta region must consider Basin Plan requirements when developing projects and programs. The Central Valley staff has and will continue to collaborate with agencies and institutions to ensure their projects attain and include appropriate management practices and mitigation measures to achieve Basin Plan amendment requirements.

Table 4.7: Summary of Recommended Implementation Actions and Timeline (Implementation Alternative 4)

TASKS	**Years After Basin Plan Effective Date**										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Year 10 to 2030**
PROGRAMMATIC ACTIONS											
Basin Plan amendment adoption process: Central Valley and State Water Boards, OAL, and USEPA.	X										
Develop Exposure Reduction Workplan (Yr 2), Implement Exposure Reduction Workplan (Yr 4), and provide Progress Reports (3yrs thereafter)		X	X	X	X	X	X	X	X	X	
Issue 13267 Orders, revise NPDES facility and MS4 permits and CWA Section 401 water quality certifications and take other actions as necessary to implement discharger monitoring, Phase 1 methylmercury (MeHg) control studies, and MeHg and TotHg control actions.		X	X								
State agencies provide demonstration of how they have secured adequate resources to fund Phase 1 studies.	X	X									
Conduct upstream watershed MeHg source analyses and develop upstream TMDL programs.		X	X	X	X	X	X	X	X		
PHASE 1 IMPLEMENTATION – TOTAL MERCURY CONTROL											
Conduct TotHg source analyses and feasibility studies to identify high priority projects, with initial focus on the watersheds that export the most mercury-contaminated sediment (e.g., the Feather, American, Mokelumne/Cosumnes Rivers and Putah Creek watersheds) in coordination with the development of upstream TMDL programs.				X	X	X	X	X	X	X	
Implement feasible, high-priority TotHg reduction projects in the tributary watersheds.										X	X
Conduct voluntary pilot MeHg and/or TotHg offset projects.		X	X	X	X	X	X	X	X	X	
DWR to initiate Congressional authorization process to modify the Cache Creek Settling Basin.		X									
DWR to submit strategy to reduce mercury loading from the Cache Creek Settling Basin.			X								
DWR to submit a feasibility study for improvements to the Cache Creek Settling Basin.					X						
DWR to submit Cache Creek settling basin improvement plans							X				
DWR to implement plans to reduce mercury loading from the Cache Creek settling basin									X		
Develop agency agreements with State Water Board, Air Resources Board, and USEPA to evaluate and reduce atmospheric mercury sources.		X	X	X							
NPDES WWTPs and MS4s submit workplans and implement control actions and BMPs to minimize TotHg discharges.		X	X	X	X	X	X	X	X	X	
PHASE 1 IMPLEMENTATION – METHYLMERCURY CHARACTERIZATION AND CONTROL STUDIES											
Staff convenes Technical advisory committee (TAC) to review MeHg study designs, evaluate results, propose follow-up studies and evaluate the efficacy of MeHg management practices.		X	X	X	X	X	X	X	X		
Dischargers submit report that describes how individual dischargers or groups of dischargers will implement individual or coordinated MeHg studies by 6 months after the Effective Date.		X									
Dischargers submit MeHg study plans for EO approval and TAC evaluation and Board staff report progress to the Board by 9 months after the Effective Date. Coordinated study plan submittal allowed an additional 9 months, if needed.		X	X								
Dischargers conduct MeHg studies.			X	X	X	X	X	X	X		

Table 4.7: Summary of Recommended Implementation Actions and Timeline (Implementation Alternative 4)

TASKS	Years After Basin Plan Effective Date										
	0	1	2	3	4	5	6	7	8	9	Year 10 to 2030
Dischargers submit MeHg study progress reports for Board staff and TAC evaluation, and staff report progress to the Board.					X						
Dischargers submit final reports that present MeHg study results, MeHg control options, preferred control options, and proposed implementation plans and schedules. TAC evaluates results and discharger conclusions and provides a report of their findings.								X	X		
Expanded/new projects with the potential to discharge MeHg conduct MeHg studies (or coordinate with other dischargers' studies).		X	X	X	X	X	X	X	X	X	
Phase 1 Delta Mercury Control Program Review: Staff reports to the Board the MeHg control study results, pilot offset project results, and TAC and staff proposals for updated TMDL allocations, and revisions for the Delta mercury control program and offset program.										X	
PHASE 2 IMPLEMENTATION											
Dischargers implement on-site and/or offset MeHg and TotHg control actions and management practices to achieve MeHg allocations.											X
Implement additional TotHg control actions as needed to comply with the San Francisco Bay mercury TMDL implementation program's TotHg allocation for the Central Valley.											X
Implement monitoring and surveillance program. Conduct Delta/Yolo Bypass fish tissue monitoring in ~2020 and 2030.											X
Staff reports to the Board fish tissue monitoring results and progress towards achieving Delta MeHg allocations, Delta fish tissue objectives and San Francisco Bay total mercury allocation.											X
PHASE 3 IMPLEMENTATION											
Continue maintenance of MeHg and TotHg control actions implemented during Phases 1 and 2.											2031 onward
Conduct Delta/Yolo Bypass fish tissue monitoring every 10 years; staff reports to the Board monitoring results and progress towards achieving fish tissue objectives. Board amends Basin Plan as necessary to achieve and maintain fish tissue objectives.											
Natural erosion processes remove TotHg deposited in creek beds and banks that could not otherwise be remediated.											

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5 MONITORING

Chapter 5 of the Basin Plan describes the methods and programs that the Central Valley Water Board uses to acquire water quality information. Acquisition of data is a basic need of a water quality control program and is required by the Clean Water Act and the Porter-Cologne Water Quality Control Act.

A monitoring plan is also an essential element of the methylmercury control strategy for the Delta. The goal of monitoring is to measure whether ambient methylmercury concentrations have been reduced and to track progress in achieving the water quality objectives. Monitoring in the Delta and its tributaries should include fish tissue, water and sediment sampling. For methylmercury control studies conducted in Phase 1 of the implementation plan, Central Valley Water Board staff will review monitoring plans.

Central Valley Water Board staff will take the lead in determining compliance with the fish tissue objectives and will work with the State Water Board and dischargers to develop a strategy to fund the fish tissue monitoring program. Fish tissue sampling required to evaluate the impact of a particular project (see Section 5.1) will be the responsibility of the project proponent. Monitoring for compliance with the proposed methylmercury allocations from specific sources will be conducted by responsible parties for each source.

The proposed modifications to Basin Plan Chapter 5 (Surveillance and Monitoring) are presented after the Executive Summary at the beginning of this report. Section 4.3.4 describes the alternatives evaluated for a surveillance and monitoring program. This chapter reviews the recommended monitoring program. Section 5.1 contains guidance for fish tissue monitoring in the Delta and Yolo Bypass. Section 5.2 contains guidance for water monitoring in the Delta and Yolo Bypass. Section 5.3 provides guidance for sediment monitoring during dredging and methylmercury control studies.

5.1 Fish Tissue Monitoring

For all fish tissue monitoring discussed below, analysis for total mercury is an appropriate and economical option rather than analysis for methylmercury. Methylmercury comprises 85% to 100% of the total mercury measured in fish (Becker and Bigham, 1995; Slotton *et al.*, 2004). Total mercury may be analyzed and reported without adjustment instead of methylmercury in fish samples in order to reduce analytical costs.

5.1.1 Compliance with Large TL3 & 4 Fish Objectives

The proposed water quality objectives for the Delta are in the form of methylmercury in small whole fish and in muscle tissue of large, trophic level three and four fish. The primary TL3 species in the Delta caught by humans or wildlife are black bullhead, bluegill, carp, Chinook salmon, redear sunfish, Sacramento blackfish, Sacramento sucker, American shad, and white sturgeon. The primary TL4 species are largemouth and striped bass, channel and white catfish, crappie, and Sacramento pikeminnow.

The initial fish tissue monitoring should take place at the following compliance reaches in each subarea to represent subarea-specific conditions:

- Central Delta subarea: Middle River between Bullfrog Landing and Mildred Island;
- Marsh Creek subarea: Marsh Creek from Highway 4 to Cypress Road;
- Mokelumne/Cosumnes River subarea: Mokelumne River from the Interstate 5 bridge to New Hope Landing;
- Sacramento River subarea: Sacramento River from River Mile 40 to River Mile 44;
- San Joaquin River subarea: San Joaquin River from Vernalis to the Highway 120 bridge;
- West Delta subarea: Sacramento/San Joaquin River confluence near Sherman Island;
- Yolo Bypass-North subarea: Tule Canal downstream of its confluence with Cache Creek; and
- Yolo Bypass-South subarea: Toe Drain between Lisbon and Little Holland Tract.

Once fish tissue methylmercury concentrations in a given subarea's compliance reach have achieved the methylmercury fish tissue objectives, fish tissue monitoring should take place at additional waterways in the subarea to ensure that the objectives are achieved throughout the subarea. Fish concentrations vary within the different Delta subareas. Multiple sites should be evaluated to ensure that human and wildlife consumers of fish are protected. Sampling should be conducted at popular angling sites. Sites with high fishing activity include Honker Cut/8 Mile Road, the Stockton Deep Water Ship Channel, the Sacramento River near Clarksburg, Whiskey Slough, Franks Tract, Taylor Slough, and Beaver Slough (FMP, 2005b). Local fish consumers, the Department of Public Health, the Office of Environmental Health Hazard Assessment, and other public health agencies should be involved in the selection of the sampling sites.

Compliance fish methylmercury monitoring should include representative fish species for comparison to each of the methylmercury fish tissue objectives:

- Trophic Level 4: bass (largemouth and striped), channel and white catfish, crappie, and Sacramento pikeminnow.
- Trophic Level 3: American shad, black bullhead, bluegill, carp, Chinook salmon, redear sunfish, Sacramento blackfish, Sacramento sucker, and white sturgeon.

Trophic level 3 and 4 fish sample sets should include three species from each trophic level and should include both anadromous and non-anadromous fish. Trophic level 3 and 4 fish sample sets should include a range of fish sizes between 150 and 500 mm total length.[41] Striped bass, largemouth bass, and sturgeon caught for mercury analysis must be within the CDFG legal catch size limits. In any subarea, if multiple species for a particular trophic level are not available, one species of that trophic level evaluated in a range of sizes is considered acceptable.

[41] The proposed TL3 and TL4 fish objectives were developed assuming that humans and large, piscivorous wildlife species (e.g., bald eagle, osprey, and river otter) would likely consume fish in the size range of 150-500 mm total length.

Sample numbers for determining compliance should be determined using statistical methods approved by the Executive Officer of the Central Valley Water Board. The USEPA has published fish sampling guidance (1995). Staff prefers that the average concentrations should be calculated from at least nine samples of individual fish or three composite samples of at least three fish per composite.

To track the progress of the proposed implementation program, fish tissue monitoring should be initiated five years after dischargers implement projects to reduce methylmercury and total mercury discharges. Monitoring should take place every ten years thereafter.

5.1.2 Compliance with Small TL2/3 Fish Objective

The recommended fish tissue objectives include an objective for methylmercury in small TL2/3 fish. The least tern, which is federally listed as endangered, feeds on fish less than 50 mm in total length. Small fish should be sampled when large TL3 and TL4 fish are sampled for comparison with the fish tissue objective to verify that wildlife species that depend on small Delta fish are protected. Fish species appropriate for sampling to ensure that least tern and other wildlife feeding on small (<50 mm) fish are: juvenile bluegill, inland silverside, mosquitofish, red shiner and threadfin shad, or other fish less than 50 mm, such as the young-of-year of the species listed earlier for the large TL3/TL4 fish monitoring.

5.1.3 Additional Monitoring for Trends Analysis

Largemouth bass in the Delta and elsewhere have been shown to be good bioindicators of methylmercury contamination (Davis *et al.*, 2003). Largemouth bass are abundant, widely distributed throughout the Delta, and non-migratory. Largemouth bass maintain a localized home range (i.e., most stay within a mile of a given waterway [Davis *et al.*, 2003]), and show good length versus mercury concentration relationships. In addition, concentrations of mercury in largemouth bass show statistically significant, positive correlations with mercury in other fish in the Delta (see Section 4.7 of the TMDL Report) and methylmercury in the water column (see Chapter 5 of the TMDL Report). Sampling largemouth bass is an economical way to track spatial and temporal changes in fish mercury levels in the Delta.

Staff identified a methylmercury concentration in standard size (350 mm) largemouth bass that corresponds to the recommended fish tissue objectives (see Section 4.7.4 of the TMDL Report). Although sampling of multiple fish species is required for compliance with the recommended fish tissue objectives, collection of largemouth bass in a range of sizes appropriate for standardization would allow for excellent comparison with previous work and analyses of spatial and temporal trends in fish methylmercury levels and water-fish methylmercury relationships (Davis *et al.*, 2003; FMP, 2006 & 2007).

5.1.4 Source or Project Assessment

Fish tissue sampling can help to evaluate the impact of a particular source or project (e.g., testing a methylmercury control program in a wetland). For this purpose, monitoring of young fish that remain in a relatively defined home territory is preferable. Young fish will more quickly reflect changes in mercury bioavailability than will larger or older fish, which integrate mercury uptake over years and large spatial areas. Inland silversides are suggested for monitoring because they are widespread in the Delta, maintain relatively localized home ranges, and have very consistent same-site, individual, whole body mercury concentrations at sizes of about 45 to 75 mm (Slotton *et al.*, 2003). Other species listed in Section 5.1.2 may also be appropriate for monitoring, depending on local abundance. Baseline levels of methylmercury in these species are fairly well established in the Delta (Slotton *et al.*, 2003).

5.2 Water Monitoring

The Central Valley Water Board and dischargers in the Delta or tributaries will need to monitor methylmercury and total mercury in water to satisfy requirements of the proposed implementation plan. Dischargers that are assigned methylmercury allocations must monitor methylmercury in their discharge and report results to the Central Valley Water Board. Methylmercury control studies will likely necessitate that dischargers and other responsible parties monitor methylmercury in discharge and ambient water.

Section 4.1.2 describes the calculation of the implementation goal for average annual methylmercury concentration in unfiltered, ambient water of 0.06 ng/l that was derived by the linkage between methylmercury concentrations in largemouth bass and ambient Delta water. For comparison of Delta and tributary waterways methylmercury concentration data with the aqueous methylmercury goal, and to continue evaluation of the fish-water methylmercury linkage, the Central Valley Water Board should take the lead in collecting water samples periodically throughout the year and during typical flow conditions as they vary by season, rather than targeting extreme low or high flow events. Ambient water monitoring should take place at the same locations as the fish methylmercury compliance monitoring described in Section 5.1 as well as where tributaries enter the Delta and Yolo Bypass. Ambient water monitoring should take place for at least one year before the fish tissue objective compliance monitoring takes place.

Delta outflows to the San Francisco Bay must comply with the total mercury allocation assigned to the Delta in the San Francisco Bay Mercury TMDL, which requires a decrease in mercury loads of 110 kg/year from existing conditions. Attainment of the allocation can be measured two ways: measuring mercury in water and flow in the inputs to the Delta or measuring the concentration of mercury per unit suspended sediment passing the compliance point of Mallard Island and multiplying by the suspended sediment loads. In addition, Suisun and Grizzly Bays in the San Francisco Bay region may contribute methylmercury to the western Delta by way of tidal pumping. As resources are available, the Central Valley and San Francisco Bay Water Boards should periodically monitor methylmercury and total mercury in ambient water in the western Delta and Suisun and Grizzly Bays to track progress in meeting the implementation goal for methylmercury in ambient water in the western Delta and the total mercury allocation for Delta outflows to San Francisco Bay. If the San Francisco Bay Water Board changes its allocation for Delta outflows during its periodic review of the San Francisco Bay Mercury TMDL, the Central Valley Water Board would adjust its total mercury monitoring and control program accordingly.

The Central Valley Water Board also would continue monitoring methylmercury in Delta tributaries as part of developing TMDLs for those tributaries and implementing the Delta TMDL.

5.3 Sediment Monitoring

Staff's recommended amendments to Chapter 5 of the Basin Plan do not contain sediment monitoring requirements for the Delta and upstream water bodies. However, evaluating total mercury in sediment may be useful for identifying sources of mercury-enriched sediments, particularly for sources that supply areas of high methylmercury production. For the methylmercury source control studies and tributary watershed total mercury source analyses described in Chapter 4, the fine-grained fraction (less than 63 micron) of sediment or soil samples should be evaluated. Staff suggests sieving samples to less than 63 microns and drying them to evaluate mercury concentrations in a uniform manner.

To comply with the requirements proposed for dredging in Chapter 4, proponents of dredging projects must monitor concentrations of mercury in sediment. Sediment samples should be sieved to less than 63 microns and dried to evaluate mercury concentrations in a uniform manner.

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6 REVIEW OF EXISTING FEDERAL AND STATE LAWS AND STATE & REGIONAL BOARD POLICIES

Any proposed changes to the Regional Water Board Basin Plans must be consistent with existing federal and state laws and adopted State and Central Valley Water Board policies. Water Code Section 13146 requires that, in carrying out activities that affect water quality, all state agencies, departments, boards and offices comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the State Water Board in writing their authority for not complying with such policy. This chapter summarizes existing federal and state laws and policies that are relevant to the proposed fish tissue objectives and implementation plan described by the proposed Basin Plan amendments.

6.1 Consistency with Federal Laws and Policies

Federal agencies have adopted water quality control policies and plans to which Central Valley Water Board actions must conform. The following federal laws are relevant to the proposed Basin Plan amendments:

- Antidegradation Policy (40 CFR §131.12)
- Clean Water Act (40 CFR §131.11 (b) *et seq*.)
- Federal & State Endangered Species Acts (50 CFR *et seq*., California Fish and Game Code §2050-2116 *et seq*.)
- Clean Air Act (42 U.S.C. §7401, et seq.)

These laws and their relevance to the proposed fish tissue objectives and implementation plan are described in the following sections.

6.1.1 Antidegradation Policy

The Federal Antidegradation Policy (40 CFR §131.12) states:

> "(a) The State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following:
>
> (1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
>
> (2) Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or

> lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.
>
> (3) Where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.
>
> (4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Act."

The proposed Basin Plan amendments would establish the first numeric of fish tissue objectives for methylmercury in the Delta to protect and maintain its beneficial uses. The proposed implementation plan is designed to maintain and improve water quality in the Delta and is consistent with this policy.

6.1.2 Clean Water Act

State Adoption of Standard – Numeric Limit

Under Section 303(c) of the Clean Water Act, water quality standards adopted by a state are subject to USEPA approval. The Clean Water Act requires that numeric criteria be based on "(i) 304(a) Guidance; or (ii) 304(a) Guidance modified to reflect site-specific conditions; or (iii) other scientifically defensible methods" (40 CFR §131.11 (b) *et seq*.). The following actions are consistent with the Clean Water Act:

- Interpreting the current narrative water quality objectives to develop numeric objectives to adopt TMDLs, because states may adopt site-specific numeric water quality standards to protect designated beneficial uses. In the case of this action, the site-specific numeric water quality standards are in the form of fish tissue objectives (see Chapter 3).
- Basing objectives on the USEPA Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (USEPA, 2000b), because the methodology is part of 304(a) Guidance.

Approval of NPDES Permittee and Storm Water Compliance Schedules

The proposed Basin Plan amendments allow the Central Valley Water Board to include compliance schedules in NPDES permits for permittees that need time to comply with the proposed methylmercury allocations. In conjunction with approval of the proposed fish tissue objectives and the mercury TMDL, the State will seek USEPA approval of the NPDES wastewater and storm water allocation implementation schedules under 40 CFR §131.13, which allows the USEPA to approve water quality standard implementation policies adopted by a state. The NPDES wastewater and storm water implementation schedules are necessary for achieving the proposed fish tissue objectives.

Title 40 CFR §122.47 sets forth the regulations for schedules of compliance for NPDES programs. The proposed Delta implementation schedule must be consistent with these regulations, which require that the compliance schedule be appropriate, require compliance as soon as possible, and include interim requirements at specified time intervals.

<u>Is the Proposed Compliance Schedule Appropriate for NPDES Permittees</u>? The proposed Basin Plan amendments allow dischargers up to 2030 to achieve methylmercury allocations. Following Phase 1 of implementation, which is an eight-year study and review period, dischargers will have about 10 years to comply with their allocations. The proposed Basin Plan amendments set the maximum time that will be allowed for NPDES permittees to comply with their requirements.

The proposed Basin Plan amendments establish final load and waste load allocations. The final allocations will be reviewed at the end of Phase 1 and may be changed pending the outcome of the Phase 1 studies. The final allocations are applicable in Phase 2. The proposed Basin Plan amendments allow for compliance schedules in NPDES permits for compliance with water quality-based effluent limits based on the waste load allocations. The compliance schedules must be consistent with the requirements of the Clean Water Act, USEPA regulations 40 CFR 122.47, state laws and regulations, including the State Water Board Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits, and the final compliance date included in the Basin Plan.

There are twenty-one NPDES-permitted municipal and industrial dischargers in the Delta and Yolo Bypass, which account for about 4% of the annual methylmercury loading o the Delta. Eight of the facilities must reduce their effluent methylmercury loads to comply with their methylmercury allocations.

Urban runoff in the Delta is regulated by twelve NPDES permits issued to MS4s. Discharge from these MS4 service areas is estimated to contribute up to about 1% of the methylmercury loading to the Delta. All MS4s but one discharge to impaired subareas of the Delta and must decrease methylmercury loads.

Population increases are anticipated in Delta/Yolo Bypass areas served by municipal facilities and urban runoff systems. All NPDES permittees will have to control effluent methylmercury resulting from urban expansion such that their methylmercury allocations are achieved and maintained.

Actions taken by NPDES permittees to achieve and maintain their methylmercury allocations will be dependent on the findings from the Phase 1 control studies. No single management action or plan will control methylmercury adequately at all NPDES facilities. Industry-wide, no standard method has been developed to control methylmercury. Concentrations of methylmercury in effluent from Delta NPDES facilities in 2004-2005 ranged from 0.02 to 3.4 ng/L (see TMDL Report Chapter 6). Because of the variety of treatment and management measures utilized by facilities discharging low concentrations of methylmercury, identifying means of control and quantifying effectiveness that could be applied to other facilities will be evaluated in the Phase 1 studies. For some Delta facilities, significant changes in treatment processes may be needed to achieve the allocations. Possible treatment additions include advanced filtration, ultraviolet radiation, extended aeration, and chemical enhancement of primary treatment. Facilities may opt to discharge a portion of their effluent to land to comply with the allocations (see Appendix C).

Similarly for MS4s, the solution for achieving methylmercury allocations must be tailored to particular urban areas. Possible actions include: (1) pollution prevention, which includes a range of public education, product exchange, and enhancement of waste collection, recycling, and disposal activities; (2) modification of storm water collection and retention systems, including aeration and sediment removal; and (3) other actions identified by the Phase 1 studies.

The ten-year period after the Phase 1 studies are completed provides the time that is expected to be needed for planning, acquiring funding, environmental review, design, construction of facilities or implementation of programs, and for the actions to show compliance with the allocations. Specific compliance schedules will be determined for each NPDES permit and will be based on the individual permittee's need for time to construct facilities or infrastructure, implement programs, and secure funding, within the ten-year time period. The Phase 1 studies will also evaluate if less time, or additional time, is required to achieve compliance with the allocations. The Central Valley Water Board will review the final compliance date at the end of Phase 1 and adjust the final compliance date and compliance schedules as appropriate.

<u>Does the Schedule Require Compliance As Soon As Possible</u>? A long-term compliance schedule to achieve compliance with the allocations is appropriate for the Delta methylmercury control program because of the uncertainty in controlling methylmercury until methylmercury control studies take place.

Phase 1 of the implementation plan is needed in order to generate more information about controlling methylmercury. The California Bay-Delta Program and other entities are funding studies of factors controlling methylmercury production. The CalFed studies will provide information about methylmercury in some wetlands and agricultural operations, but more data will be needed for NPDES sources. In particular, control options for some sources will need additional investigation during the Phase 1 study period. For example, some municipal wastewater treatment facilities in the Central Valley have effluent with very low methylmercury concentrations. Studies are needed to determine the treatment factors that cause low methylmercury levels and whether the factors can be replicated elsewhere. Rather than postpone adopting fish tissue objectives and methylmercury allocations for the Delta, the Delta implementation plan includes a study period that will facilitate production of the information necessary to reduce methylmercury.

An objective of the Phase 1 methylmercury control studies is to identify the most effective methods of reducing methylmercury. These methods will need to be applied, tested, and likely for some sources, adjusted, in order to comply with the methylmercury allocations. It will take time for the municipal and industrial wastewater facilities and urban runoff systems to adequately reduce their methylmercury discharges.

The Delta TMDL implementation plan requires control of two water quality constituents, methylmercury and inorganic (“total”) mercury. By addressing both forms of mercury, it is expected that, overall, the methylmercury fish tissue objectives will be reached more quickly than if only one form of mercury were controlled under the TMDL implementation plan. However, it may take more time and effort at the beginning of the overall implementation period to implement controls for both methylmercury and total mercury, versus controlling just one constituent.

Federal regulations and the Basin Plan require that final compliance dates for NPDES permittees to comply with waste load allocations be as soon as possible. The compliance schedule in each NPDES permit will be set to achieve the proposed waste load allocations as soon as possible during Phase 2.

<u>What are the Interim Limits, Schedules and Requirements</u>? Municipal and industrial wastewater NPDES facilities in the Delta and Yolo Bypass are assigned the following interim (Phase 1) requirements:

- By six months after the effective date of the amendment, all facilities in the Delta and Yolo Bypass must submit individual pollutant minimization program workplans to the Central Valley Water Board. The dischargers must implement their respective pollutant minimization programs within 30 days after receipt of written Executive Officer approval of the workplans. Until the NPDES permitted facility achieves compliance with its waste load allocation, the discharger must submit annual progress reports on pollutant minimization program activities implemented and evaluation of their effectiveness, including a summary of total mercury and methylmercury monitoring results.
- Interim inorganic (total) mercury mass limit: During Phase 1, all NPDES facilities in the Delta and Yolo Bypass must limit their discharges of inorganic (total) mercury. The interim inorganic (total) performance-based mercury effluent mass limit is to be derived using current, representative data and shall not exceed the 99.9th percentile of a 12-month running average effluent inorganic (total) mercury load (lbs/year). The limit shall be assigned in permits as an annual load based on a calendar year. At the end of Phase 1, the interim inorganic (total) mercury mass limit will be re-evaluated and modified as appropriate.
- Facilities must complete the Phase 1 methylmercury control studies, either individually or in collaboration with others. Milestones in this process in terms of years after the effective date of the Basin Plan amendments are: report how the facility will conduct studies (six months after effective date); submit a work plan for the studies (nine months); submit a study progress report and plans for additional studies (four years); submit final study report including analysis of results, a plan for the facility’s preferred method of meeting its methylmercury allocation, and proposed methylmercury management plan (including implementation schedule) (seven years).

NPDES-permitted MS4s are assigned the following interim requirements:

- MS4 dischargers in the Delta and Yolo Bypass must implement best management practices (BMPs) to control erosion and sediment discharges consistent with their existing permits and orders with the goal of reducing mercury discharges. Because mercury is primarily particle-bound, erosion control also prevents mercury loading.

- The Sacramento, Contra Costa County, and Stockton MS4 permittees must implement pollution prevention measures and best management practices to minimize total mercury discharges. This requirement must be implemented through mercury reduction strategies required by their existing permits and orders. Annually, the dischargers must report on the results of monitoring and a description of implemented pollution prevention measures and their effectiveness.
- The Sacramento, Contra Costa County, and Stockton MS4 permittees must conduct mercury control studies to monitor and evaluate the effectiveness of existing BMPs per existing requirements in permits and orders, and to develop and evaluate additional BMPs as needed to reduce their mercury and methylmercury discharges within and upstream of the legal Delta boundary.
- The three largest MS4's must complete the Phase 1 methylmercury control studies under the same schedule as described for municipal and industrial wastewater facilities.

Requirements for Avoiding Wetland Loss

Under Clean Water Act Section 404 and the Rivers and Harbors Act of 1899 Section 10, alteration of waterways, including wetlands, that affect navigable waters requires a permit from the federal government and assurance that impacts will be avoided or mitigated. The U.S. Army Corps of Engineers operates the 404 permit program with a goal of achieving "no net loss" of wetlands. For projects proposing unavoidable impacts on wetlands, compensatory mitigation in the form of replacing the lost aquatic functions is generally required. Under authority of Clean Water Act Section 401, the State also reviews projects affecting water bodies. The State may require compensatory mitigation for wetlands impacts not under the jurisdiction of the federal government, e.g., for wetlands not contiguous with navigable waters.

Compensatory mitigation may have schedule requirements during Phase 1 (in the proposed implementation plan) or location requirements within the Delta/Yolo Bypass boundary. The agencies involved in determining compensatory mitigation for specific projects – the USACE, USFWS, and Central Valley Water Board 401 Certification unit – should coordinate decision-making to ensure that replacement wetlands do not create a new nuisance in the form of high methylmercury levels exposed to wildlife or discharged from the site.

6.1.3 Federal & State Endangered Species Acts

The federal Endangered Species Act of 1973 (50 CFR *et seq*.) was established to identify, protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the Interior Department's U.S. Fish and Wildlife Service (USFWS) and the Department of Commerce's National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS). The USFWS has primary responsibility for terrestrial and freshwater organisms, while the NMFS has primary responsibility for marine species such as salmon and whales. In addition, the State of California enacted the California Endangered Species Act (California Fish and Game Code, Sections 2050-2116 *et seq*.), which is administered by the California Department of Fish and Game and similarly maintains state lists of rare, threatened and endangered species. Of the piscivorous wildlife species in the Delta, the California least tern, western snowy plover, bald eagle,[42] and peregrine falcon are listed as either threatened or endangered by the State of California or by the USFWS.

Therefore, fish tissue objectives must protect the aquatic life in the Delta, particularly endangered and threatened species and the food web on which they depend. The proposed fish tissue objectives are expected to fully protect wildlife species that consume Delta fish. The proposed objectives are either equal to or more protective than wildlife-specific safe fish tissue concentrations derived with guidance from the USFWS to protect all piscivorous wildlife species (including threatened and endangered species) feeding in the Delta (see Table 4.9 in the TMDL Report).

The purpose of the proposed Basin Plan amendments is to restore the beneficial uses that are not currently being met, including wildlife habitat. The recommended implementation plan based on the proposed fish tissue objectives is designed to improve the water quality of the Delta with respect to methylmercury concentrations in prey fish consumed by wildlife foraging in the Delta. At this time, it is unknown if methylmercury controls will reduce or modify wildlife habitat, or if control actions could result in increases of other risks to wildlife. The Phase 1 methylmercury control studies will develop and evaluate methylmercury management practices, including the potential benefits and risks of the inorganic mercury and methylmercury controls on wildlife habitat and other beneficial uses of Delta waters. The proposed Basin Plan amendments are not expected to adversely affect endangered species; consequently the Phase 1 studies will help inform which methylmercury controls should be implemented during Phase 2 to protect endangered species. Habitat and prey on which piscivorous wildlife species depend are expected to improve as the proposed fish tissue objectives are achieved. Therefore, the proposed Basin Plan amendments are consistent with the federal and state Endangered Species Acts.

The federal Endangered Species Act also affects regulation under the Clean Water Act. For example:

- A USACE Section 404 permit for depositing dredged or fill material will not be issued if the discharge takes or jeopardizes threatened or endangered species (33 CFR §323.4(a)(ix));
- Solid waste disposal facilities or practices are not allowed to cause or contribute to the taking of an endangered or threatened species (40 CFR §257.3-2); and
- Sewage sludge may not be placed where it is likely to adversely affect a threatened or endangered species (40 CFR §503.24).

In 1999 USEPA, FWS, and NMFS published a draft Memorandum of Agreement regarding enhanced coordination under the Clean Water Act and the ESA (64 FR 2741-57, January 15, 1999). Moreover, the USEPA has been negotiating agreements with states that issue NPDES permits for the discharge of water pollutants, requiring the states to take steps to enforce the

[42] The bald eagle was removed from the Federal List of Endangered and Threatened Wildlife in the lower 48 States on 9 July 2007 (50 CFR 17). This rule will become effective on 8 August 2007 (50 CFR 17). The bald eagle will continue to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act after the species is de-listed. In addition, the bald eagle is still listed as endangered in California (CDFG, 2005).

ESA through their permit programs. As a result, any actions taken by dischargers and other entities to comply with Basin Plan amendment requirements (e.g., requirements included in NPDES permits or CWA 401 certifications) also must comply with the ESA. As described in Chapters 4 and 7, there are reasonably foreseeable methods of compliance that would ensure implementation projects do not conflict with the ESA.

6.1.4 Clean Air Act

The Clean Air Act (CAA) is a federal law that regulates air emissions from stationary and mobile sources. Principal provisions include the authorization for the USEPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. Six criteria pollutants include carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, particulate matter (equal to or less than PM-10) and lead. The CAA establishes two categories of air quality standards, primary and secondary. Primary standards set limits to protect public health and secondary standards set limits to protect against public welfare effects. The CAA was amended in 1977 and 1990, primarily to set new deadlines for achieving attainment of NAAQS because many areas of the county had failed to meet the deadlines.

Relevant to the CAA, greenhouse gases (GHGs) and climate change is the pivotal federal court case, *Massachusetts v. Environmental Protection Agency* (549 U.S. 497). In this case, twelve states and cities, including California, sued to force the USEPA to regulate GHGs as a pollutant pursuant to the CAA. This lawsuit was pursued in conjunction with several environmental organizations. The petitioners contended that the CAA gave the USEPA the necessary authority and the mandate to address GHGs in light of scientific evidence on global warming. The USEPA was one of several respondents in the case. The USEPA contended that it did not have the authority under the CAA to regulate GHGs, and even if the USEPA did have such authority, it would decline to exercise it. Central to this case was the exact definition of an air pollutant as stipulated in the CAA. In April 2007, the United States Supreme Court ruled five to four that the plaintiffs had standing to sue, that the CAA gave the USEPA the authority to regulated GHGs, and that the USEPA's reasons for not regulating GHG were found to be inadequate. Since this ruling, the USEPA has been developing regulations for geologic carbon sequestration projects and will be issuing GHG permits for large sources.

Central Valley Board staff evaluated the potential for the Delta mercury control program to negatively affect air quality and GHG emissions in Chapter 7 CEQA Environmental Checklist and Discussion (Section 7.3, "III. Air Quality" and "VII. Greenhouse Gas Emissions") and determined that the program would have no significant impact on air quality and would not significantly increase GHG emissions so long as standard mitigation measures are implemented.

6.2 Consistency with State Water Board Policies

The following State Water Board policies are relevant to the proposed Basin Plan amendments:

- Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy) (Resolution No. 68-16)

- Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Resolution No. 74-43)
- Policy with Respect to Water Reclamation in California (Resolution No. 77-1)
- Sources of Drinking Water Policy (Resolution No. 88-63)
- Pollutant Policy Document (Resolution No. 90-67)
- Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 (Resolution No. 92-49)
- Consolidated Toxic Hot Spots Cleanup Plan (Resolution No. 99-065 and 2004-0002)
- Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Resolution No. 99-114 and 2004-0030)
- Water Quality Enforcement Policy (Resolution 2002-0040)
- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Resolution No. 2005-0019)
- Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options (Resolution No. 2005-0050)
- Mercury Fish Tissue Objectives and Total Maximum Daily Load for Mercury in San Francisco Bay (Resolution No. 2007-0045)
- Policy for Water Quality Control for Recycled Water (Resolution No. 2009-0011)

These policies and their relevance to the proposed fish tissue objectives and implementation plan are described in the following sections.

6.2.1 Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality of Water in California (Antidegradation Implementation Policy)

The Antidegradation Implementation Policy includes the following statements:

> "1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water, and will not result in water quality less than that prescribed in the policies.
>
> "2. Any activity which produces or may produce a waste or increase volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

This policy incorporates the federal antidegradation standards for surface waters (Section 6.1.1).

The proposed Basin Plan amendments do not specifically authorize any new or existing discharges, and therefore, are not expected to result in any further degradation of Delta waters. The methylmercury allocations account for new discharges by adjusting existing source allocations to meet the assimilative capacity. The proposed Basin Plan amendments are intended to improve an impaired water body (the Delta) by implementing a program to achieve the proposed fish tissue objectives through methyl and total mercury source reductions, and to maintain the fish tissue objectives should new methylmercury or total mercury discharges occur.

6.2.2 Resolution No. 74-43: Water Quality Control Policy for the Enclosed Bays and Estuaries of California

This policy was adopted by the State Water Board in 1974 and provides water quality principles and guidelines for the prevention of water quality degradation in enclosed bays and estuaries to protect the beneficial uses of such waters. The Regional Water Boards must enforce the policy and take actions consistent with its provisions.

The Delta flows into the San Francisco Bay to form the Bay-Delta Estuary. Because improvements in water quality in the Delta will result in improvements in overall Bay-Delta water quality, the actions taken to implement the Basin Plan amendments are also consistent with this policy.

6.2.3 Resolution 77-1: Policy with Respect to Water Reclamation in California

This policy was adopted by the State Water Board in 1977 in recognition of the current and future need for increased water throughout the State and a growing population. This policy provides guidance on future water reclamation projects that meet specific conditions, in addition to encouraging water reclamation, reuse, and conservation measures throughout California. The proposed Basin Plan amendments are consistent with this policy because they are expected to result in improvements in Delta water quality and were intentionally designed to be compatible with the State and Central Valley Water Board's policies for water conservation.

Staff worked with WWTP staff and other stakeholders to develop mass-based methylmercury allocations and Phase 1 (interim) total mercury mass limits that would not lead to a WWTP exceeding its allocation or interim limit if its effluent total mercury and/or methylmercury concentration increased (while its effluent total mercury and/or methylmercury loads decreased) as a result of the WWTP's efforts to implement a water recycling program, water conservation measures in a WWTP's service area, and/or additional reclamation beyond what was implemented at the time the source analysis was completed for the TMDL. As a result, the proposed Basin Plan amendments support the State and Central Valley Water Boards' policies for reclamation, recycling and conservation for WWTPs. The magnitude of a water recycling program's effect on WWTP effluent total mercury and methylmercury concentrations and subsequent effect on receiving water conditions will be evaluated on a case-by-case basis as needed during Phase 1 and later phases of the Delta mercury control program.

The infiltration, capture, and storage of urban runoff would decrease methylmercury and total mercury loads contributed to the Delta waters by urban runoff and could be effective BMPs for helping NPDES MS4s to comply with the proposed methylmercury allocations. As a result, the Central Valley and State Water Boards' goals for urban water reuse and the proposed Basin Plan amendments are mutually supportive.

6.2.4 Resolution No. 88-63: Sources of Drinking Water Policy

This policy states that all waters of the state are to be protected as existing or potential sources of municipal and domestic supply water. The proposed Basin Plan amendments are consistent with this policy because they are expected to result in improvements in Delta water quality.

6.2.5 Resolution No. 90-67: Pollutant Policy Document

This policy requires, in part, that the Central Valley and San Francisco Bay Water Boards use the Pollutant Policy Document (PPD) as a guide to update portions of their Basin Plans. The PPD requires that the Central Valley Water Board develop a Mass Emissions Strategy (MES) for limiting loads of mercury, among other pollutants, from entering the Delta. The purpose of the MES is to control the accumulation in sediments and the bioaccumulation of pollutant substances in the tissues of aquatic organisms in accordance with the statutory requirements of the state Porter-Cologne Water Quality Act and the federal Clean Water Act. The proposed Basin Plan amendments are consistent with this policy and further the milestones of the MES by specifically developing and proposing methylmercury fish tissue objectives, an area of concern in the PPD, and by including a monitoring and implementation program to measure reduction and regulate mass emissions of this pollutant, including the inclusion of interim inorganic (total) mercury mass limits for NPDES facilities in the Delta/Yolo Bypass.

6.2.6 Resolution No. 92-49: Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304

This policy contains procedures for the Central Valley Water Board to follow for oversight of cleanup projects to ensure cleanup and abatement activities protect the high quality of surface and groundwater. To attain the proposed fish tissue objectives, the proposed Basin Plan amendments include an implementation plan to reduce methyl and total mercury loading to the Delta and its tributaries. The proposed implementation plan requires that methyl and total mercury discharges from existing and future sources be evaluated and controlled and is consistent with this policy. Cleanup projects resulting from the proposed Basin Plan amendments will also consider and be consistent with resolution 92-49.

6.2.7 Resolution No. 99-065 & Resolution No. 2004-0002: Consolidated Toxic Hot Spots Cleanup Plan

In June 1999, the State Water Board adopted the Consolidated Toxic Hot Spots Cleanup Plan (Cleanup Plan), as required by California Water Code Section 13394. The Cleanup Plan identifies the entire Delta as a hot spot for mercury due to elevated mercury levels in fish and contains cleanup plans for mercury in the Delta. The Cleanup Plan requires the development of a phased TMDL for mercury, with the initial emphasis on the Cache Creek watershed, a major source of mercury to the Bay-Delta Estuary. The Central Valley Water Board adopted the

Cache Creek, Bear Creek, and Harley Gulch Basin Plan amendment and mercury TMDL in October 2005.

The Delta mercury TMDL and the implementation program through the proposed Basin Plan amendments further address the phased mercury control strategy described in the Cleanup Plan. The Cleanup Plan discusses elements that should be included in a Delta methylmercury TMDL implementation program: establishment of a mercury task force[43]; identification of fish tissue targets to protect humans and wildlife consuming local fish; evaluation of mercury and methylmercury sources; quantification of the amount of load reductions from each source; development of an implementation plan and a monitoring program; and requirements for additional studies needed to identify sources, quantify fish tissue mercury concentrations, and determine mercury bioavailability to provide resource managers with recommendations on how to minimize mercury bioaccumulation. The proposed amendments include the elements identified in the Cleanup Plan. In addition, the proposed amendments also are consistent with California Water Code Section 13392, which requires the Regional Water Boards to amend Basin Plans to incorporate strategies to prevent the creation of new toxic hot spots and further pollution of existing hot spots.

6.2.8 Resolution No. 99-114 & Resolution No. 2004-0030: Nonpoint Source Management Plan & the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program

In December 1999, the State Water Board adopted the Plan for California's Nonpoint Source (NPS) Pollution Control Program (NPS Program Plan) and in May 2004, the State Water Board adopted the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy). The NPS Policy explains how State and Regional Water Boards will use their planning and waste discharge regulation authority under the Porter-Cologne Act to implement and enforce the NPS Program Plan. The NPS Policy requires all nonpoint source discharges to be regulated under waste discharge requirements, waivers of waste discharge requirements, a Basin Plan prohibition, or some combination of these administrative tools. The NPS Policy also describes the key elements that must be included in a nonpoint source implementation program.

The proposed Basin Plan amendments do not prescribe specific control actions to reduce nonpoint sources; however, they provide total mercury mass limits for upstream watersheds that contribute the most mercury-contaminated sediment to the Delta and methylmercury allocations for sources in the Delta and Yolo Bypass that will guide the development and implementation of control actions. In addition, the proposed Basin Plan amendments include requirements for all nonpoint sources in the Delta and Yolo Bypass to implement reasonable, feasible actions to reduce sediment in runoff with the goal of reducing inorganic mercury loading to the Yolo

[43] The proposed Basin Plan amendments entail the establishment of a technical advisory committee and a stakeholder group(s) that forms to coordinate, develop, and implement the Phase 1 methylmercury studies and provide recommendations for the development of amendments to the Phase 2 methylmercury control program. This organization is considered equivalent to a mercury task force.

Bypass and Delta, in compliance with existing Basin Plan objectives and requirements, and Irrigated Lands Regulatory Program requirements. At this time, more information is needed on the factors that control methylmercury production in the Delta and its tributaries before effective management practices for nonpoint methylmercury sources can be implemented. The proposed Basin Plan amendments provide regulatory requirements by using the Porter-Cologne Water Quality Control Act and other authorities to ensure that parties responsible for those discharges obtain this information, evaluate management practices to control methylmercury, and implement technically and economically feasible control actions. The proposed Basin Plan amendments require that the responsible parties complete the Phase 1 methylmercury control studies within seven years after the effective date of the Basin Plan amendments. At that time, additional information to implement a methylmercury nonpoint source control program will be available. The Central Valley Water Board will evaluate the studies and feasible management practices and determine whether methylmercury allocations and total mercury control requirements should be modified and will revise the implementation program and Basin Plan within nine years after the effective date of the proposed Basin Plan amendments. The nonpoint source allocations, interim controls, Phase 1 control studies, and resulting implementation actions are consistent with this policy.

6.2.9 Resolution No. 2002-0040: Water Quality Enforcement Policy

The State Water Board adopted this policy to ensure enforcement actions are consistent, predictable, and fair. The policy describes tools that the State and Regional Water Boards may use to determine the following: type of enforcement order applicable, compliance with enforcement orders by applying methods consistently, and type of enforcement actions appropriate for each type of violation. The State and Regional Water Boards have authority to take a variety of enforcement actions under the Porter-Cologne Water Quality Control Act. These include administrative permitting authority such waste discharge requirements (WDRs), waivers of WDRs, and Basin Plan prohibitions.

The proposed Basin Plan amendments include implementation provisions that allow Central Valley Water Board staff to use, where applicable, the enforcement tools provided in the Water Quality Enforcement Policy. Therefore, the Basin Plan amendments are consistent with this policy.

6.2.10 Resolution No. 2005-0019: Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (a.k.a. State Implementation Plan or SIP) applies to discharges of toxic pollutants into the inland surface waters, enclosed bays, and estuaries of California subject to regulation under the Porter-Cologne Water Quality Control Act and the federal Clean Water Act. Regulation of priority toxic pollutants may occur through the issuance of National Pollutant Discharge Elimination System permits or other regulatory approaches. The goal of the SIP is to establish a statewide, standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters.

The SIP is a tool to be used with watershed management approaches and, where appropriate, the development of TMDLs to ensure achievement of water quality standards (i.e., water quality criteria or objectives, and the beneficial uses they are intended to protect). The SIP was effective on 28 April 2000 with respect to the priority pollutant criteria promulgated by the USEPA through the National Toxics Rule and to the priority pollutant objectives established by Regional Water Boards in their Basin Plans. If a water quality objective and a CTR criterion are in effect for the same priority pollutant, the more stringent of the two applies.

The TMDL Report analyzed total mercury sources and reductions to ensure the proposed TMDL implementation program complies with the CTR. The proposed Basin Plan amendments establish total mercury mass limits for upstream watersheds that contribute the most mercury-contaminated sediment to the Delta; Phase 1 (interim) inorganic (total) mercury limits and pollution minimization requirements for point sources in the Delta and Yolo Bypass; and requirements for all nonpoint sources in the Delta and Yolo Bypass to implement reasonable, feasible actions to reduce sediment in runoff with the goal of reducing inorganic mercury loading to the Yolo Bypass and Delta, in compliance with existing Basin Plan objectives and requirements, and Irrigated Lands Regulatory Program requirements. These requirements entail the reduction of total mercury loading to the Delta using, as appropriate, the tools and implementation provisions in the SIP. These requirements are designed to comply with the CTR criterion of 50 ng/l total recoverable mercury in the water column. Therefore, the proposed Basin Plan amendments are consistent with the Policy.

6.2.11 Resolution No. 2005-0050: Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options

The State Water Board's Impaired Waters Policy incorporates the following:

- CWA Section 303(d) identification of waters that do not meet applicable water quality standards and prioritization for TMDL development;
- CWC Section 13191.3(a) requirements to prepare guidelines to be used by the Water Boards in listing, delisting, developing, and implementing TMDLs pursuant to CWA Section 303(d) of the [33 United States Code (USC) Section 1313(d)]; and
- CWC section 13191.3 (b) requirements that State Water Board considers consensus recommendations adopted by the 2000 Public Advisory Group when preparing guidelines.

The Impaired Waters Policy includes the following statements:

> "A. If the water body is neither impaired nor threatened, the appropriate regulatory response is to delist the water body.
>
> B. If the failure to attain standards is due to the fact that the applicable standards are not appropriate to natural conditions, an appropriate regulatory response is to correct the standards.
>
> C. The State Board and Regional Boards are responsible for the quality of all waters of the state, irrespective of the cause of the impairment. In addition, a TMDL must be calculated for impairments caused by certain EPA designated pollutants.

D. Whether or not a TMDL calculation is required as described above, impaired waters will be corrected (and implementation plans crafted) using existing regulatory tools.

D1. If the solution to an impairment will require multiple actions of the regional board that affect multiple persons, the solution must be implemented through a Basin Plan amendment or other regulation.

D2. If the solution to an impairment can be implemented with a single vote of the Regional Board, it may be implemented by that vote.

D3. If a solution to an impairment is being implemented by a regulatory action of another state, regional, local, or federal agency, and the Regional Board finds that the solution will actually correct the impairment, the Regional Board may certify that the regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program.

D 4. If a solution to an impairment is being implemented by a non-regulatory action of another entity, and the Regional Board finds that the solution will actually correct the impairment, the Regional Board may certify that the non-regulatory action will correct the impairment and if applicable, implement the assumptions of the TMDL, in lieu of adopting a redundant program."

As described in the TMDL technical report, methylmercury levels in Delta fish exceed levels safe for human and wildlife consumption; therefore, this impairment needs to be corrected through a Regional Board action.

The Basin Plan for the Sacramento and San Joaquin River Basins does not contain numeric water quality objectives for fish tissue methylmercury within the legal Delta boundary. However, fish tissue methylmercury concentration is considered an appropriate objective (Chapter 3). As discussed in the Beneficial Uses and Existing Conditions section of this report (Chapter 2), the beneficial uses that are sensitive to mercury include: warm and cold freshwater habitat, wildlife habitat, and human consumption of aquatic organisms (covered by the commercial and sport fishing beneficial use designation). A safe fishery (for consumption of aquatic organisms) is the foremost, unmet beneficial use of the Delta. Hence, the addition of the commercial and sport fishing beneficial use, the refinement of the current narrative water quality objective into a numeric water quality objective, and a pollution reduction program are an the appropriate strategy to ensure standards are appropriate for Delta waterways.

Methyl and total mercury are toxic pollutants, and are technically suitable for TMDL calculation in the Delta. Therefore, a TMDL must be calculated to comply with the Impaired Waters Policy. The proposed Basin Plan amendments, this staff report, and the TMDL report contain all of the necessary elements of a TMDL: the loading capacity, allocations, and consideration of seasonal variations and a margin of safety.

To correct the methylmercury impairment in the Delta waterways, the proposed amendments would use existing regulatory tools, including of Clean Water Act 401 Water Quality Certification requirements, NPDES permit requirements, waste discharge requirements, and waivers of waste discharge requirements.

As discussed in Chapter 4, correcting the methylmercury impairment in the Delta will likely require multiple actions of the Central Valley Water Board to gain compliance from multiple dischargers to the Delta and its tributary watersheds; therefore, a Basin Plan amendment or other regulation is necessary. In addition, a regulatory action that would correct the methylmercury impairment in the Delta waterways is not being implemented by another agency, and no solution is being implemented through a non-regulatory action by another entity. Therefore, the adoption of a Basin Plan amendment is appropriate.

For the reasons stated above, a Basin Plan amendment is the appropriate means to address the methylmercury impairment of Delta waterways. The proposed Basin Plan amendments follow the process outlined in the Impaired Waters Policy and therefore are consistent with the policy.

6.2.12 Resolution No. 2007-0045: Mercury Fish Tissue Objectives and Total Maximum Daily Load for Mercury in San Francisco Bay

On 15 September 2004, the San Francisco Bay Water Board adopted Resolution R2-2004-0082 amending the San Francisco Bay Basin Plan to incorporate a mercury TMDL implementation plan for San Francisco Bay. On 9 September 2005, the State Water Board adopted Resolution No. 2005-0060 remanding the TMDL to the San Francisco Bay Water Board for reconsideration. In its Remand Order, the State Water Board requested specific revisions to the TMDL and associated implementation plan designed to:

- Accelerate achievement of water quality objectives for mercury in the Bay;
- Be more protective of fish and other wildlife;
- Ensure the maximum practical pollution prevention by municipal and industrial waste water dischargers; and
- More clearly incorporate risk reduction measures addressing public health impacts on subsistence fishers and their families.

On 9 August 2006, the San Francisco Bay Water Board adopted Resolution R2-2006-0052 amending the San Francisco Bay Basin Plan to address the remand-required revisions and establish Bay-specific fish tissue objectives for mercury for the protection of wildlife and human health. The State Water Board and USEPA have since approved the Basin Plan amendment and it has been incorporated into the San Francisco Bay Basin Plan.

The San Francisco Bay mercury TMDL implementation program (a.k.a. mercury control program) assigned the Central Valley a five-year average total mercury load allocation of 330 kg/yr or a decrease of 110 kg/yr. The implementation plan expects the Central Valley to meet its total mercury load allocation within twenty years of the adoption of a Delta TMDL implementation program and has an interim milestone of half the allocation in ten years. Attainment of the allocation can be measured two ways: measuring mercury in water and flow in the inputs to the Delta or measuring the concentration of mercury per unit suspended sediment passing the compliance point of Mallard Island and multiplying by the suspended sediment loads.

The proposed mercury control program for the Delta described in Chapter 4 complies with the allocation requirement and timeline. A total mercury load decrease of 110 kg/yr represents about a 28% decrease in the 20-year average annual loading from the Delta tributaries and would enable Delta waters to maintain compliance with the CTR criterion of 50 ng/l (see Section 7.4 in the TMDL Report). Such a decrease is a reasonable goal for the Delta mercury control program because staff has estimated that control actions to reduce mercury loading to the Delta by substantially more than 110 kg/yr (see Section 8.2 in the TMDL Report) may be needed along with other methylmercury source control actions to adequately address the fish methylmercury impairment in the Delta and upstream watersheds.

6.2.13 Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits

The State's Policy for Compliance Schedules in National Pollutant Discharge Elimination System Permits (Resolution 2008-0025) authorizes the Regional Water Boards to include a compliance schedule in a permit for an existing discharger to implement a new, revised, or newly interpreted water quality objective or criterion in a water quality standard that results in a permit limitation more stringent than the limitation previously imposed. The intent of the policy is to establish uniform provisions for authorizing compliance schedules and to achieve state-wide consistency implementing the provisions. The proposed Basin Plan amendments include waste load allocations for methylmercury that will result in new limitations for NPDES permits.

The proposed Basin Plan amendments are consistent with the State's Compliance Schedule Policy. The Policy states that a Regional Water Board may establish a compliance schedule for a NPDES permittee that exceeds ten years if the permit limitations are based on waste load allocations in a TMDL and the TMDL implementation plan contains a compliance schedule with a final compliance date. The proposed Basin Plan amendments contain a compliance schedule with a final compliance date of 2030 and completion dates for interim activities, including monitoring, methylmercury control studies, and implementation of pollutant minimization plans for mercury. Compliance with waste load allocations will be required as soon as possible after the start of Phase 2 of the implementation plan. USEPA Region 9 staff has acknowledged that the Phase 1 methylmercury control studies are necessary for wastewater treatment and MS4 permittees to be able to comply with methylmercury waste load allocations.

6.2.14 Resolution 2009-0011: Policy for Water Quality for Recycled Water

The purpose of the Policy for Water Quality for Recycled Water (Resolution 2009-0011) is to increase the use of recycled water from municipal wastewater sources that meets the definition in Water Code Section 13050(n), in a manner that implements state and federal water quality laws. The policy provides guidance on the issuing of permits for recycled water projects, supporting recycled water as a safe alternative to potable water for approved uses. This policy encourages the management of salts and nutrients with the adoption of management plans, and addresses landscape irrigation project general permits, recycled water groundwater recharge projects, antidegradation, and emerging contaminants. The proposed Basin Plan amendments are consistent with this policy because, as described in Section 6.2.3, they are expected to result in improvements in Delta water quality and were intentionally designed to be compatible with the State and Central Valley Water Board's policies for water conservation.

6.3 Central Valley Regional Water Quality Board Policies

The following Central Valley Water Board policies are relevant to the proposed Basin Plan amendments:

- Urban Runoff Policy
- Controllable Factors Policy
- Water Quality Limited Segment Policy
- Antidegradation Implementation Policy
- Application of Water Quality Objectives Policy
- Watershed Policy
- Policy In Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants

These policies and their relevance to the proposed fish tissue objectives and implementation plan are described in the following sections.

6.3.1 Urban Runoff Policy

On page IV-14.00 of the Basin Plan, the Central Valley Water Board's Urban Runoff Policy states:

> "a. Subregional municipal and industrial plans are required to assess the impact of urban runoff on receiving water quality and consider abatement measures if a problem exists.
>
> "b. Effluent limitations for storm water runoff are to be included in NPDES permits where it results in water quality problems."

The proposed Basin Plan amendments are consistent with this policy. The proposed amendments require MS4s in the Delta and Yolo Bypass to:

- Implement best management practices practicable to control erosion and sediment discharges in order to control mercury; and
- Achieve methylmercury allocations by 2030.

The three largest MS4s in the Delta area would also be required to:

- Conduct methylmercury control studies as needed to achieve the methylmercury allocations;
- Develop an implementation plan within seven years after the effective date of the Basin Plan amendments for achieving the proposed methylmercury allocations;

- Implement pollution prevention measures and BMPs to control mercury.

The Central Valley Water Board, upon review of the study results, will adopt inorganic mercury and methylmercury management strategies and implementation schedules that apply to large and small MS4s in the Delta that could be implemented through NPDES stormwater permits.

6.3.2 Controllable Factors Policy

On page IV-15.00 of the Basin Plan, the Central Valley Water Board's Controllable Factors Policy states:

> "Controllable water quality factors are not allowed to cause further degradation of water quality in instances where other factors have already resulted in water quality objective being exceeded. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the State, that are subject to the authority of the State Water Board or Regional Water Board, and that may be reasonably controlled."

Currently, the proposed fish tissue methylmercury objectives developed for the protection of humans and wildlife that consume Delta fish are exceeded throughout much of the Delta. Sources with net methylmercury production that are potentially controllable include: WWTP and MS4 discharges; agricultural irrigation runoff; inorganic mercury present in the sediment; some wetlands; changes to water rights and salt standards in the Delta; flood conveyance; and creation of new water impoundments.

The proposed Basin Plan amendments are consistent with the Controllable Factors Policy because the Delta methylmercury TMDL and associated implementation program seek to bring an impaired water body into compliance with water quality objectives. The proposed Basin Plan amendments include an implementation plan with actions outlined to (a) reduce inorganic mercury loading to the Delta and (b) identify, evaluate and implement feasible methylmercury controls. No additional discharges are being proposed by, or are expected as a result of, the proposed Basin Plan amendments.

6.3.3 Water Quality Limited Segment Policy

On page IV-15.00 of the Basin Plan, the Central Valley Water Board's Water Quality Limited Segment Policy states:

> "Additional treatment beyond minimum federal requirements will be imposed on dischargers to Water Quality Limited Segments. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment."

The proposed Basin Plan amendments establish methylmercury allocations for dischargers to Delta waterways that are included in the CWA Section 303(d) List of Water Quality Limited Segments. Therefore, the proposed Basin Plan amendments are consistent with this policy.

6.3.4 Antidegradation Implementation Policy

The Central Valley Water Board's Antidegradation Implementation Policy incorporates State Water Board Resolution No. 68-16 and the federal antidegradation standards for surface waters (see Sections 6.1.1 and 6.2.1). On pages IV-15.01 and IV-16.00, the Central Valley Water Board's Antidegradation Implementation Policy includes the following statements:

> "… Implementation of this policy [State Water Board Resolution No. 68-16] to prevent or minimize surface and ground water degradation is a high priority for the Board. … The prevention of degradation is, therefore, an important strategy to meet the policy's objectives.
>
> The Regional Water Board will apply 68-16 in considering whether to allow a certain degree of degradation to occur or remain. In conducting this type of analysis, the Regional Water Board will evaluate the nature of any proposed discharge, existing discharge, or material change therein, that could affect the quality of waters within the region. Any discharge of waste to high quality waters must apply best practicable treatment or control not only to prevent a condition of pollution or nuisance from occurring, but also to maintain the highest water quality possible consistent with the maximum benefit to the people of the State.
>
> Pursuant to this policy, a Report of Waste Discharge, or any other similar technical report required by the Board pursuant to Water Code Section 13267, must include information regarding the nature and extent of the discharge and the potential for the discharge to affect surface or ground water quality in the region. This information must be presented as an analysis of the impacts and potential impacts of the discharge on water quality, as measured by background concentrations and applicable water quality objectives. The extent of information necessary will depend on the specific conditions of the discharge. For example, use of best professional judgment and limited available information may be sufficient to determine that ground or surface water will not be degraded. In addition, the discharger must identify treatment or control measures to be taken to minimize or prevent water quality degradation."

The proposed Basin Plan amendments do not authorize any new or existing discharges and therefore are not expected to result in further degradation of Delta waters. In addition, the proposed amendments include actions to address potential new sources of methylmercury and total mercury so that further degradation of Delta waters does not occur. The proposed amendments include fish tissue objectives and an implementation plan to improve the Delta through methyl and total mercury source reductions. As a result, the proposed amendments are consistent with this Central Valley Water Board policy.

6.3.5 Application of Water Quality Objectives Policy

Excerpts from Policy for Application of Water Quality Objectives are presented below. The full text can be found on page IV-16.00 of the Basin Plan.

> "Water quality objectives are defined as 'the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water, or the prevention of nuisance within a specific area.'… Water quality objectives may be stated in either numerical or narrative form. Water quality objectives apply to all waters within a surface or ground water resource for which beneficial uses have been designated…
>
> "The numerical and narrative water quality objectives define the least stringent standards that the Regional Boards will apply to regional waters in order to protect beneficial uses. Numerical receiving water limitations will be established in Board orders for constituents and parameters which will, at a minimum, meet all applicable water quality objectives. However, the water quality objectives do not require improvement over naturally occurring background concentrations. In cases where the natural background concentration of a particular constituent exceeds an applicable water quality objective, the natural background concentration will be considered to comply with the objective.
>
> "Where compliance with narrative objectives is required, the Regional Board will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives."

The proposed Basin Plan amendments are consistent with this policy. The numeric water quality objectives (fish tissue objectives) in the proposed Basin Plan amendments are specific to surface waters in the Delta and Yolo Bypass and will be used to determine compliance with the narrative objective. The proposed Basin Plan amendments establish, as necessary, a combination of studies and implementation actions to control the sources of methyl and total mercury (see Chapter 4). Regulatory permits or orders will include requirements to comply with the implementation plan for the proposed objectives and time schedules. The proposed implementation plan will provide a time schedule for the local entities, state agencies, and federal agencies to develop and submit to the Central Valley Water Board plans for methylmercury and total mercury management.

6.3.6 Watershed Policy

On page IV-21.00 of the Basin Plan, the Central Valley Water Board's Watershed Policy states:

> "The Regional Water Board supports implementing a watershed based approach to addressing water quality problems. The State and Regional Water Boards are in the process of developing a proposal for integrating a watershed approach into the Board's programs. The benefits to implementing a watershed based program would include gaining participation of stakeholders and focusing efforts on the most important problems and those sources contributing most significantly to those problems."

The proposed Basin Plan amendments are consistent with the Watershed Policy. Chapter 6 of the TMDL Report includes a source analysis that identified the following methylmercury sources: tributary inflows from upstream watersheds; within-Delta sources such as sediment flux; municipal and industrial wastewater; agricultural drainage; and urban runoff. During WY2000-2003 (a relatively dry period), approximately 58% of identified methylmercury loading to the Delta came from tributary inputs while approximately 42% of the load came from within-Delta sources; in contrast, more than 98% of total mercury loading to the Delta comes came tributary inputs (see Tables 6.2 and 7.1 in the TMDL Report). Therefore, the proposed Basin Plan amendments take a comprehensive watershed approach to establishing methylmercury allocations and total mercury reduction requirements. Additionally, the adaptive management approach for the implementation program provides an opportunity to better identify sources that contribute most significantly to the impairment and to develop effective technologies and management practices for controlling those sources.

The Central Valley Water Board has conducted and will continue to conduct outreach to the stakeholders in the area encompassed by the proposed Basin Plan amendments. Staff held a CEQA scoping meeting, two public workshops, two Board workshops, and numerous informal and formal (professionally facilitated) large-group and small workgroup stakeholder meetings to receive comments and information from local, state and federal agencies, dischargers, and other stakeholders during the preparation of the proposed Basin Plan amendments (see Table 8.1 in Chapter 8). As part of the Delta methylmercury TMDL implementation program, staff will continue to inform entities responsible for studies and control actions and to solicit stakeholder participation. For these reasons, the proposed amendments are consistent with the Watershed Policy.

6.3.7 Policy in Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants

The Policy in Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants (Resolution 2009-0028) provides guidance for any new or existing discharger that owns or operates a wastewater treatment plants and facilitates opportunities for wastewater regionalization, recycling, reclamation and conservation. The proposed Basin Plan amendments are consistent with this policy because they are expected to result in improvements in Delta water quality and were intentionally designed to be compatible with the State and Central Valley Water Boards' policies for water conservation.

Staff worked with WWTP staff and other stakeholders to develop mass-based methylmercury allocations and Phase 1 (interim) total mercury mass limits that would not lead to a WWTP exceeding its allocation or interim limit if its effluent total mercury and/or methylmercury concentration increased (while its effluent total mercury and/or methylmercury loads decreased) as a result of the WWTP's efforts to implement a water recycling program, water conservation measures in a WWTP's service area, and/or additional reclamation beyond what was implemented at the time the source analysis was completed for the TMDL. As a result, the proposed Basin Plan amendments support the Central Valley Water Boards' policies for reclamation, recycling and conservation for WWTPs. The magnitude of a water recycling program's effect on WWTP effluent total mercury and methylmercury concentrations and subsequent effect on receiving water conditions will be evaluated on a case-by-case basis as needed during Phase 1 and later phases of the Delta mercury control program.

In addition, Board staff worked with WWTP staff and other stakeholders to develop a methylmercury allocation strategy for WWTPs that would be compatible with the Central Valley Water Board's goals for regionalization. The proposed Basin Plan amendments include language that allows WWTPs that regionalize or consolidate to sum their waste load allocations. If after consolidation a resulting WWTP discharge exceeds the sum of the allocations for the previous discharges, the WWTP has several options: (1) implement source control or treatment upgrades to reduce the methylmercury load; (2) access the "Unassigned WWTP allocation" for its specific subarea for that portion of its discharges that does not exceed the product of the net increase in flow volume and 0.06 ng/l methylmercury; and (3) conduct an offset project that complies with any offset program in place.

6.4 Review of Other Laws, Policies, and Programs

The following laws, policies, and programs are relevant to the proposed Basin Plan amendments:

- California Mercury Reduction Act
- DTSC Universal Waste Rule
- CalFed Bay-Delta Program
- Delta Protection Act of 1992
- California Wetlands Restoration Policy
- Delta Vision Strategic Plan
- Habitat Conservation Plans and Natural Community Conservation Plans
- Bay Delta Conservation Plan (BDCP)
- Federal Bay-Delta Leadership Committee
- 2009 Comprehensive Water Package
- Global Warming Solutions Act of 2006 (AB 32)
- CEQA Guidelines for Greenhouse Gas Emissions (SB 97)
- California Air Resources Board's Climate Change Scoping Plan
- California Natural Resources Agency's California Climate Adaptation Strategy

6.4.1 California Mercury Reduction Act

The Mercury Reduction Act of 2001 (Senate Bill 633) limits the use of mercury in household products, schools, and vehicle light switches in California. Major components of the Act and effective dates are:

- Schools are prohibited from purchasing most mercury-containing items for classrooms and laboratories (January 2002);
- Sale or distribution of mercury fever thermometers without a prescription is prohibited (July 2002);

- Manufacture and sale of mercury-containing novelty items is banned; (January 2003); and
- Sale of new motor vehicles with mercury-containing light switches is prohibited (January 2005).

The Act directs the State's Department of Toxic Substances Control (DTSC) to provide technical assistance to local agencies and businesses, such as auto dismantlers, for the safe removal and proper disposal of mercury switches from vehicles and large appliances (starting January 2002). The DTSC also provides information to the public regarding options to replace mercury switches.

By limiting the manufacture and sale in California of certain mercury-containing products, the Mercury Reduction Act is expected to reduce the amount of mercury potentially available to enter the environment, particularly through urban runoff. The Act facilitates the proposed Basin Plan amendments requirement that NPDES permittees implement pollutant minimization programs (for wastewater treatment facilities) and pollution prevention measures (for stormwater systems) to control total mercury in their discharge.

6.4.2 DTSC Universal Waste Rule

The California Department of Toxic Substances Control (DTSC) establishes rules for handling and disposal of hazardous waste, including mercury. Under DTSC's Universal Waste Rule,[44] commercial and household products that contain mercury may not be discarded in regular solid waste landfills. Examples of these wastes are mercury-containing batteries, light bulbs and tubes, thermometers, dental amalgam, and some electronic devices.

DTSC's Universal Waste Rule applies to all dischargers identified in the Delta Methylmercury TMDL for their own operations (i.e., disposal of spent fluorescent light bulbs) as well as other citizens in California.

The proposed Basin Plan amendments assign methylmercury allocations to NDPES-permitted wastewater treatment facilities and stormwater systems. The proposed amendments also require that wastewater treatment plants implement pollutant minimization programs to address total mercury in their discharge. Reasonably foreseeable methods to reduce methylmercury and/or total mercury in discharge include source control, such as disposing of mercury-containing items where they will not enter stormwater or sewer systems. Outreach by NPDES permittees to businesses, industry and the general public as part of pollutant minimization and source reduction programs should be consistent with the Universal Waste Rule. The proposed Basin Plan amendments are consistent with hazardous waste regulations and mercury waste disposal procedures and guidelines developed by DTSC.

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[44] Available at: www.dtsc.ca.gov/HazardousWaste/Mercury.

6.4.3 CalFed Bay-Delta Program

The CalFed Ecosystem Restoration Strategy includes the goal to:

> "Improve and/or maintain water quality conditions that fully support healthy and diverse aquatic ecosystems in the Bay-Delta estuary and watershed, and eliminate to the extent possible, toxic impacts to aquatic organisms, wildlife and people." (CalFed Bay-Delta Program Ecosystem Restoration Program Draft Stage 1 Implementation Plan, August 2001. Page 36, Strategic Goal 6 for Sediment and Water Quality.[45])

Because an improvement in Delta water quality should result in an overall improvement in Bay-Delta Estuary water quality, the proposed Basin Plan amendments are consistent with the above CalFed program goal.

The Record of Decision (ROD) for the California Bay-Delta Authority commits it to restore 30,000 to 45,000 acres of freshwater, emergent tidal wetlands, 17,000 acres of freshwater, emergent non-tidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CalFed Bay-Delta Program, 2000a & 2000c). However, many proposed sites are downstream of mercury-enriched watersheds. Extensive restoration efforts in the Delta have the potential to increase methylmercury exposure for people and wildlife (Chapter 3).

The proposed Basin Plan amendments support CalFed programmatic water quality goals and further support the programmatic ROD's CEQA requirements to develop mitigation strategies to address potentially significant adverse environmental impacts from CalFed projects. CalFed determined that the following adverse environmental impacts could result from CalFed projects:

- Potential exposure of mercury-laden sediments from activities related to dredging;
- Methylation of inorganic mercury to its bioavailable forms from the creation of shallow water habitat in areas that would receive mercury from source water; and
- Release of toxic substances (including methyl and total mercury) into the water column during dredging and construction of CalFed program actions such as levee demolition and disturbances to previously farmed soils.

To address potentially significant impacts that may result from CalFed projects, as indicated in CalFed's CEQA documents, CalFed is required to include mitigation measures in the ROD to reduce these impacts to a "less than significant" level (CalFed, 2000b, CEQA Findings of Fact, pp. 20-21). The proposed Basin Plan amendments are consistent with the CalFed ROD by providing requirements to study and develop management practices and control actions that would lessen adverse significant impacts resulting from CalFed programmatic projects.

Further, proposed Basin Plan amendments are consistent with CalFed programmatic water quality goals, particularly with the CalFed Water Quality Program Plan objective to "reduce mercury in water and sediment to levels that do not adversely affect aquatic organisms, wildlife,

[45] Available at: http://www.delta.dfg.ca.gov/erp/docs/reports_docs/DraftStage1ImplementationPlan.pdf.

and human health" (Section 4.3 Water Quality Program Plan, July 2000, pp 4-2). Additionally, the proposed Basin Plan amendments' requirement to develop and conduct methylmercury control studies promote existing Stage I, II, and III priority actions in CalFed's Water Quality Program Plan. Such actions include:

- Developing remediation options and projects effecting mercury loading, transportation, transformation, or bioavailability for different sections of the watershed;
- Evaluating and prioritizing remediation options, based on feasibility, cost, expected results, and time frame;
- Selecting and implementing a remediation project(s) with a short-term time frame for expected results; and
- Monitoring sources and loads of mercury, including mercury in water and sediment at sites during and after remediation (Section 4.5 Water Quality Program Plan, pp 4-9 to 4-12).

6.4.4 Delta Protection Act of 1992

As described in the Public Resources Code (§21080.22 and §29700-29780), the goals of the Delta Protection Act of 1992 are to:

> "(a) Protect, maintain, and, where possible, enhance and restore the overall quality of the Delta environment, including, but not limited to, agriculture, wildlife habitat, and recreational activities.
>
> "(b) Assure orderly, balanced conservation and development of Delta land resources.
>
> "(c) Improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety."

Section 29735 of the Delta Protection Act established the Delta Protection Commission to administer the Act. The Act directed the Commission to prepare a comprehensive long-term regional plan for the "heart" (Primary Zone) of the Delta to address key land uses (e.g., agriculture, wildlife habitat, and recreation) and resource management for the Delta area. The Primary Zone includes approximately 500,000 acres extending over portions of five counties: Solano, Yolo, Sacramento, San Joaquin, and Contra Costa.

The Commission adopted its Land Use and Resource Management Plan for the Primary Zone of the Delta (Plan) in February 1995.[46] The policies within this Plan were adopted as regulations[47] in 2000. The Plan was then forwarded to the five counties within the Primary Zone for incorporation into their General Plans and Zoning codes and implementation in their day-to-day activities. The Delta Protection Commission has appeal authority over local government actions.

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[46] The Plan was revised and reprinted in May 2002 and can be accessed on the Commission's web site: www.delta.ca.gov.

[47] See Title 14, California Code of Regulations, Chapter 3, Regulations Governing Land Use and Resources Management in the Delta

Since 2008, the Delta Protection Commission has been in the process of updating the Plan. A public review draft, released in May 2009, includes information from the CalFed Bay-Delta Program Programmatic Record of Decision, concerns and information regarding Delta wildlife species declines, updates to land use, and the 2008 Delta Vision Strategic Plan prepared by the Delta Vision Blue Ribbon Task Force. An analysis of environmental impacts of the draft Plan was released on 24 December 2009.

Central Valley Water Board staff evaluated the adopted and draft update Plan's goals and policies (specifically in the Environment, Utilities and Infrastructure, Land Use, Agriculture, and Water categories) to ensure that the proposed Basin Plan amendments are not in conflict with the Plan. The original Plan contained a policy that "Water agencies at local, state, and federal levels work together to ensure that Delta water quality standards are met and that beneficial uses of State waters are protected consistent with the CalFed (see Water Code Section 12310 (f)) Record of Decision dated August 8, 2000." In the draft updated Plan, Water Policy P-1 more generally states that agencies, "shall be strongly encouraged to preserve and protect the water quality of the Delta for both instream purposes and for human use and consumption" (DPC, 2009). The draft update of the Plan notes that a Delta methylmercury TMDL is under development, but does not contain any policies specific to the TMDL or mercury.

The proposed Basin Plan amendments protect water quality and are consistent with the Plan.

The proposed Basin Plan amendments may necessitate that spoils from dredging operations be protected from erosion, so that mercury-contaminated spoils do not enter the aquatic system. Depending on the management practice selected, this requirement may not coincide with the intent of the Utilities and Infrastructure Recommendation 3 (R-3) which states: "Material excavated from the shipping channels should, *if feasible*, be used for maintenance of Delta levees or for wildlife habitat enhancement within the Delta and for other uses within the Delta." However, dredge materials could be used for levee maintenance if erosion control management practices are implemented. Additionally, there is a proposed requirement for a study to develop and evaluate management practices to minimize increases in methyl and total mercury discharges from dredging activities.

Actions taken to implement the proposed Basin Plan amendments would improve Delta water quality and consequently improve the quality of fish eaten by humans and wildlife, resulting in fewer fish advisory postings and potentially increased recreational opportunities for sport fishing. Accordingly, local economic productivity would be enhanced. Hence, implementation of the proposed Basin Plan amendments is consistent with the land use and development goals of the Delta Protection Act.

6.4.5 California Wetlands Conservation Policy (August 23, 1993)

The goals of this policy are to:

> " Ensure no overall net loss and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California in a manner that fosters creativity, stewardship and respect for private property.

Reduce procedural complexity in the administration of state and federal wetlands conservation programs.

Encourage partnerships to make landowner incentive programs and cooperative planning efforts the primary focus of wetlands conservation and restoration."

The goal of the proposed Basin Plan amendments is to improve the water quality of the Delta/Yolo Bypass waterways by decreasing fish mercury concentrations to levels that are protective of wildlife and humans who consume Delta/Yolo Bypass fish. This is expected to result in reductions in fish tissue mercury concentrations in fish in wetlands that are hydrologically connected to the Delta/Yolo Bypass waterways and thereby improve overall wetland quality for wildlife that consume fish in the wetlands. The proposed fish tissue objectives and associated implementation program would not result in the overall net loss of wetlands in the Delta and its tributary watersheds. However, as discussed in detail in Chapter 7, implementation of methylmercury management practices conceivably could affect the habitat function of wetlands. Therefore, the Phase 1 methylmercury studies should evaluate methylmercury management measures that would minimize, mitigate, or possibly avoid altogether, negative effects on wetland function.

The proposed Basin Plan amendments would likely result in an increase in procedural complexity for the administration of state and federal wetlands conservation programs because the proposed amendments require state and federal wetland managers to participate in methylmercury studies and consider methylmercury control requirements for wetland restoration projects.

6.4.6 Delta Vision Strategic Plan

The Delta Vision Strategic Plan was finalized in October 2008. That report was written by a task force appointed by the Governor and chaired by Phil Isenberg. In December 2008, heads of State agencies took the Blue Ribbon Task Force strategy and actions and made recommendations with a timeline as to how to implement. They recommended actions that have authorization right now (like the TMDL) and actions that need legislation. The Implementation Plan contains the following:

> "In addition, by 2010 begin comprehensive monitoring of Delta water quality and fish and wildlife health, and by 2012 develop and implement Total Maximum Daily Load programs for the Delta and its tributary areas to eliminate water quality impairments, including but not limited to reduction of organic and inorganic mercury entering the Delta from tributary watersheds."

The recommended Basin Plan amendments contain a Total Maximum Daily Load program for the Delta and provide a schedule for the development and adoption of mercury control programs for the major tributaries to the Delta. The tributary programs will address both methylmercury and inorganic mercury. Staff will coordinate the Delta and tributary mercury program development and implementation with stakeholders from Delta Vision.

6.4.7 Habitat Conservation Plans and Natural Community Conservation Plans

The federal and California Endangered Species Acts prohibit harming species listed as threatened or endangered. These laws require that entities that wish to conduct activities that might incidentally harm (or "take") such wildlife first obtain an incidental take permit from the U.S. Fish and Wildlife Service (for federally-listed species) or from the California Department of Fish and Game (for state-listed species).

Under Section 10 of the federal ESA, to obtain a permit, the applicant must develop a Habitat Conservation Plan (HCP), designed to offset any harmful effects the proposed activity might have on the species. The HCP process allows the proposed activity to proceed while promoting conservation of listed species. An HCP also may be used as a tool to aid in restoring populations of listed wildlife species. The Federal Endangered Species Act Section 4(f) requires the development of recovery plans for listed species. Some recovery plans list specific HCPs (approved or in the planning stage) and acreage in the USFWS wetland easement program as part of the recovery strategy.

Analogous to the role of an HCP in the Federal process, a Natural Communities Conservation Plan (NCCP) approved by the California Department of Fish and Game allows take of listed species by participating entities as long as the NCCP provides conservation measures for that species. The Natural Communities Conservation Planning Program is a state program that incorporates protection of ecosystems into land use planning. The program seeks to anticipate and prevent the impacts that trigger the listing of species by the State as threatened or endangered by focusing on the long-term stability of wildlife and plant communities and including key interests. The program began with the 1991 Natural Communities Conservation Planning Act. Natural community conservation planning is a voluntary process that can facilitate early coordination to protect the interests of the State, federal and local public agencies, landowners, and other private parties.

The proposed Basin Plan amendments do not conflict with provisions of adopted HCPs or NCCPs (e.g., CalFed's habitat restoration goals stated in its Multi-Species Conservation Strategy, which were adopted by the CDFG as an NCCP) because they do not prevent the future restoration and development of wetlands and other critical habitat. As described in Chapter 7, impacts to existing habitats resulting from implementation actions can be reduced to less than significant levels through careful project design and construction activities.

HCPs and NCCPs written to avoid or compensate for the incidental take of listed species should follow all applicable environmental regulations, including water quality objectives and other requirements of the Basin Plan. When these plans are cited as part of the recovery strategy for listed species, however, coordination between water quality and conservation planners may be needed to develop both the conservation plans and implementation plans for water quality objectives. In particular, for wetlands restoration proposed in areas with elevated mercury concentrations in sediment, methylmercury effects on listed species that may use the new habitat should be evaluated. Both TMDL and HCP/NCCP planning efforts should be science-based and have provisions for adaptation when new information is received. The proposed Basin Plan amendments contain a phased approach and include an adaptive management approach and program review after the Phase 1 studies and new information is available.

6.4.8 Bay Delta Conservation Plan (BDCP)

The CDFG is developing a Bay Delta Conservation Plan (BDCP) that will allow water delivery and electricity generation to continue in the Delta while satisfying requirements of the federal and state Endangered Species Acts (ESAs). The goal of the BDCP is to restore habitat, including wetlands within the Delta, to repopulate and protect threatened and endangered fish species in the Delta. The BDCP was formed in 2006 and is comprised of a 26-member Steering Committee including federal and state agencies, environmental organizations, fishery agencies, water agencies, and other organizations.

The BDCP is being developed under the federal ESA and the California Natural Community Conservation Planning Act (NCCPA), and is undergoing extensive environmental analysis. The Department of Water Resources (DWR) is the lead in developing the California Environmental Quality Act (CEQA) Environmental Impact Report (EIR). The federal National Environmental Policy Act (NEPA) leads developing the Environmental Impact Statement (EIS) are the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

The BDCP framework and draft environmental analyses are expected to be released in 2010 for public review and comment. Agencies developing the EIR/EIS will evaluate ecosystem restoration and water conveyance alternatives identified in the BDCP. The agencies will also evaluate additional alternatives identified through the environmental review process under CEQA and NEPA.

One of the draft BDCP conservation strategy elements is to reduce methylmercury (BDCP, 2009). The BDCP strategy contains conservation measures for other pollutants stressors on the Delta ecosystem, including conservation measures for mercury and methylmercury. The draft conservation measure for methylmercury includes reducing the loads of methylmercury entering Delta waterways. Actions include increasing the mercury trapping efficiency of the Cache Creek settling basin, remediating inorganic mercury sources upstream of the Delta, and working with the Central Valley Regional Board to identify and implement management practices for other sources of methylmercury.

Board staff has been coordinating with BDCP in developing the conservation measures and providing cost estimates for remedial activities.

6.4.9 Federal Bay-Delta Leadership Committee

Under a memorandum of understanding signed in September 2009, the Departments of the Interior, Commerce and Agriculture, White House Council of Environmental Quality, Environmental Protection Agency, and Army Corps of Engineers will form a newly established Federal Bay-Delta Leadership Committee. The Committee will coordinate with the State of California and interested stakeholders and develop by December 15 a work plan of short-term actions. The plan may include:

- Developing an interagency science program to address key uncertainties in scientific information
- Expediting habitat restoration projects that are ready to move forward, including coordination with BDCP

- Taking an aggressive approach to addressing water quality threats
- Advancing measures to mitigate and adapt to climate change
- Coordinating processes for undertaking regulatory actions by federal agencies in the Bay-Delta

By December 2009, the committee was to develop a workplan including actions for habitat restoration projects in the Suisun Marsh and an interagency science program. Water Board staff will coordinate with this committee to ensure the members are aware of the Delta mercury control program.

The "Interim Federal Action Plan for the California Bay-Delta" was released on 22 December 2009 (http://www.doi.gov/archive/documents/CAWaterWorkPlan.pdf). The main outcome of the workplan was renewal of partnership between the Federal Government with the State and local authorities to address the ecological and water supply crises in the Delta. The workplan pledges support for development of the Bay Delta Conservation Plan and restoration effort, expeditious completion of a pipeline and new pumping plant to connect the Delta-Mendota Canal with the California Aqueduct, and further federal actions in water conservation and Bay-Delta ecosystem research.

6.4.10 2009 Comprehensive Water Package

In November 2009 the Governor of California and state lawmakers crafted a plan comprised of four bills and an $11.14 billion bond with the co-equal goals of ensuring a reliable water supply for California and restoring and enhancing the Delta ecosystem. The bills created a Delta Stewardship Council that is charged with:

- Developing a Delta Plan to guide state and local actions in the Delta in a manner that furthers the co-equal goals of Delta restoration and water supply reliability;
- Developing performance measures for the assessment and tracking of progress and changes to the health of the Delta ecosystem, fisheries, and water supply reliability;
- Determining if a state or local agency's project in the Delta is consistent with the Delta Plan and the co-equal goals, and acting as the appellate body in the event of a claim that such a project is inconsistent with the goals; and
- Determining the consistency of the Bay-Delta Conservation Plan (BDCP) with the co-equal goals.

In addition, the bills created a Sacramento-San Joaquin Delta Conservancy to implement ecosystem restoration activities within the Delta. The Conservancy is charged with assisting in the preservation, conservation, and restoration of the region's agricultural, cultural, historic, and living resources.

Water Board staff will coordinate with the Council and Conservancy to ensure their members are aware of the Delta mercury control program.

6.4.11 Global Warming Solutions Act of 2006

The Global Warming Solutions Act of 2006 (AB 32) was passed by the California State legislature on 1 August 2006. AB 32 entails a major effort to reduce greenhouse gas (GHG) emissions in California to 1990 levels by 2010 and contains several specific requirements. The California Air Resources Board (CARB) was required to prepare and approve a Scoping Plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions from sources or categories of sources of GHG gases by 2020. The Scoping Plan, which provides an outline for actions to reduce GHGs in California, was approved by the CARB Board on 12 December 2008 and includes measures to address GHG emission reduction strategies including, but not limited to, energy efficiency, water use, and recycling and solid waste. The Scoping Plan also includes recommendations for other GHG reduction actions, such as direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms (i.e., cap and trade system). In accordance with AB 32, CARB identified the statewide level of GHG in 1990 of 427 million metric tons CO_2 equivalent (MMTCO2E) which would serve as the emissions limit to be achieved by 2020. The CARB Board approved the 2020 emissions limit in December 2007, which contained measures that would allow California to attain the GHG emissions reduction goal by 2020.

The purpose of the proposed Delta mercury control program is to reduce Delta fish methylmercury concentrations to achieve the proposed fish tissue objectives to protect wildlife and people who eat Delta fish, as well as to implement an exposure reduction program for local communities who eat Delta fish. The program is not intended to reduce GHG emissions. Some activities that may be associated with implementing the mercury control program have the potential to increase GHG emissions. The Central Valley Water Board staff evaluated the potential for the Delta mercury control program to increase GHG emissions in Chapter 7 CEQA Environmental Checklist and Discussion (Section 7.3, “VII. Greenhouse Gas Emissions”) and determined that the program would not significantly increase GHG emissions so long as standard mitigation measures are implemented.

6.4.12 CEQA Guidelines for Greenhouse Gas Emissions (SB 97)

Senate Bill 97 required the Governor’s Office of Planning and Research (OPR) to develop draft CEQA guidelines “for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions”. OPR was required to prepare, develop, and transmit these guidelines on or before July 1, 2009 to The California Natural Resources Agency. The California Natural Resources Agency certified and adopted the guidelines on 30 December 2009 (CERES, 2010). Final guidance adopted by The Natural Resources Agency in December 2009 suggests that global climate change analyses in CEQA documents should be conducted for all projects that release GHGs, and that mitigation measures to reduce emissions should be incorporated into projects, to the extent feasible. The final guidance encourages lead agencies to consider many factors in performing a CEQA analysis, but preserve the discretion granted by CEQA to lead agencies in making their own determinations.

Some activities that may be associated with implementing the Delta mercury control program have the potential to increase GHG emissions. As a result, Board staff included in the CEQA evaluation in Chapter 7 a programmatic-level global climate change analysis that considers the factors outlined in OPR's final guidance, evaluates the potential for the Delta mercury control program to increase GHG emissions (see Section 7.3, "VII. Greenhouse Gas Emissions"), and lists available mitigation measures. The analysis determined that the Delta mercury control program is not expected to significantly increase GHG emissions so long as mitigation measures described in Section 7.3, or comparable measures, are implemented. Note, even though mitigation measures are expected to reduce potential impacts to less than significant levels, "Potentially Significant Impact" was selected instead of "Less Than Significant with Mitigation Incorporated" on the CEQA Environmental Checklist for the GHG Emissions category because:

- The Section 7.3 analysis identifies potential impacts that may require the implementation of mitigation measures beyond those already incorporated in existing laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. However, the proposed Basin Plan amendments do not include specific measures for mitigation of significant impacts. As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those mitigation measures identified in Section 7.3 or comparable mitigation measures, except for those site-specific projects for which the Board is the "Lead Agency".
- Also, local, regional and statewide ordinances, general plans, policies, practices and regulations are still being developed and modified to address GHG emission concerns and potential mitigation methods as more information becomes available. Additional mitigation measures may need to be developed to address these.

6.4.13 California Air Resources Board's Climate Change Scoping Plan

The Global Warming Solutions Act of 2006 (AB 32) required the California Air Resources Board (CARB) to prepare and adopt a plan that identified measures that would achieve reductions in greenhouse gas emissions in the State. The Climate Change Scoping Plan (Scoping Plan) was approved by the CARB Board in December 2008. In particular, the Scoping Plan contains six strategies for the Water Sector to implement that are expected to reduce greenhouse gas emissions due to the fact that water use requires significant amounts of energy. The six strategies for the Water Sector to implement include Water Use Efficiency (Measure W-1), Water Recycling (Measure W-2), Water System Energy Efficiency (Measure W-3), Reuse Urban Runoff (Measure W-4), Increase Renewable Energy Production from Water (Measure W-5), and a Public Goods Charge (Measure W-6). Efficient water conveyance, treatment and use can result in reductions in greenhouse gas emissions for those activities. The implementation of Measures W-1 through W-5 is expected to result in a total reduction of 4.8 MMTCO2E by 2020.

The proposed Basin Plan amendments are consistent with this Scoping Plan because, as described in Sections 6.2.3 and 6.3.7, they were intentionally designed to be compatible with the State and Central Valley Water Boards' policies for water reclamation, conservation, recycling and reuse, which align well with CARB Scoping Plan strategies for the Water Sector.

6.4.14 California Natural Resources Agency's California Climate Adaptation Strategy

This document was prepared in response to Executive Order S-13.2008, which directed the California Natural Resources Agency to identify how the state can respond to a variety of climate change impacts collaboratively across several sectors. Specifically, the document considers the water management adaptation strategies in response to the impacts of climate change, including, but not limited to, increases in temperatures, changes in precipitation patterns, sea level rise, and extreme natural events.

The proposed Basin Plan amendments are consistent with water management adaptation strategies because, as described in Sections 6.2.3 and 6.3.7, they were intentionally designed to be compatible with the State and Central Valley Water Boards' policies for water reclamation, conservation, recycling and reuse, which align well with the water management adaptation strategies outlined in the California Climate Adaptation Strategy.

6.5 Implementation Authority

The State and Central Valley Water Boards have the following regulatory authorities and/or obligations to address the methylmercury impairment in the Delta.

6.5.1 Federal Clean Water Act Requirements for Total Daily Maximum Loads

Section 303(d)(1)(A) of the federal Clean Water Act requires that "Each State shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters." The CWA also requires states to establish a priority ranking for waters on the Section 303(d) list of impaired waters and to establish a TMDL for those listed waters.

Essentially, a TMDL is a planning and management tool intended to identify, quantify, and control the sources of pollution within a given watershed so that water quality objectives are achieved and beneficial uses of water are fully protected. A TMDL is defined as the sum of the individual waste load allocations to point sources, load allocations to nonpoint sources, and background loading. Loading from all pollutant sources must not exceed the loading (or assimilative) capacity of a water body, including an appropriate margin of safety. The loading (or assimilative) capacity is the amount of pollutant that a water body can receive without violating the applicable water quality objectives. The specific requirements of a TMDL are described in the United States Code of Federal Regulations Title 40, Sections 130.2 and 130.7 (40 CFR §130.2 and 130.7), and CWA Section 303(d).

In California, the authority and responsibility to develop TMDLs rests with the Regional Water Boards. The USEPA has federal oversight authority for the CWA Section 303(d) program and may approve or disapprove TMDLs developed by the State. If the USEPA disapproves a TMDL, the USEPA is then required to establish a TMDL for the water body.

In California, the Porter-Cologne Water Quality Control Act (CWC, Division 7, Water Quality) requires that an implementation program for a TMDL to be included into the Basin Plan (CWC §13050(j)(3)). This implementation program must include a description of actions to achieve Basin Plan water quality objectives, a time schedule for specific actions to be taken, and a description of monitoring to determine attainment of objectives.

6.5.2 State Authorities over Federal Projects

The proposed Basin Plan amendment has specific requirements for federal agencies such as the U.S. Fish and Wildlife Service, U.S. Bureau and Reclamation, and the U.S. Army Corps of Engineers, for activities under their authority that may cause or contribute to the methylmercury impairment in the Delta. These activities include reservoir creation and operations, wetlands creation and restoration, dredging and dredge material disposal, flood conveyance, and salinity control in the Delta. Clean Water Action Section 313 provides that federal agencies must comply with federal, state and local requirements for the control of water pollution.
CWA Section 313 states:

> “ (a) Each department, agency, or instrumentality of the executive, legislative, and judicial branches of the Federal Government (1) having jurisdiction over any property or facility, or (2) engaged in any activity resulting, or which may result, in the discharge or runoff of pollutants, and each officer, agent, or employee thereof in the performance of his official duties, shall be subject to, and comply with, all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any nongovernmental entity including the payment of reasonable service charges.”

The proposed Basin Plan amendments contain similar requirements and time schedules for Phase 1 studies and allocations for federal agencies as those for state, local government, and nongovernmental agencies.

6.5.3 National Pollutant Discharge Elimination System Permits

The federal Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) program, which in California is administered by the nine Regional Water Boards. The Central Valley Water Board issues NPDES permits to regulate point-source discharges to surface waters in the Central Valley, such as discharges from publicly owned wastewater treatment facilities or privately owned facilities that discharge at discrete locations. The proposed Basin Plan amendments include waste load allocations and interim requirements for NDPES facilities and stormwater.

6.5.4 Stormwater Permits

The Water Quality Act of 1987 added Section 402(p) to the Clean Water Act (CWA §1251-1387). This section requires the USEPA to establish regulations for NPDES requirements for stormwater discharges. Section 402(p) of the CWA states that an area-wide MS4 permit must “require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the USEPA Administrator or the State determines appropriate for the control of such pollutants.” MS4 permittees are subject to federal law, which requires them to implement a program to monitor and control pollutants in discharges to the municipal system from industrial and commercial facilities that contribute a substantial pollutant load to the MS4 (40 CFR 122.26(d)(2)(iv)(A) and 40 CFR 122.26(d)(2)(iv)(C)).

The State of California has in-lieu authority for the NPDES program, and the Porter-Cologne Water Quality Control Act authorizes the State Water Board through the Regional Water Boards to implement this authority.

6.5.5 Prohibition of Discharge and Waste Discharge Requirements

When necessary, the Central Valley Water Board can prohibit certain waste discharges (CWC §13243). These prohibitions can apply to types of wastes and/or to specific areas. Additionally, the Central Valley Water Board has the authority to issue individual or general WDRs that govern the amount of pollution that can be discharged to a water body (CWC §13260 *et seq*.). Any individual or entity discharging waste or proposing to discharge waste in the Central Valley is required to submit a report of waste discharge to the Central Valley Water Board. The Central Valley Water Board may also initiate the permit process by requesting a report of waste discharge from an individual or entity. The Board also has authority to require dischargers to prepare technical reports about a discharge and its impacts (CWC §13267).

Unlike NPDES permits, WDRs can be applied to waste discharges to land, groundwater, and to nonpoint source discharges to surface waters, including agricultural drainage. WDRs could have an important role in the implementation of a solution to the methylmercury impairment, as they are the primary regulatory mechanism available to the Board that can be used to address nonpoint source discharges. WDRs can be issued to parties discharging wastes, including individuals, agencies such as water districts, or companies. WDRs can specify the volume of discharge and set concentration and load limits on the constituents discharged. They can also set receiving water limits, which are the allowable concentrations of a pollutant in the receiving water downstream of a discharge. The Central Valley Water Board can require ongoing discharger compliance monitoring as a permit requirement. Where discharge limits in WDRs cannot be met at the time of adoption, the Board adopts a Cease and Desist Order that specifies steps that must be taken and a timeline that must be followed to bring the discharge into compliance.

6.5.6 Clean Water Act, Section 401 Water Quality Certifications

The proposed Basin Plan amendments include methyl and total mercury requirements for CWA Section 401 Water Quality Certifications for dredging operations in the Delta. Under the federal CWA, an applicant must apply for Water Quality Certification under Section 401 of the CWA if the applicant applies for a Section 404 permit from the USACE for an in-stream activity that may affect water quality. In California, the Regional Water Boards are responsible for providing CWA Section 401 certifications (CWC §3830-3869), which are enforceable orders under California law. In order to issue a CWA Section 401 certification, the Central Valley Water Board must find that the project will, in accordance with the Basin Plan, protect beneficial uses, comply with numeric Basin Plan water quality objectives, and uphold the State Water Board's antidegradation policy. The Central Valley Water Board may impose conditions in a

Section 401 certification to comply with the CWA, California Water Code, and other applicable laws, as necessary. All dredging activities and many marsh restoration actions in the Delta require a Section 401 certification from the Central Valley Water Board.

6.5.7 Porter-Cologne Water Quality Control Act, Section 13267 Requests

The Central Valley Water Board could issue a Section 13267 order to dischargers for the Phase 1 methylmercury control studies required by the proposed Basin Plan amendments. The Central Valley Water Board has the authority to require dischargers to prepare technical reports about a discharge and its impacts, as stated in the California Water Code Section 13267(b):

> "In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waters within its regions, or any citizen or domiciliary, or political agency or entity of the state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of water within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports."

6.5.8 Porter-Cologne Water Quality Control Act, Section 13146 Requests

As noted at the beginning of this chapter, CWC Section 13146 requires that, in carrying out activities that affect water quality, all state agencies, departments, boards and offices must comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the State Water Board in writing their authority for not complying with such policy. Therefore, under this policy, State agencies identified in the proposed Basin Plan amendments as responsible for Phase 1 methylmercury control studies are required to either conduct the studies or indicate in writing to the State Water Board their authority for not complying.

6.5.9 Porter-Cologne Water Quality Control Act, Section 13263 – WDRs

CWC Section 13263 authorizes the Central Valley Water Board to prescribe waste discharge requirements (WDRs) to a discharger:

> " The requirements shall implement any relevant water quality control plans that have been adopted, and shall take into consideration the beneficial uses to be protected, the water quality objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance, and the provisions of Section 13241."

Implementation of the proposed Basin Plan amendment can be through waste discharge requirements issued to point and nonpoint sources.

6.5.10 Porter-Cologne Water Quality Control Act, Section 13269 – Waivers

CWC Section 13269 authorizes the Central Valley Water Board to waive waste discharge requirements if the waiver is consistent with state and regional Basin Plans:

> "(a)(1) On and after January 1, 2000, the provisions of subdivisions (a) and (c) of Section 13260, subdivision (a) of Section 13263, or subdivision (a) of Section 13264 may be waived by the state board or a regional board as to a specific discharge or type of discharge if the state board or a regional board determines, after any necessary state board or regional board meeting, that the waiver is consistent with any applicable state or regional water quality control plan and is in the public interest. The state board or a regional board shall give notice of any necessary meeting by publication pursuant to Section 11125 of the Government Code."

One potential method of implementing the proposed Basin Plan amendment requirements for nonpoint sources (e.g., irrigated agricultural lands and wetlands) is through Order No. R5-2006-005 Coalition Group Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands.

7 CEQA ENVIRONMENTAL CHECKLIST AND DISCUSSION

Basin Plan amendments are projects subject to the California Environmental Quality Act (CEQA). The California Secretary for Resources certified the State Water Board's water quality planning process as functionally equivalent to the requirements of Section 21080.5 of CEQA for preparation of environmental documentation, such as an Environmental Impact Report. This Basin Plan amendment staff report contains documentation that supports the Central Valley Water Board's environmental decision.

This chapter includes the CEQA Environmental Checklist and a discussion of the potential environmental impacts of the proposed plan to control methylmercury in the Sacramento-San Joaquin Delta Estuary, including references to additional supporting documentation provided throughout the staff report. The CEQA environmental evaluation was prepared in compliance with CEQA requirements as they relate to certified regulatory programs. The evaluation is organized in six sections: (1) Project Description, (2) Environmental Checklist, (3) Discussion of Potential Environmental Impacts and Mitigation Measures, (4) Economic Factors, (5) Statement of Overriding Considerations, and (6) Preliminary Staff Determination. The CEQA environmental evaluation refers to the proposed plan to control methylmercury in the Delta (a.k.a. proposed Basin Plan amendments") as "the proposed Project" or simply "the Project". The "Environmental Checklist" and "Discussion of Environmental Impacts" sections are organized into 18 resource categories (a.k.a. "issues"):

- I. Aesthetics
- II. Agriculture and Forestry Resources
- III. Air Quality
- IV. Biological Resources
- V. Cultural Resources
- VI. Geology/Soils
- VII. Greenhouse Gas Emissions
- VIII. Hazards & Hazardous Materials
- IX. Hydrology/Water Quality
- X. Land Use Planning
- XI. Mineral and Energy Resources
- XII. Noise
- XIII. Population and Housing
- XIV. Public Services
- XV. Recreation
- XVI. Transportation/Traffic
- XVII. Utilities/Service Systems
- XVIII. Mandatory Findings of Significance

The threshold of significance for potential environmental impacts is defined in general terms at the beginning of Section 7.2 (Environmental Checklist) and further defined for each resource category in the Environmental Checklist and Discussion of Potential Environmental Impacts (Section 7.3). Section 7.3 also identifies mitigation measures that would reduce potential environmental impacts to less than significant levels. Public Resources Code Section 21159 requires an evaluation of economic factors to be included in the environmental analysis; economic factors are reviewed in Section 7.4. The "Statement of Overriding Considerations" (Section 7.5) further reviews the benefits and potential impacts of the proposed Project as a whole and identifies the potential impacts that, while individually limited, could be cumulatively considerable if appropriate mitigation measures are not incorporated in the overall implementation strategy for the proposed Project.

7.1 Project Description

Project title:

Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury in the Sacramento – San Joaquin Delta Estuary

Lead agency name and address:

California Regional Water Quality Control Board, Central Valley Region
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670

Contact person and phone number:

Patrick Morris, Senior Water Quality Engineer
(916) 464-4621

Project location:

The Sacramento – San Joaquin Delta Estuary (the Delta) as defined in Section 12220 of the California Water Code (CWC) and its tributaries in the Sacramento and San Joaquin Basins.

Description of project:

The Project is defined as the proposed amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) to address the fish tissue mercury impairment in the Delta. The proposed Basin Plan amendments, also referred to as "the proposed Project" or simply "the Project" throughout this environmental analysis, establish water quality objectives for fish tissue methylmercury and define an implementation program to achieve the objectives. The following paragraphs provide a summary description of the proposed Basin Plan amendments. A more detailed description of the proposed amendments and their development can be found in Chapters 2 through 5.

The Delta is on the federal Clean Water Act (CWA) Section 303(d) List of Impaired Water Bodies because of elevated levels of mercury in Delta fish. The Delta has been identified under CWA Section 303(d) as impaired due to a fish consumption advisory for elevated concentrations of mercury in fish tissue, which pose a threat to humans. The elevated fish mercury concentrations also pose a threat to threatened and endangered wildlife species and other wildlife that consume Delta fish. In addition, the State Water Board established the Bay Protection and Toxic Cleanup Program (BPTCP) to implement the requirements of California Water Code Section 13390 *et seq.* and adopted the Consolidated Toxic Hot Spots Cleanup Plan (CWC §13394) that identified mercury in the Delta as a toxic hot spot, and the San Francisco Bay Water Board adopted a mercury control plan for San Francisco Bay that assigned mercury reductions to Central Valley outflows to the Bay to address the Bay's mercury impairment.

The goal of the proposed Basin Plan amendments and resulting actions is to lower fish mercury levels in the Delta so that the beneficial uses of fish consumption and wildlife habitat are attained. The proposed amendments (Project) include the:

- Addition of the commercial and sport fishing (COMM) beneficial use for the Delta and Yolo Bypass;

- Establishment of numeric fish tissue objectives for methylmercury in Delta/Yolo Bypass fish and documentation of the assimilative capacity of ambient methylmercury in Delta/Yolo Bypass waters based on those objectives;
- Adoption of methylmercury load and waste load allocations and total mercury limits as required by Clean Water Act Section 303(d)(1)(C);
- Adoption of an implementation strategy that incorporates an adaptive management approach to (a) reduce methyl and total mercury loading to the Delta and Yolo Bypass to enable compliance with the proposed fish tissue objectives for the Delta according to CWA Section 303(d) and the BPTCP, and with the total mercury allocation assigned to the Delta by the San Francisco Bay mercury control program; and (b) reduce methylmercury exposure to the fish-eating public;
- Adoption of a schedule for evaluating the progress of the implementation program and making changes as needed using a phased, adaptive management approach; and
- Addition of a monitoring and surveillance program.

The Project boundary extends beyond the legal Delta boundary to include those portions of the Yolo Bypass outside the Delta because available information indicates that the Yolo Bypass is a substantial source of both total mercury and methylmercury to the Delta. The Project requires responsible entities that discharge total (inorganic) mercury or methylmercury within the Delta/Yolo Bypass to:

- During the first seven years (Phase 1): implement feasible, reasonable total mercury reduction actions, including the maintenance of Phase 1 NPDES facility total mercury mass limits; conduct methylmercury control studies or collaborate with those conducting the studies; develop applicable methylmercury management practices and control measures; develop and submit a schedule for implementation; and prepare and submit supporting documentation in such cases where achieving methylmercury allocations is considered by the discharger(s) as infeasible.
- After the Board reviews the Phase 1 study results and re-evaluates the implementation program: implement applicable management practices and control actions (Phase 2).

Possible approaches to controlling methylmercury and inorganic (total) mercury inputs to the Delta and Yolo Bypass include developing and implementing management practices or control actions to reduce inputs of these constituents from: municipal storm water, water storage and management, NPDES wastewater treatment facilities, dredge material disposal, irrigated agriculture, and wetland restoration. In addition, the proposed Basin Plan amendments include study and control requirements for flood control and other water management activities within the Delta/Yolo Bypass and upstream tributary watersheds that affect total mercury and methylmercury inputs to the Delta. The proposed Basin Plan amendments also have specific requirements to reduce mercury discharges from the Cache Creek Settling Basin and include total mercury load limits for the Cache Creek, Feather River, American River and Putah Creek watersheds, the watersheds that contribute the most mercury-contaminated sediment to the Delta. Almost all total mercury loading and about half or more of the methylmercury loading comes from tributary inputs. Additional allocations and control requirements for specific methylmercury and total mercury point and nonpoint sources within the tributary watersheds will be included in future Basin Plan amendments for control programs for the upstream tributary watersheds.

The proposed Project also requires methylmercury dischargers to develop and implement a strategy to reduce methylmercury exposure to people who eat Delta fish. The amendments recommend that the dischargers should coordinate these efforts with public health agencies and affected communities.

The beneficial uses of the Delta that are sensitive to elevated fish mercury levels are described in Chapter 2. Recommended and alternative fish tissue objectives are described in Chapter 3. Implementation alternatives, load and waste load allocations and reasonably foreseeable methods of compliance associated with each alternative, and the potentially responsible entities and compliance schedule are described in Chapter 4. The monitoring and surveillance program is described in Chapter 5 and a summary of existing federal and state laws and policies that are relevant to the proposed water quality objectives and implementation plan is provided in Chapter 6.

7.2 CEQA Environmental Checklist

Adopting the proposed Project (the proposed Basin Plan amendments) could result in agencies (e.g., cities, counties, WWTPs, and other dischargers) implementing site-specific projects to satisfy requirements included in the proposed Basin Plan amendments. These site-specific projects may physically change the environment and potentially result in environmental impacts. The environmental factors (a.k.a. "resource categories" or "issues") checked below could be potentially affected by implementation of the proposed Basin Plan amendments. See the "Environmental Checklist" on the following pages for more details.

☑ Aesthetics	☑ Greenhouse Gas Emissions	☑ Population and Housing
☑ Agriculture and Forestry Resources	☑ Hazards & Hazardous Materials	☑ Public Services
☑ Air Quality	☑ Hydrology/Water Quality	☑ Recreation
☑ Biological Resources	☑ Land Use Planning	☑ Transportation/Traffic
☑ Cultural Resources	☑ Mineral and Energy Resources	☑ Utilities/Service Systems
☑ Geology/Soils	☑ Noise	☑ Mandatory Findings of Significance

The "Environmental Checklist" has four categories that characterize the potential level of impact that implementation of the proposed Project could have on environmental resources: no impact; less than significant impact; less than significant impact with mitigation incorporated; and potentially significant impact.

"No Impact": Given the potential geographic extent and variety of site-specific projects that may be implemented to comply with the proposed Basin Plan amendments, it is not likely that implementing the proposed Basin Plan amendments would have absolutely no impact on environmental resources. That is, agencies responsible for implementing site-specific projects will likely need to consider different project alternatives (e.g., site selection) and incorporate measures to avoid impacts or reduce potential impacts to less than significant levels for almost all of the resources within each of the different environmental resource categories identified in the Environmental Checklist. As a result, there is no environmental resource category for which "No Impact" was selected for all of the resources within a given resource category on the

Environmental Checklist, which is why all of the resource categories listed in the previous paragraph are checked.

"Less than Significant Impact": Staff considered a potential environmental impact to be a "Less than Significant Impact" if common, readily-available measures could enable a site-specific project to avoid any impact to environmental resources (e.g., selection of a project site and construction methods that avoid all potential impacts) or reduce potential impacts to less than significant levels. As reviewed in Section 7.3, there are numerous standard measures for ensuring that commonly conducted activities, such as project site selection and construction-related earth-moving activities, have a less than significant impact on biological, cultural, and other environmental resources. These standard measures should be part of any approved or permitted project. This environmental analysis assumes that entities responsible for complying with the proposed Basin Plan amendments will design, evaluate, and implement studies, pilot projects, management practices and controls in compliance with all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices.

In addition, staff considered a potential environmental impact to be "Less than Significant Impact" if a mitigation measure is an integral component of the proposed Project.

"Less Than Significant with Mitigation Incorporated": Staff considered a potential impact to be "Less Than Significant with Mitigation Incorporated" if implementing agencies may need to incorporate mitigation beyond standard measures associated with common construction activities to prevent substantial loss of habitat, increases in greenhouse gases, or a substantial degradation of water quality. Staff described such potential impacts in Section 7.3 and potential mitigation measures that could be incorporated to mitigate the potential impacts to less than significant levels. Per CEQA Guidelines Section 15126.4(a)(1), "Mitigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design." However, "Less Than Significant with Mitigation Incorporated" has not been selected on the Environmental Checklist for any of the environmental resources because, as explained in the following paragraphs, specific mitigation measures are not included in the proposed Basin Plan amendments. The Central Valley Water Board does not specify the actual means of compliance by which responsible entities (e.g., dischargers, government, nonprofit, and private agencies, or other persons responsible for complying with total mercury and/or methylmercury control requirements) choose to comply with the proposed Basin Plan amendments. As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those mitigation measures identified in Section 7.3 or comparable mitigation measures, except for those site-specific projects for which the Board is the "Lead Agency".[48] Consequently, "Potentially Significant Impact" was selected instead of "Less Than Significant with Mitigation Incorporated" on the Environmental Checklist even if mitigation measures described in Section 7.3 are expected to reduce potential impacts to less than significant levels. However, the discussion in Section 7.3 differentiates between the two

[48] The Central Valley Water Board is the "Lead agency" for site-specific projects when it has the principal responsibility for carrying out or approving a project that may have a significant effect upon the environment.

categories to help guide the implementation of the proposed Basin Plan amendments and to better enable entities responsible for implementing site-specific projects to develop a “tiered”[49] environmental analysis. None-the-less, this environmental analysis provides a program-level review of potential impacts and possible mitigation measures. This analysis should not be considered a replacement for project-level evaluations required of future site-specific project proponents.

“Potentially Significant Impact”: Staff considered a potential impact to be a “Potentially Significant Impact” if reasonably foreseeable mitigation measures may not be adequate for implementing entities to prevent a site-specific project, or the cumulative effects of multiple projects, either directly or indirectly, from causing substantial loss of habitat, substantial increases in greenhouse gases, or substantial degradation of water quality or other environmental resources compared to baseline conditions. In addition, as noted in the previous paragraph, “Potentially Significant Impact” was selected on the Environmental Checklist if the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate measures to mitigate potential impacts to less than significant levels.

Some form of mitigation is possible for all of the potentially significant environmental impacts that staff identified. Mitigation measures can and should be incorporated in the design and construction of site-specific projects. However, selection and performance of mitigation measures are within the responsibility and jurisdiction of agencies implementing the site-specific projects. The Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Specific measures for mitigation of significant impacts are not included in the proposed Basin Plan amendments. Although discussion in Section 7.3 identifies measures that can be performed to mitigate impacts to less than significant levels, the Central Valley Water Board does not have the authority – except when the Board is the Lead Agency – to ensure that agencies implementing the site-specific projects do indeed incorporate these or comparable measures.

A detailed discussion of the potential environmental impacts and mitigation measures for each of the environmental resource categories is provided after the Environmental Checklist.

[49] Entities that implement site-specific projects to comply with the proposed Basin Plan amendments can develop site-specific environmental impact reports that incorporate by reference the discussion in this environmental analysis and concentrate on the environmental effects that (a) are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in this environmental analysis.

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	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 that would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

II. AGRICULTURAL AND FORESTRY RESOURCES. In determining whether impacts to agricultural resources are significant environmental impacts, 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. In determining whether impacts to forestry resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.
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) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)) or timberland (as defined by Public Resources Code section 4526)?	☐	☐	☒	☐
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☒	☐
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☒	☐

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	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 the 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 that 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, or regulations or by the 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?	☐	☐	☒	☐

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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 an archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?	☐	☐	☒	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐
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 a 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?	☒	☐	☐	☐

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. GREENHOUSE GAS EMISSIONS. Would the Project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☒	☐	☐	☐
b) Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	☒	☐	☐	☐
VIII. 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 that 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?	☒	☐	☐	☐

ISSUE	POTENTIALLY SIGNIFICANT IMPACT	LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED	LESS THAN SIGNIFICANT IMPACT	NO IMPACT
IX. 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 preexisting 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 that would result in substantial erosion or 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 that results in flooding on- or off-site?	☒	☐	☐	☐
e) Create or contribute runoff water that exceeds the capacity of existing or planned storm water 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?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures that 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 by seiche, tsunami, or mudflow?	☒	☐	☐	☐

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
X. 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?	☐	☐	☒	☐
XI. MINERAL AND ENERGY RESOURCES. Would the Project:				
a) Result in the loss of availability of a known mineral or energy 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?	☐	☐	☒	☐
XII. 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?	☐	☐	☒	☐

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. 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?	☐	☐	☒	☐
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☒	☐
XIV. PUBLIC SERVICES.				
a) Would the Project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or the 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?	☐	☐	☐	☒
XV. 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 that might have an adverse physical effect on the environment?	☐	☐	☐	☒

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. 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 capacity ratio to 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 results 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)?	☐	☐	☐	☒
XVII. 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 and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒

Issue	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
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?	☐	☐	☐	☒
XVIII. 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 cumulatively considerable? ("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)?	☒	☐	☐	☐
c) Does the Project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

7.3 Discussion of Potential Environmental Impacts and Mitigation Measures

The following is an evaluation of potential environmental impacts of the proposed Basin Plan amendments. The evaluation is based on the reasonably foreseeable methods of compliance with the proposed Basin Plan amendments described in Section 4.3 of this report.

The proposed Basin Plan amendments, also referred to as “the proposed Project” or simply “the Project”, establish water quality objectives for fish tissue methylmercury and define an adaptive implementation program to achieve the objectives. The proposed Basin Plan amendments include methylmercury allocations for methylmercury discharges to the Delta and Yolo Bypass, reduction requirements for total mercury discharges to the Delta/Yolo Bypass (including requirements to reduce total mercury discharges from the Cache Creek Settling Basin), and total mercury load limits for tributary watersheds that contribute the most mercury-contaminated sediment to the Delta (Cache Creek, Feather River, American River, and Putah Creek). The proposed amendments also require: methylmercury control studies; development and implementation of management practices and control measures for reducing methyl and total mercury sources; and monitoring of source and ambient conditions to evaluate compliance with the implementation program. Implementation activities are expected to encompass a variety of site-specific studies and point and nonpoint source control projects throughout the Delta/Yolo Bypass. In addition, the proposed Basin Plan amendments include study and control requirements for flood control and other water management activities within the Delta/Yolo Bypass and upstream tributary watersheds that affect total mercury and methylmercury inputs to the Delta.

The goal of the proposed Project and resulting implementation actions is to lower fish methylmercury levels in the Delta and San Francisco Bay so that the beneficial uses of fish consumption and wildlife habitat are attained; in other words, make it safer for humans and wildlife to consume Bay-Delta fish. However, a variety of implementation activities have the potential to cause direct and indirect negative effects. Most implementation activities would have no impact or insignificant impacts, but some have the potential for significant impacts if mitigation measures are not included in the site-specific projects’ construction and operation.

CEQA requires lead agencies to review the potential for their actions to result in adverse environmental impacts and to adopt feasible measures to mitigate potentially significant impacts. “Mitigation” measures can include: (a) Avoiding the impact altogether by not taking a certain action or parts of an action; (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment; (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) Compensating for the impact by replacing or providing substitute resources or environments (CEQA Guidelines Section 15370).

Analyzing the potential adverse impacts of adoption of an environmental policy or regulation is considerably different in nature than the analysis of actions described in a more typical, public facility or private development environmental impact report. The environmental effects of a policy or regulation do not occur directly as a result of the action (i.e., adoption of the regulation), but as an indirect consequence of the practices used to comply with the policy or plan.

Consistent with Public Resources Code (PRC) Section 21159, this evaluation does not engage in speculation or conjecture, but rather considers the reasonably foreseeable environmental impacts of the reasonably foreseeable methods of compliance with the proposed Basin Plan amendments and mitigation measures that would avoid or reduce the identified impacts. Any potential environmental impacts associated with the proposed Project depend upon the specific compliance methods and mitigation selected by the entities responsible for implementing site-specific projects, most of which are public agencies subject to their own CEQA obligations. The Central Valley Water Board does not specify the actual means of compliance by which responsible entities (e.g., dischargers, agencies or other persons responsible for total mercury and/or methylmercury sources) choose to comply with the proposed Basin Plan amendments. Therefore, the following discussion provides a program-level evaluation of the potential impacts to each environmental resource described in the Environmental Checklist that could result from reasonably foreseeable methods of compliance, as well as the potential impacts that could result from reasonably foreseeable mitigation measures. Per CEQA Guidelines Section 15126.4(a)(1)(D), "If a mitigation measure would cause one or more significant effects in addition to those that would be caused by the project as proposed, the effects of the mitigation measure shall be discussed but in less detail than the significant effects of the project as proposed. (*Stevens v. City of Glendale* (1981) 125 Cal.App.3d 986.)" Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. Responsible entities may select among the methods of compliance identified in this evaluation, or they may propose another method so long as it complies with Basin Plan requirements in a lawful manner.

Many aspects of the proposed Project overlap with existing requirements established by other permitting programs, environmental program plans, and state and federal regulations. Such existing requirements, and remediation practices that already take place to comply with them, will be referred to as "baseline" requirements and practices. The Porter-Cologne Water Quality Control Act and associated Basin Plan numeric and narrative water quality objectives and implementation plans vest extensive existing authority in the State and Central Valley Water Boards. As a result, many of the requirements included in the proposed Basin Plan amendments have already been implemented and will continue regardless of whether the proposed amendments are adopted by the Central Valley Water Board. In addition, other state agencies' programs already require several of the compliance activities that could result from the implementation of the proposed amendments. For example:

- The programmatic Record of Decision CEQA documentation for the CalFed Bay-Delta Program commits the California Bay Delta Authority to developing mitigation strategies to address potentially significant adverse environmental impacts resulting from CalFed projects, including the potential exposure of mercury-laden sediments from activities related to dredging activities, and the methylation of inorganic mercury from wetlands restored as part of its Ecosystem Restoration Program.
- The USACE requires certain construction and earth-moving activities as part of its operations and maintenance plan for the Cache Creek Settling Basin, and already

evaluated the potential adverse impacts and mitigations in earlier environmental documentation.

For the sake of clarity and completeness, the following discussion reviews the potential impacts and mitigations that could result from compliance with the baseline and beyond-baseline requirements included in the proposed Basin Plan amendments. Baseline requirements are noted as applicable in the discussion of each environmental resource identified in the Environmental Checklist. However, the Determination, Environmental Checklist, Mandatory Findings of Significance, and Statement of Overriding Considerations are all based on those reasonably foreseeable methods of compliance likely to be undertaken to comply with those aspects of the proposed Basin Plan amendments that extend beyond baseline requirements.

This evaluation assumes that all responsible entities will conduct appropriate site-specific environmental analyses to evaluate potentially adverse, project-level environmental impacts, and mitigation measures once their preferred methods of achieving compliance with the proposed Basin Plan amendments have been determined. This evaluation also assumes that responsible entities will design, evaluate, and implement studies, pilot projects, management practices and controls in compliance with all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices.

The following sections of this report describe the potentially significant adverse physical impacts – both direct and indirect – that could result from the proposed Project to each resource category delineated by Roman numerals in the Environmental Checklist. For each resource, the potential environmental effects of the reasonably foreseeable methods of compliance with both Phase 1 and Phase 2 of the proposed mercury control program are reviewed. Many of the potential Phase 2 control actions are more speculative because the proposed Phase 1 methylmercury control studies are needed to further develop and evaluate the feasibility and efficacy of methylmercury management practices to be implemented in Phase 2. This evaluation addresses foreseeable mitigation measures for potential impacts resulting from foreseeable compliance methods. The proposed Phase 1 control studies would further assess the potential impacts of newly developed methylmercury and total mercury control actions and evaluate mitigation measures. The Phase 1 methylmercury control studies are expected to increase the number of both possible methylmercury control options and possible measures to mitigate potential impacts. The environmental effects of new control options will be evaluated during future Basin Planning efforts at the end of Phase 1.

The proposed Project includes key principles for voluntary mercury and methylmercury pilot offset projects but does not require offset projects to take place nor prescribes specific details for offset projects. The proposed Project includes a schedule for development of a long-term offset program for Central Valley Water Board consideration by the end of Phase 1, such that a Phase 2 offset program can be guided by the results of the proposed Phase 1 methylmercury control studies and any voluntary pilot offset projects. The proposed Project does not require long-term offset projects to take place nor prescribes specific offset projects. A program-level evaluation of the potential environmental impacts of a Phase 2 mercury offset program will be conducted when the offset program is brought before the Board. However, if a voluntary pilot offset project involves construction, agriculture land or wetland modification, hazards or hazardous material, changes to hydrology or water quality, land use, greenhouse gas emissions, or modification to utilities, then the following environmental analysis and potential mitigation measures could apply to the project. In addition, the environmental analysis addresses the use of credit accrued by pilot offset projects.

I. Aesthetics

The Phase 1 control studies and pilot projects are unlikely to alter any scenic vistas, damage scenic resources, degrade the visual character of any site, or adversely affect day or nighttime views. Control actions and management practices implemented to maintain Phase 1 NPDES facility total mercury mass limits, to improve the sediment and mercury trapping efficiency of the Cache Creek Settling Basin, and to achieve and maintain the methylmercury allocations and watershed total mercury load limits during Phase 2 are similarly unlikely to affect aesthetics because any physical changes to the aesthetic environment as a result of their implementation would be small in scale. However, in the unlikely event that construction activities or structural controls have the potential to create aesthetically offensive impacts, these can be addressed with screening and other construction best management practices (BMPs), standard architectural and landscape architectural practices such as the inclusion of landscape vegetation to serve as a visual buffer, use of building materials that do not create a source of glare, and direction of lighting away from residential and roadway areas. As a result, any potential impacts from the implementation of the proposed Project would be less than significant.

II. Agricultural and Forestry Resources

A. Agricultural Resources

Delta/Yolo Bypass Farmland. There are more than one half million acres of agricultural lands in the Delta and Yolo Bypass (see Figure 6.6 in the TMDL Report). The California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP) categorizes and maps agricultural lands of importance throughout the State. The FMMP defines the following important agricultural land categories (CDOC-FMMP, 2009):

- Prime Farmland, which has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- Farmland of Statewide Importance, which is similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.
- Unique Farmland, which consists of lesser quality soils used for the production of the State's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

- Farmland of Local Importance, which is land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.
- Grazing Land, which is land on which the existing vegetation is suited to the grazing of livestock.

The FMMP categorizes nearly all of the agricultural land in the Delta (not including the Yolo Bypass area) as Prime Farmland; almost all of the agricultural land in the Yolo Bypass and other agricultural land in the Delta are categorized as Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, or Grazing Land (CDOC-FMMP, 2009).

Phase 1 of the proposed Project requires studies to develop management practices to reduce the methylmercury load in agricultural drainage to surface waters and the implementation of reasonable, feasible actions to reduce sediment in runoff with the goal of reducing inorganic mercury loading to the Yolo Bypass and Delta, in compliance with existing Basin Plan objectives and requirements, and Irrigated Lands Regulatory Program requirements. Methylmercury control studies would not require conversion of any farmland to non-agricultural use nor conflict with existing zoning for agricultural use or a Williamson Act contract. In addition, reduction of sediment in runoff is a baseline requirement under existing regulations and programs; that is, it is not a new requirement.

Phase 2 of the proposed Project requires that management practices be implemented to reduce identified agricultural sources of methylmercury that discharge to areas of the Delta and Yolo Bypass where fish methylmercury levels exceed the proposed fish tissue objectives. Compliance methods could include, but not be limited to, modifying agriculture return water discharge patterns to decrease the methylmercury concentration of the return water entering the receiving waters, and utilizing drip irrigation or tail-water recovery systems or other water-efficient systems to curtail or limit irrigation runoff and discharge volume to the receiving waters.

These management practices have already been developed and are readily implemented to manage other pollutants such as pesticides and to conserve water. The effects and costs associated with these management practices have been previously evaluated (e.g., Karkoski *et al.*, 2003; Beaulaurier *et al.*, 2005; McClure *et al.*, 2006; and Hann *et al.*, 2007). These management practices are not expected to conflict with existing zoning for agricultural use or a Williamson Act contract or involve further changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use because it is likely that only a relatively small subset of agricultural areas will need to implement methylmercury management practices during Phase 2 and methylmercury management practices are not expected to result in significant impacts to Farmland.

The proposed Basin Plan amendments do not require methylmercury load reductions for agricultural discharges in the Central and West Delta TMDL subareas. In addition, the proposed Basin Plan amendments assign subarea allocations for agricultural discharges rather than individual allocations. This allows growers within each subarea that needs methylmercury reductions to comply with subarea allocations to focus methylmercury reduction efforts on agricultural discharges for which reasonable management practices are possible. That is, growers would be able to choose an approach appropriate to crops and fields that will minimize costs and allow them to continue farming while achieving and maintaining the proposed methylmercury allocations. The subarea allocations do not require that every individual grower implement methylmercury management practices.

Utilizing drip irrigation, tail-water recovery systems or other water conservation systems to curtail or limit irrigation runoff and discharge volume to the receiving waters are not expected to adversely impact agricultural practices, the environment, or management practices used to control other pollutants, with one exception. It is likely that not all agricultural areas would be able to make use of water conservation methods such as tailwater recovery systems or drip irrigation systems, especially areas with shallow, highly saline groundwater. This could be of particular concern in the San Joaquin River TMDL subarea in the southern Delta (Herrick, 2009). Phase 1 control studies are needed to identify and evaluate additional management practices for agriculture and other sources, with the goal of determining effective methylmercury management practices that protect beneficial uses of Delta waters and current agricultural land uses.

Potentially, some water quality management practices such as buffer strips and constructed wetlands may need to be evaluated and, if needed, modified or limited to reduce or at least not increase methylmercury production. However, there are other water management practices available that address the same goals as buffer strips and constructed wetlands.

The Phase 1 methylmercury control studies are expected to increase the number of possible control options for agricultural sources of methylmercury and possible measures to mitigate potential impacts (e.g., the potential for water conservation practices to cause decreased crop yields due to salt accumulation in southern Delta mineral soils [Herrick, 2009]). The environmental effects of new control options would be evaluated during future Basin Planning efforts at the end of Phase 1. If the potential methods of compliance described above and developed by the Phase 1 studies are unable to adequately achieve the proposed methylmercury allocations, growers may be able to participate in an offset program (if one is approved by the Central Valley and State Water Boards and USEPA; see Section 4.3.9). If the Phase 1 studies are not able to develop feasible and reasonable methylmercury management practices for all areas of the Delta/Yolo Bypass (e.g., areas with shallow, highly saline groundwater in the San Joaquin River subarea in the southern Delta) and a legally viable, long-term offset program is not possible, the Board would need to modify the allocations so that sources with feasible methylmercury control methods would be required to make greater reductions. Methylmercury loading in agricultural discharges in the San Joaquin River subarea is a relatively small portion (about 4%; see Table 8.4e in the TMDL Report) of all methylmercury sources to that subarea during the relatively dry TMDL period (water years 2000-2003). In addition, a recent study that evaluated methylmercury production on and discharges from farmed Delta Islands indicated that farmed islands in the northern/central Delta dominated by mineral soils had lower net methylmercury loads than islands dominated by organic soils (Heim *et al.*, 2009), with an overall annual loading rate lower than that estimated in the TMDL Report for the WY2000-2003 period. As a result, it is expected that if the currently proposed, equitable allocation scheme is not possible because there are no feasible methylmercury management practices for agricultural methylmercury discharges in the San Joaquin River subarea and a viable offset program is not possible, than the Board should be able to modify allocations in a way that still achieves the fish tissue objectives in the San Joaquin River subarea. The proposed Basin Plan amendments include language that commits the Board to conducting a "Delta Mercury Control Program Review" after the Phase 1 studies are completed and TMDL control programs for the major tributary inputs are developed. The Program Review includes assessing: (a) the effectiveness, costs, potential environmental effects, and technical and economic feasibility of potential methylmercury control methods; (b) whether implementation of some control methods would have negative impacts on fish and wildlife habitat or other project benefits; (c) methods that can be employed to minimize or avoid potentially significant negative impacts that may result from control methods; (d) implementation plans and schedules proposed by the dischargers; and (e) whether methylmercury allocations can be attained.

<u>Cache Creek Settling Basin Farmland</u>. The proposed Project also requires Phase 1 studies and subsequent improvements to the total mercury trapping efficiency of the Cache Creek Settling Basin. As described in Section 4.3.6, reasonably foreseeable methods to comply with the basin improvement requirements include structural modifications to increase the trapping efficiency (raise the outlet weir, excavate the basin, and/or expand the size of the basin) and periodic removal of contaminated sediment to maintain the trapping efficiency. USACE's draft sediment management plan includes the following potential activities to maintain an average 50% trapping efficiency over the 50-year (1993 to 2042) life of the basin: construction and maintenance of a training channel and levee, incremental removal of the existing training levee, and raising of the outlet weir in year 25 (2018) of the basin project. In addition, the 1979 Environmental Statement prepared by the USACE described expected maintenance activities, which included annual removal of sediments. As a result, raising the weir and excavating sediment from the basin may be considered baseline requirements under existing basin management practices. Even so, possible impacts resulting from raising the weir and excavating sediment as well as expanding the basin are evaluated below.

Portions of the Cache Creek Settling Basin are farmed during periods when the basin is not flooded. During any given year, about 1,900 acres (53%) of the 3,600-acre basin may be farmed (CDM, 2006). The 2004 Farmland Mapping and Monitoring Program data for Yolo County was obtained as a GIS layer (CDOC, 2004) and overlain with the outline of the basin to determine farmland designations within and adjacent to the basin. About 0.2% (7 acres) of the basin is designated as "Prime Farmland" and about 56% (2,004 acres) of the basin is designated as "Unique Farmland". In addition, about 83% of the Cache Creek Settling Basin is zoned as Agricultural General Zone (A-1) and 17% is zoned as Agricultural Preserve (A-P) (CDM, 2006). A-P zoned lands are contracted as Williamson Act lands with Yolo County; principal uses can include agricultural use, public parks, and rural recreation. The A-P zoned land occurs in the western portion of the basin where Cache Creek enters the basin and is bound by the training channel and levee. The A-P zoned land supports native vegetation; it is not currently farmed (CDM, 2006).

If parties responsible for the Cache Creek Settling Basin choose to dredge the basin sediments as a control measure to improve its trapping efficiency, landowners who typically grow crops during the dry season will not be able to farm that year or may need to shift their planted areas to another part of the basin. It is anticipated that excavation activities would focus on areas where the most sediment has accumulated; therefore, sediment removal would not take place over the entire basin during any one year. Therefore, all land within the basin would not need to be out of production at any one time. Sediment removal would not remove the land from long-term agricultural production. Historically, there have been sediment removal projects by private landowners in the basin while farming continued in other portions of the basin; farming resumed in areas that experienced these sediment removal projects. In addition, the State has easements on land within the basin to impound water, excavate sediment, and make other improvements related to flood control including vegetation removal. Therefore, when the basin is flooded, some or all of the basin is temporarily (e.g., one growing season) removed from agricultural production. The 1979 Environmental Statement prepared by the USACE evaluated expected maintenance activities including annual removal of sediments, which would have impacted agricultural practices to the same degree as the proposed Basin Plan amendments. The effects of sediment removal would be temporary in nature and the impacts to agriculture would be less than significant.

Another potential option for improving the sediment and total mercury trapping efficiency of the Cache Creek Settling Basin that may affect agricultural practices is the expansion of the basin. Initial modeling results (CDM, 2004b) indicate that a basin trapping efficiency of about 55% could be accomplished through a basin expansion of about 1,500 acres along the northeastern border of the basin. The majority of the acreage that would be encompassed by the expansion is designated as "Prime Farmland" (CDOC, 2004) and is currently zoned as A-P (CDM, 2006). Land within the expansion area could be farmed with like crops and practices that are currently employed within the existing basin perimeter. However, the expansion of the basin could involve permanently removing some agricultural land (about 36 acres) from production for the construction of new perimeter levees for the expansion area. If portions of the existing levee were removed during the expansion progress (those sections of levee that would now be in the interior of the expansion area and would no longer be necessary), an additional 27 acres would be available for farming. Hence, there would be net loss of about 9 acres. This potential impact is considered to be less than significant.

Current operations of the Cache Creek Settling Basin result in some portions of the southern part of the basin remaining too saturated for planting crops during some years. Increasing the outlet weir could decrease the time available for planting crops in the southern half of the basin due to the soils being too saturated from the additional time the basin is flooded. A potential mitigation would be to modify the low flow outlet structure and downstream channel to increase the volume of water passing through the low flow structure after high flows have receded. This would allow the basin to drain more quickly after the basin has flooded and minimize the impact to agriculture. Because raising the Cache Creek Settling Basin outlet weir is part of the basin's sediment management plan and was evaluated by previous environmental documentation for the basin's construction and management, there would be no new impact to agricultural resources from this action as a result of the proposed Basin Plan amendments.

Although the proposed Project could require improvements to the Cache Creek Settling Basin not previously planned by the USACE and DWR, new easements for the improvements will not be required for land within the basin. Land within the Cache Creek Settling Basin was condemned for the purposes of managing sediment from the Cache Creek watershed as documented in a settlement between the State of California and the landowners (Final Order of Condemnation, 14 July 1995). The State has easements in the basin to flow and impound water and sediment, excavate and remove sediment, and clear and remove any obstructions or vegetation for operations and maintenance of the basin. In addition, the landowners acknowledged that the State may modify, enlarge, or implement future modifications and improvements to the basin that may cause additional flood flows, material deposition, and other physical changes, and the Final Order of Condemnation allows the modifications, enlargements, and improvements to be implemented.

Tributary Watershed Farmland. As noted in the Project Description, the proposed Basin Plan amendments include total mercury load limits for the Cache Creek, Feather River, American River and Putah Creek watersheds, the watersheds that contribute the most mercury-contaminated sediment to the Delta. In addition, the proposed Basin Plan amendments include study and control requirements for flood control and other water management activities within the Delta/Yolo Bypass and upstream tributary watersheds that affect total mercury and methylmercury inputs to the Delta. Sections 4.3.10 and 4.3.11 describe the reasonably foreseeable methods of compliance with the proposed Basin Plan amendment requirements, which include conducting additional methylmercury and total mercury control feasibility analyses and implementation of total mercury control projects in the upstream watersheds, with special attention on the Feather River, American River, and Putah Creek watersheds as well as particular sources that supply mercury to hotspots of methylation in these and other tributary watersheds.

The FMMP categorizes much of agricultural land in the lowland areas of the tributary watersheds as Prime Farmland or Farmland of Statewide Importance (CDOC-FMMP, 2009). It is conceivable that site-specific projects implemented to comply with the total mercury limits for the American, Cache, Feather and Putah watersheds and the requirements for flood and water management activities could affect important farmlands. However, although some potential site-specific projects in the tributary watersheds have been identified (Tetra Tech, 2008; see Section 4.3.11), detailed feasibility analyses that identify potential environmental impacts – including the potential individual and cumulative acreages of Farmland that may be directly or indirectly affected and possible mitigation measures – have not yet been conducted, Also, as noted in Table 2.1 in the TMDL Report, the tributary watersheds that drain to the Delta during most years – the Sacramento and San Joaquin Basins – comprise almost 30% of the State of California. The extensive geographic area and variability of land uses of the tributary watersheds makes an assessment of potential affects to important farmlands too speculative to evaluate. Evaluations of potential impacts to environmental resources will be a component of the development of the TMDL control programs for upstream watersheds as well as site-specific projects in the tributary watersheds designed to comply with the proposed Delta mercury control program.

B. Forestry Resources

The proposed Project lies within a region dominated by agriculture and grasslands with some hardwood woodland and forests, as well as urban forests (CDF, 2003; CDF, 2010). Riparian and cottonwood forests are the dominant type of forest within the Delta and Yolo Bypass. According to the National Wetland Inventory (USFWS, 2006), there are about 5,000 acres of freshwater forested/shrub wetlands in the Delta and Yolo Bypass, compared to about 21,000 acres of emergent wetlands. As discussed previously under Agricultural Resources, Phase 1 of the proposed Project requires studies to evaluate the sources of methylmercury in agricultural drainage and other discharges to surface waters in the Delta and Yolo Bypass and to develop management practices to reduce the methylmercury sources. Such studies would not require conversion of any forest lands (as defined in Public Resources Code § 12220 (g)), timberlands (as defined in Public Resources Code § 4526) or range lands to non-forest use, or result in loss of forest lands. In addition, such studies would not involve further changes in the existing environment which, due to their location or nature, could result in the conversion of forest land to non-forest use.

As previously discussed under Agricultural Resources, Phase 2 of the proposed Project requires that management practices be implemented to reduce identified agricultural and other sources of methylmercury that discharge to areas of the Delta and Yolo Bypass where fish methylmercury levels exceed the proposed fish tissue objectives. Implementation of management practices are not expected to include control actions that would focus on riparian or other forests in the Delta and Yolo Bypass and as a result would not require conversion of any forest lands (as defined in Public Resources Code § 12220 (g)), timberlands (as defined in Public Resources Code § 4526) or range lands to non-forest use, or result in loss of forest lands. In addition, implementation of management practices would not involve further changes in the existing environment which, due to their location or nature, could result in conversion of forest land to non-forest use.

However, site-specific pilot projects and long-term, site-specific implementation projects to control total mercury and methylmercury, particularly in wetland and open water areas where riparian forests may exist, could involve a variety of short-term construction activities and long-term control structures that have the potential to affect isolated areas of riparian forests. CEQA requires lead agencies for specific projects to review the potential for their actions to result in adverse environmental impacts and to adopt feasible measures to mitigate potentially significant impacts. All control projects and their associated construction and maintenance activities would be required to adhere to state and federal regulations and local ordinances (e.g., General Plan conservation requirements and city and/or county tree ordinances) to avoid and/or minimize impacts to forest and other biological resources and to mitigate unavoidable impacts. Examples of such mitigation measures include, but are not limited to, the following:

- Implement only those onsite management practices that do not adversely affect forest resources;
- Where avoidance is not possible, develop and implement a reforestation/re-vegetation plan that is developed by a qualified forester or restoration ecologist and reviewed by the appropriate agencies;
- Restrict ground disturbing mechanical operations around sensitive areas and in duration of operation;
- Preserve or replace onsite trees as a means of maintaining the forest resource and providing carbon storage (afforestation/reforestation);
- Encourage replacement of onsite trees with native species, rather than with non-native invasive species; and
- Protect endangered, threatened species and other sensitive flora and fauna.

Please refer to Section IV Biological Resources for additional information about the above mitigation measures and additional measures that would be appropriate for addressing any potential negative impacts to forest resources.

As with the agricultural resources, it is conceivable that site-specific projects implemented to comply with the proposed total mercury load limits for the American, Cache, Feather and Putah watersheds and the requirements for flood and water management activities could affect forest lands in the tributary watersheds. However, as explained in the previous section, detailed feasibility analyses that identify potential environmental impacts – including the potential individual and cumulative acreages of forest lands that may be directly or indirectly affected and possible mitigation measures – have not yet been conducted. The extensive geographic area and variability of land uses of the tributary watersheds makes an assessment of potential affects to forest lands too speculative to evaluate at this time. Evaluations of potential impacts to environmental resources will be a component of the development of the TMDL control programs for upstream watersheds as well as site-specific projects in the tributary watersheds designed to comply with the proposed Delta mercury control program.

III. Air Quality

The proposed Project (the proposed Basin Plan amendments) does not involve the construction of housing and therefore would not increase population in the Delta or its tributary watersheds. In addition, reasonably foreseeable methods of compliance with the proposed Basin Plan amendments described in Chapter 4 are not expected to entail long-term employment in the Delta or its tributary watersheds. As a result, the proposed Project would not generate ongoing, permanent traffic-related emissions. In addition, the proposed Project would not involve the construction of any permanent emissions sources. For these reasons, no permanent change in air emissions would occur as a result of the proposed Project.

However, requirements to increase and maintain the sediment and total mercury trapping efficiency of the Cache Creek Settling Basin and to implement BMPs to minimize total mercury discharges from urban runoff and other sources in the Delta/Yolo Bypass, as well as potential projects to reduce total mercury inputs from upstream watersheds, will almost certainly require construction and maintenance activities that could be potential sources of air emissions that may adversely affect ambient air quality. Other methylmercury and total mercury control projects undertaken during Phases 1 and 2 could similarly adversely affect ambient air quality as a result of construction activities and periodic maintenance activities.

Dust and motor emissions could result from several construction and maintenance activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Measures are available to reduce potential impacts to ambient air quality due to increased traffic and construction equipment operation during construction and maintenance activities to less than significant levels. These are common practices to mitigate the adverse effects of motor emissions. Measures could include, but are not limited to, the following (CAAG, 2008 & 2009);

- Use construction and maintenance vehicles with zero-emission or lower-emission engines.
- Limit the unnecessary idling of delivery and construction vehicles and equipment.

- Use soot reduction traps or diesel particulate filters.
- Use emulsified diesel fuel.
- Use low/zero carbon fuels, such as B20 biodiesel or renewable diesel.
- Reduce NOx emissions from off-road diesel powered equipment.
- Control visible emissions from off-road diesel powered equipment.
- Design structural devices to minimize the frequency of maintenance trips.
- Perform necessary equipment maintenance, such as inspections, detect failures early, corrections, so that they operate cleanly and efficiently.
- Use the proper sized equipment for the job.
- Train equipment operators in proper use of equipment.
- Produce concrete on-site if determined to be less emissive than transporting ready mix.
- Minimize the amount of concrete for paved surfaces or utilize a low carbon concrete option.
- Use locally sourced or recycled materials for construction materials.

The generation of dust and particulate matter during construction and maintenance activities also could impact ambient air quality. There are several common mitigation measures that would reduce the transfer of particulates and dust to air and mitigate this potential impact, including but not limited to the following:

- Use water trucks to water active construction areas (e.g., at least twice daily).
- Cover stockpiles of soil, sand and other materials.
- Cover trucks hauling debris, soil, sand, or other material.
- Pave, apply water, or apply soil stabilizers to unpaved areas.
- Sweep surrounding streets and paved areas during construction (e.g., once per day).
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 miles per hour.
- Initiate landscaping and re-vegetation as soon as construction tasks allow in order to minimize wind erosion.

A project-specific operations plan for construction and/or maintenance activities could be completed to address the variety of available measures to limit the ambient air quality impacts. The emission of air pollutants during short-duration construction and maintenance activities associated with reasonably foreseeable methods of compliance with the proposed Project is unlikely to change long-term ambient air conditions because such emissions would cease after short-duration activities are completed.

Yolo County and a portion of Solano County are part of the Sacramento region designated by USEPA as a Serious Ozone non-attainment area for the federal 8-hour ozone standard. The Yolo-Solano Air Quality Management District developed attainment strategies and handbooks to guide projects that may contribute to air quality problems. Actions taken by responsible agencies to comply with the proposed Basin Plan amendments that may affect air quality (such as using heavy equipment to remove mercury-contaminated sediments) will most likely require a permit that would include a separate environmental review for implementation of specific projects. Projects must mitigate their emissions as described therein.

Phase 1 of the proposed Project also requires WWTPs to maintain performance-based total mercury load limits and to implement total mercury evaluation and minimization programs. As noted in Section 4.3.12.1, mercury control is an existing (baseline) requirement for many municipal WWTPs. (Indeed, controlling effluent total mercury will prevent additional mercury releases to the air.) As a result, the proposed Project is unlikely to increase air emissions above those existing from baseline activities.

Phase 2 improvements to NPDES-permitted WWTPs and urban storm water systems to comply with methylmercury allocations may require some facilities to upgrade their treatment processes and/or BMPs. Construction activities related to the upgrades are expected to result in some increase in local air pollutants at the project location; however, such construction activities are temporary and not expected to have long-term air quality impacts. Site-specific construction projects must control their emissions as described in previous paragraphs in compliance with local ordinances and state regulations.

The proposed Basin Plan amendments require dredging projects to minimize total mercury and methylmercury discharges from dredging and dredge material disposal (DMD) sites. As described in Section 4.3.12.4, reasonably foreseeable methods of compliance include, but are not limited to, the following: use a pipeline hydraulic suction dredge or 'sealed' or 'environmental' clamshell bucket dredge to reduce the amount of turbidity in the water column and the amount of water produced during the dredging operation; increase DMD return water hold time to remove suspended material from the return flow to the maximum extent practicable; control erosion at upland DMD sites, levee maintenance and improvement projects through such practices as re-vegetation, hard bank stabilization, biotechnical bank stabilization, and/or placement of dredge material at locations that have no discharge to surface water. These compliance methods are unlikely to cause significant impacts to air quality. Mitigation measures for construction activities related to the protection of dredge materials from erosion are the same as those discussed above for the Cache Creek Settling Basin improvement activities and urban stormwater BMP implementation. In addition, these compliance methods or similarly-approved methods are already required under Waste Discharge Requirements and CWA Section 401 Certifications for dredging operations to prevent exceedances of water quality objectives for turbidity. As a result, these compliance methods, associated impacts, and mitigations measures for those impacts are considered baseline conditions.

Phase 2 methyl and total mercury control actions and management practices for existing and new wetlands and new water management projects (e.g., new water diversion, salinity control, or flood control projects) are unlikely to adversely impact air quality. Construction and maintenance activities resulting from Phase 2 requirements should incorporate the mitigation measures described earlier in this section.

Construction activities and the installation and maintenance of BMPs associated with both Phases 1 and 2 of the proposed Project may result in objectionable odors and expose sensitive receptors to emissions or dust pollutants in the short-term due to exhaust and dust from construction equipment and vehicles. However, the construction activities are not expected to affect a substantial number of people because most sources (e.g., wetlands, agricultural and open-water areas) are not located near densely-populated, urban areas (see Figures 6.8, 6.4, 6.5, and 6.6 in the TMDL Report). In addition, as discussed above, there are several mitigation measures that address emissions and dust. Objectionable odors due to engine exhaust would be temporary and dissipate once a vehicle has passed through the area. Objectionable odors from exhaust could be reduced if gasoline or propane engines were used instead of diesel engines and the unnecessary idling of delivery and construction vehicles and equipment was limited. Additionally, construction and maintenance activities could be scheduled to be performed at times when these activities have lower impacts, such as periods when there are fewer people or sensitive receptors in the area.

The proposed Basin Plan amendments include the recommendation to develop a memorandum of understanding (MOU) between the USEPA, the State Water Board, and the Air Resources Board to conduct studies to evaluate local and statewide mercury emissions and deposition patterns and to develop and implement load reduction programs will be explored. Mercury is a toxic air contaminant. Development of mercury load reduction program to reduce air sources should result in air and water quality improvements.

IV. Biological Resources

The Delta is rich in biological resources. It encompasses more than 20,000 acres of wetlands and marsh, and more than two hundred species of birds and fifty species of fish inhabit the Delta (Figure 6.4 and Table 2.1 in the TMDL Report). Seasonal wetlands and rice fields in the Delta provide habitat for migratory birds of the Pacific Flyway, such as the state-listed Greater sandhill crane. In addition, several anadromous species such as American shad, salmon, steelhead trout, striped bass, and sturgeon reside in the Delta during at least part of their life cycle or pass through the Delta on their way upstream to spawn. Many of the species that reside or migrate through the Delta's wetland and upland areas are federally- or state-listed as endangered, threatened, rare, or candidate species.

The purpose of the proposed Project is to benefit biological resources in the Delta by making it safer for humans and wildlife, including rare and endangered species, to consume Delta fish. Fish mercury levels throughout much of the Delta currently are elevated such that they pose a threat to wildlife and humans who consume Delta fish. Delta wildlife species that are primarily or exclusively piscivorous and therefore most likely at risk for mercury toxicity include: American mink, river otter, bald eagle, kingfisher, osprey, western grebe, common merganser, peregrine falcon (by eating waterfowl), double crested cormorant, California least tern, and western snowy plover (USEPA, 1997; CDFG 2002). Bald eagle, California least tern, Western snowy plover, and peregrine falcon are listed by the State of California and/or by the U.S. Fish and Wildlife Service as either threatened or endangered species.

Compliance with the proposed Project's requirements for a total mercury and methylmercury control program and a monitoring and surveillance program could encompass a variety of activities throughout the Delta, Yolo Bypass and tributary watersheds. To identify specific biological resources that could be affected by these activities, specific sites must be identified. However, precise locations for projects are not known because, as noted at the beginning of Section 7.2, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. In addition, the following analysis identifies potential impacts that may require the implementation of mitigation measures beyond those already incorporated in existing laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. However, the proposed Basin Plan amendments do not include specific measures for mitigation of significant impacts. As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those mitigation measures identified in the following analysis or comparable mitigation measures, except for those site-specific projects for which the Board is the "Lead Agency". Consequently, "Potentially Significant Impact" was selected instead of "Less Than Significant with Mitigation Incorporated" on the Environmental Checklist for many of the resources in the Biological Resources category even if mitigation measures described in the following analysis are expected to reduce potential impacts to less than significant levels.

What follows is a program-level review of potential impacts on biological resources that could result from the implementation of the proposed Project's requirements.

Monitoring activities associated with the proposed Phase 1 control studies and surveillance and monitoring program would not be continuous, occurring most frequently on a monthly or seasonal basis, and would be conducted in an environmentally sensitive manner (e.g., in compliance with USFWS and CDFG regulations and permits). As a result, the impacts associated with monitoring activities, if any, would be less than significant.

However, site-specific pilot projects and long-term, site-specific implementation projects to control total mercury and methylmercury could involve a variety of construction activities, control structures, and management practices that potentially could modify habitats, adversely affect special-status species, disturb riparian habitat or sensitive natural communities, or interfere with migratory fish movement. There are also potential impacts from the use of credit accrued by voluntary pilot offset projects. Section 4.3.9 in Chapter 4 provides guidelines for a voluntary Phase 1 pilot offset program and Sections 4.3.10 through 4.3.12 describe reasonably foreseeable methods of compliance with methylmercury allocations and Phase 1 total mercury mass limits. The potential impacts and mitigation measures associated with each of these aspects of the proposed Project are discussed in the following paragraphs.

A. Habitat Disturbance and Loss

The implementation of specific methylmercury and total mercury control projects throughout the Delta, Yolo Bypass and tributary watersheds to comply with the proposed Basin Plan amendments could have the potential to disturb or remove critical wetland and upland habitats that support special status species, either through the permanent construction of controls that change existing land uses, or through short-term construction and periodic maintenance activities. CEQA requires lead agencies for specific projects to review the potential for their actions to result in adverse environmental impacts and to adopt feasible measures to mitigate potentially significant impacts. All control projects and their associated construction and maintenance activities would be required to adhere to local, state, and federal ordinances and regulations to avoid and/or minimize impacts to biological resources and to mitigate unavoidable impacts. Examples of such regulations include, but are not limited to, the following:

- USFWS ESA Section 7 Consultation for Threatened and Endangered Species;
- USACE Section 404 Permit and State Section 401 Water Quality Certification for filling or dredging waters of the United States and other federal permitting actions;
- CDFG 1601 Agreement for Streambed Alteration;
- California Water Quality Control Board Waste Discharge Requirements (which are also permits for purposes of the Clean Water Act if applicable);
- General Plan conservation requirements; and
- City and/or county tree ordinances.

In general, the implementation of specific methylmercury and total mercury control projects is expected to result in less than significant levels of habitat loss if projects are carefully designed, constructed, and maintained in accordance with the above-mentioned regulations and any required mitigation measures. Examples of methods for specific projects to avoid significant habitat disturbance and loss include, but are not limited to, the following:

- Contract qualified botanists, wildlife biologists and arborists to develop biological assessments of project site alternatives. At a minimum, assessments should include project area-specific literature searches, reviews of CDFG's *California Natural Diversity Data Base* and the California Native Plant Society's *Inventory of Rare and Endangered Plants of California*, and field surveys of all potential project sites and their surrounding areas to identify and map existing plant communities, wildlife habitat, and heritage trees and to identify wildlife species that currently occur, have occurred in the past (e.g., resident and migratory wildlife species that have been documented as foraging or nesting at the site), or have the potential to occur at the site due to the presence of suitable habitat. Field surveys should follow protocols established by CDFG and should be conducted during the appropriate time(s) of year (e.g., during the blooming period of potentially occurring plant species).
- If there are alternative project sites, select a project site that does not contain critical habitat. If there is only one project site possible, locate project facilities outside the boundaries of critical habitat areas.
- If it is determined, based on the biological assessment and evaluation of the final project site and design, that an impact on special-status species population(s) would occur, then develop a mitigation and management plan in coordination with CDFG/USFWS to implement all measures included in the Biological Opinion resulting from the USFWS ESA Section 7 consultation and to satisfy any other local, state, and federal requirements for achieving a no net loss of wetlands or other critical habitat, or take of wildlife species of concern. The plan should be submitted to the local city/county environmental planning department, USACE, USFWS, CDFG, Central Valley Water Board (e.g., as part of a Section 401 Water Quality Certification application), and/or other oversight agencies as applicable for approval prior to its implementation.
- Develop a re-vegetation plan. The re-vegetation plan should be prepared by a qualified restoration ecologist and reviewed by the appropriate agencies. The plan should specify sites where re-vegetation should take place, the planting stock appropriate for the region,

appropriate designs (e.g., plant arrangements that, when mature, replicate the natural structure and species composition of similar habitats in the region), planting techniques, monitoring frequency, and success criteria (e.g., sapling trees no longer require active management).

- Establish temporary construction buffers for drainages, wetlands/vernal pools, and other sensitive habitat in the project area that could be affected by construction activities. The outer edges of the buffer zones should will be demarcated using flagging or temporary orange mesh construction fencing before initiation of construction activities and based on site-specific conditions, seasonal restrictions for wildlife, local planning department specifications, and resource agency (e.g., USFWS and CDFG) requirements.
- Require a qualified biologist to:
    - Perform required pre-construction surveys to determine the current presence of, and demarcate the boundaries of construction buffers around, sensitive habitats and submit survey reports according to CDFG and local agency guidelines for approval prior to construction.
    - Provide USFWS-approved worker environmental awareness training that informs all construction personnel about sensitive plant and wildlife species and habitats.
    - Observe major excavation and other construction activities, with the authority to stop construction activities until appropriate corrective measures have been completed.
    - Report to the USFWS any incidental take.
    - Periodically re-inspect the project site (e.g., every week) during construction activities or whenever a substantial lapse in construction activity (e.g., >2 weeks) has occurred.
- Locate temporary access roads and staging areas outside the boundaries of critical habitat areas, restrict movement of heavy equipment to and from the project site to established roadways and areas designated for construction and staging, and do not allow parking of vehicles or storage of potentially-toxic chemicals near/up-gradient of drainages or sensitive habitats or under heritage trees.
- Implement measures to control dust, erosion and noise (see Sections III, VI, and XI, respectively).
- During construction and maintenance activities, properly contain or remove all trash that may attract predators to the worksite.
- After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions according to the before-mentioned re-vegetation plan.
- Provide compensation for unavoidable degradation or loss of critical habitat due to project construction to ensure no net loss of that habitat. Compensation should be provided at a minimum ratio (e.g., 3:1, three acres of restored wetlands for every one acre affected, or three native oak trees planted for every native oak tree eliminated) that ensures long-term replacement of habitat functions and values and complies with local, state and federal requirements. Compensation could include, but is not limited to, the following:
    - Construct replacement habitat as close as possible to the previous habitat location at the project site (e.g., locate replacement riparian and wetland habitats along the same drainage affected by the project construction).

- If site limitations prevent on-site habitat replacement, construct replacement habitat as near the project site as possible.
- Provide payment on a per-acre basis to an approved restoration or mitigation bank or other trust fund.

As noted earlier, precise locations for projects are not known and the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Similarly, possible mitigation measures for the potential impacts that could be associated with site-specific projects implemented to comply with the proposed amendments are not prescribed in the proposed amendments. However, staff identified several examples of particular reasonably foreseeable methods of compliance that have the potential to result in habitat loss if protective measures are not incorporated in their selection, design and implementation. The following paragraphs provide a program-level review of these examples and possible mitigation measures. This review should not be considered a replacement for project-level evaluations required of future, site-specific project proponents.

<u>1. Actions to Comply with Proposed Total Mercury Evaluation and Minimization Requirements and Methylmercury Allocations for WWTP and MS4 Discharges</u>. As described in Section 4.3.10 in Chapter 4, the proposed Project (Implementation Alternative 4) would require eight of the fifteen WWTPs in the Delta/Yolo Bypass to reduce their effluent methylmercury loads. These facilities have several reasonably foreseeable methods of compliance with their methylmercury allocations, including but not limited to the following:

- Implement minimization programs for total mercury discharges;
- Treat effluent to Title 22 levels and use it to irrigate recreational areas such as golf courses and parks and landscape areas in mall complexes and residential communities (such treatment and reuse is already regulated under existing programs to prevent environmental impacts) to decrease discharges to surface water;
- Implement additional secondary or advanced treatment processes to further reduce particle-bound methyl and total mercury, for example, increase retention in aeration tanks, increase retention in the primary and secondary clarifiers, and/or employ tertiary processes (e.g., reverse osmosis and multimedia filtration);
- Increase effluent disposal to land; and/or
- Participate in an offset program (if one is approved by the Central Valley and State Water Boards and USEPA; see Section 4.3.9).

The proposed Phase 1 studies are expected to determine the efficacy of the above methods in reducing effluent methylmercury discharges to surface waters and to develop and evaluate additional methods as needed.

WWTPs that need to reduce their methylmercury discharges to comply with the proposed methylmercury allocations could elect to expand their current land use footprint to include additional treatment processes and/or additional effluent disposal to land. Increasing their land use footprint could result in the loss of critical habitat, depending on the characteristics of the land available for expansion of a given facility. However, WWTPs are typically constructed in urbanized areas; expansion of WWTPs in urbanized areas is expected to have limited or no impact on critical habitats. Also, as noted earlier, there are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs that may not require the expansion of their land use footprint or other significant negative effects on habitat. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant environmental impact. Rather, it is foreseeable that agencies would select compliance alternatives that avoid significant impacts.

Similarly, the proposed Project would require 11 of the 12 MS4s that discharge to the Delta/Yolo Bypass to reduce their methylmercury discharges to comply with methylmercury allocations and three MS4s to implement mercury-specific pollution prevention measures and BMPs to control total mercury discharges to the maximum extent practicable. As described in Section 4.3.10, total mercury and methylmercury BMPs could potentially include, but are not limited to:

- Implementation of additional BMPs to reduce erosion and sediment transport. Because inorganic mercury and methylmercury are typically particle-bound, BMPs to control erosion and sediment transport would be effective in reducing mercury discharges.
- Modification of storm water collection and retention systems to reduce methylmercury production (e.g., installation of aerators or circulation systems in basins may potentially promote degradation of methylmercury in the water column).
- Regular removal of sediment from retention basins to reduce the supply of inorganic mercury available for methylation.
- Pollution prevention measures such as: thermometer exchange and fluorescent lamp recycling programs; enhancement of household hazardous waste collection programs; implementation of public and industry education and outreach on disposal of household mercury containing products and replacement with non-mercury alternatives and on proper removal, storage, and disposal of mercury switches in autos and other industrial equipment; and implementation of additional programs to reduce vehicle exhaust (e.g., improvements to mass transit, ride share, and bicycle-to-work programs), because emissions from vehicles powered by hydrocarbon-based fuels contain mercury as well as hydrocarbons that are involved in the formation of ground-level ozone and subsequently reactive gaseous mercury, which is more likely to be converted to methylmercury than other fractions of mercury.
- Expansion of existing urban tree planting programs, particularly of species that have low emissions of volatile organic compounds, to help reduce ground-level ozone, particulate matter, and other pollutants (e.g., Novak *et al*., 2006) and subsequently reactive gaseous mercury.
- Participation in an approved offset program (if one is approved by the Central Valley and State Water Boards; see Section 4.3.9).

As with the WWTPs, the proposed Phase 1 studies to be conducted by the large MS4s are expected to determine the efficacy of the above potential methods to reduce methylmercury loading and to develop and evaluate additional mercury control methods. BMPs implemented by the MS4s to comply with the methylmercury allocations and other Phase 1 requirements for reduction of total (inorganic) mercury discharges are expected to be implemented within the existing footprint of the MS4 conveyance systems and therefore have limited or no environmental impact, aside from the possible hazards potentially associated with collecting and transporting mercury as part of pollution prevention activities discussed in “VII. Hazards and Hazardous Materials”, and the potential for localized flooding discussed in “VIII. Hydrology and Water Quality”.

However, it is possible that MS4s may elect to implement BMPs that would require them to expand their current land use footprint to include additional treatment processes (e.g., construction of sediment basins; see Section 4.3.10.2). Increasing their land use footprint could cause habitat loss, depending on the characteristics of the land available for expansion of a given MS4 system, although this is expected to be minimal because the MS4 conveyance systems are typically in urbanized areas. In addition, modifying the design of existing stormwater basins and/or removing accumulated sediment could cause habitat loss in basins where, either by design or lack of maintenance, wetland habitats have developed. Potential mitigation measures include designing stormwater basins that can be cleaned without removing all of the habitat that has been established (e.g., construct a pre-sediment basin that can be periodically cleaned and leave the downstream basin natural) and identifying and remediating upstream sources of mercury that may enter the basins so that vegetation in the basins do not need to be cleared to reduce methylmercury production. In addition, as noted earlier, there are multiple reasonably foreseeable methods of reducing methylmercury loads discharged by MS4s. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant impacts to existing habitat. Rather, it is foreseeable that agencies would select compliance alternatives that avoid significant impacts, or re-design compliance features to minimize impacts.

Existing NPDES permits require 8 of the 14 municipal wastewater treatment plants that currently discharge in the Delta and Yolo Bypass to implement mercury-specific pollutant minimization programs in accordance with CWC §13263.3, or other similar mercury minimization programs. Hence, the proposed Project’s requirement for the implementation of mercury-specific pollutant minimization programs is a new requirement for only six municipal WWTPs and five non-municipal facilities. The three MS4s are already required to implement mercury-specific pollution prevention measures. The proposed Basin Plan amendment requirements for total mercury control for many of the NPDES permittees are baseline requirements and the potential environmental impacts of which are not new to the proposed Project.

Any adverse impacts from implementation of Phase 1 mercury-specific pollution minimization programs and future methylmercury control projects by WWTPs and MS4s beyond baseline requirements are not expected to be cumulatively considerable because:

- WWTPs and MS4s are typically constructed in urbanized areas; therefore, their expansion is expected to have limited or no impact on critical habitats.
- There are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs and MS4s that may not require the expansion of their land use footprint or other significant negative effects on habitat; therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant environmental impact.
- The proposed Basin Plan amendment requirements for total mercury control for many of the WWTPs and MS4s are baseline requirements, the potential environmental impacts of which are not new to the proposed Project.

2. Improvements to the Cache Creek Settling Basin and Yolo Bypass. As discussed in Sections 4.3.6 and 4.3.10.6, there are several reasonably foreseeable methods of compliance for controlling total mercury and methylmercury discharges from the Cache Creek Settling Basin:

- Potential methods to comply with the Cache Creek Settling Basin requirements to increase and maintain its sediment/total mercury trapping efficiency include structural modifications (raise the outlet weir, excavate the basin, and/or expand the size of the basin) and periodic removal of contaminated sediment.
- The reduction of methylmercury production in the Cache Creek Settling Basin possibly could be accomplished through the reduction of the total mercury concentration of suspended sediment entering the basin from the Cache Creek watershed. Additional actions beyond those required by the Basin Plan Amendment for control of mercury in Cache Creek adopted by the Central Valley Water Board in October 2005 could include, but not be limited to, the select removal, remediation or stabilization of sediments in lower Cache Creek streambeds and banks where mercury sediment concentrations are enriched (greater than 0.4 mg/kg).

Raising the outlet weir of the Cache Creek Settling Basin is part of the basin's sediment management plan and was evaluated by previous environmental documentation for the basin's construction and management. Therefore, raising the outlet would be part of baseline conditions and there would be no new impact to biological resources from this action as a result of the proposed Basin Plan amendments.

Initial plans for the basin's maintenance and sediment management plans call for the periodic removal of sediment accumulated within the basin, removal of sections of the internal training levee as the basin fills in with sediment, and clearing of channels to maintain flow capacities. The latest draft operations and maintenance plan does not mention sediment removal. As documented by the State Clearinghouse's "CEQAnet" database,[50] past basin and levee maintenance activities such as vegetation removal, flood channel maintenance, and levee repairs were categorically exempt from CEQA (Title 14 CCR §15301); future sediment removal activities may similarly be categorically exempt. Even so, possible impacts resulting from excavating sediment as well as expanding the basin are evaluated below.

The following State- and/or federally-listed species and/or their habitat may exist adjacent to or within the basin: Swainson's hawk, Western snowy plover and Palmate-bracted bird's-beak (CDM, 2004b & 2006). Since the basin was modified in 1993, some areas within the basin have established vegetation and trees (both native and invasive species) that may be suitable habitat for special status species. As a result, enlarging the Cache Creek Settling Basin and/or removing accumulated sediment from the basin could involve removing trees and other native vegetation and disturbing or removing wildlife and special status species' nesting and foraging habitat. However, it is expected that project proponents will be able to implement mitigation

[50] The State Clearinghouse within the Governor's Office of Planning and Research maintains an online searchable environmental database, "CEQAnet", that contains key information from all CEQA documents submitted to the State Clearinghouse for State review. CEQAnet is accessible at: http://www.ceqanet.ca.gov/.

measures to reduce these biological resources effects to less than significant levels (CDM, 2004b).

Possible methods to avoid or minimize sediment removal-related impacts to sensitive habitats or species include:

- Remove sediment from areas where there are known non-native invasive species rather than from areas in which native habitat may be suitable for special status species (e.g., riparian areas along the training channel).
- Remove sediment from the center of the basin where vegetation has not become established. Preliminary modeling by CDM suggests that sediment removal would not need to occur evenly across the basin, but instead could focus primarily near the center of the basin, and therefore not necessarily affect the riparian zone near the Cache Creek channel (CDM, 2004b).

In addition, DWR Flood Maintenance Division performed an extensive vegetation removal project in the Cache Creek Settling Basin in 2005 (Bencomo and Marchand, 2006), and DWR has done other maintenance activities in the settling basin including vegetation clearing, levee maintenance, and minor sediment removal projects in prior years. If improvements were made to the basin before the vegetation in those removal areas became established again, or if DWR were funded to provide regular basin maintenance activities, then habitat disturbance or removal would be minimized. No matter the status of baseline maintenance activities, the measures listed at the beginning of this section ("A. Habitat Disturbance and Loss") could be employed to avoid significant habitat disturbance and ensure no net loss of habitat from either excavation or basin enlargement activities. Unavoidable habitat loss from basin enlargement or sediment excavation would need to be mitigated by the construction of replacement habitat or payment on a per-acre basis to an approved restoration or mitigation bank or other trust fund.

The proposed Project requires that agencies that propose changes to the Yolo Bypass flood conveyance evaluate and minimize new methyl and total mercury inputs resulting from the changes. As discussed in Section 4.3.12.4, potential implementation options to minimize methylmercury production in the Yolo Bypass flood control system could include:

- Modifying the flow regimes within the Yolo Bypass;
- Modifying the channel geometry to route more water down the eastern side where the sediment is less contaminated by mercury; and
- Removing mercury contaminated sediment from within the Yolo Bypass downstream of the Cache and Putah Creek watersheds.

Removing mercury-contaminated sediment from within the Yolo Bypass downstream of the Cache and Putah Creek watersheds and other earth-moving activities related to routing water down the eastern side of the bypass could result in similar impacts as those described for excavation of sediment from the Cache Creek Settling Basin. However, such impacts could be reduced to less than significant levels if the methods described in the previous paragraphs and the measures listed at the beginning of this section ("A. Habitat Disturbance and Loss") could be employed to avoid significant habitat disturbance and ensure no net loss of habitat. The potential impacts from modifying the flow regimes and water routes within the Yolo Bypass are evaluated in the next section.

B. Habitat Modification Due to Phase 2 Methylmercury Management Changes

Methylmercury Management Practices for Existing and New Wetlands. There are about 21,000 acres of freshwater emergent wetlands in the Delta and Yolo Bypass. The Record of Decision (ROD) for the California Bay-Delta Authority commits it to restore 30,000 to 45,000 acres of freshwater, emergent tidal wetlands, 17,000 acres of freshwater, emergent non-tidal wetlands, and 28,000 acres of seasonal wetlands in the Delta by 2030 (CalFed Bay-Delta Program, 2000a & 2000c). This represents about a three to four times increase in wetland acreage from current conditions. Much of the restoration is expected to take place in the Yolo Bypass, Cosumnes/Mokelumne, Marsh Creek and San Joaquin TMDL subareas, areas that require substantial reductions from existing methylmercury sources to achieve the proposed fish tissue objectives. These areas are also downstream of major sources of mercury-contaminated sediment. The goal of the Delta mercury TMDL program and Basin Plan amendments is to improve the water quality of the Delta/Yolo Bypass waterways by decreasing fish methylmercury concentrations to levels that are protective of wildlife and humans who consume Delta/Yolo Bypass fish, which would also be a benefit for wetland habitats and the species they support.

Research conducted in the Delta and elsewhere has found that seasonally and permanently flooded wetlands are efficient sites for methylmercury production and that wetlands could act as a potentially substantial methylmercury source to the Delta (see Chapters 3 and 6 in the TMDL Report). As a result, the proposed Project includes the requirements for Phase 1 control studies to evaluate feasible methods to address methylmercury produced by permanent and seasonal wetlands in the Delta region, for existing managed wetlands in the Delta/Yolo Bypass that act as a methylmercury source to reduce their methylmercury discharges during Phase 2, and for new wetland restoration projects to minimize their methylmercury discharges. As discussed in a later section, "E. Coordination with HCPs, NCCPs and Other Plans", many of these requirements are baseline requirements for wetlands constructed under the CalFed Bay-Delta Program, which recognized in its programmatic ROD CEQA documentation that potential methylmercury production by its wetland restoration projects is a potentially adverse environmental impact that requires the development and implementation of mitigation strategies.

As described in Section 4.3.2, the proposed Basin Plan amendments do not assign methylmercury allocations to every individual wetland in the Delta/Yolo Bypass, but instead assign "subarea allocations." For example, all inputs from existing wetlands within the Yolo Bypass subarea would be grouped into a single Yolo Bypass wetlands allocation; methylmercury inputs from new wetland restoration projects completed after the effective date of the Basin Plan amendments would be incorporated in the subarea allocations for existing wetlands. It is speculative to guess where and which methylmercury reduction management practices would be incorporated at existing managed wetland sites and future restoration projects during Phase 2 within the Delta/Yolo Bypass subareas that require methylmercury reductions. However, as discussed in Section 4.3.10.3, methods of compliance for existing managed wetlands could include, but are not limited to, the following:

- Modify managed wetlands' design, e.g., water depth, flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands), vegetation types, and vegetation density (dense cover versus more open water).

- Modify managed wetlands' discharge patterns, e.g., hold irrigation water onsite longer at seasonal wetlands to allow methylmercury concentrations to decrease before discharging the water or otherwise transfer and re-use the water at another marsh to decrease the amount of discharge.

In addition, as noted in Section 4.3.12.4, new wetland restoration projects may have the opportunity to consider their location, for example, not create new wetlands directly downstream sources of mercury-contaminated sediment. The Phase 1 control studies are expected to determine the efficacy of the above potential methods to reduce methylmercury loading and to develop and evaluate additional methylmercury management practices along with possible environmental impacts of those methods and potential mitigation measures for those possible impacts. Although several stakeholders have stated that the proposed Basin Plan amendment requirements would result in the removal of existing wetlands and/or prevention of new wetland restoration projects, staff does not consider such actions to be reasonably foreseeable methods of compliance with the proposed Basin Plan amendments. Foreseeable compliance methods for new wetland projects could be altering their location or design.

Until the Phase 1 studies are completed, it is speculative to evaluate how individual wetland habitats could be impacted by the implementation of methylmercury management practices. It is not anticipated that all existing managed wetlands in the Delta/Yolo Bypass will need to implement methylmercury management practices. Preliminary results from ongoing wetland studies (see Chapter 3 in the TMDL Report) indicate that seasonal wetlands may be overall net producers of methylmercury, while permanent wetlands may be overall less productive of methylmercury or even net sinks (that is, more methylmercury enters the wetlands than leaves). If a similar pattern is observed by the Phase 1 control studies, Phase 2 management practices to reduce methylmercury production may focus on seasonal wetlands with substantial methylmercury discharges in the Delta/Yolo Bypass subareas that require source reductions. Subareas that require methylmercury source reductions to protect humans and wildlife that consume local fish include the Yolo Bypass, Sacramento, San Joaquin, Mokelumne, and Marsh Creek subareas. According to the USFWS National Wetlands Inventory (USFWS, 2006), about 11,800 acres of the 14,500 acres (81%) of seasonal wetlands in the Delta/Yolo Bypass occur in these subareas, about 10,300 acres (71%) of which occur in the Yolo Bypass subarea. More of the Delta/Yolo Bypass's 6,400 acres of permanent wetlands occur in the Central and West Delta subareas (3,800 acres, 59%) than the subareas that require methylmercury source reductions (2,600 acres, 41%).

Even so, in general, modifying wetland vegetation and/or hydrology to reduce methylmercury loading to surface waters has the potential to affect the function and attractiveness of a given wetland to target species. For example, stakeholders voiced the concern during the 2008-2009 Stakeholder Process that water re-use and other conservation measures have the potential to increase salinity levels in wetland soils, which could cause changes in desirable vegetation assemblages (e.g., food sources for over-wintering migratory wildfowl) as well as affect compliance with water quality objectives for salt. There are foreseeable ways to minimize or avoid negative effects on wetland function:

- Implement only those onsite management practices that do not change the desirable wetland functions. The Phase 1 studies are expected to develop measures to reduce methylmercury discharges and resulting bioaccumulation while still optimizing management of the wetlands as habitat for desired species and other desirable functions. Phase 1 methylmercury studies can and should be coordinated with researchers' and wetland managers' efforts to conceptualize and quantify the environmental impact and cost of various hydrologic management scenarios on flow and salt load discharges and other efforts to address dissolved oxygen and other existing and potential water quality concerns in the greater Delta region (e.g., Quinn, 2009; Quinn *et al*., 2004).

- Reduce upstream methylmercury sources and/or sources of mercury-contaminated sediment that supply the wetland sites in that subarea.
- Participate in an offset program (if one is approved by the Central Valley and State Water Boards and USEPA; see Section 4.3.9).

If no technically valid and legally defensible offset program can be developed, and the Phase 1 studies indicate that it is not feasible for wetlands in the Delta/Yolo Bypass to fully achieve their subarea allocations without affecting desirable wetland functions, then the Central Valley Water Board could adjust the allocation strategy so that greater reductions are required from other methylmercury source types within a given subarea and its upstream watershed that have feasible methylmercury reduction methods. The proposed Basin Plan amendments include language that commits the Board to conducting a "Delta Mercury Control Program Review" after the Phase 1 studies are completed and TMDL control programs for the major tributary inputs are developed. The Program Review includes assessing:

- The effectiveness, costs, potential environmental effects, and technical and economic feasibility of potential methylmercury control methods;
- Whether implementation of some control methods would have negative impacts on fish and wildlife habitat or other project benefits;
- Methods that can be employed to minimize or avoid potentially significant negative impacts that may result from control methods; and
- Whether methylmercury allocations can be attained.

The Regional Water Board would consider amendments to the Delta mercury control program during the Phase 1 Program Review, including potential modifications of the allocations so that sources with feasible and reasonable methylmercury control methods may be required to make greater reductions. However, there are a couple scenarios under which re-allocation of source controls may not be adequate to achieve the proposed fish tissue objectives:

- Wetlands in and upstream of the Delta may be a substantial source of methylmercury, for which other feasible source controls may not be able to compensate. It is conceivable that the proposed fish tissue objectives may not be achievable in some areas of the Delta/Yolo Bypass if methylmercury discharges from wetlands are not substantially reduced.
- Restored wetlands may have the potential to create an attractive nuisance if they attract wildlife species to an area that already has unsafe fish methylmercury concentrations or generate methylmercury that is locally bioaccumulated to unsafe levels by the fish and wildlife species attracted to the wetland.

Fish tissue mercury levels – especially in the Yolo Bypass and Cosumnes/Mokelumne subareas – exceed safe levels established by USFWS for the protection of wildlife species that consume fish, such as the special-status California least tern. Slotton and others (2007) conducted extended seasonal sampling of small fish at the Cosumnes River and other locations in the Delta region where restoration-related activities are underway or planned. The lower Cosumnes River, along with the Yolo Bypass in the northwestern Delta and Mud Slough in the southern San Joaquin watershed, were the most mercury-elevated areas in the greater Delta region per 2005 and 2006 small-fish sampling results (Slotton *et al.*, 2007). In fall 2005, silverside had mean mercury concentrations of 0.169, 0.147, and 0.079 mg/kg in two isolated ponds and the Toe Drain in the Yolo Bypass, respectively, and in fall 2006 silverside had mean mercury concentrations of 0.098 and 0.102 mg/kg in a recently isolated pond and the Toe Drain, respectively, in the Yolo Bypass. Slotton and others (2007, page 28) found that the Cosumnes River/McCormack-Williamson Tract Restoration Zone had fall 2005 and fall 2006 silverside mercury concentrations of 0.158 and 0.184 mg/kg, respectively. Fall 2005 juvenile largemouth bass mercury concentrations were 0.232 mg/kg, three times higher than corresponding bass from all other watershed sites where they were available. In fall 2006, corresponding juvenile bass at the Cosumnes site were more than double this concentration, at 0.545 mg/kg. Slotton and others (2007) noted that extensive seasonal and multi-species work at this site and several others indicates that the very high November 2006 small fish concentrations here represented residual, mainly declining levels traceable to an extreme, seasonal pulse event of highly elevated exposure linked to episodic flooding of the Cosumnes floodplain. Slotton and others (2007, pages 58-59) observed extreme (400-500%) increases in silverside mercury at the Cosumnes site in July 2006, when concentrations in 45-75 mm (2-3 inch) silversides reached levels averaging an “astounding” 0.869 ppm, with individual fish as high as 2.0 ppm. According to the authors, “these were concentrations that should be of serious concern, particularly in relation to wildlife exposure.”

For comparison, the proposed fish tissue objective for small fish consumed by species such as the California least tern is **0.03 mg/kg**; the silverside and juvenile largemouth bass mercury concentrations at the Cosumnes restoration zone averaged **5 to 29 times** this proposed objective, which is based on safe levels established by the USFWS for the protection of wildlife species that consume fish in the Delta region (see Chapter 2). Slotton and others (2007) observed that other small fish species with slower turnover rates than silversides (e.g., juvenile bass and prickly sculpin) exhibited much slower declines from peak mercury levels, with highly elevated concentrations persisting for many months.

One of the goals of the proposed Basin Plan amendments is to control methylmercury such that its threat to wildlife is reduced. As a result, some existing managed wetland sites and proposed restoration projects may need to modify their management practices to avoid becoming an attractive nuisance, even if such modifications alter the function of the habitat. During the 2008-2009 Stakeholder Process, several stakeholders stated that although fish mercury levels are high in areas where more wetland and floodplain restoration projects are planned, the risk to wildlife species of concern from mercury is not as critical as the risk from lack of habitat. However, research is needed that (a) determines at what biota methylmercury concentrations population-level impairments could occur to specific species of concern attracted to restored wetlands and floodplains in the Yolo Bypass and Cosumnes River, and (b) directly evaluates and compares the risks to species of concern from mercury and the risks from lack of habitat.

If it is necessary to implement methylmercury management practices that alter the function of existing wetlands, to address either methylmercury discharges to Delta waterways or attractive nuisance concerns, it may be possible to compensate for that alteration by constructing mitigation wetlands away from mercury-contaminated areas or areas that are not otherwise impaired by methylmercury (e.g., possibly the Central Delta and other Delta and tributary areas not affected by major mercury-contaminated sediment inputs). However, it is conceivable that some existing wetland habitats may support special-status species that are endemic to a particular area of the Delta and as a result mitigation habitat constructed elsewhere would not be an adequate replacement. CDFG's "Wildlife Species Matrix"[51] indicated that no such species are endemic to freshwater or saline emergent wetland habitats in the Delta region, and only two species, Delta smelt and Sacramento splittail, are endemic to estuarine and riverine habitats in the Delta region.

Delta smelt is a state- and federally-listed threatened species that is endemic to the upper Bay-Delta Estuary, principally Suisun Bay and the western Delta, primarily below Isleton on the Sacramento River side and below Mossdale on the San Joaquin River side (Moyle, 2002). Only the eastern-most range of the Delta smelt occurs in the Sacramento, Yolo Bypass and San Joaquin subareas where methylmercury source reductions are needed and methylmercury management practice likely to be implemented. In addition, according to the USFWS National Wetlands Inventory (USFWS, 2006), most seasonal wetland acreage in the Delta/Yolo – where methylmercury management practices may most likely be needed – occurs upstream of the Delta smelt's range.

Sacramento splittail is a state- and federally-listed species of special concern because it may be experiencing a decline in population and potential threats from habitat loss (USFWS, 2007; CDFG, 2005). During most years, except when they are spawning, Sacramento splittail are largely confined to the Delta, Suisun Bay, Suisun Marsh, lower Napa River, lower Petaluma River, and other parts of the San Francisco Estuary (Moyle, 2002). In wet years they may migrate as far as Salt Slough on the San Joaquin River (Merced County), Red Bluff Diversion Dam (Tehama County) on the Sacramento River, and into the lower Feather and American Rivers. Adult splittail migrate upstream during winter and spring months to forage and spawn in vegetated floodplain areas; the Yolo and Sutter Bypasses "are apparently important spawning areas today" (Moyle, 2002). As a result, management practices implemented to reduce methylmercury discharges from existing Yolo Bypass wetlands have the potential to affect an important splittail spawning area. One foreseeable method of compliance with wetland allocations is to reduce methylmercury discharges from existing managed wetlands by modifying their discharge patterns. Such modifications have the potential to directly or indirectly affect critical splittail spawning habitat, depending on whether those wetlands have shallow, open-water areas that are used by splittail for spawning and whether the modification interferes with or acts as a barrier to their access to open-water areas in the wetlands.

It is anticipated that methylmercury management practices would be implemented only at those wetland sites that act as substantial sources of methylmercury to those Delta/Yolo Bypass subareas, and that only a fraction of those, if any, would require the implementation of methylmercury management practices that have the potential to result in unavoidable impacts to

[51] The CDFG "Wildlife Species Matrix" allows the public to query information about California's species at risk via an Internet-accessible database. Available at: http://www.dfg.ca.gov/wildlife/WAP/. Accessed: 5 September 2007.

habitat sites that support an endemic species. If wetland habitats were evenly distributed across the Delta and Yolo Bypass, there would be little chance for substantial or otherwise cumulative impacts to endemic species. However, more than half of all wetlands in the Delta/Yolo Bypass occur in the central Yolo Bypass area. Further, most of the Yolo Bypass wetlands are seasonal; the ambient water methylmercury levels in the Yolo Bypass will require substantial reductions (~80%) to achieve safe fish mercury levels; and the bypass receives direct inputs from the Cache Creek, Putah Creek and Feather River watersheds, which are major sources of mercury-contaminated sediment.

As a result, achieving safe fish mercury levels in the Yolo Bypass may potentially require both very aggressive total mercury and methylmercury source reductions in the tributary watersheds and widespread implementation of methylmercury management practices in the Yolo Bypass, which increases the potential for there to be significant cumulative adverse effects to wetland habitats that support endemic species in the Yolo Bypass. For this reason, staff checked the "Potentially Significant Impact" box on the Environmental Checklist for "a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a … special status species …". Until the proposed Phase 1 control studies have been completed, it is not possible to know whether wetlands that act as a substantial source of methylmercury to the Yolo Bypass also act as critical habitat for endemic species, and whether it will be possible to mitigate any potential impact to less than significant levels. As noted earlier, the proposed Basin Plan amendments include language that commits the Board to conducting a Program Review once the Phase 1 studies are completed, during which the Board can consider re-allocating responsibility for source reductions and modifications to fish tissue objectives based on new information about the potential feasibility and impacts of methylmercury management practices and the attainability of the fish tissue objectives in some areas of the Delta/Yolo Bypass.

It is expected that, in general, potentially cumulative adverse impacts to existing wetlands throughout other areas of the Delta region could be mitigated to less than significant levels through careful site evaluation and selection of management practices.

<u>Methylmercury Management Practices for New and Existing Water Management Projects</u>. The proposed Project requires state and federal agencies whose projects affect the transport of inorganic mercury and the production and transport of methylmercury through the Yolo Bypass and Delta, or manage open water areas in the Yolo Bypass and Delta, to conduct Phase 1 studies and implement methylmercury reductions in Phase 2 as necessary to comply with the open-water allocations. State and federal projects and operational activities related to water management and storage in and upstream of the Delta and Yolo Bypass, maintenance of and changes to salinity objectives, dredging and dredge materials disposal and reuse, and management of flood conveyance flows are subject to the open water methylmercury allocations. In addition, the proposed Project requires that agencies that propose changes to the Yolo Bypass flood conveyance and other water and flood management projects evaluate and minimize to the extent practicable any new methyl and total mercury inputs resulting from the changes. Changes in flood conveyance and other water management projects could include new or modified weirs in the Yolo Bypass, new or expanded reservoirs upstream of the Delta, and changes in the *Central Valley Project – Operations Criteria and Plan, 30 June 2004*

(CVP-OCAP) that result in alterations to the currently permitted water storage or release schedules (e.g., increased flows, flood frequency, or flood duration in the Yolo Bypass).

As discussed in Section 4.3.12.4 in Chapter 4, ways to minimize existing and new methylmercury inputs resulting from flood conveyance and water management projects could include, but are not limited to, the following:

- Modifying the flow regimes, water routes and channel geometry within the Yolo Bypass.
- Locating new water storage reservoirs outside of mercury-contaminated watersheds and developing engineered controls to minimize methylmercury production (e.g., aeration or circulation) or to minimize discharges from methylmercury-enriched zones within the reservoir.

Several of these potential methods of compliance could change the water depth and flooding frequency and/or duration of open-water, floodplain and wetland habitats within or downstream of the Yolo Bypass and other areas affected by new and existing water management projects, and as a result potentially affect the desirable functions of those habitats, beyond those impacts already caused by the new water projects themselves. One way to avoid negative effects on open-water, floodplain and wetland habitat function could be to implement only those methylmercury reduction-related modifications that do not conflict with desirable water management and habitat functions. Another way would be to mitigate increases in methylmercury inputs resulting from water/flood management projects by reducing upstream sources of methylmercury or mercury-contaminated sediment and/or participating in an offset program. In addition, as noted in the previous section, if it is necessary to implement methylmercury management practices that alter habitat function at some individual sites, it may be possible to compensate for that alteration by constructing mitigation wetlands away from mercury-contaminated areas or areas that are not otherwise impaired by methylmercury. However, there is the potential for adverse impacts to habitat that supports endemic species such as Sacramento splittail, which may not be adequately compensated by constructing mitigation habitat away from mercury-contaminated areas. As noted in previous paragraphs, until the proposed Phase 1 control studies have been completed, it is not possible to know whether it will be possible to mitigate this potential impact to less than significant levels.

As described in “II. Agricultural Resources” and Chapter 4 (Section 4.3.10.4), the proposed Project may require some irrigated agricultural areas in the Delta/Yolo Bypass to reduce their methylmercury discharges. Compliance methods could include, but not be limited to, the following: modifying agriculture return water discharge patterns to decrease the methylmercury concentration of the return water entering the receiving waters; and utilizing drip irrigation systems, tailwater recovery or other water-efficient systems to curtail or limit irrigation runoff and discharge volume to the receiving waters. These management practices have already been developed and are readily implemented to manage other pollutants such as pesticides and to conserve water. The environmental effects associated with these management practices have been previously evaluated (e.g., Hann *et al.*, 2007) and are not expected to adversely impact biological resources. Even so, some stakeholders have voiced the concern that utilizing drip irrigation systems or other water-efficient systems to curtail or limit irrigation runoff and discharge volume would reduce the in-stream water flow available for open-water habitats. While this conceivably could be a concern for upland areas in the tributary watersheds that obtain irrigation water predominately from groundwater sources, it should not be a concern for agricultural areas in the Delta (where the proposed methylmercury allocations apply) because essentially all areas within the Delta are irrigated with water from nearby Delta channels (DWR, 1995). Any decrease in water consumption would likely have corresponding decreases in water withdrawals from the nearby channels, resulting in no net decrease in in-stream water flow available for open-water habitats. In addition, a stakeholder noted during the 2008-2009 Stakeholder Process that "'conservation' of water by in Delta ag users has no real meaning or benefit to the over all supply. Whatever the crops do not consume is immediately returned to the Delta pool and not lost." (Herrick, 2009).

C. Impediments to Migratory Fish

In fall 2000, migrating salmon were observed upstream of the Cache Creek Settling Basin, after having passed through the basin via the low flow outlet structure (Moyle and Ayers, 2000). Because this occurred during low flow conditions, the basin's low flow outlet apparently did not act as a barrier to the salmon migration.

The proposed Basin Plan amendments require that improvements to the Cache Creek Settling Basin's sediment and total mercury trapping efficiency be made. One reasonably foreseeable method of complying with this requirement would be to raise the basin's outlet weir earlier than planned.

Raising the outlet weir of the Cache Creek Settling Basin could interfere with the movement of migratory fish such as salmon. Currently the outlet weir is about 12 feet higher than ground level in the Yolo Bypass. The weir is designed to be raised by an additional six feet, which would make the overall height of the weir 18 feet above the Yolo Bypass. During low flows, water from the basin flows through an outlet structure, the spill elevation of which is managed by DWR. Raising the outlet weir another six feet could potentially interfere with or act as an additional barrier to the movement of migratory fish into Cache Creek during high flows. (As noted earlier, the low-flow basin outlet structure does not appear to act as a barrier to the salmon migration during low flows.) A potential mitigation measure could be to install a fish ladder adjacent to the weir or make modifications to the low flow outlet structure to make fish passage easier.

As noted earlier in this section, existing maintenance plans for the Cache Creek Settling Basin call for raising its outlet weir in 2018; hence, raising the weir would not be a new requirement. Compliance with the proposed Basin Plan amendments could result in the weir being raised several years ahead of schedule. However, no additional adverse impacts to migratory fish are expected as a result of raising the weir earlier than planned, other than an earlier impact to fish passage. The long-term effect of raising the weir would be the same.

D. Use of Credit Accrued by Voluntary Pilot Offset Projects

During Phase 1 of the proposed Project, mercury and/or methylmercury dischargers would be able to conduct voluntary pilot offset projects approved by the Central Valley Water Board and accrue total mercury and/or methylmercury mass credit for documented improvements. As noted in Chapter 4, a long-term offset program would be developed by Board staff and stakeholders during Phase 1. Voluntary pilot offset projects could include reducing within-Delta and upstream sources of methylmercury as well as upstream sources of total mercury.

Potential effects on biological resources resulting from potential methylmercury management practices have been evaluated in previous paragraphs in this section. Total mercury reduction projects could include constructing additional settling basins in mercury-contaminated watersheds, reducing erosion from mercury-contaminated stream banks, and mine and dredge field remediation. Measures listed at the beginning of this section ("A. Habitat Disturbance and Loss") could be employed to avoid significant habitat disturbance and ensure no net loss of habitat from earth moving and other construction and maintenance activities associated with total mercury reduction projects.

Implementation of Phase 1 pilot offset projects could result in more immediate methylmercury reductions. However, dischargers' use of their accrued credit has the potential to increase methylmercury levels downstream of their discharge if:

- They use accrued credit to offset long-term increases in their methylmercury discharges, or
- They conduct pilot projects in other watersheds that do not result in improvements at their points of discharge.

Even so, use of accrued credit is expected to have no or less than significant environmental impacts for several reasons:

- If a discharger is allowed to use accrued credit to offset long-term increases in their methylmercury discharges, or to use credit accrued from projects in other watersheds, the load and waste load allocations for sources upstream of the discharge would need to be adjusted to ensure that fish tissue objectives are achieved and maintained in compliance with USEPA and Clean Water Act requirements for TMDLs.
- Implementation of total mercury minimization programs is expected to enable some facilities to achieve their methylmercury allocations; therefore it is expected that only a subset of facilities will conduct pilot offset projects and use their accrued credit towards methylmercury allocation compliance schedules
- Because Alternative 4 requires compliance with the methylmercury waste load allocations as soon as possible beginning in Phase 2, it is expected that compliance schedules for Delta/Yolo Bypass and upstream facilities assigned methylmercury allocations will be staggered, further limiting the potential for negative environmental effects if one or more facilities extend their compliance schedule.

E. Coordination with HCPs, NCCPs and Other Plans

The proposed Basin Plan amendments require managers for existing wetlands and new wetland restoration projects to participate in Phase 1 methylmercury control studies to develop and evaluate practices to minimize methylmercury discharges from wetlands and implement management practices as feasible. The proposed Basin Plan amendments do not conflict with provisions of adopted Habitat Conservation Plans (HCPs) or Natural Community Conservation Plans (NCCPs) because they do not prevent the future restoration and development of wetlands and other critical habitat, and as described in earlier sections, impacts to existing habitats can be reduced to less than significant levels through careful project design and construction activities.

A perceived conflict may exist regarding the Wetland Conservation Policy, also known as the "no-net loss of wetland policy". To reduce methylmercury discharges from existing or new wetlands that act as methylmercury sources, project proponents may need to change the design and management of existing managed wetlands and new restoration projects and/or change the location of proposed wetland projects to avoid creating habitat that would increase ambient methylmercury and the bioaccumulation of methylmercury in the local and downstream aquatic ecosystems. However, the proposed Basin Plan amendments do not require the removal or fill of existing wetlands and wetlands removal is not considered a reasonably foreseeable method of compliance with the proposed methylmercury allocations. As described earlier in this section, there are numerous measures available to ensure there is no net loss in wetland acreage as a result of the construction and maintenance of projects to comply with the Basin Plan amendments. As a result, there is no actual conflict with the Wetland Conservation Policy.

Requirements in the proposed Basin Plan amendments do not conflict with CalFed's habitat restoration goals stated in its Multi-Species Conservation Strategy (adopted by the CDFG as the NCCP), and are consistent with CalFed programmatic water quality goals. The proposed Basin Plan amendments further support the CalFed programmatic ROD's CEQA requirements to develop mitigation strategies to address potentially significant adverse environmental impacts (i.e., disturbing mercury-laden sediment and methylation of mercury through habitat creation) from CalFed program projects (see Chapter 6.4). Under CEQA, CalFed is required to address potentially significant impacts resulting from project actions. To address CEQA requirements, CalFed included mitigation strategies in the ROD to reduce these impacts to a "less than significant" level (CalFed, 2000b). The proposed Basin Plan amendments are consistent with the CalFed ROD mitigation strategies, the Water Quality Program Plan priority actions, and other mitigation strategies proposed in other CalFed Program Plans by providing requirements to study and develop management practices and control actions that fulfill CalFed mitigation measures.

Implementation of the proposed Basin Plan amendments could result in delays for currently-planned wetland restoration projects due to the need for reallocating existing resources towards performing the Phase 1 methylmercury studies. However, CDFG and USGS have several studies underway to determine the impact of wetland restoration projects on mercury methylation. In addition, the cumulative impact of redirected resources for studies can be minimized if wetland managers throughout the Delta region choose to work collaboratively on the studies. Public, nonprofit and private wetland restoration organizations including the Sacramento River Watershed Program, The Nature Conservancy and Ducks Unlimited have already begun collaborating to submit grant applications (e.g., for Clean Water Act Section 319(h) funds) to obtain funds for developing an effective collaborative study approach and implementing studies.

HCPs and NCCPs developed to avoid or compensate for the incidental take of listed species by urban development and other activities are required to follow all applicable environmental regulations, including water quality objectives and other existing requirements in the Basin Plan. When HCPs and NCCPs are cited as part of the recovery strategy for listed species, however, coordination between water quality and conservation planners may be needed in development of both the conservation plans and implementation plans for water quality objectives. Both planning efforts should be science-based and have provisions for adaptation when new information is received.

V. Cultural Resources

A historical resource is a resource listed in or eligible for listing in the California Register of Historical Resources. The California Register includes resources on the National Register of Historic Places, as well as California State Landmarks and Points of Historical Interest. Properties that meet the criteria for listing also include districts that reflect California's history and culture, or properties that represent an important period or work of an individual, or yield important historical information. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified as local historical resources are also included in the California Register (COHP, 2001).

An archeological site may be considered a historical resource if it is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California (PRC §5020.1(j)), or if it meets the criteria for listing on the California Register (14 CCR §4850). If an archeological site is not a historical resource, but meets the definition of a "unique archeological resource" as defined in PRC Section 21083.2, then it should be treated in accordance with the provisions of that section (COHP, 2001).

The California Office of Historic Preservation maintains an inventory called the California Historical Resources Information System (CHRIS), which includes California historical resources, places, and landmarks, and archeological sites. Information about California Indian historical cites can be accessed through Tribal Historic Preservation Officers, found throughout California, or by contacting the State Historic Preservation Officer with the Native American Heritage Commission. Information in the CHRIS inventory is accessed through eleven regional Information Centers. The Information Centers may charge fees for information about particular sites in a proposed project area.

- An updated listing of the State Historic Preservation Officers can obtained through the Native American Heritage Commission (http://www.nahc.ca.gov/)
- Northwest Information Center at Sonoma State University maintains records for Alameda, Contra Costa, Solano and Yolo County sites (www.sonoma.edu/nwic);
- North Central Information Center at California State University, Sacramento maintains records for Sacramento County sites (www.csus.edu/hist/centers/ncic); and
- Central California Information Center at California State University, Stanislaus maintains records for San Joaquin County sites (http://www.csustan.edu/anthro/Pages/CentralCaliforniaInfoCenter.html).

Areas or places of importance to Native Americans can be considered cultural resources and subject to consideration in the environmental review for site-specific project, even if not identified as a California Historical Resource. California Code of Regulations Title 14 Section 15064.5(a)(3) identifies criteria for determining an area or place to be significant in the "social" or "cultural annals" of California for the purposes of environmental review. Additional guidelines in identifying “traditional cultural properties” are provided by the U.S. Department of the Interior (Parker and King, 1998). A traditional cultural property is significant because of its association with the “cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community” (Parker and King, 1998). Evidence of a traditional cultural property that is not listed in the National Register of Historic Places or in the above inventories should be provided to the Central Valley Water Board and/or the lead agency that performs CEQA review of site-specific projects during implementation of the Delta mercury control program.

Compliance with the proposed Basin Plan amendments will entail a variety of construction activities to implement total mercury and methylmercury controls and management practices. To identify cultural resources, specific project sites must also be identified. However, precise locations for projects are not known because, as noted at the beginning of Section 7.2, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. Project proponents must comply with the CEQA process and requirements for tribal consultation provided in Senate Bill 18, which became law in 2005. The resources described above will help proponents of site-specific projects to identify cultural resources in a specific project area.

Even though specific projects sites are not yet identified, no significant adverse impacts to known cultural resources – historical resources, sites of archeological or paleontological significance, traditional cultural properties, or human burial sites – are expected as part of Phase 1 or Phase 2 of the proposed Project because construction activities are already required to adhere to CEQA and local ordinances to evaluate potential project sites for cultural resources through a search of historical records and databases (such as those described in the previous paragraphs) and published literature and to avoid substantial change or damage to identified resources. When avoidance is infeasible, the entity completing the project activities will follow Native American Heritage Commision’s mandate for Native American Human Burials and Skeletal Remains, in partnership with affected tribe(s), in order to adequately provide for recovering scientifically consequential information from the site. A report of the excavation and data should be filed with the California Historical Resources Regional Information Center (COHP, 2001). No impact is anticipated after mitigation.

It is possible that construction activities that involve excavation or other ground disturbances where disturbances have not previously occurred could uncover previously undiscovered cultural resources. However, it expected that this would result in less-than-significant impacts because there are standard measures that could be implemented as part of the projects’ designs to avoid or minimize impacts to newly discovered resources, many of which are required by AB 2641 (Protection for Native American Burials) and local policies and ordinances. Possible measures include:

- Require a professional trained to identify evidence of cultural resources to observe major excavation and earth-moving activities.
- If any archaeological, paleontological, or historical resources are discovered during construction activities, construction should stop within a 100-foot radius of the site, and a qualified archaeologist should be brought on site within 24 hours. If the find is determined

to be significant, a full archaeological survey takes place. Construction activities in the area resumes once the survey is completed and all cultural resources are recovered.

- If any human remains are discovered during construction activities, no further excavation or other site disturbance takes place. The local coroner is notified and makes a determination as to whether the remains are of Native American origin, or whether an investigation into the cause of death is required. If the remains are determined to be Native American, the coroner notifies the Native American Heritage Commission (NAHC) within 24 hours, the NAHC immediately notifies those persons believed to be the most likely descendant(s) (MLD) of the deceased, and once the NAHC identifies the most likely descendents, the descendents, with the permission of the landowner, inspects the site of the discovery make recommendation for the treatment or disposition of the remains and any associated grave items within 48 hours (per AB2641) of the MLD being granted access to the site. The landowner is to ensure that the immediate vicinity of the remains, established according to standard professional practices, is not damaged or disturbed by further activity until the landowner has conferred with the MLD. Discussion and consultation between the landowner and MLD should take into account the possibility of multiple burials and reasonable options regarding the MLD's preferences for treatment. If the NAHC is unable to identify an MLD, if the MLD fails to make a recommendation, or if the NAHC is unable to mediate a dispute concerning the appropriate disposition of the remains, the landowner shall re-inter the human remains and any associated items with appropriate dignity on the property in a location not subject to further subsurface disturbance, and to protect the remains from disturbance, the landowner must record the site with the NAHC or the appropriate Information Center, use an open space or conservation zoning designation or easement, and/or record a document with the county in which the property is located.

One possible type of traditional cultural property is a "riverscape", or river and its associated features, including water, wildlife, fish, and topography, that has significant cultural value (Gates, 2003). Waterways within the legal Delta boundary have not been formally identified as traditional cultural riverscapes. The intent of the proposed Basin Plan amendments is to reduce levels of mercury in fish so that individuals can safely eat more Delta fish, including native fish species that may have been traditional resources from these rivers.

VI. Geology and Soils

As with the cultural resources discussed in the previous section, project-level analysis of site geology and soil conditions will take place once entities responsible for complying with the proposed Basin Plan amendments select their methods of compliance and potential project sites. The following provides a programmatic-level review.

A. Seismic Risks

Active and potentially active faults lie throughout the Project region, some of which could pose a significant threat of earthquakes in the area. Earthquakes can result in liquefaction, landslides and other seismically related hazards. The California Department of Conservation's Division of Mines and Geology Special Publication 42 (Interim Revision 2007, Table 4) lists cities and counties affected by Fault Rupture Hazard Zones as of August 16, 2007 in accordance with the Alquist-Priolo Earthquake Fault Zoning Act. Faults are classified in the State according to their potential seismicity, and may be classified as active, potentially active or inactive. A fault or fault segment that shows evidence of movement within the time of the Holocene Epoch (11,700 years to the present) is defined as *active*. A fault or fault segment is considered *potentially active* if evidence of displacement during the Quaternary Period (2.6 million years to the present) occurred (Jennings, 1994).

None of the cities listed by *Special Publication 42* are in the Delta or its tributary watersheds downstream of major dams; however, several counties are. Counties in the Delta's tributary watersheds downstream of major dams affected by Earthquake Fault Zones include: Alameda, Butte, Contra Costa, Merced, Solano, Stanislaus and Yolo Counties. All but one of the principal faults (Cleveland Hill in Butte County, with a historic surface rupture) in these counties zoned through August 2007 in Special Publication 42 are in the western areas of the counties, along the Coast Range.

The California Department of Water Resources' *Seismicity Hazards in the San Joaquin Delta*[52] (1980) identified that the Delta may be threatened by three major north-west trending faults, San Andreas, Hayward, and Calaveras, all to the west of the Delta in the San Francisco Bay area. These particular active faults pose the greatest threat to producing significant earthquakes in the region and are zoned under the Alquist-Priolo Earthquake Fault Zone Act. The San Andreas Fault is characterized as a right lateral strike slip fault, last active in 1906 and 1989, with maximum moment magnitude of 7.9 Moment magnitude (Mw)[53]. The Hayward fault is subject to creep, was historically active in 1836 and 1868, and is with maximum moment magnitudes of 7.1 Mw. The Calaveras fault, active in 1911, 1961 and 1984, is characterized by maximum moment magnitudes of 6.8 Mw (USGS, 1996). Maximum intensities (MMI)[54] for the San Andreas and Hayward faults range from IV-V, while MMI for the Calaveras fault range from VII-VI (ABAG, 2003).

Other principal faults that may contribute to significant ground shaking in this region include, but are not limited to:

- The active Greenville fault is southwest of the Delta, about 10 miles southwest of Clifton Court Forebay. On 24 January 1980, the Greenville fault produced an earthquake of 5.5 Richter magnitude plus surface rupture with aftershocks for six days, and on January 27 an earthquake of 5.8 Richter magnitude occurred at the southern end of this fault with minor surface rupture along at least six kilometers. Maximum moment magnitudes for this fault are Mw 6.9 (USGS, 1996). MMI for this fault range from VII-VI (ABAG, 2003).

[52] Available at: http://www.calwater.ca.gov/Admin_Record/C-105124.pdf

[53] The magnitude (M) is a measure of the energy released in an earthquake. The estimated magnitudes, described as moment magnitudes (Mw) represent characteristic earthquakes on particular faults. Moment magnitude is related to the physical size of a fault rupture and movement across a fault. The Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave. Moment magnitude provides a physically meaningful measure of the size of a faulting event. The concept of "characteristic" earthquake means that we can anticipate, with reasonable certainty, the actual earthquake that can occur on a fault (CDMG, 1997).

[54] The Modified Mercalli Intensity (MMI) scale is commonly used to measure earthquake effects due to ground shaking. The MM values for intensity range from I (an earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage.

- The Green Valley-Concord fault zone, which includes the Southern Green Valley fault, lies approximately 15 miles west of the Delta, on the western edge of Suisun Bay. This is an active strike slip fault with a maximum moment magnitude of Mw 6.7 (USGS, 1996). Per the 1980 DWR report, it "must be considered semiactive. While no known earthquake has occurred due to this fault, an offset fence along the fault alignment indicates recent creep." MMI for the Green Valley-Concord fault zone ranges from VII-VI (ABAG, 2003).
- The Tracy-Stockton fault is a northeast trending fault in the southern Delta. This buried fault is considered to be potentially active, but is not listed in *Special Publication 42*. Per the 1980 DWR report, "No surface expression of this fault has been mapped. Subsurface data indicate, however, that no appreciable movement has occurred on the Tracy-Stockton fault since mid-Pliocene time, perhaps three million years ago or more."
- The Antioch fault is a northwest trending fault in the westernmost Delta. While this fault is not addressed in *Special Publication 42*, it is considered to be potentially active and susceptible to potential surface rupture. It produced an earthquake of 4.9 Richter magnitude on 10 September 1965. Per the 1980 DWR report, "Previously, no active faults were known to exist in the Delta."
- The concealed Midland fault crosses the Delta from north to south. Per the 1980 DWR report, this fault "is believed capable of causing a serious quake of perhaps Richter magnitude 7 … However, there is little proven information concerning the Midland fault." This fault is not listed in *Special Publication 42*.

Per the 1980 DWR report, no strong earthquake has occurred close enough to the Delta to produce known damaging levels of ground shaking since the San Francisco Earthquake of 1906. Moderate earthquakes since that event emphasize the need to consider the seismic factor in levee rehabilitation design to prevent non-catastrophic and catastrophic failure of Delta levees and levee systems. The report also stated, while not an apparent Delta hazard in the past, liquefaction, settlement, landsliding, creeping, subsidence, or other effects of causative earthquakes could seriously damage levees, especially as levees are built larger and higher to deal with continuing island subsidence. Because the Delta is a floodplain underlain primarily by unconsolidated, water-saturated clay, silt, fine sand, and peat, the 1980 DWR Report stated that the area is highly susceptible to damage by earthquake shaking, especially prolonged shaking.

The California Geological Survey provides an "Interactive Ground Motion Map" that shows an estimate of the likelihood of earthquake ground motions, based on a probabilistic seismic hazard analysis (Cao *et al.*, 2003). The Probabilistic Seismic Hazard Assessment map is for peak ground acceleration (pga), and 0.3 and 1.0 second spectral acceleration of 5% damping at 10% probability of exceedance in 50 years, and is calculated for a firm-rock site condition. The online interactive map indicates the westernmost Delta is characterized by a moderately high potential for ground shaking (30-40% peak ground acceleration of gravity [g]), grading to low potential in the central and eastern Delta and Yolo Bypass (10-20%g). The ground-shaking zones' orientation is consistent with the location and orientation of the minor faults described in the 1980 DWR report. The zone of moderately high potential for ground shaking (20-40%g) extends to the northwest and southeast along the Coast Range in the Delta's tributary watersheds. The majority of the tributary watershed areas have a low (10-20%) to very low (<10%) potential for ground shaking. For comparison, the potential for ground shaking increases to >80%g at the San Andreas, Hayward and Calaveras faults in the San Francisco Bay area.

California Geological Survey's Seismic Hazard Zone Maps, which identify liquefaction and landslide zones, do not include areas outside of the greater San Francisco Bay and Los Angeles Areas such as the Delta and its tributary watersheds. However, the National Seismic Hazard Map database (2008) maintained by the USGS indicates the Delta lies within a region characterized by relatively high pga (USGS, 2008). Therefore, it cannot be assumed that there is no risk until site-specific project-level analyses are conducted. For example, liquefaction can happen anywhere there is loose, granular sediment (such as stream deposits), saturation of the sediment by ground water, and strong shaking. In particular, as described in the 1980 DWR report and more recent literature, liquefaction, settlement or other effects of causative earthquakes could seriously damage levees in the Delta.

A recent analysis by University of California scientists indicated that there is a significant increasing potential for Delta island flooding during the next 50 years due to levee failures, with a two-in-three chance that 100-year recurrence interval floods or earthquakes will cause catastrophic flooding and significant change in the Delta by 2050 (Mount and Twiss, 2005). As a result, while seismic shaking may not directly harm well designed, site-specific projects in the Delta, the potential exists for substantial harm due to failure of nearby levees. In addition, seismic risks may be higher in the Coast Range and other areas within Earthquake Fault Zones identified in *Special Publication 42* and/or site-specific project geotechnical investigations. As a result, a licensed geologist should evaluate county general plans and other available geologic literature for additional geological information and conduct site-specific geologic, geotechnical and soil investigations to evaluate the potential for the presence of an active fault or other seismic risks (strong ground shaking, liquefaction, landslides, mass wasting, or other ground failure) for site-specific projects implemented to comply with the proposed Basin Plan amendments, including nearby levees.

The California Geological Survey's Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California - 2008*, provides guidelines for evaluating seismic hazards other than surface fault-rupture, and for recommending mitigation measures as required by Public Resources Code Section 2695(a) (CDOC-CGS, 2008). Also, engineering geology report topics are outlined in the *Guidelines for Engineering Geologic Reports*, developed by the Board of Geologists and Geophysicists (CDCA, 1998).

Although areas of the Delta and its watershed may be subject to seismic hazards, compliance with existing regulations, building codes, standards specifications, and the mitigation recommendations of geotechnical studies prepared at the site-specific project level would reduce the risk of damage from seismic hazards to less than significant levels. Furthermore, it is not reasonably foreseeable that responsible agencies would choose to comply with the proposed Basin Plan amendments through structural means in areas where doing so would result in exposure of people or the environment to significant seismic hazards. Rather, it is expected the site-specific projects would be located where seismic risks are not substantial.

However, because choosing project sites that do not have significant seismic hazard risks and other mitigation measures are not included in the proposed Basin Plan amendments, and local requirements can vary, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact conduct adequate seismic hazard analyses and choose sites that avoid significant risks, except for those site-specific projects for which the Board is the “Lead Agency”. As a result, “Potentially Significant Impact” is checked on the Environmental Checklist.

B. Soil Erosion

The proposed Project requires the implementation of management practices and other control actions to reduce or prevent the discharge of mercury-contaminated sediments from the Cache Creek Settling Basin, the mercury-contaminated watersheds that discharge the most mercury-contaminated sediment to the Delta and Yolo Bypass (Cache and Putah Creeks and the American and Feather Rivers), MS4 service areas in the Delta/Yolo Bypass, and dredging and dredge material disposal projects. Compliance with this requirement will have a net benefit by reducing sediment and mercury loading to the Delta and Yolo Bypass. Also, erosion control and sediment management are already baseline requirements in the Basin Plan to maintain compliance with the Basin Plan’s water quality objectives for turbidity (Chapter 3 of the Basin Plan) and “Action Plan for Erosion/Sedimentation” (Appendix 34 of the Basin Plan). Any activities that may disturb soils or sediments undertaken to comply with the proposed Project’s requirements to control total mercury and methylmercury inputs to the Delta and Yolo Bypass must incorporate management practices to comply with existing Basin Plan objectives turbidity control.

In addition, construction activities are regulated by the NPDES General Permit for Storm Water Discharges Associated with Construction Activity or through the construction program of the applicable MS4 permit, both of which are already designed to minimize or eliminate erosion impacts on receiving water. Erosion control/sediment management requirements are not new requirements for construction activities in the Delta and its source region and therefore erosion control/sediment management actions and their potential for environmental effects are considered baseline conditions, the potential environmental impacts of which are not new to the proposed Project. Also, waste discharge requirements or CWA 401 certification, which would entail project-specific environmental review, will likely be required for individual projects with the potential to cause erosion or otherwise increase turbidity. Finally, there are many measures available to control erosion and sediment transport. As a result, it is expected that there will not be substantial soil erosion resulting from the implementation of the proposed Project, and indeed, a net reduction in erosion and sediment transport is an expected outcome of the Project.

Typical erosion and sedimentation control measures, include, but are not limited to, the following:

- Evaluate the project site, and up- and down-gradient areas, for erosion potential. Design the project and implement construction and maintenance activities to prevent erosion and sedimentation. Design stormwater runoff control systems to fit the hydrology of the project area once it is fully developed, to have adequate capacity to transport the flow from all upland/upstream areas, to be non-erosive, and to conduct runoff to a stable outlet. Install systems prior to the rainy season.

- Remove vegetation only when necessary and make every effort to conserve topsoil for reuse in re-vegetation of disturbed areas.
- Develop land in increments of workable size, such that construction can be completed during a single construction season, and coordinate erosion and sediment control measures with the sequence of grading and construction operations.
- Stabilize and re-vegetate all disturbed soil surfaces before the rainy season.
- Restrict stockpiling of construction materials to the designated construction staging areas and exclusive of habitats and their buffer zones.
- Employ control measures that prevent soil or sediment from leaving construction sites, monitor them for effectiveness, and maintain them throughout the construction operations and between construction seasons. Standard measures include installation of sediment basins and traps in conjunction with grading operations; development of slope drains; stabilization of stream banks; use of hydraulic mulch, hydroseeding, straw mulch anchored with a tackifier, polyacrylamide, rolled erosion control products (e.g., blankets and mats), earth dikes, drainage swales, and velocity dissipation devices; and installation of silt fences, fiber rolls, gravel bag berms, sandbag barriers, storm drain inlet protection, and check dams.
- Contain runoff from truck and cement equipment wash-down.
- Limit to the dry season any construction activities within an area of the Ordinary High Water (OHW) line of drainages and lakes.
- Limit any construction activities within a floodplain, but above an OHW line, to those actions that can adequately withstand high river flows without resulting in the inundation of and entrainment of materials in flood flows.
- Have a professional hydrologist or licensed engineer develop an erosion control and water quality protection plan to avoid habitat degradation and ensure compliance with local and state erosion- and sedimentation-related requirements. The plan should be integrated into the construction schedule, and describe how site clean-up and re-grading will impact current physical conditions.

C. Unstable and Expansive Soils

The stability of slopes is related to a variety of factors, including the slope’s steepness, the strength of geologic materials, and the characteristics of bedding planes, joints, faults, vegetation, surface water, and groundwater conditions. Landslides are the downslope movement of geologic materials and tend to occur in weak soil and rock on sloping terrain. Lateral spreading is the lateral displacement of ground as a result of pore pressure build-up or liquefaction. Liquefaction occurs when water-saturated sediments, mainly sand and silt, become suspended and flow due to vibratory motions (ground shaking). Subsidence is the motion of ground surface as it shifts downward relative to a datum such as sea level. Expansive soils contain minerals that are capable of absorbing water, which causes the soils to increase in volume when saturated and to contract when dried out, and can exert enough force on a building or other structure to cause damage.

Subsidence is of particular concern in the Delta. Much of the area within the legal Delta boundary was once an extensive tidal freshwater marsh where thick organic soil (peat and peaty alluvium) was formed as tules and other plants were covered by sediment deposited by tidal action (DWR, 1995; USGS, 2000). In the late-1800s, large-scale agricultural development entailed levee-building to prevent frequent flooding and draining of the leveed marshland tracts, which led to aerobic (oxygen-rich) conditions that favor rapid microbial oxidation of the carbon in the peat soil and subsequent emission of carbon dioxide gas to the atmosphere and soil subsidence. Microbial oxidation and compaction of the organic-rich soils due to reclamation and farming activity are the primary causes of Delta subsidence (Mount and Twiss, 2005) and have led to subsidence of the land surface on the developed islands in the central and western Delta at long-term average rates of 1-3 inches per year (USGS, 2000), and created approximately 2.5 billion cubic meters of "anthropogenic accommodation space" – the space in the Delta that lies below sea level and is filled neither with sediment not water – between 1900 and 2000 (Mount and Twiss, 2005). Many of the islands have ground surfaces that are 5 feet to more than 10 feet below sea level (DWR, 1995; USGS, 2000; Mount and Twiss, 2005). Continued subsidence, combined with sea level rise, is a major concern in the Delta because it increases the anthropogenic accommodation space, which increases the head difference between the water surface of the Delta channels and the interior of the islands. This in turn increases hydrostatic forces on levees and seepage rates through and beneath levees. Depending upon location and magnitude, subsidence increases levee foundation problems by reducing lateral support and shear resistance, promoting settling or deformation of underlying peat layers, which leads to lateral spreading, slumping and cracking of levees, which increases the likelihood of levee failure and island flooding due to seepage erosion or overtopping (DWR, 1995; Mount and Twiss, 2005).

As noted earlier in Section A. Seismic Risks, a recent analysis by University of California scientists indicated that there is a significant increasing potential for Delta island flooding during the next 50 years due to levee failures, with a two-in-three chance that 100-year recurrence interval floods or earthquakes will cause catastrophic flooding and significant change in the Delta by 2050 (Mount and Twiss, 2005). This is of critical concern because the current channel network of the Delta and the hydraulic disconnection between islands and surrounding channels is necessary for meeting water quality standards at the south Delta pumping plants that support the Central Valley Project, State Water Project and Contra Costa Water District, and because CalFed's Ecosystem Restoration Program has concluded that subsided islands and deeply flooded islands provide poor quality habitat for native aquatic plant and animal communities, and are generally viewed as undesirable (*as cited in* Mount and Twiss, 2005). Subsidence can take place in the Delta and elsewhere in the tributary watersheds not only from peat oxidation and compaction but also from wind erosion, groundwater withdrawal, and oil and gas withdrawal.

The Delta and its tributary watersheds encompass about a third of the State of California; hence, an immense variety of geologic units, taxonomic soil orders, and slope conditions exist. Licensed geologists and professional engineers should conduct site-specific geologic, geotechnical and soil investigations to evaluate potential locations of projects to be implemented to comply with the proposed Basin Plan amendments and to determine the potential for projects to:

- Be located on a 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; and

- 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.

These geotechnical and soil investigations can be combined with the investigations needed to evaluate site-specific seismic hazards, as discussed earlier in Section A. Seismic Risks, and should include, but not be limited to, an evaluation of: historic events of liquefaction and landslides in the project region and their causes (e.g., rainfall, earthquake, or construction practices, such as blasting, vibroflotation, and dynamic compaction); taxonomic soil orders and properties; geologic units and properties (e.g., unit age, regional correlation, thickness, type, location, contacts, discontinuities); site-specific subsurface geology, aquifers, and faulting; regional subsidence and uplift, including an analysis of contributing factors; identification of any plugged and abandoned oil, gas and geothermal wells near the project site (plugged, abandoned, idle and orphan wells are inventoried by the California Department of Conservation); hydrology, including evaluation of the impacts of precipitation, runoff, ground water, surface erosion, sediment transport and tidal fluctuations; and tabulation of rainfall intensity, frequency and duration. In addition, the investigations should provide recommendations for mitigations, as needed. For projects that take place in the Delta, special care needs to be taken to evaluate the effects of a project on local subsidence and the structural integrity of nearby levees, as well as the potential risk of levee failure and potential effects on site-specific projects.

To the extent that the site-specific project activities could be affected by or result in ground instability or be affected by expansive soils, potential impacts could be avoided or otherwise mitigated by a variety of measures:

- Heeding the recommendations of site- and project-specific geotechnical and soil studies;
- Locating projects away from areas with unsuitable soils or steep slopes;
- Design and installation in compliance with existing regulations, standard specifications and building codes; and,
- Depending on soil and geologic conditions:
    - Ground improvements such as soil compaction and excavation and disposal of liquefiable soils;
    - Structural improvements such berms or dikes to prevent large lateral spreading;
    - Buttressing landslides;
    - Installing special drainage devices; Water injection wells; and
    - Groundwater level monitoring to ensure stable conditions.

However, because not all of the above mitigation measures are required by current regulations and codes, and mitigation measures are not included in the proposed Basin Plan amendments, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact conduct adequate soil and geotechnical analyses and choose sites that avoid significant risks, except for those site-specific projects for which the Board is the “Lead Agency”. As a result, “Potentially Significant Impact” is checked on the Environmental Checklist.

VII. Greenhouse Gas Emissions

Global climate change refers to observed changes in weather features that occur across the Earth as a whole, such as temperature, wind patterns, precipitation, and storms, over a long period (CAT, 2006; CEC, 2006a; CEC, 2008; IPCC, 2007). Global temperatures are modulated by naturally occurring atmospheric gases, such as water vapor, carbon dioxide, methane, and nitrous oxide. These gases allow sunlight into the Earth's atmosphere, but prevent radiative heat from escaping into outer space, thus altering Earth's energy balance in a phenomenon called the "greenhouse effect". The term "natural greenhouse effect" refers to how greenhouse gases trap heat with the system-troposphere system; the term "enhanced greenhouse effect" refers to an increased concentration of greenhouse gases, which results in an increase in temperature of the surface-troposphere system. Some greenhouse gases are short lived, such as water vapor, while others, such as sulfur hexafluoride, have a long lifespan in the atmosphere.

Earth has a dynamic climate that is evidenced by repeated episodes of warming and cooling in the geologic record. Consistent with a general warming trend, global surface temperatures have increased by 0.74°C ± 0.18°C over the past 100 years (IPCC, 2007). The recent warming trend has been correlated with the global Industrial Revolution, which resulted in increased urban and agricultural centers at the expense of forests and reliance on fossil fuels (CAT, 2006). Eleven of the past twelve years are among the twelve warmest years recorded since 1850 (CEC, 2006a). Although natural processes and sources of greenhouse gases contribute to warming periods, recent warming trends are attributed to human activities as well (CAT, 2006; CEC 2006a). Whether naturally or anthropogenically produced, greenhouse gases of concern include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (CAT, 2006; CAPCOA, 2009; OPR, 2008).

In terms of Global Warming Potential (GWP), each of these gases varies substantially from one another. GWP is a measure of how much a given mass of GHG will contribute to global warming, comparing one GHG to the same mass of CO_2 on a relative scale (CAPCOA, 2009; CAT, 2006; IPCC, 2007). The GWP depends on the absorption of infrared radiation by a given species, the spectral location of its absorbing wavelengths, and the atmospheric lifetime of the species. GHG emissions are measured in units of pounds or tons of CO2 equivalents (CO2eq). As an example, HFC-23 contributes 14,800 times as much as CO2 to the GWP over 100 years. GWP values for key GHGs are summarized in the following table. The following sections contain a general discussion of the natural and anthropogenic sources of each GHG.

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Table 7.1: Global Warming Potential of Greenhouse Gases [(a)]

Gas	Lifetime (years)	Global Warming Potential for 100-Year Time Horizon
Carbon Dioxide	50-200	1
Methane	12	25
Nitrous Oxide	114	298
PFC-14	50,000	7,300
HFC-23	270	14,800
SF_6	3,200	22,800

(a) Source: IPCC. 2007. Table 2.14, Chapter 2, Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC. Available at: http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch02.pdf

Carbon Dioxide (CO_2). In the atmosphere, carbon generally exists in its oxidized form as CO_2. Natural sources of CO_2 include animal and plant respiration, ocean-atmospheric exchange and volcanic eruptions. Anthropogenic sources of CO_2 include the combustions of fossil fuels, such as coal, oil, and gas in power plants, automobiles, industrial facilities and other sources, and specialized industrial production processes and product uses (i.e., mineral production, metal production, and use of petroleum based products). The largest source of CO_2 emissions globally is the combustion of fossil fuels. Sinks of CO_2 include forests, wetlands and agriculture. When CO_2 sources exceed CO_2 sinks, the Earth's natural balance is no longer in equilibrium. Since the late 1800s, the concentration of CO_2 in the atmosphere has risen approximately 30% (CAT, 2006; CAPCOA, 2009).

Methane (CH_4). Methane in the atmosphere is eventually oxidized, yielding carbon dioxide and water. Natural sources of methane include, but are not limited to, anaerobic production, wetlands, termites, oceans, methane gas hydrates (clathrates), volcanoes and other geologic structures, wildfires, and animals. Anthropogenic sources of methane include, but are not limited to, landfills, natural gas systems, coal mining, manure management, forested lands, wastewater treatment, rice cultivation, composting, petrochemical production, and field burning of agricultural residues. In California, agricultural processes contribute significant sources of anthropogenic methane (CAT, 2006; CAPCOA, 2009).

Nitrous Oxide (N_2O). In the atmosphere, nitrous oxide reacts with ozone. Primary natural sources of nitrous oxide include bacterial breakdown of nitrogen in soils and oceans. Anthropogenic sources of nitrous oxide include fertilizer application, production of nitrogen fixing crops, nitric acid production, animal manure management, sewage treatment, combustion of fossil fuels, and nitric acid production (CAT, 2006; CAPCOA, 2009).

Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF_6). HFCs are man-made chemicals containing the element fluorine. Developed as alternatives to ozone-depleting substances for industrial, commercial and consumer products, they are used predominantly as refrigerants and aerosol propellants. PFCs are man-made as well, primarily used as replacements to ozone-damaging chlorofluorocarbons and hydrochlorofluorocarbons. Sources include aluminum production and semiconductor manufacturing. Man made, major releases of SF_6 come from leakage from electrical substations, magnesium smelters and some consumer goods, such as tennis balls and training shoes. Each of these GHGs possesses a relatively high GWP and long atmospheric lifetimes (CAT, 2006; CAPCOA, 2009).

A. How the Proposed Project Could Affect Climate Change

Compliance with the proposed Project's requirements for a monitoring and surveillance program, exposure reduction program, and a total mercury and methylmercury control program could encompass a variety of activities throughout the Delta, Yolo Bypass and tributary watersheds. However, a detailed analysis of potential greenhouse gas emissions and other climate change impacts, such as alteration of GHG sinks or changes in land albedo, that could result from these activities would require the identification of site-specific projects. Precise locations for projects are not known because, as noted at the beginning of Section 7.2, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. Public Resources Code Section 21159 places the responsibility for project-level analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. Because implementation of the proposed Basin Plan amendments will occur over more than twenty years in multiple phases, and site-specific projects have not yet been identified, it is not possible to quantify the GHG emissions or assess those GHGs as individually limiting and/or cumulatively significant, or to establish a future baseline for cumulative impacts.

In addition, the following analysis identifies potential impacts that may require the implementation of mitigation measures beyond those already incorporated in existing laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. However, the proposed Basin Plan amendments do not include specific measures for mitigation of significant impacts. As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those mitigation measures identified in the following analysis or comparable mitigation measures, except for those site-specific projects for which the Board is the "Lead Agency". Also, local, regional and statewide ordinances, general plans, policies, practices and regulations are still being developed and modified to address GHG emission concerns and potential mitigation methods as more information becomes available. Consequently, "Potentially Significant Impact" was selected instead of "Less Than Significant with Mitigation Incorporated" on the Environmental Checklist for the Greenhouse Gas Emissions category, even though mitigation measures described in the following analysis are expected to reduce potential impacts to less than significant levels, given the currently available information.

What follows is a program-level review of potential effects that could result from the implementation of the proposed Basin Plan amendments.

As discussed in the previous section on air quality, the proposed Project would not increase population or long-term employment in the Delta or its source region, and is not expected to generate ongoing, permanent traffic-related emissions, or involve the construction of any permanent emissions sources. For these reasons, no permanent change in GHG emissions would occur as a result of the proposed Project. However, activities associated with implementing requirements in the proposed Basin Plan amendments could affect GHG emissions and sinks, changes in land albedo, or other climate change impacts. For example, the requirements to increase and maintain the sediment and total mercury trapping efficiency of the Cache Creek Settling Basin and to implement BMPs to minimize total mercury discharges from urban runoff will almost certainly require construction and maintenance activities that could be potential short-term sources of GHGs. Other methylmercury and total mercury control projects undertaken during Phases 1 and 2 could similarly be potential short-term sources of GHGs as a result of construction activities, mine cleanups, and periodic maintenance activities. In addition, actions taken to improve the Cache Creek Settling Basin and implement other Phase 2 methylmercury management actions could conceivably cause reductions in vegetation mass (e.g., vegetation clearance in the Settling Basin), would could potentially reduce carbon sinks and/or increase albedo.

Mitigation measures to address these potential impacts include, but are not limited to (AEP, 2007; CAAG, 2008 & 2009; CAPCOA, 2009; Held *et al.*, 2007; OPR, 2008; OPR, 2009a; SMAQMD, 2009):

- Use construction and maintenance vehicles with zero-emission or lower-emission engines.
- Use alternative fuels for generators at construction sites such as propane or solar, or use electrical power.
- Limit the unnecessary idling of delivery and construction vehicles and equipment.
- Use soot reduction traps or diesel particulate filters.
- Use emulsified diesel fuel.
- Use low/zero carbon fuels, such as B20 biodiesel or renewable diesel.
- Reduce NOx emissions from off-road diesel powered equipment.
- Control visible emissions from off-road diesel powered equipment.
- Design structural devices to minimize the frequency of maintenance trips.
- Perform necessary equipment maintenance, such as inspections, detect failures early, corrections, so that they operate cleanly and efficiently.
- Use the proper sized equipment for the job.
- Train equipment operators in proper use of equipment.
- Produce concrete on-site if determined to be less emissive than transporting ready mix.
- Minimize the amount of concrete for paved surfaces or utilize a low carbon concrete option.
- Use locally sourced or recycled materials for construction materials.
- Implement water recycling practices or policies.
- Reuse urban water, e.g., through infiltration, capture and storage of urban runoff.
- Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation.
- Preserve known GHG sinks to the extent feasible and limit GHG sources as a component of project design.
- Preserve or replace onsite trees or contribute to a mitigation program, providing carbon storage.
- Educate the public, schools, other jurisdictions, professional associations, business and industry about reducing GHG emissions.

The proposed Project is expected to have a less than significant impact for greenhouse gas emissions when mitigations are incorporated.

Entities responsible for implementing site-specific actions to comply with the proposed Basin Plan amendments will need to conduct a site-specific GHG analysis. Thresholds of significance and a methodology for GHG analysis are not prescribed in CEQA statute or Guidelines. The OPR-recommended approach for GHG analysis is to: (1) identify and quantify GHG emissions; (2) assess the significance of the impact on climate change, and (3) if significant, identify alternatives and/or mitigation measures to reduce the impact to below significant levels (CAAG, 2008; OPR, 2009a). The analysis should be based on the best available information. Off-site or on-site site-specific project-level analyses of individual or cumulative, indirect or direct GHG emissions should quantitatively assess any emissions as individually limiting and/or cumulatively significant. Potential consideration for analysis may include, but not be limited to, lifecycle analysis, energy production and transmission from power plants supplying energy for the site-specific project, changes in land use from one type to another, removal or addition of GHG sinks and sources, and a radiative budget. Whether individually limiting and/or cumulatively significant, the analysis should consider the impacts of the site-specific project on all past, current and probable future projects. If a determination is made that the GHG emissions for a site-specific project as proposed are potentially significant, then feasible steps should be taken to avoid, minimize or mitigate the impacts of those emissions (CAPCOA, 2008; OPR, 2008, OPR, 2009b).

Future site-specific projects should make a good faith effort to calculate, model or estimate GHG emissions from the projects quantitatively. This effort should include, but not be limited to, consideration of vehicular traffic, energy consumption, water usage, and construction activities (CAPCOA 2008; CAPCOA 2009). Modeling software, such as URBEMIS or I-PLACE^{3}S, is useful in quantifying GHG emissions from a proposed site-specific project (CAPCOA, 2008; OPR, 2008; UCD Extension, 2008). Inventories of GHGs, which identify and quantify anthropogenic sources and sinks for GHGs, are available with the United States Environmental Protection Agency (USEPA, 2009), California Air Resources Board (CARB, 2009) and the California Energy Commission (CEC, 2007). Baseline conditions should address existing environmental conditions without the site-specific project. At this time there is no standard format for incorporating a site-specific project-level GHG emission analysis in an environmental document.

B. How the Proposed Project Could Be Affected by Climate Change

The proposed Project has the potential to be affected by changes in climate. This analysis considers potential indirect, direct, individual and cumulative impacts to the proposed Project and geographical area by global climate change. Climate change models have predicted several scenarios for global, national and local changes that could affect the Delta, including several direct, individual and cumulative impacts. Warmer temperatures, water abundance and quality, changes in precipitation patterns, frequency and intensity of weather events, and sea level rise are just some of the changes that could impact the Delta, its water supply, habitats, and biota (CAT, 2006; CEC, 2006a; CEC, 2008; TNRA, 2009). In addition to warmer storms, the Sierra Nevada snowpack, California's largest surface "reservoir" has been reducing each year (CAT, 2006; CAPCOA, 2009; TNRA, 2009). Typically, snowmelt provides an annual average of 15 million acre feet of water between April and July each year (DWR, 2008; TNRA, 2009). Models project the Sierra Nevada snowpack will decrease by 25-40% by 2050, which would likely result in regions that rely on surface water for domestic, industrial, and agricultural supply needing to turn to groundwater or additional diversions from the Delta (DWR, 2008; TNRA, 2009). Changes in rainfall and runoff patterns combined with warmer temperatures are expected to change the intensity and frequency of flood events (CAPCOA, 2009). Drier years could result in more frequent and intense wildfires, depleting the carbon storage that wildlands and forests provide (CAPCOA, 2009; CAT, 2006; CEC, 2006a; CEC, 2006c). Warmer temperatures may increase evapotranspiration rates and extend growing seasons, which would require more water (CAPCOA, 2009). High frequency flood events will most likely increase, changing watershed vegetation and erosion patterns (CAPCOA, 2009; CEC 2006a; CEC 2008). Flooding and wildfires would increase sedimentation rates, impacting dams, habitats and water quality and likely altering the channel shapes and depths in the Delta. Changes in water quality could include changes in streamflow patterns, dissolved oxygen, and temperatures; higher turbidity; and concentrated pulses of pollutants, all of which could stress fish and increase growth of algae in surface water bodies (DWR, 2008; TNRA, 2009). Sea level rise is already occurring; the exact rate is unknown and but it is correlated to the melting rate of the ice sheets on the western Antarctica and Greenland, and could result in abrupt changes in sea level conditions (CAT, 2006; CEC, 2006b). Sea level rise will ultimately result in increased salt water intrusion in the Delta (CEC, 2006a; CEC, 2006d; CEC, 2008; TNRA, 2009).

Other indirect effects of climate change in California that could affect the Delta, and therefore the proposed Project, may include public health impacts (i.e., potential increase in extreme conditions that are responsible for the most serious health consequences); recreational availability; changes in growth rates of weeds, pests, and disease; shifts in distribution and abundance of biota; and response by biota to elevated CO_2 levels (CAT, 2006; CAPCOA, 2009; CEC, 2006a).

The net result of all these potential changes may have unpredictable consequences on ecological processes in the Delta, including the amount and timing of methyl and inorganic mercury transported to the Delta from its tributary watersheds and the synthesis and bioaccumulation of methylmercury in the Delta because of potential changes to the Delta and watershed flow regimes, suite aquatic species in the Delta, and overall structure of the Delta food web. The source analyses, linkage analysis, methylmercury allocations and total mercury limits described in the TMDL Report and the recommended fish tissue objectives and implementation program described in this report are all based on present climate conditions. Staff will re-evaluate linkage relationships associated with changing environmental conditions as more information becomes available in the future. New analyses will be incorporated in the Phase 1 program review and future program reviews.

VIII. Hazards and Hazardous Materials

A. Hazardous Materials

Implementation of the proposed Project is not expected to create a hazard to the public or the environment through the transport, use or disposal of hazardous materials, or the accidental release of hazardous materials to the environment because several measures are available to prevent impacts.

Compliance with the implementation plan outlined by the proposed Basin Plan amendments will entail a variety of construction and maintenance activities to implement total mercury and methylmercury controls and management practices. There is the potential for human health hazards associated with the installation, operation, and maintenance of heavy equipment. Unprotected sites also may result in accidental health hazards for people. Once constructed, mercury controls and management practices are not expected to entail any onsite use of hazardous materials other than small quantities of janitorial products and possibly oil and fuel for emergency generators, with two exceptions. First, improvements to WWTPs may require some facilities to upgrade or otherwise change their treatment processes, which could result in an increase or change in the types of chemicals used onsite. In addition, a potential manner of compliance with the WWTP and urban runoff total mercury minimization requirements is source control, i.e., the prevention of mercury from entering the wastewater or stormwater collection systems. This could include the collection and handling of mercury-containing items such as thermometers, medical equipment, automotive switches, and other devices containing mercury, as well as the collection of mercury amalgam from dental offices. Thus some dischargers may be collecting and transporting a hazardous waste.

Implementation of these and other mercury control actions and management practices will create no create significant hazards to the public or environment because there are several mitigation measures available to minimize or prevent impacts:

- Provide hazardous materials and worksite safety training for construction workers and those who maintain the projects in accordance with local, state and federal requirements including, but not limited to the Occupational Safety and Health Act, Title 9 of the Code of Federal Regulations, and Title 8 of the California Code of Regulations.
- Provide hazardous materials accidental spill response plans and training that would outline methods, materials, and responsibilities for the response to, and clean-up of, and an accidental hazardous material spill during construction or long-term maintenance of the project. At a minimum, the plans should include provisions for immediate response, containment, and cleanup of a spill, including excavation and disposal of contaminated soil and notification responsibilities. Materials needed for potential clean-up activities should be kept onsite.
- Provide a health and safety plan for construction workers and those who maintain the projects that: is prepared by a certified industrial hygienist; complies with all appropriate local, state and federal regulations; and identifies specific safety measures to be followed during all phases of construction and long-term operation.
- Obtain hazardous waste storage and transport permits and associated required training for the collection and transport of recovered mercury.
- Conduct careful surveys of mine sites and prepare written reports and guidance in compliance with applicable state and federal requirements before commencing cleanup actions to identify and characterize: safety concerns; potential for erosion during and after cleanup actions; potentially recyclable materials (e.g., sediment/soil for fill, scrap steel, processing equipment, brick, wood, mercury and gold); and major waste streams for disposal in onsite or offsite landfills.

- Implement dust-suppression and other measures available to prevent risks associated with inhaling dust and exhaust during construction and maintenance activities (see “III. Air Quality”).
- Label all hazardous materials onsite to inform users of potential risks and train users in appropriate handling, storage and disposal procedures.
- Protect sites from unmonitored access with fencing and signs to prevent accidental health hazards to the nearby residents.
- To control vector (e.g., mosquito) production, design projects so that they do not increase the area and/or duration of standing water; selectively install systems that are prone to standing water away from high-density areas and away from residential housing; and/or incorporate measures to mitigate vector creation (e.g., install netting over devices and/or employ vector control agencies to mitigate vector production). Design projects to comply with local vector/mosquito control agencies’ requirements.

As with the resources discussed in the previous sections, project-level analysis will take place once entities responsible for complying with the proposed Basin Plan amendments select their methods of compliance and potential project sites. It is not reasonably foreseeable that responsible agencies would choose to comply with the proposed Basin Plan amendments through structural means in areas where doing so would place a project at a site included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. Rather, it is foreseeable that localities would avoid such compliance measures in lieu of other compliance measures.

Although increased pollution prevention efforts, such as mercury amalgam collection from dental offices and mercury thermometer collection programs, would increase the transport of mercury-containing items, if the mercury were properly handled and disposed, the pollution prevention efforts would be a benefit by preventing the mercury from improperly ending up in sewers and non-hazardous waste landfills. Because many common consumer products, such as fluorescent light bulbs, contain mercury, these wastes could be handled within 0.25 mile of a school or near an airport or airstrip. However, properly handled mercury waste near such sites would not create a significant public or environmental hazard beyond the hazards already inherent in the use of the mercury-containing consumer products.

Options for methylmercury and total mercury control include excavation of mercury-contaminated sediment from the Cache Creek Settling Basin, Yolo Bypass, and elsewhere in the Delta. Delta sediments evaluated by dredging projects contain levels of total mercury ranging from 0.01 to 0.33 mg/kg (dry weight) (see Table 6.17 in the TMDL Report). Mercury concentrations in Yolo Bypass surface sediments range from 0.09 to 0.58 mg/kg, and in the Cache Creek Settling Basin from 0.38 to 0.71 mg/kg (Heim *et al.*, 2003). It is unlikely that sediment from the Delta, Yolo Bypass or Cache Creek Settling Basin will exceed hazardous waste levels (20 mg/kg; Title 22 of the California Code of Regulations, Section 66261.24(a)(2)(A)). Disposal options for removed sediment could include landfill cover, use as a building material, or for the construction of the land-side of levees, as long as the material was kept from contact with surface waters and protected from erosion. Dredge material is typically disposed to either disposal ponds on Delta islands or upland areas. Existing regulatory programs already require dredging and other earth-moving projects be protected from erosion. Sediment at or immediately downstream of mine sites could conceivably exceed 20 mg/kg and would need to be disposed at appropriately classified landfills or protected onsite by storage at appropriate upland waste management units.

B. Airport Safety

California Public Utility Code (Sections 21670-21679.5) provides the statutory authority for establishment of airport land use commissions and requires that the commissions adopt a land use compatibility plan for each public airport. The airport land use plans identify safety zones around the airports that require additional land use regulation to ensure the continued viability of the airports and are subject to special use and development regulations including but not limited to building height, low density residential uses, and other limiting factors to discourage land uses that would be inconsistent with safe airport operations. State law (Government Code Section 65302.3) requires each local agency having jurisdiction over land uses within an airport's land use plan are to modify its general plan and any affected specific plans to be consistent with the airport land use plan. There are numerous public, private and military airports located in Delta/Yolo Bypass region, including but not limited to:

- Contra Costa County: Byron Airport, Buchanan Field Airport (Contra Costa County, 2005)
- Sacramento County: Sacramento International Airport, Sacramento Executive Airport, Franklin Field, Mather Airport, McClellan Air Force Base, Natomas Airpark, Rancho Murieta, Rio Linda Airport, and Sunset Skyranch (County of Sacramento, 1993)
- San Joaquin County: Stockton Metropolitan, Tracy Municipal, Kingdon, Lodi (Precissi), Lodi (Lind's), and New Jerusalem (San Joaquin County, 2009)
- Solano County: Travis Air Force Base, Rio Vista Municipal Airport, and Nut Tree Airport (County of Solano, 2008)
- Yolo County: Yolo County Airport, Borges-Clarksburg Airport, Watts-Woodland Airport, and University Airport (County of Yolo, 2009)

As a result, it is conceivable that site-specific projects implemented to comply with the proposed Basin Plan amendments (the proposed Project) could occur within an airport land use plan area or within two miles of a public use airport where a land use plan has not been adopted. Also, given site-specific projects may take place in both urban and rural areas in the Delta and its upstream watersheds, it is conceivable that a site-specific project may occur in the vicinity of a private airstrip such as a hospital heliport or small agricultural airstrip on a private farm. However, site-specific projects associated with implementation of the proposed Project are not expected to result in a safety hazard for people residing or working in the area of the site-specific projects because the projects will not involve the construction of family residences, shopping centers, restaurants, schools, hospitals, arenas or other places of public assembly, and are not expected to involve high densities of people during project construction. In addition, there are several measures that can be taken to avoid safety hazards, for example, but not limited to:

- When evaluating potential project sites, review city/county general plans, maps, and aerial photographs and conduct other research as needed to identify public airports, military air bases, and private airstrips (including hospital heliports and small agricultural airstrips on private farms). If possible, select project sites that are not within the area of influence of an airport land use plan or are not within 2 miles of private airstrips and public airports that do not have adopted land use plans.

- If a project site must be located within the jurisdiction of an airport land use plan, early in project development consult with local city/county planners to ensure that project design and construction activities comply with the city/county general plans' incorporation of the airport land use plan's restrictions and any height limitation ordinances.
- If a project site must be located near a private airstrip or airport that does not have an adopted land use plan, review the Caltrans 2002 *California Airport Land Use Planning Handbook* (Caltrans, 2002; e.g., Chapter 9) and consult with the airstrip/airport owner or manager, local city/county planners, State Department of Transportation, and technical consultants experienced with the airport/airstrip operations, and even the Federal Aviation Administration if needed, to ensure that project design and construction activities avoid safety hazards to the extent feasible and comply with any local height limitation ordinances.
- Avoid project design features and construction activities that could endanger or interfere with the landing, taking off, or maneuvering of an aircraft at an airport or airstrip, including but not limited to:
    - Attracting large concentrations of birds or other wildlife that create bird strike hazards and other forms of wildlife hazards
    - Creating glare, dust, steam, or smoke which may impair pilot visibility
    - Having lighting that is difficult to distinguish from airport lighting
    - Creating electrical interference with navigational signals or radio communication between the airport and aircraft
    - Using or storing highly toxic, flammable or otherwise hazardous materials that, in the event of an aircraft accident, could be released into the surrounding environment to threaten human life or property
    - Building or staging construction activities within a runway protection zone (e.g., within a distance of 5,000 feet from the runway primary surface), which may be owned by an airport/airstrip or be an easement with the neighboring property owner
    - Building any temporary or permanent structure or permitting any natural growth of a height that would constitute a hazard to air navigation

The proposed Basin Plan amendments do not include the above measures. As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects near airports or airstrips that do not have adopted land use plans will in fact incorporate those measures identified above or comparable measures, except for those site-specific projects for which the Board is the "Lead Agency". As a result, even though there are common measures available to prevent significant impacts in the vicinity of private airstrips and public airports that do not have adopted land use plans, "Potentially Significant Impact" is checked on the Environmental Checklist.

C. Emergency Response Plans and Evacuation Plans

Construction activities associated with specific projects implemented to comply with the proposed Basin Plan amendments could result in temporary interference with adopted emergency response or evacuation plans if project-related construction equipment, road closures, or traffic delayed or otherwise interfered with emergency or evacuation vehicles traveling near or through the project area. However, it is expected that potential impacts would be minimized to less than significant levels by implementing standard measures. Measures could include, but are not limited to, the following:

- Adhere to applicable building and safety codes and permits, which would ensure that construction activities would result in less-than-significant delays in response times for fire and police vehicles.
- Coordinate with local fire and police providers to establish alternative routes and traffic control during the construction activities that could cause traffic congestion or road closures. Most jurisdictions have in place established procedures to ensure safe passage of emergency and police vehicles during periods of road maintenance, construction, or other attention to physical infrastructure, and there is no evidence to suggest that construction activities that could occur as a result of the proposed Project would create any more significant impediments than other such typical activities.

D. Wildland Fire Risk

Public Resources Code §4201-4204 and Government Code §51175-89 direct the California Department of Forestry and Fire Protection (CDF) to map zones of significant fire hazards based on fuels, terrain, weather, and other relevant factors. These areas, referred to as Fire Hazard Severity Zones (FHSZ), can then define the application of various mitigation strategies to reduce risk associated with wildland fires. FHSZs are mapped in “Moderate”, “High” and “Very High” fire hazard severity categories for State Responsibility Areas (SRA) for each county.[55] In addition, Government Code §51175-89 direct CDF to map areas of “Very High” fire hazard severity within Local Responsibility Areas (LRAs); however, LRA areas of “High” and “Moderate” fire hazard severity have been mapped for some counties.

No areas within or adjacent to the Delta and Yolo Bypass have been categorized as Very High or High FHSZ, and only relatively small and isolated areas have been categorized as Moderate FHSZ. In addition, it is expected that construction of WWTP controls and urban runoff BMPs to comply with the proposed Basin Plan amendments would be located in urbanized areas, and therefore it is not reasonably foreseeable that their installation would expose people to wildland fires. Therefore, construction activities and long-term operations associated with site-specific projects in the Delta and Yolo Bypass are not expected to expose people or structures to significant risk of loss, injury, or death involving wildland fires.

It is conceivable that site-specific projects implemented to comply with the proposed Basin Plan amendment requirements for water and flood management activities could take place in the tributary watersheds where extensive areas in the Coast Range and Sierra Nevada foothills and higher elevations have been classified as High and Very High FHSZs. Even so, there are numerous common mitigation measures that can be employed to reduce the risk of loss, injury or death involving wildland fires to less than significant levels. These measures can be used for

[55] CDF’s statewide and county maps of Fire Hazard Severity Zones are available at: http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones_maps.php

projects in the tributary watersheds and in the Delta/Yolo Bypass. Such measures include, but are not limited to:

- Review CDF's FHSZ maps and contact local fire protection agencies during early phases of project planning and, if possible, select project sites that are not in a High or Very High fire severity hazard zone.
- Identify local laws, ordinances and building codes related to fire prevention, burning, welding and blasting, etc., obtain any necessary permits and adhere to permit conditions.
- Develop a site-specific Fire Plan for all construction projects and ongoing operations and maintenance activities in consultation with local fire protection agencies. Fire Plans should address the potential risks of fire threats due to construction equipment operations, long-term maintenance, and employees smoking; describe measures to avoid starting a wildland fire; document requirements for manpower, training and equipment that can be used for fighting fire; identify the people and agencies to be contacted and means of contact if there is a fire, including individuals who may act as Incident Commanders until fire agency personnel arrive; a map of the location and extent of the operating area with all roads, landings, equipment servicing areas, drainages, field offices and other structures indicated; and other pertinent data.
- Maintain an adequate number of fire extinguishers and other tools and equipment that can be used for fighting fire onsite and ensure that personnel are trained in their use.
- Maintain a water tender during extensive welding/cutting operations.
- Maintain a fire watch during hazardous operations and after the work has ceased for the day.
- Provide funding for an inspector from the local fire agency.
- Provide equipment that provides construction and operations personnel and fire agencies the ability to communicate with one another.
- Remove materials that easily ignite or contribute to an increased intensity and spread of fire from high risk areas. Such materials could include partially decomposed wood, dry grass and loose or crumpled paper, slash, snags, spilled petroleum products, and piles of any kind of flammable. High risk areas could include refueling areas; locations of stationary or portable engines; welding, cutting or grinding operations; and personnel assembly areas where smoking and/or lunch or warming fires are allowed.
- Maintain a defensible space around the perimeter of the project area.
- Use extra caution when refueling and using equipment that can produce sparks when working near dry grass or trees.
- Post the project sites with signs for designated smoking areas to prevent accidental fires due to smoking or prohibit smoking at the project site.
- Restrict work during critical or "Red Flag" weather conditions; for example, curtail high-risk activities such as smoking, welding and cutting, blasting, and operating chain saws.

Numerous additional mitigation measures and an annotated outline of a typical Fire Plan are provided in the *Industrial Operations Fire Prevention Field Guide* (USFS *et al*., 1999). Timber operators in California, on both federal and private land, and contractors to the California Department of Transportation and the U.S. Forest Service are required to develop and file Fire

Plans (USFS *et al.*, 1999). All other entities should file them for reasons of safety and liability. In addition, many of the above mitigation measures or comparable measures likely will be needed for some types of projects to comply with the California Fire Code and Wildland-Urban Interface Fire Area Building Standards (components of the California Building Standards Code) and local fire prevention ordinances and standards. However, because the above mitigation measures are not included in the proposed Basin Plan amendments, and local requirements can vary, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those measures identified above or comparable measures, except for those site-specific projects for which the Board is the "Lead Agency". As a result, even though there are numerous common measures available to mitigate the wildland fire risks, "Potentially Significant Impact" is checked on the Environmental Checklist.

IX. Hydrology and Water Quality

Implementation of the proposed Project is not expected to deplete groundwater, interfere with groundwater recharge, create or contribute runoff water that exceeds the capacity of stormwater drainage systems, provide substantial additional sources of polluted runoff, or place housing within a 100-year flood hazard area. The Project should result in less erosion and less mercury-polluted runoff if adequate controls and management practices are developed and implemented to control mercury discharges to comply with the proposed Basin Plan amendments.

A. Water Quality Standards and Waste Discharge Requirements

The Porter-Cologne Water Quality Control Act defines water quality objectives as "...the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area" [Water Code Section 13050(h)]. It also requires the Regional Water Board to establish water quality objectives. The federal Clean Water Act requires a state to submit for approval of the Administrator of the U.S. Environmental Protection Agency all new or revised water quality standards that are established for surface and ocean waters. Chapter III of the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins documents water quality objectives that apply to surface waters in the Delta and its tributary watersheds. The water quality objectives are in both numerical and narrative form. California **water quality standards** consist of both beneficial uses (identified in Chapter II of the Basin Plan) and the water quality objectives based on those uses. Beneficial uses and objectives are achieved primarily through the adoption of **waste discharge requirements** (including permits) and cleanup and abatement orders.

The purpose of the proposed Project is to establish water quality objectives in the form of fish tissue objectives that are protective of the Delta's beneficial uses, primarily wildlife habitat and human consumption of aquatic organisms (see Chapter 2 in this report). High methylmercury levels in fish pose risks for people and wildlife that eat Delta fish. However, as discussed in earlier sections, there is the potential for the proposed Project to result in increases in soil salinity in irrigated agricultural areas and wetlands, which could also lead to potential increases in salt loads discharged to Delta waterways, which then could contribute to exceedances of salinity objectives.

The objectives for salinity (electrical conductivity, total dissolved solids, and chloride) that apply to the Delta are listed in Table III-5 in Chapter III of the Basin Plan. The objectives in Table III-5 were adopted by the State Water Board in May 1991 in the Water Quality Control Plan for Salinity. The 303(d) List identifies the northwestern, western and southern portions of the Delta as impaired by exceedances of objectives for salinity (electrical conductivity) with agriculture listed as the potential source.

As described earlier in Section II (Agricultural Resources), implementation of water conservation methods such as tailwater recovery systems and drip irrigation systems in order to comply with the proposed Basin Plan amendment requirements to reduce methylmercury discharges could confound efforts to manage groundwater and soil salinity in the southern Delta where there is shallow, highly saline groundwater. Similarly, as described Section IV Biological Resources (B. Habitat Modification), water re-use and other conservation measures have the potential to increase salinity levels in wetland soils, which could cause changes in desirable vegetation assemblages (e.g., food sources for over-wintering migratory wildfowl) as well as affect compliance with salinity objectives.

As described in Section II, there are likely adequate mitigation measures to avoid significant impacts to agriculture and agricultural discharges of salt in the southern Delta from the implementation of methylmercury management methods. In addition, it may be possible to manage discharges from wetlands to avoid or lessen contributions to salinity problems in Delta waterways (e.g., Quinn, 2009; Quinn *et al*., 2004).

Phase 1 control studies are needed to identify and evaluate additional management practices for agriculture and wetlands, with the goal of determining effective methylmercury management practices with no or minimal negative effects on other beneficial uses of Delta waters or current land uses. Phase 1 methylmercury studies can and should be coordinated with researchers' and wetland managers' efforts to conceptualize and quantify the environmental impact and cost of various hydrologic management scenarios on flow and salt load discharges and other efforts to address dissolved oxygen and other existing and potential water quality concerns in the greater Delta region, along with potential mitigation measures for potential impacts. In addition, as discussed in more detail in Section II, it is expected that if the currently proposed, equitable allocation scheme is not possible because no feasible methylmercury management practices for agricultural methylmercury discharges in the San Joaquin River subarea are developed by the Phase 1 studies and a viable offset program is not possible, than the Board should be able to modify allocations during the Phase 1 Program Review in a way that still achieves the fish tissue objectives in the San Joaquin River subarea.

Because requirements for Phase 1 control studies and a Phase 1 Program Review are included in the proposed Basin Plan amendments, "Less than Significant Impact" is checked for the following categories on the Environmental Checklist:

- "a) Violate any water quality standards or waste discharge requirements?"; and
- "f) Otherwise substantially degrade water quality?"

B. Ground Water Supplies and Recharge

The proposed Project is not expected to deplete groundwater supplies or interfere with groundwater recharge because none of the reasonably foreseeable methods of compliance described in Chapter 4 are expected to entail drilling new groundwater wells or increased use of existing groundwater supplies, nor are they expected to substantially increase the cumulative amount of impermeable surfaces.

C. Drainage Patterns, Runoff Contributions, 100-Year Flood Hazard Areas and Other Flood-Related Risks

The proposed Project does not entail construction of any housing. As a result, "No Impact" is checked on the Environmental Checklist for "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?".

Construction and maintenance activities associated with the implementation of methylmercury and total mercury controls to comply with the proposed Project (the draft Basin Plan amendments) have the potential to increase erosion. However, all projects would be subject to existing requirements to comply with existing Basin Plan water quality objectives for turbidity and erosion control (e.g., through existing general and individual stormwater permits, waste discharge requirements, and CWA 401 certification requirements; please refer to Section VI. Geology and Soils). As a result, no significant increases in erosion are expected.

As noted earlier, precise locations for projects implemented to comply with the proposed Basin Plan amendments are not known and the Central Valley Water Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. However, staff identified several examples of particular reasonably foreseeable methods of compliance in Chapter 4 that have the potential to take place within a 100-year flood hazard area or alter the existing drainage patterns of a particular site or area, which could conceivably affect levees. The following paragraphs provide a program-level review of these examples and possible mitigation measures. Because the possible mitigation measures include some measures that are not common, required by existing laws and ordinances, or included in the proposed Basin Plan amendments, "Potentially Significant Impact" is checked on the Environmental Checklist for:

- "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 that results in flooding on- or off-site?"
- "h) Place within a 100-year flood hazard area structures that 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?"

This review should not be considered a replacement for site-specific environmental analyses required for future site-specific projects implemented to comply with the proposed Basin Plan amendments.

Cache Creek Settling Basin. The primary purpose for construction of the Cache Creek Settling Basin was to reduce sediment loads to the Yolo Bypass in order to maintain the Bypass's ability to protect the Sacramento region from flooding. As the basin fills in with sediment, its ability to retain sediment is diminished and there is a corresponding loss in flood carrying capacity in the Yolo Bypass. Increasing the basin's trapping efficiency will have positive effects for downstream flood control in the Yolo Bypass as well as for reducing the amount of mercury-contaminated sediment in the Yolo Bypass, which in turn is expected to reduce methylmercury levels in Yolo Bypass fish and water and help comply with the total mercury allocation assigned to the Delta by the San Francisco Bay TMDL control program. However, it is possible that improvements to the Cache Creek Settling Basin (such as raising the outlet weir) may increase the risk of flooding upstream of the basin (CDM, 2004b & 2007). The land directly west of the Cache Creek Settling Basin is already at risk from a 100-year flood event as it falls within the 100-year floodplain as mapped on both the 1981 and 2001 draft Flood Insurance Rate Map issued by the Federal Emergency Management Agency for the Woodland/Cache Creek area. The City of Woodland has zoning ordinances and building requirements to restrict building within the flood area. Even without the proposed Project, these portions of the City of Woodland are at risk of flooding due to the 100-year event.

As part of the current USACE Operations and Maintenance Manual sediment management plan, the basin outlet weir would be raised in about 2018. According to a USACE 1987 report, *"… improvements to the CCSB done for the current project would not increase maximum water surface elevations upstream from the CCSB, even for end-of-project-life conditions. However the 1997 maintenance analysis by the Corps showed that dredging deposited sediment in the training channel would be necessary during the life of the project to maintain the design flood control capacity upstream of the CCSB. According to a 2003 qualitative geomorphic study conducted by the Corps (Corps of Engineers 2003), future training channel bed aggradation due to sedimentation could significantly reduce flow capacity upstream of the CCSB unless aggressive sediment and vegetation maintenance is conducted."* (CDM, 2004a, page 37). The proposed Project would require improvements to the basin's mercury/sediment trapping efficiency by 2018. There is the potential that an agency could choose to raise the weir earlier than planned by the USACE. Such a project would not increase the flooding potential for the upstream Cache Creek area over baseline conditions, but could potentially increase the number of years of exposure to increased flood risk by about three years. This risk could be mitigated by increased excavation in the basin to maintain its flood carrying capacity during the initial years of the project if the weir were raised earlier than previously planned.

Another adverse impact that possibly could result from improvements to the Cache Creek Settling Basin would be an increase in methylmercury production within the basin. The February 2008 TMDL Report noted that the basin may act as a source of methylmercury; however, more recent data indicates that, although the basin may act as a seasonal source during low flows, it acts as a sink during high flows, and does not act as a long-term net source of methylmercury (Bosworth, 2009 pers. comm.). Raising the basin weir and enlarging the basin would increase the area of inundation in the basin and therefore could potentially increase methylation of the mercury-laden sediment. As noted in the previous paragraph, raising the weir is considered a baseline condition. The proposed Project would not cause a new impact with respect to potentially increased methylation, but could result in a small increase in the number of years that the potential increase in methylation could occur if the responsible parties chose to comply with the proposed Basin Plan amendments by raising the weir earlier than previously planned by the USACE. Methods to mitigate an increase in methylation that could potentially result from the weir raising or basin enlargement to less than significant levels include, but are not limited to, the following:

- Modify the low flow outlet structure and downstream channel to increase the volume of water passing through the low flow structure after high flows have receded. This would allow the basin to drain more quickly after the basin has flooded and minimize the extent and duration of basin inundation and methylmercury production.
- Reduce the total mercury concentration of suspended sediment entering the basin from the Cache Creek watershed. Production of methylmercury in the Cache Creek watershed is positively correlated with the level of mercury in surficial sediment (Cooke and Morris, 2005). As a result, reducing total mercury loads transported to Cache Creek would reduce concentrations of mercury in sediment and is expected to reduce subsequent methylmercury production in both Cache Creek and the Cache Creek Settling Basin. As described in Section 4.3.10.6 of this report, the Cache Creek watershed mercury control program adopted in 2005 entails mercury mine cleanup activities and other erosion control/remediation activities in mercury-enriched areas that would ultimately reduce the mercury concentration of sediment entering the Cache Creek Settling Basin. It is possible to conduct additional sediment mercury remediation efforts in the lower Cache Creek watershed to further stabilize or remove mercury-enriched channel sediment to further decrease sediment mercury concentrations, and associated methylmercury production, in the basin.

The proposed Project includes additional feasibility studies to evaluate potential methods of improving the Cache Creek Settling Basin's mercury-trapping efficiency and long term environmental benefits and cost of maintaining the basin. The responsible agencies will be preparing detailed plans for improving the basin and these plans should address the potential negative impacts and mitigation measures for those impacts so that impacts associated with improvements to the basin are reduced to less than significant levels.

Yolo Bypass. As described in Section 4.3.12, possible methylmercury management practices for the Yolo Bypass flood conveyance and/or new flood control projects in the Yolo Bypass could include, but are not limited to: (a) modifying the flow regimes within the Yolo Bypass; (b) modifying the channel geometry to route more water down the eastern side where the sediment has less mercury contamination; (c) actively remediating or removing mercury contaminated sediment within the Yolo Bypass downstream of the Cache and Putah Creek watersheds; and (d) reducing total mercury loading from tributary sources. Options (a), (b) and (c) could affect floodwater conveyance. To mitigate negative effects, project proponents should carefully evaluate the potential of each of the before-mentioned options, and any new options developed in Phase 1, to negatively affect flood conveyance and associated levees; comply with all local, state and federal laws and ordinances for levee protection[56]; and implement the

[56] For example, obtain and comply with Central Valley Flood Protection Board (formerly the Reclamation Board) encroachment permits for any activities on federal flood control levees, within Reclamation Board easements, or

management practices that have neutral or positive effects on flood conveyance and/or focus on reducing mercury loading from upstream sources.

Localized Hydrologic Modifications. Localized hydrological impacts may occur if managers of existing or new wetlands, water and salinity management projects, and MS4 conveyance systems choose to comply with methylmercury allocations by using structure-based management practices or modifying channel and vegetation characteristics to reduce or avoid methylmercury discharges. Localized hydrological impacts also could occur as a result of total mercury control actions such as the construction of additional sediment settling basins. However, such hydrologic impacts could be mitigated through careful design and construction, for example, by selecting compliance options that would not result in increased flood risk or by incorporating overflow/bypass structures, performing regular maintenance of the structures, or enlarging the storm drain upstream of the structure. In addition, projects that take place on land with Central Valley Flood Protection easements would be required to comply with easement conditions that preclude landowners from building structures or berms or growing vegetation that would significantly obstruct flood flows.

D. Tsunami, Seiche and Mudflow Risks

A tsunami is a series of waves most commonly caused by the deformation of the sea floor during a submarine earthquake. They are also generated by landslides, volcanic eruptions or more rarely by asteroid impact (SSC, 2005). There are three primary sources of damage from tsunamis: inundation (the extent the water goes over the land), wave impact (both incoming and receding currents) and erosion.

Seiches are standing waves, caused by resonances of a disturbed body of water that can occur in an enclosed or partially enclosed body of water, such as a lake, reservoir, bay or sea. Unlike tsunamis, seiches may not be noticeable due to their long waves. They can last from a few minutes to a few hours. Seiche sources vary from wind, atmospheric pressure variations, seismic activity, or tsunamis and are only returned to state of equilibrium by the force of gravity. Seiches can occur as single events, or as part of an accumulative seismic event, such as would occur with a tsunami. Seiches can result as a secondary effect of tsunamis, resulting in a rapid, but temporary downward shit in sea level, causing soil instability along shorelines. Soil instability can occur when submerged slopes emerge at a relatively rapid rate from the water, with no time to equilibrate to the temporary lower sea level or for pore water to drain.

Mudflows and landslides may occur as secondary effects of accelerated water movements and elevated water levels associated with tsunamis and seiches.

The California Geological Survey (CGS) worked closely with the California Emergency Management Agency (CEMA) and the Tsunami Research Center at the University of Southern California to produce Tsunami Inundation Maps for all populated areas at risk to tsunamis in California (CEMA *et al*., 2009). The maps do not represent inundation from a single scenario

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within floodways of regulated Central Valley streams listed in Table 8.1 in Title 23 of the California Code of Regulations, and for any activities that may impact flood control functioning of levees.

event but instead a combination of the maximum considered tsunamis for each area. They were created by combining inundation results for an ensemble of source events representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Local tsunami sources that were considered include offshore reverse-thrust faults, restraining bends on strike-slip fault zones and large submarine landslides capable of significant seafloor displacement and tsunami generation. Distant tsunami sources that were considered include great subduction zone events that are known to have occurred historically (1960 Chile and 1964 Alaska earthquakes) and others which can occur around the Pacific Ocean "Ring of Fire."

Tsunami Inundation Maps prepared for Contra Costa and Solano Counties indicate that tsunami effects may extend eastward from the San Francisco Bay to as far as the Carquinez Strait (CEMA *et al*., 2009, "Benecia Quadrangle"). No tsunami inundation was mapped for San Pablo Bay, Honker Bay, or the Delta, which are east of the Carquinez Strait.

The Tsunami Inundation Map developers noted the following on the Benecia Quadrangle: "although an attempt has been made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event." It is conceivable that the western and central Delta could experience the effects of a major tsunami event. However, the proposed Basin Plan amendments do not require reductions for existing methylmercury and total mercury sources in the Central and West Delta TMDL subareas; only new sources in the Central and West Delta subareas are expected to implement control projects. As a result, significant impacts resulting from a tsunami event are not anticipated.

The California Department of Water Resources' *Seismicity Hazards in the San Joaquin Delta* (DWR, 1980) determined that a seiche could potentially occur in Clifton Court Forebay or in Franks Tract, both of which are permanently flooded islands, as well as on an island during temporary flooding. Per the 1980 DWR report, in 1980 the following Delta lands were flooded: Holland, Webb, Upper Jones, Lower Jones, and Deadhorse Tracts and Prospect Island. Per DWR's 1995 Delta Atlas, the following islands and tracts were flooded between 1980 and 1992: 1982 – McDonald, Prospect and Venice Islands; 1983 – Bradford, Prospect and Mildred Islands; and 1986 – Tyler and Prospect Islands and Glanville, McCormack-Williamson and New Hope Tracts. In addition, Liberty Island has been flooded since 1998 when levees were breached during high flows through the Yolo Bypass. The 1980 DWR report determined that waves due to seiches could result in the erosion or topping of levees. The 1997 *Probabilistic Risk Assessment for the Sacramento-San Joaquin Delta Levee System* prepared for CalFed also seiches as a potential hazard in the Delta (CalFed Bay-Delta Program, 1997).

Several mitigation measures are available that may be able to reduce risk from tsunami and seiche events:

- Include the evaluation of site-specific tsunami and seiche risks in the hazard assessments for the site-specific projects, making use of the results of the CGS/CEME Tsunami Inundation Maps, any new probabilistic tsunami and seiche hazard analyses as they become available from the CGS, CEMA, National Tsunami Hazard Mitigation Program, and other tsunami research centers, and vulnerability and loss models to determine whether a project would be exposed to tsunami inundation and runup or seiche waves, and project structure vulnerability and probable maximum losses based on structural design, material, condition of structure, and distance from shoreline. The vulnerability of any nearby levees should also be evaluated.

- Actively educate project personnel about tsunami and seiche hazards, characteristics and evacuation routes as part of site safety training.
- Develop multiple ways to receive tsunami and seiche warnings and alert site personnel.
- Develop a formal tsunami hazard plan as part of the project's site safety plan and conduct emergency exercises.
- Comply with local building codes that address tsunami and seiche risk and consult with an engineer to ensure that critical structures are designed to resist both strong ground motion and tsunami and seiche wave impact, as modeled for a given project site.
- Elevate and brace any project buildings.
- Position project roads and structures to be perpendicular to potential waves so there is less resistance and erosive force.
- Ensure that project activities do not weaken nearby levees.

Because the above mitigation measures are not included in the proposed Basin Plan amendments, and local requirements may not adequately address the hazards associated with inundation and erosion associated with seiches, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those measures identified above or comparable measures, except for those site-specific projects for which the Board is the "Lead Agency". As a result, even though there are numerous common measures available to mitigate the risks, "Potentially Significant Impact" is checked on the Environmental Checklist.

X. Land Use and Planning

The proposed Project is not expected to physically divide an established community because activities that typically divide communities – e.g., re-routing an existing road or constructing a new highway – are not reasonably foreseeable methods of compliance with the proposed Basin Plan amendments. In addition, the proposed Project is not expected to conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect beyond the potential impacts described in other sections of this analysis (e.g., IV. Biological Resources and XI. Mineral Resources), and potential mitigations were identified.

One foreseeable method of compliance with the methylmercury allocations would be for WWTPs to reduce their wastewater discharge to surface waters by expanded reclamation to land, which has the potential to result in a land use change. The existing Basin Plan has a wastewater reuse policy that requires dischargers to evaluate land disposal as a disposal option for wastewater. Therefore, the evaluation of expanded reclamation to land is a baseline requirement. In addition, NPDES facilities have a variety of control options that may not require a change in land use, such as pollution prevention, implementing additional secondary or advanced treatment processes to further reduce particle-bound methyl and total mercury, incorporating ultraviolet radiation disinfection in coordination with advanced filtration, and, if an offset program is approved for Phase 2, conducting offset projects off site. As result, it is expected that new impacts related to changes in land use plans to provide for expanded reclamation to land will be unlikely or minimal and therefore less than significant.

The proposed Project is founded on methylmercury source load estimates based on current land uses and requires that many methylmercury and total mercury sources be reduced. As a result, land use planners and other project proponents will need to evaluate future changes to their existing land use plans and any new plans or projects that propose to change land uses for consistency with these requirements. Land use planners and project proponents should ensure that zoning and land use changes do not have the potential to increase methylmercury or total mercury loading to the Delta and Yolo Bypass and, if increases are unavoidable, that any increase is minimized using feasible management practices identified by the proposed Phase 1 methylmercury control studies. If a viable Phase 2 offset program is approved by the Central Valley and State Water Boards, OAL and USEPA, increased mercury loading that cannot be prevented by onsite management practices could be mitigated through offset projects elsewhere.

The proposed Project's requirement to minimize, and if possible, avoid any increase in methylmercury or total mercury loading is not a new requirement in the Delta. As described in Section 6.4.2, the Delta Protection Commission's "Land Use and Resource Management Plan for the Primary Zone of the Delta" (Delta Land Use Plan), developed in accordance with Section 29735 of the Delta Protection Act, requires that adequate Delta water quality standards are set and met, that beneficial uses of State waters are protected consistent with the CalFed Record of Decision dated August 8, 2000, and that projects in the Delta not result in degradation of water quality or result in increased nonpoint source pollution. These requirements are baseline conditions for the proposed Project. The proposed Basin Plan amendments support and are consistent with the requirements of the Delta Protection Commission's Delta Land Use Plan.

The proposed Basin Plan amendments require project proponents of future dredging activities and activities that reuse dredge material in the Delta/Yolo Bypass to minimize increases in any new methyl and total mercury loads to Delta/Yolo Bypass waterways. This requirement may not coincide with the intent of the Delta Land Use Plan's "Utilities and Infrastructure Recommendation 3 (R-3)", which states: "Material excavated from the shipping channels should, *if feasible*, be used for maintenance of Delta Levees or for wildlife habitat enhancement within the Delta and for other uses within the Delta." Using mercury-contaminated dredge spoils for levee maintenance and wetland habitat restoration may lead to increased total mercury discharge or increased methylmercury production and discharge, thus degrading water quality. However, as described in Sections 4.3.10 through 4.3.12 in Chapter 6, and in earlier sections of this Environmental Checklist discussion, there are reasonably foreseeable methods of compliance with the proposed Project's requirement to minimize increases in methyl and total mercury loading, and foreseeable mitigation methods to prevent impacts to the environment that could be associated with these methods of compliance. None-the-less, Section 29715 of the Delta Protection Act states "…*any conflict or inconsistency between this division and any provision of the Water Code, the provisions of the Water Code shall prevail*." Dredging and dredge material disposal activities are required to comply with existing Basin Plan requirements for erosion and turbidity control, and the Basin Plan narrative water quality objective for chemical constituents states, *“Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.”* Hence, the proposed Project’s requirements for new land use plans and projects to minimize increases in pollutant (methyl and total mercury) loading, and resulting compliance actions, can be considered baseline requirements under the California Water Code and Delta Protection Act.

Further, actions taken to implement the proposed Basin Plan amendments would improve the water quality in the Delta and consequently improve the quality of the local fish for consumption by humans and wildlife, resulting in a decrease in the number of fish advisory postings along Delta recreational areas. Decreasing the number of fish advisory postings would increase the recreational opportunities for sport fishing and enhance the local economic productivity associated with increased recreational activities. Therefore, implementation of the proposed Basin Plan amendments supports the land use and development goals of the Delta Protection Act.

As discussed in Section E of “IV. Biological Resources”, the proposed Project does not conflict with any adopted Habitat Conservation Plans, Natural Community Conservation Plans, or other policies adopted for the purpose of avoiding or mitigating an environmental effect. Implementation of the proposed Basin Plan amendments could result in delays for planned wetland restoration projects due to the need for reallocating existing resources towards performing the studies. However, CDFG and USGS have several studies underway to determine the impact of wetland restoration projects on mercury methylation. In addition, the cumulative impact of redirected resources for studies can be minimized if wetland managers throughout the Delta region choose to work collaboratively on the studies.

XI. Mineral and Energy Resources

Energy and metallic and non-metallic mineral resources in the Delta and Yolo Bypass include natural gas, oil, sand, gravel, clay, stone, peat soil, lignite, coal, titanium, calcium, phosphate, placer gold, silver, mercury, manganese and magnesium (CDMG, 1998; OMR, 2000 & 2001; USGS, 2005; see also the citations in Table 7.2). The primary resources that are currently extracted are natural gas and aggregate (sand and gravel). Gold is found only as a secondary product of sand and gravel processing (San Joaquin County, 2009).

There are numerous natural gas fields located throughout the Delta and Yolo Bypass area (CDOC, 2001a). In 2008 the Rio Vista Field was California's largest producing area; four of the top ten largest producing areas in California are located in the Delta/Yolo Bypass (Rio Vista, French Camp, Millar and Lindsay Slough gas fields) (CDOC, 2009). In addition to the extraction of natural gas, there are three gas storage projects in the Delta: McDonald Island, Kirby Hills, and Lodi gas storage projects (CDOC, 2009).

There is one oil field in the Delta/Yolo Bypass region, the Brentwood oil and gas field in Contra Costa County, which is located at the border of the Marsh Creek and West Delta TMDL subareas (CDOC, 2001a). Oil was discovered at the Brentwood field in December 1962 and by December 1965 there were 50 producing wells that had produced approximately 2.3 million barrels (Mbbl) (Ditzler and Vaughan, 1968). Production steadily declined between the 1970s and 1990s until there was only one producing well in 2000 (Cummings, 1999; CDOC, 2000 & 2001b). By the time the Brentwood field was abandoned in 2005, it had a cumulative production of 9.3 Mbbl of oil and 52.1 billion cubic feet of gas (CDOC, 2006 & 2007). The 2008 Annual Report of the State Oil and Gas Supervisor continued to identify the Brentwood oil and gas field as abandoned (CDOC, 2009).

The California Surface Mining and Reclamation Act of 1975 (Public Resources Code Sections 2710 et seq.) establishes state policies for the protection and continued availability of mineral resources. Under this Act, the State Geologist is required to identify areas with non-fuel mineral resources of statewide and regional significance and to classify land into mineral resource zones (MRZ) according to the known or inferred mineral potential of the land. The purpose of the mineral land classification is to help identify and protect mineral resources in areas within the State subject to urban expansion or other irreversible land uses that would preclude mineral extraction. The MRZ categories (CDOC-SMGB, 2000) are:

- MRZ-1: Areas where adequate geologic information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence.
- MRZ-2a: Areas underlain by mineral deposits where geologic data show that significant measured or indicated resources are present. Areas classified MRZ-2a contain discovered mineral deposits as determined by such evidence as drilling records, sample analysis, surface exposure, and mine information. Land included in the MRZ-2a category is of prime importance because it contains known economic mineral deposits.
- MRZ-2b: Areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present. Areas classified MRZ-2b contain discovered mineral deposits that are either inferred reserves or are deposits that presently are subeconomic as determined by limited sample analysis, exposure, and past mining history. Further exploration and/or changes in technology or economics could result in upgrading areas classified MRZ-2b to MRZ-2a.
- MRZ-3: Areas containing mineral deposits that may qualify as mineral resources. Further exploration work within these areas could result in the reclassification of specific localities into the MRZ-2a or MRZ-2b categories. MRZ-3a areas are considered to have a moderate potential for the discovery of economic mineral deposits.
- MRZ-4: Areas where geologic information does not rule out either the presence or absence of mineral resources.

Cities and counties are required to incorporate mineral resource management policies that are consistent with the Act and MRZ classifications into their general plans. Public Resources Code Section 2762 directs that if a use is proposed that might threaten the potential recovery of minerals from an area that has been classified MRZ-2, the county (or city) must specify its reasons for permitting the use, provide public notice of those reasons, and forward a copy of its statement of reasons to the State Geologist and State Mining and Geology Board.

Table 7.2 at the end of this section identifies which county general plans identified MRZ-2 areas in the Delta/Yolo Bypass and which California Department of Conservation reports provide additional information. Three significant deposits of sand and gravel are located in the southwestern portion of San Joaquin County (San Joaquin County, 1992 and 2009), which is in the San Joaquin River TMDL subarea. These deposits are near the cities of Tracy, Lathrop and

Manteca. One of these deposits, located in the Corral Hollow Creek alluvial fan near Tracy, is the major construction aggregate production district in San Joaquin County; over 80% of the aggregate material consumed in the San Joaquin County region is produced from this deposit (San Joaquin County, 1992). In addition, a significant deposit of domegine sandstone is located in eastern Contra Costa County, which is the sole deposit of this material in the State of California and is an important resource nationally because it is a primary ingredient in the manufacture of heat-resistant glass used in the national space program (Contra Costa County, 2005). This significant mineral resource is within the Central Delta TMDL subarea.

It is conceivable that implementation of the proposed Basin Plan amendments could result in site-specific projects that could be constructed over, or adjacent to, energy or mineral resource lands, which could deny or limit access to energy or mineral resource deposits and natural gas pipelines. However, no impacts to mineral resources or their recovery are expected for several reasons.

First, the TMDL source analysis identified agriculture areas, wetlands, open water, floodplains, wastewater treatment plants and urban areas as sources of methylmercury that may require site-specific projects to reduce methylmercury and/or inorganic mercury inputs. Current resource extraction activities in the Delta and Yolo Bypass have not been identified as a source of methylmercury. As a result, the proposed Basin Plan amendments do not include any methylmercury control requirements for current resource extraction activities in the Delta and Yolo Bypass and, consequently, implementation of the proposed amendments is not expected to have any direct impacts on current resource extraction activities.

Second, the significant mineral resource area in eastern Contra Costa County (the Domegine sandstone deposit) is in the Central Delta TMDL subarea. The proposed Basin Plan amendments do not require reductions from existing methylmercury sources in the Central Delta. As a result, implementation of the proposed Basin Plan amendments should not limit access to, or otherwise impact, the Domegine sandstone deposit.

Finally, there are numerous measures that would enable site-specific projects to avoid any impacts to the three significant deposits of sand and gravel in the San Joaquin River TMDL subarea (a subarea where methylmercury source reductions are required) and natural gas fields and related pipelines throughout the Delta/Yolo Bypass, for example, but not limited to:

- Conduct a review of relevant General Plans, Habitat Conservation Plans, Land Use, Resource and Land Management Plans, and mineral resource maps produced by local, state and federal agencies with jurisdiction over potential project sites. The review should be focused on identifying energy and mineral resource zones and mineral recovery sites of local importance to ensure project site selection yields the least impact to energy and mineral resources, including transmission pipelines for natural gas and pipeline conveyance routes to existing off-site transmission pipelines (CEC, 2005; CEC, 2010; DOE, 2009).
- Coordinate with natural gas companies and Underground Service Alert before beginning any excavation or other construction activities to ensure that pipelines are not impacted.

- In accordance with applicable law, provide surface entry sites on original parcels encumbered by third party rights to access minerals, and locate surface entry sites in public areas that allow convenient vehicular access

There are no documented geothermal wells, geothermal fields, geothermal power plants, commercial geothermal projects, or other known geothermal resource areas in the Delta or Yolo Bypass (CDOC, 2001a; Hodson and Youngs, 2002). In addition, available information indicates that while there are wind farms near the Delta/Yolo Bypass, there are no wind farms or hydropower facilities within the Delta/Yolo Bypass (San Joaquin County, 2009; City of Sacramento, 2005; City of Stockton, 2007; Contra Costa County, 2005; County of Yolo, 2009; County of Solano, 2006 & 2008; SMUD, 2009). There are wind farms within San Joaquin County and Contra Costa County located in the Altamont Pass area southwest of the Delta (San Joaquin County, 2009; Contra Costa County, 2005). The Sacramento Municipal Utility District, which provides electricity for all of Sacramento County, operates the Solano Wind Facility in the Montezuma Hills in Solano County near Rio Vista, immediately north of the West Delta TMDL subarea, and the Upper American River Project, which consists of large and small hydro facilities (SMUD, 2009 & 2010). The Solano County general plan identifies the Collinsville-Montezuma Hills area as the primary wind resources area in the county (County of Solano, 2008). As of 2006, all of Solano County's existing and planned wind farms are located in this area (County of Solano, 2006). Because these wind farms are outside of the legal Delta and Yolo Bypass, no impacts to them are expected to occur as a result of the implementation of the proposed Basin Plan amendments requirements for methylmercury and total mercury sources within the Delta/Yolo Bypass.

The proposed Basin Plan amendments include study and control requirements for flood control and other water management activities within the Delta/Yolo Bypass and upstream tributary watersheds that affect total mercury and methylmercury inputs to the Delta. The proposed Basin Plan amendments also have specific requirements to reduce mercury discharges from the Cache Creek Settling Basin and include total mercury load limits for the Cache Creek, Feather River, American River and Putah Creek watersheds, the watersheds that contribute the most mercury-contaminated sediment to the Delta.

The Cache Creek Settling Basin may overlay portions of the Conaway Ranch natural gas field and the abandoned Crossroads natural gas fields (CDOC, 2001a). As a result, it is conceivable that activities designed to improve the mercury trapping efficiency of the basin (e.g., expand the size of the basin) could affect access to the gas fields. The mitigation measures identified on the previous page, or comparable measures, are expected to enable the avoidance of impacts to the natural gas fields and related pipelines in the Cache Creek Settling Basin area. Available information indicates that there are no designated significant mineral (MRZ-2 zones), geothermal, oil, or wind energy resources within or adjacent to the Cache Creek Settling Basin area (County of Yolo, 2009; CDOC, 2001a).

It is conceivable that site-specific projects implemented to comply with the total mercury limits for the American, Cache, Feather and Putah watersheds and the requirements for flood and water management activities could affect energy mineral resources in the tributary watersheds. However, although some potential site-specific projects in the tributary watersheds have been identified (Tetra Tech, 2008; see Section 4.3.11), detailed feasibility analyses that identify potential environmental impacts – including the mineral resources that may be directly or indirectly affected and possible mitigation measures – have not yet been conducted, Also, as noted in Table 2.1 in the TMDL Report, the tributary watersheds that drain to the Delta during most years – the Sacramento and San Joaquin Basins – comprise almost 30% of the State of California. The extensive geographic area and variability of land uses of the tributary watersheds makes an assessment of potential affects to mineral resources too speculative to evaluate at this time. Evaluations of potential impacts to environmental resources will be a component of the development of the TMDL control programs for upstream watersheds as well as site-specific projects in the tributary watersheds designed to comply with the proposed Delta mercury control program. It is expected that common mitigation measures, as described in previous paragraphs or comparable measures, should enable upstream projects to avoid significant impacts to mineral resources. In fact, it is likely that water management and mineral resource extraction efforts can be coordinated to achieve multiple benefits, as is expected for the Combie Reservoir Sediment and Mercury Removal Project described in Chapter 4 (Section 4.3.11).

Table 7.2: County General Plan Citations for Mineral Resource Zone 2 (MRZ-2) Designations within the Delta and Yolo Bypass and California Department of Conservation Citations for Additional Information

County	MRZ-2 within the Delta or Yolo Bypass?	County General Plan Citations	California Department of Conservation Citations [a]
Contra Costa	Yes	Contra Costa County, 2005	OFR 96-03, SR 146-1, SR 146 2, Map Sheet 52
Sacramento	No	County of Sacramento, 1993 & 2009; City of Sacramento, 2005	SR 156, OFR 99-09, Map Sheet 52
San Joaquin	Yes	San Joaquin County, 1992 & 2009; City of Stockton, 2007	OFR 77-16, OFR 91-03, SR 160, Map Sheet 52
Solano	No	County of Solano, 2006 & 2008	SR 146-1, SR 146-3, SR 156, Map Sheet 52
Yolo	No	County of Yolo, 2009	SR 156, Map Sheet 52

(a) OFR: Open File Report. SR: Special Report.
OFR 77-16: Rapp *et al*., 1977. OFR 91-03: Boylan and Loyd, 1991. OFR 96-03: Kohler-Antablin, 1996.
OFR 99-09: Dupras, 1999. OFR 146-1: Stinson *et al*., 1986. OFR 146-2 & 146-3: Stinson *et al*., 1987a & 1987b.
Map Sheet 52: Kohler, 2006. SR 156: Dupras, 1988. SR 160: Jensen and Silva, 1990.

XII. Noise

Compliance with the implementation plan outlined by the proposed Project will entail a variety of construction activities to implement total mercury and methylmercury controls and management practices. Use of heavy equipment, power tools, generators and other equipment during construction would increase noise in the construction areas. However, noise associated with construction activities would be temporary, isolated to the immediate construction site, and minimized by implementing standard noise reduction measures, many of which are already required by local City and/or County noise ordinances. These noise ordinances limit intrusive noise and establish sound measurements and criteria, and establish minimum ambient noise levels for different land use zoning classifications, sound emission levels for specific uses, hours of operation for certain activities (such as construction and trash collection), standards for determining noise deemed a disturbance of the peace, and legal remedies for violations. If project-specific construction activities comply with local ordinances, they are not expected to result in exposure of persons to noise levels in excess of established standards. Such ordinances typically include measures such as:

- Limit construction work to the hours between 7:00 a.m. to 6:00 p.m. on weekdays and permit no work on Saturdays, Sundays or holidays unless appropriate City and County building officials grant prior approval. When possible, use noise-generating equipment during periods when fewer people are present near the construction area.
- Muffle or otherwise control all construction equipment with a high noise-generating potential, including all equipment powered by internal combustion engines.
- Shroud or shield all impact tools.
- Locate all stationary noise-generating equipment, such as compressors, as far as possible from adjacent occupied offices, residents, or sensitive habitats.
- Turn off mobile equipment and machinery when not in use to reduce noise from idling equipment.
- Use temporary noise barriers or curtains along installation boundaries or partial enclosures around continuously operating equipment.
- Use the shortest possible routes from construction sites to local freeways for truck delivery routes, except when selecting routes to avoid going through residential neighborhoods.
- Identify sensitive receptors (e.g., schools, religious institutions, residences, libraries, parks, hospitals and other care facilities, and sensitive wildlife habitats) within a quarter-mile vicinity of the construction site; characterize existing ambient noise levels at these sensitive receptors; determine noise levels of any and all installation and maintenance equipment; and adjust values for distance between noise source and sensitive receptor(s).
- Establish an active community liaison program that notifies landowners within 300 feet of construction areas of the construction schedule prior to construction in writing, keeps them informed of schedule changes, and designate a “disturbance coordinator” for the construction site. The disturbance coordinator would be responsible for responding to any local complaints regarding construction noise, determining the cause of the complaints, and requiring the implementation of reasonable measures to correct the problem. The telephone number of the disturbance coordinator could be conspicuously posted on the construction site fence and on the notification letter sent to neighbors adjacent to the site.
- Develop an operations plan for specific construction activities that documents maximum noise limits and addresses the variety of available measures to limit the impacts from noise to adjacent homes, businesses, or sensitive habitats.
- Regularly inspect equipment and monitor noise and vibration to ensure that all equipment on the site is in good condition and effectively muffled, and that contractors take all reasonable steps to minimize impacts, particularly when near sensitive areas. Modify and/or reschedule construction activities if monitoring determines that maximum limits are exceeded.

Earth moving and other construction activities could result in temporary groundborne vibration or noise. However, implementation of several of the above measures (e.g., restricting the hours of operations and equipping earth-moving equipment with muffles) and other applicable measures required by local agencies would reduce groundborne vibration and noise to less than significant levels.

Long-term operations and maintenance of total mercury and methylmercury controls and management practices are not expected to result in significant noise impacts because, as noted at the beginning of this Environmental Checklist discussion, it is assumed that projects will be designed to comply with local City and/or County noise ordinances. Operations plans for specific operations and maintenance activities should be developed to address the variety of available measures to limit the impacts from noise to adjacent homes, businesses, or sensitive habitats. There is the potential for a mercury control project to take place in the vicinity of a public airport or private airstrip; however, for the reasons described previously, construction and long-term maintenance activities associated with such projects are not expected to expose people residing or working in the area to excessive noise levels.

XIII. Population and Housing

The proposed Project does not entail the construction of new homes or businesses, or the extension of roads or other infrastructure. As a result, the proposed Phase 1 control studies and Phase 1 and 2 construction and long-term operation and maintenance of total mercury and methylmercury controls and management practices implemented to comply with the proposed Basin Plan amendments are not expected to induce population growth in an area either directly or indirectly or displace substantial numbers of people or existing housing.

It is conceivable that facility upgrades and new BMPs to control total mercury and methylmercury implemented by WWTPs and urban stormwater management agencies to comply with the proposed Basin Plan amendments could entail the displacement of some housing. However, as described in Section 4.3.10, there are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury and total mercury loading from WWTPs and stormwater conveyance systems. Therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would require the substantial displacement of available housing when other compliance methods are available. Consequently, no significant impact is expected.

XIV. Public Services

The implementation of site-specific projects to comply with the proposed Basin Plan amendments (the proposed Project) will not result in development of land uses for residential, commercial, and/or industrial uses or increase growth. As a result, the proposed Project is not expected to affect service ratios or cause permanent changes to response times of public services such that new or altered government facilities will be needed for fire protection, police protection, schools, parks or other public services.

As noted in Section VII (Hazards and Hazardous Materials), construction activities associated with site-specific projects have the potential to temporarily delay or otherwise interfere with emergency response and evacuation vehicles, but the mitigation measures outlined in

Section VII reduce potential impacts to less than significant levels and do not entail the construction or modification of government facilities.

The proposed Project recognizes that, until the Delta beneficial uses are attained, activities need to be undertaken to help manage the health risk and reduce methylmercury exposure to people who eat Delta fish. Several state and local agencies serving the public may be involved with mercury risk reduction efforts. The proposed Project requires methylmercury dischargers to develop and implement a strategy to reduce mercury related risks and quantify risk reductions resulting from the risk reduction activities. The amendments encourage the dischargers to coordinate these efforts with public health agencies and local communities. The purpose of an exposure reduction program (including public outreach, education, and other activities with fish consumers) would be to reduce the risk of harmful effects of mercury exposure to people who eat Delta fish and to quantify the amount of risk reduction from those activities. The public would be informed about the health effects of mercury and about which local fish species to avoid or eat less frequently because of high mercury levels. Section 4.3.1 in Chapter 4 describes reasonably foreseeable methods to reduce risk to people who consume Delta fish. Adverse environmental impacts are not expected due to human health exposure reduction outreach programs.

XV. Recreation

The proposed Project does not include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

The proposed Phase 1 control studies would not increase the use of existing neighborhood and regional parks or other recreational facilities nor include recreational facilities. Because the implementation of Phase 1 and 2 methylmercury and total mercury controls and management practices will not result in development of land uses for residential uses or increase growth, it is reasonably foreseeable that neither their implementation, nor the conduct of Phase 1 studies, will require the construction or expansion of any recreational facilities.

The proposed Project's net impact on recreation is expected to be positive. Fishing is an important recreation activity in the Delta. OEHHA has issued fish consumption advisories for the Delta that warn consumers to limit the quantity of fish consumed. A potential benefit from the project could be increased recreational fishing and consumption of sport fish from the Delta if the fish had lower mercury concentrations. After the fish tissue methylmercury concentrations have decreased and the fish advisories are downgraded, there is the possibility that there will be an increase in the use of regional parks and other recreational facilities as people who previously were limited or discouraged by the fish advisories begin to catch more fish from the Delta. However, until the fish tissue objectives are attained, increased public awareness of the mercury problem may reduce fishing activities in the Delta.

XVI. Transportation/Traffic

Because the proposed Project would not increase population or provide permanent employment, none of the activities associated with the proposed Project are expected to (a) cause increases in traffic that are substantial in relation to existing traffic load and capacity of the street systems; (b) exceed – either individually or cumulatively – a level of service standard established by the county congestion/management agencies; (c) result in a change to air traffic patterns; (d) substantially increase hazards due to a design feature or incompatible use; (e) result in inadequate emergency access; (f) result in inadequate parking capacity, or (g) conflict with adopted policies or programs supporting alternative transportation.

As responsible agencies and dischargers conduct the Phase 1 control studies and implement expanded monitoring programs, there will be an increase in traffic at some sites as the researchers travel to collect samples and ship them to laboratories, but these increases would not be substantial compared to existing travel loads and capacity.

Implementation of Phase 1 and 2 total mercury and methylmercury control actions and management practices would result in additional vehicular movement during construction and, to the extent that site-specific projects entail excavation in roadways, such excavations could conceivably temporarily increase road hazards. However, activities undertaken pursuant to the proposed Project that may affect transportation and traffic would most likely require construction permits that would include a separate environmental review. In addition, project-specific increases in traffic load and/or hazards due to construction activities can be reduced to less than significant impacts by a variety of mitigation measures. For example:

- Use signage, striping, fencing, barricades and other physical structures to mark the excavated areas, promote safety, and minimize pedestrian/bicyclist accidents.
- Control traffic with signals or traffic control personnel in compliance with authorized local police or California Highway Patrol requirements.
- Develop and implement a project-specific construction management plan to minimize traffic impacts upon the local circulation system and ensure that construction activities adhere to local and state police and transportation requirements. A construction traffic management plan could address traffic control for any street closure, detour, or other disruption to traffic circulation; identify the routes that construction vehicles will use to access the site, hours of construction traffic, and traffic controls and detours; and include strategies for temporary traffic control, temporary signage and tripping, location points for ingestion and egress of construction vehicles, staging areas, and timing of construction activity that appropriately limits hours during which large construction equipment may be brought on or off site.
- Limit or restrict hours of construction so as to avoid peak traffic times.

It is not foreseeable that the proposed Project will result in significant increases in traffic loads or hazards to motor vehicles, bicyclists or pedestrians, especially when considered in light of those hazards currently endured in ordinary urbanized environments throughout the Delta and its tributary watersheds.

Improvements to the Cache Creek Settling Basin and subsequent maintenance will cause temporary increases in truck traffic on surface roads, more so if the sediment excavated from the basin is disposed of offsite. Insignificant impacts to traffic are expected if the sediment is moved to adjacent farmland. If the sediment is transported to the Yolo County Central Landfill or other projects in the region for use as fill material or other construction purposes, the resulting truck traffic is likely to result in no new impact because similar truck traffic would occur anyway if the landfill or other projects were hauling dirt from other locations in the region to use in their operations; the landfill and other projects are likely to select dirt sources that are nearby to be cost effective.

Construction activities associated with total mercury and methylmercury controls and management practices implemented to comply with Phases 1 and 2 of the proposed Project have the potential for temporary delays in response times of fire and police vehicles due to road closure/traffic congestion. However, as described in Section VII "Hazards and Hazardous Materials", it is expected that potential impacts would be minimized to less than insignificant levels by implementing standard measures.

XVII. Utilities and Service Systems

The proposed Project would establish new requirements for discharges from NPDES-permitted wastewater treatment facilities and urban stormwater conveyance systems (a.k.a. MS4s) by setting methylmercury allocations for NPDES facilities and MS4s in the Delta/Yolo Bypass and performance-based Phase 1 total mercury mass limits for NPDES facilities in the Delta/Yolo Bypass. During the first phase of the proposed Project, WWTPs and MS4s would be required to conduct methylmercury control studies; identify, develop and evaluate control actions to reduce methylmercury discharges; and implement total mercury minimization programs. WWTPs and MS4s would be required to implement methylmercury controls during Phase 2 of the proposed Project.

The Phase 1 studies would not have a physical impact on utilities and service systems but may have an economic impact, as described in Section 7.4. The proposed Project is not expected to result in additional discharges to any WWTP or stormwater conveyance system, and reasonably foreseeable actions taken to comply with total mercury discharge minimization requirements would not require the construction of new WWTPs (see Chapter 4, Section 4.3). In addition, because the proposed Project would not increase population or result in substantial long-term employment increases, the proposed Project does not need new or expanded water supply entitlements or increases in wastewater treatment capacity. Proponents for specific projects are already required by existing laws and local ordinances to coordinate with electric, gas, sewer and other utility companies that provide services in the proposed project areas, as well as Underground Service Alert, before beginning any excavation or other construction activities to ensure that utilities are not impacted.

Although it is conceivable that WWTP treatments for methylmercury and total mercury could affect other pollutants for which the Central Valley Water Board requires wastewater treatment or otherwise conflict with the State and Central Valley Water Boards' policies and resolutions for reclamation and regionalization, negative effects are not expected for the following reasons.

As described in Chapter 6 (e.g., Sections 6.2.3 and 6.3.7), Board staff worked with WWTP staff and other stakeholders to develop mass-based methylmercury allocations and Phase 1 (interim) total mercury mass limits that would not lead to a WWTP exceeding its allocation or interim limit if its effluent total mercury and/or methylmercury concentration increased (while its effluent total mercury and/or methylmercury loads decreased) as a result of the WWTP's efforts to implement a water recycling program, water conservation measures in a WWTP's service area, and/or additional reclamation beyond what was implemented at the time the source analysis was completed for the TMDL.

In addition, Board staff worked with WWTP staff and other stakeholders to develop a methylmercury allocation strategy for WWTPs that would be compatible with the Central Valley Water Board's goals for regionalization. The proposed Basin Plan amendments include language that allows WWTPs that regionalize or consolidate to sum their waste load allocations. If after consolidation a resulting WWTP discharge exceeds the sum of the allocations for the previous discharges, the WWTP has several options: (1) implement source control or treatment upgrades to reduce the methylmercury load; (2) access the "Unassigned WWTP allocation" for its specific subarea for that portion of its discharges that does not exceed the product of the net increase in flow volume and 0.06 ng/l methylmercury; and (3) conduct an offset project that complies with any offset program in place.

It is possible that implementation of treatment processes for other pollutants such as ammonia, suspended solids and inorganic mercury could enable reductions in methylmercury discharges from WWTPs and MS4s:

- As described in Chapter 4, because mercury is typically particle-bound, if MS4s implement BMPs to the maximum extent practicable to control erosion and sediment discharges, in compliance with their existing permits, they may also reduce total mercury and methylmercury discharges.
- During the April 2008 Board hearing meeting for the proposed project, the Sacramento Regional County Sanitation District (SRCSD) District Engineer testified that implementation of the Be Mercury Free Program to reduce inorganic mercury sources to SRCSD's WWTP resulted in reductions in both inorganic mercury and methylmercury discharges from the WWTP.
- In addition, as described in the TMDL Report, upgrades to the City of Stockton WWTP completed in September 2006 to meet new ammonia effluent limits and Title 22 (or equivalent) tertiary requirements appear to have led to substantial reductions in average effluent total mercury and methylmercury concentrations (83% and 91% reductions, respectively) as well as ammonia (~95% reductions).

However, methylmercury control studies for WWTP and MS4 discharges have not been conducted yet. As a result, the potential range of effects that methylmercury control measures may have on other pollutant levels in WWTP and MS4 discharges is not yet known. None-the-less, it is not reasonably foreseeable that the Central Valley Water Board would require a WWTP or MS4 permittee to comply with a methylmercury allocation if the only method(s) of compliance resulted in an exceedance of other Board-required treatment standards. Instead, it is reasonably foreseeable that the permittee could participate in an offset program in lieu of on-site methylmercury controls or, if a legally viable offset program is not developed and therefore the currently proposed, equitable allocation method is not possible, the Board could revise the methylmercury allocations so that sources with feasible methods of compliances would be allocated a greater reduction to compensate for sources that do not (e.g., WWTPs and MS4s that cannot reduce their methylmercury discharges without causing an exceedance of another pollutant standard or other Board treatment requirements).

The proposed Basin Plan amendment amendments include language that commits the Board to conducting a “Delta Mercury Control Program Review” after the Phase 1 studies are completed and TMDL control programs for the major tributary inputs are developed. The Program Review includes assessing:

- The effectiveness, costs, potential environmental effects, and technical and economic feasibility of potential methylmercury control methods;
- Whether implementation of some control methods would have negative impacts on other project or activity benefits;
- Methods that can be employed to minimize or avoid potentially significant negative impacts that may result from control methods; and
- Whether methylmercury allocations can be attained.

The Regional Water Board may consider modifications to the Delta mercury control program during the Phase 1 Program Review, including potential modifications of the allocations so that sources with feasible and reasonable methylmercury control methods may be required to make greater reductions.

Consequently, implementation of the proposed Project (the Basin Plan amendments) is not expected to cause any exceedances of wastewater treatment requirements.

As noted earlier in “IV. Biological Resources”, expansion or modification of existing WWTPs and MS4 facilities could be one method of compliance with the proposed methylmercury allocations. Any adverse environmental effects from implementation of total mercury and methylmercury control projects by WWTPs and MS4s are not expected to be significant because:

- WWTPs and MS4s are typically constructed in urbanized areas; therefore, their expansion is expected to have limited or no adverse environmental impact.
- There are multiple reasonably foreseeable methods of compliance with the requirements to reduce methylmercury loading from WWTPs and MS4s that may not require the expansion of their land use footprint; therefore, it is not reasonably foreseeable that the responsible agencies would implement compliance methods that would result in significant environmental impact.
- There are many measures available to avoid or minimize to less than significant levels any negative effects potentially associated with WWTP and MS4 improvement projects’ construction and operations (refer to earlier sections).
- The proposed Basin Plan amendment requirements for total mercury-specific pollution prevention programs for many of the WWTPs and MS4s are baseline requirements, the potential environmental impacts of which are not new to the proposed Project. In addition, implementation of these programs may enable some facilities to also comply with their methylmercury allocations.

However, some of the above mitigation methods and others identified in the earlier sections of this environmental analysis may be beyond those already incorporated in existing laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. In addition, the proposed Basin Plan amendments do not include specific measures for mitigation of potentially significant impacts. As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate these or comparable mitigation measures, except for those site-specific projects for which the Board is the "Lead Agency". Consequently, "Potentially Significant Impact" was selected instead of "Less Than Significant with Mitigation Incorporated" on the Environmental Checklist, even though mitigation measures are expected to reduce potential impacts to less than significant levels for: "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?" and "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?".

It is not expected that implementation of the Project will result in significant impacts on landfill capacity for several reasons. First, it is assumed that projects implemented to comply with the proposed Basin Plan amendments would be designed and constructed in compliance with all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices regarding source reduction, recycling, and land disposal of solid waste. For example, it is assumed that all sediment removed from the Cache Creek Settling Basin, stormwater basins, and mine cleanup sites would be evaluated for hazardous materials and disposed of appropriately (see "VII. Hazards and Hazardous Materials"), and that materials collected by pollution prevention efforts (thermometers, fluorescent light bulbs, etc.) would be sent to landfill facilities that manage hazardous wastes. Maintenance of stormwater control structures may result in the periodic removal of accumulated sediments from sediment traps; however, if this material is disposed of at a landfill, the additional volume is considered to be insignificant and, as noted earlier, is a component of baseline conditions under the Basin Plan and existing stormwater permits. One of the alternatives to increase the mercury retention of the Cache Creek Settling Basin is to remove accumulated sediment from with the basin and deposit it elsewhere. A viable disposal location is the Yolo County Central Landfill. This landfill is near the basin and has a continuous need for soils for cover material, landfill units, and other construction purposes. The landfill would benefit from a readily available, nearby source of soils such as the Cache Creek Settling Basin material.

XVIII. Mandatory Findings of Significance

The proposed Project is comprised of Basin Plan amendments that establish water quality objectives for fish tissue methylmercury and define an implementation program to achieve the objectives. The goal of the proposed Project and resulting implementation actions is to lower fish mercury levels in the Delta so that the beneficial uses of fishing and wildlife habitat are attained; in other words, make it safer for humans and wildlife to consume Delta fish. The proposed Project is expected to have an overall beneficial impact on the environment.

The proposed Basin Plan amendments provide regulations for methylmercury reduction in the environment. Adoption of the proposed Basin Plan amendments will not by itself have a physical effect on the environment. However, implementation actions taken by responsible agencies to comply with the proposed implementation plan may affect the environment. The proposed amendments do not prescribe compliance methods. Public Resources Code Section 21159 places the responsibility for project-level environmental analysis on the entities that will implement site-specific actions to comply with the proposed Basin Plan amendments. Responsible entities may select among the reasonably foreseeable methods of compliance identified in Chapter 4 and mitigation methods identified in this chapter, or they may propose other methods so long as the methods comply with Basin Plan requirements in a lawful manner.

Implementation activities taken to comply with the proposed Basin Plan amendments are expected to encompass a variety of site-specific studies and total mercury and methylmercury source control projects throughout the Delta and Yolo Bypass. The proposed Basin Plan amendments also have specific requirements to evaluate and reduce mercury discharges from the Cache Creek Settling Basin and include total mercury load limits for the Cache Creek, Feather River, American River and Putah Creek watersheds, the watersheds that contribute the most mercury-contaminated sediment to the Delta. In addition, the proposed Basin Plan amendments include study and control requirements for flood control and other water management activities within the Delta/Yolo Bypass and upstream tributary watersheds that affect total mercury and methylmercury inputs to the Delta. Although the proposed Project is expected to have an overall beneficial impact on the environment, a variety of implementation activities have the potential to cause direct and indirect negative effects. Most implementation activities would have no impact or insignificant impacts, while some have the potential for significant impacts if mitigation measures are not included in the site-specific projects' design, construction, and operation.

Staff's evaluation indicated that reasonably foreseeable, site-specific implementation activities are expected to have no impact or insignificant impacts on most of the environmental resources identified in the Environmental Checklist if mitigation measures identified in the preceding environmental analysis (many of which are common measures associated with construction practices), or comparable methods, are incorporated. However, the environmental analysis identifies potential impacts that may require the implementation of mitigation measures beyond those already incorporated in existing laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. In addition, the proposed Basin Plan amendments do not include specific measures for mitigation of significant impacts.

As a result, the Central Valley Water Board cannot be certain that entities responsible for implementing site-specific projects will in fact incorporate those mitigation measures identified in the preceding analysis or comparable mitigation measures, except for those site-specific projects for which the Board is the "Lead Agency". Consequently, "Potentially Significant Impact" was selected instead of "Less Than Significant with Mitigation Incorporated" on the Environmental Checklist for many of the resources even if mitigation measures described in the environmental analysis are expected to reduce potential impacts to less than significant levels.

Implementing agencies may be required to incorporate mitigation in addition to common measures to protect resources listed in the following categories: Biological Resources, Geology and Soils, Greenhouse Gases Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, and Utilities and Service Systems. Some form of mitigation is possible for all of the potentially significant environmental impacts that staff identified. However, selection and performance of mitigation is within the responsibility and jurisdiction of agencies implementing the site-specific projects. Mitigation can and should be adopted by the implementing agencies.

As specific implementation project proposals are developed, lead agencies must undertake environmental reviews and identify specific environmental impacts and appropriate mitigation measures. In cases where potential impacts could be significant, lead agencies should adopt readily available mitigation measures to ensure that potential impacts would be less than significant. Project proponents are required to develop and adhere to their respective environmental documents under CEQA, NEPA, and other state and local guidelines.

As described in previous sections, there are many common measures associated with construction practices and other mitigation available to ensure that potential impacts resulting from monitoring activities, short-term project construction activities, and long-term project operations – both local and cumulative – are reduced to less than significant levels. Therefore, the incremental effects of the proposed Basin Plan amendments and resulting implementation actions are expected to be negligible to human beings when viewed in the context of the overall environmental changes foreseeable in the Delta/Yolo Bypass and tributary watersheds as California's population grows and urban development occurs. The same is expected to be true for biological resources, with one potential exception. As described in "IV. Biological Resources", the implementation of management practices to reduce methylmercury discharges from existing wetland habitats in the Yolo Bypass has the potential for localized and cumulative impacts to habitats that support endemic species such as Sacramento splittail and Delta smelt.

It is anticipated that methylmercury management practices would be implemented only at those wetland sites that act as substantial sources of methylmercury to Delta/Yolo Bypass subareas that require source reductions to achieve the proposed subarea methylmercury allocations. It is speculative to guess where and which methylmercury reduction management practices would be incorporated at existing managed wetland sites and future restoration projects during Phase 2 within the Delta/Yolo Bypass subareas that require reduction. However, as discussed in Section 4.3.10.3, methods of compliance for existing managed wetlands could include, but not be limited to, the following:

- Modify managed wetlands' design, e.g., water depth, flooding frequency and/or duration (e.g., recent studies suggest episodically flooded wetlands produce more methylmercury than permanently flooded wetlands), vegetation types, and vegetation density (dense cover versus more open water).
- Modify managed wetlands' discharge patterns, e.g., hold irrigation water onsite longer at seasonal wetlands to allow methylmercury concentrations to decrease before discharging the water or otherwise transfer and re-use the water at another marsh to decrease the amount of discharge.

In addition, as noted in Section 4.3.12.4, new wetland restoration projects may have the opportunity to consider their location, for example, and not create new wetlands directly downstream sources of mercury-contaminated sediment. The Phase 1 control studies are expected to determine the efficacy of the above potential methods to reduce methylmercury loading and to develop and evaluate additional methylmercury management practices. Until the Phase 1 studies are completed, it is speculative to evaluate how individual wetland habitats could be impacted by the implementation of methylmercury management practices. Even so, in general, modifying wetland vegetation and/or hydrology to reduce methylmercury loading to surface waters has the potential to affect the function and attractiveness of a given wetland to target species. There are foreseeable ways to minimize or avoid negative effects on wetland function:

- Implement only those onsite management practices that do not change the desirable wetland functions. The Phase 1 studies are expected to develop measures to reduce methylmercury discharges and resulting bioaccumulation while still optimizing management of the wetlands as habitat for desired species.
- Reduce upstream methylmercury sources and/or sources of mercury-contaminated sediment that supply the wetland sites in that subarea and/or participate in an offset program (if one is approved by the Central Valley and State Water Boards and USEPA; see Section 4.3.9).

In the absence of an offset program, and if the Phase 1 studies indicate that it is not feasible for wetlands in the Delta/Yolo Bypass to achieve their subarea allocations without affecting desirable wetland functions, then the Central Valley Water Board could adjust the allocation strategy so that greater reductions were required from other methylmercury source types within a given subarea and its upstream watershed that have feasible methylmercury reduction methods. However, there are a couple scenarios under which re-allocation of source controls may not be adequate to achieve the proposed fish tissue objectives:

- Wetlands may be a substantial source of methylmercury, for which other feasible source controls may not be able to compensate. It is conceivable that the proposed fish tissue objectives may not be achievable in some areas of the Delta/Yolo Bypass if methylmercury discharges from wetlands are not substantially reduced.
- Restored wetlands may have the potential to create an attractive nuisance if they generate methylmercury that is locally bioaccumulated to unsafe levels by the fish and wildlife species attracted to the wetland.

Fish tissue mercury levels – especially in the Yolo Bypass and Cosumnes/Mokelumne subareas – greatly exceed safe levels established by USFWS for the protection of wildlife species that consume fish, such as the special-status California least tern. One of the goals of the proposed Basin Plan amendments is to control methylmercury such that its threat to wildlife is reduced. As a result, some existing managed wetland sites and proposed restoration projects may need to modify their management practices to avoid becoming an attractive nuisance, even if such modifications alter the function of the habitat.

If it is necessary to implement methylmercury management practices that alter the function of existing wetlands, it may be possible to compensate for that alteration by constructing mitigation wetlands away from mercury-contaminated areas or areas that are not otherwise impaired by methylmercury (e.g., possibly the Central Delta and other Delta and tributary areas not affected by major mercury-contaminated sediment inputs). However, it is conceivable that some existing wetland habitats may support special-status species that are endemic to a particular area of the Delta and as a result mitigation habitat constructed elsewhere would not be an adequate replacement.

As noted earlier, it is anticipated that methylmercury management practices would be implemented only at those wetland sites that act as substantial sources of methylmercury to those Delta/Yolo Bypass subareas, and that only a fraction of those, if any, would require the implementation of methylmercury management practices that have the potential to result in unavoidable impacts to habitat sites that support an endemic species. If wetland and floodplain habitats were evenly distributed across the Delta and Yolo Bypass, there would be little chance for substantial or otherwise cumulative impacts to endemic species. However, more than half of all wetlands in the Delta/Yolo Bypass occur in the central Yolo Bypass area. In addition, when the Fremont, Sacramento and Cache Creek Settling Basin weirs spill, the Yolo Bypass itself acts as a massive floodplain that, along with the Sutter Bypass to the north, provides important spawning habitat for Sacramento splittail (Moyle, 2002). Further, most of the Yolo Bypass wetlands are seasonal; the ambient water methylmercury levels in the Yolo Bypass will require substantial reductions (~80%) to achieve safe fish mercury levels; and the bypass receives direct inputs from the Cache Creek, Putah Creek and Feather River watersheds, which are major sources of mercury-contaminated sediment.

As a result, achieving safe fish mercury levels in the Yolo Bypass may require both very aggressive total mercury and methylmercury source reductions in the tributary watersheds and potentially widespread implementation of methylmercury management practices in the Yolo Bypass, which increases the potential for significant local and cumulative adverse effects to aquatic habitats that support endemic species such as Sacramento splittail in the Yolo Bypass. Until the proposed Phase 1 control studies have been completed, it is not possible to know whether the wetlands that act as substantial methylmercury sources in the Yolo Bypass also provide critical habitat to endemic species, and whether it will be possible to mitigate any potential impact to less than significant levels.

It is expected that, in general, potentially cumulative adverse impacts to existing wetlands throughout other areas of the Delta region could be mitigated to less than significant levels through careful site evaluation and selection of methylmercury management practices.

7.4 Economic Factors

As noted at the beginning of Section 4.3 in Chapter 4, Public Resources Code Section 21159 requires that economic factors be part of this environmental analysis. Economic factors are not included on the Environmental Checklist because this requirement is specific to just a few state agencies such as the State and Regional Water Boards, the Air Resources Board, and the Department of Toxic Substances Control.

As summarized in Section 4.4.2 and detailed in Appendix C, the potential costs of complying with requirements for studies, monitoring and implementation actions are substantial. The 2008-2009 Stakeholder Process participants identified the following potential economic impacts that could result from the estimated methylmercury study and management costs that may be associated with complying with the proposed Basin Plan amendments:

- Additional financial burden on growers could result in agricultural land being taken out of production. Because nearly all of the agricultural land in the Delta is considered Prime Farmland (see Section II in Section 7.3), this is of particular concern.
- For wetland restoration and management projects already underway with fixed budgets, methylmercury study and management costs could result in less wetland acreage being actively managed or restored.
- Municipalities may need to decrease other services in order to shift financial resources towards conducting studies and implementing additional best management practices and source controls to reduce mercury discharges.

The proposed Basin Plan amendments (the Project) incorporate several components that may enable parties responsible for conducting studies and implementing monitoring and control actions to minimize economic impacts:

- The proposed amendments incorporate a phased, adaptive management approach for the implementation of the proposed Delta mercury control program that includes evaluating additional information as it becomes available and adapting the control program so that effective and efficient actions can be taken that minimize the potential for adverse environmental and economic effects. The proposed amendments include language that commits the Board to conducting a "Delta Mercury Control Program Review" after the Phase 1 studies are completed and TMDL control programs for the major tributary inputs are developed. The Program Review includes assessing:
- The effectiveness, costs, potential environmental effects, and technical and economic feasibility of potential methylmercury control methods;
- Whether implementation of some control methods would have negative impacts on other project or activity benefits;
- Methods that can be employed to minimize or avoid potentially significant negative impacts that may result from control methods;
- Implementation plans and schedules proposed by the dischargers; and
- Whether methylmercury allocations can be attained.

  As part of the Program Review, the Board could consider modifications to the Delta mercury control program, including potential modifications of the allocations so that sources without feasible and reasonable methylmercury control methods may have their allocations adjusted to a feasible level, and sources that can more readily implement feasible and reasonable methylmercury control methods may be required to make greater reductions.

- The proposed amendments include specific language that allows dischargers to conduct control studies using a stakeholder group approach or other collaborative mechanism, instead of requiring individual studies.
- The proposed amendments assign subarea allocations for nonpoint discharges (e.g., irrigated agriculture and wetlands) rather than individual allocations. This allows dischargers within each subarea that needs methylmercury reductions to comply with subarea allocations to focus methylmercury reduction efforts on discharges for which reasonable management practices are possible. That is, dischargers would be able to choose approaches appropriate to wetlands, crops and fields that will minimize costs and

allow them to continue desired activities while achieving and maintaining the proposed methylmercury allocations. The subarea allocations do not require that every individual grower or wetland manager implement methylmercury management practices.

- The proposed amendments include specific language that allows pilot offset projects to be developed and includes a schedule for the development of a long-term mercury (inorganic and/or methyl) offsets program with an overall objective of providing more flexibility than the current regulatory system provides to improve the environment while meeting regulatory requirements (i.e., load and wasteload allocations) at a lower overall cost.

However, as noted in previous sections, the Central Valley Water Board does not specify the actual means of compliance by which responsible entities (e.g., dischargers, government, nonprofit, and private agencies, or other persons responsible for total mercury and/or methylmercury sources) choose to comply with the proposed Basin Plan amendments. Nonetheless, dischargers can choose to minimize potential economic impacts by the following means:

- Study costs can be decreased if dischargers develop coordinated and collaborative study plans.
- Implementation costs can be decreased if:
    - Entities responsible for meeting subarea methylmercury allocations collaboratively focus implementation efforts on sources with the most feasible methylmercury reduction measures (i.e., measures that are cost effective and do not have significant environmental impacts) within each subarea; and
    - Entities responsible for both meeting both waste load and load allocations help develop and participate in an offset program.

In addition, the proposed Basin Plan amendments include the commitment for the Board to re-consider the allocations based on an assessment of the economic feasibility of potential methylmercury control methods identified by the Phase 1 control studies. Modification of the allocations during the Phase 1 Program Review could minimize potential economic impacts.

Study, monitoring and implementation costs also could be mitigated by financing from a variety of different sources:

- Developing a project for consideration as a Supplemental Environmental Project;
- State or federal grants or low-interest loan programs;
- Single-purpose appropriations from federal or State legislative bodies;
- Bonded indebtedness or loans from governmental institutions;
- Surcharge on water deliveries to lands contributing to a methylmercury or total mercury discharge;
- Ad Valorem tax on lands contributing to a methylmercury or total mercury discharge;
- Taxes and fees levied by a water district created for the purpose of drainage management; and
- U.S.D.A. Agricultural Stabilization and Conservation Service.

Regardless of the availability of funding sources, parties identified in the Basin Plan as responsible for studies and implementation actions to comply with allocations must comply with the Basin Plan requirements. Measures have been incorporated in the proposed Basin Plan amendments to provide options that could lessen significant economic impacts. However, the Board does not specify the actual means of compliance by which responsible entities choose to comply with the proposed Basin Plan amendments. In addition, because there are substantial costs associated with the studies and implementation actions, it is conceivable that there could be potentially significant impacts to some biological (e.g., wetlands) and agricultural resources and utilities and service systems if additional sources of funding are not obtained.

Nonetheless, while complying with the proposed Project may result in increases in expenditures associated with conducting studies, installing and maintaining mercury controls and long-term monitoring, any increase is expected to be outweighed by the resulting overall improvement in water quality and protection of human health. In addition, to the extent that these costs may be new costs for the implementing agencies, the costs of mercury-impaired waterways are already being borne by downstream communities and ecosystems. It is reasonable to require municipal agencies and other dischargers to address pollutants generated locally within their jurisdictions that otherwise ultimately burden downstream communities.

7.5 Statement of Overriding Considerations

The proposed Basin Plan amendments (the Project) include exposure reduction and mercury control programs for the Delta that incorporate a phased, adaptive management approach that evaluates additional information as it becomes available and adapts the exposure reduction and control programs so that effective and efficient actions can be taken that minimize the potential for adverse environmental effects. Nonetheless, unavoidable adverse environmental effects may result from implementation of the proposed control program. The majority of these effects can be mitigated to less than significant levels, but mitigation measures lie within the jurisdiction of agencies implementing site-specific projects.

The Central Valley Water Board staff has evaluated the environmental and other benefits of this proposed mercury control program against the potentially unavoidable environmental risks in determining whether to recommend that the Central Valley Water Board approve this Project. Upon review of the environmental information generated for this Project and in view of the entire record supporting this Project, staff recommends that the Central Valley Water Board conclude that the specific environmental and other benefits of this proposed Project outweigh the potentially unavoidable adverse environmental effects, and that such adverse environmental effects are acceptable under the circumstances in order to protect the health of wildlife and humans who consume contaminated Delta fish. The available environmental information documented in this staff report supports such a finding.

Having a fishery with mercury-contaminated fish is an environmental justice and tribal concern. There are people in the Delta who consume local fish because of need or custom, or to supplement their diet. Mercury is a toxicant that can have lasting effects on the neurological development and abilities of persons exposed *in utero* and as children. Studies of people exposed to methylmercury through consumption of fish by their mothers and/or themselves showed deficits in memory, attention, language, fine motor control and visual-spatial perception that can be translated to decrements in intelligence quotient (IQ) (NRC, 2000; Trasande *et al.*, 2005). Under existing Delta conditions, consumption of some Delta fish species more than one or two times per month may cause adverse health effects, which affects peoples' livelihoods and standard of living.

The Delta fishery is a valuable resource (see Section 2.3). Although it is difficult to estimate the economic value of the Delta fishery, the Delta Protection Commission produced an economic report for the Delta in which expenditure estimates were calculated for recreational activities, including fishing, for the local economy in 1994. According to the report, anglers on average spent an estimated 186 million dollars inside the Delta and an estimated 206 million dollars outside of the Delta due to sport-fishing activities in the Delta (Goldman *et al.*, 1998).

The implementation of the proposed Basin Plan amendments will result in overall improvement in water quality in the waters of the Delta region and will have significant positive impacts to the environment over the long term by enabling humans and wildlife to safely consume Delta fish. Beneficial uses of the Delta that are impaired due to elevated methylmercury levels in fish are consumption of fish and aquatic organisms by humans and wildlife species. Phases 1 and 2 of the mercury control program described by the proposed Basin Plan amendments are the primary steps required to fully protect these beneficial uses. Fully achieving these beneficial uses will have positive health benefits and social and economic effects by decreasing the exposure of methylmercury to humans. In addition, habitat carries a significant non-market economic value. Enhancement of habitat beneficial uses will not only be beneficial to wildlife species that consume Delta fish, but it also will have positive indirect economic and social benefits.

Specific projects employed to implement the proposed Basin Plan amendments may have the potential for significant environmental impacts, but these impacts, with two exceptions discussed below, are expected to be mitigated to less than significant levels through careful planning, design, and implementation. This staff report and environmental analysis provide the necessary information pursuant to Public Resources Code Section 21159 to conclude that properly designed and implemented mercury control projects should mitigate and generally avoid foreseeable significant adverse effects on the environment. Potential impacts can be mitigated at the subsequent project level when site-specific projects are identified and evaluated. The Central Valley Water Board does not have legal authority to specify the manner of compliance with its orders (CWC §13360), and thus cannot specify particular implementation projects nor dictate that specific mitigation measures be implemented by any particular project. Project selection and mitigation measures are all within the jurisdiction and authority of the entities that will be responsible for implementing the Basin Plan amendments, and those entities can and should employ mitigation measures as necessary to reduce any impacts as much as feasible (14 CCR §15091(a)(2)). These mitigation measures in most cases are routine measures to ease the expected and routine impacts attendant with ordinary construction projects.

Actions needed to achieve fish mercury levels in the Yolo Bypass that are safe for wildlife and humans who consume the fish have the potential to impact wetland habitat that may support endemic species with limited geographic ranges. Until the proposed Phase 1 studies have been completed, it is not possible to know whether wetlands that act as substantial methylmercury sources in the Yolo Bypass also provide critical habitat to endemic species, and whether it will be possible to mitigate all potential impacts to less than significant levels. Potential impacts to such habitat in the Yolo Bypass would be reduced to the extent feasible by:

- Performing aggressive total mercury and methylmercury source reductions in the upstream tributary watersheds, particularly the Cache Creek Settling Basin; and
- Prioritizing implementation efforts such that they focus on (a) management practices that do not change desirable wetland functions and (b) wetlands that do not support geographically-limited endemic species. Implementing methylmercury management practices that would alter the function of wetlands that support endemic species with a limited geographic range would be considered only if other actions were not able to achieve fish mercury levels that are protective of wildlife.

In addition, the potential costs of complying with requirements for studies, monitoring and implementation actions are substantial. It is conceivable that there could be potentially significant economic impacts to some biological resources (e.g., wetlands), agricultural resources and utilities and service systems if additional sources of funding are not obtained. Until the proposed Phase 1 studies and Phase 1 Program Review have been completed, it is not possible to know whether it will be possible to mitigate all potential economic impacts to less than significant levels. Potential economic impacts would be reduced if:

- Dischargers develop and implement coordinated and collaborative study plans.
- Entities responsible for meeting subarea methylmercury allocations collaboratively focus implementation efforts on nonpoint sources with the most feasible methylmercury reduction measures (i.e., measures that are cost effective and do not have significant environmental impacts) within each subarea.
- Dischargers help develop and participate in an offset program.
- Dischargers obtain financing from sources such as state and federal grants and low-interest loan programs and imposed administrative civil liabilities projects consistent with Supplemental Environmental Project policies.
- As part of the Phase 1 Program Review, the Board re-considers the allocations based on an assessment of the economic feasibility of potential methylmercury control methods identified by the Phase 1 control studies and modifies the allocations as appropriate to require sources that can more readily implement feasible and reasonable methylmercury control methods to make greater reductions and adjust allocations for sources with few or no feasible and reasonable methylmercury control methods.

Implementation of the proposed Project is both necessary and beneficial. If there were no project, the Delta fish tissue impairment would remain and likely worsen. Substantial population growth, extensive wetland restoration projects, and changes in water management practices are anticipated during the next twenty years and could cause Delta fish mercury levels to increase, placing more humans and wildlife that consume Delta fish at risk.

7.6 Staff Determination

On the basis of this evaluation and staff report, which collectively provide the required information:

☐ The proposed project COULD NOT have a significant effect on the environment, and, therefore, no alternatives or mitigation measures are proposed.

☒ The proposed project MAY have a significant or potentially significant effect on the environment, and therefore alternatives and mitigation measures have been evaluated.

PAMELA C. CREEDON, Executive Officer
Central Valley Regional Water Quality Control Board

DATE

Note: Authority cited: Public Resources Code Sections 21083 and 21087
Reference: Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.3, 21093, 21094, 21151; *Sundstrom v. County of Mendocino*, 202 Cal.App.3d 296 (1988); *Leonoff v. Monterey Board of Supervisors*, 222 Cal.App.3d 1337 (1990).

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8 PUBLIC PARTICIPATION & AGENCY CONSULTATION

8.1 2005-2008 Delta Methylmercury TMDL Public Participation Process

Staff sought public participation throughout the development of the proposed Basin Plan amendments through the following means:

- Notices of the public and Board workshops and availability of reports were mailed electronically and/or by postal system to more than 800 persons or entities. Interested persons contacted staff or responded through the Central Valley Water Board's website to be placed on the mailing list.
- Notices were also distributed through the email lists of groups interested in mercury issues, including the Delta Tributaries Mercury Council and Sacramento River Watershed Program.
- Staff reports and comment letters were posted on the Central Valley Water Board website. Paper copies of reports and electronic databases were provided upon request.
- Notices of public and Board workshops and hearings were placed in local papers at least 45 days prior to the event.
- Beginning in September 2008, staff worked with the California State University Sacramento's Center for Collaborative Policy (CCP) to conduct a facilitated stakeholder process that included meetings and detailed discussion with stakeholders of the proposed Basin Plan amendment text and control program.

Staff has held a CEQA scoping meeting, two public workshops, two Board workshops, one public hearing before the Board, and numerous stakeholder meetings to receive comments and information from local, state and federal agencies, dischargers, and other stakeholders during the preparation of the proposed Basin Plan amendments, and has received and responded to comments from scientific peer reviewers contracted by the State Water Board. In addition, many stakeholders submitted written comments on the various draft staff reports. Table 8.1 describes the timeline for obtaining input from the public, starting with release of the first draft technical TMDL Report.

Staff also sought input from the scientific community beyond the State Water Board's scientific peer review process. Staff gave oral and poster presentations about the TMDL and implementation alternatives at numerous conferences, including the 14th Annual NorCal SETAC annual meeting (May 2004), Seventh Biennial State of the Estuary Conference (October 2005), National Water Quality Monitoring Council's Fifth National Monitoring Conference (May 2006), and San Francisco Bay Mercury Coordination Meeting (February 2007). In addition, staff contracted with University of California, Davis, researchers to review the statistical methods for evaluating tributary total mercury and suspended sediment loads and their confidence intervals and subsequently updated the total mercury and sediment source analyses. Also, staff has prepared a framework for a technical advisory committee (TAC) to evaluate the proposed Phase 1 methylmercury control studies. The framework provides a preliminary outline for the charge of the TAC members, TAC qualifications, and expected work products. Staff will work with the Delta Stakeholder Group, State Water Board and USEPA to form and fund a TAC.

Staff has revised substantial portions of the proposed Basin Plan amendment language based on written and verbal comments and data provided by the scientific peer reviewers, state and federal agency staff, formal stakeholder process, and numerous other stakeholders throughout the TMDL development and Basin Planning process. Comments and information provided by the public have been very valuable in developing Basin Plan amendments.

Table 8.1: Timeline for Public Participation in the Basin Plan Amendment Process

August 2005	A technical mercury TMDL report for the Delta was submitted to the USEPA and posted on the Central Valley Water Board website. The technical TMDL described the rationale for fish tissue objective alternatives, provided data and calculations for total mercury and methylmercury load estimates and methylmercury allocations, and included a preliminary outline for how the methylmercury allocations could be implemented. The State Water Board remanded the San Francisco Bay mercury TMDL that was approved by the San Francisco Bay Water Board in August 2004 and required, among other things, provisions for limiting total mercury discharges and evaluating methylmercury discharges. Recent research (including Delta-specific research) has highlighted the importance of biotic exposure to aqueous methylmercury. Since the remand, staff from the two Regional Water Boards and State Water Board had numerous discussions about consistency between the two regions with respect to total mercury versus methylmercury concerns and selection of water quality objectives.
September 2005	Staff held a CEQA scoping workshop on 29 September 2005 to review potential environmental impacts that could be associated with a Delta mercury control program and to identify a range of implementation alternatives.
November 2005	Staff held a Central Valley Water Board workshop on 28 November 2005 that included stakeholder panel presentations to discuss the technical TMDL, a range of potential implementation alternatives, and the schedule for amendment development.
June 2006	Draft TMDL/Basin Plan amendment staff reports were forwarded to scientific peer reviewers and made available for public review. The cover letters to the peer reviewers and attached reports were posted on the Central Valley Water Board website and are attached to this report (Appendix D). These reports built upon the 2005 technical TMDL and included options and alternatives for an implementation plan. The proposed implementation plan incorporated elements that directly reflected input received from stakeholders. Written comments received on the draft TMDL/Basin Plan amendment staff reports were posted to the Central Valley Water Board and evaluated during the development of the next draft of the report.
July 2006 to February 2008	Staff met with numerous agencies, dischargers, and stakeholder groups to obtain feedback on the June 2006 draft TMDL/Basin Plan staff report and proposed Basin Plan amendments. Staff had meetings and conference calls with, or written comments from representatives from the following groups: - California Department of Public Health & representatives of Delta fish consumers - California Department of Water Resources - California Rice Commission - CalFed staff - Central Valley Clean Water Association - Central Valley Joint Venture Group - Clean Water Action - Delta Tributaries Mercury Council / Sacramento River Watershed Program - Delta Protection Commission - Delta Protection Commission - Delta Mercury TMDL Collaborative

Table 8.1: Timeline for Public Participation in the Basin Plan Amendment Process

	- Ducks Unlimited - Fish Mercury Project[57] Steering Committee - Local Stakeholder Advisory Group[58] - Mercury Working Group[59] - Northern California Water Association - Sacramento Valley Water Quality Coalition - Northern Section of the Sacramento Valley California Water Environment Association - Sacramento Stormwater Quality Partnership - Sacramento Regional County Sanitation District - San Joaquin-Delta Water Quality Coalition - Sierra-Trinity Abandoned Mine Lands Agency Group - State and federal wetland managers - State Water Board Division of Water Rights - Stockton MS4 Permittees - The Nature Conservancy - U.S. Army Corps of Engineers - U.S. Bureau of Reclamation - USEPA Region 9 Water Division (Dredging & Sediment Management Team and San Francisco Bay and Central Valley Regional TMDL Liaisons) and Superfund Emergency Response Program - Water Education Foundation - Wetlands interests in the Yolo Bypass and other wetland groups/managers
August to September 2006	Staff received scientific peer review comments on the draft TMDL/Basin Plan amendment reports (Appendix E) in August and September 2006. One peer reviewer did not directly address the questions outlined in the cover letters; as a result, staff requested and received additional review from that reviewer. The follow-up comments were received in September 2006. Staff prepared responses to written comments provided by the scientific peer reviewers (Appendix F). In response to comments and concerns expressed by the scientific peer reviewers and stakeholders during the before-mentioned stakeholder meetings, staff researched publicly available information to compile a database that describes the characteristics and management costs associated with existing managed wetland areas as well as completed, in-progress and anticipated habitat restoration efforts in the Sacramento-San Joaquin Delta Estuary and its upstream watersheds. Staff used the database to improve staff recommendations for Basin Plan amendment requirements for methylmercury control studies for Delta and Yolo Bypass wetlands. The database may be used in the future to enable state and federal agency staff, public and private habitat managers and wetland project proponents to collaborate on methylmercury control studies. Information request letters to wetland managers and the resulting database are provided online.
September 2006	After scientific peer review comments were received, staff presented the Basin Plan recommendations and supporting analyses at staff workshops in Sacramento and Stockton on the 18th and 19th of September 2006, respectively, to (1) obtain further stakeholder input, particularly from groups not heard from previously, and (2) provide a forum where the different stakeholders could directly learn each others' concerns.

[57] The Fish Mercury Project is a CalFed-funded project to monitor sport fish, conduct outreach, and develop fish consumption advisories in the Central Valley.

[58] The Local Stakeholder Advisory Group conducts public outreach and provides guidance to CDHS.

[59] A multi-stakeholder group that gathered to discuss concerns related to wetlands, irrigated agriculture, wastewater treatment, urban stormwater, dredging, and water management.

Table 8.1: Timeline for Public Participation in the Basin Plan Amendment Process

February 2007	Staff revised their recommendations for a Basin Plan amendment after considering comments and other information provided by the scientific peer reviewers, stakeholder meeting and workshop participants, and written comments from public reviewers. Staff made the revised amendment language recommendations available on the Board website for public review before the Board Workshop scheduled for March 2007. Six entities submitted written comments for the February 2007 amendment draft, which staff posted to the Board website.
March 2007	Staff coordinated a Central Valley Water Board Workshop on 16 March 2007 at the Board's office in Sacramento. Staff gave a slide presentation that summarized staff recommendations and remaining concerns. Panels of private and non-profit stakeholder groups and agencies provided oral summaries of their comments and concerns directly to the Board. The workshop lasted six hours, encompassing staff's presentation, panelist presentations, public comments, and ongoing questions and comments from the Board members addressed to the staff, panelists and other stakeholders. A 230-page workshop transcript was prepared by a court reporter and was added to the Administrative Record.
March 2007 to February 2008	Staff met with concerned stakeholders to discuss Cache Creek Settling Basin improvements, effects of the proposed program on wetlands restoration, and potential for an offset program. Staff revised the June 2006 draft TMDL and Basin Plan staff reports and proposed Basin Plan amendments based on comments made during the March 2007 Board Workshop; additional agency and stakeholder review of the February 2007 draft Basin Plan amendments; and staff's response to scientific peer review and stakeholder comments. To the reports, staff added the CEQA environmental analysis and cost estimates for every program element. Staff posted the revised February 2008 versions of the draft TMDL and Basin Plan staff reports and proposed amendments for public review on the Board website and mailed a notice of the availability of report electronically and/or by postal system to more than 800 persons or entities.
March to April 2008	Staff reviewed 16 written comment letters that the Board received regarding the February 2008 draft Basin Plan amendments and staff reports and posted them on the website. The letters represented a variety of interests, including state and federal agencies, environmental justice, wastewater treatment, urban stormwater, irrigated agriculture, and Delta habitat protection. Staff reviewed all comments and prepared general responses for presentation at the April hearing.
April 2008	The Central Valley Water Board opened the hearing for the Delta methylmercury TMDL and Basin Plan amendments and received staff's presentation and public testimony. In its presentation, staff highlighted comments that it had received but had not incorporated into the proposed Basin Plan amendment. Some stakeholders had proposed significant changes to the control program. Staff presented these comments to the Board as five "outstanding policy questions", including whether the program should focus on inorganic mercury. Staff also presented six possible changes to the draft Basin Plan amendments stemming from comments made on the February 2008 versions. At the hearing, various stakeholders voiced concerns about the achievability of the methylmercury allocations and fish tissue objectives. The Board directed staff to work through a stakeholder process to resolve stakeholders' concerns.
April 2008 to January 2010	Staff conducted a facilitated stakeholder process with the assistance of CCP. Starting in December 2008, there were 13 large Stakeholder Group meetings and numerous smaller workgroup meetings. Details and outcomes of the process are provided in Section 8.2.
December 2009	Staff placed the draft Basin Plan amendments worked on by the formal Stakeholder Group on the Central Valley Water Board's website and informed all stakeholders of its availability via the large email subscription list. Stakeholders had the opportunity to review the document prior to the January 2010 Stakeholder Group meeting.
February 2010	Staff released the Public Draft Basin Plan amendments and February 2010 draft TMDL and Basin Plan Amendment Staff Reports for public review and formal comment. Staff issued the Notice of Public Hearing, which described the availability of the draft documents and the start of the 45-day public comment period.
April 2010	Central Valley Water Board public hearing.

8.2 2008-2009 Delta Methylmercury TMDL Stakeholder Process

At the April 2008 hearing, Central Valley Water Board members directed staff to work with stakeholders to resolve stakeholders' concerns about the Delta methylmercury control program. Staff worked with CCP to conduct a facilitated stakeholder process. In summer 2008, a freeze on State contracts delayed the start of the stakeholder process. In November and December 2008, CCP interviewed about 60 Delta stakeholders to develop an understanding of the range of perspectives on the methylmercury program. Stakeholder meetings began in December 2008. Discussions with stakeholders occurred in general Stakeholder Group meetings, which occurred approximately monthly, and in smaller workgroups. The general Stakeholder Group meetings attracted 30 to 60 participants at each meeting. Meetings were held in Rancho Cordova, Sacramento, Stockton, and Davis and always had the option of attendance by conference call and Internet. Notice of meetings was provided by email to the Board's list of parties interested in the Delta TMDL (>800 email list subscribers) and on the Board's website.

Topics at the stakeholder meetings included: changes to the draft Basin Plan amendment language, "Guiding Principles for a methylmercury control program, scientific background, and approaches for further development of the program after the Basin Plan amendments are approved. The Guiding Principles developed by the Stakeholder Group are given in Chapter 1.

Workgroups were created to address issues that needed more detailed discussion than was possible in the large Stakeholder Group meetings. Participation in workgroups was open to all stakeholders. Topics addressed by workgroups included specific mercury program requirements for point and nonpoint dischargers and coordination with existing requirements, offset program options, and how to incorporate adaptive management into the program). Workgroup discussions and recommendations were presented in the larger Stakeholder Group meetings.

The facilitated 2008-2009 stakeholder process was funded by the Central Valley Water Board and voluntary contributions from some stakeholders. Some stakeholders also provided in-kind contributions, such as meeting space and workgroup meeting organization. Stakeholders who contributed to the process did not receive preferential treatment or consideration.

Meeting summaries, documents and presentations, and attendance lists for all Stakeholder Group meetings are available on the Central Valley Water Board's website: http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/stakeholder_meetings/. Due to a lack of resources, meeting summaries for workgroup meetings were generally not prepared.

Formal Stakeholder Group

In April 2009, staff and CCP provided the Board with a progress report on the Stakeholder Process. CCP recommended that the Board continue the Stakeholder Process. CCP also recommended that the Board implement a more formalized, representative approach for the Stakeholder Group with seated spokespersons representing various interests. Spokespersons would be asked to commit to participation in meetings and to communicate with other stakeholders with similar interests. All stakeholders could participate in meetings, but voting, if it occurred, would be done by members of the seated Stakeholder Group. Board members agreed with continuing the process using the “formalized” approach.

CCP and Central Valley Water Board management identified 23 categories of Delta stakeholder interests to be represented by a possible 35 members in the “Seated Stakeholder Group”. Interests to be represented included regional wastewater treatment, habitat conservation, environmental justice, public health advocates, agriculture, stormwater treatment, Delta county governments, environmental advocates, and state and federal agencies with various roles in the Delta.

In June 2009, Executive Officer Creedon sent letters to selected stakeholders, inviting them to participate in the Seated Stakeholder Group. The first choices for invitation were stakeholders already active in the Stakeholder Process who could fulfill the proposed seats. For proposed seats that did not have active participants, staff and CCP sought new participants. In October 2009, members of the seated Stakeholder Group adopted a charter to guide decision making, roles, responsibilities, and membership.

The initial plan for seated stakeholders included three seats for environmental justice and fish consumer advocates and creation of an Environmental Justice (EJ) Caucus. The EJ Caucus was envisioned to allow for all interested consumer advocates to meet via conference call between full Stakeholder Group meetings. Environmental justice advocates expressed concern that the stakeholder group had too few environmental justice seats, relative to the various discharger seats. Representatives of Native American Tribes expressed similar concerns. In discussions with these groups, staff and CCP proposed that the number of environmental justice/community organizations and Tribe seats be adaptable to accommodate all Tribe and Delta environmental justice and community organizations who were willing to participate.

Discussion topics and overall participation in the Stakeholder Group meetings were similar before and after identification of the seated stakeholder members. There were active stakeholders who did not become seated members, continued to attend, and commented on the proposed Basin Plan amendments. Through December 2009, the seated Stakeholder Group cast two votes, both related to the charter.

Environmental Justice and Tribe Participation

Staff and CCP sought input in the stakeholder process that encompassed points of view of entities potentially assigned responsibility for mercury reductions and fish consumers. Staff and CCP recognized that maintaining participation by non-profit environmental justice and community organizations, in particular, could be difficult due to resource limitations. As part of the initial stakeholder assessment, CCP contacted eleven non-governmental organizations with environmental justice, fish consumer, Tribal, and/or public health interests and informed them of the process. In April 2009, CCP called these organizations with the intention of starting to organize the EJ Caucus. Initial response in April to CCP’s calls was small. There is no existing coalition or network for Delta community groups and fish consumer advocates, which increased the difficulty of organizing an EJ Caucus for the Stakeholder Group. Due to uncertainty about funding for the stakeholder process, CCP did not again pursue organization of the EJ Caucus until fall 2009. In September 2009, CCP called environmental justice and community organizations to encourage participation. As a result of the September calls, several additional community groups were added to the project email lists. In October and November 2009, Central Valley Water Board management and TMDL staff and CCP held two conference calls with environmental justice and community-based organizations to discuss the draft Basin Plan amendment and the stakeholder process. During the October and November conference calls, representatives of community-based organizations particularly expressed frustration with the lack of funding for their organizations to participate in the process and perform public outreach. They also indicated that exposure reduction programs were desired.

Staff from one environmental/human health advocacy organization has participated actively in the Delta methylmercury TMDL Stakeholder Process. Representatives of Delta community-based organizations attended several stakeholder meetings, but they did not participate regularly. Community organizations said that their participation was limited by time, resources, and inability to attend day-time meetings. As of January 2010, the EJ Caucus did not have an identified membership. Staff will continue to seek input from environmental justice advocates and Delta community-based organizations through individual contacts and group meetings.

Involvement by individual California Indian Tribes in the Stakeholder Process began in October 2009. An environmental health organization dedicated to tribal concerns had previously commented on the draft Basin Plan amendments and was an active participant, starting at the beginning of the stakeholder process. In October 2009, this organization gave staff information about four Native American Tribes interested in the Delta methylmercury TMDL. Staff followed up with a conference call with the four Tribal representatives. At the request of these four Tribes, staff mailed a letter of invitation to all California Tribes (federally- and non-federally recognized) to become involved in the Delta and future, upstream mercury TMDLs. With assistance from the State Water Resources Control Board's Tribal Liaison, staff held an informational meeting with Tribal representatives in November 2009.

Work Products

Staff received detailed comments from stakeholders on the proposed Basin Plan amendments at two times during the stakeholder meeting process. Staff prepared tables containing draft Basin Plan amendment text, all Stakeholder Group participants' comments, staff's responses, and proposed changes to the Basin Plan amendments. Staff incorporated comments from conference calls with Delta environmental justice and community groups and communications with interested Tribes into the second comment/response/amendment revisions table. These tables were emailed to the Water Board's Lyris distribution list for Delta methylmercury TMDL and Basin Plan amendment development and posted on the Board's website. The complete tables are in the Administrative Record.

Stakeholders and Board staff are also creating tools that will help guide implementation activities. Some details of implementation, particularly for the Phase 1 methylmercury control studies, need more flexibility than if placed in the Basin Plan amendment and are still being created with stakeholders. Examples are scientific questions that the studies must answer, an organizational structure so that dischargers can collaborate on studies, and a plan for interaction between dischargers, staff, and a Technical Advisory Committee. CCP proposed a multiple-document approach with regulatory (Basin Plan amendment) and no-regulatory components. The Stakeholder Group and a workgroup are developing an organizational document (currently called the Adaptive Management Plan) and the Control Study Workplan Guidance document. These documents are not included in the April 2010 Basin Plan amendment draft staff report because they are not part of the regulations being considered by the Central Valley Water Board.

Adaptive Management Plan

As noted above, the Stakeholder Group and the *Adaptive Management Plan*Workgroup are developing an organizational, adaptive management approach document currently called the Adaptive Management Plan. The plan is intended to memorialize some of the 2008-2009 Stakeholder Process and associated products as well as provide tools to help coordinate implementation activities, including voluntary offset projects, during Phase 1 of the proposed control program. The adaptive management plan that can be used by dischargers and other stakeholders to develop and implement activities required under Phase 1 of the Delta Mercury Control Program in an effective and efficient manner. The adaptive management plan includes, among other information: guiding principles for the overall Delta Mercury Control Program and for future offset policy, an organizational structure with roles and responsibilities, guidance for the Phase 1 methylmercury control studies and exposure reduction program, and potential funding strategies

Delta Methylmercury Total Maximum Daily Load
Seated Stakeholder Group Participants

In July 2009, the Delta Methylmercury Stakeholder Group began operating under a format of seated stakeholders (representatives) that represented a broad range of viewpoints (see Table 8.2 on the next page). Other stakeholders continued to participate and provide input. Complete attendance lists for the Stakeholder Group meetings are available on the Central Valley Water Board's website.

The following groups were invited to participate as seated representatives, but either declined or did not participate: Environmental Justice Coalition for Water, and Delta Five Counties Coalition (county government). US Army Corps of Engineers (USACE) did not accept the formal invitation but continued to participate in the stakeholder meetings. The California Indian Environmental Alliance also participated actively. CDFG CalFed staff was invited to participate but were unable to attend the meetings.

Stakeholder entities that initially committed to participating with seated membership but did not continue to actively participate in the Seated Stakeholder Group were: the Port of Sacramento, California Sportfishing Protection Alliance and Reservoir Utility Managers (represented by Pacific Gas and Electric Company).

Table 8.2: Seated Stakeholder Group Participants

Stakeholder Type	Representative
Wastewater Treatment Plants	Central Valley Clean Water Association City of Vacaville Sacramento Regional County Sanitation District
Private Habitat Conservation Advocates	Ducks Unlimited The Nature Conservancy
Delta Dredging	Port of Stockton [one unfilled seat]
Environmental Justice	Initially 3 seats to be filled from Environmental Justice Caucus. Expanded in October 2009 to allow all groups willing to participate in process. In Oct-Nov 2009, 7 groups participated in various meetings.
Environmental and Public Health Advocates	Clean Water Action [one unfilled seat]
Public Health Agencies	[one-two unfilled seats]
Regional Watershed Issues	Tuleyome/Sierra Club-Yolano Group
Regional Agriculture	California Rice Commission California Farm Bureau Northern California Water Association
Delta Agriculture	South Delta Water Agency
Regional Stormwater Agencies	Sacramento Urban Area Stockton Urban Area
Delta Environmental Advocates	Restore the Delta (began participating Nov. 2009)
California Department of Fish and Game (DFG), Bay Delta Region	DFG Bay Delta Region staff person
California Central Valley Flood Protection Board	Central Valley Flood Protection Board staff person
California Department of Water Resources (DWR), Division of Environmental Services	DWR Division of Environmental Services staff person
California Department of Water Resources (DWR), Division of Flood Management	DWR Division of Flood Management staff person
California State Lands Commission	California State Lands Commission staff person
Central Valley Water Board	Executive Officer Mercury TMDL Unit staff person
USEPA Region 9	USEPA Region 9 staff person
US Fish and Wildlife Service	US Fish and Wildlife Service staff person
Bay Delta Conservation Plan	DWR technical staff person for BDCP
California Native American Tribes	Four Tribes participating, starting October 2009

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APPENDICES A THROUGH F

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The appendices are available on the Central Valley Water Board website:

http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/delta_hg/